This book replaces the Instruction Books GEI-100332A Rev. 7.5, GEI-100332B Rev.7.6 and GEI-100332G REV. 9.2.0.
The up-to-dating is referred to SW version 9.2XX

These instructions do not purport to cover all details or variations in equipment, nor to provide every possible contingency to be met during installation, operation, and maintenance. If further information is desired or if particular problems arise that are not covered sufficiently for the purchaser’s purpose, the matter should be referred to GE Consumer & Industrial.

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SAFETY SYMBOL LEGEND

**Warning:** Commands attention to an operating procedure, practice, condition, or statement which, if not strictly observed, could result in personal injury or death.

**Caution:** Commands attention to an operating procedure, practice, condition, or statement which, if not strictly observed, could result in damage or destruction of equipment.

**Note:** Commands attention to an operating procedure, practice, condition, or statement that must be highlighted.

BLOCK DIAGRAM LEGEND

**Parameters**

- Ramp +/- delay
- Parameter: 100 ms
- Parameter name: Parameter value

**Variables**

- Variable: T current ref
- Variable: 50%
- Variable name: Variable value
1 - SAFETY PRECAUTIONS - PRECAUTIONS DE SECURITE

ATTENTION!
According to the EEC standards the DV-300 and accessories must be used only after checking that the machine has been produced using those safety devices required by the 89/392/EEC set of rules, as far as the machine industry is concerned.
Drive systems cause mechanical motion. It is the responsibility of the user to insure that any such motion does not result in an unsafe condition. Factory provided interlocks and operating limits should not be bypassed or modified.

WARNING - ELECTRICAL SHOCK AND BURN HAZARD / ATTENTION – DÉCHARGE ÉLECTRIQUE ET RISQUE DE BRÛLURE:
When using instruments such as oscilloscopes to work on live equipment, the oscilloscope’s chassis should be grounded and a differential amplifier input should be used. Care should be used in the selection of probes and leads and in the adjustment of the oscilloscope so that accurate readings may be made. See instrument manufacturer’s instruction book for proper operation and adjustments to the instrument.

WARNING - FIRE AND EXPLOSION HAZARD / ATTENTION – RISQUE D’INCENDIES ET D’EXPLOSIONS:
Fires or explosions might result from mounting Drives in hazardous areas such as locations where flammable or combustible vapors or dusts are present. Drives should be installed away from hazardous areas, even if used with motors suitable for use in these locations.

WARNING - STRAIN HAZARD / ATTENTION À L’ÉLÉVATION:
Improper lifting practices can cause serious or fatal injury. Lift only with adequate equipment and trained personnel.

ATTENTION – CAS DE DÉCHARGE ÉLECTRIQUE:
Drives and motors must be ground connected according to the NEC.

WARNING / ATTENTION:
Replace all covers before applying power to the Drive. Failure to do so may result in death or serious injury.

WARNING / ATTENTION:
Converters are electrical appliances for use in heavy current installations. Parts of the converter are energized during operation. The electrical installation and the opening of the device should therefore only be carried out by qualified personnel. Improper installation of motors or converters may therefore cause the failure of the device as well as serious injury to people or material damage. Follow the instructions given in this manual and observe the local and national safety regulations applicable.

ATTENTION – CAS DE DÉCHARGE ÉLECTRIQUE:
Les convertisseurs sont des dispositifs électriques utilisés dans des installations industrielles. Une partie des drive sont sous tension pendant l’opération. L’installation électrique et l’ouverture des drive devrait être exécuté uniquement par du personnel qualifié. De mauvaises installations de moteurs ou de drive peuvent provoquer des dommages matériels ou blesser des personnes On doit suivir les instructions données dans ce manuel et observer les règles nationales de sécurité.
**WARNING! - POWER SUPPLY AND GROUNDING / ATTENTION! ALIMENTATION PUISSANCE ET MISE À LA TERRE**

In case of a three phase supply not symmetrical to ground, an insulation loss of one of the devices connected to the same network can cause functional problem to the drive, if the use of a wye/delta transformer is avoided.

1. The drives are designed to be powered from standard three phase lines that are electrically symmetrical with respect to ground (TN or TT network).
2. In case of supply with IT network, the use of delta/star transformer is mandatory, with a secondary three phase wiring referred to ground.

Please refer to the following connection sample.

Si le réseau n’est pas équilibré par rapport à la terre et qu’il n’y a pas de transformateur raingle/étoile, une mauvaise isolation d’un appareil électrique connecté au même réseau que le variateur peut lui causer des troubles de fonctionnement.

1. Les variateurs sont prévus pour être alimentés par un réseau triphasé équilibré avec un régime de neutre standard (TN ou TT).
2. Si le régime de neutre est IT, nous vous recommandons d’utiliser un transformateur triangle/étoile avec point milieu ramené à la terre

Vous pouvez trouver ci-après des exemples de câblage.

---

**CAUTION / PRECAUTION:**

Do not connect power supply voltage that exceeds the standard specification voltage fluctuation permissible. If excessive voltage is applied to the Drive, damage to the internal components will result.

Ne pas raccorder de tension d’alimentation dépassant la fluctuation de tension permise par les normes. Dans le cas d’une alimentation en tension excessive, des composants internes peuvent être endommagés.

**CAUTION / PRECAUTION:**

Do not operate the Drive without the ground wire connected. The motor chassis should be grounded to earth through a ground lead separate from all other equipment ground leads to prevent noise coupling.

The grounding connector shall be sized in accordance with the NEC or Canadian Electrical Code. The connection shall be made by a UL listed or CSA certified closed-loop terminal connector sized for the wire gauge involved. The connector is to be fixed using the crimp tool specified by the connector manufacturer.

Ne pas faire fonctionner le drive sans prise de terre. Le chassis du moteur doit être mis à la terre à l’aide d’un connecteur de terre séparé des autres pour éviter le couplage des perturbations. Le connecteur de terre devrait être dimensionné selon la norme NEC ou le Canadian Electrical code. Le raccordement devrait être fait par un connecteur certifié et mentionné à boucle fermé par les normes CSA et UL et dimensionné pour l’épaisseur du cable correspondant. Le connecteur doit être fixé à l’aide d’un instrument de serrage spécifié par le producteur du connecteur.

**CAUTION / PRECAUTION:**

Do not perform a megger test between the Drive terminals or on the control circuit terminals.

Ne pas exécuter un test megger entre les bornes du drive ou entre les bornes du circuit de contrôle.
CAUTION / PRECAUTION:
Because the ambient temperature greatly affects Drive life and reliability, do not install the Drive in any location that exceeds the allowable temperature. Leave the ventilation cover attached for temperatures of 104°F (40°C) or below.

Étant donné que la température ambiante influe sur la vie et la fiabilité du drive, on ne devrait pas installer le drive dans des places où la température permise est dépassée. Laisser le capot de ventilation en place pour températures de 104°F (40°C) ou inférieures.

CAUTION / PRECAUTION:
If the Drive’s Fault Alarm is activated, consult the TROUBLESHOOTING section of this instruction book, and after correcting the problem, resume operation. Do not reset the alarm automatically by external sequence, etc.

Si la Fault Alarm du drive est activée, consulter la section du manuel concernant les défauts et après avoir corrigé l’erreur, reprendre l’opération. Ne pas réinitialiser l’alarme automatiquement par une séquence externe, etc....

CAUTION / PRECAUTION:
Be sure to remove the desicant dryer packet(s) when unpacking the Drive. (If not removed these packets may become lodged in the fan or air passages and cause the Drive to overheat).

Lors du déballage du drive, retirer le sachet déshydraté. (Si celui-ci n'est pas retiré, il empêche la ventilation et provoque une surchauffe du drive).

CAUTION / PRECAUTION:
The Drive must be mounted on a wall that is constructed of heat resistant material. While the Drive is operating, the temperature of the Drive’s cooling fins can rise to a temperature of 194°F (90°C).

Le drive doit être monté sur un mur construit avec des matériaux résistants à la chaleur. Pendant le fonctionnement du drive, la température des ailettes du dissipateur thermique peut arriver à 194°F (90°C).

Note:
The terms “Converters”, “Controller” and “Drive” are sometimes used interchangeably throughout the industry. We will use the term “Drive” in this document.

Les mots “Convertisseur”, “Controller” et “Drive” sont interchangeables dans le domaine industriel. Nous utiliserons dans ce manuel seulement le mot “Drive”.

1. Never open the device or covers while the AC Input power supply is switched on. Wait for at least one minute before working on the terminals or inside the device.

Ne jamais ouvrir l’appareil lorsqu’il est sous tension. Le temps minimum d’attente avant de pouvoir travailler sur les bornes ou bien à l’intérieur de l’drive est de 1 minute.

2. Do not touch or damage any components when handling the device. The changing of the isolation gaps or the removing of the isolation and covers is not permissible. If the front plate has to be removed because of a room temperature higher than 40 degrees, the user has to ensure that no occasional contact with live parts may occur.

Manipuler l’appareil de façon à ne pas toucher ou endommager des parties. Il n’est pas permis de changer les distances d’isolement ou bien d’enlever des matériaux isolants ou des capots. Si la plaque frontale doit être enlevée pour un fonctionnement avec la température de l’environnement plus haute que 40°C, l’utilisateur doit s’assurer, par des moyens opportuns, qu’aucun contact occasionnel ne puisse arriver avec les parties sous tension.

3. Protect the device from impermissible environmental conditions (temperature, humidity, shock etc.)

Protéger l’appareil contre des effets extérieurs non permis (température, humidité, chocs etc.).

4. No voltage should be connected to the output of the converter (terminals C and D). The parallel connection of several motors on a converter output is not permissible.

Aucune tension à la sortie du convertisseur ne peut être appliquée (bornes C et D). Il n’est pas permis d’insérer plus de convertisseurs en parallèle à la sortie ni d’effectuer une connexion directe de l’entrée avec une sortie du convertisseur.
5. When engaging a running motor, the Auto capture function (Auto capture in the ADD SPEED FUNCT menu) must be activated.

Pour reprendre des moteurs en rotation, la fonction suivante doit être activée : “Auto capture” dans le menu ADD SPEED FUNCT.

6. A capacitative load (e.g. phase compensation capacitors) should not be connected to the output of the frequency inverter (terminals C and D).

Aucune charge capacitive ne doit être connectée à la sortie du convertisseur (bornes C et D) (par exemple des condensateurs de mise en phase).

7. Always connect the converter to the protective ground (PE) via the marked connection terminals and the housing. The discharge current to earth ground is greater than 3.5 mA. EN 50178 specifies that with discharge currents greater than 3.5 mA the protective conductor ground connection must be fixed type and doubled for redundancy.

Effectuer toujours des connexions de terre (PE) par le biais des bornes et du chassis. Le courant de dispersion vers la terre est supérieur à 3,5 mA. Selon EN 50178 il faut prévoir dans ces cas une double connexion à terre.

8. The electrical commissioning should only be carried out by qualified personnel, who are also responsible for the provision of a suitable ground connection and a protected power supply feeder in accordance with the local and national regulations. The motor must be protected against overloads.

La mise en service électrique doit être effectuée par un personnel qualifié. Ce dernier est responsable de l’existence d’une connexion de terre adéquate et d’une protection des câbles d’alimentation selon les prescriptions locales et nationales. Le moteur doit être protégé contre la surcharge.

9. No dielectric tests should be carried out on parts of the frequency inverter. A suitable measuring instrument (internal resistance of at least 10 kΩ/V) should be used for measuring the signal voltages.

Il ne faut pas exécuter de tests de rigidité diélectrique sur des parties du convertisseurs. Pour mesurer les tensions, des signaux, il faut utiliser des instruments de mesure appropriés (résistance interne minimale 10 kΩ/V).

10. When the drive is stopped, but it has not been disconnected from the main via the main contactor, it is not possible to exclude the accidental movement of the motor shaft when a failure occurs.

Quand l’actionnement est arrêté, mais non débranché du réseau par le contacteur de réseau, il n’est pas possible d’exclure le mouvement accidentel de l’arbre moteur en cas de panne.

11. The user must provide overload protection for the motor, as indicated in chapter 2.7.1 and Fig. 4.8.2.

L’utilisateur doit effectuer la protection de sur-chARGE du moteur, comme indiqué dans le chapitre 2.7.1 et figure 4.8.2.

**WARNING / ATTENTION:**

The UL listed equipments is suitable for use on a circuit capable of delivering not more than the rms symmetrical amperes, 500 volts maximum, shown in the table below, when protected by special purpose fuses JFHR2, Gould or Bussman, Model n. as in table 4.9.1.1 and 4.9.2.1. Fuses are internally mounted on sizes 770...1050A.

Cet appareil est adapté pour usage sur un circuit en mesure de fournir un courant de t/min symétrique de court-circuit, à un maximum de 500 V, non supérieur aux valeurs spécifiées plus avant, si protégé par des fusibles pour usage spécial JFHR2, Gould ou Bussman, avec n° de modèle comme indiqué dans les tableaux 4.9.1.1 et 4.9.2.1. Les fusibles sont montés de façon interne sur des tailles de 770 à 1050 A.

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<tr>
<td>17 …850 A (American sizes)</td>
<td>100 kA</td>
</tr>
<tr>
<td>20 ... 1050 A (European sizes)</td>
<td>100 kA</td>
</tr>
</tbody>
</table>
2 - DESCRIPTION, COMPONENT IDENTIFICATION AND SPECIFICATIONS

2.1 GENERAL

A converter transforms the constant voltage of an existing three-phase power supply into a direct voltage, in order to regulate the speed and/or the torque of a direct current motor with a separate excitation.

The available DV-300 converters are of two types:
6KDV3...Q2 for a two quadrant functioning
6KDV3...Q4 for a four quadrant functioning

The default version of a converter includes the presence of a power supply circuit for the adjustable field; in this way the motors can operate with a mixed armature or field regulation, without adding other devices.

Each type includes three series of devices, which differ the one from the other because of the max. power supply voltage:
6KDV3...Q2A...; 6KDV3...Q4E... AC input supply voltage up to 400 V, 3Ph
6KDV3...Q2B...; 6KDV3...Q4F... AC input supply voltage up to 500 V, 3Ph
6KDV3...Q2C...; 6KDV3...Q4G... AC input supply voltage up to 690 V, 3Ph

![Base diagram of a converter](image)

- AC input supply voltage: 230 V, 3Ph, 50/60 Hz
  400 V, 3Ph, 50/60 Hz
  460 V, 3Ph, 50/60 Hz
  500 V, 3Ph, 50/60 Hz
  690 V, 3Ph, 50/60 Hz

- Armature converter: Totally controlled three-phase bridge. It converts the alternating voltage into a direct voltage. (Double bridge for 6KDV3...Q4...)

- Field converter: Semi-controlled single-phase bridge
Programmable control section: Control and regulation cards of the power section. Commands, references and feedbacks are connected to them.

Output voltage:
Direct voltage changing from 0 to \( U_{in} \)

Output rated current:
20... 3300 A [for a max. ambient temperature of 104°F (40°C)]

The converters of DV-300 series are available in the following versions:

- 6KDV3...Q4E... Four quadrant converter for AC input voltage up to 400 V
- 6KDV3...Q2A... Two quadrant converter for AC input voltage up to 400 V
- 6KDV3...Q4F... Four quadrant converter for AC input voltage up to 500 V
- 6KDV3...Q2B... Two quadrant converter for AC input voltage up to 500 V
- 6KDV3...Q4G... Four quadrant converter for AC input voltage up to 690 V
- 6KDV3...Q2C... Two quadrant converter for AC input voltage up to 690 V

Sizes above 850A / 1050A (American / European) are listed in Appendix A (GEI-100332C).

The converter choice is made on the basis of the motor rated current and of the available AC input voltage. The output rated current must be higher or equal to the one required by the used motor.

**Note!**
If the motor must operate at greater than rates speed, refer to the motor producer for the mechanical problems which may occur (bearing, unbalance,...). Because of termal problems, this principle is valid also in case of continuous use with a voltage 40% lower than rated or at less than 60% of rated speed (insufficent ventilation, if the motor is not provided with additional ventilation).


**Functions and features (Overview)**

The devices of the DV-300 series are developed as converters with excellent regulation features and a wide function range.

Integrated field converter.
- Galvanic separation and high impedance between the power and the regulation section.
- Galvanic separation between the regulation section and the digital I/O terminals.
- Differential analog inputs.
- Diagnostic LED module (KC) supplied as a standard and mounted on the drive front cover
- Removable optional Keypad (KB)

START UP menu which makes set-up easier.

Simple operation of the device
- via terminal strip
- via keypad with a back-lit keypad
- via a default set PC program and RS485 serial interface
- via a connection with a Field Bus (option), INTERBUS S with a DRIVECOM profile, PROFIBUS DP and GENIUS.

Stored messages concerning the last 10 faults and indication of the operation time.

Separate configuration of the drive behaviour for each message in an alarm situation.

Automatic change into an armature feedback because of the interruption of the speed feedback signal (only in constant torque mode).

Overload control

Three freely configurable analog inputs on the standard device.

Widening of digital inputs and of digital, analog outputs via a option card.

Reference assignment and display of the feedback values as a percentage or in a dimension which can be defined by the user.

Possibility of a speed and torque regulation

Adaptive of the speed regulator

Current predictive regulator with an automatic adaptation.

Motor potentiometer function (increase / decrease speed command).

Jog function.

8 internal speed references.

5 internal linear or S-shaped ramps.

Internal signal conditioning (gains, min/max limits, offset...).

Function widening available for specific applications (option).
2.2 UPON DELIVERY INSPECTION PROCEDURES

Storage, Transport

A high degree of care is taken in packing the converters of the DV-300 series and preparing them for delivery. They should only be transported with suitable transport equipment (see weight data). Observe the instructions printed on the packaging. This also applies when the device is unpacked up to when it is installed in the control cabinet.

On delivery check the following:
- the packaging for any external damage
- whether the delivery note matches your order.

Open the packaging with suitable tools. Check whether
- any parts were damaged during transport
- the device type corresponds to your order

In the event of any damage or of an incomplete or incorrect delivery please notify the sales offices responsible immediately.

The devices should only be stored in dry rooms within the temperature ranges specified.

Note! A certain degree of moisture condensation is permissible if this arises from changes in temperature (see section 3.1, “Permissible Ambient Conditions”) This does not, however, apply when the devices are in operation. Ensure always that there is no moisture condensation in devices that are connected to the power supply!

2.2.1 Device setting

The converters of the DV-300 series can operate connected to an AC input three-phase voltage from 230V to 690V. Inside this voltage range the device setting is carried out on the basis of the motor rated current. Therefore the converter rated current must be higher or the same as the motor rated one.

If an overload is necessary, the setting is carried out according to the example mentioned in section 6.14.5, “Overload control”, so that the overcurrent must not be supplied in a continuative way from the type of the chosen converter.

Note! A reduction factor should be considered if the converter is installed at altitudes of over 3,300 feet (1000 m) above sea level and at higher temperatures (see section 3.1, “Permissible ambient conditions”).
Example for a 10HP motor

AC input voltage: 460 V, 3Ph

Two quadrant functioning

Nameplate data:  
<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP</td>
<td>10</td>
</tr>
<tr>
<td>Armature Voltage</td>
<td>500 VDC</td>
</tr>
<tr>
<td>Armature Current</td>
<td>17.6 Amps</td>
</tr>
<tr>
<td>Field Voltage</td>
<td>300 VDC</td>
</tr>
<tr>
<td>Field Current</td>
<td>1.32 Amps</td>
</tr>
</tbody>
</table>

Choice criteria:  

<table>
<thead>
<tr>
<th>Condition</th>
<th>Range</th>
<th>Table Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>460 V, 3Ph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 A &lt; 17.6 A &lt; 35 A</td>
<td>per table 2.4.3.1: Output current (Armature current)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.32 A &lt; 10 A</td>
<td>per table 2.4.3.1: Output current (Field current)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chosen converter: 6KDV30 35Q2B10A1

The converter can supply 150% rated current for 60 seconds. If higher overload values are required, see section 6.14.5, “Overload control”.

**Note!** See Overload Curves, section 6.14.5, “Overload control”.

---

DV-300 Adjustable Speed Drives

DESCRIPTION, COMPONENT IDENTIFICATION AND SPECIFICATIONS
2.3 DRIVE KEYPAD DESCRIPTION

Keypad

![Keypad image]

The keypad is made of a LCD display with two 16-digit lines and of 8 function buttons.

It is used:
- to command the drive when this system has been selected
- to display the speed, the voltage ..... during the operating time
- to set parameters

LED module KC

In the standard delivery the convert is supplied with the led module mounted on the front cover. It contains six leds for an easy monitoring of the converter status. The KC module can be manually removed and replaced with the Keypad, which is connected to the regulation board through the dedicated connector. On the Keypad, which is supplied as optional, the same leds at the KC module are mounted.
### LEDs

**Table 2.3.1: Keypad LEDs**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Torque</td>
<td>yellow</td>
<td>the LED is lit, when the drive operates with a negative torque (anti-clockwise rotation or clockwise braking). Only for 6KDV3...Q4.</td>
</tr>
<tr>
<td>+ Torque</td>
<td>yellow</td>
<td>the LED is lit, when the drive operates with a positive torque (clockwise rotation or anti-clockwise braking). Braking only for 6KDV3...Q4.</td>
</tr>
<tr>
<td>Alarm</td>
<td>red</td>
<td>the LED is lit, it signals the intervention and the alarm condition</td>
</tr>
<tr>
<td>Enable</td>
<td>green</td>
<td>the LED is lit, when the converter is enabled</td>
</tr>
<tr>
<td>Zero Speed</td>
<td>yellow</td>
<td>the LED is lit, when the motor speed is lower than the threshold set by Speed zero level</td>
</tr>
<tr>
<td>I Limit</td>
<td>yellow</td>
<td>the LED is lit, when the converter operates at a current limit</td>
</tr>
</tbody>
</table>
2.4 SPECIFICATIONS

2.4.1 Standards

General: EN 61800-1, EN 50178.
Climatic conditions: IEC 68-2 part 2 and 3 (EN 60068-2-2, test Bd).
Isolations distances: IEC 664, IEC 664 A; Environment pollution degree 2.
Interference immunity: EN 61000-4-4, Interference immunity level 4
    EN 61000-4-2, Interference immunity level 6 kV CD / 8 kV AD.
Oscillation test: EN 60068-2-6, test Fc.
EMC compatibility: EN 68100-3, see information in “EMC Guidelines”.
Safety: EN 50178.
Protection degree: EN 60529.

2.4.2 AC Input

Table 2.4.2.1: AC input voltages

<table>
<thead>
<tr>
<th>DC Drive series</th>
<th>Power section (U/V/W terminals)</th>
<th>Field circuit (U1/V1 terminals)</th>
<th>Power supply regulation section (U2/V2 terminals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3...Q2A</td>
<td>230 V ±10 %*, 3Ph</td>
<td>230 V ±10 %*, 1Ph</td>
<td>115 V ±15 % **, 1Ph</td>
</tr>
<tr>
<td>6KDV3...Q2B</td>
<td>230 V ±10 %*, 3Ph</td>
<td>400 V ±10 %*, 1Ph</td>
<td>or</td>
</tr>
<tr>
<td>6KDV3...Q4F</td>
<td>230 V ±10 %*, 3Ph</td>
<td>460 V ±10 %, 1Ph</td>
<td>230 V ±15 % **, 1Ph</td>
</tr>
<tr>
<td>6KDV3...Q4E</td>
<td>50/60 Hz ±5 %</td>
<td>50/60 Hz ±5 %</td>
<td></td>
</tr>
</tbody>
</table>

* With the indicated tolerance values the output voltage complies the DIN 40030 standard.
With wider tolerances the max output voltage changes accordingly.

** To work at 115 V with drives from 224 Amps and above a jumper between terminals SA - SB
(placed on the rear size of the drive) must be inserted.
As for 6KDV3...Q2C / Q4G converters see Appendix A (GEI-100332C).

During start-up the threshold for the undervoltage message has to be set via the **Undervolt thr** parameter (standard: 230 V).

**Note!**
According the input voltage the switch S15.7/8 on the regulation board must be set as follows:
- 6KDV3...Q2A; 6KDV3...Q4E: S15.7 = OFF, S15.8 = OFF
- 6KDV3...Q2B; 6KDV3...Q4F: S15.7 = ON, S15.8 = OFF
- 6KDV3...Q2C; 6KDV3...Q4G: S15.7 = OFF, S15.8 = ON

**Note!**
As for the operation of the DV-300 converters AC input reactors and interference suppression filters are required. See section 4.10, “Reactors/Filters”.
The converters above 560 / 770 A (American / European) and the AC input reactors have a discharge currents to ground higher than 3.5 mA. EN 50178 states that beside the ground conductor another ground connection should be laid.

**Caution!**
Due to the increased discharge current involved, a fixed ground connection (without connectors) for the filters of the DV-300 converter is required.

### Table 2.4.2.2: AC input currents

<table>
<thead>
<tr>
<th>American</th>
<th>Current on the American Ac Input</th>
<th>Current on the European AC Input</th>
<th>Current on the field AC Input</th>
<th>Power Supply Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3017...</td>
<td>17.2 A</td>
<td>6KDV3020...</td>
<td>17.2 A</td>
<td>10 A</td>
</tr>
<tr>
<td>6KDV3035...</td>
<td>34.4 A</td>
<td>6KDV3040...</td>
<td>34.4 A</td>
<td>10 A</td>
</tr>
<tr>
<td>6KDV3056...</td>
<td>60.2 A</td>
<td>6KDV3070...</td>
<td>60.2 A</td>
<td>10 A</td>
</tr>
<tr>
<td>6KDV3188...</td>
<td>75.6 A</td>
<td>6KDV3110...</td>
<td>94.6 A</td>
<td>14 A</td>
</tr>
<tr>
<td>6KDV3112...</td>
<td>96.2 A</td>
<td>6KDV3140...</td>
<td>120.4 A</td>
<td>14 A</td>
</tr>
<tr>
<td>6KDV3148...</td>
<td>127.2 A</td>
<td>6KDV3185...</td>
<td>159.1 A</td>
<td>20 A</td>
</tr>
<tr>
<td>6KDV3224...</td>
<td>192.5 A</td>
<td>6KDV3280...</td>
<td>240.8 A</td>
<td>20 A</td>
</tr>
<tr>
<td>6KDV3280...</td>
<td>240.6 A</td>
<td>6KDV3350...</td>
<td>301 A</td>
<td>20 A</td>
</tr>
<tr>
<td>6KDV3336...</td>
<td>288.7 A</td>
<td>6KDV3420...</td>
<td>361.2 A</td>
<td>20 A</td>
</tr>
<tr>
<td>6KDV3400...</td>
<td>343.7 A</td>
<td>6KDV3500...</td>
<td>430 A</td>
<td>20 A</td>
</tr>
<tr>
<td>6KDV3450...</td>
<td>386.7 A</td>
<td>6KDV3650...</td>
<td>559 A</td>
<td>20 A</td>
</tr>
<tr>
<td>6KDV3560...</td>
<td>481.2 A</td>
<td>6KDV3770...</td>
<td>662.2 A</td>
<td>25 A</td>
</tr>
<tr>
<td>6KDV3800...</td>
<td>687.4 A</td>
<td>6KDV3101H...</td>
<td>860 A</td>
<td>25 A</td>
</tr>
<tr>
<td>6KDV3850...</td>
<td>730.4 A</td>
<td></td>
<td></td>
<td>25 A</td>
</tr>
</tbody>
</table>

* Current reduction for higher temperatures, see “Permissible ambient conditions”.
** The overload size and duration depend on the overload cycle, see section 6.14.5, “Overload control”.

As for sizes above 850 / 1050 A (American / European) see Appendix A (GEI-100332C).
2.4.3 Output

**Note!** It is not possible to connect an external voltage to the converter output terminals! It is not even possible to disconnect the motor from the device output while the drive is active.

In normal cases no leveling choke is necessary. It must be taken into account, anyway, that some motor producers prescribe such a choke according to the type of the motor used. In this case it must inserted on the motor cable.

The stated currents refer to the continuative operation with an ambient temperature of 104°F (40°C).

**Output current**

**Armature circuit**

| Table 2.4.3.1: Output currents |
|-------------------|-------------------|-------------------|-------------------|
|                   | American          | European          | Field converter   |
|                   | Armature current  | Armature current  | Continuous curr. |
|                   | (Terminals C / D) | (Terminals C / D) | with Ambient     |
|                   | Continuous curr. | Continuous curr.  | temp @ 104°F      |
|                   | with Ambient     | with Ambient      | **                 |
|                   | temp @ 104°F      | temp @ 104°F      | **                 |
|                   | Max. current      | Max. current      | Continuous curr.  |
|                   | (with overload)   | (with overload)   | with Ambient      |
| 6KDV3017...       | 17 A              | 20 A              | temp @ 104°F      |
| 6KDV3035...       | 35 A              | 40 A              | 10 A               |
| 6KDV3056...       | 56 A              | 70 A              | 10 A               |
| 6KDV3088...       | 88 A              | 110 A             | 14 A               |
| 6KDV3112...       | 112 A             | 140 A             | 14 A               |
| 6KDV3148...       | 148 A             | 185 A             | 14 A               |
| 6KDV3224...       | 224 A             | 280 A             | 20 A               |
| 6KDV3280...       | 280 A             | 350 A             | 20 A               |
| 6KDV3336...       | 336 A             | 420 A             | 20 A               |
| 6KDV3400...       | 400 A             | 500 A             | 20 A               |
| 6KDV3450...       | 450 A             | 650 A             | 20 A               |
| 6KDV3560...       | 560 A             | 770 A             | 25 A               |
| 6KDV3800...       | 800 A             | 1000 A            | 25 A               |
| 6KDV3850...       | 850 A             | 1050 A            | 25 A               |

* Current reduction for higher temperatures, see section 3.1, “Permissible ambient conditions”.

** The overload size and duration depend on the overload cycle, see section 6.14.5, “Overload control”

As for sizes above 850 / 1050 A (American / European) see Appendix A (GEI-100332C).

**Note!** The field motor current can sometimes be very small compared with rated field current of the converter. In order to provide regulation during Voltage control of the motor, follow the described instructions to change the Flux current max of the converter. In this case the **Nom field scale** parameter must be set with the new rated field current value.
**Field circuit**

The DV-300 regulation card is shipped with the field current feedback resistor dipswitches S14 calibrated for the maximum rating of the field package capacity for each size DV-300. This maximum field package rating is incorporated in the DV-300 catalog number. For example 6KD-V3017Q4F10D1 the “10” represents a 10A field exciter.

Compare the actual motor field data to the maximum rating of the field package of the DV-300 model supplied (see table 2.4.3.1), and to the field calibration dipswitch S14, as noted below.

- For fixed field current operation, if the actual motor (base) field current ≤ 10% of the maximum rating of the field package it is required to calibrate the field current feedback scaling using dipswitch S14.
- For weak field operation, also referred as “CEMF field control” or “crossover field control”, if the top base speed Motor nom flux ≤ 10% of the maximum rating of the field package it is required to calibrate the field current feedback scaling using dipswitch S14.

Calibration to the exact field current setting is not required, as long as the above conditions are met. Calibration is not required if the field control is provided by a separate field converter.

Setting all dip switches to OFF allows a custom calculated resistor to be used in terminals LA and LB using the following formula for model numbers 3017 to 3850, 3020 to 310H:

\[
\text{Resistance} = \frac{1667}{\text{field current amps}}.
\]

For model numbers 30900 to 33300 the formula is in Appendix A (GEI-100332C).

<table>
<thead>
<tr>
<th>Switch ohms</th>
<th>168.5 ohm</th>
<th>333.3 ohm</th>
<th>182 ohm</th>
<th>36.4 ohm</th>
<th>845 ohm</th>
<th>1668 ohm</th>
<th>Equivalent resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom flux curr</td>
<td>S14-1</td>
<td>S14-2</td>
<td>S14-3</td>
<td>S14-4</td>
<td>S14-5</td>
<td>S14-6</td>
<td>S14-7</td>
</tr>
<tr>
<td>1.0 A</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td></td>
</tr>
<tr>
<td>2.0 A</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>845 ohm</td>
</tr>
<tr>
<td>3.0 A</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>560.9 ohm</td>
</tr>
<tr>
<td>5.0 A</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>9.9 A</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>168.5 ohm</td>
</tr>
<tr>
<td>12.9 A</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>129.6 ohm</td>
</tr>
<tr>
<td>14.2 A</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>117.7 ohm</td>
</tr>
<tr>
<td>17.1 A</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>97.3 ohm</td>
</tr>
<tr>
<td>20.0 A</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>83.1 ohm</td>
</tr>
<tr>
<td>24.1 A</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>69.3 ohm</td>
</tr>
<tr>
<td>25.1 A</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>66.5 ohm</td>
</tr>
<tr>
<td>Not used</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Output voltage

The below mentioned output voltages take into account an AC input undervoltage within the stated tolerance limits and a voltage drop of 4% due to the inserted AC input reactors. It is the same as the rated armature voltage suggested for the connected motor.

Armature circuit

Table 2.4.3.3: Armature circuit output voltages

<table>
<thead>
<tr>
<th>AC input voltage (Terminals U / V / W)</th>
<th>Output Armature voltage (Terminals C / D)</th>
<th>Two quadrant converter</th>
<th>Four quadrant converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>230 V ±10%, 3Ph</td>
<td>260 V</td>
<td>240 V</td>
<td></td>
</tr>
<tr>
<td>400 V ±10%, 3Ph</td>
<td>470 V *</td>
<td>420 V *</td>
<td></td>
</tr>
<tr>
<td>440 V ±10%, 3Ph</td>
<td>530 V</td>
<td>460 V</td>
<td></td>
</tr>
<tr>
<td>460 V ±10%, 3Ph</td>
<td>560 V</td>
<td>480 V</td>
<td></td>
</tr>
<tr>
<td>480 V ±10%, 3Ph</td>
<td>580 V</td>
<td>500 V</td>
<td></td>
</tr>
</tbody>
</table>

* Voltage measured as per DIN 40 030 (09/93)

As for 6KDV3...Q2C / Q4G converters see Appendix A (GEI-100332C).

Field circuit

Table 2.4.3.4: Field circuit output voltages

<table>
<thead>
<tr>
<th>AC input voltage (Terminals U1 / V1)</th>
<th>Output field voltage** (Terminals C1/D1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed field</td>
</tr>
<tr>
<td>230 V ±15 %, 1Ph</td>
<td>200 V *</td>
</tr>
<tr>
<td>400 V ±15 %, 1Ph</td>
<td>310 V *</td>
</tr>
<tr>
<td>460 V ±10%, 1Ph</td>
<td>360 V</td>
</tr>
</tbody>
</table>

* Voltage measured as per DIN 40 030 (09/93)

** The max field voltage is equal to 0.85 x AC input line voltage

Note! The minimum AC input voltage supply value for the field circuit is 110VAC.

As for 6KDV3...Q2C / Q4G converters see Appendix A (GEI-100332C).
### 2.4.4 Control section

**Enables**
- 0 / 15...30 V  
- 3.2...6.4 mA (approx. 5 mA at 24 V)

**Analog inputs**
- option
- 0...±10 V  
- 0.25mA max
- 0...20 mA  
- 10 V max
- 4...20 mA  
- 10 V max

**Analog outputs**
- 0...±10 V  
- 5 mA max each output

**Digital inputs**
- 0 / 15...30 V  
- 3.2...6.4 mA (approx. 5 mA at 24 V)

**Digital outputs**
- supply +15...35 V
- signal +15...35 V  
- 20 mA max each output

**Encoder inputs**
- Sinusoidal
  - voltage 1 V pp
  - current 8.3 mA pp each channel (input resistance = 124 ohm)
  - pulses per rev min 600  
  - max 9999
  - max frequency 150 kHz
  - max cable length screened, 150m (0.75 mm²) / 125m (0.5 mm²) / 55m (0.22 mm²)

- Digital
  - voltage 5V TTL / 15...24V HTL (H logic)
  - current 4.5 mA / 6.8 ... 10.9 mA each channel with H logic
  - pulses per rev min 600  
  - max 9999
  - max frequency 150 kHz
  - max cable length screened, 150m (0.75 mm²) / 125m (0.5 mm²) / 55m (0.22 mm²)

**Analog tachogenerator input**
- voltage 22.7 / 45.4 / 90.7 / 181.6 / 302.9 V max,
  - depending on the switch S4 setting
- current 8 mA full scale
- max cable length screened, the max length depends on the installation, typical 150m

**Internal supply voltage**
- max load +5 V  
- 160 mA  
- encoder connector, PIN 7/9
  - (only for sinusoidal encoder)
- +10 V  
- 10 mA  
- terminal 7
- -10 V  
- 10 mA  
- terminal 8
- +24 V  
- 200 mA  
- terminal 19
- encoder connector, PIN 2/9
  - (only for digital encoder)

- tolerance +10 V  
- ±3 %  
- (1)
- -10 V  
- ±3 %  
- (1)
- +24 V  
- +20 ... 30 V, not stabilized

(1) The values of the voltages +10V and -10V are the same. The stated tolerance refers to the voltage width.
2.4.5 Accuracy

Internal reference voltage (± 10V, terminals 7 and 8):
  temperature dependent stability error 100 ppm/°C

References
  via keypad/serial line/Bus
    resolution: 16 Bit or 15 Bit + sign
  via terminals (1/2, 3/4, 5/6)
    resolution: 11 Bit + sign
    linearity ±0.1% of the full range value

Analog outputs (6KCV300TBO only)
  resolution: 11 Bit + sign
  linearity: ±0.5% of the full range value

Speed regulation
  for all the operation mode
    max speed 8000 rpm
    digital reference resolution: 0.25 rpm
    analog reference resolution: ≥0.25 rpm
  with sinusoidal encoder
    speed feedback resolution: 0.25 rpm
    accuracy typical 0.01%
    control range better than 1:10000
  with digital encoder
    speed feedback resolution 0.5 rpm
    accuracy typical 0.02%
    control range better than 1:1000
  with tachogenerator
    speed feedback resolution better than 1:2000
    accuracy typical 0.1%
    control range better than 1:1000

Torque regulation
  resolution better than 1:2000
  accuracy typical 0.2%
  control range better than 1:500
2.5 DIMENSION AND WEIGHTS

Fig. 2.5.1: Drive dimensions for 20 A … 185 A sizes (form 1)

<table>
<thead>
<tr>
<th>American</th>
<th>European</th>
<th>Form</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3017...</td>
<td>6KDV3020...</td>
<td>1</td>
<td>18.5/8.4</td>
</tr>
<tr>
<td>6KDV3035...</td>
<td>6KDV3040...</td>
<td></td>
<td>18.5/8.4</td>
</tr>
<tr>
<td>6KDV3056...</td>
<td>6KDV3070...</td>
<td></td>
<td>19.4/8.8</td>
</tr>
<tr>
<td>6KDV3088...</td>
<td>6KDV3110...</td>
<td></td>
<td>23.8/10.8</td>
</tr>
<tr>
<td>6KDV3112...</td>
<td>6KDV3140...</td>
<td></td>
<td>23.8/10.8</td>
</tr>
<tr>
<td>6KDV3148...</td>
<td>6KDV3185...</td>
<td></td>
<td>23.8/10.8</td>
</tr>
</tbody>
</table>
Fig. 2.5.2: Drive dimensions for 280 A ... 650 A sizes (form 2)

<table>
<thead>
<tr>
<th>American</th>
<th>European</th>
<th>Form</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3224...</td>
<td>6KDV3280...</td>
<td></td>
<td>54.0/24.5</td>
</tr>
<tr>
<td>6KDV3280...</td>
<td>6KDV3350...</td>
<td>2</td>
<td>54.0/24.5</td>
</tr>
<tr>
<td>6KDV3336...</td>
<td>6KDV3420...</td>
<td>54.0/24.5</td>
<td></td>
</tr>
<tr>
<td>6KDV3400...</td>
<td>6KDV3500...</td>
<td>65.0/29.5</td>
<td></td>
</tr>
<tr>
<td>6KDV3450...</td>
<td>6KDV3650...</td>
<td>70.6/32</td>
<td></td>
</tr>
</tbody>
</table>
**Fig. 2.5.3: Drive dimensions for 770 A ... 1050 A sizes (form 3)**

<table>
<thead>
<tr>
<th>American</th>
<th>European</th>
<th>Form</th>
<th>Weight Pounds/Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3560...</td>
<td>6KDV3770...</td>
<td>3</td>
<td>134.5/61</td>
</tr>
<tr>
<td>6KDV3800...</td>
<td>6KDV310H...</td>
<td>3</td>
<td>143.3/65</td>
</tr>
<tr>
<td>6KDV3850...</td>
<td></td>
<td></td>
<td>143.3/65</td>
</tr>
</tbody>
</table>
2.6 WATT LOSS

The power dissipation on the converter side depends on the AC input voltage. The values of the dissipated powers stated in the following table refer to the functioning with rated current.

**Note!** The mounting should take into consideration a free space above and below the device of at least 6 inches (150 mm). (Air circulation).

Starting from the type 560 / 770 A (American / European), the fans must be supplied from the outside with a single-phase voltage of 230V 50/60 Hz (terminals U3 & V3).

<table>
<thead>
<tr>
<th>American</th>
<th>European</th>
<th>Power loss [W]</th>
<th>Fans Voltage</th>
<th>Rated current [A]</th>
<th>Air capacity [m³/h]</th>
<th>Enclosure ventilation area [mm²] [in.²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3017... 6KDV3020...</td>
<td>131</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3035... 6KDV3040...</td>
<td>186</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3056... 6KDV3070...</td>
<td>254</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3088... 6KDV3110...</td>
<td>408</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3112... 6KDV3140...</td>
<td>476</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3148... 6KDV3185...</td>
<td>553</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3224... 6KDV3280...</td>
<td>781</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3280... 6KDV3350...</td>
<td>939</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3336... 6KDV3420...</td>
<td>1038</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3400... 6KDV3500...</td>
<td>1248</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3450... 6KDV3650...</td>
<td>1693</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 x 5100</td>
<td>2 x 7.91</td>
</tr>
<tr>
<td>6KDV3560... 6KDV3770...</td>
<td>2143</td>
<td>230</td>
<td>0.75</td>
<td>1050</td>
<td>2 x 53100</td>
<td>2 x 82.37</td>
</tr>
<tr>
<td>6KDV3800... 6KDV310H...</td>
<td>2590</td>
<td>230</td>
<td>0.75</td>
<td>1050</td>
<td>2 x 53100</td>
<td>2 x 82.37</td>
</tr>
<tr>
<td>6KDV3850...</td>
<td>2590</td>
<td>230</td>
<td>0.75</td>
<td>1050</td>
<td>2 x 53100</td>
<td>2 x 82.37</td>
</tr>
</tbody>
</table>

* Table 2.6.1: Power Dissipation

* When the Drive is mounted in a cabinet, door filters are required to meet pollution degree II ratings for UL.
2.7 MOTORS, ENCODER, TACHOMETER

The converters of the DV-300 series are provided for the regulation of DC motors with an independent excitation. As for speed feedback there is the use of a sinusoidal incremental encoder, a digital encoder or an analog tachometer generator. In case of limited precision needs it is possible to use as feedback the armature voltage without defluxing.

2.7.1 Motors

The electrical and mechanical data of the dc motors with an independent excitation refer to a particular functioning field. The following points have to be taken into consideration in order to operate these motors:

**Motor data necessary to connect it to a converter**

The data on the motor nameplate:
- Armature rated voltage
- Armature rated current
- Field rated current
- Motor rated speed

**Motor protection**

**Thermo relay of the motor**
- The relay contact can stop the drive through a control circuit or it can signal to the converter as an external failure (terminal 15).

**Note!**
Remember that with a thermo relay it is possible only to control the heating of the motor due to an overload, but not the one due to an insufficient ventilation. For this purpose some PTC thermistors or thermal switches should be inserted in the motor windings.

**Thermistors and thermal switches**

On terminals 78 and 79 it is possible to connect a thermistor or thermal switch in order to detect motor overheating. When no temperature sensors are present an external resistor (R = 1 kohm) has to be connected to these terminals. The connection of the sensor has to be done according the following instructions.

**Thermists (PTC)**

PTC thermistors according to DIN 44081 or 44082 fitted in the motor can be connected directly to the converter via terminals 78 and 79. In this case the resistor (1 kohm) mounted between the terminals 78, 79 has to be removed.

**Thermal switches (klixons) in the motor windings**

Temperature-dependent contacts “klixon” type can disconnect the drive via the external control or can be reported as an external error on the converter (terminal 15). They can also be connected to the terminals 78 and 79 in order to have a specific error signal. In this case remove the 1 kohm resistor from these terminals and connect it in series to the wiring.

**Limitation of the converter current**

The current limitation can protect the motor from unwanted overloads. To this purpose it is necessary to set the current limitation and the control function of the converter overload (overload function), so that the current remains within the values allowed for the motor.

**Note!**
Remember that with a current limitation it is possible to control only the motor heating due to an overload, but not the one due to an insufficient ventilation. For this purpose some PTC thermistors or thermal switches should be inserted in the motor windings.
2.7.2 Encoder / Tachometer

The encoders and the tachometers give the speed feedback to the regulation. They have to be mounted on the motor shaft with joints without gaps. The best regulation results are possible by using incremental sinusoidal encoders; it is also possible to use digital incremental encoders or tachogenerators, see section, “Accuracy”.

Features:

Sinusoidal encoder

- max frequency: 150 kHz
- number of pulses per revolution: min 600, max 9999
- channel: two-channel
- supply: + 5V (internal supply)
- load capacity: > 8.3 mA pp each channel

Digital encoder

- max frequency: 150 kHz
- number of pulses per revolution: min 600, max 9999
- channels: two-channel, with complementary outputs
- supply: + 5V / 15 ... 24V (external supply), + 24V (internal supply)
- load capacity: > 4.5 mA / 6.8 ... 10.9 mA each channel

Analogue tachometer

- for 6KDV3...Q2...
- for 6KDV3...Q4...
- max voltage at max speed: 22.7 / 45.4 / 90.7 / 181.6 / 302.9 V, depending on the dip switch S4 setting
- current: 8 mA, full scale

DC tacho (recommended), rectified AC tacho
DC tacho only
3 - INSTALLATION GUIDELINES

3.1 PERMISSIBLE AMBIENT CONDITION

Protection degree: IP 20 at operating temperatures of 32-131° F (0 ... 55° C).
UL enclosure type 1. (American size) The converter must be installed in a pollution degree 2 environment.

Altitude: Up to 3300 feet (1000 m) above sea level; higher altitudes a current reduction of 1.2 % for every 330 feet (100 m) of additional altitude.

Temperature:
- Operation Ambient temperature = 32-131° F (0 ... 55° C).
  Over 104° F (40 °C): current reduction of 1.25 % for every 1.8 ° F over 104° F (1 °C over 40 °C) better than the 3K3 class per EN 50178)
- Storage Ambient temperature = -13° F ... 131° F (-25 ... +55° C) (1K4 class as per EN 50178)
  Ambient temperature = -4° F ... 131° F (-20 ... +55° C) for devices with keypad (type DV-300)
- Transport Ambient temperature = -13° F ... 131° F (-25 ... +55° C) (2K3 class as per EN 50178)
  Ambient temperature = -4° F ... 140° F (-20 ... +60° C) for devices with keypad (type DV-300)

Air humidity:
- Operation 5% up to 85%, 1 g/m³ up to 25 g/m³ without moisture condensation or icing (3K3 class as per EN 50178)
- Storage 5% up to 95%, 1 g/m³ up to 29 g/m³ (1K3 class as per EN 50178)
- Transport 95% 1) 60 g/m² 2)
  A light condensation of moisture may occur for a short time occasionally when the device is not in operation. (2K3 class as per EN 50178)

Air pressure:
- Operation From 86 kPa up to 106 kPa (3K3 class per EN 50178)
- Storage From 86 kPa up to 106 kPa (1K4 class per EN 50178)
- Transport From 70 kPa up to 106 kPa (2K3 class per EN 50178)

1) Greatest relative air humidity occurs with the temperature 104° F (40° C) or if the temperature of the device is brought immediately from -13° F ... 86° F (-25° C to +30° C).
2) Greatest absolute air humidity if the device is brought immediately from 158° F ... 59° F (70° C to +15° C).
3.2 DISPOSAL OF THE DEVICE

The converters of the DV-300 series can be disposed as electronic scraps in accordance with the currently valid national regulations for the disposal of electronic parts. The plastic covering of the converters up to type 185 A are recyclable: the material used is ABS+PC “-FR”

3.3 INSTALLATION, MOUNTING CLEARANCE

Mounting the device

*Note!*

The dimensions and weights specified in this manual should be taken into consideration when the device is mounted. The technical equipment required (carriage or crane for large weights) should be used. Improper handling and the use of unsuitable tools may cause damage.

![max Angle of Inclination](image)

*Figure 3.3.1: max Angle of Inclination*

The maximum angle of inclination is 30°.
The converters must be mounted in such a way that the free flow of air is ensured.
The clearance to the device must be at least 6 inches (150 mm).
A space of at least 2 inches (50 mm) must be ensured at the front.
Devices that generate a large amount of heat must not be mounted in the direct vicinity of the frequency inverter.

*Note!*

Mounting screws should be re-tightened after a few days of operation.
Figure 3.3.2: Mounting Clearance
4 - WIRING PROCEDURES

4.1 REMOVING THE FRONT COVER

The front cover of the device must be removed to make the electrical connections and to mount the option card.

**Warning!** Observe the safety instructions and warnings given in this manual. The devices can be opened without the use of force. Only use the tools specified.

![Figure 4.1.1: Removing the Front Panel](image)

To remove the lower cover of devices, use a phillips screwdriver. Remove the screws, lift cover, and open out to the front.

**Terminal Assignments/Cable Sections**

The terminals of the devices are made accessible by removing the front cover.

4.2 WIRING THE DRIVE

Wire the drive in accordance with the standard connection diagrams, Figures 4.8.1 and 4.8.2.
4.3 POWER SECTION

**Note!** Use copper conductors only.
For UL listed equipments use 75°C stranded copper conductors only.

### Table 4.3.1: Terminals description

<table>
<thead>
<tr>
<th>Designation</th>
<th>Function</th>
<th>I/O</th>
<th>max voltage</th>
<th>max current</th>
</tr>
</thead>
<tbody>
<tr>
<td>U, V, W</td>
<td>Connection to the AC mains of the armature circuit</td>
<td>I</td>
<td>500V AC +10%, 3Ph</td>
<td>see 2.4.2</td>
</tr>
<tr>
<td>C, D</td>
<td>Armature connection</td>
<td>O</td>
<td>see 00</td>
<td>see 2.4.3</td>
</tr>
<tr>
<td>U1, V1</td>
<td>Connection to the AC mains of the field circuit</td>
<td>I</td>
<td>460V AC + 15%, 1Ph</td>
<td>see 2.4.2</td>
</tr>
<tr>
<td>C1, D1</td>
<td>Field connection</td>
<td>O</td>
<td>0.87 x AC line volts</td>
<td>see 2.4.2</td>
</tr>
<tr>
<td>U2, V2</td>
<td>AC power supply regulation</td>
<td>I</td>
<td>115V -10%, 1Ph</td>
<td>see 2.4.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>230V +10%, 1Ph</td>
<td></td>
</tr>
<tr>
<td>U3, V3</td>
<td>AC mains power supply for internal fan</td>
<td>I</td>
<td>230V AC, 1Ph</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>(for types with armature current = 560A American)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(for types with armature current = 770A European)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 / 36</td>
<td>Contact without potential of OK relay (closed = OK),</td>
<td>O</td>
<td>250 VAC</td>
<td>1 A AC11</td>
</tr>
<tr>
<td></td>
<td>function as per the OK relay func parameter in the CONFIGURATION /</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>digital output menu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 / 76</td>
<td>Contact without potential of relay 2,</td>
<td>O</td>
<td>250 VAC</td>
<td>1 A AC11</td>
</tr>
<tr>
<td></td>
<td>function as per Relay 2 parameter in the</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I/O CONFIGURATION / digital outputs menu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78 / 79</td>
<td>Thermistor connection</td>
<td>I</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>81 / 82</td>
<td>Internal fuses intervention signalling</td>
<td>O</td>
<td>250 VAC</td>
<td>1 A AC11</td>
</tr>
<tr>
<td></td>
<td>(sizes ≥ 6KDV3560.../6KDV3770...)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 4.3.2: Cable size for power terminals U, V, W, C, D, PE

<table>
<thead>
<tr>
<th>American</th>
<th>European</th>
<th>max cable section [mm²]</th>
<th>AWG</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3017...</td>
<td>6KDV3020...</td>
<td>...4</td>
<td>...12</td>
<td>2.5...3</td>
</tr>
<tr>
<td>6KDV3035...</td>
<td>6KDV3040...</td>
<td>...10</td>
<td>...8</td>
<td></td>
</tr>
<tr>
<td>6KDV3056...</td>
<td>6KDV3070...</td>
<td>...16</td>
<td>...6</td>
<td></td>
</tr>
<tr>
<td>6KDV3088...</td>
<td>6KDV3110...</td>
<td>6...50</td>
<td>10...1</td>
<td></td>
</tr>
<tr>
<td>6KDV3112...</td>
<td>6KDV3140...</td>
<td>16...95</td>
<td>6...000</td>
<td>12</td>
</tr>
<tr>
<td>6KDV3148...</td>
<td>6KDV3185...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3224...</td>
<td>6KDV3280...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3280...</td>
<td>6KDV3350...</td>
<td>Cu-Band 10 x 16 x 0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3336...</td>
<td>6KDV3420...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3400...</td>
<td>6KDV3500...</td>
<td>Cu-Band 11 x 21 x 1</td>
<td></td>
<td>20...25</td>
</tr>
<tr>
<td>6KDV3450...</td>
<td>6KDV3650...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3560...</td>
<td>6KDV3770...</td>
<td>Cu-Band 50 x 8 or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3800...</td>
<td>6KDV310H</td>
<td>Cu-Band 50 x 8 or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3850</td>
<td></td>
<td>2x Cu-Band 11 x 21 x 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 4.3.3: Cable section for UL approval

<table>
<thead>
<tr>
<th>Device type</th>
<th>Terminals</th>
<th>Wire</th>
<th>Terminal bolt</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AWG / kcmils</td>
<td>metric size [mm]</td>
<td>[Nm]</td>
</tr>
<tr>
<td>6KDV3017...</td>
<td>U, V, W</td>
<td>10</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>10</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>10</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6KDV3035...</td>
<td>U, V, W</td>
<td>8</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>8</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>8</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6KDV3056...</td>
<td>U, V, W</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6KDV3088...</td>
<td>U, V, W</td>
<td>1/0</td>
<td>terminal block</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>1/0</td>
<td>terminal block</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2</td>
<td>terminal block</td>
<td>12</td>
</tr>
<tr>
<td>6KDV3112...</td>
<td>U, V, W</td>
<td>2/0</td>
<td>terminal block</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>2/0</td>
<td>terminal block</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2</td>
<td>terminal block</td>
<td>12</td>
</tr>
<tr>
<td>6KDV3148...</td>
<td>U, V, W</td>
<td>3/0</td>
<td>terminal block</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>4/0; kit required</td>
<td>terminal block</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2</td>
<td>terminal block</td>
<td>12</td>
</tr>
<tr>
<td>6KDV3224...</td>
<td>U, V, W</td>
<td>2 x 2/0</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>2 x 2/0</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2/0</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>6KDV3280...</td>
<td>U, V, W</td>
<td>2 x 4/0</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>2 x 4/0</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2/0</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>6KDV3336...</td>
<td>U, V, W</td>
<td>2 x 4/0</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>2 x 300</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2/0</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>6KDV3400...</td>
<td>U, V, W</td>
<td>2 x 300; kit required</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>2 x 350; kit required</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2/0</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>6KDV3450...</td>
<td>U, V, W</td>
<td>2 x 500; kit required</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>2 x 600; kit required</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2/0</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>6KDV3560...</td>
<td>U, V, W</td>
<td>4 x 4/0</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>4 x 250</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2/0</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>6KDV3800...</td>
<td>U, V, W</td>
<td>4 x 300; kit required</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>4 x 350; kit required</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2/0</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>6KDV3850...</td>
<td>U, V, W</td>
<td>4 x 300; kit required</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>C, D</td>
<td>4 x 400; kit required</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>2/0</td>
<td>8</td>
<td>25</td>
</tr>
</tbody>
</table>

The following sizes are not provided with pressure connectors. Any UL listed lug, sized for the indicated bolt and AWG cable, is suitable for use. Compression lug from ILSCO manufacturer are suggested for sizes greater than 56A.
Table 4.3.4: Wire adapter kit and lugs suggested for UL approval

<table>
<thead>
<tr>
<th>Device type</th>
<th>Terminals</th>
<th>Wire adapter kit</th>
<th>Recommended lugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>type</td>
<td>ILSCO type</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kit bolt size [mm]</td>
<td>Tightening torque [Nm]</td>
</tr>
<tr>
<td>6KDV3148...</td>
<td>U, V, W</td>
<td>C, D</td>
<td>EAM 1578</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>6KDV3224...</td>
<td>U, V, W</td>
<td>C, D</td>
<td>EAM 1578</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>6KDV3280...</td>
<td>U, V, W</td>
<td>C, D</td>
<td>EAM 1578</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>6KDV3336...</td>
<td>U, V, W</td>
<td>C, D</td>
<td>EAM 1578</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>6KDV3400...</td>
<td>U, V, W</td>
<td>EAM 1579</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C, D</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>6KDV3450...</td>
<td>U, V, W</td>
<td>EAM 1580</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C, D</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>6KDV3560...</td>
<td>U, V, W</td>
<td>C, D</td>
<td>EAM 1581</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>6KDV3800...</td>
<td>U, V, W</td>
<td>EAM 1581</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C, D</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>6KDV3850...</td>
<td>U, V, W</td>
<td>EAM 1581</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C, D</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE</td>
<td></td>
</tr>
</tbody>
</table>

**Caution!** The current in the protective conductor of the motor cable can be up to twice the value of the rated current if there is an earth fault at the output of the DV-300 converter.

In the table above 2X... means that two compression lugs of the specified type have to be used on the opposite side of the bus bar. 4X... means that four compression lugs of the specified type have to be used on the same bus bar, two for each side and one for each bolt hole.

Bolt, nuts and washers are factory mounted on output bus bars.
For sizes above 112 A the front terminal covers have to be removed when using the above listed lugs.
Table 4.3.5: Cable size for power field terminals U1, V1, C1, D1

<table>
<thead>
<tr>
<th>American</th>
<th>European</th>
<th>Max cable section [mm²]</th>
<th>AWG</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3017...</td>
<td>6KDV3020...</td>
<td>0.2...4</td>
<td>24...10</td>
<td>0.5...0.8</td>
</tr>
<tr>
<td>6KDV3018...</td>
<td>6KDV3021...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3035...</td>
<td>6KDV3040...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3056...</td>
<td>6KDV3070...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3088...</td>
<td>6KDV3110...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3112...</td>
<td>6KDV3140...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3148...</td>
<td>6KDV3185...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3224...</td>
<td>6KDV3280...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3280...</td>
<td>6KDV3350...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3336...</td>
<td>6KDV3420...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3400...</td>
<td>6KDV3500...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3450...</td>
<td>6KDV3650...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3560...</td>
<td>6KDV3770...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3800...</td>
<td>6KDV310H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3850</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following sizes are provided with terminal blocks:

U/V/W/C/D: AWG 5 - 3/0 (16-95 mm²), stranded Cu
PE: AWG 5 - 1 (16-50 mm²), stranded Cu

The following AWG and torque are required for field wiring:

<table>
<thead>
<tr>
<th>Device</th>
<th>AWG</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3088...</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>6KDV3112...</td>
<td>1/0</td>
<td>12</td>
</tr>
<tr>
<td>6KDV3148...</td>
<td>3/0</td>
<td>12</td>
</tr>
<tr>
<td>earth</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

**Note!**
When connecting the converter, a 9.5 mm (3/8 in.) spacing between uninsulated live parts of opposite polarity should be maintained.

**Note!**
The DV-300 converters are UL listed only when used with the above mentioned terminal kits.

Table 4.3.6: Cable size for fans, signals, thermistors and regulation supply

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Max connection cable section</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>flexible [mm²]</td>
<td>multi-core [mm²]</td>
</tr>
<tr>
<td>U2, U3, V2, V3, 35, 36, 75, 76, 78, 79</td>
<td>0.14...1.5</td>
<td>0.14...2.5</td>
</tr>
</tbody>
</table>
4.4 REGULATION SECTION

The R-TPD32-GE Regulation card is factory set according to the device type. When fitting a regulator card as a spare, remember to set switch S15 (device type selection), S4 (tachometer feedback) and S14 (field current resistor selection) accordingly.

As for sizes above 850 / 1050 A (American / European) see Appendix A (GEI-100332C).

4.4.1 R-TPD32-GE Regulation Card

![R-TPD32-GE regulation card diagram]

**Table 4.4.1: LEDs on the R-TPD32-GE card**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>ON when the +5 V voltage is present at the right value</td>
</tr>
<tr>
<td>RST</td>
<td>ON when the signal RST is active</td>
</tr>
<tr>
<td>RS485</td>
<td>ON when the RS485 interface is supplied</td>
</tr>
<tr>
<td>ACT</td>
<td>It is lit when the SCR driving system is active</td>
</tr>
<tr>
<td>RUN</td>
<td>The LED blinks during the regulation phase</td>
</tr>
</tbody>
</table>
### Table 4.4.2: Dip-switch S15 adaptation of the regulation card to the device type

<table>
<thead>
<tr>
<th>European</th>
<th>S15-1</th>
<th>S15-2</th>
<th>S15-3</th>
<th>S15-4</th>
<th>S15-5</th>
<th>S15-6</th>
<th>S15-7</th>
<th>S15-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3020...</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
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<td>OFF</td>
</tr>
<tr>
<td>6KDV3040...</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6KDV3070...</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6KDV3110...</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6KDV3140...</td>
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<td>OFF</td>
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<td>OFF</td>
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<td>OFF</td>
</tr>
<tr>
<td>6KDV3185...</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6KDV3280...</td>
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<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6KDV3350...</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6KDV3420...</td>
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<td>OFF</td>
<td>ON</td>
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<tr>
<td>6KDV3500...</td>
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<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6KDV3650...</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6KDV3770...</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6KDV310HQ2...</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6KDV310HQ4...</td>
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<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
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</tr>
</tbody>
</table>

### Table 4.4.3: Dip-switch S4 adaptation of the tachometer feedback to the input voltage

<table>
<thead>
<tr>
<th>Tacho voltage full scale (V)</th>
<th>S4-1</th>
<th>S4-2</th>
<th>S4-3</th>
<th>S4-4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S4-8</td>
<td>S4-7</td>
<td>S4-6</td>
<td>S4-5</td>
</tr>
<tr>
<td>22.7</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>45.4</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>90.7</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>181.6</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>302.9</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>
### Table 4.4.4: Jumpers on the R-TPD32-GE card

<table>
<thead>
<tr>
<th>Designation</th>
<th>Function</th>
<th>Factory</th>
</tr>
</thead>
<tbody>
<tr>
<td>S4</td>
<td>Matching of the input voltage of the tachogenerator reaction, see table 4.4.3</td>
<td></td>
</tr>
<tr>
<td>S5, S6</td>
<td>Adaptation of the speed feedback type: Pos. A Sinusoidal encoder Pos. B Tachogenerator Any position: digital encoder, armature feedback</td>
<td>B</td>
</tr>
<tr>
<td>S9</td>
<td>Adaptation to the signal of the analog input 1 (terminals 1 and 2) ON 0 ... 20 mA / 4 ... 20 mA OFF 0 ... 10V / -10 ... +10V</td>
<td>OFF</td>
</tr>
<tr>
<td>S10</td>
<td>Adaptation to the signal of the analog input 2 (terminal 3 and 4) ON 0 ... 20 mA / 4 ... 20 mA OFF 0 ... 10V / -10 ... +10V</td>
<td>OFF</td>
</tr>
<tr>
<td>S11</td>
<td>Adaptation to the signal of the analog input 3 (terminals 5 and 6) ON 0 ... 20 mA / 4 ... 20 mA OFF 0 ... 10V / -10 ... +10V</td>
<td>OFF</td>
</tr>
<tr>
<td>S12 / S13</td>
<td>Terminating resistor for the serial interface RS485 ON Interface terminated with resistor OFF Interface not terminated</td>
<td>OFF</td>
</tr>
<tr>
<td>S14</td>
<td>Field current resistors setting, see table 2.4.3.2</td>
<td></td>
</tr>
<tr>
<td>S15</td>
<td>Adaptation of the regulation card to the device type, see table 4.4.2</td>
<td></td>
</tr>
<tr>
<td>S18 / S19</td>
<td>Selection of the internal/external supply of the RS485 serial interface OFF Serial interface supplied from the outside (PIN 5 and 9) and galvanic divided form the regulation section. ON Serial interface supplied from the inside and connected to the potential reference point of the regulation. PIN 5 and 9 are used to supply the adaptor of the serial interface (for use of 6KDV300PIU).</td>
<td>OFF</td>
</tr>
<tr>
<td>S20</td>
<td>Monitoring of the C channel of the digital encoder on connector XE2 ON C-channel monitored OFF C-channel not monitored</td>
<td>OFF</td>
</tr>
<tr>
<td>S21 / S22 / S23</td>
<td>Encoder supply voltage selection ON 5 V encoder supply voltage OFF 15 ... 30 V encoder supply voltage</td>
<td>OFF</td>
</tr>
</tbody>
</table>

ON Mounted Jumpers OFF Non mounted Jumpers

### Table 4.4.5: Test points on Regulator card

<table>
<thead>
<tr>
<th>Designation</th>
<th>Function</th>
<th>Designation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>XY20</td>
<td>Monitoring (± 10VDC) of the Select output parameters setting. (Using this test point set all the Select output 1,2,3,4 to the variable that has to be measured).</td>
<td>XY17</td>
<td>Output current signal (0.61 V = Nominal Drive output current)</td>
</tr>
<tr>
<td>XY10</td>
<td>Reference point</td>
<td>XY18</td>
<td>Reference point</td>
</tr>
</tbody>
</table>
### Table 4.4.6 - A: Terminal Assignment (terminals from 1 to 20)

<table>
<thead>
<tr>
<th>Terminal Designation</th>
<th>Function</th>
<th>I/O</th>
<th>Max voltage</th>
<th>Max current</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 +2 Analog input 1</td>
<td>Configurable analog differential input</td>
<td>I</td>
<td>±10V</td>
<td>0.25mA</td>
</tr>
<tr>
<td>3 +4 Analog input 2</td>
<td>Configurable analog differential input</td>
<td>I</td>
<td>±10V</td>
<td>0.25mA</td>
</tr>
<tr>
<td>5 +6 Analog input 3</td>
<td>Configurable analog differential input</td>
<td>I</td>
<td>±10V</td>
<td>0.25mA</td>
</tr>
<tr>
<td>7 +10V</td>
<td>Reference voltage +10V</td>
<td>O</td>
<td>+10V</td>
<td>10mA</td>
</tr>
<tr>
<td>8 -10V</td>
<td>Reference voltage -10V</td>
<td>O</td>
<td>-10V</td>
<td>10mA</td>
</tr>
<tr>
<td>9 +0V 10</td>
<td>Reference point for the reference voltages on terminal 7 and 8</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>11 Internal 0V</td>
<td>Converter enable</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td>12 Enable drive</td>
<td>Disabled converter</td>
<td>I</td>
<td>+30V</td>
<td>24V/5mA</td>
</tr>
<tr>
<td>14 Fast stop</td>
<td>Fast stop</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td>15 External fault</td>
<td>External fault present</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td>16 COM ID</td>
<td>Reference point of the digital inputs, terminals 12 to 15</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>18 0V 24</td>
<td>Reference point of the 24V voltage on terminal 19</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>19 +24 V</td>
<td>Voltage +24V</td>
<td>O</td>
<td>+20...30V</td>
<td>200 mA**</td>
</tr>
<tr>
<td>20 Screen connection (PE) (connected with housing)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

* The user can adapt the configuration to the requirements of the application concerned via the keypad, the serial interface or a bus connection.

** Total value including Terminal 19, Pin 2 of connector XE2 and the digital outputs on the option card 6KCV300TBO.
From the R-TPD32-GE regulation card, a 6KCV300 TBO card has been integrated on the regulation section (terminals from 21 to 42). The integrated card is considered by the device as TBO “A”.

### Table 4.4.6 - B: Terminal Assignment (terminals from 21 to 42)

<table>
<thead>
<tr>
<th>Designation</th>
<th>Function</th>
<th>I/O</th>
<th>Max voltage</th>
<th>Max current</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Analog output 1</td>
<td>O</td>
<td>±10V</td>
<td>5mA</td>
</tr>
<tr>
<td></td>
<td>Reference point: Terminal 22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factory set for Actual speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Reference point of analog output 1</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>23</td>
<td>Analog output 2</td>
<td>O</td>
<td>±10V</td>
<td>5mA</td>
</tr>
<tr>
<td></td>
<td>Reference point: Terminal 24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factory set for Motor current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Reference of analog output 2</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>25</td>
<td>COM digital outputs</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>26</td>
<td>Digital output 1</td>
<td>O</td>
<td>+30V</td>
<td>50mA</td>
</tr>
<tr>
<td></td>
<td>COM: Terminal 25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factory set for Ramp +</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Digital output 2</td>
<td>O</td>
<td>+30V</td>
<td>50mA</td>
</tr>
<tr>
<td></td>
<td>COM: Terminal 25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factory set for Ramp -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Digital output 3</td>
<td>O</td>
<td>+30V</td>
<td>50mA</td>
</tr>
<tr>
<td></td>
<td>COM: Terminal 25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factory set for Spd threshold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Digital output 4</td>
<td>O</td>
<td>+30V</td>
<td>50mA</td>
</tr>
<tr>
<td></td>
<td>COM: Terminal 25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factory set for Overload available</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Supply digital output</td>
<td>I</td>
<td>+30V</td>
<td>depends on the load max 80mA</td>
</tr>
<tr>
<td></td>
<td>Supply voltage for digital outputs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Digital input 1</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td></td>
<td>COM: Terminal 37</td>
<td></td>
<td></td>
<td>24V/5mA</td>
</tr>
<tr>
<td></td>
<td>Not Factory set</td>
<td></td>
<td></td>
<td>30V/6.4mA</td>
</tr>
<tr>
<td>32</td>
<td>Digital input 2</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td></td>
<td>COM: Terminal 37</td>
<td></td>
<td></td>
<td>24V/5mA</td>
</tr>
<tr>
<td></td>
<td>Not Factory set</td>
<td></td>
<td></td>
<td>30V/6.4mA</td>
</tr>
<tr>
<td>33</td>
<td>Digital input 3</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td></td>
<td>COM: Terminal 37</td>
<td></td>
<td></td>
<td>24V/5mA</td>
</tr>
<tr>
<td></td>
<td>Not Factory set</td>
<td></td>
<td></td>
<td>30V/6.4mA</td>
</tr>
<tr>
<td>34</td>
<td>Digital input 4</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td></td>
<td>COM: Terminal 37</td>
<td></td>
<td></td>
<td>24V/5mA</td>
</tr>
<tr>
<td></td>
<td>Not Factory set</td>
<td></td>
<td></td>
<td>30V/6.4mA</td>
</tr>
<tr>
<td>37</td>
<td>COM digital inputs</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>38 … 42</td>
<td>Not used</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
Table 4.4.7: Cable size for fans, signals, and thermistors

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Max connection cable section</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>flexible [mm²]</td>
<td>multi-core [mm²]</td>
</tr>
<tr>
<td>1...20, +, -</td>
<td>0.14...1.5</td>
<td>0.14...1.5</td>
</tr>
</tbody>
</table>

The use of a 3 x 0.1 x 0.02 inches (75 x 2.5 x 0.4 mm) flat screwdriver is recommended. Remove 0.26 inches (6.5mm) of the insulation at the cable ends. Only one unprepared wire (without ferrule) should be connected to each terminal.

Table 4.4.8: Terminal strip for the connection of an analog tachometer

<table>
<thead>
<tr>
<th>Designation</th>
<th>Function</th>
<th>I/O</th>
<th>max volt.</th>
<th>max curr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>Negative tachometer input</td>
<td>I</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>+</td>
<td>Positive tachometer input</td>
<td>I</td>
<td>22.7 / 45.4 / 90.7 / 181.6 / 302.9 V *</td>
<td>8 mA</td>
</tr>
<tr>
<td></td>
<td>Clockwise rotation: positive / counterclockwise: negative.</td>
<td>I</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* It depends on the section set via the Dip switch S4 (see table 4.4.3).

Table 4.4.9: Assignment of an XE1 connector for a sinusoidal encoder

<table>
<thead>
<tr>
<th>Designation*</th>
<th>Function</th>
<th>I/O</th>
<th>max volt.</th>
<th>max curr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN 1</td>
<td>Channel B-</td>
<td>I</td>
<td>1 V pp</td>
<td>8.3mA pp</td>
</tr>
<tr>
<td>PIN 2</td>
<td>Not connected</td>
<td></td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>PIN 3</td>
<td>Channel C+ (zero pulse)</td>
<td>I</td>
<td>1 V pp</td>
<td>8.3mA pp</td>
</tr>
<tr>
<td>PIN 4</td>
<td>Channel C- (zero pulse)</td>
<td>I</td>
<td>1 V pp</td>
<td>8.3mA pp</td>
</tr>
<tr>
<td>PIN 5</td>
<td>Channel A+</td>
<td>I</td>
<td>1 V pp</td>
<td>8.3mA pp</td>
</tr>
<tr>
<td>PIN 6</td>
<td>Channel A-</td>
<td>I</td>
<td>1 V pp</td>
<td>8.3mA pp</td>
</tr>
<tr>
<td>PIN 7</td>
<td>Reference point for 5V</td>
<td>O</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>PIN 8</td>
<td>Channel B+</td>
<td>I</td>
<td>1 V pp</td>
<td>8.3mA pp</td>
</tr>
<tr>
<td>PIN 9</td>
<td>Supply voltage + 5V for the encoder</td>
<td>O</td>
<td>+5 V</td>
<td>160mA</td>
</tr>
</tbody>
</table>

* 9-pole socket connector, fitted on device. A plug connector according DIN 41 652 is required for the connection.

Table 4.4.10: Assignment of the XE2 connector for a digital encoder

<table>
<thead>
<tr>
<th>Designation*</th>
<th>Function</th>
<th>I/O</th>
<th>max volt.</th>
<th>max curr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN 1</td>
<td>Channel B-</td>
<td>I</td>
<td>30 V pp**</td>
<td>17mA pp</td>
</tr>
<tr>
<td>PIN 2</td>
<td>Supply voltage +24V for the encoder</td>
<td>O</td>
<td>24 V</td>
<td>200mA***</td>
</tr>
<tr>
<td>PIN 3</td>
<td>Channel C+ (zero pulse)</td>
<td>I</td>
<td>30 V pp**</td>
<td>17mA pp</td>
</tr>
<tr>
<td>PIN 4</td>
<td>Channel C- (zero pulse)</td>
<td>I</td>
<td>30 V pp**</td>
<td>17mA pp</td>
</tr>
<tr>
<td>PIN 5</td>
<td>Channel A+</td>
<td>I</td>
<td>30 V pp**</td>
<td>17mA pp</td>
</tr>
<tr>
<td>PIN 6</td>
<td>Channel A-</td>
<td>I</td>
<td>30 V pp**</td>
<td>17mA pp</td>
</tr>
<tr>
<td>PIN 7</td>
<td>Reference point for 24V</td>
<td>O</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>PIN 8</td>
<td>Channel B+</td>
<td>I</td>
<td>30 V pp**</td>
<td>17mA pp</td>
</tr>
<tr>
<td>PIN 9</td>
<td>Not connected</td>
<td></td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* 9-pole socket connector, fitted on device. A plug connector acc. DIN 41 652 is required for the connection.

** The max voltage is 30V when the S21, S22, S23 jumpers are not mounted (Encoder 15...30 V). If these jumpers are mounted the max voltage at these Pins is 5V!

*** Total value including Terminal 19, Pin 2 of connector XE2 and the digital outputs on the option card 6KCV300TBO.
4.5 SERIAL INTERFACE

4.5.1 Description

The RS 485 serial interface enables data transfer via a loop made of two symmetrical, spiral conductors with a common shield. The maximum transmission distance is 3936 feet (1200 m) with a transfer rate of 38,400 KBaud. The transmission is carried out via a differential signal.

RS 485 interfaces are bus-compatible in half-duplex mode, i.e. sending and receiving take place in succession. Up to 31 devices (up to 128 address selectable) can be networked together via the RS 485 interface.

Address setting is carried out via the Device address parameter. Further information concerning the parameters to be transferred, their type and value range is given in the table contained in section 10, “Parameter List” (RS485 column).

The RS 485 on the DV-300 series devices is located on the Regulation card in the form of a 9-pole SUB-D socket connector (XS). The communication may be with or without galvanic isolation: by using galvanic isolation an external power supply is necessary for +5V. The differential signal is transferred via PIN 3 (TxA/RxA) and PIN 7 (TxB/RxB). Bus terminating resistors must be connected at the physical beginning and end of an RS 485 bus in order to prevent signal reflexion. The bus terminating resistors on DV-300 series devices are connected via jumpers S12 and S13. This enables a direct point-to-point connection with a PLC or PC.

![RS485 serial interface diagram]

**Note!** Ensure that only the first and last drop of an RS 485 bus have a bus terminating resistor (S12 and S13 mounted). In all other cases (within the line) jumpers S12 and S13 must not be mounted. With S18 and S19 mounted the drive supply the serial line. This modality is allowed on point-to-point connection without galvanic isolation only.
**Note!**  
A connection point to point can be done using “6KCV300CTI” option interface (S18 and S19 mounted). For multidrop connection (two or more drive), an external power supply is necessary (pin 5 / 0V and pin 9 / +5V). Pins 6 and 8 are reserved for use with the “6KCV300CTI” interface card.
When connecting the serial interface ensure that:  
- only shielded cables are used  
- power cables and control cables for contactors/relays are routed separately.

### 4.5.2 RS485 serial interface connector description

**Table 4.5.2.1: Description of the XS connector for the RS485 serial interface**

<table>
<thead>
<tr>
<th>Designation*</th>
<th>Function</th>
<th>I/O</th>
<th>Elec. Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN 1</td>
<td>Internal use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIN 2</td>
<td>Internal use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIN 3</td>
<td>RxA/TxA</td>
<td>I/O</td>
<td>RS485</td>
</tr>
<tr>
<td>PIN 4</td>
<td>Internal use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIN 5</td>
<td>0 V (reference point 5V)</td>
<td>Power supply</td>
<td></td>
</tr>
<tr>
<td>PIN 6</td>
<td>Internal use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIN 7</td>
<td>RxB/TxB</td>
<td>I/O</td>
<td>RS485</td>
</tr>
<tr>
<td>PIN 8</td>
<td>Internal use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIN 9</td>
<td>+5V</td>
<td></td>
<td>Power supply</td>
</tr>
</tbody>
</table>

* 9-pole socket connector, fitted on device. A plug connector acc. DIN 41 652 is required for the connection

The pin 5 and 9 function depends on the position of the jumpers S18 and S19

**S18 and S19 in position OFF**  
The serial interface is galvanic separated from the regulator section. The serial interface power supply is provided from the outside via the PIN 5 (0V) and PIN 9 (+5V) of the XS connector (default factory setting).

**S18 and S19 in position ON**  
The serial interface has the same potential reference point as the regulator. The PIN 5 and 9 can be used to supply the adaptor of the RS 232 to RS 485 serial interface that can be purchased from the General Electric Company. They can not be used for any other purpose!

### 4.6 INPUT/OUTPUT EXPANSION CARD 6KCV300TBO

The input/output expansion card 6KCV300TBO can be fitted in a converter of the DV-300 Series. The card provides analog outputs and digital inputs/outputs.
This option card, which is inserted on the XBB connector, is considered by the device as TBO “B”.
### 4.6.1 Assignment of the plug-in terminal strip (terminals 1...15) for Option Card 6KCV300TBO

<table>
<thead>
<tr>
<th>Designation</th>
<th>Function</th>
<th>I/O</th>
<th>Max voltage</th>
<th>Max current</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Analog output 1</td>
<td>Analog output 1 (3) Reference point: Terminal 2 Factory set for T current (motor current)</td>
<td>O</td>
<td>±10V</td>
<td>5mA</td>
</tr>
<tr>
<td>(3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 COM analog</td>
<td>Reference point of analog output 1 (Terminal 1)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>output 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Analog output 2</td>
<td>Analog output 2 (4) Reference point: Terminal 4 Factory set for motor speed (Current U)</td>
<td>O</td>
<td>±10V</td>
<td>5mA</td>
</tr>
<tr>
<td>(4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 COM analog</td>
<td>Reference of analog output 2 (Terminal 3)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>output 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 COM digital</td>
<td>COM digital outputs (Terminals 6...9)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>outputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Digital output</td>
<td>Digital output 1 (5) COM: Terminal 5 Factory set for Ramp + (Curr limit state)</td>
<td>O</td>
<td>+30V</td>
<td>50mA</td>
</tr>
<tr>
<td>1 (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Digital output</td>
<td>Digital output 2 (6) COM: Terminal 5 Factory set for Ramp - (Overvoltage)</td>
<td>O</td>
<td>+30V</td>
<td>50mA</td>
</tr>
<tr>
<td>2 (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Digital output</td>
<td>Digital output 3 (7) COM: Terminal 5 Factory set for Spd threshold (Undervoltage)</td>
<td>O</td>
<td>+30V</td>
<td>50mA</td>
</tr>
<tr>
<td>3 (7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Digital output</td>
<td>Digital output 4 (8) COM: Terminal 5 Factory set for Overload available (Overcurrent)</td>
<td>O</td>
<td>+30V</td>
<td>50mA</td>
</tr>
<tr>
<td>4 (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Supply digital</td>
<td>Supply voltage for digital outputs</td>
<td>I</td>
<td>+30V</td>
<td>depends on the load max 80mA</td>
</tr>
<tr>
<td>outputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Digital input</td>
<td>Digital input 1 (5) COM: Terminal 15 Not Factory set</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td>1 (5)</td>
<td></td>
<td></td>
<td></td>
<td>24V/5mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30V/6.4mA</td>
</tr>
<tr>
<td>12 Digital input</td>
<td>Digital input 2 (6) COM: Terminal 15 Not Factory set</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td>2 (6)</td>
<td></td>
<td></td>
<td></td>
<td>24V/5mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30V/6.4mA</td>
</tr>
<tr>
<td>13 Digital input</td>
<td>Digital input 3 (7) COM: Terminal 15 Not Factory set</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td>3 (7)</td>
<td></td>
<td></td>
<td></td>
<td>24V/5mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30V/6.4mA</td>
</tr>
<tr>
<td>14 Digital input</td>
<td>Digital input 4 (8) COM: Terminal 15 Not Factory set</td>
<td>I</td>
<td>+30V</td>
<td>15V/3.2mA</td>
</tr>
<tr>
<td>4 (8)</td>
<td></td>
<td></td>
<td></td>
<td>24V/5mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30V/6.4mA</td>
</tr>
<tr>
<td>15 COM digital</td>
<td>COM of the digital inputs (Terminals 11...14)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>inputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The use of a 3 x 0.1 x 0.02 inches (75 x 2.5 x 0.4 mm) flat screwdriver is recommended. Strip the ends of the cables to a length of 0.26 inch (6.5 mm). Only one unprepared wire (without ferrule) should be connected to each terminal.

### 4.6.2 Fitting the option card

**Figure 4.6.2.1: Installing the option card**

1. Unscrew the existing fixing screws and screw the spacers in the threaded holes.
2. Fix the option card (connector XB of the option in the connector XBB of the device).
3. Fix the option cards on the spacers with the screws.
4.7 DIGITAL ENCODER INTERFACE 6KDV300DES

4.7.1 Description

The option card 6KDV300DES has been projected to adapt, to separate galvanically and to connect a digital encoder to the input XE1 of the converters DV-300 regulations boards. As standard, this input is arranged for the connection of an analog encoder.

The card 6KDV300DES will be fixed externally to the drive by the mounting rail DIN EN 50 022-35. The input female connector XS1 must be connected to the digital encoder using a 9-pole male connector, through a shielded cable, Tasker c/186 (6 x 2 x 0.22) with a maximal length of 150 m.

The output male connector XS2, provided with shielded cable of 1.5 m, must be connected to the 9-pole connector fitted on the DV-300 regulation card.

Terminals +Venc and 0Venc are needed for the external supply of the digital encoder: the input voltage can be 15V...24V with open Jumpers S1, S2, S3 (standard delivery conditions), or 5V with closed Jumpers S1, S2, S3.

S4 jumper is used to cut out the canal C (no impulse) from the test of encoder loss. S4 closed = canal C included, S4 open = canal C cut out.

The jumper SH is mounted on condition of standard delivery; it must be cut only in case of the shield side encoder is connected to the chassis of the motor, to avoid the moulding of ground ring.

For converter operation with the 6KDV300DES card it is necessary to set the jumper S5, S6 on the regulation board in position A.

![Diagram of 6KDV300DES card](image)

Figure 4.7.1.1: 6KDV300DES card
4.7.2 Terminal Assignment

Table 4.7.2.1: Terminal assignment (Terminals 0Venc and +Venc)

<table>
<thead>
<tr>
<th>Designation</th>
<th>Function</th>
<th>I/O</th>
<th>max volt.</th>
<th>max curr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0Venc</td>
<td>0 V supply to the encoder</td>
<td>I</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>+Venc</td>
<td>+15 ... 24 V supply to the encoder (S1, S2, S3 open)</td>
<td>I</td>
<td>+24V</td>
<td>depending on encoder data</td>
</tr>
<tr>
<td></td>
<td>+5 V supply to the encoder (S1, S2, S3 closed)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I = Input    O = Output

Table 4.7.2.2: Permissible cable cross section on the terminals of option card 6KDV300DES

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Max cable connection section [mm²]</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>flexible</td>
<td>multi-core</td>
</tr>
<tr>
<td>0 Venc and +Venc</td>
<td>0.14 ... 1.5</td>
<td>0.14 ... 1.5</td>
</tr>
</tbody>
</table>

The use of a 3 x 0.1 x 0.02 inches (75 x 2.5 x 0.4 mm) flat screwdriver is recommended. Strip the ends of the cables to a length of 0.26 inch (6.5 mm). Only one unprepared wire (without ferrite) should be connected to each terminal.

Table 4.7.2.3: XS1 9-pole connector

<table>
<thead>
<tr>
<th>Designation</th>
<th>Function</th>
<th>I/O</th>
<th>max volt.</th>
<th>max curr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN 1</td>
<td>Channel B-</td>
<td>I</td>
<td>+24V</td>
<td>10.9mA</td>
</tr>
<tr>
<td>PIN 2</td>
<td>Supply voltage for the encoder (the allowed level depends on the jumper position, see chapter 4.7.1)</td>
<td>I</td>
<td>+24V</td>
<td>depending on ext. power supply unit</td>
</tr>
<tr>
<td>PIN 3</td>
<td>Channel C+ (zero pulse)</td>
<td>I/O</td>
<td>+24V</td>
<td>10.9mA</td>
</tr>
<tr>
<td>PIN 4</td>
<td>Channel C- (zero pulse)</td>
<td>I/O</td>
<td>+24V</td>
<td>10.9mA</td>
</tr>
<tr>
<td>PIN 5</td>
<td>Channel A+</td>
<td>I/O</td>
<td>+24V</td>
<td>10.9mA</td>
</tr>
<tr>
<td>PIN 6</td>
<td>Channel A-</td>
<td>I/O</td>
<td>+24V</td>
<td>10.9mA</td>
</tr>
<tr>
<td>PIN 7</td>
<td>Reference point for supply voltage</td>
<td>I/O</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PIN 8</td>
<td>Channel B+</td>
<td>I/O</td>
<td>+24V</td>
<td>10.9mA</td>
</tr>
<tr>
<td>PIN 9</td>
<td>not connected</td>
<td>I/O</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

I = Input    O = Output
4.8 STANDARD CONNECTION DIAGRAMS

**Figure 4.8.1: Control sequencing**

- **L00**: Emergency
- **L01**: Motor thermal protection
- **Q1 Control circuit supply**: G1, ok [P412]
- **K0**: Off / Stop
- **S11**: On / Start
- **S2**: Emergency braking, disconnection after the motor stop
- **K1M**: Any jumper: direct disconnection, the motor ceases to stop
- **K2**: Jumper: emergency braking, disconnection after the motor stop

**Note!**

Q2 for fans mounted on drives from 560 / 770 A (American / European)

**Stop control** [P629]

---

**G1**

**L01**

**K0**

**K1M**

**Mains line**

---
Figure 4.8.2: Example for relay interface

**Note:**

1. ENABLE must remained energized during a normal STOP or FAST STOP for the DV-300 to decel on a ramp.
2. ENABLE must be de energized to power up and to reset a fault or alarm.
3. If the external fault input, or fast stop input, is unused, the unused input must be tied to +24V (terminal 19).
4. EXTERNAL FAULT input, FAST STOP input, START input and ENABLE input need picked up during LAN operation. Opening the input will cause labeled drive reaction.

* - T.D.A.D. = Time Delay After De energization.
Figure 4.8.3: Typical connections

Typical wiring diagram for the standard configuration of the converter.
It is necessary to follow the instructions for mounting and wiring given in the chapters concerning engineering notes and EMC measures.
Option cards connection is not indicated here.
It is not considered the autorestart of the drive after an alarm condition.

(1) Fan with external supply only above 560/770 A included (American/European).
(2) Fuses only for 6KDV3...Q4 up to 450/650 A (American/European).
(3) 1Kohm resistor connected when the thermistor is not present.
(4) The indicated connections are relative for a digital Encoder.
(5) From 770 A (European) and 560 A (American) sizes.
Connections for sinusoidal encoder and tachogenerator are separately indicated.
**Sinus encoder**

**Digital encoder**

**Analog tacho**

*Figure 4.8.4: Encoder and Tachometer Connections*

*Figure 4.8.5: Programmable Inputs/outputs (option 6KCV300TBO) with relay and contacts*

**Note!** To improve the noise immunity it is advisable to connect the common of the outputs (terminals 22/24, 25/37 of 6KCV300TBO) with the ground (terminals 10 or 20 of the regulation board). It is not possible, the above mentioned common have to be grounded by means of a 0,1 µF/250V capacitor.
**Analog outputs**
1 2

**Digital outputs**
21 22 23 24

**Supply**
R-TPD32-GE

**Digital inputs**
37 31 32 33 34
1 2 3 4

**Analog inputs**
IA1 IA2

**Digital Inputs**
ID 1 2 3 4

**Digital Outputs**
QD 1 2 3 4

**SPS / PLC**

---

**Figure 4.8.6: Programmable Inputs/outputs with PLC**

**Figure 4.8.7: 6KCV300DES connection**
4.9 CIRCUIT PROTECTION

4.9.1 Fuses

Fuses of the power section

![Diagram of fuse configuration]

Figure 4.9.1.1: Position of the super fast fuses

For protection of the bridge thyristors use fast acting fuses. The following recommended fuses are externally mounted. Models 6KDV3560..., 6KDV3770... and higher, HAVE internally mounted fuses provided (Code C on table 4.8.1.1).

**Note!** The 6KDV3 ... QB2... and 6KDV3 ...Q4F... Drives (500V AC input supply) have the field converter fuses internally mounted. The fuses type for the different sizes of converter are the following:

- 6KDV3 size up to 56 / 70 A *
  - Bussman
  - FWH-015A6F

- 6KDV3 size 88 / 110 ... 850 / 1050 A *
  - Bussman
  - FWC 25A10F
  - Gould Shawmut
  - A60Q25-2

* American / European
Table 4.9.1.1: Recommended fuses (externally mounted)

<table>
<thead>
<tr>
<th>Code</th>
<th>Pieces</th>
<th>European</th>
<th>European (GRD2/20)</th>
<th>American</th>
<th>American</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>6KV3020</td>
<td>Z14gR20 (GRD2/20)</td>
<td>6KV3017</td>
<td>A70P25</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>Nr. 10 005 07.25</td>
<td></td>
<td>FWP25</td>
</tr>
<tr>
<td>B*</td>
<td>2</td>
<td></td>
<td>Z14gR20 (GRD2/20)</td>
<td>A70P25</td>
<td>FWP25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nr. 10 005 07.30</td>
<td></td>
<td>FWP25</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td></td>
<td>Z14gR20 (GRD2/20)</td>
<td>A70P20</td>
<td>FWP20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nr. 10 005 07.20</td>
<td></td>
<td>FWP20</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>6KV3040</td>
<td>Z22gR50 (GRD3/50)</td>
<td>6KV3035</td>
<td>A70P40</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>Nr. 10 005 07.50</td>
<td></td>
<td>FWP40</td>
</tr>
<tr>
<td>B*</td>
<td>2</td>
<td></td>
<td>Z22gR63 (GRD3/63)</td>
<td>A70P50</td>
<td>FWP50</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Nr. 10 005 07.63</td>
<td></td>
<td>FWP50</td>
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<td>D</td>
<td>2</td>
<td></td>
<td>Z14gR20 (GRD2/20)</td>
<td>A70P20</td>
<td>FWP20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nr. 10 005 07.20</td>
<td></td>
<td>FWP20</td>
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<tr>
<td>A</td>
<td>3</td>
<td>6KV3070</td>
<td>Z22gR63 (GRD3/63)</td>
<td>6KV3056</td>
<td>A70P70</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>Nr. 10 007 07.63</td>
<td></td>
<td>FWP70</td>
</tr>
<tr>
<td>B*</td>
<td>2</td>
<td></td>
<td>S00UF01/80/100A/660V</td>
<td>A70P80</td>
<td>FWP80</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nr. 20 189 20, 80 A</td>
<td></td>
<td>FWP80</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td></td>
<td>Z14gR20 (GRD2/20)</td>
<td>A70P20</td>
<td>FWP20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nr. 10 005 07.20</td>
<td></td>
<td>FWP20</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>6KV3110</td>
<td>SOOUF1/80/100A/660V</td>
<td>6KV3088</td>
<td>A70P100</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>Nr. 20 189 20.100</td>
<td></td>
<td>FWP100</td>
</tr>
<tr>
<td>B*</td>
<td>2</td>
<td></td>
<td>SOOUF1/80/125A/660V</td>
<td>A70P150</td>
<td>FWP150</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>Nr. 20 189 20.125</td>
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<td>FWP150</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td></td>
<td>Z14gR20 (GRD2/20)</td>
<td>A70P20</td>
<td>FWP20</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>FWP20</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>6KV3140</td>
<td>SOOUF1/80/125A/660V</td>
<td>6KV3112</td>
<td>A70P150</td>
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<tr>
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<td>3</td>
<td></td>
<td>Nr. 20 189 20.125</td>
<td></td>
<td>FWP150</td>
</tr>
<tr>
<td>B*</td>
<td>2</td>
<td></td>
<td>SOOUF1/80/160A/660V</td>
<td>A70P175</td>
<td>FWP175</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nr. 20 189 20.160</td>
<td></td>
<td>FWP175</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td></td>
<td>Z14gR20 (GRD2/20)</td>
<td>A70P20</td>
<td>FWP20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nr. 10 005 07.20</td>
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<td>FWP20</td>
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<td>A</td>
<td>3</td>
<td>6KV3185</td>
<td>SOOUF1/80/200A/660V</td>
<td>6KV3148</td>
<td>A70P175</td>
</tr>
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<td></td>
<td>3</td>
<td></td>
<td>Nr. 20 189 20.200</td>
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<td>FWP175</td>
</tr>
<tr>
<td>B*</td>
<td>2</td>
<td></td>
<td>SOOUF1/80/200A/660V</td>
<td>A70P200</td>
<td>FWP200</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nr. 20 189 20.200</td>
<td></td>
<td>FWP200</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td></td>
<td>Z14gR20 (GRD2/20)</td>
<td>A70P20</td>
<td>FWP20</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Nr. 10 005 07.20</td>
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<td>FWP20</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>6KV3280</td>
<td>S1UF1/110/250A/660V</td>
<td>6KV3224</td>
<td>A70P300</td>
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<td>3</td>
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<td>Nr. 20 458 20.250</td>
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<td>FWP300</td>
</tr>
<tr>
<td>B*</td>
<td>2</td>
<td></td>
<td>S1UF1/110/315A/660V</td>
<td>A70P350</td>
<td>FWP350</td>
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<td></td>
<td></td>
<td>Nr. 20 458 20.315</td>
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<td>FWP350</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td></td>
<td>Z14gR32 (GRD2/30)</td>
<td>A70P30</td>
<td>FWP30</td>
</tr>
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<td>FWP30</td>
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<tr>
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<td>3</td>
<td>6KV3350</td>
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<td>6KV3280</td>
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<td>3</td>
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<td>Nr. 20 458 20.315</td>
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<td>B*</td>
<td>2</td>
<td></td>
<td>S2UF1/110/400A/660V</td>
<td>A70P400</td>
<td>FWP400</td>
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<td></td>
<td>Z14gR32 (GRD2/30)</td>
<td>A70P30</td>
<td>FWP30</td>
</tr>
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<td></td>
<td></td>
<td>Nr. 10 005 07.30</td>
<td></td>
<td>FWP30</td>
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### Wiring Procedures

<table>
<thead>
<tr>
<th>Code</th>
<th>Pieces</th>
<th>European</th>
<th>Europe</th>
<th>American</th>
<th>American</th>
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<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>6KDV3420</td>
<td>S2UF1/110/400A/660V&lt;br&gt;Nr. 20 459 20.400</td>
<td>6KDV3336</td>
<td>A70P400 &lt;br&gt;FWP400</td>
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<td>6KDV3420</td>
<td>S2UF1/110/500A/660V&lt;br&gt;Nr. 20 459 20.500</td>
<td></td>
<td>A70P500 &lt;br&gt;FWP500</td>
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<tr>
<td></td>
<td>2</td>
<td>S2UF1/110/630A/660V&lt;br&gt;Nr. 20 459 20.630</td>
<td>Z14gR32 (GRD2/30)&lt;br&gt;Nr. 10 005 07.30</td>
<td>A70P30 &lt;br&gt;FWP30</td>
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<td>6KDV3500</td>
<td>S2UF1/110/500A/660V&lt;br&gt;Nr. 20 459 20.500</td>
<td>6KDV3400</td>
<td>A70P500 &lt;br&gt;FWP500</td>
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<tr>
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<td>2</td>
<td>S2UF1/110/630A/660V&lt;br&gt;Nr. 20 459 20.630</td>
<td>Z14gR32 (GRD2/30)&lt;br&gt;Nr. 10 005 07.30</td>
<td>A70P600 &lt;br&gt;FWP600</td>
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</tr>
<tr>
<td>D</td>
<td>2</td>
<td>6KDV3650</td>
<td>S2UF1/110/630A/660V&lt;br&gt;Nr. 20 459 20.630</td>
<td>6KDV3450</td>
<td>A70P600 &lt;br&gt;FWP600</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>S3UF1/110/710A/660V&lt;br&gt;Nr. 20 460 20.710</td>
<td>Z14gR32 (GRD2/30)&lt;br&gt;Nr. 10 005 07.30</td>
<td>A70P700 &lt;br&gt;FWP700</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Z14gR32 (GRD2/30)&lt;br&gt;Nr. 10 005 07.30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C**</td>
<td>3</td>
<td>6KDV3770Q2</td>
<td>170MS464/800A/660V&lt;br&gt;A2-66C800TS&lt;br&gt;Z14gR32 (GRD2/30)&lt;br&gt;Nr. 10 005 07.30</td>
<td>6KDV3560Q2</td>
<td>170MS464/800A/660V&lt;br&gt;A2-66C800TS&lt;br&gt;A70P30 &lt;br&gt;FWP30</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>6KDV3770Q2</td>
<td>170MS462/630A/660V&lt;br&gt;A2-66C630TS&lt;br&gt;Z14gR32 (GRD2/30)&lt;br&gt;Nr. 10 005 07.30</td>
<td>6KDV3560Q4</td>
<td>170MS462/630A/660V&lt;br&gt;A2-66C630TS&lt;br&gt;A70P30 &lt;br&gt;FWP30</td>
</tr>
<tr>
<td>C**</td>
<td>6</td>
<td>6KDV310H</td>
<td>170MS464/1000A/660V&lt;br&gt;A2-66C1000TS&lt;br&gt;Z14gR32 (GRD2/30)&lt;br&gt;Nr. 10 005 07.30</td>
<td>6KDV3800</td>
<td>70M5464/1000A/660V&lt;br&gt;A2-66C1000TS&lt;br&gt;A70P30 &lt;br&gt;FWP30</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>6KDV310H</td>
<td>170MS464/800A/660V&lt;br&gt;A2-66C800TS&lt;br&gt;Z14gR32 (GRD2/30)&lt;br&gt;Nr. 10 005 07.30</td>
<td>6KDV3850</td>
<td>170MS464/800A/660V&lt;br&gt;A2-66C800TS&lt;br&gt;A70P30 &lt;br&gt;FWP30</td>
</tr>
</tbody>
</table>

* Necessary only for the four quadrant functioning
** These fuses are internally mounted and are provided on the delivery
A External fuses for the armature converter on the AC input side
B External fuses for the armature circuit on the direct current side
C Internal armature fuses for the device starting from type 560A / 770A (American/European)
D External fuses for the field circuit on the AC input side.

Note: These fuses are necessary only for 6KDV3...Q2A/Q4E Internal fuses are provided for 6KDV3...Q2B/Q4F.

**Note!**

When with the same letter different fuses are stated, it means that they can be used alternatively. The different types differ for the building forms and for the production house. See the following indications.

Fuses producer:
- Type Z14gR..., GRD2... (E27), Z22gR..., GRD3... (E33)
- S... (screw fuses with a distance 80 or 110 mm) Jean Müller, Eltville
- A70P, A2-66C Gould Shawmut
- FWP..., 170 M Bussmann

**Note!**

The fuse technical data (dimensions, weights, dissipated powers, fuses carrier etc.), can be derived from the relative data sheets.
4.9.2 Fuses selection when the Overload function is activated

> 100% for 60 seconds - European
> 150% for 60 seconds - American

The fuses suitable for the max Overload capacity of each converter are listed in the following table.

<table>
<thead>
<tr>
<th>Converter</th>
<th>Code</th>
<th>Pieces</th>
<th>400 VAC Input supply</th>
<th>500 VAC Input Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KDV3017</td>
<td>A</td>
<td>3</td>
<td>Z14gR25 (GRD2/25)</td>
<td>Z14gR25 (GRD2/25)</td>
</tr>
<tr>
<td>6KDV3020</td>
<td></td>
<td>3</td>
<td>Nr. 10 005 07.25</td>
<td>Nr. 10 005 07.25</td>
</tr>
<tr>
<td></td>
<td>B*</td>
<td>3</td>
<td>Z14gR32 (GRD2/30)</td>
<td>Z14gR32 (GRD2/30)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Nr. 10 005 07.30</td>
<td>Nr. 10 005 07.30</td>
</tr>
<tr>
<td>6KDV3035</td>
<td>A</td>
<td>3</td>
<td>Z22gR50 (GRD3/50)</td>
<td>Z14gR40 (GRD3/35)</td>
</tr>
<tr>
<td>6KDV3040</td>
<td></td>
<td>3</td>
<td>Nr. 10 005 07.50</td>
<td>Nr. 10 005 07.35</td>
</tr>
<tr>
<td></td>
<td>B*</td>
<td>2</td>
<td>Z22gR63 (GRD3/63)</td>
<td>Z22gR50 (GRD3/50)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Nr. 10 005 07.63</td>
<td>Nr. 10 005 07.50</td>
</tr>
<tr>
<td>6KDV3056</td>
<td>A</td>
<td>3</td>
<td>Z22gR80 (GRD4/80)</td>
<td>S00UF1/80/100A/660V</td>
</tr>
<tr>
<td>6KDV3070</td>
<td></td>
<td>3</td>
<td>S00UF1/80/100A/660V</td>
<td>Nr. 20 189 20, 80 A</td>
</tr>
<tr>
<td></td>
<td>B*</td>
<td>2</td>
<td>S00UF1/80/125A/660V</td>
<td>Nr. 20 189 20, 100 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Nr. 20 189 20, 125</td>
<td>Nr. 20 189 20, 125</td>
</tr>
<tr>
<td>6KDV3088</td>
<td>A</td>
<td>3</td>
<td>S00UF1/80/100A/660V</td>
<td>Nr. 20 189 20, 160</td>
</tr>
<tr>
<td>6KDV3110</td>
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<td>3</td>
<td>Nr. 20 189 20, 100</td>
<td>Nr. 20 189 20, 125</td>
</tr>
<tr>
<td></td>
<td>B*</td>
<td>2</td>
<td>S00UF1/80/200A/660V</td>
<td>Nr. 20 189 20, 200</td>
</tr>
<tr>
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<td></td>
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<td>Nr. 20 189 20, 200</td>
<td>Nr. 20 189 20, 200</td>
</tr>
<tr>
<td>6KDV3112</td>
<td>A</td>
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<td>S1UF1/110/315A/660V</td>
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<tr>
<td>6KDV3140</td>
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<td>S2UF1/110/400A/660V</td>
<td>Nr. 459 20, 400</td>
</tr>
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<td></td>
<td>2</td>
<td>Nr. 459 20, 400</td>
<td>Nr. 459 20, 400</td>
</tr>
<tr>
<td>6KDV3148</td>
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<td>S1UF1/110/400A/660V</td>
<td>S1UF1/110/400A/660V</td>
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<tr>
<td>6KDV3185</td>
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<td>Nr. 459 20, 400</td>
<td>Nr. 459 20, 400</td>
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<tr>
<td></td>
<td>B*</td>
<td>2</td>
<td>S2UF1/110/500A/660V</td>
<td>Nr. 459 20, 500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Nr. 459 20, 500</td>
<td>Nr. 459 20, 500</td>
</tr>
<tr>
<td>6KDV3224</td>
<td>A</td>
<td>3</td>
<td>S2UF1/110/500A/660V</td>
<td>S2UF1/110/500A/660V</td>
</tr>
<tr>
<td>6KDV3280</td>
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<td>3</td>
<td>Nr. 459 20, 500</td>
<td>Nr. 459 20, 500</td>
</tr>
<tr>
<td></td>
<td>B*</td>
<td>2</td>
<td>S2UF1/110/630A/660V</td>
<td>Nr. 459 20, 630</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Nr. 459 20, 630</td>
<td>Nr. 459 20, 630</td>
</tr>
<tr>
<td>6KDV3336</td>
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<td>S2UF1/110/630A/660V</td>
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<tr>
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<td>Nr. 459 20, 630</td>
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<td>S3UF1/110/710A/660V</td>
<td>Nr. 460 20, 710</td>
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<td></td>
<td>2</td>
<td>Nr. 460 20, 710</td>
<td>Nr. 460 20, 710</td>
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</table>
A External fuses for the armature circuit on the DC side
B External fuses for the armature converter on the AC input side
* Necessary only for the four quadrant functioning

**Note for sizes 6KD3770 ... 6KD310H: the armature fuses are internally mounted (see table 4.9.1.1)**

### 4.9.3 Internal Fuses

**Table 4.9.3.1: Internal fuses**

<table>
<thead>
<tr>
<th>Converter</th>
<th>Designation</th>
<th>Fuses for</th>
<th>Fuse Type</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>6KD3017 - 3148</td>
<td>F1</td>
<td>+ 24V</td>
<td>IEC 250 V 1 A slo-blo 0.2&quot; x 0.8&quot; (5 x 20 mm)</td>
<td>SW1-31</td>
</tr>
<tr>
<td>6KD3020 - 3185</td>
<td>F1</td>
<td>+ 24V</td>
<td>IEC 250 V 3.15 A fast acting 0.2&quot; x 0.8&quot; (5 x 20 mm)</td>
<td>SW2-32</td>
</tr>
<tr>
<td>6KD3224 - 3450</td>
<td>F2</td>
<td>+ 24V</td>
<td>IEC 250 V 2.50 A slo-blo 0.2&quot; x 0.8&quot; (5 x 20 mm)</td>
<td>SW3-32</td>
</tr>
<tr>
<td>6KD3280 - 3650</td>
<td>F1/F2/F3</td>
<td>Varistor fuse</td>
<td>IEC 500 V 16 A fast acting 0.24&quot; x 1.26&quot; (6 x 32 mm)</td>
<td>SW2-31</td>
</tr>
<tr>
<td>6KD3560 - 3850</td>
<td>F1/F2/F3</td>
<td>Varistor fuse</td>
<td>IEC 500 V 25 A fast acting 0.24&quot; x 1.26&quot; (6 x 32 mm)</td>
<td>FL-31</td>
</tr>
<tr>
<td>6KD3770 - 310H</td>
<td>F1/F2/F3</td>
<td>Varistor fuse</td>
<td>IEC 500 V 16 A fast acting 0.24&quot; x 1.26&quot; (6 x 32 mm)</td>
<td>FL-31</td>
</tr>
</tbody>
</table>

**Replacement vendor sources** - equivalent to meet above rating

- **F1** 1 A Omega (Europe) ST 520210 Littlefuse 218 001 (Littlefuse 239 1.25 may also be substituted).
- **F1** 3.15 A Omega (Europe) SF 520231 Littlefuse 217 3.15
- **F2** 2.5 A Omega (Europe) ST 520225 Littlefuse 218 2.5
- **F...** 16 A Omega (Europe) FF 632316 Cooper/Bussman FWH-016A6F
- **F...** 25 A Omega (Europe) FF 632325 Cooper/Bussman FWH-025A6F

**Internal field exciter fuse** (American version only; for “standard” version the fuses are externally mounted).

<table>
<thead>
<tr>
<th>Device</th>
<th>Internal field exciter fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>Fuse</td>
</tr>
<tr>
<td>6KD3017 - 3148</td>
<td>2 pieces</td>
</tr>
<tr>
<td>6KD3224 - 3850</td>
<td>2 pieces</td>
</tr>
</tbody>
</table>
4.9.4 AC input contactors

**Note!** The contactor sizes must be selected based on the converter rated current. The dimensions basis is the thermo current AC1, which is absorbed by the input during the rated functioning.

**Note!** The technical data of the contactors, as for example weights, dissipated powers, auxiliary contacts etc. can be found in the appropriate data sheets.

4.9.5 Control power protection

The 115 VAC/230 VAC control power input, U2 & V2, for the DV-300 are required to be short circuit protected. This protection can be provided by using standard time delay fuses, or circuit breaker. The circuit breaker and/or time delay fuses must be selected to survive the short circuit available current of the feeder source for this circuit, and the inrush current of the drive power supply. The rating of the fuses or circuit breaker should be sized mainly to protect the wiring from the fuses/circuit breaker connections to U2 & V2, and not nuisance trip or blow from the inrush current.

The table below, Table 4.9.5, lists the input current characteristics of the control power.

<table>
<thead>
<tr>
<th>Device</th>
<th>American</th>
<th>European</th>
<th>Card</th>
<th>Power</th>
<th>Regulation Power Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6KDV3017</td>
<td>6KDV3020</td>
<td>to ...</td>
<td>SW1-31</td>
<td>60 W</td>
</tr>
<tr>
<td></td>
<td>6KDV3148</td>
<td>6KDV3185</td>
<td>to ...</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6KDV3224</td>
<td>6KDV3280</td>
<td>to ...</td>
<td>SW2-32</td>
<td>110 W</td>
</tr>
<tr>
<td></td>
<td>6KDV3850</td>
<td>6KDV310H</td>
<td>to ...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The control power input is best served by a power source that is stabilized and buffered from the power system transients. The control power of many drives can be fed from a single source, as long as proper distribution protection is provided.

For example, a 6KDV3017, with 480VAC input, has control power fed from a 2 KVA 480:115 transformer that is panel mounted in the drive panel. The transformer primary is wired from the 480VAC drive incoming power from the load side of the main power disconnect and is fused with Fusetron 600 V 5A FRS fuses. The wires from the transformer secondary to the drive connection points U2 & V2 are 12 AWG.

No additional circuit protection is required, and control power is disconnected when the main power disconnected is off.

If the 2KVA transformer was mounted in a remote panel, a 250V/120V 10A 5kA interrupting CB could be panel mounted near the Drive to locally turn off the Drive control panel.
4.10 REACTORS / FILTERS

In order to provide AC line protection from transients and high frequencies, it is necessary to insert a threephase reactor on the AC input of the DV-300. The values here stated take into consideration the recommendation per EN 60146-1-1, IEC 146-1-2, EN 61136-1.

The reactors can be provided by means of line reactors or an isolation transformer.

4.10.1 AC input choke

The type of the required AC input choke depends on
- the current absorbed by the AC input
- the AC input voltage
- the relative short circuit voltage
- the AC input frequency

The values stated in the following tables refer to a functioning with the connected converter rated current and with a relative short circuit voltage of $u_k = 4\%$. The saturation current of the reactors is 200% of the full load current rating of the reactor.

In case of functioning with a motor having a rated current lower than the converter one it is possible to choose the main reactor on the basis of the motor current stated on the AC input side (armature current $\times 0.82 \times 1.05$). The reactor saturation current can also be calculated according the required motor overload.

Example: calculating the AC input choke

Motor: $V_a = 400V$ $I_a = 80 A$ $P = 29.4 kW$ Overload 150% $I_a$

Converter 6KDV3110Q2A.../Q4A...

AC input current: $I_{\text{mains}} = I_a \cdot 0.82 \cdot 1.05 = 80 \cdot 0.82 \cdot 1.05 = 68.9 A$

AC input inductance: $L = \frac{0.04 \cdot V_{\text{mains}}}{\sqrt{3} \cdot 2\pi \cdot f_{\text{mains}} \cdot I_{\text{mains}}} = \frac{0.04 \cdot 400}{\sqrt{3} \cdot 2\pi \cdot 50 \cdot 68.9} = 0.427 mH$

Choke saturation current: $I_{\text{sat}} = 1.5 I_{\text{mains}} = 103.3 A$
### Table 4.10.1.1: AC input choke

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Main 400 V, 3Ph, 50 Hz</td>
<td>6KDV3020Q2A.../Q4E...</td>
<td>1.71</td>
<td>17.2</td>
<td>34.4</td>
<td>50</td>
<td>KLR18CTB</td>
</tr>
<tr>
<td></td>
<td>6KDV3040Q2A.../Q4E...</td>
<td>0.855</td>
<td>34.4</td>
<td>68.8</td>
<td>50</td>
<td>KLR45CTB</td>
</tr>
<tr>
<td></td>
<td>6KDV3070Q2A.../Q4E...</td>
<td>0.488</td>
<td>60.2</td>
<td>120.4</td>
<td>50</td>
<td>KLR80CTB</td>
</tr>
<tr>
<td></td>
<td>6KDV3110Q2A.../Q4E...</td>
<td>0.311</td>
<td>94.6</td>
<td>189.2</td>
<td>50</td>
<td>KLR110CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3140Q2A.../Q4E...</td>
<td>0.244</td>
<td>120.4</td>
<td>240.8</td>
<td>50</td>
<td>KLR160CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3185Q2A.../Q4E...</td>
<td>0.185</td>
<td>159</td>
<td>318</td>
<td>50</td>
<td>KLR300CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3280Q2A.../Q4E...</td>
<td>0.122</td>
<td>241</td>
<td>482</td>
<td>50</td>
<td>KLR300CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3350Q2A.../Q4E...</td>
<td>0.098</td>
<td>301</td>
<td>602</td>
<td>50</td>
<td>KLR360CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3420Q2A.../Q4E...</td>
<td>0.081</td>
<td>361</td>
<td>722</td>
<td>50</td>
<td>KLR420CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3500Q2A.../Q4E...</td>
<td>0.068</td>
<td>430</td>
<td>860</td>
<td>50</td>
<td>KLR600CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3650Q2A.../Q4E...</td>
<td>0.053</td>
<td>559</td>
<td>1118</td>
<td>50</td>
<td>KLR750CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3770Q2A.../Q4E...</td>
<td>0.044</td>
<td>662</td>
<td>1324</td>
<td>50</td>
<td>KLR750CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV310HQ2A.../Q4E...</td>
<td>0.034</td>
<td>860</td>
<td>1720</td>
<td>50</td>
<td>KLR1250C</td>
</tr>
<tr>
<td></td>
<td>6KDV310HQ2A.../Q4E...</td>
<td>0.033</td>
<td>903</td>
<td>1806</td>
<td>50</td>
<td>KLR1250C</td>
</tr>
<tr>
<td>Main 460 V, 3Ph, 60 Hz</td>
<td>6KDV3017Q2B.../Q4F...</td>
<td>1.933</td>
<td>14.6</td>
<td>29.2</td>
<td>60</td>
<td>KLR18CTB</td>
</tr>
<tr>
<td></td>
<td>6KDV3035Q2B.../Q4F...</td>
<td>0.938</td>
<td>30.1</td>
<td>60.2</td>
<td>60</td>
<td>KLR45CTB</td>
</tr>
<tr>
<td></td>
<td>6KDV3056Q2B.../Q4F...</td>
<td>0.586</td>
<td>48.2</td>
<td>96.4</td>
<td>60</td>
<td>KLR80CTB</td>
</tr>
<tr>
<td></td>
<td>6KDV3088Q2B.../Q4F...</td>
<td>0.373</td>
<td>75.8</td>
<td>151.6</td>
<td>60</td>
<td>KLR110CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3112Q2B.../Q4F...</td>
<td>0.293</td>
<td>96.4</td>
<td>193</td>
<td>60</td>
<td>KLR160CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3148Q2B.../Q4F...</td>
<td>0.227</td>
<td>127.4</td>
<td>255</td>
<td>60</td>
<td>KLR160CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3224Q2B.../Q4F...</td>
<td>0.146</td>
<td>193</td>
<td>386</td>
<td>60</td>
<td>KLR300CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3280Q2B.../Q4F...</td>
<td>0.117</td>
<td>241</td>
<td>482</td>
<td>60</td>
<td>KLR300CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3336Q2B.../Q4F...</td>
<td>0.098</td>
<td>289</td>
<td>578</td>
<td>60</td>
<td>KLR360CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3400Q2B.../Q4F...</td>
<td>0.082</td>
<td>344</td>
<td>688</td>
<td>60</td>
<td>KLR420CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3450Q2B.../Q4F...</td>
<td>0.073</td>
<td>387</td>
<td>774</td>
<td>60</td>
<td>KLR600CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3560Q2B.../Q4F...</td>
<td>0.058</td>
<td>482</td>
<td>964</td>
<td>60</td>
<td>KLR600CCB</td>
</tr>
<tr>
<td></td>
<td>6KDV3800Q2B.../Q4F...</td>
<td>0.041</td>
<td>689</td>
<td>1378</td>
<td>60</td>
<td>KLR1250C</td>
</tr>
<tr>
<td></td>
<td>6KDV3850Q2B.../Q4F...</td>
<td>0.038</td>
<td>732</td>
<td>1464</td>
<td>60</td>
<td>KLR1250C</td>
</tr>
</tbody>
</table>

**4.10.2 Interference suppression filters**

The converters of DV-300 series must be equipped with an external EMI filter in order to reduce the radio-frequency emissions on the mains line. The filter selection is depending on the drive size and the installation environment. For this purpose see the “EMC Guidelines”.

In the Guide it is also indicated how to install the cabinet (connection of filter and mains reactors, cable shields, grounding, etc.), in order to make it EMC compliant according the EMC Directive 89/336/EEC.

The document describes the present situation concerning the EMC standards and the compliance tests made on the GE drives.
4.11 ENGINEERING NOTES

The potentials of the regulator section are galvanic divided from the power section. Figure 4.11.1 shows their connection.

- The analog inputs are designed as differential.
- The enables are isolated from the regulation via optoisolators. The terminals 12 to 15 have terminal 16 as a common reference potential.
- The internal potential 0V is connected to terminal 11. In the majority of the cases the interference suppression is decreased!
- The regulation card puts at your disposal the following power supplies, which have a common reference point:
  + 10V and -10V for the reference
  + 24V for the power supply of the digital inputs and outputs
  + 5V for the encoder power supply
- The analog outputs are divided from the internal potential through a differential amplifier. The two outputs of the option card have the same potential (terminal 22 and 24 of 6KCV300TBO option card). When the 6KCV300TBO option card is used, the potential of the analog outputs are divided. For a better interference suppression and for the “cleaning” of the output signals, the terminals 22 and 24 of the 6KCV300TBO option card are directly ground connected (terminal 10 and/or 20 of the R-TPD3 card) or via a 0.1µF/250V capacitor.
- The digital outputs have the same potential (terminal 37) but they are divided from the regulator internal potential via optoisolators. In order to use the outputs, it is necessary to connect a power supply voltage to the terminal 30.
- The digital inputs are divided from the regulator through optoisolators. The terminals 31 to 34 have terminal 37 as a common potential.

**Figure 4.11.1: Potentials of the regulator section**
External devices

As for the installation of contactors, protection devices, chokes, filters and other external devices it is necessary to follow the indication given in the previous chapters. The same theory is valid for motors, encoders and tachometers.

Connection cables

The encoder shielded cable must be made of twisted pairs. The connection cables of the encoders and of the motors, if possible, should be connected directly to the device, without going through support terminal strips. The shieldings of the signal conductors have to be ground connected on both sides. Anyway, for all analog and digital signals with very long connections (outside the electric board), it is suggested to have a ground connection only on the converter side, in order to avoid possible noises caused by the closing of the ground loops. In particular cases it could be necessary to connect the shielding on both sides, thus granting the point equipotentiality via suitable connection cables.

The encoder cable has to be made up of twisted loops with the global shielding connected to the ground on the converter side. Avoid to connect the shielding on the motor side connector. In particular cases (cable longer than 100 meters, strong electromagnetic noise), it could be necessary to use a cable with a shielding on every loop to be connected to the power supply ground. The global shielding has always to be ground connected.
5 - CONVERTER OPERATION

5.1 KEYPAD

The keypad is made of a LCD display with two 16-digit lines and 8 function buttons. It is used
- to command the drive when this system has been selected
- to display the speed, the voltage and diagnostics during the operating time
- to set parameters

5.1.1 LEDs

The leds present on the keypad are used to diagnose in a fast way the functioning situation of the converter.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Torque</td>
<td>yellow</td>
<td>the LED is lit, when the drive operates with a negative torque</td>
</tr>
<tr>
<td>+ Torque</td>
<td>yellow</td>
<td>the LED is lit, when the drive operates with a positive torque</td>
</tr>
<tr>
<td>Alarm</td>
<td>red</td>
<td>the LED is lit, it signals the intervention and the alarm condition</td>
</tr>
<tr>
<td>Enable</td>
<td>green</td>
<td>the LED is lit, when the converter is enabled</td>
</tr>
<tr>
<td>Zero Speed</td>
<td>yellow</td>
<td>the LED is lit, when the motor speed is lower than the threshold set by Speed zero level</td>
</tr>
<tr>
<td>I Limit</td>
<td>yellow</td>
<td>the LED is lit, when the converter operates at a current limit</td>
</tr>
</tbody>
</table>
5.1.2 Moving inside a menu

- The DRIVE STATUS always appears when the converter is switched on.
- Use the ▲ and ▼ keys to select the individual points within the same menu level.
- Press the ENT key to enter the next menu level.
- Use the CANC key to return to the next higher menu level, irrespective of which menu point was selected. The appropriate menu of the next higher level will appear once the return has been made.

![Diagram of menu structure]

Figure 5.1.2.1: Moving inside a menu

5.1.3 Displaying parameters

- Select the parameters within the menu
- Press ENT. The parameter with its relative value will appear.
- Return to the menu using CANC.
5.1.4. Changing / Saving parameters / Password

The parameters with changeable values are divided into three groups:
- Parameters whose content is either selected as a number or as text within a defined range e.g. ramp times and reference values
- Parameters whose contents are fixed values that can be selected. e.g. Jog selection with the “speed input” and “Ramp input” alternatives.
- Parameters that are automatically scaled by the keypad e.g. Auto tune inp XX

Note! Only those parameters that are not assigned to a digital or analog input/output can be changed with the keypad. The changed parameters must be saved otherwise the previous values will be loaded the next time the device is switched on.

Changing numerical values and text

- Select within the menu the parameters to be changed.
- Press ENT. The value of the parameter will appear and the last digit will flash. The value of the flashing digit is always the one that can be changed.
- Increase the value with +
- Reduce the value with -
- Select the next digit left with ▲
- Select the next digit right with ▼
- Confirm the new value and return to the previous display by pressing ENT.
- Press CANC to return without changes.

Note! When setting the Dim factor text parameter, the following characters are also available in addition to the numbers: / % & + , . : < = > ? A...Z [ ] a...z
Selection from predefined values

- The parameters that can be selected among the several possibilities are marked with +/- on the keypad display.
- To change a value press ENT. The current value is shown in the display. This can be changed with the + and - keys.
- Confirm the new value and return to the previous display by pressing ENT.
- Return without changes via CANC

Autotuning of Analog input

- Select the parameter **Auto tune input XX**.
- Press ENT
- The tuning procedure will run automatically. The messages “Tuning” and “Ready” will appear in succession before the original parameter is shown.

**Note!** The maximum signal possible must be present on the analog input concerned during the tuning procedure.
**Parameters Saving**

The parameters must be saved, otherwise the previous values will be loaded the next time the device is switched on.

- Select **Save parameters** in the START UP or in the SPEC FUNCTIONS menu.
- Press ENT
- The saving operation is automatic. The messages “Wait...” and “Write ok” will appear in succession before the original parameter is shown.

**Entering a password**

The operator can define a password consisting of a freely selectable five-digit number combination in order to protect the keypad from unauthorized access. This is carried out via the **Pword 1** parameter.

- Select **Pword1** (= Password 1) in the CONFIGURATION menu.
- Press ENT. The value 00000 will appear with the last digit flashing. The value of the flashing digit is changed.
- Increase the numerical value with +
- Reduce the numerical value with -
- Select the next digit left with ▲
- Select the next digit right with ▼
- Confirm the password by pressing ENT. The message: Pword1: Enabled will then appear shortly with the currently valid password displayed.
- The existing password is indicated in the CONFIGURATION menu via the “Pword 1: Enabled” message.
- Press the CANC key in order to abort the entry of the password.

**Note!**

The password must be saved with Save parameters so that it is also active the next time the device is switched on.
General unlocking of the password

- Select the parameter **Pword1** (= Password 1) in the CONFIGURATION menu.
- When the password is enabled, the message “Pword 1: Enabled” appears.
- Press ENT to call the value 00000 with the last digit flashing. The value changed is always the digit that is flashing. The valid password must be re-entered in order to unlock it.
- Increase the numerical value with +
- Reduce the numerical value with -
- Select the next digit left with ▼
- Select the next digit right with ►
- Confirm the password by pressing ENT. The message: Pword1: Enabled will then appear for a short time.
- The existing password is indicated in the CONFIGURATION menu via the “Pword 1: Enabled” message.
- Press the CANC key in order to abort the entry of the password if required.
- If the incorrect password is entered and then the ENT key pressed, the message “Password wrong” will appear and the keypad will return to the CONFIGURATION menu with the display “Pword1: Enabled”

**Note!** The Save parameter function must be used to save the password if the password itself must not only be disabled but completely unlocked.

5.1.5 Operating the drive via the Keypad

In order to operate the drive via the keypad, the following settings must be done:

- **START UP and CONFIGURATION menu**
  - Set **Main commands** = Digital
  - Set **Control Mode** = Local

- The hardware enables on terminals 12...15 are also active when the drive is operated via the keypad. This means, for example, that the signal at terminal 13 must also be present for starting the drive in addition to the command via the keypad.
- If the drive is stopped via the keypad, it can be restarted simply by pressing the Start Key.
- If the stop was caused by removing the voltage signal on terminal 13, both the signal at terminal 13 and the command via the keypad are necessary to restart the drive. The signal at the terminals must be present before giving the keypad command.
- The same applies accordingly to the enabling of the drive via the Enable drive parameter.

5.1.5.1 Starting and stopping the drive

**Note:** The keypad must be enabled (see section 6.11.1) before performing these actions.

**Enabling the converter**

- Select the parameter Enable drive in the DRIVE STATUS or START UP or MONITOR menu.
- Press ENT
- Use the key + to choose “Disabled” or “Enabled”.
- Press ENT to confirm your entry.

**Disabling the converter**

- Select the parameter Enable drive in the DRIVE STATUS or START UP or MONITOR menu.
- Press ENT
- Use the key - to change the display from “Enabled” into “Disabled”.
- Press ENT to confirm your entry.

**Start / Stop**

**Warning:** The keypad STOP can be used only when MAIN COMMANDS parameter is set to digital.

- Start: press the Start key.
- Stop: press the STOP key.
5.1.5.2 Failure register / Acknowledging alarms

Display of the failure register
- Select the parameter **Failure register** in the SPEC FUNCTIONS menu.
- Press ENT. The last error that has occurred will be displayed.
- Using the key + it is possible to display the previous alarm.
- The failure register can take up to 10 values. If a new failure is reported, the oldest entry in the failure register is overwritten.
- The entries in the failure register are retained until the register is cleared.
- Pressing ENT the time when the alarm occurred will be displayed. The time refers to the converter functioning period (presence of the supply voltage).
- After displaying, the menu goes back automatically to the **Failure register point**.
- By pressing the key CANC during the alarm display, the intervention time is not shown but on the contrary you go back to the **Failure register menu**.

**Clearing the failure register**

- Select the parameter **Failure reg del** in the SPEC FUNCTIONS menu.
- Press ENT. The failure register is cleared.
**Acknowledging a failure alarm**

- If a failure occurs, the appropriate failure alarm will appear in the display and the message will flash.
- Acknowledge or reset the failure by pressing the CANC key. The converter must be disabled for this and a Start command must not be present.

**Acknowledging when several failure alarms occur at the same time**

- When several failure alarms occur at the same time, the blinking message “Multi failures” will appear in the display.
- Select the parameter **Failure reset** in the SPEC FUNCTIONS menu.
- Press the CANC key to acknowledge or reset the failure alarm. The converter must be disabled for this and there should be no Start command present.

**5.1.5.3 Motor potentiometer function**

*Note!* To use the motor potentiometer function, this must be enabled with the **Enable motor pot** parameter!

**Acceleration, Deceleration**

- Select the Motor pot oper parameter in the “Motor pot” submenu.
- Pressing ENT the current reference value is displayed.
- Press the + key to increase the reference value and accelerate the drive.
- Press the - key to decrease the reference value and decelerate the drive. This applies to both rotation directions.
- Press CANC to return to the “Motor pot” submenu.
Changing rotation direction

- Select the **Motor pot sign** parameter in the “Motor pot” submenu.
- Pressing ENT the current rotation direction is displayed.
- Press the + key to select clockwise rotation and the - key for counterclockwise rotation.
- Confirm by pressing ENT.
- Changing the **Motor pot sign** parameter during operation causes the drive to reverse rotation according to the ramp times set.

Resetting the speed reference value

- Select the **Motor pot reset** parameter in the “Motor pot” submenu.
- Press ENT. The reference speed is set to zero.

*Note!* The speed reference value can only be reset when the drive is switched off.

5.1.5.4. Jog function

*Note!* The Jog function must be enabled via the Enable jog parameter!

- Select the **Jog operation** parameter in the “Jog function” submenu.
- Press ENT. The selection Jog function is displayed.
- Press the + key to select clockwise rotation and the - key for counterclockwise rotation.
- Press CANC to return to the “Jog function” submenu.
5.2. MENU STRUCTURE

The menu consists of a main menu with submenus and parameters. The structure can be compared to the organization of files and subdirectories on a PC.

| DV-300 | main menu | corresponds PC main menu (main menu = Root) |
| DV-300 | submenu   | corresponds to PC submenu                     |
| DV-300 | parameter | corresponds to individual parameters         |

The menu structure is described in the function description given in section 6, “Function description”. The following conventions apply:

Main menu: Black field, text in capitals
Submenu: Black field
Parameter: White field

---

DV-300 Adjustable Speed Drives

---

CONVERTER OPERATION

---
### DRIVE STATUS

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[44]</td>
<td>Ramp ref 1 [FF]</td>
</tr>
<tr>
<td>[314]</td>
<td>Enable drive</td>
</tr>
<tr>
<td>[315]</td>
<td>Start/Stop</td>
</tr>
<tr>
<td>[233]</td>
<td>Output voltage [V]</td>
</tr>
<tr>
<td>[199]</td>
<td>Motor current [%]</td>
</tr>
<tr>
<td>[122]</td>
<td>Actual spd (rpm)</td>
</tr>
<tr>
<td>[118]</td>
<td>Speed ref (rpm)</td>
</tr>
<tr>
<td>[1052]</td>
<td>Output power [kW]</td>
</tr>
<tr>
<td>[351]</td>
<td>Flux current (A)</td>
</tr>
<tr>
<td>[466]</td>
<td>Mains voltage [V]</td>
</tr>
<tr>
<td></td>
<td>Digital I/Q</td>
</tr>
</tbody>
</table>

### START UP

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[45]</td>
<td>Speed base value [FF]</td>
</tr>
<tr>
<td>[374]</td>
<td>Nom flux curr [A]</td>
</tr>
<tr>
<td>[499]</td>
<td>Speed-0 f weak</td>
</tr>
<tr>
<td>[21]</td>
<td>Acc delta speed [FF]</td>
</tr>
<tr>
<td>[22]</td>
<td>Acc delta time [s]</td>
</tr>
<tr>
<td>[29]</td>
<td>Dec delta speed [FF]</td>
</tr>
<tr>
<td>[30]</td>
<td>Dec delta time [s]</td>
</tr>
</tbody>
</table>

#### Motor Data

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[280]</td>
<td>Motor nom flux [A]</td>
</tr>
<tr>
<td>[469]</td>
<td>Flux reg mode</td>
</tr>
<tr>
<td>[179]</td>
<td>Full load curr [A]</td>
</tr>
<tr>
<td>[162]</td>
<td>Motor max speed [rpm]</td>
</tr>
<tr>
<td>[175]</td>
<td>Max out voltage [V]</td>
</tr>
<tr>
<td>[456]</td>
<td>Flux weak speed [%]</td>
</tr>
</tbody>
</table>

#### Limits

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[7]</td>
<td>T current lim [%]</td>
</tr>
<tr>
<td>[468]</td>
<td>Flux current min [%]</td>
</tr>
<tr>
<td>[467]</td>
<td>Flux current max [%]</td>
</tr>
<tr>
<td>[1]</td>
<td>Speed min amount [FF]</td>
</tr>
<tr>
<td>[2]</td>
<td>Speed max amount [FF]</td>
</tr>
</tbody>
</table>

#### Speed Feedback

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[414]</td>
<td>Speed fbk sel</td>
</tr>
<tr>
<td>[562]</td>
<td>Tacho scale</td>
</tr>
<tr>
<td>[563]</td>
<td>Speed offset</td>
</tr>
<tr>
<td>[169]</td>
<td>Encoder 2 pulses</td>
</tr>
<tr>
<td>[457]</td>
<td>Enable fbk contr</td>
</tr>
<tr>
<td>[652]</td>
<td>Refresh enc 2</td>
</tr>
</tbody>
</table>

#### Alarms

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[481]</td>
<td>Undervolt thr [V]</td>
</tr>
<tr>
<td>[584]</td>
<td>Overcurrent thr [%]</td>
</tr>
</tbody>
</table>
### Overload control

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>309</td>
<td>Enable overload</td>
</tr>
<tr>
<td>318</td>
<td>Overload mode</td>
</tr>
<tr>
<td>312</td>
<td>Overload current [%]</td>
</tr>
<tr>
<td>313</td>
<td>Base current [%]</td>
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<td>Overload time [s]</td>
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<td>1289</td>
<td>Motor ovrld preal.</td>
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<td>Motor I2t accum</td>
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<tr>
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<td>Drive ovrld preal.</td>
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<td>1439</td>
<td>Drive I2t accum</td>
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<td>311</td>
<td>Pause time [s]</td>
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### Analog inputs

#### Analog input 1

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<td>Select input 1</td>
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<tr>
<td>72</td>
<td>Scale input 1</td>
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<td>74</td>
<td>Offset input 1</td>
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#### Analog input 2

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<td>Select input 2</td>
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<tr>
<td>77</td>
<td>Scale input 2</td>
</tr>
<tr>
<td>260</td>
<td>Auto tune inp 2</td>
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#### Analog input 3

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<td>80</td>
<td>Select input 3</td>
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<td>82</td>
<td>Scale input 3</td>
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<td>261</td>
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<table>
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<tr>
<td>452</td>
<td>R&amp;L Search</td>
</tr>
<tr>
<td>314</td>
<td>Enable drive</td>
</tr>
<tr>
<td>315</td>
<td>Start/Stop</td>
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### Speed self tune

<table>
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<th>Description</th>
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<tbody>
<tr>
<td>1029</td>
<td>Fwd-Rev spd tune</td>
</tr>
<tr>
<td>1048</td>
<td>Test T curr lim [%]</td>
</tr>
<tr>
<td>1027</td>
<td>Start</td>
</tr>
<tr>
<td>1014</td>
<td>Inertia [kg<em>m</em>m*]</td>
</tr>
<tr>
<td>1030</td>
<td>Inertia Nw [kg<em>m</em>m*]</td>
</tr>
<tr>
<td>1015</td>
<td>Friction [N*m]</td>
</tr>
<tr>
<td>1031</td>
<td>Friction Nw [N*m]</td>
</tr>
<tr>
<td>87</td>
<td>Speed P [%]</td>
</tr>
<tr>
<td>1032</td>
<td>Speed P Nw [%]</td>
</tr>
<tr>
<td>88</td>
<td>Speed I [%]</td>
</tr>
<tr>
<td>1033</td>
<td>Speed I Nw [%]</td>
</tr>
<tr>
<td>1028</td>
<td>Take val</td>
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<table>
<thead>
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<td>Main commands</td>
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<td>253</td>
<td>Control mode</td>
</tr>
<tr>
<td>256</td>
<td>Save parameters</td>
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## TUNING

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<tr>
<td>[452]</td>
<td>R&amp;L Search</td>
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<tr>
<td>[314]</td>
<td>Enable drive</td>
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<tr>
<td>[315]</td>
<td>Start/Stop</td>
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### Speed self tune

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<tbody>
<tr>
<td>[1029]</td>
<td>Fwd-Rev spd tune</td>
</tr>
<tr>
<td>[1048]</td>
<td>Test T curr lim [%]</td>
</tr>
<tr>
<td>[1027]</td>
<td>Start</td>
</tr>
<tr>
<td>[1014]</td>
<td>Inertia [kg<em>m</em>m*]</td>
</tr>
<tr>
<td>[1030]</td>
<td>Inertia Nw [kg<em>m</em>m*]</td>
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<tr>
<td>[1015]</td>
<td>Friction [N*m]</td>
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<td>[1031]</td>
<td>Friction Nw [N*m]</td>
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<tr>
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<td>Speed P [%]</td>
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<tr>
<td>[1032]</td>
<td>Speed P Nw [%]</td>
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<tr>
<td>[88]</td>
<td>Speed I [%]</td>
</tr>
<tr>
<td>[1033]</td>
<td>Speed I Nw [%]</td>
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<tr>
<td>[1028]</td>
<td>Take val</td>
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<tr>
<td>[87]</td>
<td>Speed P [%]</td>
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<td>[88]</td>
<td>Speed I [%]</td>
</tr>
<tr>
<td>[444]</td>
<td>Prop filter [ms]</td>
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<tr>
<td>[91]</td>
<td>Flux P [%]</td>
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<td>[92]</td>
<td>Flux I [%]</td>
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<tr>
<td>[493]</td>
<td>Voltage P [%]</td>
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<td>Voltage I [%]</td>
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<td>---</td>
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<tr>
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<td>Enable drive</td>
</tr>
<tr>
<td>[315]</td>
<td>Start/Stop</td>
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### Speed

#### Speed in DRC

- [109] Ramp ref (d) [FF]
- [112] Ramp output (d) [FF]
- [115] Speed ref (d) [FF]
- [119] Actual spd (d) [FF]
- [925] F act spd (d) [FF]
- [923] Act spd filter [s]

#### Speed in rpm

- [110] Ramp ref (rpm)
- [113] Ramp outp (rpm)
- [118] Speed ref (rpm)
- [122] Actual spd (rpm)
- [427] Enc 1 speed (rpm)
- [420] Enc 2 speed (rpm)
- [924] F act spd (rpm)
- [923] Act spd filter [s]

#### Speed in %

- [111] Ramp ref (%)  
- [114] Ramp output (%)  
- [117] Speed ref (%)  
- [121] Actual spd (%)  

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<thead>
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<tr>
<td>[466]</td>
<td>Mains voltage [V]</td>
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<tr>
<td>[588]</td>
<td>Mains frequency [Hz]</td>
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<tr>
<td>[1052]</td>
<td>Output power [Kw]</td>
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<tr>
<td>[233]</td>
<td>Output voltage [V]</td>
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<tr>
<td>[199]</td>
<td>Motor current [%]</td>
</tr>
<tr>
<td>[928]</td>
<td>F T curr (%)</td>
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<tr>
<td>[926]</td>
<td>T curr filter [s]</td>
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<td>T current ref [%]</td>
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<td>Flux reference [%]</td>
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<td>Flux current %</td>
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<tr>
<td>[351]</td>
<td>Flux current (A)</td>
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### I/O

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<td>[582]</td>
<td>Virtual dig inp</td>
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<td>[583]</td>
<td>Virtual dig out</td>
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### INPUT VARIABLES

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<td>[44] Ramp ref 1 [FF]</td>
<td>[48] Ramp ref 2 [FF]</td>
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<td>[47] Ramp ref 1 (%)</td>
<td>[49] Ramp ref 2 (%)</td>
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<table>
<thead>
<tr>
<th>Speed ref 1</th>
<th>Speed ref 2</th>
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<tbody>
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<td>[42] Speed ref 1 [FF]</td>
<td>[43] Speed ref 2 [FF]</td>
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<td>[378] Speed ref 1 (%)</td>
<td>[379] Speed ref 2 (%)</td>
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<tr>
<td>[39] T current ref 1 [%]</td>
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<td>[40] T current ref 2 [%]</td>
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### LIMITS

#### Speed limits

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<th>Speed amount</th>
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<td>[1] Speed min amount [FF]</td>
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<td>[2] Speed max amount [FF]</td>
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<table>
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<th>Speed min/max</th>
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<td>[5] Speed min pos [FF]</td>
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<td>[3] Speed max pos [FF]</td>
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<tr>
<td>[6] Speed min neg [FF]</td>
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<td>[4] Speed max neg [FF]</td>
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#### Current limits

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<tr>
<td>[7] T current lim [%]</td>
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<td>[8] T current lim + [%]</td>
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<td>[9] T current lim - [%]</td>
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<tr>
<td>[10] In use Tcur lim+ [%]</td>
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<tr>
<td>[11] In use Tcur lim- [%]</td>
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<tr>
<td>[13] Current lim red [%]</td>
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<td>[342] Torque reduct</td>
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#### Flux limits

<p>| Flux current max [%] |</p>
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<th>Flux current min [%]</th>
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<tr>
<td>[467] Flux current max [%]</td>
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<tr>
<td>[468] Flux current min [%]</td>
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### DV-300 Adjustable Speed Drives

#### CONVERTER OPERATION

### RAMP

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<td>[30]</td>
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<td>[37]</td>
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<td>[38]</td>
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<table>
<thead>
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<table>
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<th>S acc t const [ms]</th>
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<th>S dec t const [ms]</th>
<th>[664]</th>
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<th>Ramp +/- delay [ms]</th>
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<th>Ramp out = 0</th>
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<tr>
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| Freeze ramp            | [373]    |
### SPEED REGULAT

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<td>Speed ref [rpm]</td>
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<td>236</td>
<td>Speed reg output [%]</td>
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<td>322</td>
<td>Lock speed reg</td>
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<td>348</td>
<td>Lock speed I</td>
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<td>1016</td>
<td>Aux spd fun sel</td>
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<td>Prop filter [ms]</td>
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#### Self tuning

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<tr>
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<td>Fwd-Rev spd tune</td>
</tr>
<tr>
<td>1048</td>
<td>Test T curr lim [%]</td>
</tr>
<tr>
<td>1027</td>
<td>Start</td>
</tr>
<tr>
<td>1014</td>
<td>Inertia [kg<em>m</em>m*]</td>
</tr>
<tr>
<td>1030</td>
<td>Inertia Nw [kg<em>m</em>m*]</td>
</tr>
<tr>
<td>1015</td>
<td>Friction [N*m]</td>
</tr>
<tr>
<td>1031</td>
<td>Friction Nw [N*m]</td>
</tr>
<tr>
<td>87</td>
<td>Speed P [%]</td>
</tr>
<tr>
<td>1032</td>
<td>Speed P Nw [%]</td>
</tr>
<tr>
<td>88</td>
<td>Speed I [%]</td>
</tr>
<tr>
<td>1033</td>
<td>Speed I Nw [%]</td>
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<tr>
<td>1028</td>
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#### Spd zero logic

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<td>123</td>
<td>Enable spd=0 I</td>
</tr>
<tr>
<td>124</td>
<td>Enable spd=0 R</td>
</tr>
<tr>
<td>125</td>
<td>Enable spd=0 P</td>
</tr>
<tr>
<td>126</td>
<td>Spd=0 P gain [%]</td>
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<tr>
<td>106</td>
<td>Ref 0 level [FF]</td>
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#### Speed up

<table>
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<tr>
<td>445</td>
<td>Speed up gain [%]</td>
</tr>
<tr>
<td>446</td>
<td>Speed up base [ms]</td>
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<tr>
<td>447</td>
<td>Speed up filter [ms]</td>
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#### Droop function

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<td>Droop gain [%]</td>
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<tr>
<td>697</td>
<td>Droop filter [ms]</td>
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<tr>
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<td>Load comp [%]</td>
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<td>700</td>
<td>Droop limit [FF]</td>
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<td>699</td>
<td>Enable droop</td>
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#### Inertia/loss cp

<table>
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<tr>
<td>1014</td>
<td>Inertia [kg<em>m</em>m]</td>
</tr>
<tr>
<td>1015</td>
<td>Friction [N*m]</td>
</tr>
<tr>
<td>1013</td>
<td>Torque const [N*m/A]</td>
</tr>
<tr>
<td>1012</td>
<td>Inertia c filter [ms]</td>
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### CURRENT REGULATION

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<th>Description</th>
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<tbody>
<tr>
<td>[41]</td>
<td>T current ref [%]</td>
</tr>
<tr>
<td>[199]</td>
<td>Motor current [%]</td>
</tr>
<tr>
<td>[1430]</td>
<td>Mot cur threshld [%]</td>
</tr>
<tr>
<td>[1431]</td>
<td>Mot cur th delay [ms]</td>
</tr>
<tr>
<td>[453]</td>
<td>Arm resistance [ ]</td>
</tr>
<tr>
<td>[454]</td>
<td>Arm inductance [mH]</td>
</tr>
<tr>
<td>[587]</td>
<td>E int [V]</td>
</tr>
<tr>
<td>[452]</td>
<td>R&amp;L Search</td>
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<tr>
<td>[353]</td>
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### FLUX REGULATION

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<td>[469]</td>
<td>Flux reg mode</td>
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<td>[498]</td>
<td>Enable flux weak</td>
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<td>[499]</td>
<td>Speed-0 f weak</td>
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<tr>
<td>[500]</td>
<td>Flux reference [%]</td>
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<td>Flux current %</td>
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<td>[921]</td>
<td>Out vlt level</td>
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#### Flux \ if curve

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<td>[916]</td>
<td>I field cnst 40</td>
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<td>[917]</td>
<td>I field cnst 70</td>
</tr>
<tr>
<td>[918]</td>
<td>I field cnst 90</td>
</tr>
<tr>
<td>[919]</td>
<td>Set flux / if</td>
</tr>
<tr>
<td>[920]</td>
<td>Reset flux / if</td>
</tr>
<tr>
<td>[374]</td>
<td>Nom flux curr [A]</td>
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<tr>
<td>[280]</td>
<td>Motor nom flux [A]</td>
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</table>
### REG PARAMETERS

#### Percent values

<table>
<thead>
<tr>
<th>Speed regulator</th>
<th>Flux regulator</th>
<th>Voltage reg</th>
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<tbody>
<tr>
<td>[88] Speed I [%]</td>
<td>[92] Flux I [%]</td>
<td>[494] Voltage I [%]</td>
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<tr>
<td>[459] Speed P bypass [%]</td>
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#### Base values

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<tr>
<th>Speed regulator</th>
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<th>Voltage reg</th>
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<tr>
<td>[94] Speed I base [A/rpm·ms]</td>
<td>[98] Flux I base</td>
<td>[496] Voltage I base [%/V·ms]</td>
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#### In use values

<table>
<thead>
<tr>
<th>Speed P in use [%]</th>
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<tr>
<td>[99]</td>
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<tr>
<td>[100] Speed I in use [%]</td>
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## CONFIGURATION

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<thead>
<tr>
<th>Address</th>
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<td>[252]</td>
<td>Main commands</td>
</tr>
<tr>
<td>[253]</td>
<td>Control mode</td>
</tr>
<tr>
<td>[45]</td>
<td>Speed base value [FF]</td>
</tr>
<tr>
<td>[179]</td>
<td>Full load curr [A]</td>
</tr>
<tr>
<td>[175]</td>
<td>Max out voltage [V]</td>
</tr>
<tr>
<td>[412]</td>
<td>Ok relay funct</td>
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### Speed fbk

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<td>[162]</td>
<td>Motor max speed [rpm]</td>
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<tr>
<td>[414]</td>
<td>Speed fbk sel</td>
</tr>
<tr>
<td>[457]</td>
<td>Enable fbk contr</td>
</tr>
<tr>
<td>[458]</td>
<td>Enable fbk bypas</td>
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<tr>
<td>[456]</td>
<td>Flux weak speed [%]</td>
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<td>[455]</td>
<td>Speed fbk error [%]</td>
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<td>[562]</td>
<td>Tacho scale</td>
</tr>
<tr>
<td>[563]</td>
<td>Speed offset</td>
</tr>
<tr>
<td>[416]</td>
<td>Encoder 1 pulses</td>
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<tr>
<td>[169]</td>
<td>Encoder 2 pulses</td>
</tr>
<tr>
<td>[649]</td>
<td>Refresh enc 1</td>
</tr>
<tr>
<td>[652]</td>
<td>Refresh enc 2</td>
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<tr>
<td>[911]</td>
<td>Enable ind store</td>
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### Drive type

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<td>[464]</td>
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### Dimension fact

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<td>[51]</td>
<td>Dim factor den</td>
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<td>[52]</td>
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### Face value fact

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<td>Face value num</td>
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### Prog alarms

#### Failure supply

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<td>[194]</td>
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<tr>
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#### Undervoltage

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<td>[357]</td>
<td>Latch</td>
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<tr>
<td>[470]</td>
<td>Hold off time [ms]</td>
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<tr>
<td>[359]</td>
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### Converter Operation

#### Overvoltage

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<td>203</td>
<td>Activity</td>
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<tr>
<td>361</td>
<td>Latch</td>
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<tr>
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<tr>
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<td>Hold off time [ms]</td>
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<td>483</td>
<td>Restart time [ms]</td>
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#### Overspeed

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<td>1422</td>
<td>Activity</td>
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<td>1421</td>
<td>Latch</td>
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<tr>
<td>1423</td>
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<tr>
<td>1424</td>
<td>Hold off time [ms]</td>
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#### Heatsink

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#### Overtemp motor

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<tr>
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#### External fault

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<td>Activity</td>
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<tr>
<td>355</td>
<td>Latch</td>
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<td>502</td>
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#### Brake fault

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#### Motor I2t ovrld

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<tr>
<td>1419</td>
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#### Drive I2t ovrld

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#### Overcurrent

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### Field loss

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<th>Restart time [ms]</th>
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<td>Hold off time [ms]</td>
<td>Restart time [ms]</td>
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<td>[471]</td>
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<td>[472]</td>
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<td>[475]</td>
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<td>Restart time [ms]</td>
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<td>[474]</td>
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### Delta frequency

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<th>Hold off time [ms]</th>
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<td>Restart time [ms]</td>
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<td>[1434]</td>
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<tr>
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<td>Hold off time [ms]</td>
<td>Restart time [ms]</td>
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<td>[1436]</td>
<td>Restart time [ms]</td>
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### Speed fbk loss

<table>
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<tr>
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<th>Hold off time [ms]</th>
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<tbody>
<tr>
<td>[478]</td>
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<td>Ok relay open</td>
<td>Hold off time [ms]</td>
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<td>[477]</td>
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<tr>
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### Opt2 failure

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### Bus loss

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<th>Restart time [ms]</th>
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<tbody>
<tr>
<td>[634]</td>
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<td>Hold off time [ms]</td>
<td>Restart time [ms]</td>
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<td>[633]</td>
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<td>[635]</td>
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<tr>
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<td>Restart time [ms]</td>
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<tr>
<td>[637]</td>
<td>Restart time [ms]</td>
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### Hw opt1 failure

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### Enable seq err

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### Set serial comm

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<tr>
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<th>Ser protocol sel</th>
<th>Ser baudrate sel</th>
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<tbody>
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<td>Ser protocol sel</td>
<td>Ser baudrate sel</td>
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<tr>
<td>[408]</td>
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<td>Ser protocol sel</td>
<td>Ser baudrate sel</td>
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<td>[323]</td>
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<td>Ser baudrate sel</td>
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<td>[326]</td>
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[85] | Pword 1 |
## I/O Config

### Analog Outputs

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>[66] Select output 1</td>
<td></td>
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<td>[62] Scale output 1</td>
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<tr>
<td>[67] Select output 2</td>
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<td>[63] Scale output 2</td>
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<tbody>
<tr>
<td>[68] Select output 3</td>
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<td>[64] Scale output 3</td>
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<td>[65] Scale output 4</td>
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### Analog Inputs

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<td></td>
</tr>
<tr>
<td>[71] Input 1 type</td>
<td></td>
</tr>
<tr>
<td>[389] Input 1 sign</td>
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<tr>
<td>[72] Scale input 1</td>
<td></td>
</tr>
<tr>
<td>[73] Tune value inp 1</td>
<td></td>
</tr>
<tr>
<td>[259] Auto tune inp 1</td>
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<td>[792] Input 1 filter [ms]</td>
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<td>[1042] Input 1 compare</td>
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<td>[1043] Input 1 cp error</td>
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<td>[1044] Input 1 cp delay</td>
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<td>[296] An in 2 target</td>
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<td>[76] Input 2 type</td>
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</tr>
<tr>
<td>[390] Input 2 sign</td>
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<tr>
<td>[77] Scale input 2</td>
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<tr>
<td>[78] Tune value inp 2</td>
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<td>[260] Auto tune inp 2</td>
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<td>[297] An in 3 target</td>
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<tr>
<td>[81] Input 3 type</td>
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<tr>
<td>[391] Input 3 sign</td>
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<tr>
<td>[82] Scale input 3</td>
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<td>[83] Tune value inp 3</td>
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### Digital outputs

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<td>147</td>
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<td>Inversion out 3</td>
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<td>Inversion out 4</td>
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<td>Select enc 2</td>
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<td>Encoder 1 pulses</td>
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<td>Encoder 2 pulses</td>
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<td>Refresh enc 2</td>
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<td>Parameter</td>
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<td>388</td>
<td>Auto capture</td>
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<td>Enable spd adap</td>
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<td>Adap reference [FF]</td>
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<td>Adap selector</td>
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<td>Adap speed 1 [%]</td>
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<td>Adap I gain 1 [%]</td>
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<td>190</td>
<td>Adap P gain 2 [%]</td>
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<td>Adap I gain 2 [%]</td>
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<td>Speed zero delay [ms]</td>
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FUNCTIONS

Motor pot

| [246] | Enable motor pot |
| [247] | Motor pot oper |
| [248] | Motor pot sign |
| [249] | Motor pot reset |

Jog function

| [244] | Enable jog |
| [265] | Jog operation |
| [375] | Jog selection |
| [266] | Jog reference [FF] |

Multi speed fct

| [153] | Enab multi spd |
| [154] | Multi speed 1 [FF] |
| [155] | Multi speed 2 [FF] |
| [156] | Multi speed 3 [FF] |
| [157] | Multi speed 4 [FF] |
| [158] | Multi speed 5 [FF] |
| [159] | Multi speed 6 [FF] |
| [160] | Multi speed 7 [FF] |
| [208] | Multispeed sel |

Multi ramp fct

| [243] | Enab multi rmp |
| [202] | Ramp selector |

Multi ramp fct

Ramp 0

Acceleration 0

| [659] | Acc delta speed0 [FF] |
| [660] | Acc delta time 0 [s] |
| [665] | S acc t const 0 [ms] |

Deceleration 0

| [661] | Dec delta speed0 [FF] |
| [662] | Dec delta time 0 [s] |
| [666] | S dec t const 0 [ms] |

Ramp 1

Acceleration 1

| [23] | Acc delta speed1 [FF] |
| [24] | Acc delta time 1 [s] |
| [667] | S acc t const 1 [ms] |

Deceleration 1

| [31] | Dec delta speed1 [FF] |
| [32] | Dec delta time 1 [s] |
| [668] | S dec t const 1 [ms] |

Ramp 2

Acceleration 2

| [25] | Acc delta speed2 [FF] |
| [26] | Acc delta time 2 [s] |
| [669] | S acc t const 2 [ms] |
### Deceleration 2
- Dec delta speed2 [FF]
- Dec delta time 2 [s]
- S dec t const 2 [ms]

### Ramp 3

### Acceleration 3
- Acc delta speed3 [FF]
- Acc delta time 3 [s]
- S acc t const 3 [ms]

### Deceleration 3
- Dec delta speed3 [FF]
- Dec delta time 3 [s]
- S dec t const 3 [ms]

### Speed draw
- Speed ratio
- Speed draw out (d)
- Speed draw out (%)

### Overload contr
- Enable overload
- Overload mode
- Overload current [%]
- Base current [%]
- Overload time [s]
- Motor ovrd ptl preal.
- Motor I2t accum
- Drive ovrd ptl preal.
- Drive I2t accum
- Pause time [s]

### Stop control
- Stop mode
- Spd 0 trip delay [ms]
- Trip cont delay [ms]
- Jog stop control

### Brake control
- Enable Torque pr
- Closing speed [rpm]
- Torque delay [ms]
- Torque proving [%]
- Actuator delay [ms]

### I/n curve
- I/n curve
- I/n lim 0 [%]
- I/n lim 1 [%]
- I/n lim 2 [%]
- I/n lim 3 [%]
- I/n lim 4 [%]
- I/n speed [rpm]
## SPEC FUNCTIONS

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### Links

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<td>489</td>
<td>Input min</td>
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## OPTIONS

### Option 1

| Menu                              |
|                                   |
| [425] Enable OPT2                 |

### Option 2

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### PID references

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**DV-300 Adjustable Speed Drives**

---

**CONVERTER OPERATION**
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<td>[1194]</td>
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### Comp calculat

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<td>Time acc/dec min [s]</td>
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<td>Acc/dec filter [ms]</td>
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<td>Line acc [%]</td>
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<tr>
<td>[1185]</td>
<td>Line dec [%]</td>
</tr>
<tr>
<td>[1186]</td>
<td>Line fast stop [%]</td>
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<td>[1188]</td>
<td>Line acc status</td>
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<td>Line dec status</td>
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<td>Line fstp status</td>
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<td>Constant J comp [%]</td>
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<td>[1192]</td>
<td>Act var J comp [%]</td>
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<tr>
<td>[1191]</td>
<td>Act const J comp [%]</td>
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<td>Static f [%]</td>
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<td>Dynamic f [%]</td>
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<td>Static f Zero</td>
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<td>[1213]</td>
<td>Actual comp [%]</td>
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### Taper function

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<td>Init diameter [m]</td>
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<td>[1178]</td>
<td>Final diameter [m]</td>
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<td>[1180]</td>
<td>Tension ref [%]</td>
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<td>[1179]</td>
<td>Tension red [%]</td>
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### Speed demand

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<td>Winder side</td>
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<td>W gain [%]</td>
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<td>[1195]</td>
<td>Speed match</td>
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<td>[1196]</td>
<td>Spd match acc [s]</td>
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<tr>
<td>[1197]</td>
<td>Spd match dec [s]</td>
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<td>[1203]</td>
<td>Spd match compl</td>
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<td>[1216]</td>
<td>Spd match torque [%]</td>
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<td>W reference [rpm]</td>
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<td>Jog TW enable</td>
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<td>Jog TW speed [%]</td>
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### DRIVECOM

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<td>Control word</td>
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<td>56</td>
<td>Status word</td>
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<td>Speed input var [FF]</td>
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<td>115</td>
<td>Speed ref var [FF]</td>
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### Speed amount

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### Speed min/max

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<td>Speed max pos [FF]</td>
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<td>Speed min neg [FF]</td>
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<td>Speed max neg [FF]</td>
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### Acceleration

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<tr>
<td>21</td>
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<td>Acc delta time [s]</td>
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### Deceleration

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### Quick stop

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<tr>
<td>37</td>
<td>QStp delta speed [FF]</td>
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<td>QStp delta time [s]</td>
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### Face value fact

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### Dimension fact

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<td>Dim factor den</td>
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<td>Dim factor text</td>
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<td>Speed input perc [%]</td>
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<td>Percent ref var [%]</td>
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<td>Act percentage [%]</td>
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### SERVICE

<table>
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<tr>
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<td></td>
<td>Password 2</td>
</tr>
</tbody>
</table>
5.3 COMMISSIONING

Warning! The safety instructions, danger warnings and technical data in Section 1 and 2 of this manual must be observed!

Definitions:
- Positive speed is clockwise rotation seen from the motor shaft end side.
- Negative Speed is counter-clockwise rotation seen from the motor shaft end side.
- Positive torque is torque in clockwise direction seen from the motor shaft end side.
- Negative torque is torque in counter-clockwise direction seen from the motor shaft end side.

5.3.1 Setting jumpers and switch

The hardware configuration set via the jumpers and switches on the R-TPD32-GE regulator card must be adapted to the application at hand and checked before switching on the device.

- Analog inputs 1/2/3
  - Voltage input 0...10V
  - Current voltage 0...20 mA / 4...20 mA
  - Mixed possible configuration
  - Jumper S9/S10/S11 = OFF
  - Jumper S9/S10/S11 = ON

- Adaptation for the speed feedback type
  - Sinusoidal Encoder
  - Digital Encoder
  - Analog tachometer generator
  - Armature reaction
  - Jumper S5/S6 in position A
  - Jumper S5/S6 any position

- Adaptation for the digital encoder voltage
  - Voltage = 5 V
  - Voltage = 15...30 V
  - Jumper S21/S22/S23 = ON
  - Jumper S21/S22/S23 = OFF

- Control of a digital encoder connected to the connector XE2
  - Channel C controlled
  - Channel C not controlled
  - Jumper S20 = ON
  - Jumper S20 = OFF

- Adaptation of the max voltage using a tachometer generator:
  - 22.7 / 45.4 / 90.7 / 181.6 / 302.9 V, depending on the dip switch S4 setting (see chapter 4.4.3)

- Serial interface RS485
  - On the first and last drop of a line:
  - On the other converters
  - Jumper S12 / S13 = ON
  - Jumper S12 / S13 = OFF

- RS485 serial interface
  - divided from the regulation
  - (An external 5 V power supply is needed on the PINs 5 and 9) see section 4.5.2
  - with a common potential 0 V of the regulation
  - Internal power supply
  - Jumper S18 / S19 in position OFF
  - Jumper S18 / S19 in position ON

For further information see section 4.4, “Regulation section”.

--- CONVERTER OPERATION ---
5.3.2 Checking the wiring and the auxiliary voltages

The following should be checked before switching on the device:
- Proper connection of cables (Section 4, “Wiring procedures”)
- Compliance with Section 4.11, “Engineering notes”
- When the device current limit is not set according to the rated current value of the connected motor, a protection thermal relay must be inserted in the upper part of the converter, which has to be scaled according to the motor rated current times 0.86.

**Warning!** It is not allowed to connect an external voltage on the converter output.

- Drive disabled (disconnect the terminal 12)
- The following voltages must be present:
  - terminal 7 + 10V to terminal 9
  - terminal 8 - 10V to terminal 9
  - terminal 19 + 24 ... 30V to terminal 18

- Select the **Actual spd (rpm)** parameter in the DRIVE STATUS menu.
  - With a disabled regulator turn the motor in a clockwise direction (view facing the shaft). The displayed value must be positive.
  - If the value does not change or if wrong values are shown, check the power supply and the cabling of the encoder/tachometer.
  - If the displayed value is negative, the connections of the encoder or of the tachometer generator must be changed: channel A+ with A- or B+ with B- of the encoder, change the connections of the tachometer signal.

5.3.3 Basic settings of the converter

**Note!** It is assumed that the device has the default configuration and is connected and tested according to the diagrams provided in section 4.8, “Standard connection diagrams”. The default setting can be loaded via the **Load default** parameter in the SPEC FUNCTIONS menu. Loading this parameter will mean that all modifications carried out by the user will be overwritten. An exception is represented by the **Tacho scale** and **Speed parameters**. These are not overwritten when the factory set values are loaded and it is not necessary to scale again the input signal of the tachometer section. The same is valid for the **Size selection** parameter.

The factory setting allows a speed regulation with the cascade current regulation for a DC motor, with an independent excitation and provided with a digital encoder. The drive, in this case, does not operate with a Voltage control. Independently of the desired configuration, it is advised to carry out all the basic settings described in order to avoid possible mistakes. After the commissioning all other available functions can be activated. Their setting is described in the following pages.

The possible values set for each parameter can be found in section 10, “Parameter lists”.

The following settings must be carried out with the disabled converter.

**Enable drive** = disabled (no voltage on the terminal 12).

See section 5.1, “Keypad”, for information about operating the keypad.
Selection of the drive command (via terminals or digital)
- When the converter is controlled only via the terminal strip, set the Main commands parameter to “Terminals”. Before change this parameter set be sure that no voltage is supplied to terminal 12.
- When the keypad is used Main commands = Digital

Saving Settings
- Use Save parameters in SPECIAL FUNCTION menu
- User parameters setting must be saved into memory, so that the stored values are read the next time the device is switched on.
- When using the keypad: press ENT.

On standard setting, to perform the self tuning of current regulator during the commissioning, the Main commands parameter is set as “Digital”.

5.3.4 START UP procedures

Following START UP menu allows a quick basic commissioning of the drive.

- **Speed base value**
  - This value determines the max rpm corresponding to the max signal applied to an analog input (e.g. 10V or 20mA).

- **Nom flux curr**
  - Nominal field current of the drive. Set the range through the dip switches on the regulation board. See table 2.4.3.2.

- **Speed-0 f weak**
  - Enables Speed-0 f weak at zero speed.

- **Speed-0 f weak delay**
  - Sets a time delay.

- **Acc delta ...**
  - Acceleration ramp time setting on the speed reference.

- **Dec delta ...**
  - Deceleration ramp time setting on the speed reference.

**Motor data**

In this menu all the motor plate data are placed.

**Note !** Performing the speed regulator self tuning the following parameters must be set correctly according to the motor used.

- **Motor nom flux**
  - Motor nom flux in Amps.

- **Flux reg mode**
  - Flux regulator mode: constant current (fixed field) or Voltage control.

- **Full load curr**
  - Nominal armature current in Amps. It corresponds to the 100% of the nominal drive output current. The default value is the nominal drive current. The settings for the current limits (T current limit parameters) and the “Overload function” are based on this value.

- **Motor max speed**
  - Maximum motor speed value. Set the motor plate data value.

- **Max out voltage**
  - Maximum armature voltage value. When Flux reg mode is set to fld weakening, it corresponds to the crossover point.

- **Flux weak speed**
  - Motor max speed percentage where the flux weakening range starts. (Crossover point)

**Note !** With speed regulator self tuning performed, the above parameters value can be changed.
**Limits**

This menu allows setting of speed limits value, current limits value and field current limits when different from the default values in *Motor data* menu.

- **T current limit**: Armature current limit value as percentage of *Full load curr*. When overload function is used this value must be equal or higher than *Overload current* parameter value (Overload function).
- **Flux current max**: Maximum field current value as percentage of *Motor nom flux*.
- **Flux current min**: Minimum field current value as percentage of *Motor nom flux*. It corresponds to the Speed-0 f weak current value when Speed-0 f weak function is active and it will be the lower field current limit value when the motor is running in Voltage control range.
- **Speed min amount**: Minimum speed reference limit.
- **Speed max amount**: Maximum speed reference limit.

**Speed feedback setting**

- **Speed fbk sel**: Speed feedback selection: encoder 1, encoder 2, tach generator, armature (CEMF).
- **Tacho scale**: Tach generator feedback scaling (*Speed fbk sel* must be set to *Tacho*).
- **Encoder 2 pulses**: Number of pulses per revolution of the digital encoder to the XE2 connector.
- **Enable fbk contr**: Speed feedback loss control. The *Motor max speed*, *Max out voltage*, *Flux weak speed* parameters must be set correctly according to the motor used.
- **Refresh enc 2**: Enable the monitoring of the encoder 2 (XE2 connector) connection status (A, B, Anot, Bnot channels). *Enable fbk contr* must be enabled.

**Alarms**

- **Undervolt thr**: AC input alarm threshold value.
- **Overcurrent thr**: Overcurrent alarm threshold value.

**Overload control**

The overload control function allows an overcurrent for a limited time that can exceed the rated current of the drive. It is used in order to provide an increased acceleration torque. (See Overload control function for more details).

**Analog inputs 1, 2 and 3**

Three (3) differential analog inputs programmable are available (1-2, 3-4, 5-6 terminals) that allow a large number of configurations.

With the standard setting, analog input 1 (1 - 2 terminals) is set to *Ramp ref 1*. The other analog inputs are set to OFF.
5.3.5 Drive tuning

5.3.5.1 Self tuning of the current regulator

The following operation must be done before enabling the drive for the first time.
The autotuning of the current regulator is enabled via the R&L Search command. The values stated for the armature resistance and inductance are recorded as Arm resistance and Arm inductance (CURRENT REGULAT menu). If necessary the user can change these parameters value.

- If the motor field is externally power supplied (not from the drive), disconnect the motor field supply terminals.

It is not necessary when the motor field power supply comes from the drive (C1 & D1 terminals)

- The user must be sure that during the current regulator self tuning the motor shaft does not turn (remanent magnetization, field series motor, etc.). If necessary, lock the motor shaft during the procedure.
- AC input voltage to U2 and V2 terminals,
- Drive disabled (no +24 voltage at terminal 12)
- Set Main commands parameter (START UP or CONFIGURATION menu) to “Digital” (Enable & Start/stop command from the keypad).
- Set the Armature current desired via T current lim + (positive torque) and T current lim - (Negative torque).
- Set Overload control function to disable. (Enable overload = Disabled).
- Set R&L Search command to ON (START UP menu)
- Power up the drive
- Power up U, V, W terminals,
- Enable the drive (+24V to terminal 13) and Start (+24V to terminal 12).
- Enable drive command = ENABLE (START UP menu).

Note! If Stop mode parameter is not set to “OFF” (FUNCTIONS/Stop Control menu), press Start button on the keypad.

- The R&L Search takes a few minutes, and can be interrupted by powering off the drive or set Enable drive to disable.
- At the end of the current self tuning procedure the drive is automatically set to disabled and the R&L Search command to OFF.
- Set the Enable drive parameter to disabled (No voltage on terminal 12)
- Set Main commands parameter to the desired setting (Terminals or Digital).
- Set Overload control function to enable if used. (Enable overload = Enabled).
- Save setting via Save parameters command (START UP menu)

Note! The procedure can be interrupted by powering off the drive or set Enable drive to disable. The previous parameters setting are stored in the drive. It is not possible to start the procedure if the Enable drive is set to disable.
5.3.5.1.1 Checking current regulator performance using parameter Eint

While running the drive, monitor the parameter (Eint), located under menu heading “Current Regulator”. This measure an average internal current error.

Its value should be close to zero, but values dynamically changing between -40 and 40 are acceptable. The drive must have at least 30% load for this reading to be considered as a valid performance measurement. If adjustments are needed, make small changes to the parameter (Current regulator\Arm inductance) to fine tune (Eint) to an acceptable value.

- If Eint is positive value, increase “Arm inductance” value.
- If Eint is negative value, decrease “Arm inductance” value.

5.3.5.2 Self tuning of the speed regulator

Speed Self tuning identifies the total Inertia value at the motor shaft (Kg*m²), the friction value (or Loss compensation) in N*m and computes the Proportional and Integral gains of the speed regulator.

**WARNING !**  
This procedure requires free rotation of the motor shaft coupled to the load. Start/Stop command is disregarded, therefore it can not be used on drives with limited travel.

**CAUTION !**  
The test is performed using the torque limit value set in Test T curr lim parameter. The torque is applied stepwise, with no ramp (profile), therefore the mechanical transmission must not have significant backlash, and it must be compatible with operation at the torque limit set in Test T curr lim parameter. The user can reduce the torque limit to a suitable value via the Test T curr lim parameter.

**NOTE !**  
- Application where the system inertia coupled to the motor shaft is much higher than the motor inertia value, increase the Test T curr lim parameter to avoid “Time out” error.
- This procedure is not suitable for use with “hoist” or “elevator” drives.

Preliminary operation before the correct execution of the Speed self tuning procedure is the appropriate calculation of the Torque const parameter.

Set the motor name plate data parameters:

- **Motor max speed**  
  Set the maximum motor speed value

- **Flux weak speed**  
  **Motor max speed** percentage where the flux weakening range starts. (Crossover point)

- **T Current limit +/-**  
  Set the nominal motor current value

- **Motor nom flux**  
  Set the Motor nom flux in Amps.

- **Max out voltage**  
  Set the maximum armature voltage value

With speed regulator self tuning performed, the above parameters value can be changed according to the application without Torque const parameter modification.

- Set the motor shaft direction: Forward or Reverse via the Fwd-Rev spd tune parameter
- Select the torque current value to be used during the test via the Test T curr lim parameter
TO EXECUTE SELF TUNING, enter START UP \ Self tuning menu.
- Start execution by entering “Start”.

The procedure performs an acceleration test at the torque limit value set in Test T curr lim parameter up to a speed threshold, then a deceleration test with no torque applied (coasting) down to zero speed.

The speed threshold is 33% of the lowest in the following:
- Speed base value
- Speed max pos or Speed max neg according to direction of rotation.

The procedure may take a few minutes, depending on inertia and friction values.
Based on inertia and friction values, the drive will calculate the speed loop gains (Speed P and Speed I parameters).
If manual adjustment are required (in case of vibrations, etc.) these should be applied to the integral gain Speed I [%]. In case self-tuning of speed regulator is not satisfactory, refer to manual tuning procedure in section 5.3.6.

After the completion of the Speed self tune by the Drive, the new identified parameter values (“Nw” suffix) can be compared with values prior to the procedure, by browsing the subsequent menu entries. Parameters in this menu are read only. Editing of individual parameters must be done in their specific menus. New parameters can be accepted all togethether by entering “Take val” after disabling the Drive. In this case, prior values are overwritten. “Self tuning” can be repeated, whether values from the previous trial have been accepted or not.

Note! “Take val” does not store values in non-volatile memory, so values are lost if Drive power is cycled off and on. You need to enter Save parameters in the START UP or SPEC FUNCTIONS menu to permanently store values in non-volatile memory.

In case of extreme parameter ranges, error messages can occur. Repeat execution in this case. If the error message is persistent, keep default values and use manual tuning of speed regulator (section 5.3.6 Manual tuning of the regulators).

List of self tune error messages

Generic messages

<table>
<thead>
<tr>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Drive disabled”:</td>
<td>Provide enable input by setting terminal 12 high.</td>
</tr>
<tr>
<td>“Not ready”:</td>
<td>“Take val” can not be executed because the measurement has not been completed correctly. Repeat self tune command.</td>
</tr>
<tr>
<td>“Time out”:</td>
<td>Measurement has not been completed in the proper time</td>
</tr>
<tr>
<td>“Start ?”</td>
<td>Press ENT to confirm start of measurement.</td>
</tr>
<tr>
<td>“Tuning aborted”:</td>
<td>Measurement aborted by user (CANC button has been pressed).</td>
</tr>
<tr>
<td>“Set Main cmd=Dig”:</td>
<td>Go to CONFIGURATION menu and set Main commands = digital.</td>
</tr>
<tr>
<td>“Set Ctrl=Local”:</td>
<td>Go to CONFIGURATION menu and set Control mode = Local.</td>
</tr>
</tbody>
</table>
Measurement error messages

These messages may occur when extreme parameter values have to be identified. It can be useful to retry the self tune command when any of the following messages occurs. If messages persist, alternative manual tuning procedures should be used.

<table>
<thead>
<tr>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Over speed”</td>
<td>Increase value of parameter Test T curr lim and repeat Self tuning</td>
</tr>
<tr>
<td>“Drive stalled”</td>
<td>Nominal zero load torque at standstill was detected. Self tuning is impossible for this type of load.</td>
</tr>
<tr>
<td>“Load applied”</td>
<td>Reduce value of Test T curr lim parameter for Self tuning</td>
</tr>
<tr>
<td>“T curr too high”</td>
<td>Value of friction is zero or lower than the accuracy limit of the control system</td>
</tr>
<tr>
<td>“Friction null”</td>
<td></td>
</tr>
</tbody>
</table>

5.3.5.3 Field converter

The default DV-300 converters are set to operate without Voltage control. The following settings must be taken into consideration when a functioning in Voltage control is needed or when the field of the connected motor is not power supplied via the converter.

All the settings described in this chapter must be carried out in disable condition (no voltage on terminal 12).

Selection of the functioning system

- With a constant field current: Flux reg mode = Constant current
  Enable flux reg = Enabled

- With Voltage control: Flux reg mode = Voltage control.
  In the CONFIGURATION menu set the max output voltage via the Max out voltage parameter.
  Enable flux reg = Enabled

- Field circuit not supplied by DV-300 Flux reg mode = OFF
  Enable flux reg = Disabled

Setting the rated field current

- Set the rated field current of the motor via the Motor nom flux parameter.
- When the field motor current is substantially lower than the rated current of the field converter, adapt through the S14 dip switches the field converter. It must be configured according to the table 5.3.5.3.1 Via the Nom flux curr parameter it is possible to select the new field rated current.
- For fixed field current operation, if the actual motor (base) field current $\leq 10\%$ of the maximum rating of the field package it is required to calibrate the field current feedback scaling using dipswitch S14.
- For weak field operation, also referred as “CEMF field control” or “crossover field control”, if the top base speed Motor nom flux $\leq 10\%$ of the maximum rating of the field package it is required to calibrate the field current feedback scaling using dipswitch S14.

Calibration to the exact field current setting is not required, as long as the above conditions are met. Calibration is not required if the field control is provided by a separate field converter.
Table 5.3.5.3.1: Tuning resistances of the field current

<table>
<thead>
<tr>
<th>Switch ohms</th>
<th>168.5 ohm</th>
<th>333.3 ohm</th>
<th>182 ohm</th>
<th>36.4 ohm</th>
<th>845 ohm</th>
<th>1668 ohm</th>
<th>Equivalent resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom flux curr</td>
<td>S14-1</td>
<td>S14-2</td>
<td>S14-3</td>
<td>S14-4</td>
<td>S14-5</td>
<td>S14-6</td>
<td>S14-7</td>
</tr>
<tr>
<td>1.0 A</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>2.0 A</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>3.0 A</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>5.0 A</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>9.9 A</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>12.9 A</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>14.2 A</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>17.1 A</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>20.0 A</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>24.1 A</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>25.1 A</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

**Flux current min/max**

- Setting in LIMITS / Flux limits menu via the **Flux current max** and **Flux current min** parameters as a percentage of **Nom flux curr**.

**5.3.6 Manual tuning of the regulators**

The tuning of the DV-300 converters is factory set to a typical value for the motor size concerned. This normally ensures satisfactory regulator results. If this setting, however, meets the requirements of the application concerned, the regulator need not be optimized.

The converter contains the following close-loop control circuits:

- Regulator of the armature current. The auto tuning has to be perform via the **R&L Search** parameter.
- Speed regulator
- Field current regulator
- Armature voltage regulator

Following is a description of the system suitable to obtain the optimization, if necessary. In order to have a step function, the internal “Test generator” is used (“SPEC FUNCTIONS” menu). The aim is to obtain a very good step response.

The analog output can be brought back to the terminal strip, with a sampling time of 2 ms.

**Using the Test generator**

This function generates and makes available some signals with a square wave, with a frequency and a width that can be set and which can be added to an offset that can be set too. With the parameter Gen access it is possible to state on which regulator input the signal must be active. Further information can be found in section 6.15.1, “Test generator”.
**Manual tuning of speed regulator**

- No voltage on terminal 12 (Drive disabled)
- Choose the following settings for the Test generator:
  - Gen access = Ramp ref
  - Gen frequency = 0.2 Hz
  - Gen amplitude = 10 %
  - Gen offset = 10 %

- Measuring the reaction on an analog output. To this purpose **Actual Spd** and **Motor current** variables must be set on two different analog outputs (see “Programming inputs/outputs”).
- In the START UP menu set the **Acc delta speed** parameter with the highest value and the **Acc delta time** parameter at 1 second.
- Set at 0.00 the **Speed P** and **Speed I** parameters in the REG PARAMETERS / ...parameters.
- Enable the drive (voltage on terminal 12) and Start (voltage on terminal 13).
- Increase the **Speed P** till when the overshoot is lower by 4% when the reaction time is shorter.
- Increase **Speed I** until the overshoot is higher by 4%. Decrease it, so that it is slightly lower than 4%.
- Stop and disable the drive (remove the voltage on terminal 12 and 13).
- **Gen access** = Not connected
- Save the settings (SAVE PARAMETERS command in the SPECIAL FUNCTION menu).

**Note!** With the feedback “Bypass” function enabled (**Enable fbk bypass** = Enabled) the converter switch directly to the armature feedback (CEMF) when the speed feedback is no more present. This is possible when the converter is working at constant field. In this case with a disconnected reaction signal, it is necessary to carry out again the above mentioned optimization of the speed regulator. The P section of the speed regulator is set via the **Speed P bypass** parameter and the I section with the **Speed I bypass** parameter.

In some cases it is necessary to have different gains for the speed regulator, above the speed range. To this purpose the converters of the DV-300 series are provided with an adaptive speed regulator.

For the tuning see the following pages
Manual tuning of field current regulator

**Note!** In the majority of the cases the dc motors with an independent excitation operate with a direct field (Flux reg mode = Constant current). In this case it is not necessary to optimize the regulator of the field current and the regulator of the armature voltage.

The optimization showed below, refers to drives operating with constant power range (armature and field mixed regulation). In these cases it is necessary to configure the field converter for this particular use. See below.

**Note!** During the optimization of the regulator of the field current, the converter must not receive a Start command.

- Converter disabled (no voltage on terminal 12)
- Menu LIMITS / Flux limits: **Flux current max** = 100% equal to the rated field current of the motor. **Flux current min** = 0
- Set at 0.00 the Flux I and Flux P parameters in the REG PARAMETERS / ...menu .
- Measure the field current via an analog output. To this purpose the variable “Flux current” has to be parameterized on one output and the variable “Flux reference” on another (see “Input/Output programming”).
- Select the FLUX REGULATION menu.
- **Enable flux reg** = Enabled (default)
- **Flux reg mode** = Voltage control
- **Enable flux weak** = Enabled
- Set **Gen access** = Flux reference and **Gen amplitude** to 70% of the rated field motor current (this to allow the overshoot of the system).
- Increase the value of the **Flux P** parameter till the overshoot of the field current is lower than 4% (Field curr).
- Increase the value of **Flux I** until the overshoot is higher than 4%, then reduce it slightly lower than 4%.

**Note!** Because of the high time constant, the rate of rise of the field current is limited. The increase time with optimal scale conditions can be last several hundreds of milliseconds.

- **Gen access** = Disconnected
- **Enable flux weak** = Disabled
- Set **Flux current min** at the desired value
- Configure the analog outputs on the basis of your needs.
- Save the settings.

Figures 5.3.6.5 ... 5.3.6.7 show some examples of tuning of the Flux regulator.

![Figure 5.3.6.5](image1)

*Figure 5.3.6.5: Above: Flux reference; Below: Flux current. The regulator behavior is not good. Jumps are due to field changing.*

![Figure 5.3.6.6](image2)

*Figure 5.3.6.6: Above: Flux reference; Below: Flux current. The reduction of the field current depends on the field time constant. The reg has no influence.*

![Figure 5.3.6.7](image3)

*Figure 5.3.6.7: Above: Flux reference; Below: Flux current. The increment in the field current has no jump. Variation compared to Fig. 4.5.7: Increase of Flux P from 2 to 10%. Flux I = 5%.*
Voltage regulator in the field converter

Note! In the most of the cases the DC motors with an independent excitation operate with a direct field (Flux reg mode=Constant current). In this case it is not necessary to optimize the regulator of the armature voltage.

When a Voltage control occurs, the voltage regulator keeps the armature voltage at a constant level. The most difficult moment for this regulator is the beginning of the Voltage control, because due to the saturation of the motor field, the flux variation requires quicker changes of the field current.

Tune the regulator in order to have small changes of the armature voltage.

Note! All the other converter regulators must be set before the optimization of the voltage regulator.

- Drive disabled = no voltage on terminal 12
- Choose the following settings for the Test generator:
  - Gen access = Ramp ref
  - Gen frequency = 0.2 Hz
  - Gen amplitude = 10 %
  - Gen offset = according to the changing point from the armature regulation to the field one. Example: Motor max speed = 2000 rpm, the Voltage control starts at 1500 rpm. Gen offset = 75 %
- Measure the field current and the armature voltage on an analog output. The “Flux current” and the “Output voltage” variables must be set on two different analog outputs (see Programming “Inputs/Outputs”).
- Enable the drive and give the Start command (voltage on the terminals 12 and 13)
- Check the armature voltage. After a possible short jump, the voltage should remain constant. See figures 5.3.6.8 ... 5.3.6.10. In the REG PARAMETER /... menu, it is possible to change the P and I section with the Voltage P and Voltage I parameters.
- Stop and disable the drive.
- Gen access = Not connected
- Save the settings.
Figure 5.3.6.8: Above: Flux; Below: Output voltage. After a speed change the field current (Flux) has some jumps. Voltage $P = 10\%$, Voltage $I = 80\%$.

Figure 5.3.6.9: Above: Flux; Below: Output voltage. The gain is too low. The armature voltage increases. Voltage $P = 3\%$, Voltage $I = 5\%$.

Figure 5.3.6.10: Above: Flux; Below: Output voltage. After a short transient, the field current and armature voltage are constant. Voltage $P = 40\%$, Voltage $I = 50\%$. 
5.3.7 Others tuning

Flux / if curve tuning (Flux / if curve)

The function of this curve is to model the real flux of the motor. The flux model allows the control of torque current to better relate to torque. The figure below describes the relation between flux and flux current in conditions of Flux / if curve defined and not defined.

Note! The field current (previous section) and the output voltage tunings (next section) must be carried out when a Voltage control is required, whether the relevant flux curve has been defined or not.

The tunings scale is the following:
- Field current regulator
- Flux / if curve tuning (Flux / if curve)
- Voltage regulator in the field converter

Example:

A - With the default setting of the converter, there will be a linear characteristic (Curve A) of the flux current (Flux current) when the parameter Flux reference changes.

Then:
Flux current max / Flux reference = 100%  
Flux current / Flux reference = Motor nom flux
Flux current max / Flux reference = 50%  
Flux current / Flux reference = 50% of Motor nom flux

B- Carrying out the tuning of the flux curve (see below tuning procedure) the result will be emphasized by curve B. The values of Flux current will follow a characteristic determined by the real flux percentage Flux reference, necessary to determinate the circulation of that field current for the connected system.
Tuning procedure:

- Reset the curve flux/current via the **Reset flux / if** command (FLUX REGULATION \ Flux / if curve menu).
- Set the Motor nom flux: **Motor nom flux** parameter (FLUX REGULATION menu).
- Set the output voltage via the **Max out voltage** parameter (CONFIGURATION menu) and the correspondent percentage (100%) in the **Out vlt level** parameter (FLUX REGULATION menu).
- Set the Flux regulator **Flux reg mode** = Constant current (FLUX REGULATION menu).
- Set the flux percentage at 100% via the **Flux current max** parameter (FLUX REGULATION menu).
- Operate the Drive speed, so that the Armature voltage (MONITOR \ Measurements menu) corresponds to the value previously set in **Max out voltage** (CONFIGURATION menu).
- Via the **Flux current max** parameter decrease the voltage displayed in Armature voltage, up to obtain an output voltage equal to the 90% of **Max out voltage**.
- Carry out the reading of the current in the **Flux current** parameter (FLUX REGULATION menu) and insert it in the **I field cnst 90** parameter (FLUX REGULATION \ Flux if curve menu).
- Via the **Flux current max** parameters decrease the voltage displayed in Armature voltage, to obtain an output voltage equal to the 70% of **Max out voltage**.
- Carry out the reading of the current circulating in the **Flux current** parameter (FLUX REGULATION menu) and insert it in the **I field cnst 70** parameter (FLUX REGULATION \ Flux if curve menu).
- Via the **Flux current max** parameters decrease the voltage displayed in Armature voltage, to obtain an output voltage equal to the 40% of **Max out voltage**.
Carry out the reading of the current circulating in the **Flux current** parameter (FLUX REGULATION menu) and insert it in the **I field cnst 40** parameter (FLUX REGULATION\Flux if curve menu).

- Disable the converter
- Via the **Set flux / if** parameter (FLUX REGULATION menu) the calculation of the curve parameters will be carried out. Enter this parameter then press ENT to execute the calculation.
  The procedure requires a few seconds.
- Set the operating mode of the field control (**Constant current / Voltage control**), set the value of **Flux current max** at 100% and save the parameters.
- Changing of **Max out voltage** or **Motor nom flux** need a new curve tuning.

**Speed-up function**

With loads having a high moment of inertia it is possible to check the jumps during the speed changes. They can be reduced using the function “Speed-up”. The figures 5.3.7.3 and 5.3.7.4 show the influence of this function.

Parameters used in the example:

- Speed up base: 14 ms
- Speed up gain: 50 %
- Speed up filter: 20 ms

**Setting of the speed zero logic**

- The speed zero logic is factory set as disabled. See section 6.7.2, “Speed zero logic”, for a description of the drive behavior.
- Disable of the I-section of the speed regulator with n=0:
  - I-section disabled: Enable spd=0 I = Enabled
  - I-section enabled: Enable spd=0 I = Disabled

**Note!**

When the motor is at a stop, it is possible to avoid the creep of the drive disabling the I section. In this case when the motor is at a stop, it can not receive any load and therefore this function is not suitable for all applications!
- Suppression of the P-gain set via Spd=0 P gain:
  - If the reference is above Ref 0 level: Enable spd=0 R = Enabled
  - If the ref. and/or the reaction are above Ref 0 level: Enable spd=0 R = Disabled

*Note!* Enable spd=0 R is active only when Enable spd=0 P is enabled.

- Choice of the proportional gain for zero speed:
  The P-gain corresponds to Spd=0 P gain: Enable spd=0 P = Enabled
  The P-gain corresponds to the normal P-gain: Enable spd=0 P = Disabled
- The P-gain at a zero speed is set via Spd=0 P gain, when Enable spd=0 P is enabled.
- The intervention threshold for the recognition of zero speed is determined with Ref 0 level. It is expressed in the dimension set by the factor function.

**Adaptive of the speed regulator**

*Note!* The adaptive of the speed regulator is factory set as disabled. It must be used only when the gain of the speed regulator has to get higher than the speed range or it has to be replaced with another unit. As for the interaction among the parameters see section 6.13.2, “Adaptive spd reg”.

Enable of the adaptive with a blocked drive. Enable spd adap = Enabled. In this way the settings of Speed P and Speed I are disabled.

Determine on the basis of which unit the gain of the speed regulator has to be changed. It normally depends on the speed (Select adap type = Speed).

If the gain has to be changed on the basis of another unit, set Select adap type = Adap reference. This unit is connected to the device as an analog value via an analog input. For this reason the Adap reference variable must be assigned to an analog input (see in the following pages the configuration of the analog inputs).

The other possibility is to insert Adap reference via the serial interface or a Bus. In this case the insertion via the terminal strip is not necessary.

Entering Adap speed 1 and Adap speed 2 three different speed ranges are available with several gains. Value expressed as a percentage of Speed base value and respectively of the max value of Adap reference.

With Select adap type = Speed: the optimization is carried out as described for the “Speed regulator”. To this purpose the following points must be taken into consideration:
- Enter with Gen offset a value which is at the beginning of the range to be optimized but which at the same time is outside the range set with Adap joint XX.
- Enter with Gen amplitude the step, so that the speed remains inside the range to be optimized.
- The optimization is carried out separately for each range and the parameters of the regulator are set for each range with Adap P gain XX and Adap I gain XX.
- After the optimization of the different phases look over the whole speed range.
- By changing the value of Adap joint XX it is possible to reduce the instabilities present in the transients during the changes from one range to the other. Increasing the values the transients are slighter.

With Select adap type = Adap reference: the optimization depends on the system and it is impossible to state here the general information needed.

When the speed zero logic is disabled (factory setting) with a blocked drive the gains of the speed regulator are active. These are set via Adap P gain 1 and Adap I gain 1. When the speed zero logic is enabled, the values set for a motor at a stop are valid.
6 - FUNCTION DESCRIPTION

Functions and parameters

The converters of the DV-300 series feature a number of functions that can be set and assigned parameters in order to meet the requirements of the application at hand. The device can be controlled in different ways:
- via the terminal strip
- via the keypad
- via the RS 485 serial interface
- via a bus connection (option)

The settings required are made via the Main commands and Control mode parameters in the CONFIGURATION menu. The device is supplied with a Windows™-based user interface software for controlling the drive and setting parameters via the RS 485 serial interface. The device is factory set for speed regulation with a cascade current regulation and is connected according to the connection diagram shown on in section 4.8, “Standard connection diagrams”. Only the entry of parameters in the START UP of the software is required for the initial commissioning of the drive. The drive is thus controlled via the terminal strip with all parameters set via the keypad. If functions are required that are not in the standard configuration, these can be selected and their parameters set accordingly via the appropriate menu.

The 6KCV300TBO option card is required for expanding the standard device with programmable inputs/outputs. Up to no. 2 6KCV300TBOs can be fitted, each providing 4 digital inputs, 4 digital outputs and 2 analog outputs. Three analog inputs are provided on the standard device.

The converters of the DV-300 series enable reference values for the ramp and for the speed regulator to be set in different units of measure:
- in percentages of the Speed base value
- in a unit of measure (dimension) that the user can define using the factor function, e.g. as speed in m/s.

According to which one is set as last the other will be updated. This means that the other reference value is overwritten with the current value.

A freely selectable password 1 prevents the operation of the converter by unauthorized persons. It is entered in the form of a five-digit number combination. Password 2 is also provided by the manufacturer. This password enables the service personnel to access the Service menu which is not accessible for the user.

Note! All parameter settings must be saved otherwise the last settings saved will be loaded the next time the device is switched on (Save parameters command)
**Explanation of parameter tables**

In the following pages the parameters list of each menu is shown. For each table the following notes are valid:

- **“No.” column** Parameter number (decimal). In order to address parameters when a serial line/bus or the 6KCV300DGF card are used, the user must add 2000H (= decimal 8192) to the indicated value.

- **“Value” field** \( S = \) value depending on the size of the device.

<table>
<thead>
<tr>
<th><strong>DRIVE STATUS</strong></th>
<th>Start up parameters status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>START UP</strong></td>
<td>Basic commissioning of the drive</td>
</tr>
<tr>
<td><strong>TUNING</strong></td>
<td>Drive regulators tuning</td>
</tr>
<tr>
<td><strong>MONITOR</strong></td>
<td>Display of reference values, speed, voltage, current, frequency...</td>
</tr>
<tr>
<td><strong>INPUT VARIABLES</strong></td>
<td>Ramp reference, speed reference, current reference</td>
</tr>
<tr>
<td><strong>LIMITS</strong></td>
<td>Speed limits, current limits, field current limits</td>
</tr>
<tr>
<td><strong>RAMP</strong></td>
<td>Acceleration, deceleration, quick stop, ramp shape</td>
</tr>
<tr>
<td><strong>SPEED REGULAT</strong></td>
<td>Configuration of the speed regulator, speed zero logic, speed up, droop function</td>
</tr>
<tr>
<td><strong>CURRENT REGULAT</strong></td>
<td>Configuration of the current regulator</td>
</tr>
<tr>
<td><strong>FLUX REGULATION</strong></td>
<td>Parameters of the field current regulator</td>
</tr>
<tr>
<td><strong>REG PARAMETERS</strong></td>
<td>Functioning, regulation, encoder type, function factor, programmable alarms, address, password</td>
</tr>
<tr>
<td><strong>CONFIGURATION</strong></td>
<td>Configuration of programmable digital and analog input and output</td>
</tr>
<tr>
<td><strong>I/O CONFIG</strong></td>
<td>Motor capture, adaptive speed regulation, speed control, speed zero</td>
</tr>
<tr>
<td><strong>ADD SPEED FUNC</strong></td>
<td>Motopotentiometer, jog function, multi-speed, multi-ramps, overload, stop control, Taper current function</td>
</tr>
<tr>
<td><strong>FUNCTIONS</strong></td>
<td>Test generator, saving parameters, loading factory settings, signal adaptation, PAD parameters</td>
</tr>
<tr>
<td><strong>SPEC FUNCTIONS</strong></td>
<td>Access to the optional field bus card (Option1), and the DGF (Option2), PID function</td>
</tr>
<tr>
<td><strong>OPTIONS</strong></td>
<td>Parameter setting for the DRIVECOM profile</td>
</tr>
<tr>
<td><strong>DRIVECOM</strong></td>
<td>Menu, only accessible to service personnel of the manufacturer</td>
</tr>
<tr>
<td><strong>SERVICE</strong></td>
<td>Menu, only accessible to service personnel of the manufacturer</td>
</tr>
</tbody>
</table>
6.1 ENABLES

The following hardware enables are always required irrespective of whether the device is to be controlled via the terminal strip, the keypad or the serial interface.

- Figure 6.1.1 show the connection principle
- The enable signals are activated via a +15 ... 30 V voltage at the appropriate terminals. The inputs are protected against reverse polarity.
- Negative voltage, 0 V and a missing signal are interpreted as disable signals.
- The reference point for the enable signals is terminal 16.
- When using an operator keypad/serial interface (Mains Command = Digital), both the signals on the appropriate terminals and the corresponding commands on the keypad/serial interface are necessary. If an enable is removed via a signal on the terminals, the appropriate command must be sent via the keypad/serial interface in addition to the signal on the terminal in order to restart the drive.

There are four types of enable signals that have a different effect on the behavior of the DV-300 converter.

- **Enable drive** enables the entire converter
- **Start** enables the regulation
- **Fast stop** sets the speed reference value immediately to zero so that the motor is stopped as quickly as possible
- **External fault** incorporates external fault condition into the enable
6.1.1 Enable drive

The Enable drive command activates the DV-300 Drive.

An auxiliary contact on the AC Input contactor may be wired in the Drive enable (terminal 12).

When the Enable drive=disable and terminal 12 = 0V, no other control commands (e.g. Jog +, Jog - or Start) are accepted.

Removal of the Enable drive command (Enable drive=disable) while the drive is running causes the motor coasting to stop. Neither electrical braking nor controlled stopping of the motor within a prescribed time during the run down are possible. The actuation of the Drive is disabled.

When operated via the keypad the Enable drive command is provided in the DRIVE STATUS, START UP, TUNING and MONITOR menu.

Using Enable drive command from keypad (mains command=Digital), active voltage level is also required on terminal 12.

Using Enable drive command from terminal 12 set “Main command=terminals”.

Enable drive in the menu is read only parameter.
6.1.2 Start / Stop

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>min</th>
<th>max</th>
<th>Value Factory American</th>
<th>Factory European</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start/Stop</td>
<td>315</td>
<td>0</td>
<td>1</td>
<td>Stop (0)</td>
<td>Stop (0)</td>
<td>Terminal 13 +15 ... 30 V 0 V</td>
</tr>
</tbody>
</table>

When **Main commands** is set to **digital**, **Start/Stop** parameter allows the motor running and the STOP button on the keypad stop the motor.

When **Main commands** is set to **terminals**, **Start/stop** will be a read only parameter.

**Note!** The following signals are required for operating the drive in addition to the **Start** command:
- **Enable drive**
- **Fast stop**
- **External fault**

The behavior of the drive after the **Start** command is given or removed depends on the parameter setting at hand:

- When using the ramp (**Enable ramp** = Enabled and **Enable spd reg** = Enabled) the drive accelerates to the required speed according to the ramp specified. If the Start command is removed, the drive runs down to zero according to the ramp defined. If the Start command is selected once more during the deceleration time, the drive accelerates once more to the required speed.

- If the **Speed ref 1** value reaches the input of the speed regulator directly without a ramp (**Enable ramp** = Disabled and **Enable spd reg** = Enabled), the drive accelerates to the required speed in the shortest possible time once the Start command has been given. When the Start command is removed, the **Speed ref 1** value is set to zero immediately. The command has not effect on **Speed ref 2**.

- When using torque regulation (**Enable spd reg** = Disabled) the **Start** command enables the torque reference value (**T current ref 1**) or disables it after the **Start** command is removed.

The **Start** command has no effect on the correction value **Speed ref 2** (with speed regulation) or **Torque ref 2** (with torque regulation).

The **Start** command is not required for Jog function mode.

If the **Start** command and **Jog +** or **Jog -** are given at the same time, the **Start** command is given priority. If the **Start** command is given during Jog operation, the Jog operation is aborted.
6.1.3 Fast stop

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>min</th>
<th>max</th>
<th>Value Factory American</th>
<th>Value Factory European</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast/Stop</td>
<td>316</td>
<td>0</td>
<td>1</td>
<td>No Fast Stop</td>
<td>No Fast Stop</td>
<td>Terminal 14 +15 ... 30 V 0 V</td>
</tr>
</tbody>
</table>

Terminal 14: +15 ... 30V = No Fast stop 0V = Fast stop

Note! The function cannot be actuated via the keypad!

Application: **Fast stop** is actuated in emergencies and hazardous situations, in order to stop the drive in the shortest possible time. This method of stopping has the advantage over disconnection in that with a four quadrant drive (6KDV3 ... Q4) energy can be recovered in the AC input and the motor can be brought to a halt in a shorter time than when it coastes down.

The **Fast stop** command is always required for operation of the converter. A removal of the command when the drive is running initiates braking with the ramp specified by the parameters **Qstp delta speed** and **Qstp delta time**.

When the drive is brought to a halt, it is still enabled and has torque. The **Start** command or **Enable drive** command must be removed for it to be disconnected.

The drive behavior after the Fast stop command has been given depends on the type of operating mode selected:

- Operation via the terminal strip (**Main commands** = Terminals):
  The drive executes braking until there is no voltage on terminal 14. When voltage is restored, the drive automatically accelerates to the required reference value (precondition: the other enable commands are still active).

- Operation via serial line with commands given via terminals too (**Main commands** = Digital):
  The drive executes braking until it has come to a halt. When voltage is restored on terminal 14, there is no automatic start. This requires the entry of the **Start** command.

- If the **Fast stop** command is actuated via the serial interface while there is a voltage present on terminal 14, the fast stop is executed until the drive is at a halt. The **Start** command must be entered for the drive to be restarted.
6.1.4 Quick Stop

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>min</th>
<th>max</th>
<th>Value Factory American</th>
<th>Value Factory European</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick stop</td>
<td>343</td>
<td>0</td>
<td>1</td>
<td>No Quick stop</td>
<td>No Quick stop</td>
<td></td>
</tr>
</tbody>
</table>

**Note!**
This function cannot be executed via the terminal strip or the keypad but can only be actuated via the serial interface or a bus connection!

**Application:**
Quick stop is actuated in emergencies or hazardous situations in order to bring the drive to a halt in the shortest possible time. This method of stopping has the advantage over disconnection in that with a tetraquadrant drive (6KD\textsuperscript{V}3 \ldots \textsuperscript{Q}4) energy can be recovered in the main and the motor can be brought to a halt in a shorter time than when it coasts down.

- If the Quick stop command is given when the drive is running, this initiates braking with the ramp specified by the Qstp delta speed and Qstp delta time parameters.

- When the drive is at a halt, it is disabled and thus has no torque. The Start command must be given again for the drive to be started.

6.1.5 External fault

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>min</th>
<th>max</th>
<th>Value Factory American</th>
<th>Value Factory European</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>External fault</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Terminal 15 +15 \ldots 30 V 0 V</td>
</tr>
</tbody>
</table>

The External fault command enables an external signal to be incorporated in the failure alarms of the converter.

**Application example**
The converter is being used for closed-loop control of a single drive without contactors. A temperature-dependent contact, which opens under excessive temperature, is located within the motor. Connect this contact between 24 V and terminal 15. When the contact opens (= overtemperature) the converter will be disabled.

- During operation a signal is always required on terminal 15, irrespective of whether the commands are transmitted via the terminal strip or not.

- In the event of an external fault, the drive will behave according to the configuration set in the “Programmable Alarms, 6.11.7.”.
6.2 BASIC START UP MENUS

The following DRIVE STATUS, START UP and TUNING allow a basic commissioning of the drive.

**NOTE!** The parameters in these menus are available in other menus.
See Start up procedure on chapter 5.4 for commissioning information.

**DRIVE STATUS**

Menu displayed at power up.
Status parameters of the drive are available and **Ramp ref 1** parameter for basic speed reference with ramp time.

**START UP**

In this menu the start up sequencing is available.

**First basic setting**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed base value</td>
<td>Speed base value is defined by the unit in the factor function specified. It is the reference value for all the speed reference values (reference values, adaptive speed regulation) given as a percentage, and corresponds to 100% of the speed. Changing this parameter is only possible when the drive is disabled (Enable drive=Disable). The speed base value does not define the maximum possible speed, which in some cases can be formed from the addition of several reference values. This is defined with Speed max amount.</td>
</tr>
<tr>
<td>Nom flux curr</td>
<td>Drive field current value.</td>
</tr>
<tr>
<td>Speed-0 f weak</td>
<td>Enables the field economy at zero speed.</td>
</tr>
<tr>
<td>Acc / Dec ...</td>
<td>Acceleration and deceleration ramp time setting on the speed reference.(see chapter 6.6.1 for more details).</td>
</tr>
</tbody>
</table>

**Motor data**

Motor plate data:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor nom flux</td>
<td>Motor field current in Amps.</td>
</tr>
<tr>
<td>Flux reg mode</td>
<td>Field regulator mode.</td>
</tr>
<tr>
<td>Full load curr</td>
<td>Nominal motor current in Amps</td>
</tr>
<tr>
<td>Motor max speed</td>
<td>Maximum motor speed value</td>
</tr>
<tr>
<td>Max out voltage</td>
<td>Maximum armature voltage value</td>
</tr>
<tr>
<td>Flux weak speed</td>
<td>Motor max speed percentage where the flux weakening range starts. (Crossover point)</td>
</tr>
</tbody>
</table>
**Limits**

Speed limits and current limits drive setting:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T current lim</strong></td>
<td>Current limit setting (see chapter 6.5.2 for more details).</td>
</tr>
<tr>
<td><strong>Flux current max</strong></td>
<td>Maximum field current value as percentage of Motor fld curr.</td>
</tr>
<tr>
<td><strong>Flux current min</strong></td>
<td>Minimum field current value as percentage of Motor fld curr. (See chapter 6.5.3 for more details).</td>
</tr>
<tr>
<td><strong>Speed min amount</strong></td>
<td>Minimum speed reference limit. (see chapter 6.5.1 for more details).</td>
</tr>
<tr>
<td><strong>Speed max amount</strong></td>
<td>Maximum speed reference limit. (see chapter 6.5.1 for more details).</td>
</tr>
</tbody>
</table>

**Speed feedback**

Speed feedback setting (see chapter 6.11.4 for more details):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speed fbk sel</strong></td>
<td>Speed feedback selection</td>
</tr>
<tr>
<td><strong>Tacho scale</strong></td>
<td>Tach generator feedback scaling (Speed fbk sel must be set to Tacho)</td>
</tr>
<tr>
<td><strong>Speed offset</strong></td>
<td>Speed feedback offset</td>
</tr>
<tr>
<td><strong>Encoder 2 pulses</strong></td>
<td>Number of pulses per revolution of the digital encoder to the XE2 connector.</td>
</tr>
<tr>
<td><strong>Enable fbk contr</strong></td>
<td>Speed feedback loss control. The Motor max speed, Max out voltage, Flux weak speed parameters must be set correctly according to the motor used.</td>
</tr>
<tr>
<td><strong>Refresh enc 2</strong></td>
<td>Enable the monitoring of the encoder 2 (XE2 connector) connection status (A, B, Anot, Bnot channels). Enable fbk contr must be enabled.</td>
</tr>
</tbody>
</table>

**Alarms**

Overvoltage and Overcurrent threshold setting (see chapter 6.11.7 for more details):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Undervolt thr</strong></td>
<td>AC input alarm threshold value</td>
</tr>
<tr>
<td><strong>Overcurrent thr</strong></td>
<td>Overcurrent alarm threshold value.</td>
</tr>
</tbody>
</table>
Analog inputs

For programmable analog inputs see chapter 6.12.2 for more details.

Self tuning of current regulator

See chapter 5.3.5.1.

R&L Search Command for current regulator self tuning execution

- Enable the drive (Enable Drive parameter = Enabled)
- Start the drive (Start/Stop parameter = Start).

Self tuning of speed regulator

(see chapter 5.3.5.2 for more details):

- Fwd-Rev spd tune Direction of motor shaft rotation for the speed self tune test (Forward or Reverse; Forward is clock-wise as seen from shaft drive end).
- Test T curr lim Torque current limit applied during Speed self tune test.
- Start Speed regulator self tuning start command.
- Inertia Total Inertia value at the motor shaft in Kg*m² (1 Kg*m² = 23.76 lb*ft²).
- Inertia Nw New total Inertia value at the motor shaft in Kg*m² identified during the speed self tune procedure. (1 Kg*m² = 23.76 lb*ft²)
- Friction Friction value (or Loss compensation) in N*m (1 N*m = 0.738 lb*ft).
- Friction Nw New Friction value (or Loss compensation) in N*m identified during the speed self tune procedure. (1 N*m = 0.738 lb*ft)
- Speed P Proportional coefficient of the speed regulator in percentage
- Speed P Nw New value of Proportional coefficient of the speed regulator in percentage computed during the speed self tune procedure.
- Speed I Integral coefficient of the speed regulator in percentage
- Speed I Nw New value of Integral coefficient of the speed regulator in percentage computed during the speed self tune procedure.
- Take val Acquire the parameters after the self tune procedure (overwrite current values).

Note! This is not a permanent save. Go to “Save parameters” command.
Final operation

(See chapter 6.11.1 for more parameters detail).

Main commands

This command specifies from where the Enable drive and Start command has to be actuated.

Control mode

Defines whether the digital channel is the keypad/RS485 or Fieldbus card.

Save parameters

Saving of user parameters value setting

TUNING

This menu allows a fine manual tuning of the drive regulators.

Current self tuning

Current regulator self tuning procedure via R&I. Search (as indicate in START UP menu).

Speed self tune

Speed regulator self tune procedure (as indicate in START UP\ Speed self tune menu).

Manual tuning of speed regulator, field regulator and voltage regulator

Manual tuning of the drive regulators (see chaper 5.3.6 for other details):

- Speed P: Proportional coefficient of the speed regulator in percentage
- Speed I: Integral coefficient of the speed regulator in percentage.
- Prop filter: Time constant filter to the proportional coefficient of the speed regulator
- Flux P: Proportional coefficient of the field regulator in percentage.
- Flux I: Integral coefficient of the field regulator in percentage
- Voltage P: Proportional coefficient of the voltage regulator in percentage.
- Voltage I: Integral coefficient of the voltage regulator in percentage
- Save parameters: Saving of user parameters value setting
6.3 MONITOR

The MONITOR menu shows all current reference and actual values and also the situation of the digital inputs/outputs. The values related to the speed are given in rpm (revolutions per minute), as a percentage (related to the Speed base value) and in the dimension specified by the factor function.
## DV-300 Adjustable Speed Drives

### FUNCTION DESCRIPTION

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>min</th>
<th>max</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable drive</td>
<td>314</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Disabled</td>
</tr>
<tr>
<td>Start/Stop</td>
<td>315</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Disabled</td>
</tr>
<tr>
<td>Ramp ref (d) [FF]</td>
<td>109</td>
<td>-32768</td>
<td>+32767</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ramp ref (rpm)</td>
<td>110</td>
<td>-32768</td>
<td>+32767</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ramp ref (%)</td>
<td>111</td>
<td>-200.0</td>
<td>+200.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ramp output (d) [FF]</td>
<td>112</td>
<td>-32768</td>
<td>+32767</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ramp outp (rpm)</td>
<td>113</td>
<td>-32768</td>
<td>+32767</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ramp output (%)</td>
<td>114</td>
<td>-200.0</td>
<td>+200.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Speed ref (d) [FF]</td>
<td>115</td>
<td>-32768</td>
<td>+32767</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Speed ref (rpm)</td>
<td>116</td>
<td>-32768</td>
<td>+32767</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Speed ref (%)</td>
<td>117</td>
<td>-200.0</td>
<td>+200.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Actual spd (d) [FF]</td>
<td>119</td>
<td>-32768</td>
<td>+32767</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Actual spd (rpm)</td>
<td>120</td>
<td>-8192</td>
<td>+8192</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Actual spd (%)</td>
<td>121</td>
<td>-200.0</td>
<td>+200.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>F act spd (rpm)</td>
<td>924</td>
<td>-32768</td>
<td>+32767</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Act spd filter [s]</td>
<td>923</td>
<td>0.001</td>
<td>1.000</td>
<td>0.100</td>
<td>An Output 1 *</td>
</tr>
<tr>
<td>Enc 1 speed (rpm)</td>
<td>427</td>
<td>-8192</td>
<td>+8192</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Enc 2 speed (rpm)</td>
<td>420</td>
<td>-8192</td>
<td>+8192</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mains voltage [V]</td>
<td>466</td>
<td>0</td>
<td>999</td>
<td>-</td>
<td>*</td>
</tr>
<tr>
<td>Mains frequency [Hz]</td>
<td>588</td>
<td>0.0</td>
<td>70.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Output power [Kw]</td>
<td>1052</td>
<td>0.01</td>
<td>9999.99</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Output voltage [V]</td>
<td>233</td>
<td>0</td>
<td>999</td>
<td>-</td>
<td>*</td>
</tr>
<tr>
<td>Motor current [%]</td>
<td>199</td>
<td>-250</td>
<td>250</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>F T curr (%)</td>
<td>928</td>
<td>-500</td>
<td>+500</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>T curr filter [s]</td>
<td>926</td>
<td>0.001</td>
<td>0.250</td>
<td>0.100</td>
<td>-</td>
</tr>
<tr>
<td>T curr ref [%]</td>
<td>41</td>
<td>-200</td>
<td>+200</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Flux reference [%]</td>
<td>500</td>
<td>0.0</td>
<td>100.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Flux current [%]</td>
<td>234</td>
<td>0.0</td>
<td>100.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Flux current (A)</td>
<td>351</td>
<td>0.1</td>
<td>99.9</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Digital I/Q</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Dig input term 1</td>
<td>565</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 2</td>
<td>566</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 3</td>
<td>567</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 4</td>
<td>568</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 5</td>
<td>569</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 6</td>
<td>570</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 7</td>
<td>571</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 8</td>
<td>572</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 9</td>
<td>573</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 10</td>
<td>574</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 11</td>
<td>575</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 12</td>
<td>576</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 13</td>
<td>577</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 14</td>
<td>578</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 15</td>
<td>579</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig input term 16</td>
<td>580</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dig output term</td>
<td>581</td>
<td>0</td>
<td>65535</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Virtual dig inp</td>
<td>582</td>
<td>0</td>
<td>65535</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Virtual dig out</td>
<td>583</td>
<td>0</td>
<td>65535</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* This function can be assigned to a programmable analog output.
Enable drive

When the converter is controlled via the keypad, it is activated via the Enable drive parameter. A voltage is also required on terminal 12. The Start command is required for starting the drive.

- Enabled: Enable drive
- Disable: Drive disabled

Start/Stop

Using the keypad as Start/Stop control, if Enter key is pushed, the motor run at the speed set.

Ramp ref (d)

Total reference value for the ramp in units specified by the factor function.

Ramp ref (rpm)

Total reference value for the ramp in rpm.

Ramp ref (%)

Total reference value for the ramp as a percentage of the Speed base value.

Ramp output (d)

Ramp output in units specified by the factor function.

Ramp output (rpm)

Ramp output in rpm.

Ramp output (%)

Ramp output as a percentage of the Speed base value.

Speed ref (d)

Total speed reference value in units specified by the factor function.

Speed ref (rpm)

Total speed reference value in rpm.

Speed ref (%)

Total speed reference value as a percentage of the Speed base value.

Actual spd (d)

Actual speed in units specified by the factor function.

Actual spd (rpm)

Actual speed in rpm (revolutions per minute).

Actual spd (%)

Actual speed as a percentage of the Speed base value.

F act spd (d)

Filtered value of Actual speed in units specified by the factor function.

F act spd (rpm)

Filtered value of Actual speed in rpm.

Act spd filter

1st order low pass filter time constant on Actual speed.

Enc 1 speed (rpm)

Actual speed measured by the encoder 1. The parameter is accessible only if the Speed fbk sel = encoder 2 and a digital encoder is used as encoder 1 (interfacing with the drive by means of the 6KKDV300DES card).

Enc. 2 speed (rpm)

Actual speed measured by the encoder 2. The parameter is accessible only if Speed fbk sel = encoder 2.

Mains voltage

Mains voltage in V

Mains frequency

AC input frequency in Hz

Output power

Output power value in Kw

Output voltage

Armature Voltage $U_{da}$ in $V_{AV}$

Motor current

Armature current in % of Full load curr.

F T curr (%)

Filtered value of Torque current in percentage.

T curr filter

1st order low pass filter time constant on Torque current.

T current ref

Total current reference value as a percentage of the Full load current.

Flux reference

Field current (reference) as a percentage of Motor nom flux.

Flux curr (%)

Actual field current value as percentage of Motor nom flux.

Flux curr (A)

Actual field current value in amps.

Digital I/O

Status of the digital input and output of the base converter and the card 6KCV300TBO.

Display: I 1 2 3 4 5 6 7 8 E S F

Q 1 2 3 4 5 6 7 8

An I/O is displayed only if a voltage is present on the corresponding terminal. E.g., if the inputs 4 and 6 are displayed, that means that the digital inputs 4 and 6 on the
6KCV300TBO card are at High level.
E= Enable drive (terminal 12)
S= Start (terminal 13)
F= Fast stop (terminal 14)

When a serial line or a Bus is used, the status of the digital I/O can be read by means of the **Dig input term** and **Dig output term** parameters.

**Dig input term**

Status of the digital inputs on the device and 6KCV300TBO option card to be read by serial line or field bus. The information is contained in a word, where each bit is 1 if voltage is present on the corresponding input terminal.

<table>
<thead>
<tr>
<th>Bit n.</th>
<th>output</th>
<th>Bit n.</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>TBO “A”, Term. 31 (Digital input 1)</td>
<td>8</td>
<td>DV-300, Term. 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Enable drive)</td>
</tr>
<tr>
<td>1</td>
<td>TBO “A”, Term. 32 (Digital input 2)</td>
<td>9</td>
<td>DV-300, Term. 13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Start)</td>
</tr>
<tr>
<td>2</td>
<td>TBO “A”, Term. 33 (Digital input 3)</td>
<td>10</td>
<td>DV-300, Term. 14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Fast stop)</td>
</tr>
<tr>
<td>3</td>
<td>TBO “A”, Term. 34 (Digital input 4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>TBO “B”, Term. 11 (Digital input 5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>TBO “B”, Term. 12 (Digital input 6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>TBO “B”, Term. 13 (Digital input 7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>TBO “B”, Term. 14 (Digital input 8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Dig input term 1***  Status of the digital input 1 (terminal 21, integrated TBO “A”)
**Dig input term 2***  Status of the digital input 2 (terminal 22, integrated TBO “A”)
**Dig input term 3***  Status of the digital input 3 (terminal 23, integrated TBO “A”)
**Dig input term 4***  Status of the digital input 4 (terminal 24, integrated TBO “A”)
**Dig input term 5***  Status of the digital input 5 (terminal 11, option 6KCV300TBO, TBO “B”)
**Dig input term 6***  Status of the digital input 6 (terminal 12, option 6KCV300TBO, TBO “B”)
**Dig input term 7***  Status of the digital input 7 (terminal 13, option 6KCV300TBO, TBO “B”)
**Dig input term 8***  Status of the digital input 8 (terminal 14, option 6KCV300TBO, TBO “B”)
**Dig input term 9***  Status of the digital input on terminal 12 (Enable drive)
**Dig input term 10*** Status of the digital input on terminal 13 (Start)
**Dig input term 11*** Status of the digital input on terminal 14 (Fast stop)
**Dig input term 12*** Not used
**Dig input term 13*** Not used
**Dig input term 14*** Not used
**Dig input term 15*** Not used
**Dig input term 16*** Not used

**Dig output term**

Status of the digital outputs on the device and 6KCV300TBO option card to be read by serial line or field bus. The information is contained in a word, where each bit is 1 if voltage is present on the corresponding terminal.
### 6.4 INPUT VARIABLES

The converters of the DV-300 series enable reference values for the ramp and regulator to be specified in different dimensions:

- as a percentage of the **Speed base value**
- in a dimension that the user can define himself with the factor-function, i.e. as a speed m/s. The default factory setting is rpm.

The value processes inside the device is the same irrespective of how it was defined. This means that the other reference is overwritten with the new value.

**Example:**

A motor has a maximum speed of 1500 rpm. This corresponds to 100% and at the same time the user-defined value of 10,000 bottles per hour.

Changing the reference value to 50% will automatically result in a change of the other value to 5,000 bottles per hour.

The table below shows the relationship of reference values. In the event of a change, the other parameters are overwritten automatically.

<table>
<thead>
<tr>
<th>Parameters with same value</th>
<th>N.</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp ref 1 (%)</td>
<td>44</td>
<td>according to the Factor function %</td>
</tr>
<tr>
<td>Speed input var*</td>
<td>47</td>
<td>according to the Factor function %</td>
</tr>
<tr>
<td>Speed input perc*</td>
<td>44</td>
<td>according to the Factor function %</td>
</tr>
<tr>
<td>Speed ref 1 (%</td>
<td>46</td>
<td>according to the Factor function %</td>
</tr>
<tr>
<td>Speed ref 2 (%)</td>
<td>48</td>
<td>according to the Factor function %</td>
</tr>
<tr>
<td>Speed ref 1 (%)</td>
<td>49</td>
<td>according to the Factor function %</td>
</tr>
<tr>
<td>Speed ref 2 (%)</td>
<td>115</td>
<td>according to the Factor function %</td>
</tr>
<tr>
<td>Speed ref 2 (%)</td>
<td>116</td>
<td>according to the Factor function %</td>
</tr>
</tbody>
</table>

* Defined in the DRIVECOM menu
6.4.1 Ramp ref

The ramp reference value specifies the speed the drive should reach once the acceleration phase has been completed. Modifications to the ramp reference value are therefore transferred to the ramp accordingly. The height of the ramp reference value determines the motor speed. As for the four quadrant drives (6KDV3 ... Q4...) the rotation direction is determined by the reference polarity.

**Note!**

Two quadrant 6KDV3 ... Q2... drives accept only positive references. Negative values are not considered!

![Diagram of ramp references](image)

*Figure 6.4.1.1: Ramp references*
### Parameter description

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp ref 1 [FF]</td>
<td>44</td>
<td>-2 P45 -200.0</td>
<td>Factory American</td>
</tr>
<tr>
<td>Ramp ref 1 (%)</td>
<td>47</td>
<td>+2 P45 +200.0</td>
<td>Factory European</td>
</tr>
<tr>
<td>Ramp ref 2 [FF]</td>
<td>48</td>
<td>-2 P45 -200.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>Ramp ref 2 (%)</td>
<td>49</td>
<td>+2 P45 +200.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>Ramp ref (rpm)</td>
<td>110</td>
<td>-32768</td>
<td>-</td>
</tr>
<tr>
<td>Ramp ref (d) [FF]</td>
<td>109</td>
<td>0 0.0</td>
<td>-</td>
</tr>
<tr>
<td>Ramp ref (%)</td>
<td>111</td>
<td>0 0.0</td>
<td>-</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable analog inputs. The converter is already factory set for a configuration using the terminals stated. The setting can also be modified to suit the application at hand.

** This parameter can be assigned to a programmable analog output.

- **Ramp ref 1**: 1st reference value for the ramp. The value to be entered depends on the factor function.
- **Ramp ref 1 (%)**: 1st reference value as a percentage of the Speed base value
- **Ramp ref 2**: 2nd reference value for the ramp. The value to be entered depends on the factor function.
- **Ramp ref 2 (%)**: 2nd reference value as a percentage of the Speed base value
- **Ramp ref (rpm)**: Total reference value for the ramp in rpm (revolutions per minute)
- **Ramp ref (d)**: Total reference value for the ramp in the dimension specified by the factor function.
- **Ramp ref (%)**: Total reference value of the ramp as a percentage of the Speed base value

**Nota:**
Speed base value cannot exceed 8192 rpm

The total Ramp reference value **Ramp ref** consists of the signed addition of **Ramp ref 1** and **Ramp ref 2** (see Figure 6.4.1.1).

**Example 1:**
- Ramp ref 1 = + 50 %
- Ramp ref 2 = + 30 %
- Ramp ref = 50 % + 30 % = 80 %

**Example 2:**
- Ramp ref 1 = + 40 %
- Ramp ref 2 = - 60 %
- Ramp ref = 40 % - 60 % = - 20 %

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via terminals.

The **Ramp ref (rpm)**, **Ramp ref (d)** and **Ramp ref (%)** are influenced by the minimum speed limits. These are directly applied on the **Ramp ref 1**, as well as the Motor potentiometer and Multispeed references.

### 6.4.2 Speed ref

**INPUT VARIABLES**

- **Speed ref**: Speed reference value specifies the required speed of the drive. The drive responds to the reference value progression directly, except in cases where the torque available is insufficient for this purpose. In this case, the drive operates at current limit until the selected speed has been reached. The speed reference value determines the speed of the motor, while the polarity determines the direction of rotation.
Two quadrant 6KDV3 ... Q2 drives accept only positive references. Negative values are not considered!

**Note:**

Speed base value cannot exceed 8192 rpm
The total speed reference value consists of the signed addition of Speed ref 1 and Speed ref 2.

Example 1:  
\[
\begin{align*}
\text{Speed ref 1} & = + 50 \% \\
\text{Speed ref 2} & = + 30 \%
\end{align*}
\]
\[
\text{Speed ref} = 50 \% + 30 \% = 80 \%
\]

Example 2:  
\[
\begin{align*}
\text{Speed ref 1} & = + 40 \% \\
\text{Speed ref 2} & = - 60 \%
\end{align*}
\]
\[
\text{Speed ref} = 40 \% - 60 \% = - 20 \%
\]

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via terminals. The speed reference value has an upper and a lower limit.

If the ramp is selected, (Enable ramp parameter= Enabled), the reference value input Speed ref 1 is automatically linked with the ramp output.

### 6.4.3 Torque current reference (T current ref)

#### INPUT VARIABLES

<table>
<thead>
<tr>
<th>T current ref</th>
<th>[39] T current ref 1 [%]</th>
<th>[40] T current ref 2 [%]</th>
</tr>
</thead>
</table>

The current reference value is proportional to the armature current of the motor and determines the torque, the polarity determines the torque direction. For most applications T current Ref comes from the speed regulator output. T current ref 2 can also be used as a correction value.

![Figure 6.4.3.1: Torque current reference](image)

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>T current ref 1 [%]</td>
<td>39</td>
<td>min: -200, max: +200</td>
<td>Speed regulator output *</td>
</tr>
<tr>
<td>T current ref 2 [%]</td>
<td>40</td>
<td>min: -200, max: +200</td>
<td>-</td>
</tr>
<tr>
<td>T current ref [%]</td>
<td>41</td>
<td>min: -200, max: +200</td>
<td>-</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the freely programmable analog inputs.

** This parameter can be assigned to a freely programmable analog output.
**T current ref 1**

1st current reference value as a percentage of the **Full load curr**. The maximum value possible depends on the **Enable overload** parameter.

- **Enable overload** disabled: **T current ref 1** 100% max
- **Enable overload** enabled: **T current ref 1** 200% max

**T current ref 2**

2nd current reference value as a percentage of the **Full load curr**. The maximum value possible depends on the **Enable overload** parameter.

- **Enable overload** disabled: **T current ref 2** 100% max
- **Enable overload** enabled: **T current ref 2** 200% max

**T current Ref**

Total current reference value as a percentage of the **Full load curr** value.

The total current reference value consists of the signed addition of **T current ref 1** and **T current Ref 2**.

**Example 1:**

\[ \text{T current ref 1} = +50\% \quad \text{T current ref 2} = -30\% \]

**T current ref** = \(+50\% - 30\% = 80\%\)

**Example 2:**

\[ \text{T current ref 1} = +40\% \quad \text{T current ref 2} = -60\% \]

**T current ref** = \(+40\% - 60\% = -20\%\)

The current reference value has an upper limit.

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via terminals. Reference set using input current, usually are with sign positive and they are used with biquadrant drives.

### 6.5 LIMITS

#### 6.5.1 Speed Limits

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed min amount [FF]</td>
<td>1</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Speed max amount [FF]</td>
<td>2</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Speed min pos [FF]</td>
<td>5</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Speed max pos [FF]</td>
<td>3</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Speed min neg [FF]</td>
<td>6</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Speed max neg [FF]</td>
<td>4</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Speed limited</td>
<td>372</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

* This function can be assigned to a programmable digital output.
**Speed min amount**  
It defines the minimum speed for both directions 6KDV3 ... Q4. A value below minimum is not accepted, regardless of the reference value selected. This parameter affects the ramp input. If the **Speed min amount** parameter is changed, the Parameter **Speed min pos** and **Speed min neg** parameters are set to the same value. If any of these parameters are subsequently changed, the last change is valid. The value to be entered is based on the factor function.

**Speed max amount**  
It defines the maximum speed for both directions 6KDV3 ... Q4... This parameter affects the speed regulator input and therefore takes into account both the reference values that come from the ramp as well as the direction of rotation (see Figure 6.4.2.1). If the **Speed max amount** parameter is changed, the **Speed max pos** and **Speed max neg** parameters are set to the same value. If any of these values is subsequently changed, the last change is valid. The value to be entered is based on the factor function.

**Speed min pos**  
It defines the minimum speed for the clockwise rotation of the motor. A value below minimum is not accepted, regardless of the reference value selected. This function effects the ramp input (see Figure 6.4.1.1). The value of the parameter to be entered is based on the factor function.

**Speed max pos**  
It defines the maximum speed for the clockwise rotation of the motor. This function affects the input of the speed regulator and therefore takes into account both the reference values that come from the ramp as well as the direction of rotation (see Figure 6.4.1.1). The value of the parameter entered is based on the factor function.

**Speed min neg**  
It defines the minimum speed for the counterclockwise rotation of the motor 6KDV3 ... Q4.... A value below minimum is not accepted, regardless of the reference value selected. This parameter effects the ramp input (see Figure 6.4.1.1). The value of the parameter entered is based on the factor function.

**Speed max neg**  
It defines the maximum speed for the counterclockwise rotation of the motor 6KDV3 ... Q4.... This parameter effects the input of the speed regulator and therefore takes into account both the reference values that come from the ramp as well as the direction of rotation (see Figure 6.4.1.1). The value of the parameter entered is based on the factor function.

**Speed limited**  
Message that indicates that the reference value, is currently limited by the entered minimum and maximum limit values.

- **High** Reference value currently limited since the value entered is out of range of the limit values defined.
- **Low** Reference value within the defined limit values.

**Note!**  
The **Speed min amount**, **Speed min pos** and **Speed min neg** parameters have an effect on the **Ramp ref 1** reference value, the motor potentiometer function and the multi-speed function. They do not, however, have an effect on the **Ramp ref 2** parameter!
6.5.2. Armature current limits (Current limits)

The current effects the input of the current regulator and only take into account the armature current.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>T current lim type</td>
<td>715</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>T current lim [%]</td>
<td>7</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>T current lim + [%]</td>
<td>8</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>T current lim - [%]</td>
<td>9</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>Curr limit state</td>
<td>349</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>In use Tcur lim+ [%]</td>
<td>10</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>In use Tcur lim- [%]</td>
<td>11</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>Current lim red [%]</td>
<td>13</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>Torque reduct</td>
<td>342</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital inputs.
** This parameter can be assigned to a programmable analog input.
*** This function can be assigned to one of the programmable digital outputs.

** T curr lim type **

This parameter determines the behaviour of the drive in current limit condition.

- **T lim +/-**
  The active positive torque limit is T current lim and the active negative torque limit is T current lim -.

- **T lim mot/gen**
  With this selection 3 conditions are possible:
  1 - If the motor speed > +1% of Motor max speed the active positive torque limit is T current lim+ and the active negative torque limit is T current lim-.
  2 - If the motor speed < -1% of Motor max speed the active positive torque limit is T current lim- and the active negative torque limit is T current lim+.
  3 - If motor speed < -1% of Motor max speed the active positive torque limit is T current lim+ and the active negative torque limit is T current lim+.
**T current lim**

Symmetrical current limit for both current directions for 6KDV3 ... Q4 converters. Defined as a percentage of the **Full load curr** parameter. The maximum value depends on the **Enable overload** parameter.

- **Enable overload** Disabled **T current limit** 100 % max
- **Enable overload** Enabled **T current limit** 200% max

If the T current limit parameter is changed, the Parameter **T current lim + and T current lim -** parameters are set to the same value. If both these parameters are subsequently changed, the last change is valid.

**T current lim +**

Setting of the drive current limit for the positive current direction (clockwise drive and counter-clockwise brake). Entered as a percentage of the **Full load curr** value. The maximum value depends on the value of the **Enable overload** parameter.

- **Enable overload** Disabled **T current lim+** 100 % max
- **Enable overload** Enabled **T current lim+** 200% max

**T current lim -**

Setting of the drive current limit for the negative current direction (counterclockwise drive and clockwise brake). Entered as a percentage of the **Full load curr** parameter. The maximum value depends on the value of the **Enable overload** parameter. This parameter is not active for the 6KDV3 ... Q4 converters.

- **Enable overload** Disabled **T current lim-** 100 % max
- **Enable overload** Enabled **T current lim-** 200% max

**Curr limit state**

Status message, indicating whether the drive is working with the set current limit or not.

- High Drive working at the current limit. “I Limit” LED lights up.
- Low Drive not working at the current limit.

**In use Tcur lim +**

Status message, indicating the used value of the current limit for the positive torque direction as a percentage of **Full load curr**.

**In use Tcur lim -**

Status message, indicating the used value of the current limit for the negative torque direction as a percentage of **Full load curr**.

**Current lim red**

Setting of the armature current limit, as % of Full load curr, when the Torque reduct function is active.

**Torque reduct**

Selection for torque reduction. This function can be assigned to a freely programmable digital input. When the torque reduction function is active, the current limit changes accordingly by the percentage defined with the **Current lim red** parameter.

- High Torque reduction not active
- Low Torque reduction active
Example of the function of the **Current lim red** and **Torque reduct** parameters.

- **T current limit** (or **T current lim +/-**) = 80%
- **Current lim red** = 70%
- **Torque reduct** = High (not active)  
  Current limit = 80%
- **Torque reduct** = Low (active)  
  Current limit = 70%

The value for **T current limit** can be set in the START UP>Limits menu.

### 6.5.3 Flux limits

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flux current max [%]</td>
<td>467</td>
<td>P468</td>
<td>100 100</td>
</tr>
<tr>
<td>Flux current min [%]</td>
<td>468</td>
<td>0 P467</td>
<td>5 5</td>
</tr>
</tbody>
</table>

* This parameter can be set on a programmable analogic outputs.
** This parameter can be set on a programmable analogic input.

The limits regarding the field current are set in this submenu.

**Flux current max**  
Percentage of maximum field current according to the **Motor nom flux** parameter.  
The max. value (100%) corresponds to the circulation in the field circuit of the motor, of a current equal to the value set in **Motor nom flux**.
If any curve has been set via **I field cnst** parameter, the variation of this parameter influences the field current in a linear way.
(see Flux/if curve section 5.4.5)

**Flux current min**  
Percentage of minimum field current according to the **Motor nom flux** parameter.
Its value states the circulation in the field circuit of the motor, of a minimum current compared to the value set in **Motor nom flux**.
The value set here affect the threshold of the “Field loss” alarm indication. The threshold is the half of **Flux current min**.
6.6 RAMP

The ramp (reference value integrator) determines the acceleration and deceleration times of the drive. These times can be set independently of each other.

An additional ramp is provided for a quick stop. This ramp can only be activated via the serial interface or a field bus.

The ramp can either be linear or S-shaped.

The reference values can be defined in different ways
- with the Ramp ref 1 and/or Ramp ref 2 reference values
- with the multi-speed function
- with the motor potentiometer function
- with the Jog function

The Ramp generator can be used in a stand alone configuration. When the Ramp generator is disabled (Enable ramp = disabled), the Enable drive, Start/Stop and Fast stop commands have no more influence on Ramp generator. In such a condition it is free to run and can be used separately.
### 6.6.1 Acceleration, Deceleration, Quick Stop

#### RAMP

**Acceleration**
- [21] Acc delta speed [FF]
- [22] Acc delta time [s]

**Deceleration**
- [29] Dec delta speed [FF]
- [30] Dec delta time [s]

**Quick stop**
- [37] QStp delta speed [FF]
- [38] QStp delta time [s]

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>Acc delta speed [FF]</td>
<td>21</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Acc delta time [s]</td>
<td>22</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>Dec delta speed [FF]</td>
<td>29</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Dec delta time [s]</td>
<td>30</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>QStp delta speed [FF]</td>
<td>37</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>QStp delta time [s]</td>
<td>38</td>
<td>0</td>
<td>65535</td>
</tr>
</tbody>
</table>

**Figure 6.6.1.1: Accel, decel and Quick stop**

- **Acc delta speed**: Has the same units as the ramp reference value and is based on the factor function.
- **Acc delta time**: Is defined in seconds. If “0 s” is entered, the ramp output directly follows the reference value.
- **Dec delta speed**: Has the same units as the ramp reference value and is based on the factor function.
- **Dec delta time**: Is defined in seconds. If “0s” is entered, the ramp output directly follows the reference value.
- **QStp delta speed**: Has the same dimension as the ramp reference value and is based on the factor function.
- **QStp delta time**: Is defined in seconds. If “0 s” is entered, the ramp output follows the reference value.
- **Quick stop**: Activates the Quick stop ramp.

The acceleration of the drive is defined as a quotient of the Acc delta speed and Acc delta time parameters (see Figure 6.6.1.1). As for the four quadrant converters (6KDV3 ... Q4...) it is the same for both directions of rotation.
The deceleration of the drive is defined as a quotient of the parameters **Dec delta speed** and **Dec delta time** (see Figure 6.6.1.1). As for the four quadrant converters (6KDV3 ... Q4...) it is the same for both directions of rotation.

The Quick Stop function provides the possibility of a second deceleration ramp for the emergency braking of the drive. The ramp output in this case is not set to zero immediately but after a set time. The deceleration of the drive via the Quick Stop function is defined as the quotient of the **Qstp delta speed** and **Qstp delta time** parameters. As for the four quadrant converters (6KDV3 ... Q4...) it is the same for both directions of rotation. This ramp is activated by the functions **Fast stop** (via terminals) and **Quick stop**.

### 6.6.2 Ramp shape and control commands

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ramp shape</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear (0)</td>
<td>18</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>S-Shaped (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>S shape t const [ms]</strong></td>
<td>19</td>
<td>100</td>
<td>3000</td>
</tr>
<tr>
<td><strong>S acc t const [ms]</strong></td>
<td>663</td>
<td>100</td>
<td>3000</td>
</tr>
<tr>
<td><strong>S dec t const [ms]</strong></td>
<td>664</td>
<td>100</td>
<td>3000</td>
</tr>
<tr>
<td><strong>Ramp +/- delay [ms]</strong></td>
<td>20</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td><strong>Fwd-Rev</strong></td>
<td>673</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

- No direction (0)
- Fwd direction (1)
- Rev direction (2)
- No direction (3)

**Forward sign**

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>293</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Reverse sign**

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>294</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Enable ramp**

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>245</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Ramp out = 0**

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>344</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Ramp in = 0**

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>345</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Freeze ramp**

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>373</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Ramp +**

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>346</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Ramp -**

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>347</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital inputs.
** This parameter can be assigned to a programmable digital output.
*** This function can be assigned to one of the programmable analog outputs.
The shape of the ramp is determined by the **Ramp shape**, **S shape t const**, **S dec t const** parameters.

**Ramp shape**  |  Linear  |  Linear ramp  
|----------------|---------|-----------------| 
| S shaped       | S-shaped ramp  

**S shape t const**  
Determines the curve for S-shaped ramps (see Figure 6.6.2.1).

![Figure 6.6.2.1: Ramp shape](image)

The value of **S shape t constant** is added to the ramp time of linear ramps. The ramp time is thus lengthened by the value deigned by the **S shape t const** parameter. This is done regardless of the speed changed involved!

**S acc t const**  
Determines the curve for S-shaped acceleration ramps.

**S dec t const**  
Determines the curve for S-shaped deceleration ramps.

Using very different **S acc t const** and **S dec t const** values it is possible to have a discontinuous behaviour during the changing of the motor direction.

Speed changes (=Active ramp) are indicated by the **Ramp +** and **Ramp -** parameters.

**Ramp +/- delay**  
Defines a delay time. It is only valid if the ramp is active.

![Figure 6.6.2.2: Ramp delay](image)
**Fwd-Rev**  Changes the sign of the Ramp reference. When Fwd direction is selected the Ramp reference is multiplied by +1. When Rev direction is selected the Ramp reference is multiplied by -1.

**Forward sign**  Set the Fwd direction of the Ramp reference. It can be programmed on a digital input.

**Reverse sign**  Set the Rev direction of the Ramp reference. It can be programmed on a digital input.

When both Fwd and Rev sign are 0 or 1, or Fwd-Rev is 0 or 1, the multiplexer is 0.

The behavior of the ramp circuit is defined by the **Enable Ramp**, Ramp In = 0, Ramp Out = 0 and **Freeze ramp** parameters.

**Enable Ramp**  This parameter can be changed only with a disabled drive.

- **Enabled**  The ramp is enabled.
- **Disabled**  The ramp is disabled.

**Ramp out = 0**  Not active (H)  Enabled ramp output.

- **Active (L)**  The ramp output is immediately set to zero.

**Ramp in = 0**  Not active (H)  Enabled ramp input. The Ramp Ref parameter corresponds to the set reference.

- **Active (L)**  Disabled ramp input. Ramp Ref = 0

---

**Freeze ramp**  Not active (H)  The value at the ramp output is kept, irrespective of any possible reference value changes at the ramp input.

- **Active (L)**  The ramp output follows the reference value changes at the ramp input according to the times set.

**Ramp**

- **Ramp +**  Active if the drive uses a positive torque (clockwise rotation and counter-clockwise braking).
- **Ramp -**  Active if the drive uses a negative torque (counter-clockwise rotation and clockwise braking). Only for 6KDV3 ... Q4...

Drive operation is only possible with the ramp function enabled. **Enable ramp** = Enabled.

When the ramp input is enable via **Ramp in = 0**, the acceleration time of the drive starts. If the input is disabled, the drive slows down according to the deceleration time set until zero speed is reached.

When the ramp output is set to zero via **Ramp out = 0**, the drive brakes through the maximum available torque. With the 6KDV3 ... Q2 converters no braking is possible. The function (also Quick Stop) causes the motor to coast.
6.7 SPEED REGULATION (SPEED REGULAT)

The converters of the DV-300 series are provided with a speed regulator circuit that can adapt flexibly to the requirements of various applications. The device is factory set for PI regulation and regulator parameters that stay the same throughout the entire speed range.

The following functions are also provided:

- “Speed-up” function in order to avoid oscillations in presence of loads with a high moment of inertia.
- Speed zero logic for regulator behavior when the motor is stopped.
- Speed regulator adaptation for optimizing the regulator according to the actual speed or to an external reference (Adap Reference).
- Auto capture function of a running motor
- Speed signals
- Droop function for current balancing

For the speed PI regulator diagram block, please refer to “Speed regulator PI part” block diagram on chapter 9.
### 6.7.1 Speed regulator

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed ref [rpm]</td>
<td>118</td>
<td>118 -32768 +32767</td>
<td>-</td>
</tr>
<tr>
<td>Speed reg output [%]</td>
<td>236</td>
<td>-200 +200</td>
<td>-</td>
</tr>
<tr>
<td>Lock speed reg</td>
<td>322</td>
<td>0 1</td>
<td>OFF</td>
</tr>
<tr>
<td>Enable spd reg</td>
<td>242</td>
<td>0 1</td>
<td>Enabled</td>
</tr>
<tr>
<td>Lock speed I</td>
<td>348</td>
<td>0 1</td>
<td>Not active (1)</td>
</tr>
<tr>
<td>Aux spd fun sel</td>
<td>1016</td>
<td>0 1</td>
<td>Speed up (0)</td>
</tr>
<tr>
<td>Prop filter [ms]</td>
<td>444</td>
<td>0 1000</td>
<td>0</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital inputs.
** This parameter can be assigned to a programmable analog output.

**Speed ref**
Total speed reference value in rpm

**Speed reg output**
Output value of the speed regulator, used as the reference value for the current regulator.

**Note!** The speed regulator is still active even if disabled (Enable spd reg = Disabled), therefore the Speed reg output contains valid information also in this case. Such a data can be transferred to the 6KCV300DGF board to be used for other regulation. If the speed regulator is enabled (Enable spd reg = Enabled) the Speed reg output contains the sum of the actual speed regulator output and T current ref 2.

**Lock speed reg**
This parameter is used in order to lock the speed regulator. When this happens, it stops to work, the current reference value is set to zero and the drive comes to a stop. This coasting time then depends on the rotating mass and the friction within the system concerned. If the connection between the speed regulator and the current regulator is restored, the drive will restart in the shortest possible time.

ON Speed regulator locked (= 0 V when using a digital input).
OFF Speed regulator unlocked (= 15...30 V when using a digital input).

**Enable spd reg**
This parameter can only be changed when the drive is switched off.

Enabled The speed regulator is enabled. The regulator output is connected to the input of the current regulator. Speed reg output = T current ref 1

Disabled The speed regulator is disabled.
Lock speed I

- Not active (H): I component of the speed regulator is enabled
- Active (L): I component of the speed regulator is disabled

Aux spd fun sel

Selection of the *Speed up* or *Inertia/loss cp* (see chapter 6.7.3. *Speed up function* and chapter 6.7.5. *Inertia/loss cp* for more details).

Prop filter

Time constant of the filter belonging to the circuit of the speed feedback. Filtering of the high frequency components of speed feedback signal is useful in case of elastic coupling between motor and load (joint or belts).

The speed regulator must be enabled with the **Enable spd reg** parameter in order for it to be used.

The reference value for the speed regulator consists of the signed addition of **Speed ref 1** and **Speed ref 2**.

The speed feedback is supplied by an encoder or a tachometer that are mounted to the motor shaft. The higher the resolution of the encoder, the better the control accuracy of the regulator.

The regulator parameters can be set separately.

For the speed PI regulator diagram block, please refer to diagram on chapter 9.

### 6.7.1.1 Self tuning of Speed regulator

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fwd-Rev spd tune</td>
<td>1029</td>
<td>1-2</td>
<td>Fwd Direction (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fwd Direction (1)</td>
</tr>
<tr>
<td>Test T curr lim [%]</td>
<td>1048</td>
<td>0-S</td>
<td>20 20</td>
</tr>
<tr>
<td>Start</td>
<td>1027</td>
<td>0</td>
<td>65535 -</td>
</tr>
<tr>
<td>Inertia [kg<em>m</em>m/s]</td>
<td>1014</td>
<td>0.001</td>
<td>999.999 S S</td>
</tr>
<tr>
<td>Inertia Nw [kg<em>m</em>m/s]</td>
<td>1030</td>
<td>0.001</td>
<td>999.999 - -</td>
</tr>
<tr>
<td>Friction [N*m]</td>
<td>1015</td>
<td>0.000</td>
<td>99.999 S S</td>
</tr>
<tr>
<td>Friction Nw [N*m]</td>
<td>1031</td>
<td>0.00</td>
<td>99.99 - -</td>
</tr>
<tr>
<td>Speed P [%]</td>
<td>87</td>
<td>0.00</td>
<td>100.00 S S</td>
</tr>
<tr>
<td>Speed P Nw [%]</td>
<td>1032</td>
<td>0.00</td>
<td>100.00 - -</td>
</tr>
<tr>
<td>Speed I [%]</td>
<td>88</td>
<td>0.00</td>
<td>100.00 S S</td>
</tr>
<tr>
<td>Speed I Nw [%]</td>
<td>1033</td>
<td>0.00</td>
<td>100.00 - -</td>
</tr>
<tr>
<td>Take val</td>
<td>1028</td>
<td>0</td>
<td>65535 -</td>
</tr>
</tbody>
</table>
**Fwd-Rev spd tune**  Direction of motor shaft rotation for the speed self tune test (Forward or Reverse; Forward is clock-wise as seen from shaft drive end).

**Test T curr lim**  Torque current limit applied during Speed self tune test.

**Start**  Start-up speed self tune.

**Inertia**  Inertia value in Kg*m² (1 Kg*m² = 23.76 lb*ft²).

**Inertia Nw**  New Inertia value in Kg*m² identified during the speed self tune procedure.

**Friction**  Friction value (or Loss compensation) in N*m (1 N*m = 0.738 lb*ft).

**Friction Nw**  New Friction value (or Loss compensation) in N*m identified during the speed self tune procedure.

**Speed P**  Proportional coefficient of the speed regulator in percentage.

**Speed P Nw**  New value of Proportional coefficient of the speed regulator in percentage computed during the speed self tune procedure.

**Speed I**  Integral coefficient of the speed regulator in percentage.

**Speed I Nw**  New value of Integral coefficient of the speed regulator in percentage computed during the speed self tune procedure.

**Take val**  Acquire the parameters after the speed self tune procedure (overwrite current values).

**Note!**  This is not a permanent save. Go to “Save parameters” command.

### 6.7.2 Spd zero logic

The speed zero logic determines the behavior of the drive when the motor shaft is at a stop.

#### Figure 6.7.2.1: Speed zero logic

<table>
<thead>
<tr>
<th>SPEED REGULAT</th>
<th>Spd zero logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>[123]</td>
<td>Enable spd=0 I</td>
</tr>
<tr>
<td>[124]</td>
<td>Enable spd=0 R</td>
</tr>
<tr>
<td>[125]</td>
<td>Enable spd=0 P</td>
</tr>
<tr>
<td>[126]</td>
<td>Spd=0 P gain [%]</td>
</tr>
<tr>
<td>[106]</td>
<td>Ref 0 level [FF]</td>
</tr>
</tbody>
</table>
### 6.7.3 Speed up

**SPEED REGULATOR**

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>Speed up gain [%]</td>
<td>445</td>
<td>0.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Speed up base [ms]</td>
<td>446</td>
<td>0</td>
<td>16000</td>
</tr>
<tr>
<td>Speed up filter [ms]</td>
<td>447</td>
<td>0</td>
<td>1000</td>
</tr>
</tbody>
</table>

**Enable spd=0 I**

Enabled (1) Disables (0)

Enabled: The I component of the speed regulator is set to 0 when the reference value and the actual value = 0. The drive control is then only proportional. The I component is enabled when a reference value is entered to restart acceleration.

Disabled: Disable the function.

**Enable spd=0 R**

Only effective if **Enable spd=0 P** is enabled.

Enabled: The proportional gain, equal to Spd=0 P gain at zero speed, is equal to Speed P when the speed reference becomes higher than the value defined by Ref 0 level.

Disabled: The proportional gain, equal to Spd=0 P gain at zero speed, is equal to Speed P when the speed reference or the actual speed become higher than the value defined by Ref 0 level.

**Enable spd=0 P**

Enabled: When both reference value and actual value = 0, the proportional Spd=0 P gain component is active after the delay time defined by Speed zero delay.

Disabled: The speed regulator also keeps its proportional gain component when the drive is at a stop.

**Spd=0 P gain**

Proportional gain of the speed regulator, that is only active when both reference value and actual value = 0, and if the Enable spd=0 P function has been enabled.

**Ref 0 level**

Switch threshold for speed zero logic. Defined in the dimension specified in the factor function. Speeds below this threshold are defined as zero.
The Speed-up function is used in order to avoid oscillations in presence of loads with a high moment of inertia. It is made up of a derivative part in the speed feedback circuit, which allows to increase the integral gain of the speed regulator. It is also useful in case of cyclical non constant loads on the motor (ex. cams). The feedback applied to the speed regulator is made of two components:
- the motor speed
- the output signal from the Speed up function

This function is mutually exclusive to the Inertia/loss comp function, This selection must be done via the Aux spd fun sel [1016] parameter. (SPEED REGULAT menu). See section 6.7.1 Speed regulator.

**Speed up gain** Speed up function gain as a percentage of Speed up base

**Speed up base** Speed up function max. gain. The defined value corresponds to 100% of the Speed up gain parameter.

**Speed up filter** Time constant of the filter belonging to the D part of the Speed up function.

See example figure 5.3.7.3. and 5.3.7.4.

### 6.7.4. Droop function

![Diagram of Droop compensation](image)

*Figure 6.7.4.1: Droop compensation*

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Droop gain [%]</td>
<td>696</td>
<td>0.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Droop filter [ms]</td>
<td>697</td>
<td>0</td>
<td>1000</td>
</tr>
<tr>
<td>Load comp [%]</td>
<td>698</td>
<td>-200</td>
<td>+200</td>
</tr>
<tr>
<td>Droop limit [FF]</td>
<td>700</td>
<td>0</td>
<td>2*P45</td>
</tr>
<tr>
<td>Enable droop</td>
<td>699</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

* This parameter can be assigned to one of the programmable analog inputs.
** This parameter can be assigned to one of the programmable digital inputs.
The Droop function is used when a current balancing between two drives is required. A typical situation is when two motors are mechanically coupled and have to run at the same speed. If, because of a different characteristic of the two speed regulators, one of the motors is driven to run at a higher speed, it will be overloaded and the second motor will work as a brake. The Droop function permits to avoid this bad functioning by adding a component in the in the speed reference of the drive, which is proportional to the actual load difference of the drives. The effect is the balancing of the two motor current.

**Droop gain**  
Droop function gain. It is defined as a percentage of the ratio between Speed base value and the difference Load comp - T current ref. This means that when the difference Load comp - T current ref is 100% and Droop gain = 100%, the speed reference correction signal is equal to Speed base value.

**Droop filter**  
Filter time constant

**Load comp**  
Load compensation signal. It is typically equal to the “master” drive current, but it can also be assigned to a programmable analog output. It is defined as a percentage of Idn.

**Enable droop**  
Enabled Droop function enabled.  
Disabled Droop function disabled.

**Droop limit**  
It defines the speed reference correction range in which the droop function is active. The value to be entered is based on the factor function.

(For more detail see Figure 6.7.1 “Speed regulator”).

**Figure 6.7.4.2: Droop function example**

Example setting:  
----- Pourpose: Torque of motor 1 has to be equal to torque of motor 2

**Drive Master**  
Analog input 1= Speed ref 1  
Analog output 1= Tcurr ref

**Drive slave**  
Analog input 1= Speed ref 1  
Analog input 2= Load comp  
Enable droop= enables  
Droop gain= 5%  
Droop filter= 100ms  
Droop limit=1000
### 6.7.5 Inertia/Loss compensation

**Figure 6.7.5.1: Inertia/Loss compensation**

#### SPEED REGULAT

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inertia [kg<em>m²</em>m]</td>
<td>1014</td>
<td>0.001 - 999.999</td>
<td>S</td>
</tr>
<tr>
<td>Friction [N*m]</td>
<td>1015</td>
<td>0.000 - 99.999</td>
<td>S</td>
</tr>
<tr>
<td>Torque const [N*m/A]</td>
<td>1013</td>
<td>0.01 - 99.99</td>
<td>S</td>
</tr>
<tr>
<td>Inertia c filter [ms]</td>
<td>1012</td>
<td>0 - 1000</td>
<td>0</td>
</tr>
</tbody>
</table>

Speed regulator feedforward term that allows to increase the dynamic response to a speed reference variation. These parameters are identified from the **Speed self tune** function (START UP-Speed self tune and SPEED REGULAT-Self tuning) but they can also be set from the user.

This function is mutually exclusive to the Speed up function. This selection must be done via the **Aux spd fun sel** [1016] parameter (SPEED REGULAT menu). See section 6.7.1, Speed regulator.

#### Inertia

Total Inertia value at the motor shaft in Kg*m² identified during the speed self tune procedure. (1 Kg*m² = 23.73 lb*ft²)

#### Friction

Friction value (or Loss compensation) in N*m identified during the speed self tune procedure. (1 N*m = 0.738 lb*ft)

#### Torque const

Total torque constant value internally computed that allows to obtain the N*m/A conversion when the motor operates within the specified speed range. This value is identified during the speed self tune procedure.

#### Inertia c filter

1st order low pass filter time constant. The filter reduces the noise value owed to the operation of the speed differentiation in the Inertia compensation block.
6.8 CURRENT REGULATION (CURRENT REGUlat)

**Current Limits**
- T current lim +: 190%
- T current lim -: 190%
- T current ref
- Current regulator includes anti-windup logic

**Torque Reduction**
- Torque reduction command
- Torque reduction

**Motoring & Generating Torque Limit**
- Torque limit +/-
- T current lim +: 150%
- T current lim -: 150%

**Parameter Description**
<table>
<thead>
<tr>
<th>Parameter</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>T current ref [%]</td>
<td>41</td>
<td>-200 to +200</td>
<td>Factory American: -</td>
</tr>
<tr>
<td>Motor current [%]</td>
<td>199</td>
<td>-250 to 250</td>
<td>Factory European: -</td>
</tr>
<tr>
<td>Mot cur threshold [%]</td>
<td>1430</td>
<td>0 to 200</td>
<td>100 to 100</td>
</tr>
<tr>
<td>Mot cur th delay [ms]</td>
<td>1431</td>
<td>0 to 65535</td>
<td>1000 to 1000</td>
</tr>
<tr>
<td>Arm resistance [Ω]</td>
<td>453</td>
<td>S to S</td>
<td>0.500 to 0.500</td>
</tr>
<tr>
<td>Arm inductance [mH]</td>
<td>454</td>
<td>S to S</td>
<td>4.00 to 4.00</td>
</tr>
<tr>
<td>E int [V]</td>
<td>587</td>
<td>-80 to +80</td>
<td>-</td>
</tr>
<tr>
<td>R&amp;L Search</td>
<td>452</td>
<td>OFF to ON</td>
<td>OFF to OFF</td>
</tr>
<tr>
<td>Zero torque</td>
<td>353</td>
<td>Active to Not active</td>
<td></td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital inputs.
** This parameter can be assigned to a programmable analog output.
The user defines the full load current of the motor via the **Full load curr** (FLC) parameter in the CONFIGURATION menu. This is at the same time the output current of the inverter when \( T \text{ current ref} = 10\% \).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T current ref</strong></td>
<td>Total current reference as a percentage of <strong>Full load curr</strong>. For this parameter the 6KDV3 ... Q4... converters need a positive value. In this case the negative references are processed and correspond to a zero reference.</td>
</tr>
<tr>
<td><strong>Mot cur threshld</strong></td>
<td>When the motor current exceeds the Full Load Current percentage threshold, this condition is signalled via a digital output.</td>
</tr>
<tr>
<td><strong>Mot cur th delay</strong></td>
<td>The <strong>Mot cur th delay</strong> parameter can be used to set the delay after which the current within limit condition is signalled..</td>
</tr>
<tr>
<td><strong>Arm resistance</strong></td>
<td>Motor armature resistance in ( \Omega ). When self-tuning cycle is performed via <strong>R&amp;L Search</strong> this parameter is set to the obtained value. Therefore, if necessary, it can be changed.</td>
</tr>
<tr>
<td><strong>Arm inductance</strong></td>
<td>Motor armature inductance in mH. When self-tuning cycle is performed via <strong>R&amp;L Search</strong> this parameter is set to the obtained value. Therefore, if necessary, it can be changed.</td>
</tr>
</tbody>
</table>
| **E int** | Auxiliary signal used to determine whether the current regulator is correctly tuned. Its value should be close to zero, but values dynamically changing between -40 and 40 are acceptable.  
The drive must have at least 30% load for this reading to be considered as a valid performance measurement (see chapter 5.3.5.1.1 for more detail setting). |
| **R&L Search** | Execution of self-tuning for the current regulator. The identified values for resistance and inductance armature are set to the **Arm resistance** and **Arm inductance** parameters. |
| **Zero torque** | The parameter can be used to set the reference value for the armature current **T current ref** to zero so that the drive has no more torque.  
Not active (H) \( T \text{ current ref} \) not set to zero  
Active (L) \( T \text{ current ref} \) set to zero. The drive has no torque. |
6.9 FLUX REGULATION

![Diagram of FLUX REGULATION](image)

**Figure 6.9.1: Motor control**

<table>
<thead>
<tr>
<th>FLUX REGULATION</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>[497] Enable flux reg</td>
<td></td>
</tr>
<tr>
<td>[469] Flux reg mode</td>
<td></td>
</tr>
<tr>
<td>[498] Enable flux weak</td>
<td></td>
</tr>
<tr>
<td>[499] Speed-0 f weak</td>
<td></td>
</tr>
<tr>
<td>[500] Flux reference [%]</td>
<td></td>
</tr>
<tr>
<td>[234] Flux current %</td>
<td></td>
</tr>
<tr>
<td>[921] Out vlt level</td>
<td></td>
</tr>
<tr>
<td>Flux \ if curve</td>
<td></td>
</tr>
<tr>
<td>[1916] I field cnst 40</td>
<td></td>
</tr>
<tr>
<td>[1917] I field cnst 70</td>
<td></td>
</tr>
<tr>
<td>[1918] I field cnst 90</td>
<td></td>
</tr>
<tr>
<td>[1919] Set flux / if</td>
<td></td>
</tr>
<tr>
<td>[1920] Reset flux / if</td>
<td></td>
</tr>
<tr>
<td>[374] Nom flux curr [A]</td>
<td></td>
</tr>
<tr>
<td>[280] Motor nom flux [A]</td>
<td></td>
</tr>
<tr>
<td>Parameter description</td>
<td>No.</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----</td>
</tr>
<tr>
<td><strong>Enable flux reg</strong></td>
<td>497</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Flux reg mode</strong></td>
<td>469</td>
</tr>
<tr>
<td>Constant current</td>
<td></td>
</tr>
<tr>
<td>External control (OFF)</td>
<td></td>
</tr>
<tr>
<td><strong>Enable flux weak</strong></td>
<td>498</td>
</tr>
<tr>
<td><strong>ON</strong> / <strong>OFF</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Speed-0 f weak</strong></td>
<td>499</td>
</tr>
<tr>
<td><strong>ON</strong> / <strong>OFF</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Flux reference [%]</strong></td>
<td>500</td>
</tr>
<tr>
<td><strong>Flux current [%]</strong></td>
<td>234</td>
</tr>
<tr>
<td><strong>Out vlt level</strong></td>
<td>921</td>
</tr>
<tr>
<td><strong>I field cnst 40</strong></td>
<td>916</td>
</tr>
<tr>
<td><strong>I field cnst 70</strong></td>
<td>917</td>
</tr>
<tr>
<td><strong>I field cnst 90</strong></td>
<td>918</td>
</tr>
<tr>
<td><strong>Set flux / if</strong></td>
<td>919</td>
</tr>
<tr>
<td><strong>Reset flux / if</strong></td>
<td>920</td>
</tr>
<tr>
<td><strong>Nom flux curr [A]</strong></td>
<td>374</td>
</tr>
<tr>
<td><strong>Motor nom flux</strong></td>
<td>280</td>
</tr>
</tbody>
</table>

* This function can be set on a programmable digital input.
** This parameter can be set on a programmable analog output.
*** This parameter can be set on a programmable analog input.

**Enable flux reg**

Enabling of the field converter

- Enabled: Field converter Enabled
- Disabled: Field converter Disabled

The field current is zero

**Flux reg mode**

Operating mode of the field converter.

- Constant current: The motor field works with a constant current. The current value corresponds to the setting of the **Motor nom flux** parameter.
  
  If any curve via the **I field cnst** parameters will be defined, this value can be changed linearly, through **Motor nom flux** (percentage of nominal flux **Motor nom flux**) (see Flux /if curve paragraph 5.4.5)

- Voltage control: The drive works with a regulation combined with torque and constant power (armature and field regulation). Via the **Max out voltage** parameter in the CONFIGURATION menu, is set the max. armature voltage.

- External control: The field is supplied through an external excitation (rectifier/field converter).

**Enable flux weak**

Command for **Voltage control**.

- Enabled: The field current corresponds to the value set via the **Flux current min** parameter.
- Disabled: The field current is regulated on the basis of the functioning mode and on the drive working setpoint.

**Speed-0 f weak**

When this function is enabled, and the speed 0 threshold is reached, it will be produced the minimum field current set via **Flux current min**.

Supposing that: **Start** = Low level and/or **Fast stop** = Low level

Set as field economy:
To avoid the overheating of motors which should not run or to avoid the presence of condensation in motor which work externally (the field will be used as anti condensation heating).

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flux reference</strong></td>
<td>Flux/current reference: the 100% corresponds to the <strong>Motor nom flux</strong> parameter. With the function Flux / if curve defined, this reference corresponds to the flux reference. With the function Flux / if curve not defined (default conditions), this reference corresponds to the field current reference.</td>
</tr>
<tr>
<td><strong>Flux curr (%)</strong></td>
<td>Field current feedback, expressed as percentage of the <strong>Motor nom flux</strong> parameter.</td>
</tr>
<tr>
<td><strong>Out vlt level</strong></td>
<td>Percentage of the maximum output voltage according to the <strong>Max out voltage</strong> parameter. This parameter allows the changing of the output voltage in “Voltage control” (FLUX REGULATION/Flux reg mode).</td>
</tr>
<tr>
<td><strong>I field cnst 40</strong></td>
<td>Current value at 40% of flux (see Flux /if curve, paragraph 5.4.5)</td>
</tr>
<tr>
<td><strong>I field cnst 70</strong></td>
<td>Current value at 70% of flux (see Flux /if curve, paragraph 5.4.5)</td>
</tr>
<tr>
<td><strong>I field cnst 90</strong></td>
<td>Current value at 90% of flux (see Flux /if curve, paragraph 5.4.5)</td>
</tr>
<tr>
<td><strong>Set flux / if</strong></td>
<td>Command for the setting of the flux curve according to the setting of <strong>I field cnst 40-70-90</strong> parameter. With the defined curve, the meaning of <strong>Flux current max/Flux reference</strong> indicates only the flux percentage according to the characteristic of this curve. As a consequence, the value of the field current will be determined by this characteristic (see Flux /if curve paragraph 5.4.5).</td>
</tr>
<tr>
<td><strong>Reset flux / if</strong></td>
<td>Command for the reset of the flux curve set via command <strong>Set flux / if</strong>. With this command the <strong>Motor nom flux</strong> parameter will be again linearly changed through <strong>Flux current max/Flux reference</strong>. (see Flux /if curve paragraph 5.4.5)</td>
</tr>
<tr>
<td><strong>Nom flux curr</strong></td>
<td>Rated current I_{FN} of the field regulator. In order to improve the behaviour of the regulation, the maximum field current can be reduced by setting the S14 dip-switches (on the regulation board, see table 2.4.3.2).</td>
</tr>
</tbody>
</table>

Example Armature: 500 VDC Field: 230 VDC 102 ADC 0.8 ADC Drive type: 6KDV3112 (Field current set to 14 Amps = default)

Set the dip switches S14 to decrease the field current from the drive supplied, as below:

<table>
<thead>
<tr>
<th>Switch ohms</th>
<th>148 ohm</th>
<th>330 ohm</th>
<th>182 ohm</th>
<th>36.4 ohm</th>
<th>845 ohm</th>
<th>1668 ohm</th>
<th>Equivalent resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nom flux curr</strong></td>
<td>S14-1</td>
<td>S14-2</td>
<td>S14-3</td>
<td>S14-4</td>
<td>S14-5</td>
<td>S14-6</td>
<td></td>
</tr>
<tr>
<td>1.0 A</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>1668 ohm</td>
</tr>
</tbody>
</table>

Set **Nom flux curr** parameter to 0.8.

**Motor nom flux** Rated field current I_{FN} of the connected motor.
# 6.10 REG PARAMETERS

## Percent values

### Speed regulator

- Speed P [%] (87)
- Speed I [%] (88)
- Speed P bypass [%] (459)
- Speed I bypass [%] (460)

### Flux regulator

- Flux P [%] (91)
- Flux I [%] (92)

### Voltage reg

- Voltage P [%] (493)
- Voltage I [%] (494)

## Base values

### Speed regulator

- Speed P base [A/rpm] (93)
- Speed I base [A/rpm·ms] (94)

### Flux regulator

- Flux P base (97)
- Flux I base (98)

### Voltage reg

- Voltage P base [%/V] (495)
- Voltage I base [%/V·ms] (496)

## In use values

- Speed P in use [%] (99)
- Speed I in use [%] (100)

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>min</th>
<th>max</th>
<th>Value Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed P [%]</td>
<td>87</td>
<td>0.00</td>
<td>100.00</td>
<td>Factory American 10.00</td>
</tr>
<tr>
<td>Speed I [%]</td>
<td>88</td>
<td>0.00</td>
<td>100.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Speed P bypass [%]</td>
<td>459</td>
<td>0.00</td>
<td>100.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Speed I bypass [%]</td>
<td>460</td>
<td>0.00</td>
<td>100.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Flux P [%]</td>
<td>91</td>
<td>0.00</td>
<td>100.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Flux I [%]</td>
<td>92</td>
<td>0.00</td>
<td>100.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Voltage P [%]</td>
<td>493</td>
<td>0.00</td>
<td>100.00</td>
<td>30.00</td>
</tr>
<tr>
<td>Voltage I [%]</td>
<td>494</td>
<td>0.00</td>
<td>100.00</td>
<td>40.00</td>
</tr>
<tr>
<td>Speed P base [A/rpm]</td>
<td>93</td>
<td>0.001</td>
<td>S</td>
<td>0.3 x P93max P93max</td>
</tr>
<tr>
<td>Speed I base [A/rpm·ms]</td>
<td>94</td>
<td>0.001</td>
<td>S</td>
<td>0.3 P94max P94max</td>
</tr>
<tr>
<td>Flux P base</td>
<td>97</td>
<td>1</td>
<td>32767</td>
<td>3277</td>
</tr>
<tr>
<td>Flux I base</td>
<td>98</td>
<td>1</td>
<td>32767</td>
<td>3277</td>
</tr>
<tr>
<td>Voltage P base [%/V]</td>
<td>495</td>
<td>0.0100</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Voltage I base [%/V·ms]</td>
<td>496</td>
<td>0.01</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Speed P in use [%]</td>
<td>99</td>
<td>0.00</td>
<td>100.00</td>
<td>S</td>
</tr>
<tr>
<td>Speed I in use [%]</td>
<td>100</td>
<td>0.00</td>
<td>100.00</td>
<td>S</td>
</tr>
</tbody>
</table>
**Speed P**
Proportional gain $K_p^*\%$ of the speed regulator expressed as a percentage of Speed P base.

**Speed I**
Integral gain $K_i^*\%$ of the speed regulator expressed as a percentage of Speed I base.

**Speed P bypass**
Proportional gain $K_p^*\%$ of the speed regulator expressed as a percentage of Speed P base, when a feedback via encoder or tachometer is changed into an armature feedback (Enable fbk bypass = Enabled).

**Speed I bypass**
Integral gain $K_i^*\%$ of the speed regulator expressed as a percentage of Speed I base, when a feedback via encoder or tachometer is changed into an armature feedback (Enable fbk bypass = Enabled).

**Fld reg P gain**
Proportional gain $K_p^*\%$ of the field current regulator expressed as percentage of Flux P base.

**Fld reg I gain**
Integral gain $K_i^*\%$ of the field current regulator expressed as a percentage of Flux I Base.

**Voltage P**
Proportional gain $K_p^*\%$ of the field voltage regulator expressed as a percentage of Voltage P base.

**Voltage I**
Integral gain $K_i^*\%$ of the field voltage regulator expressed as a percentage of Voltage I base.

**Speed P base**
Proportional gain $K_{p0}$ of the speed regulator in A/rpm (base value)

**Speed I base**
Integral gain $K_{i0}$ of the speed regulator in A/rpm·ms (base value)

**Flux P base**
Proportional gain $K_{p0}$ of the field current regulator (base value)

**Flux I Base**
Integral gain $K_{i0}$ of the field current regulator in (base value)

**Voltage P base**
Proportional gain $K_{p0}$ of the field voltage regulator in A / Vs (base value)

**Voltage I base**
Integral coefficient $K_{i0}$ of the field voltage regulator in A / V · ms (base value)

**Speed P in use**
Display of the active proportional coefficient of the speed regulator as a percentage of Speed P base.

**Speed I in use**
Display of the active derivative coefficient of the speed regulator as a percentage of Speed I base.

The maximum value for the regulator parameters is defined by the base values. The settings possible depend on the size of the device.

The user can optimize the function of the regulator by changing the percentage values (values marked with *). The resulting gains for the regulator are calculated as follows:

$$K_p = K_{p0} \cdot K_p^*/100\%$$
$$K_i = K_{i0} \cdot K_i^*/100\%$$

Example of the speed regulator:

Speed P base = 12 (= $K_{p0}$)

Speed P = 70 % (= $K_p^*$)

Proportional gain $K_p = 12 \cdot 70\% / 100\% = 8.4$

The base values ... base are also the basis for setting the adaptive speed regulator.

When the adaptive speed regulator is enabled (Enable spd adap = Enabled), the Speed P and Speed I parameters have no effect. They still retain their value and are effective again when the speed regulator adaption is disabled.

The Speed P in use and Speed I in use parameters indicate the current gains for the speed regulator. This also applies when the speed regulator adaption is active.
6.11 CONFIGURATION

6.11.1 Operating mode selection

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>Main commands</td>
<td>252</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Terminals (0) Digital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>253</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Control mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local (0) Bus (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Main commands

These commands specify from where the Enable drive, Start and Fast stop commands are to be actuated.

Termsinals

The above commands are actuated exclusively via the terminal strip.

Digital

Commands must be selected both via the terminal strip and via the digital channel (keypad or RS485 or bus, depending on the Control mode). If, for example, a stop of the drive is initiated by removing the Start command on terminal 13, both the voltage on terminal 13 and the command via the digital channel are necessary to restart the drive. This also applies to a removal of the Fast stop command. If the Stop is initiated via the digital channel, the digital command is sufficient to restart the drive.

The control method through terminal commands (Terminals) is selectable only when terminals 12 (Enable) and 13 (Start) are not supplied.

Carrying out the passage of the commands from Digital to Terminals with those terminals supplied, it will appear the message “Change input”, signalling the wrong action.

Control mode

Defines whether the digital channel is the keypad/RS485 or a bus system (Option).

Local

The digital channel is the keypad or the RS485 serial interface

Bus

The digital channel is a bus system (Option)

The following tables show the operating modes possible.
## DV-300 Adjustable Speed Drives

### Function Description

#### Main commands

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control mode</th>
<th>Actuation of:</th>
<th>Control mode selection</th>
<th>Failure reset</th>
<th>Save parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminals</td>
<td>Local</td>
<td>Terminals</td>
<td>Keypad / RS485</td>
<td>Terminals or keypad</td>
<td>Keypad / RS485</td>
</tr>
<tr>
<td>Digital</td>
<td>Local</td>
<td>Terminals and keypad/RS485</td>
<td>Keypad / RS485</td>
<td>Terminals or keypad</td>
<td>Keypad / RS485</td>
</tr>
<tr>
<td>Terminals</td>
<td>Bus</td>
<td>Terminals</td>
<td>Keypad* / RS485* or Bus</td>
<td>Terminals or keypad* or Bus</td>
<td>Keypad RS485 or Bus</td>
</tr>
<tr>
<td>Digital</td>
<td>Bus</td>
<td>Terminals and Field Bus</td>
<td>Keypad* / RS485* or Bus</td>
<td>Terminals or keypad* / RS485* or Bus</td>
<td>Keypad RS485 or Bus</td>
</tr>
</tbody>
</table>

GD6125g

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Write Access Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main commands</td>
<td>Control mode</td>
</tr>
<tr>
<td>Terminals</td>
<td>Local</td>
</tr>
<tr>
<td>Digital</td>
<td>Local</td>
</tr>
<tr>
<td>Terminals</td>
<td>Bus</td>
</tr>
<tr>
<td>Digital</td>
<td>Bus</td>
</tr>
</tbody>
</table>

GD6130g

* Access via the keypad or the RS485 serial interface is protected in this configuration by **Password level 1**

**Note!** Write access from Bus through data channel is not affected by Control Mode selection.
6.11.2 Speed base value, Full load current

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed base value [FF]</td>
<td>45</td>
<td>1</td>
<td>16383</td>
</tr>
<tr>
<td>Full load curr [A]</td>
<td>179</td>
<td>0.1</td>
<td>P465</td>
</tr>
<tr>
<td>Max out voltage [V]</td>
<td>175</td>
<td>20</td>
<td>999</td>
</tr>
</tbody>
</table>

**Speed base value**  
The Speed base value is defined by the unit specified in the factor function. It is the reference value for all speed values (reference values, adaptive speed regulation) given as a percentage, and corresponds to 100% of the speed. Changing this parameter is only possible when the drive is disabled (Enable drive = Disabled). The Speed base value does not define the maximum possible speed, which in some cases can be formed from the addition of several reference values. This is defined with Speed max amount.

**Full load curr**  
The Full load curr (FLC) parameter is defined in Amps. It corresponds to 100% of the current limit. The settings for the current limit and the overload function are based on this active current value.

**Max out voltage**  
Max armature voltage supplied from the drive. When it has been set as Flux reg mode “Voltage control”, Max out voltage corresponds to the crossover point. This parameter has an influence on the intervention threshold of the “Overvoltage” message.

6.11.3 Configuration of the OK relay (Terminals 35,36)

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ok relay funct</td>
<td>412</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Ok relay funct**  
This parameter defines the condition in which the relay contact will close.

Drive healthy  
The contact will close when the drive is supplied with voltage and when there are no failure alarms.

Ready to start  
The contact closes when the following conditions are fulfilled:  
- The drive has a voltage supply  
- There are no failure alarms present  
- The drive is enabled with Enable drive.
### 6.11.4. Configuration of the speed feedback circuit

<table>
<thead>
<tr>
<th>Parameter Description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motor max speed [rpm]</strong></td>
<td>162</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Speed fbk sel</strong></td>
<td>414</td>
<td>0</td>
<td>6553</td>
</tr>
<tr>
<td>Encoder 1 (0)</td>
<td>Encoder 2 (1)</td>
<td>Tacho (2)</td>
<td>Armature (3)</td>
</tr>
<tr>
<td><strong>Encoder 1 state</strong></td>
<td>648</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Encoder Fault (0)</td>
<td>Encoder ok (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enable fbk contr</strong></td>
<td>457</td>
<td></td>
<td>Disabled (0)</td>
</tr>
<tr>
<td>Enabled (1)</td>
<td>Disabled (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enable fbk bypas</strong></td>
<td>458</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Enabled (1)</td>
<td>Disabled (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Flux weak speed [%]</strong></td>
<td>456</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td><strong>Speed fbk error [%]</strong></td>
<td>455</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td><strong>Tacho scale</strong></td>
<td>562</td>
<td>0.90</td>
<td>3.00</td>
</tr>
<tr>
<td><strong>Speed offset</strong></td>
<td>563</td>
<td>-20.00</td>
<td>+20.00</td>
</tr>
<tr>
<td><strong>Encoder 1 pulses</strong></td>
<td>416</td>
<td>600</td>
<td>9999</td>
</tr>
<tr>
<td><strong>Encoder 2 pulses</strong></td>
<td>169</td>
<td>150</td>
<td>9999</td>
</tr>
<tr>
<td><strong>Refresh enc 1</strong></td>
<td>649</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Enabled (1)</td>
<td>Disabled (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Encoder 2 state</strong></td>
<td>651</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Encoder Fault (0)</td>
<td>Encoder ok (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Refresh enc 2</strong></td>
<td>652</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Enabled (1)</td>
<td>Disabled (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enable ind store</strong></td>
<td>911</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Enabled (1)</td>
<td>Disabled (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ind store ctrl</strong></td>
<td>912</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td><strong>Index storing</strong></td>
<td>913</td>
<td>0</td>
<td>+232-1</td>
</tr>
</tbody>
</table>

**Note!**
The encoder or the tachometer are necessary for the regulation mode Flux reg mode “Voltage control” and “External control”. The features of the electrical data of the encoder and the tachometer are defined in sections 2.7.2, “Encoder / Tachometer”, and 2.4.5, “Accuracy”.
Motor max speed
Max motor speed. It is used to convert tach and armature feedback values in rpm. In case of speed feedback from tachogenerator it is used to convert the tach voltage in an rpm value. In case of armature voltage feedback Max out voltage parameter is considered equivalent to Motor max speed.

Speed fbk sel
Select which feedback has to be used.
- Encoder 1: The sinusoidal encoder connected to the XE1 connector is used.
- Encoder 2: The digital encoder connected to the XE2 connector is used (standard).
- Tacho: The analog tachogenerator connected to the terminals + and - is used.
- Armature: The internal measurement of the armature voltage is used. No external connection is required.

Enable fbk contr
Enable of the control for the speed feedback.
- Enabled: Enabled control
- Disabled: Disabled control

This function controls the speed feedback, where a comparison between the armature voltage and the speed value read by the encoder or by the tachometer is made. When an excursion higher of the value set via Speed fbk error is signaled, the failure message “Speed fbk loss” appears. This function is automatically disabled when the armature feedback has been selected. (Speed fbk sel = Armature).
Enable fbk bypass

Enable of the automatic change into an armature feedback when the failure message “Speed fbk loss” is caused by a lack of the encoder or tachometer feedback.

<table>
<thead>
<tr>
<th>Enabled</th>
<th>Enabled automatic change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td>Disabled automatic change</td>
</tr>
</tbody>
</table>

After an automatic change into an armature feedback, the speed regulator works with the Speed P bypass and Speed I bypass parameters of the REG PARAMETERS/Percent values/Speed regulator menu. The failure message “Speed fbk loss” with an enable must be configured so that it is set as “Activity = Warning”.

Possible working only with constant field current.

Flux weak speed

Speed value as a percentage of Motor max speed, when the Voltage control phase starts. The Flux weak speed parameter, when the speed feedback control is enabled (Enable fbk contr = Enabled), is used to underline the fact that during the Voltage control phase the armature voltage and the feedback signal are not proportional. If the drive works with a constant torque on the whole regulation range (Flux reg mode = Constant Current), it is necessary to insert the factory set 100% value.

Speed fbk error

Max. allowed error expressed as a percentage of the max. output voltage (Max out voltage). By means of Max out Voltage, Flux weak speed and Motor nominal speed a relation between motor speed and armature voltage is obtained. If a difference higher than Speed fbk error occurs a Speed fbk loss failure occurs.

Tacho scale

Fine scaling of the speed feedback using a tachometer analog generator (Speed fbk sel = Tacho). It is a multiplier of the read tach voltage.

For example:

Analog tach = 60V/1000 rpm, motor top running speed 3000 rpm.

Maximum tach volts = (60V/1000 rpm*3000rpm)= 180 VDC.

- Set dip-switch S4 for 181.6V (see table 4.4.3)
- Set the tacho scale parameter = 181.6V / 180V = 1.01
- Fine adjust the value of Tacho scale if the 180 VDC tach voltage is not perfectly reached.

Speed offset

Offset scaling of the feedback circuit.

Encoder 1 pulses

Number of pulses per revolution of the sinusoidal encoder connected to the XE1 connector.

Encoder 2 pulses

Number of pulses per revolution of the digital encoder connected to the XE2 connector. The Encoder 2 pulses and Motor max speed shall be inside the allowed area shown in figure 6.11.4.2

Figure 6.11.4.2: Allowed area for Encoder 2 pulses and Motor max speed

Refresh enc 1

Enable the monitoring of the encoder 1 (connector XE1) connection status, in order to
detect a speed feedback loss alarm.
When an alarm is detect, the keypad will shown „Speed fbk loss“. **Encoder 1 state** provides the indication of encoder 1 connection status. The parameter can be programmed on a digital output. This function is activate setting **Enable fbk contr** = Enabled.

**Refresh enc 2** Enable the monitoring of the encoder 2 (connector XE2) connection status, in order to detect a speed feedback loss alarm.
When an alarm is detect, the keypad will shown „Speed fbk loss“. **Encoder 2 state** provides the indication of encoder 2 connection status. The parameter can be programmed on a digital output. This function is activate setting **Enable fbk contr** = Enabled.

**Encoder 1 state** Provides the indication of the encoder 1 (connector XE1) connection status. The parameter can be programmed on a digital output.

**Encoder 2 state** Provides the indication of the encoder 2 (connector XE2) connection status. The parameter can be programmed on a digital output.

**Note!** The **Tacho scale** and **Speed offset** parameters are used for a fine scaling of the speed feedback circuit. When the factory set parameters are loaded (**Load default**) these two parameters do not undergo any change, so that a new scaling is not necessary!

**Following parameters allows to determine the machine absolute zero and perform a positioning control:**

**Enable ind store** This parameter enables the reading of the encoder index and qualifying signal that could be used in a system for implementation of position control.

Enabled This setting enables the reading of the encoder index.
Disabled This setting disables the reading of the encoder index

**Ind store ctrl** Control register for the encoder index and qualifying signal (*).

**Index storing** Status register and function data.

(*) Index qualifier signal is not supported by regulation card R-TPD3-2G revision f (product configuration “D1”) and lower

**Ind store ctrl parameter [92]**

<table>
<thead>
<tr>
<th>No. bit</th>
<th>Name</th>
<th>Description</th>
<th>Access</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>-</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>POLNLT</td>
<td>It indicates the encoder index edge polarity:</td>
<td>R/W</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = rising edge</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 = falling edge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4-5</td>
<td>ENNQUAL</td>
<td>It indicates the qualifier level that activates the encoder index reading:</td>
<td>W</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = Switched off</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 = Switched off</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = Through signal = 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 = Through signal = 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Target Enc Num</td>
<td>It points out for which encoder the values of this parameter are reported:</td>
<td>R/W</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = operations requested on the Encoder 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 = operations requested on the Encoder 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8-9</td>
<td>ENNLT</td>
<td>Control function of the encoder index reading:</td>
<td>R/W</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = Switched off, function disabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 = Once, enables the reading of the first index signal edge only</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = Continuous, enables the reading of the index signal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

- **Tacho scale** and **Speed offset** parameters are used for a fine scaling of the speed feedback circuit.
- When the factory set parameters are loaded (**Load default**) these two parameters do not undergo any change, so that a new scaling is not necessary!
- **Following parameters allows to determine the machine absolute zero and perform a positioning control:**
- **Enable ind store** Enables the reading of the encoder index and qualifying signal.
- **Ind store ctrl** Control register for the encoder index and qualifying signal.
- **Index storing** Status register and function data.

(*) Index qualifier signal is not supported by regulation card R-TPD3-2G revision f (product configuration “D1”) and lower.
Index storing parameter [13]

<table>
<thead>
<tr>
<th>No. bit</th>
<th>Name</th>
<th>Description</th>
<th>Access (Read/Write)</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Source Enc Num</td>
<td>It indicates to which encoder the values in this register are referred to: 0 = register data are referred to the Encoder 1 1 = register data are referred to the Encoder 2</td>
<td>R</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>MP_IN</td>
<td>Actual Qualifier level value: 0 = qualifier input level is low 1 = qualifier input level is high</td>
<td>R</td>
<td>0</td>
</tr>
<tr>
<td>2-3</td>
<td>STATNL T</td>
<td>Status of the acquisition function: 0 = Switched off 1 = Once, storing is not executed yet 2 = Once, storing is already executed 3 = Continuous</td>
<td>R</td>
<td>0</td>
</tr>
<tr>
<td>16-31</td>
<td>CNTNL T</td>
<td>Position counter value corresponding to the index. 0 = Switched off Value is only valid when STANLT is equal to 2 or 3</td>
<td>R</td>
<td>0</td>
</tr>
</tbody>
</table>

6.11.5 “Standard / American” selection, Software Version

CONFIGURATION

<table>
<thead>
<tr>
<th>Drive type</th>
<th>Drive size [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[465]</td>
<td>[201] 2B + E</td>
</tr>
<tr>
<td>[464]</td>
<td>Size selection</td>
</tr>
<tr>
<td>[331]</td>
<td>Software version</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive size [A]</td>
<td>465</td>
<td>min 0 max S Factory American S Factory European -</td>
<td></td>
</tr>
<tr>
<td>2B + E</td>
<td>201</td>
<td>min 0 max 1 Factory American 0</td>
<td></td>
</tr>
<tr>
<td>Size selection</td>
<td>464</td>
<td>min 0 max 1 Factory American 0</td>
<td></td>
</tr>
<tr>
<td>Software version</td>
<td>331</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Drive type</td>
<td>300</td>
<td>min 10 max 11 Factory American S Factory European S</td>
<td></td>
</tr>
</tbody>
</table>

Drive size
Display of the converter armature current in ampere (it is codified by the SW15 Switch placed on the R-TPD32-GE. regulation card). The stated value depends on the setting of the Size selection parameter.

2B + E
Selection of the Q2 + external excitation configuration. Only for Q2 converters. The function allows the drive to work with an external 4 quadrant field controller. When the parameter is On the Ramp / Speed / T current references and Speed measurement have the same behaviour of the Q4 drive.

Size selection
With the “Standard” selection the converter produces rated current in a continuative way in the preset ambient conditions without overload (for overload see 6.14.5). With “America” selection the rated current is defined considering an overload of 1.5 times for 60 seconds. This causes a reduction of the converter rated current (continuative current) for the same type of drive. See section 4.4, R-TPD32-GE Regulation card.

Standard The converter produces rated current in a continuative way. It is stated as Drive size. No overload functions are set.
American The rated current (produced continuously) will be reduced to the value stated in the mentioned table and indicated in Full load current and Drive size parameters.

Automatically, the overload function (FUNCTION/Overload control), is set to the following:

- **Enable overload** = ON
- **Overload mode** = I2t motor
- **Overload time** = 60s
- **Pause time** = 540s
- **Overload current** = 150%
- **Base current** = 100%
- **T current lim** = 150%
- **Full load current** = American

If the size “American” is selected, the parameter **Overcurrent thr** [584] will be set at 160%.

**Note!** If the converter is reconfigured as “Standard”, these parameters and the continuous current limit take the values corresponding to the previous configuration (overload disabled) and the parameter **Overcurrent thr** [584] returns to 110%.

**Software version** Display of the software version number active in the converter.
**Drive type** Display of the drive type: Q2 or Q4.

### 6.11.6. Dimension factor, Face value factor

#### CONFIGURATION

<table>
<thead>
<tr>
<th>Dimension fact</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>[50] Dim factor num</td>
<td>Dim factor num</td>
</tr>
<tr>
<td>[51] Dim factor den</td>
<td>Dim factor den</td>
</tr>
<tr>
<td>[52] Dim factor text</td>
<td>Dim factor text</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Face value fact</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>[54] Face value num</td>
<td>Face value num</td>
</tr>
<tr>
<td>[53] Face value den</td>
<td>Face value den</td>
</tr>
</tbody>
</table>

The factor function consists of two factors - the dimension factor and the face value factor. Both factors are defined as fractions. The dimension factor is used to specify the drive speed in a dimension related to the machine concerned, e.g. kg/h or m/min. The face value factor is used to increase the resolution.

See the calculation examples given below.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dim factor num</td>
<td>50</td>
<td>1</td>
<td>65535</td>
</tr>
<tr>
<td>Dim factor den</td>
<td>51</td>
<td>1</td>
<td>+231 -1</td>
</tr>
<tr>
<td>Dim factor text</td>
<td>52</td>
<td>rpm</td>
<td>rpm</td>
</tr>
<tr>
<td>Face value num</td>
<td>54</td>
<td>1</td>
<td>+32767</td>
</tr>
<tr>
<td>Face value den</td>
<td>53</td>
<td>1</td>
<td>+32767</td>
</tr>
</tbody>
</table>

**Dim factor num** Numerator of the dimension factor
**Dim factor den** Denominator of the dimension factor
**Dim factor text** Unit of the dimension factor (5 characters). This text is shown in the keypad display for reference value entry. Possible characters: %&+-.0...9;<==>?A...Z[]a...z
Face value num       Numerator of the face value factor
Face value den       Denominator of the face value factor

The reference value given multiplied with the dimension factor and the face value factor defines the motor speed in rpm.

\[
\text{Dimension factor} = \frac{\text{output (rpm)}}{\text{input (here: m/s)}} \quad \text{for01}
\]

0.01 m corresponds to 1 revolution of the motor shaft.
0.01 m/min corresponds to 1/min.
0.01 m/60s corresponds to 1/min.

\[
\text{Dimension factor} = \frac{1}{\text{min}} \cdot \frac{60 \text{ s}}{0.01 \text{ m}} = \frac{6000}{1} \cdot \frac{1}{\text{min}} \cdot \frac{\text{m}}{1} \quad \text{for02}
\]

When calculating the dimension factor, units should not be shortened (1 min is not shortened as 60 s)

- Dim factor num: 6000
- Dim factor den: 1
- Dim factor text: m/s

**Example 2 of the calculation of the dimension factor**

The reference values for a bottling plant are given in bottles per minute. One revolution of the drive corresponds to the filling of 0.75 bottles. This corresponds to a dimension factor of 4/3. The speed limitation and the ramp function are also given in bottles per minute.

\[
\text{Dimension factor} = \frac{\text{output (rpm)}}{\text{input (here: bottles / min)}} \quad \text{for03}
\]

3/4 of a bottle corresponds to 1 revolution of the motor shaft.

\[
\text{Dimension factor} = \frac{1}{\text{min}} \cdot \frac{4 \text{ min}}{3 \text{ bottles}} = \frac{4}{3} \cdot \frac{1}{\text{min}} \cdot \frac{\text{bottles}}{\text{bottles}} \quad \text{for04}
\]

Units should not be shortened when calculating the dimension factor.
**Example of the face value factor**

Normally the reference value has a resolution of 1 rpm. In order to exploit the available resolution, the face value factor is used.

The motor speed range required is, for example, 0..1500 rpm. A more accurate resolution (i.e. 1/4 revolution) can be obtained by setting the face value factor to 1/4.

The value 4000 is entered, for example, in order to select 1000 rpm. This is then multiplied with the face value factor to give the value 1000 rpm.

**6.11.7. Programmable alarms**

<table>
<thead>
<tr>
<th>CONFIGURATION</th>
<th>Prog alarms</th>
<th>Failure supply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>[194] Latch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[195] Ok relay open</td>
</tr>
<tr>
<td></td>
<td>Undervoltage</td>
<td>[481] Undervolt thr [V]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[357] Latch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[358] Ok relay open</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[470] Hold off time [ms]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[359] Restart time [ms]</td>
</tr>
<tr>
<td></td>
<td>Overvoltage</td>
<td>[203] Activity</td>
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<td></td>
<td></td>
<td>[361] Latch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[362] Ok relay open</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[482] Hold off time [ms]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[483] Restart time [ms]</td>
</tr>
<tr>
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<td>Overspeed</td>
<td>[1426] Overspeed thr [rpm]</td>
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<tr>
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<td>[1422] Activity</td>
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<td>[1421] Latch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[1423] Ok relay open</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[1424] Hold off time [ms]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[1425] Restart time [ms]</td>
</tr>
<tr>
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<td>Heatsink</td>
<td>[368] Activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[370] Ok relay open</td>
</tr>
<tr>
<td></td>
<td>Overtemp motor</td>
<td>[365] Activity</td>
</tr>
<tr>
<td>Function</td>
<td>Index</td>
<td>Description</td>
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<tr>
<td>-----------------------</td>
<td>-------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>External fault</td>
<td>[354]</td>
<td>Activity</td>
</tr>
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<td></td>
<td>[355]</td>
<td>Latch</td>
</tr>
<tr>
<td></td>
<td>[356]</td>
<td>Ok relay open</td>
</tr>
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<td></td>
<td>[501]</td>
<td>Restart time [ms]</td>
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<tr>
<td></td>
<td>[502]</td>
<td>Hold off time [ms]</td>
</tr>
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<td>[1296]</td>
<td>Activity</td>
</tr>
<tr>
<td></td>
<td>[1297]</td>
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</tr>
<tr>
<td>Motor I2t ovrld</td>
<td>[1419]</td>
<td>Activity</td>
</tr>
<tr>
<td></td>
<td>[1420]</td>
<td>Ok relay open</td>
</tr>
<tr>
<td></td>
<td>[1442]</td>
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</tr>
<tr>
<td>Drive I2t ovrld</td>
<td>[1441]</td>
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</tr>
<tr>
<td>Overcurrent</td>
<td>[584]</td>
<td>Overcurrent thr [%]</td>
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<tr>
<td></td>
<td>[363]</td>
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<td></td>
<td>[364]</td>
<td>Ok relay open</td>
</tr>
<tr>
<td></td>
<td>[585]</td>
<td>Restart time [ms]</td>
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<tr>
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<td>[473]</td>
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<td>Field loss</td>
<td>[472]</td>
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<tr>
<td>Field loss</td>
<td>[474]</td>
<td>Restart time [ms]</td>
</tr>
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<td>[475]</td>
<td>Hold off time [ms]</td>
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<td>[1437]</td>
<td>Delta freq thres [%]</td>
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<tr>
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<td>[1433]</td>
<td>Latch</td>
</tr>
<tr>
<td></td>
<td>[1434]</td>
<td>Ok relay open</td>
</tr>
<tr>
<td></td>
<td>[1435]</td>
<td>Hold off time [ms]</td>
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<td>[1436]</td>
<td>Restart time [ms]</td>
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<td>Speed fbk loss</td>
<td>[478]</td>
<td>Activity</td>
</tr>
<tr>
<td>Speed fbk loss</td>
<td>[480]</td>
<td>Hold off time [ms]</td>
</tr>
<tr>
<td>Opt2 failure</td>
<td>[639]</td>
<td>Activity</td>
</tr>
<tr>
<td>Opt2 failure</td>
<td>[640]</td>
<td>Ok relay open</td>
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<tr>
<td>Bus loss</td>
<td>[634]</td>
<td>Activity</td>
</tr>
<tr>
<td>Bus loss</td>
<td>[635]</td>
<td>Ok relay open</td>
</tr>
<tr>
<td></td>
<td>[636]</td>
<td>Hold off time [ms]</td>
</tr>
<tr>
<td></td>
<td>[637]</td>
<td>Restart time [ms]</td>
</tr>
<tr>
<td>Hw opt1 failure</td>
<td>[638]</td>
<td>Activity</td>
</tr>
</tbody>
</table>
The converters of the DV-300 series contain extensive monitoring functions. The effect of possible alarms on the behaviour of the drive are defined in the PROG ALARMS submenu:

- Saving of alarm status
- How the drive is to react to the alarm
- Indication via the relay between terminal 35 and 36 (central alarm). The switch conditions for the relay can be defined with the Ok relay func parameter in the CONFIGURATION menu.
- Automatic restart
- Failure reset

For some alarms, the behaviour of the drive can be configured separately. All alarms can also be assigned to a freely programmable digital output.

<table>
<thead>
<tr>
<th>Alarm</th>
<th>N.</th>
<th>Factory</th>
<th>Activity</th>
<th>Latch</th>
<th>Open OK relay</th>
<th>Hold off time [ms]</th>
<th>Restart time [ms]</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure Supply</td>
<td></td>
<td>Disable drive</td>
<td>ON</td>
<td>ON</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Undervoltage</td>
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<td>Disable drive</td>
<td>ON</td>
<td>ON</td>
<td>0</td>
<td>1000</td>
<td>Dig. Outp. 7*</td>
<td></td>
</tr>
<tr>
<td>Overvoltage</td>
<td></td>
<td>Ignore</td>
<td>ON</td>
<td>ON</td>
<td>0</td>
<td>0</td>
<td>Dig. Outp. 6*</td>
<td></td>
</tr>
<tr>
<td>Overspeed</td>
<td></td>
<td>Ignore</td>
<td>ON</td>
<td>ON</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Heatsink</td>
<td></td>
<td>Disable drive</td>
<td>-</td>
<td>ON</td>
<td>-</td>
<td>-</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Overtemp motor</td>
<td></td>
<td>Disable drive</td>
<td>-</td>
<td>ON</td>
<td>-</td>
<td>-</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>External fault</td>
<td></td>
<td>Disable drive</td>
<td>ON</td>
<td>ON</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Brake fault</td>
<td></td>
<td>Disable drive</td>
<td>ON</td>
<td>ON</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Motor I²t ovrdl</td>
<td></td>
<td>Disable drive</td>
<td>ON</td>
<td>ON</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Drive I²t ovrdl</td>
<td></td>
<td>Disable drive</td>
<td>ON</td>
<td>ON</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Overcurrent</td>
<td></td>
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<td>ON</td>
<td>0</td>
<td>0</td>
<td>Dig. Outp. 8*</td>
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</tr>
<tr>
<td>Field loss</td>
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<td>Disable drive</td>
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<td>ON</td>
<td>0</td>
<td>0</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Delta frequency</td>
<td></td>
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<td>ON</td>
<td>0</td>
<td>0</td>
<td>-</td>
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</tr>
<tr>
<td>Speed fbk loss</td>
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<td>Disable drive</td>
<td>-</td>
<td>ON</td>
<td>8</td>
<td>-</td>
<td>*</td>
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</tr>
<tr>
<td>Opt 2 failure</td>
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<td>Disable drive</td>
<td>ON</td>
<td>ON</td>
<td>-</td>
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<td>Disable drive</td>
<td>ON</td>
<td>ON</td>
<td>0</td>
<td>0</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Hw Opt 1 failure</td>
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<td>Disable drive</td>
<td>-</td>
<td>ON</td>
<td>-</td>
<td>-</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Enable seq err</td>
<td></td>
<td>Disable drive</td>
<td>ON</td>
<td>ON</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital outputs.

If the serial interface or a bus system is used, the alarms can be evaluated via the Malfunction Code parameter. The parameters required to configure the alarm are shown in Table in Section 10 of the manual.
possible current. The converter is then disabled when stopped.

Not all alarms can initiate a controlled stop of the drive. The possibility of setting the particular “Activity” for individual alarms is described in the table below.

**Latch**
- **ON** The alarm is stored. The programmed actions (e.g. opening the OK relay) are enabled. This status is kept latched even if the fault condition is restored. A Reset command is required before a restart.
- **OFF** In case of alarm, the drive is disabled and the programmed functions are enabled. The alarm is not latched. When the failure is removed, the alarm is automatically reset and the device tries restarting.

**Ok relay open**
- **ON** An alarm causes the opening of the potential isolated contact between terminals 35 and 36.
- **OFF** The alarm does not cause the opening of the potential free contact of the OK relay.

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Ignore</th>
<th>Warning</th>
<th>Disable drive</th>
<th>Quick stop</th>
<th>Normal stop</th>
<th>Curr lim stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure Supply</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Undervoltage</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Overvoltage</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Overspeed</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Heatsink</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>External fault</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Brake fault</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Motor I2t ovrld</td>
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<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Drive I2t ovrld</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
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<td>Overcurrent</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Field loss</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
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<td>Speed fbk loss</td>
<td>-</td>
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<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Opt 2 failure</td>
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<td>-</td>
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<td>X</td>
<td>X</td>
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</tr>
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<td>Bus loss</td>
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<td>X</td>
<td>X</td>
<td>X</td>
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<td>X</td>
</tr>
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<td>Hw Opt 1 failure</td>
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<td>X</td>
<td>X</td>
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<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Hold off time**
Delay time between the alarm condition detection and the alarm activation. If an alarm condition occurs the alarm stay OFF for the **Hold off time**. When this time is elapsed and the alarm is still present, the alarm activates.

**Restart time**
If **Latch**=Off and the alarm condition persists even after the time defined via **Restart time**, the alarm is stored and no restart is possible (Latch=OFF).

**Note!**
In Terminal mode to reset the fault the terminals enable and start must be at zero voltage. The occurrence of a failure is indicated in the display of the keypad. If “Latch”=ON is selected, a Reset command is necessary. This can be carried out, for example, by pressing the CANCEL key on the keypad. If a second error occurs before the first one was reset, the text “Multiple failures” will appear in the display. In this case, a reset is only possible via **Failure reset** parameter in the SPEC FUNCTIONS menu. The reset can be obtained by pressing the ENT key with a disabled inverter.

**Failure supply**
Failure on the supply voltage.
It indicates a failure on the internal voltage of the regulation circuit. The message “Failure supply” occurs if an enabled converter has no voltage on the U2 and V2 terminals. If it is of a short duration and restored, a possible digital output prepared for the message is set to a Low condition. A normal reset can be carried out.
**Undervoltage**

AC Input undervoltage.

In case of an AC Input voltage when the regulation is enabled (Enable drive = Enabled) the message **Undervoltage** appears. The converter is immediately disabled. To this purpose an intervention threshold is preset via the **Undervolt thr** parameter.

If the alarm is not saved (Latch=OFF), the drive tries to start automatically after the voltage has been restored. Using the ramp, when the voltage is restored, if the function Auto capture is active, the ramp output is set to the value corresponding to the current motor speed. This avoids speed jumps.

**Overvoltage**

Armature obervoltage. Ther message appears when the armature voltage exceeds the value set via **Max out voltage** by 20%.

If the alarm is not saved (Latch = OFF), the drive will attempt to restart automatically after the voltage has been restored.

Using the ramp, when the voltage is restored, if the function Auto capture is active, the ramp output is set to the valuue corresponding to the current motor speed. This avoids speed jumps.

**Overspeed**

This alarm condition is signalled if the speed limit set in the **Overspeed thr** parameter is exceeded.

**Heatsink**

Heatsink temperature of the converter is too high.

This alarm always initiates the disconnection of the device 10 seconds after the failure has been detected (Latch=ON).

An external controller (PLC,etc.) can read the alarm via programmable output, RS485 or Bus and it can execute a controlled stop within a 10 second delay.

**Overtemp motor**

Motor temperature (connection for thermistor:terminals 78 and 79).

**External Fault**

External fault (no voltage on terminal 15)

**Brake fault**

(See chapter 6.14.8) The DC drive has not managed to establish the selected torque within the time specified by the Torque Delay parameter.

The brake feedback has not been received within the allowed time.

The brake feedback remains for 1 second after the closure order has been given to it.

**Motor I2t ovrld**

If the **Motor I2t accumulator** parameter reaches 100% the relative alarm is signalled.

**Drive I2t ovrld**

If the **Drive I2t accumulator** parameter reaches 100% the relative alarm is signalled.

**Overcurrent**

Overcurrent (short-circuit / earth fault). The intervention point is determined by the **Overcurrent thr** parameter. This can also be used as indication of threshold overpass for system applications.

**Field loss**

Too low field current. The intervention point corresponds to 50% of the min. field current set with the **Flux current min** parameter. This alarm message is active with the enabled converter (Enable drive=Enabled).

**Delta frequency**

This alarm condition is active if the frequency of the three-phase power supply to the drive exceeds the positive or negative percentage threshold set via the **Delta freq thres** parameter. The power supply frequency (50 or 60 Hz) and thus the relative thresholds are automatically calculated by the drive as soon as the three-phase power supply is available.

**Speed fbk loss**

No speed feedback available.

When Activity=Warning in the CONFIGURATION /Speed fbk menu is chosen, the **Enable fbk bypass** parameter has to be set as “Enabled”, otherwise the drive reaches an uncontrolled speed which can not be stopped.

**Opt2 failure**

Failure on the card “Option 2” (optional).

**Bus loss**

Failure in the connection on the field bus (only in connection with an option card of bus interface).

**Hw opt1 failure**

Failure on the card “Option 1” (optional).

**Enable seq err**

Wrong drive enabling sequence. The correct sequence is as follows:

Case a:  **Main commands** = Terminal

1 - Regulation board power-up: Enable terminal (term.12) in any state.
2 - Drive initialization. Max duration time: 5 s.
3 - End of drive initialization. The Enable drive terminal (12) is L (0V).
4 - Delay time during which the Enable drive terminal must be L (0V): 1s.
5 - Drive enabling. Terminal 12 is H (+24V).

If at the end of the drive initialization (step 3) or during the 1s delay time the Enable drive terminal (term. 12) is High (+24V) a fault is detected.

Figure 6.11.7.1: Drive enabling sequence: **Main command** = Terminals

**Case b:** **Main command** = Digital

1 - Regulation board power-up: Enable terminal (term.12) in any state.
2 - Drive initialization. Max duration time: 5 s.
3 - End of drive initialization.
4 - Delay time during which the Enable drive terminal must be L (0V) and *Enable drive [314]* = Disable (0): 1s. During this time the Process data channels setup initialization occurs.
5 - Drive enabling. Terminal 12 is H (+24V) and *Enable drive [314]* = Enable (1).

If at the end of the drive initialization (step 3) or during the 1s delay time the Enable drive terminal (term. 12) is High (+24V) and *Enable drive [314]* = Disable (0) a fault is detected.

Figure 6.11.7.2 Drive enabling sequence: **Main command** = Digital
In case of fault the reset sequence is as follows:

Case a:  **Latch** = ON
1 - Set Enable drive terminal (term. 12) = L (0V)
2 - Set **Enable drive [314]** = Disable (0)
3 - If **Main commands** = Terminals set Start/Stop terminal (term. 13) = L (0V)
4 - Failure reset command. The failure is reset and the drive can work normally.

Case b:  **Latch** = OFF
1 - Set Enable drive terminal (term. 12) = L (0V) and **Enable drive [314]** = Disable (0) for at least 30 ms. The failure is automatically reset.

**Note:** In case of Enable seq err alarm, the behaviour of the Ok Relay function can be affected only if OK relay funct = Drive Healthy. If OK relay funct = Ready to start, the contact will be open anyway.

### 6.11.8 Address for bus operation

#### CONFIGURATION

<table>
<thead>
<tr>
<th>Set serial comm</th>
<th>Device address</th>
<th>Ser answer delay</th>
<th>Ser protocol sel</th>
<th>Ser baudrate sel</th>
</tr>
</thead>
<tbody>
<tr>
<td>[319]</td>
<td>[408]</td>
<td>[323]</td>
<td>[326]</td>
<td></td>
</tr>
<tr>
<td>Device address</td>
<td>Ser answer delay</td>
<td>Ser protocol sel</td>
<td>Ser baudrate sel</td>
<td></td>
</tr>
<tr>
<td>319</td>
<td>0 127</td>
<td>SLINK3 (0)</td>
<td>9600 (1)</td>
<td></td>
</tr>
<tr>
<td>408</td>
<td>0 900</td>
<td>9600 (1)</td>
<td>9600 (1)</td>
<td></td>
</tr>
<tr>
<td>323</td>
<td>0 2</td>
<td>SLINK3 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>326</td>
<td>0 4</td>
<td>9600 (1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The configuration modes relating to the serial communication are defined in the submenu **Set serial comm**.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device address</td>
<td>319</td>
<td>0 127</td>
<td>0 0 -</td>
</tr>
<tr>
<td>Ser answer delay</td>
<td>408</td>
<td>0 900</td>
<td>0 0 -</td>
</tr>
<tr>
<td>Ser protocol sel</td>
<td>323</td>
<td>0 2</td>
<td>SLINK3 (0) SLINK3 (0)</td>
</tr>
<tr>
<td>Ser baudrate sel</td>
<td>326</td>
<td>0 4</td>
<td>9600 (1) 9600 (1)</td>
</tr>
</tbody>
</table>

* For SLINK3 the baud rate is steady at 9600.

**Note!** The setting of Ser protocol sel and Ser baudrate sel become active during the Drive start up: they must therefore be stored and the drive has to be switched off. See the specific manual for the numbering system of the registers and coils Di MODBUS RTV and JBUS.

**Device address** Address with the drive can be accessed if it is networked via the RS485 interface. (For connection see section 4.5. “Serial interface”).
Ser answer delay
Setting of the minimum delay between the receiving of the last byte from the converter and the beginning of its answer. This delay avoids conflicts on the serial line, in case the interface RS485 of the master is not arranged for an automatic commutation Tx/Rx.

The parameter only concerns the working with standard serial line RS485.

**Example:**
If the delay of the commutation Tx/Rx on the master is at its max. 20ms, the setting of the parameter **Ser answer delay** should be at a higher number of 20ms: 22ms.

Ser protocol sel
Serial protocol signaling procedure.

Ser baudrate sel
Baud rate selection (except for SLINK3)

### 6.11.9 Password

<table>
<thead>
<tr>
<th>CONFIGURATION</th>
<th>SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>[85] Pword 1</td>
<td>Password 2</td>
</tr>
</tbody>
</table>

Passwords are used by the operator to protect the parameters from unauthorized access.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>Pword 1</td>
<td>85</td>
<td>0</td>
<td>99999</td>
</tr>
</tbody>
</table>

**Pword 1**
Protects the parameters entered by the user from unauthorized changes. It allows the reset of failure messages (**Failure reset**) and to change on the keypad the **Control mode** even when the bus functioning system has been chosen (**Control mode**= Bus).

The password can be freely defined by the user in the form of a 5-digit combination.

Proceed as follows to activate **Pword 1**:
- Select **Pword 1** in the CONFIGURATION menu
- This indicates whether the Password is active (Enabled) or not (Disabled)
- If not, press ENTER and enter the password (see Commissioning).
- Press ENTER once more. The keypad indicates that the Password is active (Enabled).
- The password must be saved so that it is valid when the power supply is switched off and then later switched back on. —> Saving parameters

Proceed as follows to unlock the **Pword 1**:
- Select **Pword** in the CONFIGURATION menu
- The display indicates whether the password is active (Enabled) or not (Disabled)
- If yes, press ENTER and enter the password (see start-up)
- Press ENTER again. The display now indicates that the password is not active (Disabled)
- This configuration must be saved in order to keep the password switched off even after the power supply is turned off and switched back on again. —> Saving parameters
The message **Wrong password** appears if an incorrect password is entered.
If the drive shows the message **EEPROM** the password is deactivated. This takes place the first time the drive is switched on and after a possible change of the operating system.

On delivery the Service menu of the drive is protected by **Password 2**. No **Pword 1** has been entered. The user has free access to all parameters.
**Password 2** cannot be deactivated.

**Note:**
In case personal password has been forgotten, it is possible to deactivate it through the setting of the universal password.
The code of this password is: 51034
The setting mode of this one remains unchanged compared to the personal password.

### 6.12 I/O Config

**Figure 6.12.1: Arrangement of the programmable I/O**

Apart from the terminals which have fixed functions (e.g. for Enables), the converters of the DV-300 series provide the possibility of assigning freely programmable inputs/outputs to particular functions. This can either be carried out via the keypad, the serial interface or any bus connection present.

The freely programmable inputs/outputs are factory set for assignment to the most frequently required functions. However, these can be modified by the user accordingly to meet the requirements of the application at hand.

The device inputs/outputs are subdivided as follows:

- converter with integrated TBO “A”:

  3. Analog inputs (1...3), designed as differential inputs
  2. Analog outputs (1 and 2) with common reference point
  4. Digital outputs (1...4) with common reference point and common voltage supply
  4. Digital inputs (1...4) with common reference point.
When other digital inputs/outputs and/or analog outputs are required, together with the already existing ones, the TBO option card has to be used, which is inserted on the converter regulation card. A converter card can also be mounted (see figure):

```
- with TBO “B” (6KCV300TBO) option card:
```

Option “B”:
1. Analog outputs (3 and 4) with common reference point
2. Digital outputs (5 ... 8) with common reference point and common voltage supply
3. Digital inputs (5...8) with common reference point.

**Note!**
If parameters are assigned to particular terminals, the parameter value (e.g. speed reference value) can only be entered via this terminal and not via the keypad or bus.

### 6.12.1 Analog Outputs

#### I/O Config

<table>
<thead>
<tr>
<th>Analog Outputs</th>
</tr>
</thead>
</table>
| Analog output 1
| Analog output 2
| Analog output 3
| Analog output 4 |

<table>
<thead>
<tr>
<th>Parameter Description</th>
<th>No.</th>
<th>min</th>
<th>max</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select output 1</td>
<td>66</td>
<td>0</td>
<td>94</td>
<td>Actual speed (8)</td>
</tr>
<tr>
<td>Scale output 1</td>
<td>62</td>
<td>Float</td>
<td>+10.000</td>
<td>Actual speed (8)</td>
</tr>
<tr>
<td>Select output 2</td>
<td>67</td>
<td>0</td>
<td>94</td>
<td>Motor current (16)</td>
</tr>
<tr>
<td>Scale output 2</td>
<td>63</td>
<td>-10.000</td>
<td>+10000</td>
<td>Motor current (16)</td>
</tr>
<tr>
<td>Select output 3</td>
<td>68</td>
<td>0</td>
<td>94</td>
<td>Flux</td>
</tr>
<tr>
<td>Scale output 3</td>
<td>64</td>
<td>-10.000</td>
<td>+10000</td>
<td>Flux</td>
</tr>
<tr>
<td>Select output 4</td>
<td>69</td>
<td>0</td>
<td>94</td>
<td>Output voltage (20)</td>
</tr>
<tr>
<td>Scale output 4</td>
<td>65</td>
<td>-10.000</td>
<td>+10000</td>
<td>Output voltage (20)</td>
</tr>
</tbody>
</table>

* 6KCV300TBO option card (TBO “B”) has to be installed.

**Select output XX**
Selection of the parameter assigned as a variable to the corresponding analog output.

The following assignments are possible:
Scale output XX  Scaling of the analog output concerned

1) With a scaling factor of 1 the output supplies 10 V when the reference value or speed corresponds to the value defined by Speed base value.

2) With a scaling factor of 1, the analog output = 10V when the reference or current is 100%.

3) With a scaling factor of 1 the output supplies 10V when the voltage corresponds to the Volt value defined via Max out voltage.

4) With a scaling factor of 1 the output supplies 10V when the voltage reaches 10V on the analog input (with scaling factor and Tune value of the input=1). See figure 6.12.2.1.

5) With a scaling factor of 1 the output supplies 10V when the field current corresponds to Nom flux curr.

6) With a scaling factor of 1 the output supplies 10V when a Pad value corresponds to 2047.

7) With a scaling factor of 1 the output supplies 10V when the field current reference corresponds to Nom flux curr.

8) For the max. full-scale values, refer to paragraph 6.16.3 PID function

9) With a scaling factor of 1 the output is 10V when the Speed ratio = 20000.

10) With a scale factor equal to 1, the output supplies 5 volts to the rated power given by: Full load current * Max out voltage

11) output that monitors the value of the Torque proving parameter.

Figure 6.12.1.1: Option card, analog output blocks

You have at your disposal an analog display device for indicating the speed of the drive. The instrument has a measuring range of 0 ... 2 V.
This means that at maximum speed 2 V is required at the analog output of the converter. A scaling factor of 1 would supply 10 V. (Scaling factor = 2 V / 10 V = 0.200).

**Note!** Using Regen Drive (4 quadrant) the analog output supplies bipolar 10V.

### 6.12.2 Analog Inputs

<table>
<thead>
<tr>
<th>I/O CONFIG</th>
<th>Analog inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analog input 1</strong></td>
<td></td>
</tr>
<tr>
<td>[70]</td>
<td>Select input 1</td>
</tr>
<tr>
<td>[295]</td>
<td>An in 1 target</td>
</tr>
<tr>
<td>[71]</td>
<td>Input 1 type</td>
</tr>
<tr>
<td>[389]</td>
<td>Input 1 sign</td>
</tr>
<tr>
<td>[72]</td>
<td>Scale input 1</td>
</tr>
<tr>
<td>[73]</td>
<td>Tune value inp 1</td>
</tr>
<tr>
<td>[259]</td>
<td>Auto tune inp 1</td>
</tr>
<tr>
<td>[792]</td>
<td>Input 1 filter [ms]</td>
</tr>
<tr>
<td>[1042]</td>
<td>Input 1 compare</td>
</tr>
<tr>
<td>[1043]</td>
<td>Input 1 cp error</td>
</tr>
<tr>
<td>[1044]</td>
<td>Input 1 cp delay</td>
</tr>
<tr>
<td>[74]</td>
<td>Offset input 1</td>
</tr>
<tr>
<td><strong>Analog input 2</strong></td>
<td></td>
</tr>
<tr>
<td>[75]</td>
<td>Select input 2</td>
</tr>
<tr>
<td>[296]</td>
<td>An in 2 target</td>
</tr>
<tr>
<td>[76]</td>
<td>Input 2 type</td>
</tr>
<tr>
<td>[390]</td>
<td>Input 2 sign</td>
</tr>
<tr>
<td>[77]</td>
<td>Scale input 2</td>
</tr>
<tr>
<td>[78]</td>
<td>Tune value inp 2</td>
</tr>
<tr>
<td>[260]</td>
<td>Auto tune inp 2</td>
</tr>
<tr>
<td>[79]</td>
<td>Offset input 2</td>
</tr>
<tr>
<td><strong>Analog input 3</strong></td>
<td></td>
</tr>
<tr>
<td>[80]</td>
<td>Select input 3</td>
</tr>
<tr>
<td>[297]</td>
<td>An in 3 target</td>
</tr>
<tr>
<td>[81]</td>
<td>Input 3 type</td>
</tr>
<tr>
<td>[391]</td>
<td>Input 3 sign</td>
</tr>
<tr>
<td>[82]</td>
<td>Scale input 3</td>
</tr>
<tr>
<td>[83]</td>
<td>Tune value inp 3</td>
</tr>
<tr>
<td>[261]</td>
<td>Auto tune inp 3</td>
</tr>
<tr>
<td>[84]</td>
<td>Offset input 3</td>
</tr>
<tr>
<td>Parameter description</td>
<td>No.</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Select input 1</td>
<td>70</td>
</tr>
<tr>
<td>An in 1 target Assigned (0) / Not assigned (1)</td>
<td>295</td>
</tr>
<tr>
<td>Input 1 type</td>
<td>71</td>
</tr>
<tr>
<td>Input 1 sign +</td>
<td>389</td>
</tr>
<tr>
<td>Input 1 sign -</td>
<td></td>
</tr>
<tr>
<td>Scale input 1</td>
<td>72</td>
</tr>
<tr>
<td>Tune value inp 1</td>
<td>73</td>
</tr>
<tr>
<td>Auto tune inp 1</td>
<td>259</td>
</tr>
<tr>
<td>Input 1 filter [ms]</td>
<td>792</td>
</tr>
<tr>
<td>Input 1 compare</td>
<td>1042</td>
</tr>
<tr>
<td>Input 1 cp error</td>
<td>1043</td>
</tr>
<tr>
<td>Input 1 cp delay</td>
<td>1044</td>
</tr>
<tr>
<td>Input 1 cp match</td>
<td>1045</td>
</tr>
<tr>
<td>Offset input 1</td>
<td>74</td>
</tr>
<tr>
<td>Select input 2</td>
<td>75</td>
</tr>
<tr>
<td>An in 2 target Assigned (0) / Not assigned (1)</td>
<td>296</td>
</tr>
<tr>
<td>Input 2 type</td>
<td>76</td>
</tr>
<tr>
<td>Input 2 sign +</td>
<td>390</td>
</tr>
<tr>
<td>Input 2 sign -</td>
<td></td>
</tr>
<tr>
<td>Scale input 2</td>
<td>77</td>
</tr>
<tr>
<td>Tune value inp 2</td>
<td>78</td>
</tr>
<tr>
<td>Auto tune inp 2</td>
<td>260</td>
</tr>
<tr>
<td>Offset input 2</td>
<td>79</td>
</tr>
<tr>
<td>Select input 3</td>
<td>80</td>
</tr>
<tr>
<td>An in 3 target Assigned (0) / Not assigned (1)</td>
<td>297</td>
</tr>
<tr>
<td>Input 3 type</td>
<td>81</td>
</tr>
<tr>
<td>Input 3 sign +</td>
<td>391</td>
</tr>
<tr>
<td>Input 3 sign -</td>
<td></td>
</tr>
<tr>
<td>Scale input 3</td>
<td>82</td>
</tr>
<tr>
<td>Tune value inp 3</td>
<td>83</td>
</tr>
<tr>
<td>Auto tune inp 3</td>
<td>261</td>
</tr>
<tr>
<td>Offset input 3</td>
<td>84</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital inputs.
** This parameter can be assigned to one of the programmable digital outputs.
**Select input XX**

Selection of the parameter to be assigned its value via an analog input. The following assignments are possible:

<table>
<thead>
<tr>
<th>OFF</th>
<th>Jog reference 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed ref 1 1)</td>
<td>Speed ref 2 1)</td>
</tr>
<tr>
<td>Ramp ref 1 1)</td>
<td>Ramp ref 2 1)</td>
</tr>
<tr>
<td>T current ref 1 2)</td>
<td>T current ref 2 2)</td>
</tr>
<tr>
<td>Adap reference 1)</td>
<td>T current limit 2)</td>
</tr>
</tbody>
</table>

### Selection of parameter

- **OFF**: 0
- **Jog reference 1)**: 0
- **Speed ref 1 1)**: 2
- **Speed ref 2 1)**: 3
- **Ramp ref 1 1)**: 4
- **Ramp ref 2 1)**: 5
- **T current ref 1 2)**: 6
- **T current ref 2 2)**: 7
- **Adap reference 1)**: 8
- **T current limit 2)**: 9

### Description

#### An in xx target

Assign the analog input xx sampling. If **assigned**, the sampled value is copied into the parameter programmed on the analog input. If **not assigned**, the programmed parameter takes the value preset via keypad or RS485 or BUS, before to assign an analog input. Exception are the “PAD” parameters, where the last value on the analog input is stored when An in XX target = not assigned is executed.

#### Input XX type

Selection of input type (voltage or current input)

Jumpers on the regulator card of the DV-300 should be fitted or removed according to the input signal used. The inputs of the device are factory set for voltage signals.

<table>
<thead>
<tr>
<th>Analog Input</th>
<th>Input Signal</th>
</tr>
</thead>
</table>
| Analog input 1 | S9 = OFF  
S9 = ON |
| Analog input 2 | S10 = OFF  
S10 = ON |
| Analog input 3 | S11 = OFF  
S11 = ON |

### Analog Input

- **ON**: Jumper fitted
- **OFF**: Jumper not fitted
- **10 V ...+10 V**: A voltage of max ±10 V is connected to the analog input concerned. If the signal is used as a reference value, a polarity reversal can be used to reverse the rotation direction of the drive (only with 6KDV3 ... Q4 converters). The 6KDV3 ... Q2 converters accept as speed reference only positive references. Negative references are not accepted and the drive does not start.
- **0-10V, 0-20mA**: A voltage of max. 10 V or a current signal of 0...20 mA is connected to the analog input concerned. The signal must be positive. If the signal is used as a reference value for 6KDV3 ... Q4 converters, the rotation direction can be reversed via the **Input XX sign** + and **Input XX sign** - parameters.
- **4-20 mA**: A current signal of 4...20 mA is connected to the analog input concerned. The signal must be positive. If the signal is used as a reference value for 6KDV3 ... Q4 converters, the drive rotation direction can be reversed via the **Input XX sign** + and **Input XX sign** - parameters.

### Input XX sign

Selection of rotation direction when operated via the serial interface or bus for the tetraquadrant 6KDV3 ... Q4 converters.

### Input XX sign +

Selection of “Clockwise” rotation when operated via the terminal strip for the 6KDV3...4B converters, when the reference value is only given with one polarity.

- **High**: Clockwise selected
- **Low**: Clockwise not selected
Input XX sign - Selection of “Counter-clockwise” rotation when operated via the terminal strip for the 6KDV3 ... Q4 converters, when the reference value is only given with one polarity.

- High: Counterclockwise selected
- Low: Counterclockwise not selected

If both Input XX sign+ and Input XX sign- are 0 or 1 the reference value is zero.

Scale input XX Scaling of the corresponding analog input

1) With a scaling factor of 1 and a Tune value inp XX = 1, 10 V or 20 mA on the input correspond to the Speed base value.
2) With a scaling factor of 1 and a Tune value inp XX = 1, 10 V or 20 mA on the input correspond to max possible current.
3) With a scaling factor of 1, 10V or 20 mA in the input correspond to the Pad value of 2047.
4) For the max. full scale values, refer to paragraph 6.16.3 PID function
5) With a scaling factor of 1.0 and Tune value inp XX =1, 10V or 20mA correspond to Speed ratio = 20000.

Tune value inp XX Fine tuning of the input when the max. signal does not exactly correspond to the rated value. Example see below.

Auto tune inp XX Automatic fine tuning of the input. If this command is given, Tune value inp XX is automatically selected so that the input signal present corresponds to the max. variable value, such as the Speed base value. Two conditions are necessary for automatic fine tuning:

- Input voltage greater than 1 V or input current greater than 2 mA
- Positive polarity. The value found is automatically set for the other direction for the 6KDV3 ... Q4 converters.

Note: The automatically calculated value can, if necessary, be modified manually via Tune value inp XX.

Offset inp XX If the analog signal has an offset or if the variable assigned to the input already has a value although there is no input signal present, this can be compensated via the Offset inp XX.

The converter is factory set so that analog values as +10V/-10V.

With field bus operation (Option), the Input XX sign parameter specifies the sign for the rotation direction.

If a parameter is already internally assigned (e.g. if Speed ref 1 is automatically connected with the ramp output when the ramp is enabled), it will no longer appear in the list of parameters that can be assigned to an analog input.

The Input XX sign + and Input sign - parameters cannot be addressed via the serial interface.

Example 1: The speed reference value of a drive is defined with an external voltage of 5V. With this value the drive should reach the max. allowed speed (set via Speed base value). As parameter Scale input XX the scaling factor 2 is entered (10V : 5V)

Example 2: An external analog reference reaches only max. 9.8V instead of 10V. As parameter Tune value inp XX 1.020 is entered (10V : 9.8V).

The same result would have been obtained via the Auto tune inp XX function. The appropriate parameters would have to be entered in the menu of the keypad. The maximum possible analog value (in this case 9.8 V) would have to be present at the terminal with a positive polarity. The keypad will adjust the “Tune value” automatically if the ENTER key is pressed.
**Analog Input 1 window comparator**

This function allows to signal the match of a programmable value on analog input 1.

- **Input 1 compare**
  Sets the level for the comparator.

- **Input 1 cp error**
  Defines a tolerance window around **Input 1 compare**.

- **Input 1 cp delay**
  Millisecond delay during the switching from the low to the high level **Input 1 cp match**.

- **Input 1 cp match**
  Signalling output of the video comparator.

  It can be read through a Field Bus LAN or digital output.

  - **High**
    Analog input 1 value is within the comparation window.

  - **Low**
    Analog input 1 value is out the comparation window.

---

**Figure 6.12.2.1: Analog input**
**Note!** How to calculate Input 1 compare and Input 1 cp error parameters:

Input 1 compare = (Compare value) * 10000 / (Full range value)
Input 1 error = (Tolerance half window) 10000 / (Full range value)

**Example 1:**
Select analog input 1 to **Ramp ref 1**
**Speed base value** equal to 1500 [RPM]
10Volt or 20 mA on analog input 1 (Ramp ref 1=Speed base value).
The application requires a signaling at 700 [RPM] via a digital output, with a tolerance window equal to 100 [RPM]

**Input 1 cp match** assigned to a programmable digital output.
Input 1 compare = 700 * 10000 / 1500 = 4667
Input 1 cp error = 100 * 10000 / 1500 = 666

**Example 2:**
Select analog input 1 to **Ramp ref 1**
**Speed base value** equal to 1500 [RPM]
10Volt or 20 mA on Analog input 1 (Ramp ref 1=Speed base value).
The application requires a signaling at –700 [RPM] via LAN, with a tolerance window equal to ±100 [RPM]

Input 1 compare = -700 * 10000 / 1500 = -4667
Input 1 cp error = 100 * 10000 / 1500 = 666

**Example 3:**
Select analog input 1 to **Pad 0**
10Volt or 20 mA on Analog input 1 corresponds to Pad 0=2047.
The application requires a signaling at 700 [count] via a digital output, with a tolerance window equal to ±50 [count]

**Input 1 cp match** assigned to a programmable digital output.
Input 1 compare = 700 * 10000 / 2047 = 3420
Input 1 cp error = 50 * 10000 / 2047 = 244

**Example 4:**
Select analog input 1 to **PID feedback**
10Volt or 20 mA on Analog input 1 corresponds to **PID feedback**=10000.
The application requires a signaling at 4000 [count] via a digital output, with a tolerance band equal to ±1000 [count]

**Input 1 cp match** assigned to a programmable digital output.
Input 1 compare = 4000 * 10000 / 10000 = 4000
Input 1 cp error = 1000 * 10000 / 10000 = 1000
Example 5:
Select input 1 to \text{T current lim}
10 Volt or 20 mA on Analog input 1 corresponds to \text{T current lim} = 100 [\%]
The application requires a signaling at 50 [\%] via a digital output, with a tolerance band equal to \pm 2 [\%]
\text{Input 1 cp match} assigned to a programmable digital output
\text{Input 1 compare} = 50 \times 10000 / 100 = 5000
\text{Input 1 cp error} = 2 \times 10000 / 100 = 200

6.12.3 Digital Outputs

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital output 1</td>
<td>145</td>
<td>0 77</td>
<td>Ramp + (8) Ramp + (8)</td>
</tr>
<tr>
<td>Inversion out 1</td>
<td>1267</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital output 2</td>
<td>146</td>
<td>0 77</td>
<td>Ramp - (9) Ramp - (9)</td>
</tr>
<tr>
<td>Inversion out 2</td>
<td>1268</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital output 3</td>
<td>147</td>
<td>0 77</td>
<td>Spd thr. (2) Spd thr. (2)</td>
</tr>
<tr>
<td>Inversion out 3</td>
<td>1269</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital output 4</td>
<td>148</td>
<td>0 77</td>
<td>Overld avail. (6) Overld avail. (6)</td>
</tr>
<tr>
<td>Inversion out 4</td>
<td>1270</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital output 5</td>
<td>149</td>
<td>0 77</td>
<td>Curr lim. state (4) Curr lim. state (4)</td>
</tr>
<tr>
<td>Inversion out 5</td>
<td>1271</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital output 6</td>
<td>150</td>
<td>0 77</td>
<td>Over-voltage (12) Over-voltage (12)</td>
</tr>
<tr>
<td>Inversion out 6</td>
<td>1272</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital output 7</td>
<td>151</td>
<td>0 77</td>
<td>Under-voltage (11) Under-voltage (11)</td>
</tr>
<tr>
<td>Inversion out 7</td>
<td>1273</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital output 8</td>
<td>152</td>
<td>0 77</td>
<td>Over-current (14) Over-current (14)</td>
</tr>
<tr>
<td>Inversion out 8</td>
<td>1274</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Relay 2</td>
<td>629</td>
<td>0 77</td>
<td>Stop ctrl (23) Stop ctrl (23)</td>
</tr>
<tr>
<td>Inversion relay 2</td>
<td>1275</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
</tbody>
</table>
**TBO integrated (pos. “A”)**

<table>
<thead>
<tr>
<th>Digital output</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital output 1</td>
<td>Ramp +</td>
</tr>
<tr>
<td>Digital output 2</td>
<td>Ramp +</td>
</tr>
<tr>
<td>Digital output 3</td>
<td>Speed limited</td>
</tr>
<tr>
<td>Digital output 4</td>
<td>Overvoltage</td>
</tr>
</tbody>
</table>

**TBO card pos. B (option)**

<table>
<thead>
<tr>
<th>Digital output</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital output 5</td>
<td>Curr limit state</td>
</tr>
<tr>
<td>Digital output 6</td>
<td>Overvoltage</td>
</tr>
<tr>
<td>Digital output 7</td>
<td>Undervoltage</td>
</tr>
<tr>
<td>Digital output 8</td>
<td>Overtorque</td>
</tr>
</tbody>
</table>

**Drive Relay Output**

- Relay 2: Stop control
- Inversion relay 2: Inversion relay
- Pad A bit
- Pad B bit
- Virt dig input
- Torque sign
- Stop control
- Field loss
- Speed fbk loss
- Bus loss
- Hw opt1 failure
- Opt2 failure
- Encoder 1 state
- Encoder 2 state
- Enable seq err
- Diameter calc st
- Drive healthy
- Input 1 cp match
- Dia reached
- Spd match compl
- Acc state
- Dec state
- Brake comand
- Brake failure
- Drive healthy
- Motor overload preal
- Drive overload preal
- Drive overload avail
- Motor overload fail
- Drive overload fail
- Mot cur threshld
- Overspeed
- Delta Frequency
- Drv rdy to start
- BUS control mode

**Digital output XX**

Selection of the parameter that is assigned to the digital output concerned. The following assignments are possible:

<table>
<thead>
<tr>
<th>Digital output XX</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Pad A bit</td>
</tr>
<tr>
<td>Speed zero thr</td>
<td>Pad B bit</td>
</tr>
<tr>
<td>Spd threshold</td>
<td>Virt dig input</td>
</tr>
<tr>
<td>Set speed</td>
<td>Torque sign</td>
</tr>
<tr>
<td>Curr limit state</td>
<td>Stop control</td>
</tr>
<tr>
<td>Drive ready</td>
<td>Field loss</td>
</tr>
<tr>
<td>Mot ovrd avail</td>
<td>Speed fbk loss</td>
</tr>
<tr>
<td>Overload state</td>
<td>Bus loss</td>
</tr>
<tr>
<td>Ramp +</td>
<td>Hw opt1 failure</td>
</tr>
<tr>
<td>Ramp -</td>
<td>Opt2 failure</td>
</tr>
<tr>
<td>Speed limited</td>
<td>Encoder 1 state</td>
</tr>
<tr>
<td>Undervoltage</td>
<td>Encoder 2 state</td>
</tr>
<tr>
<td>Overvoltage</td>
<td>Enable seq err</td>
</tr>
<tr>
<td>Heatsink</td>
<td>Diameter calc st</td>
</tr>
<tr>
<td>Overcurrent</td>
<td>Drive healthy</td>
</tr>
<tr>
<td>Overtemp motor</td>
<td>Input 1 cp match</td>
</tr>
<tr>
<td>External fault</td>
<td>Dia reached</td>
</tr>
<tr>
<td>Failure supply</td>
<td>Spd match compl</td>
</tr>
<tr>
<td></td>
<td>Acc state</td>
</tr>
<tr>
<td></td>
<td>Dec state</td>
</tr>
<tr>
<td></td>
<td>Brake comand</td>
</tr>
<tr>
<td></td>
<td>Brake failure</td>
</tr>
<tr>
<td></td>
<td>Drive healthy</td>
</tr>
<tr>
<td></td>
<td>Motor overload preal</td>
</tr>
<tr>
<td></td>
<td>Drive overload preal</td>
</tr>
<tr>
<td></td>
<td>Drive overload avail</td>
</tr>
<tr>
<td></td>
<td>Motor overload fail</td>
</tr>
<tr>
<td></td>
<td>Drive overload fail</td>
</tr>
<tr>
<td></td>
<td>Mot cur threshld</td>
</tr>
<tr>
<td></td>
<td>Overspeed</td>
</tr>
<tr>
<td></td>
<td>Delta Frequency</td>
</tr>
<tr>
<td></td>
<td>Drv rdy to start</td>
</tr>
<tr>
<td></td>
<td>BUS control mode</td>
</tr>
</tbody>
</table>

1) Refer to paragraph 6.16.3 PID function
2) brake relay control; indicates the presence of adequate current to support the load (Torque proving) parameter.
3) brake alarm signal.
4) this signal is enabled when the thermal image of the motor Motor I2t accum = 90 % and returns to 0 when Motor I2t accum = 0.
5) this signal is enabled when the thermal image of the drive Drive I2t accum = 90 % and returns to 0 when Drive I2t accum = 0.
6) The default condition of this signal is enabled. It is disabled when Motor I2t accum = 100 % and is re-enabled when Motor I2t accum = 0.
7) The default condition of this signal is enabled. It is disabled when Drive I2t accum = 100 % and is re-enabled when Drive I2t accum = 0.
8) I2t motor overload alarm signal.
9) I2t drive overload alarm signal.
10) current threshold exceeded signal.
11) overspeed alarm signal.
12) frequency alarm signal.
13) The following drive condition is signalled, via a digital output:
    - regulator power supply present
    - no alarms present
14) The following drive condition is signalled, via a digital output:
    - power supply present
    - no alarms present
    - Enable signal present
    - three-phase network synchronisation achieved
    - excitation current present (only necessary if Field Loss alarm Activity is other than IGNORE)
15) A signal is sent via a digital output to indicate whether the drive is in a data transfer
    via fieldbus condition (Control mode = BUS).

Inversion out XX
Reverse the digital outputs signal.

Relay 2
Selection of the parameters, that are assigned to the relay contact on terminals 75 and 76 has to trip.

Note!
As for an alarm signal the following are valid:
Output = Low and open relay contact: Alarm
Output = High and closed relay contact: No alarm
See the chapters concerning the output behavior with other messages.
6.12.4 Digital Inputs

Figure 6.12.4.1: Digital inputs

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>I/O CONFIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>137</td>
<td>Digital input 1</td>
</tr>
<tr>
<td>[1276]</td>
<td>Inversion in 1</td>
</tr>
<tr>
<td>[138]</td>
<td>Digital input 2</td>
</tr>
<tr>
<td>[1277]</td>
<td>Inversion in 2</td>
</tr>
<tr>
<td>[139]</td>
<td>Digital input 3</td>
</tr>
<tr>
<td>[1278]</td>
<td>Inversion in 3</td>
</tr>
<tr>
<td>[140]</td>
<td>Digital input 4</td>
</tr>
<tr>
<td>[1279]</td>
<td>Inversion in 4</td>
</tr>
<tr>
<td>[141]</td>
<td>Digital input 5</td>
</tr>
<tr>
<td>[1280]</td>
<td>Inversion in 5</td>
</tr>
<tr>
<td>[142]</td>
<td>Digital input 6</td>
</tr>
<tr>
<td>[1281]</td>
<td>Inversion in 6</td>
</tr>
<tr>
<td>[143]</td>
<td>Digital input 7</td>
</tr>
<tr>
<td>[1282]</td>
<td>Inversion in 7</td>
</tr>
<tr>
<td>[144]</td>
<td>Digital input 8</td>
</tr>
<tr>
<td>[1283]</td>
<td>Inversion in 8</td>
</tr>
</tbody>
</table>
## DV-300 Adjustable Speed Drives

### Function Description

#### Parameter description

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital input 1</td>
<td>137</td>
<td>0 87</td>
<td>OFF (0) OFF (0)</td>
</tr>
<tr>
<td>Inversion in 1</td>
<td>1267</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital input 2</td>
<td>146</td>
<td>0 87</td>
<td>OFF (0) OFF (0)</td>
</tr>
<tr>
<td>Inversion in 2</td>
<td>1268</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital input 3</td>
<td>147</td>
<td>0 87</td>
<td>OFF (0) OFF (0)</td>
</tr>
<tr>
<td>Inversion in 3</td>
<td>1269</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Inversion in 4</td>
<td>1270</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital in 5</td>
<td>149</td>
<td>0 87</td>
<td>OFF (0) OFF (0)</td>
</tr>
<tr>
<td>Inversion in 5</td>
<td>1271</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital in 6</td>
<td>150</td>
<td>0 87</td>
<td>OFF (0) OFF (0)</td>
</tr>
<tr>
<td>Inversion in 6</td>
<td>1272</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital in 7</td>
<td>151</td>
<td>0 87</td>
<td>OFF (0) OFF (0)</td>
</tr>
<tr>
<td>Inversion in 7</td>
<td>1273</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
<tr>
<td>Digital in 8</td>
<td>152</td>
<td>0 87</td>
<td>OFF (0) OFF (0)</td>
</tr>
<tr>
<td>Inversion in 8</td>
<td>1274</td>
<td>0 1</td>
<td>Disabled (0) Disabled (0)</td>
</tr>
</tbody>
</table>

#### Digital input XX

Selection of the parameter that is addressed by the digital input concerned. The following assignments are possible:

- **OFF**
- **Motor pot reset**
- **Motor pot up**
- **Motor pot down**
- **Motor pot sign +**
- **Motor pot sign -**
- **Jog +**
- **Jog -**
- **Failure reset**
- **Torque reduct**
- **Ramp out = 0**
- **Ramp in = 0**
- **Freeze ramp**
- **Lock speed reg**
- **Lock speed I**
- **Auto capture**
- **Input 1 sign + 1)**
- **Input 1 sign - 1)**
- **Input 2 sign + 1)**
- **Input 2 sign - 1)**
- **Input 3 sign + 1)**
- **Input 3 sign - 1)**
- **Zero torque**
- **Speed sel 0 2)**
- **Speed sel 1 2)**
- **Speed sel 2 2)**
- **Ramp sel 0 3)**
- **Ramp sel 1 3)**
- **Field loss**
- **Enable flux reg**
- **Enable flux weak**
- **Pad A bit 0**
- **Pad A bit 1**
- **Pad A bit 2**
- **Pad A bit 3**
- **Pad A bit 4**
- **Pad A bit 5**
- **Pad A bit 6**
- **Pad A bit 7**
- **Forward sign**
- **Reverse sign**
- **An in 1 target**
- **An in 2 target**
- **An in 3 target**
- **Enable droop**
- **Enable PI PID 4)**
- **Enable PD PID 4)**
- **PI integral freeze 4)**
- **PID offs. Sel 4)**
- **PI central vs0 4)**
- **PI central vs1 4)**
- **Diameter calc 4)**
- **Diam reset**
- **Diam calc Dis**
- **Torque winder EN**
- **Line acc status**
- **Line dec status**
- **Line fsp status**
- **Speed match**
- **Diam inc/dec En**
- **Wind/unwind**
- **Diam preset sel0**
- **Diam preset sel1**
- **Taper enable**
- **Speed demand En**
- **Winder side**
- **Enable PI-PD PID**
- **Jog TW enable**
- **Brake bk 5)**
- **Adapt Sel 1 6)**
- **Adapt Sel 2 7)**
1) The **Input xx sign** + and **Input XX sign** - parameters can only be used in conjunction with the other parameter.

2) The **Speed sel 0**, **Speed sel 1** and **Speed sel 2** parameters can only be used together.

3) The **Ramp sel 0** and **Ramp sel 1** parameters can only be used together.

4) Refer to paragraph 6.16.3 **PID function**

5) brake relay feedback; this command is necessary in order for the brake to be released or closed without generating the alarm

6) Gains value selection with the significance 2¹

7) Gains value selection with the significance 2²

**Inversion in XX**  
Reverse the digital inputs signal.
6.12.5 Speed reference from encoder input (Tach follower function)

<table>
<thead>
<tr>
<th>I/O CONFIG</th>
<th>Encoder inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1020]</td>
<td>Select enc 1</td>
</tr>
<tr>
<td>[1021]</td>
<td>Select enc 2</td>
</tr>
<tr>
<td>[416]</td>
<td>Encoder 1 pulses</td>
</tr>
<tr>
<td>[169]</td>
<td>Encoder 2 pulses</td>
</tr>
<tr>
<td>[649]</td>
<td>Refresh enc 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select enc 1</td>
<td>1020</td>
<td>0-5</td>
<td>OFF (0)</td>
</tr>
<tr>
<td>Encoder 1 pulses</td>
<td>416</td>
<td>600-9999</td>
<td>1024</td>
</tr>
<tr>
<td>Encoder 2 pulses</td>
<td>169</td>
<td>150-9999</td>
<td>1024</td>
</tr>
<tr>
<td>Refresh enc 1</td>
<td>649</td>
<td>0-1</td>
<td>Disabled (0)</td>
</tr>
<tr>
<td>Refresh enc 2</td>
<td>652</td>
<td>0-1</td>
<td>Disabled (0)</td>
</tr>
</tbody>
</table>

This configuration allows the use of the encoder inputs, as a speed reference. Compared to an analog input, these inputs have higher resolution and higher noise immunity.

Using for this purpose the encoder input (XE1 or XE2 connector), it is necessary to define the destination, selecting properly the type of speed reference on which it has to interact (Ramp ref 1, Speed ref 1, etc.)

When the encoder input is used as a speed reference source, using the same encoder input as speed feedback is disallowed. It is impossible to configure the same speed reference to the encoder input and an analog input.
The function “Tach follower” can be used in accordance with the table below:

<table>
<thead>
<tr>
<th>Speed fbk sel [414]</th>
<th>Encoder 1 as reference</th>
<th>Encoder 2 as reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encoder 1</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>Encoder 2</td>
<td>Available</td>
<td>Not available</td>
</tr>
<tr>
<td>Tacho</td>
<td>Not available</td>
<td>Available</td>
</tr>
<tr>
<td>Armature</td>
<td>Available</td>
<td>Available</td>
</tr>
</tbody>
</table>

**Note!** It is possible to set any configuration. Follow the configuration possible in the table above.

- **Select enc 1** These parameters define which speed reference the encoder signal will reference to.
- **Select enc 2** The OFF condition indicates that the encoder connector is not used as speed reference and then it could be used as speed feedback. (CONFIGURATION/Speed fbk sel menu).

The speed reference destination choice must be done according to the speed regulator configuration (e.g. can not use Speed ref 1 with the ramp active).

- **Encoder 1 type** It defines the encoder type to the XE1 connector connected.
  - Sinusoidal Sinusoidal encoder
  - Digital Digital encoder (DES option required)
- **Encoder 1 pulses** Pulse number of the encoder to the XE1 connector connected.
- **Encoder 2 pulses** Pulse number of the encoder to the XE2 connector connected.
- **Refresh enc 1** Enables the monitoring of the encoder 1 connection status, in order to detect a speed feedback loss alarm
- **Refresh enc 2** Enables the monitoring of the digital encoder 2 connection status, in order to detect a speed feedback loss alarm

**Figure 6.12.5.2: Example of application of the encoder reference**

The Drive A speed reference is provided in this case by an external analog signal but it could be set from internal digital sources (e.g. DGF optional card or field bus).

A configuration using the encoder signal as the line speed reference, is only possible when the speed reference source is provided by an additional encoder, independent from the motor shaft.
6.13 ADDITIONAL SPEED FUNCTIONS (ADD SPEED FUNCT)

6.13.1 Auto capture

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto capture</td>
<td>388</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital inputs.

**Auto capture**

**ON** When the converter is switched on, the speed of the motor is measured and the ramp output is set accordingly. The drive then runs to the set reference value.

**OFF** When the converter is switched on, the ramp starts from zero.

Main uses:
- Connection to a motor that is already running due to its load (e.g. in the case of pumps, the flowing medium).
- Reconnection after a fault alarm.

If the speed reference value is defined via the ramp, with **Auto capture** = ON, starting at a reference value corresponding to the motor speed.

**Note!** If the function is switched off, ensure that the motor is not turning when the converter is switched on. If this is not the case, this may cause a harsh motor deceleration in current limit.

6.13.2 Adaptive spd reg

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable spd adap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select adap type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap reference [FF]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap selector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap speed 1 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap speed 2 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap joint 1 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap joint 2 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap P gain 1 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap I gain 1 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap P gain 2 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap I gain 2 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap P gain 3 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap I gain 3 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap P gain 4 [%]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adap I gain 4 [%]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The adaptive speed regulator function enables different gains of the speed regulator depending on the speed or another variable (Adaptive Reference). This allows optimum adaptation of the speed regulator to the application at hand.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable spd adap</td>
<td>181</td>
<td>0-1</td>
<td>Disabled Disabled -</td>
</tr>
<tr>
<td>Select adap type</td>
<td>182</td>
<td>0-2</td>
<td>Speed Speed -</td>
</tr>
<tr>
<td>Adap reference [FF]</td>
<td>183</td>
<td>-32768+32767</td>
<td>1000 1000 *</td>
</tr>
<tr>
<td>Adap selector</td>
<td>1464</td>
<td>0-3</td>
<td>0 0 -</td>
</tr>
<tr>
<td>Adap speed 1 [%]</td>
<td>184</td>
<td>0-200.0</td>
<td>20.3 20.3 -</td>
</tr>
<tr>
<td>Adap speed 2 [%]</td>
<td>185</td>
<td>0-200.0</td>
<td>40.7 40.7 -</td>
</tr>
<tr>
<td>Adap joint 1 [%]</td>
<td>186</td>
<td>0-200.0</td>
<td>6.1 6.1 -</td>
</tr>
<tr>
<td>Adap joint 2 [%]</td>
<td>187</td>
<td>0-200.0</td>
<td>6.1 6.1 -</td>
</tr>
<tr>
<td>Adap P gain 1 [%]</td>
<td>188</td>
<td>0.0-100.0</td>
<td>10.00 10.00 -</td>
</tr>
<tr>
<td>Adap I gain 1 [%]</td>
<td>189</td>
<td>0.0-100.0</td>
<td>1.00 1.00 -</td>
</tr>
<tr>
<td>Adap P gain 2 [%]</td>
<td>190</td>
<td>0.0-100.0</td>
<td>10.00 10.00 -</td>
</tr>
<tr>
<td>Adap I gain 2 [%]</td>
<td>191</td>
<td>0.0-100.0</td>
<td>1.00 1.00 -</td>
</tr>
<tr>
<td>Adap P gain 3 [%]</td>
<td>192</td>
<td>0.0-100.0</td>
<td>10.00 10.00 -</td>
</tr>
<tr>
<td>Adap I gain 3 [%]</td>
<td>193</td>
<td>0.0-100.0</td>
<td>1.00 1.00 -</td>
</tr>
<tr>
<td>Adap P gain 4 [%]</td>
<td>1462</td>
<td>0.0-100.0</td>
<td>10.00 10.00 -</td>
</tr>
<tr>
<td>Adap I gain 4 [%]</td>
<td>1463</td>
<td>0.0-100.0</td>
<td>1.00 1.00 -</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable analog inputs.

**Enable spd adap**
- **Enabled**: Adaptive speed regulation enabled.
- **Disabled**: Adaptive speed regulation is not enabled. The regulator operates with the parameters set in the REG PARAMETERS menu.

**Select adap type**
- **Speed**: The regulator parameters are modified according to the speed.
- **Adap reference**: The regulator parameters are modified according to the Adap reference parameter.
- **Parameter**: It allows to change the gains via parameter or via dual digital input. Only in these operating conditions are 4 sets of PI gains available.

**Adap reference**
The variable according to which the speed regulator parameters are to be modified (only with Select adap type = Adap reference).

**Adap selector**
The Adap selector parameter selects a pair of parameters: Adap P gain and Adap I gain from 1 to 4, if Sel adap type is set to Parameter. If the Adap selector parameter is programmed on digital inputs Adapt Sel 1 or Adapt Sel 2, it only indicates which pair of gains has been selected.

**Adap speed 1**
Parameter set 1 is valid below this point, and parameter set 2 above it. The transition behaviour between the values is defined by the Adap joint 1 parameter. The definition is a percentage of the Speed base value and the maximum value of Adap reference.

**Adap speed 2**
Parameter set 2 is valid below this point, and parameter set 3 above it. The transition behaviour between the values is defined by Adap joint 2. The definition is a percentage of the Speed base value and the maximum value of Adap reference.

**Adap joint 1**
 Defines a range around Adap speed 1 in which there is a linear change in gain from parameter set 1 to parameter set 2 in order to prevent jumps in the behavior of the regulator. It is defined as a percentage of Speed base value.
**Adap joint 2**
Defines a range around **Adap Speed 2** in which there is a linear change in gain from parameter set 2 to parameter set 3 in order to prevent jumps in the behavior of the regulator. It is defined as a percentage of **Speed base value**.

**Adap P gain 1**
Proportional gain for the range from zero to **Adap speed 1**. Defined as a percentage of **Speed P base**.

**Adap I gain 1**
Integral gain for the range from zero to **Adap speed 1**. Defined as a percentage of **Speed I base**.

**Adap P gain 2**
Proportional gain for the range from **Adap speed 1** to **Adap speed 2**. Defined as a percentage of **Speed P base**.

**Adap I gain 2**
Integral gain for the range from **Adap speed 1** to **Adap speed 2**. Defined as a percentage of **Speed I base**.

**Adap P gain 3**
Proportional gain for the range above **Adap speed 2**. Defined as a percentage of **Speed P base**.

**Adap I gain 3**
Integral gain for the range above **Adap speed 2**. Defined as a percentage of **Speed I base**.

**Adap P gain 4**
Proportional gain for the range above **Adap speed 3**. Defined as a percentage of **Speed P base**.

**Adap I gain 4**
Integral gain for the range above **Adap speed 3**. Defined as a percentage of **Speed I base**.

In order to activate Adaptive speed regulation, the function must be enabled with the **Enable spd adap** parameter.

Normally the gain depends on the speed of the drive. It can, however, also vary according to another variable, defined by the **Adap reference** parameter. This must be selected with the **Select adap type** parameter.

The **Adap speed 1** and **Adap speed 2** parameters are used to define the three ranges that may have different gains. A parameter set can be defined for each of these ranges, with each set containing an individually definable P and I component.

The **Adap joint 1** and **Adap joint 2** parameters ensure a smooth transition between the different parameter sets. The fields must be defined so that **Adap joint 1** and **Adap joint 2** do not overlap.

When the Adaptive speed regulation is enabled (**Enable spd adap** = Enabled) the **Speed P** and **Speed I** parameters have no effect. They still retain their value and are effective after any disabling of the adaptive speed regulation.

When the drive is not enabled, the gain of the speed regulator is determined by the zero speed logic. See section 6.7.2, “Zero speed logic”.

![Figure 6.13.2.1: Adaptive of the speed regulator](image-url)
6.13.3 Speed control

Two speed control messages are provided:
- when a particular, adjustable speed is not exceeded.
- when the speed corresponds to the set reference value

**Parameter description**

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>Spd threshold + [FF]</td>
<td>101</td>
<td>1</td>
<td>32767</td>
</tr>
<tr>
<td>Spd threshold - [FF]</td>
<td>102</td>
<td>1</td>
<td>32767</td>
</tr>
<tr>
<td>Threshold delay [ms]</td>
<td>103</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>Spd threshold</td>
<td></td>
<td>393</td>
<td>0</td>
</tr>
<tr>
<td>Speed exceeded (0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed not exceeded (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set error [FF]</td>
<td>104</td>
<td>1</td>
<td>32767</td>
</tr>
<tr>
<td>Set delay [ms]</td>
<td>105</td>
<td>1</td>
<td>65535</td>
</tr>
<tr>
<td>Set speed</td>
<td></td>
<td>394</td>
<td>0</td>
</tr>
<tr>
<td>Speed not ref. val. (0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed = ref. val. (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* This function can be assigned to a programmable digital output.

**Spd threshold +**
Switch point for the “Speed not exceeded” for clockwise rotation of the drive in the units defined by the Factor function.

**Spd threshold -**
Switch point for the “Speed not exceeded” for counter-clockwise rotation of the drive in the units defined by the Factor function.

**Threshold delay**
Setting of a delay time in milliseconds which is active when the speed is lowered within the limits of the set threshold.

**Spd threshold**
Message “Set speed not exceeded” (via a programmable digital input)
- High: Speed not exceeded
- Low: Speed exceeded

**Set error**
Defines a tolerance band around the speed reference in the units specified by the Factor function.

**Set delay**
Setting of a delay time in milliseconds which is active when the speed is lowered within the limits of the set threshold.

**Set speed**
Message “The speed corresponds to the reference value” (via a programmable digital output)
- High: Speed corresponds to the reference value
- Low: Speed does not corresponds to the reference value

The message “The speed corresponds to the reference value” refers to the total reference value in front of the Speed ref speed regulator and to the Ramp Ref ramp reference when the ramp is selected.

When the references are lower than ± 1 %, the signal is always low!
Figure 6.13.3.1: “Speed threshold” (up) and “Set speed” (down) messages
### 6.13.4 Speed zero

**ADD SPEED FUNCT**

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed zero level [FF]</td>
<td>107</td>
<td>1 – 32767</td>
<td>Factory American 10</td>
</tr>
<tr>
<td>Speed zero delay [ms]</td>
<td>108</td>
<td>0 – 65535</td>
<td>Factory European 100</td>
</tr>
<tr>
<td>Speed zero thr</td>
<td>395</td>
<td>0 – 1</td>
<td></td>
</tr>
</tbody>
</table>

* This function can be assigned to a programmable digital output.

**Speed zero level**  
Switch threshold for **Speed zero level**. The value applies to both rotation directions for the 6KDV3 ... Q4 converters. Defined by the units specified in the factor function.

**Speed zero delay**  
Definition of a delay time in milliseconds, when the zero speed is reached.

**Speed zero thr**  
"Speed zero thr" message “Drive turning" (via a programmable digital output).

- High: Drive turning
- Low: Drive not turning

The LED “Zero Speed” is lit when the drive is not turning.

*Figure 6.13.4.1: Speed zero*


6.14 FUNCTIONS

6.14.1 Motorpotentiometer

The motor potentiometer function allows the speed of the drive to be adjusted by pressing a key. The speed is then adjusted according to the defined ramp time.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable motor pot Enabled (1) / Disabled (0)</td>
<td>246</td>
<td>0 1</td>
<td>Disabled Disabled</td>
</tr>
<tr>
<td>Motor pot oper</td>
<td>247</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor pot sign Positive (1) / Negative (0)</td>
<td>248</td>
<td>0 1</td>
<td>Positive Positive</td>
</tr>
<tr>
<td>Motor pot sign +</td>
<td>-</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>Motor pot sign -</td>
<td>-</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>Motor pot reset</td>
<td>249</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Motor pot up No acceleration (0) Acceleration (1)</td>
<td>396</td>
<td>0 1</td>
<td>*</td>
</tr>
<tr>
<td>Motor pot down No deceleration (0) Deceleration (1)</td>
<td>397</td>
<td>0 1</td>
<td>*</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital inputs.
** This parameter can be assigned to a programmable analog output.

Enable motor pot
- Enabled: The motor potentiometer function is enabled. The ramp receives its reference value from the motor potentiometer function.
- Disabled: The reference value potentiometer function is disabled.

Motor pot oper
- By pressing the “+” and “-” keys of the keypad the drive can be accelerated or decelerated.
- Accelerate: +
- Decelerate: -

Motor pot sign
- This parameter is only accessible via the keypad and via the serial interface or Bus.
- When the drive is operated via the terminal strip, the parameters Motor pot sign + and Motor pot sign - must be used. As for 6KDV3 ... Q2... converters the “Positive” function must be selected.
- Positive: “Clockwise” rotation selected
- Negative: “Counterclockwise” rotation selected

Motor pot sign +
- Only for 6KDV3 ... Q4...! Selection of the “Clockwise” rotation direction when the selection is carried out via the terminal strip. The Motor pot sign + parameter is linked with the Motor pot sign - parameter via an XOR function. This means that the command (+24V) must be given only to one of the two terminals.
- High: “Clockwise” rotation direction selected
- Low: “Clockwise” rotation direction not selected
**Motor pot sign** - Only for 6KDV3 ... Q4...! Selection of the “Counter-clockwise” rotation when the changeover is carried out via the terminal strip. The **Motor pot sign** parameter is linked with the **Motor pot sign** parameter via an XOR function. This means that the command (+24V) must be given only to one of the two terminals.

High: “Counter-clockwise” rotation direction selected.
Low: “Counter-clockwise” rotation direction not selected.

**Motor pot reset.** When the Reset command is activated and the drive is switched off, the restart begins at “Zero” speed. The command is only possible with the drive switched off!

**Motor pot up** The drive is accelerated with the preselected ramp. The setting is either carried out via the terminal, serial interface or Bus.

**Motor pot down** The drive is decelerated with the preselected ramp. The setting is either carried out via the terminal, serial interface or Bus.

When the motor potentiometer function is active (**Enable motor pot**), the current speed reference value is shown in the **Motor pot** submenu of the keypad. When controlled via the keypad, the drive can be accelerated by pressing the “+” key and decelerated by pressing the “-” key. This corresponds to the commands **Motor pot up** and **Motor pot down**. Select the menu point **Motor pot oper** for this purpose.

The speed of the drive can be adjusted between 0 to 100 % by setting the command **Motor pot up**. The drive reduces the speed between 100 and 0 % by setting the command **Motor pot down**. If the command is given when the drive is already at a stop, it will not cause the reverse running of the drive.
If the **Motor pot up** and **Motor pot down** commands are given at the same time, they will not change the speed reference value. The last speed reference value is saved when the drive is switched off or if there is a fault. When the drive is restarted, it accelerates to this speed according to the ramp set. If the command **Motor pot reset** is given with the drive switched off, the speed reference value is deleted and the drive starts at zero speed. If the status of the **Motor pot sign** command is changed while the drive is running, the drive will reverse according to the specified ramp times.

When using the motor potentiometer function, the ramp must be enabled and the **Start** command must be present.

### 6.14.2 Jog function

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enable jog</strong></td>
<td>244</td>
<td>0 1</td>
<td>Disabled Disabled -</td>
</tr>
<tr>
<td><strong>Jog operation</strong></td>
<td>265</td>
<td>- -</td>
<td>- - - - - - - - - -</td>
</tr>
<tr>
<td><strong>Jog selection</strong></td>
<td>375</td>
<td>0 1</td>
<td>0 0 - - - - - - - -</td>
</tr>
<tr>
<td><strong>Jog reference [FF]</strong></td>
<td>266</td>
<td>0 32767</td>
<td>0 0 **</td>
</tr>
<tr>
<td><strong>Jog +</strong></td>
<td>398</td>
<td>0 1</td>
<td>*</td>
</tr>
<tr>
<td><strong>Jog -</strong></td>
<td>399</td>
<td>0 1</td>
<td>*</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital inputs.
** This parameter can be assigned to a programmable analog input.

- **Enable jog**: Enabled Enabled Jog function (this selection is possible only when the drive is switched off).
  - Disabled Disabled Jog function
- **Jog operation**: Pressing the “+” and “-” keys on the keypad enables the drive to be moved forward and backward. In connection with the 6KDV3 ... Q4 converters it is possible to operate the Jog function in an anti-clockwise rotation by pressing the “-” key.
  - + Jog clockwise rotation
  - - Jog counter-clockwise rotation
- **Jog reference**: Reference value for jog mode. Defined by the units, specified by the factor function.
- **Jog selection**: This parameter determines if the Jog function reference must go through the ramp or directly to the speed regulator.
  - Speed input The Jog reference is directly defined. The ramp is not active.
  - Ramp input The Jog reference is defined with a set ramp.
- **Jog +**: High Clockwise Jog function when the Jog function is enabled and the **Start** command is not present.
  - Low Disabled
- **Jog -**: High Counter-clockwise Jog function for the 6KDV3 ... Q4 when the Jog function is enabled and the **Start** command is not present.
**Note!**

The following signals are required for Jog mode in addition to the commands Jog + and Jog -:
- Enable drive
- Fast Stop
- External fault
- Low
- Disabled

The jog speed corresponds to the value which is defined by the Jog reference parameter. In this case no ramp is used.

The jog reference value can only be activated by the Jog + or Jog - command if there is no Start command active. If the Start command is given in addition to the Jog + and Jog - command, Jog mode will be aborted and the drive will react according to the Start command.

When controlled via the keypad the “+” and “-” keys can be used in the Jog function menu. (only for 6KDV3... Q4...). For this select the Jog operation menu point.

The correction value Speed ref 2 for the speed regulator is also active in jog operation.

**Note!**

If the Stop control function is activated, to enable the Jog function the Jog Stop control (FUNCTION/Stop control) must also be set to ON (1).
6.14.3 Multi speed function

The Multi speed function allows up to seven internally saved reference values to be called up via a digital signal.

Figure 6.14.3.1: Selection of different references via terminals
<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enab multi spd</td>
<td>153</td>
<td>0-1</td>
<td>Disabled - Disabled</td>
</tr>
<tr>
<td>Multi speed 1 [FF]</td>
<td>154</td>
<td>-32768 to +32767</td>
<td>0 - 0 -</td>
</tr>
<tr>
<td>Multi speed 2 [FF]</td>
<td>155</td>
<td>-32768 to +32767</td>
<td>0 - 0 -</td>
</tr>
<tr>
<td>Multi speed 3 [FF]</td>
<td>156</td>
<td>-32768 to +32767</td>
<td>0 - 0 -</td>
</tr>
<tr>
<td>Multi speed 4 [FF]</td>
<td>157</td>
<td>-32768 to +32767</td>
<td>0 - 0 -</td>
</tr>
<tr>
<td>Multi speed 5 [FF]</td>
<td>158</td>
<td>-32768 to +32767</td>
<td>0 - 0 -</td>
</tr>
<tr>
<td>Multi speed 6 [FF]</td>
<td>159</td>
<td>-32768 to +32767</td>
<td>0 - 0 -</td>
</tr>
<tr>
<td>Multi speed 7 [FF]</td>
<td>160</td>
<td>-32768 to +32767</td>
<td>0 - 0 -</td>
</tr>
<tr>
<td>Speed sel 0</td>
<td>400</td>
<td>0-1</td>
<td>Digital inp 5*</td>
</tr>
<tr>
<td>Speed sel 1</td>
<td>401</td>
<td>0-1</td>
<td>Digital inp 6*</td>
</tr>
<tr>
<td>Speed sel 2</td>
<td>402</td>
<td>0-1</td>
<td>Digital inp 7*</td>
</tr>
<tr>
<td>Multi speed sel</td>
<td>208</td>
<td>0-7</td>
<td></td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital inputs.

Enab multi spd
- **Enabled**
  - Enabled multi speed function
- **Disabled**
  - Disabled multi speed function

Multi speed 1
- Reference value 1 for enabled multi speed function. Defined by the units specified in the factor function

Multi speed 2
- Reference value 2 for enabled multi speed function. Defined by the units specified in the factor function

Multi speed 3
- Reference value 3 for enabled multi speed function. Defined by the units specified in the factor function

Multi speed 4
- Reference value 4 for enabled multi speed function. Defined by the units specified in the factor function

Multi speed 5
- Reference value 5 for enabled multi speed function. Defined by the units specified in the factor function

Multi speed 6
- Reference value 6 for enabled multi speed function. Defined by the units specified in the factor function

Multi speed 7
- Reference value 7 for enabled multi speed function. Defined by the units specified in the factor function

Speed sel 0
- Reference value selection with the significance 2^0 (=1) (Bit 0). Parameter can only be used in conjunction with Speed sel 1 and Speed sel 2.
  - **High**
    - Significance 2^0 selected
  - **Low**
    - Significance 2^0 not selected

Speed sel 1
- Reference value selection with the significance 2^1 (=2) (Bit 1). Parameter can only be used in conjunction with Speed sel 0 and Speed sel 2.
  - **High**
    - Significance 2^1 selected
  - **Low**
    - Significance 2^1 not selected

Speed sel 2
- Reference value selection with the significance 2^2 (=4) (Bit 2). Parameter can only be used in conjunction with Speed sel 0 and Speed sel 1.
  - **High**
    - Significance 2^2 selected
  - **Low**
    - Significance 2^2 not selected

Multi speed sel
- It is the word representation of the three parameters Speed sel 1 (bit0), Speed sel 2 (bit1) and Speed sel 3 (bit2). Used to change the speed selection by changing only one parameter instead of three. This allows selecting different speeds via serial line or Bus instantaneously.
The table and graph below show the interaction between the selection and the corresponding reference value.

<table>
<thead>
<tr>
<th>Speed sel 0</th>
<th>Speed sel 1</th>
<th>Speed sel 2</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0 rpm</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0 rpm</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Multi speed 1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>Multi speed 2</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Multi speed 3</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Multi speed 4</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>Multi speed 5</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Multi speed 6</td>
</tr>
</tbody>
</table>

**Table 6.14.2.1: Multi speed function**

In order to operate the Multi speed function, it must be enabled with **Enab multi spd** parameter.
The required reference value is selected with the **Speed sel 0**, **Speed sel 1** and **Speed sel 2** signals.
The selection of the reference values is carried out via the keypad or the serial interface.
The reference values are signed so that they can be defined for a particular rotation direction of the drive. As for the 6KDV3 ... Q2... the reference must have a positive polarity.

When the Multi speed function is enabled, **Multi speed 0** is defined by the addition of the reference values **Ramp ref 1** and **Ramp ref 2**.
**6.14.4 Multi ramp function**

The Multi ramp function enables up to four different ramps to be called up. The acceleration and deceleration times can also be defined here separately. The ramps are called up via digital signals.
<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enab multi rmp</td>
<td>243</td>
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<td>202</td>
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<td>3</td>
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<tr>
<td>Acc delta speed0 [FF]</td>
<td>659</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Acc delta time 0 [s]</td>
<td>660</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>S acc t const 0 [ms]</td>
<td>665</td>
<td>100</td>
<td>3000</td>
</tr>
<tr>
<td>Dec delta speed0 [FF]</td>
<td>661</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Dec delta time 0 [s]</td>
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<td>65535</td>
</tr>
<tr>
<td>S dec t const 0 [ms]</td>
<td>666</td>
<td>100</td>
<td>3000</td>
</tr>
<tr>
<td>Acc delta speed1 [FF]</td>
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<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Acc delta time 1 [s]</td>
<td>24</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>S acc t const 1 [s]</td>
<td>667</td>
<td>100</td>
<td>3000</td>
</tr>
<tr>
<td>Dec delta speed1 [FF]</td>
<td>31</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Dec delta time 1 [s]</td>
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<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>S dec t const 1 [ms]</td>
<td>668</td>
<td>100</td>
<td>3000</td>
</tr>
<tr>
<td>Acc delta speed2 [FF]</td>
<td>25</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Acc delta time 2 [s]</td>
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<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>S acc t const 2 [ms]</td>
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<tr>
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<td>65535</td>
</tr>
<tr>
<td>S dec t const 2 [ms]</td>
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<td>100</td>
<td>3000</td>
</tr>
<tr>
<td>Acc delta speed3 [FF]</td>
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<td>232-1</td>
</tr>
<tr>
<td>Acc delta time 3 [s]</td>
<td>28</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>S acc t const 3 [ms]</td>
<td>671</td>
<td>100</td>
<td>3000</td>
</tr>
<tr>
<td>Dec delta speed3 [FF]</td>
<td>35</td>
<td>0</td>
<td>232-1</td>
</tr>
<tr>
<td>Dec delta time 3 [s]</td>
<td>36</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>S dec t const 3 [ms]</td>
<td>672</td>
<td>100</td>
<td>3000</td>
</tr>
<tr>
<td>Ramp sel 0</td>
<td>403</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Ramp sel 1</td>
<td>404</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

* This function can be assigned to one of the programmable digital inputs.

**Enab multi rmp**
- **Enabled**
- **Disabled**

- **Ramp selector**
- It is the word representaton of the two parameters **Ramp sel 0** (bit0) and **Ramp sel 1** (bit1). Used to change the ramp selection by changing only one parameter instead of two. This allows to select different ramps via serial line or Bus instantaneously.

- **Acc delta speed 0**
- It defines together with **Acc delta time 0** the acceleration ramp 0. Defined by the units specified in the factor function.

- **Acc delta time 0**
- It defines together with **Acc delta speed 0** the acceleration ramp 0. Defined in seconds.

- **S acc t const 0**
- Defines the acceleration curve for S-shape ramp 0. Defined in ms.

- **Dec delta speed0**
- It defines together with **Dec delta time 0** the deceleration ramp 0. Defined by the units specified in the factor function.

- **Dec delta time 0**
- It defines together with **Dec delta speed 0** the deceleration ramp 0. Defined in seconds.

- **S dec t const 0**
- Defines the deceleration curve for **S-shape ramp 0**. Defined in ms.

- **Acc delta speed1**
- It defines together with **Acc delta time 1** the acceleration ramp 1. Defined by the units specified in the factor function.
Acc delta time 1
It defines together with Acc delta speed 1 the acceleration ramp 1. Defined in seconds.

S acc t const 1
Defines the acceleration curve for S-shape ramp 1. Defined in ms.

Dec delta speed1
It defines together with Dec delta time 1 the deceleration ramp 1. Defined by the units specified in the factor function.

Dec delta time 1
It defines together with Dec delta speed 1 the deceleration ramp 1. Defined in seconds.

S dec t const 1
Defines the deceleration curve for S-shape ramp 1. Defined in ms.

Acc delta speed2
It defines together with Acc delta time 2 the acceleration ramp 2. Defined by the units specified in the factor function.

Acc delta time 2
It defines together with Acc delta speed 2 the acceleration ramp 2. Defined in seconds.

S acc t const 2
Defines the acceleration curve for S-shape ramp 2. Defined in ms.

Dec delta speed2
It defines together with Dec delta time 2 the deceleration ramp 2. Defined by the units specified in the factor function.

Dec delta time 2
It defines together with Dec delta speed 2 the deceleration ramp 2. Defined in seconds.

S dec t const 2
Defines the deceleration curve for S-shape ramp 2. Defined in ms.

Acc delta speed3
It defines together with Acc delta time 3 the acceleration ramp 3. Defined by the units specified in the factor function.

Acc delta time 3
It defines together with Acc delta speed 3 the acceleration ramp 3. Defined in seconds.

S acc t const 3
Defines the acceleration curve for S-shape ramp 3. Defined in ms.

Dec delta speed3
It defines together with Dec delta time 3 the deceleration ramp 3. Defined by the units specified in the factor function.

Dec delta time 3
It defines together with Dec delta speed 3 the deceleration ramp 3. Defined in seconds.

S dec t const 3
Defines the deceleration curve for S-shape ramp 3. Defined in ms.

Ramp sel 0
Ramp selection with the significance \(2^0\) (Bit 0). Parameter can only be used in conjunction with Ramp sel 1.

- **High**: Significance \(2^0\) selected
- **Low**: Significance \(2^0\) not selected

Ramp sel 1
Ramp selection with the significance \(2^1\) (Bit 1). Parameter can only be used in conjunction with Ramp sel 0.

- **High**: Significance \(2^1\) selected
- **Low**: Significance \(2^1\) not selected

See in the following table and graph the interaction between the selection and the ramp

<table>
<thead>
<tr>
<th>Ramp sel 0</th>
<th>Ramp sel 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp 0</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Ramp 1</td>
<td>High</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Ramp 2</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Ramp 3</td>
<td>High</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

*Table 6.14.4.1: Ramp selection*

In order to activate the **Multiramp function**, it must be enabled with the **Enab multi rmp** parameter.

The ramp required is selected via the **Ramp sel 0** and **Ramp sel 1** signals. When the selection is made via the terminal strip, it is possible to select only one digital input. This configuration enables only the ramp time selected. Another ramp can be selected at any time. If this happens during an acceleration or deceleration phase, the reference value will then follow the new ramp. The ramp parameter are defined via the keypad or serial line.
DV-300 Adjustable Speed Drives

——— FUNCTION DESCRIPTION ———

Figure 6.14.4.1: Multi ramp selection via terminals

Figure 6.14.4.2: Multi ramp selection via signals
6.14.5 Speed Draw function

**FUNCTIONS**

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>Speed ratio</td>
<td>1017</td>
<td>0</td>
<td>+32767</td>
</tr>
<tr>
<td>Speed draw out (d)</td>
<td>1018</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Speed draw out (%)</td>
<td>1019</td>
<td>-200.0</td>
<td>+200.0</td>
</tr>
</tbody>
</table>

This function allows a configurable **Speed ratio** to be applied to the main reference **Speed ref 1**. The Speed ratio range can be set between 0 and 32767 if written in digital form. It can be set from 0 to 20000 (0 to +10V) if assigned via an analog input.

This function is useful in a multidrive system where between the motors is required (see example in figure 6.14.5.2).

The speed resulting value can be read through the **Spd draw out** parameter via an analog output.

**Speed ratio**
- This parameter determines the speed ratio value. This setting can be done in digital form, via LAN or through an analog input.

**Spd draw out (d)**
- Speed value in the unit specified by the factor function.

**Spd draw out (%)**
- Speed value as a percentage of **Speed base value**.
EXAMPLE (RUBBER CALENDER)

Example Setting:

**DRIVE A** (master)
Set Analog input 1 = Ramp ref 1

**DRIVE B**
Line speed ratio 1 = Line speed + 5%
Set Analog input 1 = Ramp ref 1
Set Analog input 2 = Speed ratio
Set Speed ratio parameter = 10500

**DRIVE C**
Line speed ratio 2 = Line speed + 10%
Set Analog input 1 = Ramp ref 1
Set Analog input 2 = Speed ratio
Set Speed ratio parameter = 11000

---

**Figure 6.14.5.2: Rubber calender example**
6.14.6 Overload control

The Overload control function allows an overcurrent for a limited time that can also exceed the rated current of the inverter. It is used in order to provide the drive with an increased acceleration torque or for example to allow peak loads, such as with cyclical loads characteristics.

**Enable overload**
- Enabled: Overload control is enabled
- Disabled: Overload control is disabled

**Overload mode**
- Curr limited: The armature current is restricted to the limits set by the Overload control (size and duration of overcurrent).
- Curr not limited: The armature current is not limited by the Overload control. However, an alarm is possible via the Overload state parameter. This alarm indicates whether the current is within the set limits or not.

**I2t Motor**
- If Motor I2t ovrld is set to Activity = Ignore, the current is reduced from Overload current parameter value to Base current parameter value when Motor I2t accum =
100% (Overload current\(^2\) x Overload time)

- If **Motor I2t ovrld** is set to **Activity = Warning**, the current is maintained at **Overload current** parameter value also when **Motor I2t accum** = 100% (Overload current\(^2\) x Overload time)

**Note!**  **Motor I2t accum** is equal to 100% if (Overload current\(^2\) x Overload time) is reached but in any case the limit maximum is [(150% FLC)\(^2\) x 60 sec]

### I2t Drive

The current is limited to **T current lim (\(+/-\)** value until **Drive I2t accum** = 100% i.e. equal to [(150% Derated Drive Current\(^*)\(^2\) x 60 sec]. When this value is reached, the drive is disabled.

### I2t Motor & Drv

The current is limited to **T current lim (\(+/-\)** value until reaching **Drive I2t accum** = 100% [(150% Derated Drive Current\(^*)\(^2\) x 60 sec] if **Motor I2t ovrld** Activity is set to Warning & Ignore or, If set to Disable drive until reaching **Motor I2t accum** = 100% (Overload current\(^2\) x Overload time).

\(^*\)Derated Drive Current:

If using the drive with **Standard sizes** (Size selection = Standard) the Derated Drive Current is calculated as follows:

- Derated Drive Current = Drive size x Derating_fact (see table below)

If using the drive with **American sizes** (Size selection = **American**) the Derated Drive Current is calculated as follows:

- Derated Drive Current = Drive size.

The motor overload function is designed to allow the current selected with **Overload Current** for a time equal to **Overload Time**.

\((I_{load}^2 - I_{ovld}^2)^{ts[sec]} = ((Over Curr / 100)^2 - 1^2)\times I_{Flc}^2 \times (Overload time)\)

\(I_{F} = \) full load current

The motor overload function gives the possibility to have 1.5 the **Overload current** for 60 sec. If the threshold is higher than the value is limited to:

\((I_{load}^2 - I_{F}^2)^{ts[sec]} = (1.5^2 - 1^2)\times I_{F}^2 \times 60\)

The **Motor ovrld preal.** is available on digital output (code 65), it is 1 with **Motor I2t accum** = 90 % and 0 when **Motor I2t accum** = 0.

The **Overld available** signal is available on digital output (code 6), it is 0 with **Motor I2t accum** = 100 % and 1 with **Motor I2t accum** = 0.

The **Drive ovrld preal.** is available on digital output (code 66), it is 1 with **Drive I2t accum** = 90 % and 0 when **Drive I2t accum** = 0.

The **Overld available** signal is available on digital output (code 67), it is 0 with **Drive I2t accum** = 100 % and 1 with **Drive I2t accum** = 0.
**Table 6.14.6.1: I2t derating**

<table>
<thead>
<tr>
<th>American sizes (Q2/Q4)</th>
<th>European sizes (Q2/Q4)</th>
<th>Derating_fct</th>
<th>American sizes (Q2)</th>
<th>European sizes (Q2)</th>
<th>Derating_fct</th>
<th>American sizes (Q4)</th>
<th>European sizes (Q4)</th>
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<td>6KDV3100H02... 6KDV3100H02...</td>
<td>0.80</td>
<td>6KDV313000Q4... 6KDV315000Q4...</td>
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<td></td>
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<td>6KDV310000Q3... 6KDV315000Q2...</td>
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<td>0.8</td>
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<td>6KDV315000Q4... 6KDV320000Q4...</td>
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<td>6KDV337000Q2... 6KDV345000Q2...</td>
<td>0.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6KDV3560... 6KDV3770...</td>
<td>6KDV345000Q2... 6KDV365000Q2...</td>
<td>0.8</td>
<td>6KDV345000Q2... 6KDV365000Q2...</td>
<td>0.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Overload current**  Armature current that is permissible during the overload time (set with **Overload time**). It is always 200% as a maximum of the active current at **Full load curr** and therefore proportional to the torque.

**Base current**  Armature current that is permissible during the pause time (set with **Pause time**). The percentage refers to the active current at **Full load curr**.

**Overload time**  Maximum time in which the **Overload current** is permissible.

**Pause time**  Minimum time between two Overload cycles. During this time the **Base current** is permissible.

**Motor I2t accum**  It gives a percentage definition of the integration of the rms current. 100% = trip level motor I2t. **Motor I2t accum** is equal to 100% if \((\text{Overload current})^2 \times \text{Overload time}\) is reached but in any case with a maximum limit of \([(150\% \text{ FLCC})^2 \times 60 \text{ sec}]\).

**Motor ovrld preal.**  This signal can be set on a digital output (code 65). It goes to the high level (1) when **Motor I2t accum** = 90 %. It goes to low level (0) when **Motor I2t accum** = 0.

**Drive I2t accum**  It gives a percentage definition of the integration of the rms current. 100% = trip level drive I2t. **Drive I2t accum** is equal to 100% if \([(150\% \text{ Derated Drive Current(*))}^2 \times 60 \text{ sec}]\) is reached.

**Drive ovrld preal.**  This signal can be set on a digital output (code 66). It goes to the high level (1) when **Drive I2t accum** = 90 %. It goes to low level (0) when **Drive I2t accum** = 0.

**Overld available**  Indicates whether an overload is possible this very instant or whether this is not yet the case, due to the set cycle (**Pause time** not yet expired).

- **High**  Overload possible
- **Low**  Overload currently not possible

**Overload state**  If the **Overload mode** parameter is defined so that the current is not limited by the Overload control, the **Overload state** can be used to determine whether the current is within the set limits or not.

- **High**  Current exceeds the set limits
- **Low**  Current does not exceed the set limits

**Note!**  Overload state is not a latched output. For I2t, it is can be considered as a one shot.

The Overload control is enabled with the **Enable overload** parameter. It can be used to protect the drive or motor...
from thermal overloads with cyclical loads.
The max. possible values (as for the converter) are obtainable through the following curves. The operating point must always be below the corresponding curve. At the verification it is to state, that the torque and the current are proportional.

The **Overload available** parameter allows to understand if the drive is ready to supply an overload current. If the current exceeds the value defined by the **Base current** parameter, the time set by the **Overload time** parameter starts to run. Once this time has expired, the current is limited again to the Base current. This takes place irrespective of how high the overload was and how long it lasted. A subsequent overload is permissible immediately after the time set by the **Pause time** parameter. If **Overload mode** is set to “Curr not limited”, The current is not limited but the **Overload state** parameter indicates whether it is out of the defined range.

**Caution!**

A wrong input of the values may cause the destruction of the device!

---

**Figure 6.14.6.1:** Overload control (Overload mode = curr limited)

**Figure 6.14.6.2:** Overload control (Overload mode = curr not limited)
(American size)

\[ I_{dAN} = 17 \, \text{A} \]

\[ I_{dAN} = 35 \, \text{A} \]
Base current = 50% \( I \)

Base current = 75% \( I \)

Base current = 100% \( I \)

\[ I_{dAN} = 56 \text{ A} \]
(American size) 

\[ I_{dAN} = 88 \, A \]

![Graphs showing overload time and current for different base currents.]
DV-300 Adjustable Speed Drives

(American size)

\[ I_{Dan} = 112 \text{ A} \]

- Base current = 00 \% \( I_{Dan} \)
- Base current = 25 \% \( I_{Dan} \)
- Base current = 50 \% \( I_{Dan} \)
- Base current = 75 \% \( I_{Dan} \)
- Base current = 100 \% \( I_{Dan} \)
(American size)

\[ I_{\text{SAN}} = 148 \, \text{A} \]

<table>
<thead>
<tr>
<th>Base current</th>
<th>Overload current</th>
<th>Overload time</th>
<th>Pause time + Overload time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% I</td>
<td></td>
<td>30 s</td>
<td></td>
</tr>
<tr>
<td>25% I</td>
<td></td>
<td>1 s</td>
<td></td>
</tr>
<tr>
<td>50% I</td>
<td></td>
<td>30 s</td>
<td></td>
</tr>
<tr>
<td>75% I</td>
<td></td>
<td>1 s</td>
<td></td>
</tr>
<tr>
<td>100% I</td>
<td></td>
<td>60 s</td>
<td></td>
</tr>
</tbody>
</table>

\[ I = 148 \, \text{A} \]
I_{\text{AN}} = 224 \, \text{A}

(American size)
(American size)

\[ I_{_{\text{SAN}}} = 280 \text{ A} \]
(American size) $I_{\text{AN}} = 336 \, A$

**Graphs showing overload current for different base currents:**

- **Base current = 0% $I_{\text{AN}}$**
- **Base current = 25% $I_{\text{AN}}$**
- **Base current = 50% $I_{\text{AN}}$**
- **Base current = 75% $I_{\text{AN}}$**
- **Base current = 100% $I_{\text{AN}}$**

The graphs illustrate the overload current as a function of the overload time, indicating the maximum safe overload for the DV-300 Adjustable Speed Drives under specified conditions.


(American size)

\[ I_{dAN} = 400 \text{ A} \]

Base current = 00 \% \( I_{dAN} \)

Base current = 25 \% \( I_{dAN} \)

Base current = 50 \% \( I_{dAN} \)

Base current = 75 \% \( I_{dAN} \)

Base current = 100 \% \( I_{dAN} \)

Overload time / (Pause time + Overload time)

Overload current / \( I \)

Overload current / \( I \)

Overload current / \( I \)

Overload current / \( I \)
(American size) $I_{\text{AN}} = 450 \text{ A}$
(American size)

\[ I_{\text{SAN}} = 560 \, \text{A} \]

Overload time / (Pause time + Overload time)
(American size)  \( I_{\text{AN}} = 850 \text{ A} \)

- **Base current = 00 % \( I_{\text{AN}} \)**
  -  Overload time
  -  1 s
  -  30 s
  -  60 s

- **Base current = 25 % \( I_{\text{AN}} \)**
  -  Overload time
  -  30 s
  -  1 s

- **Base current = 50 % \( I_{\text{AN}} \)**
  -  Overload time
  -  30 s
  -  1 s

- **Base current = 75 % \( I_{\text{AN}} \)**
  -  Overload time
  -  60 s

- **Base current = 100 % \( I_{\text{AN}} \)**
  -  Overload time
  -  60 s
  -  1 s
(European size)

$I_{\text{dAN}} = 20 \ldots 70 \text{ A}$
(European size)

\[ I_{dan} = 110 \ldots 185 \text{ A} \]
(European size)

\[ I_{\text{GAN}} = 280 \ldots 650 \, \text{A} \]
Example

Motor

P = 30 kW, Armature volts = 420 V, Armature current = 82 A

Loadcycle

The motor is overloaded for 1 s at 180% of the rated current, then it works at the rated load for at least 5 s. Four quadrant converter.

Procedure

At first select the dc current according to the motor rated current. Usually it is the motor rated current. If the determined motor operating point is not below the Overload curve of the converter, the calculation should be repeated with the next larger converter size.

Converter

6KDV3110Q4E14AI
Diagram

\[
\frac{\text{Base current}}{I_{\text{AN}}} = \frac{82 \text{ A}}{110 \text{ A}} = 0.75
\]

This means that the diagram for the converters 110 A ... 185 A with a Base current = 75 % has to be considered for the calculation.

**Operating point**

Basis: rated data of the converter

\[
\text{Overload current} = 82 A \times 1.8 = 147.6 A
\]

\[
\text{Overload factor} = \frac{\text{Overload current}}{I_{\text{AN}} \text{ (of converter)}} = \frac{147.6 \text{ A}}{110 \text{ A}} = 1.34
\]

\[
\text{Overload time} = \frac{1s}{5s + 1s} = 0.16
\]

![Diagram showing operating point](image)

*Figure 6.14.6.3: Example- Operating point of drive*

The calculated operating point is below the corresponding curve for an overload time of 1 s. Therefore the converter is suitable for the application. The following two settings are possible:

<table>
<thead>
<tr>
<th>Full load curr</th>
<th>82 A</th>
<th>or</th>
<th>110 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable overload</td>
<td>Enabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overload current</td>
<td>180 %</td>
<td>or</td>
<td>134 %</td>
</tr>
<tr>
<td>Base current</td>
<td>100 %</td>
<td>or</td>
<td>75 %</td>
</tr>
<tr>
<td>Overload time</td>
<td>1 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pause time</td>
<td>5 s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note!** The percentages for **Overload current** and **Base current** are referred to **Full load curr** and not to the converter rated current!
## 6.14.7 Stop control

### FUNCTIONS

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop control</td>
<td></td>
</tr>
<tr>
<td>626</td>
<td>Stop mode</td>
</tr>
<tr>
<td>627</td>
<td>Spd 0 trip delay [ms]</td>
</tr>
<tr>
<td>628</td>
<td>Trip cont delay [ms]</td>
</tr>
<tr>
<td>630</td>
<td>Jog stop control</td>
</tr>
</tbody>
</table>

This function is intended to help the system engineer to coordinate the AC input contactor with the drive enabling. According to the selected mode the terminals 75 and 76 drive the ON/OFF of the AC input contactor.

Basically, when the drive receives the Start command the Relay 2 closes the AC input contactor, the drive waits for a certain time the AC input voltage, synchronizes itself and starts the motor. When the drive stops, the motor goes to zero speed. When the zero speed is reached, the drive is disabled only when a “Spd 0 trip” delay is elapsed. Then after the “Trip cont delay” the Relay 2 opens to remove the supply from the drive.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop mode</td>
<td>626</td>
<td>0 – 3</td>
<td>Factory American: Stop &amp; Speed 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OFF (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stop &amp; speed 0 (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fast stp &amp; spd 0 (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fst / stp &amp; spd 0 (3)</td>
</tr>
<tr>
<td>Spd 0 trip delay [ms]</td>
<td>627</td>
<td>0 – 40000</td>
<td>0</td>
</tr>
<tr>
<td>Trip cont delay [ms]</td>
<td>628</td>
<td>0 – 40000</td>
<td>0</td>
</tr>
<tr>
<td>Jog stop control</td>
<td>630</td>
<td>0 – 1</td>
<td>OFF</td>
</tr>
</tbody>
</table>

### Figure 6.14.7.1: Start and stop management
**Stop mode**

OFF  The function is disabled.

Stop & Speed 0  The Start command determines the behavior. If the Start command is not present (digital or via terminal strip) and the drive is stopped, the converter is blocked and the contact is open. When the Start command is given, the converter is enabled and the contact is closed. Disabling the Start command and after reaching zero speed, the converter is blocked after a timespan set by **Spd 0 trip delay**. The relay contact between the terminals 75/76 opens after a timespan set by **Trip cont delay**.

Fast stp & spd 0  The Fast Stop command determines the behavior. If the Fast Stop command is present (digital or via terminal strip; f.e. with 0 V on the terminal 14) and the drive is stopped, the converter is blocked and the contact is open. When the Fast Stop command is disabled (i.e. with 24 V on the terminal 14), The converter is enabled and the contact is closed. Entering the Fast Stop command, when the zero speed has been reached, the converter is blocked after a timespan set with **Spd 0 trip delay**.

Fst / stp & spd 0  The Fast Stop and Start commands determine the behavior. When the Stop or Fast Stop commands are present and the drive is stopped, the converter is blocked and the contact is open. When the Start command is given or when the Fast Stop command is disabled, the converter is blocked and the contact is closed. When the Start command is disabled or when a Fast Stop command is entered and after reaching zero speed, the converter is stopped after a timespan set by **Spd 0 trip delay**. The relay contact between the terminals 75/76 opens after a timespan set by **Trip cont delay**.

**Spd 0 trip delay**  Delay time in ms between reaching zero speed and disenabling of the converter.

**Trip cont delay**  Delay time in ms between disenabling and opening of the contact between the terminals 75 and 76.

**Jog stop control**

OFF  The behavior selected by **Stop mode** has no influence on the Jog function.

ON  The behavior selected by **Stop mode** is active also on the Jog function.

The mentioned “contact” can be either the one between the terminals 75/76 or a digital output (option TBO). In both cases during the display of the message the “**Stop control**” parameter must be selected. The function is factory set on the relay contact. The open contact, mentioned in the description, corresponds to 0 V on the digital output, while the closed contact corresponds to +24 V on the digital output.

**Note!**  At all the described possibilities for **Stop mode**, the stop signal on the terminal 13 must be present. With **Main commands** = Digital, it is necessary to select **Enable drive** parameter = Enabled via keypad or Bus.
6.14.8 Brake control

The purpose of this function is to ensure that the machine develops a torque which is capable of supporting the load of a crane or hoist during the transient brake release phase, in any direction.

Enable Torque pr

Enables the brake control function, making it possible to apply the torque capable of supporting the load during the transient brake release phase.

Closing speed

After the stop command, this parameter sets the motor speed at which the “Brake contactor control” digital output is disabled.

Torque delay

The time, after the start command, within which the brake released feedback must be received. If the transient phase is not completed within the time limit set in this parameter, the “Brake error” alarm condition is signalled. In the closing phase the Torque delay is set to 1 second.

Torque proving

Current capable of supporting the load the drive must guarantee before the brake is released (as a percentage with respect to FLC). It can be set from a parameter and from an analog input set as Brake Ref (32).

Actuator delay

Delay at the end of the transient release phase, from receiving the signal to confirm that the brake has been released until the motor actually starts to run.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable Torque pr</td>
<td>1295</td>
<td>0 1 Disabled</td>
<td>Disabled</td>
</tr>
<tr>
<td>Closing speed [rpm]</td>
<td>1262</td>
<td>0 200 30</td>
<td>30</td>
</tr>
<tr>
<td>Torque delay [ms]</td>
<td>1293</td>
<td>0 30000 3000</td>
<td>3000</td>
</tr>
<tr>
<td>Torque proving [%]</td>
<td>1294</td>
<td>0 200 75</td>
<td>75</td>
</tr>
<tr>
<td>Actuator delay [ms]</td>
<td>1266</td>
<td>0 30000 1000</td>
<td>1000</td>
</tr>
</tbody>
</table>

Parameter description No. Value | Factory American | Factory European | Standard Configuration |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable Torque pr</td>
<td>1295</td>
<td>0 1 Disabled</td>
<td>Disabled</td>
</tr>
<tr>
<td>Closing speed [rpm]</td>
<td>1262</td>
<td>0 200 30</td>
<td>30</td>
</tr>
<tr>
<td>Torque delay [ms]</td>
<td>1293</td>
<td>0 30000 3000</td>
<td>3000</td>
</tr>
<tr>
<td>Torque proving [%]</td>
<td>1294</td>
<td>0 200 75</td>
<td>75</td>
</tr>
<tr>
<td>Actuator delay [ms]</td>
<td>1266</td>
<td>0 30000 1000</td>
<td>1000</td>
</tr>
</tbody>
</table>
Diagram of control

Functional diagram with minimal use of inputs and outputs. Specific assignments of this diagram:

- **DI1**: Fwd sign Ascending, conventionally “Forward”
- **DI2**: Rev sign Descending, conventionally “Reverse”
- **DI3**: Brake fbk Brake contactor feedback
- **Relay 2**: Brake command KM10 contactor command

With reference to the previous graph, a brake alarm condition occurs if:

- **when the brake is released**, following the Enable and Start commands, the current is not adequate to support the load (indicated by the Torque proving parameter and signalled by the Brake command digital output) within less than the Torque delay time; or, when the current is adequate, the brake released confirmation input (Brake fbk) is not received, again within the Torque delay time.

- **when the brake is closed**, once the Closing speed (signalled by the Brake command digital output) has been reached, the input signal (Brake fbk) is not sent within less than 1 second.
Figure 6.14.8.2: Brake control diagram
6.14.9 Current limitation according to the speed (I/n curve)

**FUNCTIONS**

**I/n curve**

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/n curve</td>
<td>750</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I/n lim 0 [%]</td>
<td>751</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>I/n lim 1 [%]</td>
<td>752</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>I/n lim 2 [%]</td>
<td>753</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>I/n lim 3 [%]</td>
<td>754</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>I/n lim 4 [%]</td>
<td>755</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>I/n speed [rpm]</td>
<td>756</td>
<td>0</td>
<td>P162</td>
</tr>
</tbody>
</table>

This function allows the changing of the current limits “In use Tcur lim + / -” according to the motor speed, through a curve composed by six setpoints. The “I/n speed” and “I/n lim 0,1,2,3,4” are the parameters that allow to define the curve.

“I/n speed” parameter defines the speed range in which the current limits are kept at the value of “I/n lim 0”. The speed range included between “I/n speed” and the 100% of the max. speed will be divided internally in four equal segments, at the ends of which the current limits “I/n lim 0,1,2,3,4” are associated. The set values must decrease, starting from “I/n lim 0” up to “I/n lim 4”.

I/n curve

- Enabled: Limits current /speed curve enabled
- Disabled: Limits current /speed curve disabled

I/n lim 0

Current limit of the I/n curve that operates constantly up to the speed set by the “I/n speed” parameter.

I/n lim 1

First current limit which states the Taper current curve construction.

I/n lim 2

Second current limit which states the curve construction.

I/n lim 3

Third current limit which states the curve construction.

I/n lim 4

Fourth current limit which states the curve construction.

I/n speed

Threshold speed at which torque reduction starts.

![Figure 6.14.8.1 Current limitation according to the speed](image)
6.15 SPEC FUNCTIONS

6.15.1 Test generator

The test generator of the DV-300 converter is used to manually tune the regulators. It consists of a square wave generator whose frequency, offset, and amplitude can be set. The output signal of the “Test Generator” can be set on a programmable analog output.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generator access</td>
<td>58</td>
<td>0</td>
<td>Factory American</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>Not conn.</td>
</tr>
<tr>
<td>Gen frequency [Hz]</td>
<td>59</td>
<td>0.1</td>
<td>62.5</td>
</tr>
<tr>
<td>Gen amplitude [%]</td>
<td>60</td>
<td>0</td>
<td>200.00</td>
</tr>
<tr>
<td>Generator offset [%]</td>
<td>61</td>
<td>-200.00</td>
<td>+200.00</td>
</tr>
</tbody>
</table>

The generator output consists of the addition of Gen amplitude and Generator offset.

**Figure 6.15.1.1: Test generator output**

Gen access: Different parameters can be simulated by the test generator. The parameter concerned then has the value of the generator output.

Gen frequency: Output frequency of the generator in Hz.

Gen amplitude: Amplitude of the square-wave signal produced by the generator in percent.

Generator offset: Offset of the generator in percent.
6.15.2 Saving parameters, loading default factory settings, life time

**SPEC FUNCTIONS**

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter description</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>256</td>
<td>Save parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>258</td>
<td>Load default</td>
<td></td>
<td></td>
</tr>
<tr>
<td>235</td>
<td>Life time [h.min]</td>
<td>0.00</td>
<td>65535.00</td>
</tr>
</tbody>
</table>

**Save parameters**

Savings of parameters that are currently set by the user.

This command can also be given from keypad, when “Bus” through the **Control mode parameter**, has been selected.

**Load default**

Loading of the default settings (“Factory” column in the parameter table).

**Life time**

Shows the operating time of the converter. This parameter counts the time in which the converter is powered on (even if disabled).

Default values for individual parameters are factory set in the device. These values are shown in the “Factory” column of the individual parameter tables. In order to obtain the values specific to your application when the device is switched on, they must be saved via the Save parameters command after being set.

The factory default values can be re-loaded by selecting **Load default**. If these are not saved, the application specific drive settings will still be available the next time the drive is switched on.

When the device is switched on the saved parameter set is loaded.

**Note!**

The **Tacho scale** and **Speed offset** parameters are used for the fine scaling of the speed feedback circuit. When the factory set parameters are loaded (**Load Default**) these two parameters do not change, so that a new scaling is not required!
6.15.3 Failure Register

**SPEC FUNCTIONS**

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure register</td>
<td>330</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Failure reset</td>
<td>262</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Failure reg del</td>
<td>263</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The Failure register contains the last 10 failures that have occurred. It also contains information about the time the failure occurred, based on the operating hours (Life time), as well as information on the type of failure. This information can be accessed by pressing the ENTER key on the keypad when a failure is indicated. If several failures occur in sequence, all the failures are stored in the failure register until a failure occurs that causes the disconnection of the drive (Latch = ON, see Programmable alarms). The content of the failure register can also be read out via the bus or the serial interface.

**Failure register**

Acknowledgement of a failure. The failure reset can be initiated by pressing the CAN-CEL key when the failure is shown in the display of the keypad. If, however, several failures occur in sequence, these can only be reset by selecting Failure reset command through the ENT key.

**Failure reg del**

Clearing the failure register.

The informations about the last 10 failures that have occurred are available thru serial line in the following way:
- Set the parameter FAILURE REGISTER [330], it indicates the position number of the failure occurred:
- Read: FAILURE TEXT [327], FAILURE HOUR [328], FAILURE MIN [329], they indicate the type and when the alarm is occurred.
6.15.4. Signal adaptation

The Link1 and Link 6 functions are two control section operating independently of each other for the signal adaptation. With the Links, parameters can be: rectified, limited, multiplied by a factor, divided by a factor and provided with an offset.

Source
Parameter number used as an input quantity. For example “8236” for the Ramp ref 1 parameter (44+8192 offset). Select the parameter number in the individual descriptions or in the list of all parameters in section 10, “Parameter list”.

Destination
Parameter number, which determines the output quantity. Select the parameter number (+8192 offset) in the individual description column or in the list of all parameters in section 10, “Parameter lists”.

Mul gain
Multiplicative factor of the input quantity (after a possible limitation). Resolution: 5 digits.

Div gain
Divisor, through which it is possible to divide the input quantity already multiplied and limited. Resolution: 5 digits.

Input max
Max. limit of the input quantity. Resolution: 5 digits.

Input min
Min. limit of the input quantity. Resolution: 5 digits.

Input offset
Offset to be added to the input quantity. Resolution: 5 digits.

Output offset
Offset to be added to the output quantity. Resolution: 5 digits.
The input behavior can be determined with this parameter.

**OFF** The input quantity is processed with its sign.

**ON** The input quantity is processed with a positive sign (absolute value). It is possible to have a polarity change with the signs of **Mul gain** or **Div gain**.

In order to write SOURCE LINK (1/6) parameter or DESTINATION LINK (1/6) parameter it is necessary to add to the parameter number the offset “8192”

**Eg.**

RAMP REF 1 “44”

SOURCE LINK (1/2) = 44 + 8192 = 8236

**Note!** The Links are executed with an approximate cycle time of 20 ms. They are not mainly intended to be used for regulation but to access or connect parameters otherwise not accessible. The use of Links according to the parameter chosen as a destination involves a CPU overhead that can slow down the keypad/display operation. Check that the functionality corresponds to the needs before plant-wide implementation.

**Note!** The following parameters cannot be used as a destination of a Link:
- All parameters with only “R” access code
- All parameters with “Z” access code
- All parameters with “C” access code
- All the following:
  - Link 1
  - Link 2
  - Input absolute 1
  - Input absolute 2
  - Input absolute 3
  - Input absolute 4
  - Input absolute 5
  - Input absolute 6

**Figure 6.15.4.1: Structure of the signal adaptation**
6.15.5 Pads

The pads are used for the data exchange among the several components of a Bus system. They can be compared to the variables of a PLC. The figure 6.15.5.1 shows the overall structure of the system. With the help of pads it is possible for example to send information from a field Bus to an option card. All the pads can be written and read. See the several access possibilities in section 10, “Parameter list”

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>Pad 0</td>
<td>503</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 1</td>
<td>504</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 2</td>
<td>505</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 3</td>
<td>506</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 4</td>
<td>507</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 5</td>
<td>508</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 6</td>
<td>509</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 7</td>
<td>510</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 8</td>
<td>511</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 9</td>
<td>512</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 10</td>
<td>513</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 11</td>
<td>514</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 12</td>
<td>515</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 13</td>
<td>516</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 14</td>
<td>517</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Pad 15</td>
<td>518</td>
<td>-32768</td>
<td>+32767</td>
</tr>
<tr>
<td>Bitword pad A</td>
<td>519</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>Pad A Bit 0</td>
<td>520</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 1</td>
<td>521</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 2</td>
<td>522</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 3</td>
<td>523</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 4</td>
<td>524</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 5</td>
<td>525</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 6</td>
<td>526</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 7</td>
<td>527</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 8</td>
<td>528</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 9</td>
<td>529</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 10</td>
<td>530</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 11</td>
<td>531</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 12</td>
<td>532</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 13</td>
<td>533</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 14</td>
<td>534</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad A Bit 15</td>
<td>535</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bitword pad B</td>
<td>536</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>Pad B Bit 0</td>
<td>537</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 1</td>
<td>538</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 2</td>
<td>539</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 3</td>
<td>540</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 4</td>
<td>541</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 5</td>
<td>542</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 6</td>
<td>543</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 7</td>
<td>544</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 8</td>
<td>545</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 9</td>
<td>546</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 10</td>
<td>547</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 11</td>
<td>548</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 12</td>
<td>549</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 13</td>
<td>550</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 14</td>
<td>551</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pad B Bit 15</td>
<td>552</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

* These parameters can be set on a programmable analog inputs.
** These parameters can be set on a programmable analog output.
*** These parameters can be set on a programmable digital input.
**** These parameters can be set on a programmable digital output.
***** These parameters can be set on Relay 2.

**Pad 0...15** General variables, 16 Bit. The Pads 0...3 can be set via analog inputs. The values of the Pads 0, 1, 4, 5 and 6 can be set on analog outputs.

**Bitword pad A (B)** Bitmap of the parameters Pad A (B) bit 0 up to Pad A (B) bit 15. With a parameter it is possible to read or write all the Bits inside a Word.

Example:

| Pad A bit 0 | 0 |
| Pad A bit 1 | 1 = 2^1 = 2 |
| Pad A bit 2 | 0 |
| Pad A bit 3 | 0 |
| Pad A bit 4 | 0 |
| Pad A bit 5 | 1 = 2^5 = 32 |
| Pad A bit 6 | 1 = 2^6 = 64 |
| Pad A bit 7 | 0 |
| Pad A bit 8 | 0 |
Pad A bit 9
Pad A bit 10
Pad A bit 11
Pad A bit 12
Pad A bit 13
Pad A bit 14
Pad A bit 15

Bitword pad A = 2 + 32 + 64 + 1024 + 4096 = 5218

**Pad A (B) bit 0...15**

Bit variables. The single Bits can be read or written. With the **Bitword pad A (B)** it is possible to process a Word. See the example. From the Pad A it is possible to read the Bits 0…..7 of a digital input. On a digital output it is possible to write all the Bit.

---

**Note**

When setting the PADs bit to digital I/O the following rules have to be applied:

1. Assigning PAD A/B bit to a Digital Output will cause the state of the digital output (n) coming from PAD A/B bit (n-1)
2. Relay 2 can be driven by means of PAD A/B bit 14.
6.16 OPTIONS

6.16.1 Option 1

Through this menu the assignment of Drive parameters to the virtual digital I/O (MONITOR\Virtual digital Inp-Out menu) and to the process data channels (PDC) of the field bus can be carried out.

If the bus card is not present you will be prompted (inside the menu) by the message **OPT1 not present**.

If the used bus card is not up-to-date for this management, you will be prompted (inside the menu) by the message **OPT1 old version**.

For further and detailed information, refer to the bus interface instruction book.

6.16.2 Option 2

This menu allows the user access to the parameter set of the 6KCV300DGF option card.

**Menu**

The menu is active only if the OPT2 card is present (e.g. a 6KCV300DGF card). If the user tries to enter in the Option 2 menu and the card is not mounted on the device the message “Not present” is displayed.

For further and detailed information see the instruction book of the optional board.

**Enable OPT2**

This command can also be given from keypad, when “Bus” through the Control mode parameter, has been selected.

Default configuration = Disabled.

To change the configuration:

1 - set the new value of **Enable OPT2** parameter

2 - store via the **Save parameters** (BASIC MENU)

3 - switch-off and switch-on the drive
If Enabled and the DGF card is not present, will be generated the error:

OPT2 failure code 100-98 or OPT2 failure code 100-96.

**Note**

When using the 6KCV300DGF card (Option 2), all parameters listed in the “Opt2-A/PDC” column of Parameter List (section 10.1 and 10.2) can be accessed through the automatic asynchronous communication. Parameters listed in the High Priority Parameter List (section 10.4) can be accessed by means of the automatic synchronous communication. (See 6KCV300DGF manual for more details.)

If the software has detected the presence of the 6KCV300DGF the parameter set of the optional card is accessible. In this case see the 6KCV300DGF user manual for detailed information.
# 6.16.3 PID Function

## OPTIONS

**PID**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[769]</td>
<td>Enable PI PID</td>
</tr>
<tr>
<td>[770]</td>
<td>Enable PD PID</td>
</tr>
</tbody>
</table>

## PID source

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[786]</td>
<td>PID source</td>
</tr>
<tr>
<td>[787]</td>
<td>PID source gain</td>
</tr>
<tr>
<td>[758]</td>
<td>Feed-fwd PID</td>
</tr>
</tbody>
</table>

## PID references

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[759]</td>
<td>PID error</td>
</tr>
<tr>
<td>[763]</td>
<td>PID feed-back</td>
</tr>
<tr>
<td>[762]</td>
<td>PID offs. Sel</td>
</tr>
<tr>
<td>[760]</td>
<td>PID offset 0</td>
</tr>
<tr>
<td>[761]</td>
<td>PID offset 1</td>
</tr>
<tr>
<td>[1046]</td>
<td>PID acc time</td>
</tr>
<tr>
<td>[1047]</td>
<td>PID dec time</td>
</tr>
<tr>
<td>[757]</td>
<td>PID clamp</td>
</tr>
</tbody>
</table>

## PI controls

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[765]</td>
<td>PI P gain PID</td>
</tr>
<tr>
<td>[764]</td>
<td>PI I gain PID</td>
</tr>
<tr>
<td>[695]</td>
<td>PI steady thr</td>
</tr>
<tr>
<td>[731]</td>
<td>PI steady delay</td>
</tr>
<tr>
<td>[793]</td>
<td>P init gain PID</td>
</tr>
<tr>
<td>[734]</td>
<td>I init gain PID</td>
</tr>
<tr>
<td>[779]</td>
<td>PI central v sel</td>
</tr>
<tr>
<td>[776]</td>
<td>PI central v1</td>
</tr>
<tr>
<td>[777]</td>
<td>PI central v2</td>
</tr>
<tr>
<td>[778]</td>
<td>PI central v3</td>
</tr>
<tr>
<td>[784]</td>
<td>PI top lim</td>
</tr>
<tr>
<td>[785]</td>
<td>PI bottom lim</td>
</tr>
<tr>
<td>[783]</td>
<td>PI integr freeze</td>
</tr>
<tr>
<td>[771]</td>
<td>PI output PID</td>
</tr>
<tr>
<td>[418]</td>
<td>Real FF PID</td>
</tr>
</tbody>
</table>

## PD control

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[768]</td>
<td>PD P gain 1 PID [%]</td>
</tr>
<tr>
<td>[766]</td>
<td>PD D gain 1 PID [%]</td>
</tr>
<tr>
<td>[788]</td>
<td>PD P gain 2 PID [%]</td>
</tr>
<tr>
<td>[789]</td>
<td>PD D gain 2 PID [%]</td>
</tr>
<tr>
<td>[790]</td>
<td>PD P gain 3 PID [%]</td>
</tr>
<tr>
<td>[791]</td>
<td>PD D gain 3 PID [%]</td>
</tr>
<tr>
<td>[767]</td>
<td>PD D filter PID [ms]</td>
</tr>
<tr>
<td>[421]</td>
<td>PD output PID</td>
</tr>
<tr>
<td>[772]</td>
<td>PID out sign PID</td>
</tr>
<tr>
<td>[774]</td>
<td>PID output</td>
</tr>
</tbody>
</table>

## PID target

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[782]</td>
<td>PID target</td>
</tr>
<tr>
<td>[773]</td>
<td>PID out scale</td>
</tr>
</tbody>
</table>

## Diameter calc

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[794]</td>
<td>Diameter calc</td>
</tr>
<tr>
<td>[795]</td>
<td>Positioning spd [rpm]</td>
</tr>
<tr>
<td>[796]</td>
<td>Max deviation</td>
</tr>
<tr>
<td>[797]</td>
<td>Gear box ratio</td>
</tr>
<tr>
<td>[798]</td>
<td>Dancer constant [mm]</td>
</tr>
<tr>
<td>[799]</td>
<td>Minimum diameter [cm]</td>
</tr>
</tbody>
</table>
6.16.3.1 General

The PID function has been developed for general uses which can include nip-roll, winders, unwinders, pressure control of pumps and extruders.

A dancer or a load cell can be used as position/tension transducer.

The inputs (with the exception of those concerning the transducers) and the outputs can be configured, they can be associated to various converter parameters. E.g. the PID output can be sent to the speed or to current regulator.

The analog inputs/outputs will be sampled/updated to 2ms.
The digital inputs/outputs will be sampled/updated to 8ms.

Note! PID function in the firmware can not be used when the DGF card is present.

6.16.3.2 Inputs / Outputs

Regulation Inputs/outputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID source</td>
<td>Sample parameter of Feed-forward normally programmed on analog input.</td>
</tr>
<tr>
<td>PID feed-back</td>
<td>Analog input of position / tension transducer (dancer/load cell). PID feed-back must be programmed on the analog input 1 (terminals 1-2) because of the input filter provided.</td>
</tr>
<tr>
<td>PID offset 0</td>
<td>Offset analog input added to PID feed-back. Used for the adjustment of the dancer position.</td>
</tr>
<tr>
<td>PID target</td>
<td>Parameter associated with the regulator output. Normally, it will be programmed on the speed reference of the drive.</td>
</tr>
<tr>
<td>PID output</td>
<td>Analog output of the regulator. Used to carry on a reference cascade in multidrives systems.</td>
</tr>
<tr>
<td>PI central v3 PID</td>
<td>Initial value setting of the integral component of the regulator (corresponds to initial diameter). It can be programmed on an analog input. E.g. to an ultrasonic transducer used for the diameter measure of a winder/unwinder.</td>
</tr>
</tbody>
</table>

Input Command (programmable on digital inputs)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable PI PID</td>
<td>Enable of the PI (proportional - integral) of the regulator.</td>
</tr>
<tr>
<td>Enable PD PID</td>
<td>Enable of the PD (proportional - derivative) of the regulator.</td>
</tr>
<tr>
<td>PI integral freeze</td>
<td>Freezing of the actual value of the integral component of the regulator.</td>
</tr>
<tr>
<td>PID offset sel</td>
<td>Offset select, in addition to PID feed-back: L = PID offset 0, H = PID offset 1.</td>
</tr>
<tr>
<td>PI central v S0</td>
<td>Used with PI central v S1 to select one of four values for the initial integral level (corresponding to initial diameter). Through binary selection.</td>
</tr>
<tr>
<td>PI central v S1</td>
<td>Used with PI central v S0 to select one of four values for the initial integral level (corresponding to initial diameter). Through binary selection.</td>
</tr>
<tr>
<td>Diameter calc</td>
<td>Enable of the initial diameter calculation.</td>
</tr>
<tr>
<td>Diameter calc st</td>
<td>State of the initial diameter calculation (digital output).</td>
</tr>
</tbody>
</table>
6.16.3.3 Feed - Forward

<table>
<thead>
<tr>
<th>PID source</th>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID source</td>
<td>786</td>
<td>0</td>
<td>65535</td>
<td></td>
</tr>
<tr>
<td>PID source gain</td>
<td>787</td>
<td>-100.000</td>
<td>+100.000</td>
<td>0.00</td>
</tr>
<tr>
<td>Feed forward</td>
<td>758</td>
<td>-10000</td>
<td>+10000</td>
<td>0</td>
</tr>
</tbody>
</table>

* This parameter can be set on an analog programmable input.

When used, the feed-forward signal represents the main reference of the regulator. Inside the regulator it will be attenuated or amplified by the PID function and sent to the output as reference signal for the drive.

Through the parameter PID source, it is possible to select which point in the drive the feed-forward signal may be sent. The selectable parameters are those indicated in the paragraph 10.4. “List of the high-priority parameters”. The measure units are those indicated in the notes at the end of this paragraph.

1. Programming example of the ramp output block (Parameter Ramp out) on PID source:

   Menu OPTION
   ———> PID
   ———> PID source
   ———> PID source = 8305

   The PID source must be set to the parameter number to which it will be associated, choosing it from paragraph 10.4. “List of high-priority parameters” (Ramp out has the decimal number 113).

   To obtain the value, it must be added to the decimal value 8192 (fixed offset): 8192 + 113 = 8305.

   If you need to set the feed-forward on analog input, given that they are not directly inserted in the ‘high-priority parameters’, it is necessary to pass through a PAD 0.....PAD 15 parameter.
2. Programming example of the analog input 2 on PID source:

   a) Input programming on a PAD parameter
      Menu I/O CONFIG
      ———> Analog input
      ———> Analog input 2
      ———> Select input 2 = PAD 0

   b) Setting of the PAD 0 as feed-forward input:
      Menu OPTION
      ———> PID
      ———> PID source
      ———> PID source = 8695

The **PID source** must be set to the parameter number to which it will be associated, choosing it from paragraph 10.4 “List of high-priority parameters’ (**PAD 0** has the decimal number 503).

To obtain the value must be added the decimal value 8192 (fixed offset):

\[ 8192 + 503 = 8695 \]

The full-scale of the feed-forward is limited to the value +/- 10000, which depends on the parameter set on **PID source**. It will be necessary the calibration through **PID gain source**.

The measure units are those indicated in the notes at the end of the paragraph 10.4. “List of the high-priority parameters”.

The feed-forward value can be read through the parameter **Feed-fwd PID** via keypad or serial line.

Referring to the above examples:

1. Programming example of the ramp output block (**Parameter Ramp out**) on **PID source**:
   
   Speeds will be converted inside the drive into RPM x 4.
   
   The ramp input references take as maximum set value what set in **Speed base value**.

   \[
   \text{Feed - fwd PID} = \text{Speed base value} \times 4 \times \text{PID source gain}
   \]

   If, with max. ramp reference and **Speed base value** = 3000rpm, to have
   
   **Feed - fwd PID** = 10000, it is necessary to set:
   
   \[
   \text{PID source gain} = \frac{10000}{(3000 \times 4)} = 0.833
   \]

2. Programming for example analog input 2 on **PID source**:
   
   When an analog input will be set on a **PAD** parameter, this will have a max. value of +/- 2047.
   
   With max. analog reference, for having **Feed - fwd PID** = 10000, it is necessary to set:
   
   \[
   \text{PID source gain} = \frac{10000}{2047} = 4.885
   \]

**Note!**

Using the regulator as “generic PID” without the feed -forward function, **Feed - fwd PID** must be at its max. value.

To do this, it is necessary to set **PID source** on a **PAD** parameter and program it = 10000.
6.16.3.4 **PID function**

The PID function is divided in three blocks:

- Feed-back input **“PID reference”**
- Proportional-integral control block **“PI controls”**
- Proportional-derivative control block **“PD controls”**.

![PID blocks description](image)

**Figure 6.16.3.2: PID blocks description**

<table>
<thead>
<tr>
<th>PID references</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[759]</td>
<td>PID error</td>
</tr>
<tr>
<td>[763]</td>
<td>PID feed-back</td>
</tr>
<tr>
<td>[762]</td>
<td>PID offs. Sel</td>
</tr>
<tr>
<td>[760]</td>
<td>PID offset 0</td>
</tr>
<tr>
<td>[761]</td>
<td>PID offset 1</td>
</tr>
<tr>
<td>[1046]</td>
<td>PID acc time</td>
</tr>
<tr>
<td>[1047]</td>
<td>PID dec time</td>
</tr>
<tr>
<td>[757]</td>
<td>PID clamp</td>
</tr>
<tr>
<td>Parameter description</td>
<td>No.</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PID error</td>
<td>759</td>
</tr>
<tr>
<td>PID feed-back</td>
<td>763</td>
</tr>
<tr>
<td>PID offs. Sel</td>
<td>762</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PID offset 0</td>
<td>760</td>
</tr>
<tr>
<td>PID offset 1</td>
<td>761</td>
</tr>
<tr>
<td>PID acc time</td>
<td>1046</td>
</tr>
<tr>
<td>PID dec time</td>
<td>1047</td>
</tr>
<tr>
<td>PID clamp</td>
<td>757</td>
</tr>
</tbody>
</table>

* This function can be set on a digital programmable input.
** This parameter can be set on an analog programmable input.

- **PID error**: Error reading in the input of the function PID (PID clamp block output).
- **PID feed-back**: Reading of feed-back value from the transducer position (dancer) or tension (load cell).
- **PID offs. sel**: Offset selector added to PID feed-back. This parameter can be set on a digital programmable input.
  
  \[ 0 = \text{PID offset 0} \quad 1 = \text{PID offset 1} \]

- **PID offset 0**: Offset 0 added to PID feed-back. This parameter can be set on analog input, e.g. for the tension setting when a load cell has to be used as feed-back.
- **PID offset 1**: Offset 1 added to PID feed-back.
- **PID acc time**: Acceleration ramp time value in seconds after the PID offset block.
- **PID dec time**: Deceleration ramp time value in seconds after the PID offset block.
- **PID clamp**: The clamp allows a smooth tension setting of a controlled system winder/unwinder, when the “calculation of the initial diameter” function cannot be used.

  When the drive is enabled, the dancer is at its lower full scale, with PID error at its maximum value. The motor could accelerate to fast in taking the dancer in its central position of work.

  Setting PID clamp at a value sufficiently low e.g = 1000, at the drive enabling and at the enabling of Enable PD PID, the value of PID error is limited to 1000 until the signal coming from the dancer (PID feed-back) does not reach this value. Now PID clamp is automatically take back at its maximum value corresponding to 10000. The clamp is kept at 10000 till the next disabling of the drive or of Enable PD PID.

The feed-back input is provided for the analog transducers connection like dancer, with relative potentiometer or load cell. Nevertheless, it is possible to use this input block as comparison point between two different analog signals + / - 10V.

**Connection to a dancer with potentiometer connected between - 10 and + 10V.**

The cursor of the potentiometer can be connected to one of the analog inputs of the drive. Normally it should be used the analog input 1 (terminals 1 and 2) because it is provided with filter.

The input chosen for that connection must be programmed in the menu I/O CONFIG as PID feed-back. Its value can be read in the PID feed-back parameter in the PID REFERENCE submenu.

Through PID offset 1 (or PID offset 0), it is possible to carry on the adjustment of the dancer position.
Connection to a load cell with full range +10V.

The output of the load cell can be connected to one of the drive analog inputs. Normally the analog input 1 (terminals 1 and 2) should be used because of the filter provided.

The input chosen for the connection must be programmed in the menu I/O CONFIG as PID feed - back. Its value can be read in the PID feed - back parameter of the PID REFERENCE submenu.

The tension setting can be sent, with value 0...-10V, to one of the remaining programmable analog inputs in the I/O CONFIG menu as PID offset 0.

6.16.3.5 Proportional - integral block

The PI block receives its input from the PID error parameter, which represents the error that must be corrected by the regulator. The PI block carries on a proportional-integral regulation, its output PI output PID after having been appropriately adapted, according to the system which it has to control, it will be used as multiplier factor of the feed-forward (Feed-fwd PID) obtaining the correct value of the speed reference for the drive (Real FF PID).

The PI block will be enabled setting Enable PI PID = Enable. If Enable PI PID has been programmed on a digital input, this must be set to a high logic level (+2V).

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enable PI PID</td>
<td>769</td>
<td>0-1</td>
<td>Disable/Disable</td>
</tr>
</tbody>
</table>

* This function can be set on a digital programmable input.

Enable PI PID
- Enabled: Enable of the proportional-integral block
- Disabled: Disabling of the proportional-integral block.
### PI controls

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI P gain PID</td>
<td>765</td>
<td>0.00 100.00</td>
<td>10.00 10.00</td>
</tr>
<tr>
<td>PI I gain PID</td>
<td>764</td>
<td>0.00 100.00</td>
<td>10.00 10.00</td>
</tr>
<tr>
<td>PI steady thr</td>
<td>695</td>
<td>0 10000</td>
<td>0 0</td>
</tr>
<tr>
<td>PI steady delay</td>
<td>731</td>
<td>0 60000</td>
<td>0 0</td>
</tr>
<tr>
<td>P init gain PID</td>
<td>793</td>
<td>0.00 100.00</td>
<td>10.00 10.00</td>
</tr>
<tr>
<td>I init gain PID</td>
<td>734</td>
<td>0.00 100.00</td>
<td>10.00 10.00</td>
</tr>
<tr>
<td>PI central v sel</td>
<td>779</td>
<td>0 3</td>
<td>1 1 *</td>
</tr>
<tr>
<td>PI central v1</td>
<td>776</td>
<td>PI bottom lim PI top lim</td>
<td>1.00 1.00</td>
</tr>
<tr>
<td>PI central v2</td>
<td>777</td>
<td>PI bottom lim PI top Lim</td>
<td>1.00 1.00 **</td>
</tr>
<tr>
<td>PI central v3</td>
<td>778</td>
<td>PI bottom lim PI top Lim</td>
<td>1.00 1.00</td>
</tr>
<tr>
<td>PI top lim</td>
<td>784</td>
<td>PI bottom lim</td>
<td>10.00 10.00 10.00</td>
</tr>
<tr>
<td>PI bottom lim</td>
<td>785</td>
<td>-10.00 PI top lim</td>
<td>0.0 0.0</td>
</tr>
<tr>
<td>PI integr freeze</td>
<td>783</td>
<td>0 1</td>
<td>0 0 *</td>
</tr>
<tr>
<td>PI output PID</td>
<td>771</td>
<td>0 1000 x PI top limit</td>
<td>1000 1000</td>
</tr>
<tr>
<td>Real FF PID</td>
<td>418</td>
<td>-10000 +10000</td>
<td>0 0</td>
</tr>
</tbody>
</table>

* This function can be set on a digital programmable input
** This parameter can be set on an analog programmable input

- **PI P gain PID**: Proportional gain of PI block
- **PI I gain PID**: Integral gain of PI block
- **PI steady thr**: Threshold feed-forward survey. If Feed-fwd PID is less than PI steady thr the integral regulation will be frozen, the proportional gain assumes the value set in P init gain PID. When Feed-fwd PID overcomes the threshold, the integral regulation with the gain set in I init gain PID will be enabled. The PI block will maintain the gains P init gain PID and I init gain PID for the time preset through PI steady delay. Once this delay is over, they will be brought automatically to PI P gain PID and PI I gain PID.
**PI steady delay**

Time for which the gains **P init gain PID** and **I init gain PID** have been kept operative after overcoming the feed-forward **PI steady thr** threshold.

The delay time **PI steady delay** and the resulting function of initial gains changing also, operate on the transition L to H of the **Enable PI PID** parameter.

**P init gain PID**

Initial proportional gain. **P init gain PID** operates when feed-forward is less than **PI steady thr** and at its overcoming, for the time set in **PI steady delay** or on the transition L to H of **Enable PI PID** for the same time.

**I init gain PID**

Initial integral gain. **I init gain PID** operates after the threshold **PI steady thr** has been overcome or on the transition L to H of **Enable PI PID** for the time set in **PI steady delay**.

**PI central v sel**

Output selector of the starting PI block. **PI central v sel (0...3)** selects between the 4 possible settings of the initial value of the regulator integral component (corresponding to initial diameter).

**PI central v sel** can be set directly from keypad, serial line or through two digital inputs set respectively as **PI central v S0** and **PI central v S1**.

Selecting **PI central v sel = 0**, when PI block is disabled (**Enable PI PID = Disable**), the last value of the integral component calculated (corresponding to roll diameter) is stored. This value is displayed in **PI output PID**. When enabled again, the regulation restarts again from that value. The same functionality is used when switching off the drive. This kind of operation can be used when controlling a winder and it is necessary to stop the machine and disable the drives or even remove AC incoming power from the electrical cabinet.

Selecting **PI central v sel = 1-2-3**, when PI block has been disabled, the value of **PI output PID** will be set at what is programmed in the correspondent parameter (x1000). When the drive is restarted after a power off, the precalculated value will be automatically set only if, when powering up the drive, the digital input programmed as **Enable PI PID** is already set at a high level.

**PI central v 1**

Setting of the first initial value of the regulator’s integral component (corresponding to initial diameter 1). The **PI central v 1** value must be included in the limits set in **PI top lim PID** and **PI bottom lim PID**.

**PI central v 1** will be selected by setting **PI central v sel = 1**.

**PI central v 2**

Setting of the second initial value of the regulator’s integral component (corresponding to initial diameter 2). The **PI central v 2** value must be included in the limits set in **PI top lim PID** and **PI bottom lim PID**.

**PI central v 2** will be selected by setting **PI central v sel = 2**.

**PI central v 3**

Setting of the third initial value of the regulator’s integral component (correspondent to initial diameter 3). The **PI central v 1** value must be included in the limits given by **PI top lim PID** and **PI bottom lim PID**.

**PI central v 3** will be selected by setting **PI central v sel = 3**.

**PI top lim**

It defines the higher limit of the adapting block of the PI correction.

**PI bottom lim**

It defines the lower limit of the adapting block of the PI correction.

The output of the PI block represents the multiplier factor of feed-forward, whose value must be adapted from the regulator in the max. limits included between +10000 and -10000 and defined by **PI top lim** and **PI bottom lim**. The value of these parameters will be defined according to the system that has to be controlled. For a better understanding please refer to the paragraph “Examples of application”.
**PI integral freeze**
Freezing of the present condition of regulator integral component.

**PI output PID**
Output of PI block, adapted to the values included between **PI top limit** and **PI bottom limit**. At the power up of the drive, **PI output PID** acquires automatically the selected value with **PI central v sel** multiplied by 1000.

Example: If **PI central v 2** = 0.5 is selected, at the start **PI output PID** acquires value = 500.

When **Enable PI PID** has been enabled, the output **PI output PID** is, independently on the input error able to integrate its value up to the limits set with **PI top limit** or **PI bottom limit** multiplied by 1000.

Example: **PI top limit** = 2, **PI output PID** max = 2000.

The PI block output will be further limited from the parameter saturation **Real FF PID** (see corresponding parameter).

As previously described, **PI output PID** is used as a multiplier factor of the feed-forward in order to obtain the angular speed reference of the motor. If the PID function is used to control a winder/unwinder system, its value is inversely proportional to the roll diameter. When winding with a constant peripheral speed, the following is valid:

\[ \omega_0 \Phi_1 = \omega_1 \Phi_0 \]

where:
- \( \omega_0 \) = angular speed at minimum diameter
- \( \Phi_0 \) = minimum diameter
- \( \omega_1 \) = angular speed at actual diameter
- \( \Phi_1 \) = actual diameter
- \( \omega_1 = \omega_0 \times (\Phi_0 / \Phi_1) \)

If the drive is set correctly, and \( \omega_0 \) is equivalent to the maximum value of the feed-forward, then **PI output PID** depends on \( (\Phi_0 / \Phi_1) \).

Taking into consideration the internal coefficients of the firmware, it can be written:

\[ \text{PI output PID} = (\Phi_0 / \Phi_1) \times 1000 \]

This formula can be used to verify the accuracy of the setting when the system is on working or during the procedure for the calculation of the initial diameter.

**Real FF PID**
Represents the feed-forward value which has been recalculated according to the PI correction. It will be calculated with the following formula:

\[ \text{Real FF PID} = (\text{Feed-fwd PID} / 1000) \times \text{PI output PID} \]

The max. value of **Real FF PID** is +/- 10.000. If this limit had been reached during operation, in order to avoid dangerous levels of regulator saturation, further increases of **PI output PID** will be blocked.

Example: Feed-fwd = + 8000, the positive limit of PI output PID will be automatically set at 10000 / (8000 / 1000) = 1250.
6.16.3.6 Proportional - Derivative control block

The PD block receives the values **PID error** at its input, which represents the error that must be corrected by the regulator. The PD block carries out proportional-derivative regulation and its output **PD output PID** will be added to **Real FF PID**.

The PD block is enabled by setting **Enable PD PID** = Enable. If **Enable PD PID** has been programmed on a digital input, this must be set to a high logical level.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Menu</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enable PD PID</strong></td>
<td>770</td>
<td>0 1</td>
<td>Disable Disable</td>
</tr>
<tr>
<td><strong>Enabled (1) / Disabled (0)</strong></td>
<td>770</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

* This function can be set on a digital programmable input.

**Enable PD PID**

<table>
<thead>
<tr>
<th>Enabled</th>
<th>Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabling of the block proportional-derivative</td>
<td>Disabling of the block proportional-derivative</td>
</tr>
</tbody>
</table>
The gains of the block can remain fixed and programmed in this case through the parameters **PD P gain 1 PID** and **PD I gain 1 PID**, or changed depending on machine parameters, through the function Adap spd reg. In this case the gains come from **PD P gain 1-2-3 PID** and **PD I gain 1-2-3 PID**.

For example, it is possible to modify, dynamically, the gains of PD block according to the speed, to a regulation parameter internal to the drive, or to an analog input proportional to the unit related to the machine. The behaviour of the regulator can be so configured to meet the needs of the machine.

**Note:** When **Adap Spd reg** has been enabled (paragraph 6.13.2. of the manual), it operates both on the PID function and on the gains of the speed regulator. So it is necessary to appropriately program all relative parameters. If one wishes to modify only the gains of the speed regulator and keep fixed the gains of the PID function, it is necessary set the three proportional gains and integral gains of the PD block at the same value. The same is valid in case the PID gains have to be modified and the speed regulator gains must remain fixed.

**PD P gain 1**
Proportional gain 1 of the block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

**PD D gain 1**
Derivative gain 1 of block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

**PD P gain 2**
Proportional gain 2 of the block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

**PD D gain 2**
Derivative gain 2 of block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

**PD P gain 3**
Proportional gain 3 of the block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

**PD D gain 3**
Derivative gain 3 of block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

**PD D filter PID**
Time constant of the filter from the derivative side.

**PD output PID**
PD block output.
6.16.3.7 Output reference

**PID control**

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID out sign PID</td>
<td>772</td>
<td>0-1</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>Positive (0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bipolar (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID output</td>
<td>774</td>
<td>-10000+10000</td>
<td>0 0 *</td>
</tr>
</tbody>
</table>

* This parameter can be set on an analogue programmable output.

**PID out. sign PID**

Through this parameter it is possible to set the output of the regulator to be either bipolar or simply positive (clamp of negative side).

**PID output**

Display of regulator output. It is possible to program this parameter to an analog output, in order to perform a reference cascade in multidrive systems.
## FUNCTION DESCRIPTION

### PID target

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>PID target</td>
<td>782</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>PID out scale</td>
<td>773</td>
<td>-100.000</td>
<td>-100.000</td>
</tr>
</tbody>
</table>

**PID target**

Address of the parameter which contains the value to be used as PID target. To obtain the real settable value, it is necessary to add +2000H (8192 decimal) to the parameter number.

**PID out scale**

Matching factor of PID output. Its value depends on the parameter to which the regulator output is addressed.

Through the parameter **PID target** it is possible to select which point of the drive will be addressed for output signal of the regulation. The selectable parameters are those assigned as writing parameters (W or R/W) indicated in the paragraph 10.4. “List of high-priority parameters”. The units are those indicated in the notes at the end of the paragraph.

Programming example of the speed reference 1 (parameter **Speed ref 1**) on PID target:

Menu OPTION

——> PID

——> PID target

——> PID target = 8234

**PID target** must be set according to the number of the parameter to which it will be associated, choosing it from the paragraph 10.4. “List of high-priority parameters” (Speed ref 1 has the decimal number 42). To obtain the value it must be added the decimal number 8192 (fixed offset):

8192 + 42 = 8234.

**Note:** When the ramp function has been enabled, Speed ref 1 will be automatically programmed on its output. To have it available it is necessary to set parameter Enable ramp = disable.

**Speed ref 1** will be set in RPM x 4, considering that PID output assumes values included between 0....10000, it is necessary to set appropriately the calibration through PID out scale.

Calculation of PID out scale:

If it is necessary that PID output, at its max. value = 10000, corresponds at speed reference = 2000rpm it is necessary to set:

**PID out scale** = \((2000 \times 4) / 10000 = 0.8\)

It is possible to read the set value of **Speed ref 1** in the appropriate parameter of the menu INPUT VARIABLES / Speed ref.

**Note:** The value of PID out scale will be defined according to the system which is being controlled. For a better understanding, please refer to the paragraph “Application examples”.
6.16.3.8 Function of calculation for Initial diameter

This function performs a preliminary calculation of the diameter of an unwinder/winder before starting the line. This allows better control of the system avoiding unwanted balancing of the dancer.

The calculation is based on the measure of the movement of the dancer from the position of lower fullrange to its central position of work, and on the measure of angular movement of the roll during the initial phase.

**Note:** The function of initial diameter calculation can be carried out only when the winder/unwinder are controlled through dancer (no load cell) and the speed feed-back is carried out through encoder.

The result of the calculation is assigned to the parameter **PI output PID**, and so it represents the multiplier factor of the feed-forward, in order to obtain the angular speed reference of the motor.

Its value is universally proportional to the roll diameter.

![Image](image.png)

**Figure 6.16.3.6: Diameter calculation block description**

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter calc</td>
<td>794</td>
<td>0 1 0 0</td>
<td></td>
</tr>
<tr>
<td>Positioning spd [rpm]</td>
<td>795</td>
<td>-100 +100 0 0</td>
<td></td>
</tr>
<tr>
<td>Max deviation</td>
<td>796</td>
<td>-10000 +10000 8000 8000</td>
<td></td>
</tr>
<tr>
<td>Gear box ratio</td>
<td>797</td>
<td>0.001 1.000 1.000 1.000</td>
<td></td>
</tr>
<tr>
<td>Dancer constant [mm]</td>
<td>798</td>
<td>1 10000 1 1</td>
<td></td>
</tr>
<tr>
<td>Minimum diameter [cm]</td>
<td>799</td>
<td>1 2000 1 1</td>
<td></td>
</tr>
</tbody>
</table>

* This function can be set on a digital programmable input.
**Diameter calc**  
Enabling of the initial function of diameter calculation.  
The calculation will be enabled by setting **Diameter calc = Enable**.  

If **Diameter calc** has been programmed on a digital input, this must be brought to a high logic level.

**Positioning spd**  
Motor speed at which the dancer is at its central working position, during the calculation phase of the initial diameter.

**Max deviation**  
Value expressed in count of D/A which corresponds to the maximum shift allowed by the dancer. This value will be associated with the starting measurement of the dancer movement during the calculation of the initial diameter.

During the preliminary phase of the commissioning, it is necessary to carry out the self-calibration of the analog inputs, so at the fullrange position of the dancer they will correspond, whatever was the value of the analog input, at 10000 counts. The parameter **Max deviation**, in order to guarantee a precise calculation of the movement, must be set at a value slightly lower. (standard **Max deviation = 8000**).

**Gear box ratio**  
Ratio reduction between the motor and the roll (< = 1).

**Dancer constant**  
It expresses the measure in mm, the total bunching of material in the dancer.

![Diagram of Dancer and Gearbox Ratio](image)

**Measurement of Dancer constant**:  
With dancer in lower fullrange position, perform the self-calibration of the analog input programmed as **PID feed-back**.  
Set the keypad of the drive on the parameter **PID feed-back**.  
Measure and multiply by 2, the distance in mm between the lower mechanical fullrange and the position of the dancer that, on the parameter **PID feed-back**, will display 0 (position of electrical 0).  
Multiply the above calculated value by 2 if the dancer has only one pitch, by 4 if the dancer has two pitches and so on, as per the figure above.

**Minimum diameter**  
Min. value of core diameter expressed in cm.
6.16.3.9 Procedure of calculation for initial diameter

The calculation is based on the measurement of the dancer movement from the lower fullrange position to its central working position, and on the measurement of the angular movement of the coil during the drawing phase. For that reason, during this period, make sure that the gear maintaining the material blocked. For this reason it is necessary to enable the regulation of the nip-roll drive with speed reference = 0.

If line nip-rolls are controlled by dancers or load cells, it is necessary to carry out the diameter calculation of the winders/unwinders first, then the gear.

The parameter **PI central v sel** must be set at 0 to avoid **PI output PID** being set automatically at a predefined value.

Bringing the digital input programmed as **Diameter calc** to a high logic level (+24V), if the drive is enabled, will start the procedures. During this phase, the parameters **Enable PI PID** and **Enable PD PID** are automatically disabled.

The regulation verifies the signal coming from the dancer potentiometer. If this is higher than what is already set in **Max deviation**, the motor begins following the speed reference set in **Positioning speed** in order to wind the material and bring the dancer to its central position of working.

The polarity of the reference assigned to **Positioning speed** will be winder / unwinder equal to the one working as a winder.

If the initial regulation verifies that the signal coming from the potentiometer of the dancer is lower than what already set in **Max deviation**, the motor starts running with speed reference set in **Positioning speed** in order to unwind the material and bring the dancer on the point identified by **Max deviation**, at this point the reference will be inverted to bring the dancer to its central position.

When the dancer has reached the central position, the parameter **PI output PID** will be set at a value inversely proportional to the diameter and the digital output **Diameter calc st**, that indicates the end of diameter calculation, will be brought to high logical level.

At this point, if **Enable PI PID** and/or **Enable PD PID** are enabled, the system passes automatically in regulation. For this reason generally the digital inputs programmed as **Diameter calc** and **Enable PI PID** and/or **Enable PD PID** will be brought to high logic level at the same time.

The output signal Diameter calc st can be used to reset the command **Diameter calc** (this command will be activated on the sliding edge of the digital input). For that reason, it must be brought to high logical level after the supply of the regulation part of the drive and reset once the initial calculation phase has finished.

The value of **PI output PID** will be calculated with the following formula:

\[
\text{PI output PID} = \frac{(\text{Min diameter} \times \text{PI top lim})}{\text{Value of the calculated diameter}}
\]

The parameters **PI top limit** and **PI bottom limit** in the menu **PI controls** have to be set according to the max. and min. diameter of the roll. For better explanation, please refer to paragraph 6.16.3.10 “Application examples”.

---

**DV-300 Adjustable Speed Drives**

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**FUNCTION DESCRIPTION**

---

153  6
6.16.3.10 Examples of application

Nip-roll control with dancer

![Diagram of Nip-roll control with dancer]

### Machine data:

- Rated speed of slave motor \( V_n = 3000\text{rpm} \)
- Slave motors speed correspondent to the max. line speed = 85% \( V_n = 2550\text{rpm} \)
- Max. correction of the dancer = +/- 15% of the line speed = +/- 382.5rpm

The slave drive must be sent the analog signals regarding line speed and the position of the dancer (whose potentiometer will be supplied between terminals -10V...+10V) and the digital commands regarding the enabling of the PID control.

The regulator output will be sent to speed reference 1.

Drive setting: (below parameters regarding only the PID function)
**Input/output**

Set **Analog input 1** as input for the cursor of the dancer potentiometer.

**Analog input 1 / Select input 1= PID Feed-back**  
Set **Analog input 2** as line speed input (feed-forward).

To set the feed-forward on analog input, seeing that this one is not directly accessible in the list of high-priority parameters, it is necessary to pass through a supporting parameter **PAD 0.....PAD 15**.

**Analog input 2 / Select input 2 = PAD 0**

Set **Digital input 1** as enabling input of PI block of the PID  
**Digital input 1 = Enable PI PID**

Set **Digital input 2** as enabling input of PD block of the PID  
**Digital input 2 = Enable PD PID**

**Parameters**

Set **Speed base value** equal to the rated speed of the motor.  
**Speed base value = 3000rpm**

Set **PID source** as **PAD 0**.  
*(PAD 0 has been used as supporting parameter for the feed-forward reading on Analog input 2)*

For PID source, set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4. “List of high-priority parameters” *(PAD 0 has the decimal number 503).*

To obtain the correct value it must be added to the decimal number 8192 (fixed offset):  
**PID source** = (8192 + 503) = 8695

Set **PID source Gain** so that **Feed-fwd PID** reaches, along with the max. analog value on Analog input 2, 85% of its max. value = 10000 x 85%.

When an analog input is set on a PAD parameter, this will have a max. value +/- 2047.  
So:  
**PID source Gain** = (max **Feed-fwd PID** x 85%) / max **PAD 0** = (10000 x 0.85) / 2047 = 4.153

Set **PID target** as **Speed ref 1**.

*Note:* When the ramp function is enabled, **Speed ref 1** is not available. In order to keep it available, it is necessary to set the parameter **Enable ramp** = Disable.

**PID target** must be set to the parameter number to which it will be associated, choosing it from the list of paragraph 10.4, “List of high-priority parameters” *(Speed ref 1 has the decimal number 42).*

To obtain the correct value it must be added the decimal number 8192 (fixed offset)  
**PID target** = 8192 + 42 = 8234
Set PID out scale so that, the max. analog value on Analog input 2 (Feed-fwd PID = 8500) and Enable PI PID and Enable PD PID = Disable, Speed ref 1 is the same at 2550rpm.
The parameter Speed ref 1 will set in RPM x 4, so:

\[
\text{PID out scale} = \frac{2550 \times 4}{8500} = 1.2
\]

Set PI central v sel = 1.
Set PI central v 1 = 1

In absence of a correction performed by the PI block of the regulator, the line speed reference (Feed-forward) must be multiplied by 1 and sent directly to the speed regulator of the drive.

In this application, the regulator carries out a mono type proportional control. The correction will be indicated in percentage, according to the line speed, from 0 to the maximum.

Set PI top limit and PI bottom limit so that, with max. of the dancer (max. value of the analog input 1 = PID feed-back) and setting the proportional gain of the PI block at 15%, it will correspond to an equal proportional correction of feed-forward. For this reason set:

\[
\text{PI top limit} = 10
\]
\[
\text{PI bottom limit} = 0.1
\]

Set PI P gain PID = 15%
Set PI I gain PID = 0%

With this configuration, having a correction proportional to the line speed, the PI block is not able to position the dancer at speed = 0. In order to do the drawing in stop conditions, it is necessary to use the PD block.

Set PD P gain PID to a value that allows positioning of the dancer without large dynamic variations.
For example:

\[
\text{PD P gain PID} = 1\%
\]

If necessary, use the derivative component as damping component of the system, setting for example:

\[
\text{PD D gain PID} = 5\%
\]
\[
\text{PD D filter PID} = 20\text{ms}
\]
If not necessary, keep these parameters = 0.

If it is necessary to carry out a reference cascade for another drive, set PID output on an analog output, for example:

Analog output 1 / Select output 1= PID output
(with Real FF PID = 10000 count, Analog output 1 = 10V).
Nip-rolls control with load cell

Machine data:

Rated speed of slave motor \( V_n = 3000 \text{rpm} \)
Slave motors speed corresponding to the max. line speed = 85% \( V_n = 2550 \text{rpm} \)
Max. correction of the dancer = +/- 20% of the line speed = +/-510rpm

To the slave drive must be sent the analog signals regarding the line speed and the position of the load cell signal (0... +10V) and the tension set (0... +10V), and the digital commands regarding the enabling of the PID control.

The regulator output will be sent to the speed reference 1.

Drive setting: (below are parameters regarding only the PID function)
Input/output

Set Analog input 1 as input for the load cell signal.
Analog input 1 / Select input 1 = PID Feed-back

Set Analog input 2 as line speed input (feed-forward).
Setting the feed-forward on analog input, seeing it is not directly inserted in the list of high-priority parameters, it is necessary to pass through a supporting parameter PAD 0.....PAD 15.
Analog input 2 / Select input 2 = PAD 0

Set Analog input 3 as input for the tension set (PID offset 0).
Analog input 3 / Select input 3 / PID offset 0

Set Digital input 1 as enabling input of the PI block of the PID
Digital input 1 = Enable PI PID

Set Digital input 2 as enabling input of the PD block of the PID
Digital input 2 = Enable PD PID

Parameters

Program Speed base value equal to the rated speed of the motor.
Speed base value = 3000rpm

Program PID source as PAD 0.
(PAD 0 has been used as supporting parameter of the feed-forward reading on Analog input 2)
For PID source set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4. “List of high-priority parameters” (PAD 0 has the decimal number 503).
To obtain the correct value it must be added the decimal number 8192 (fixed offset):
PID source = (8192 + 503) = 8695

Set PID source Gain so that Feed-fwd PID reaches, along with the max. analog value on Analog input 2, 85% of its max. value = 10000 x 85%.
When an analog input is set on a PAD parameter, this will have a max. value +/- 2047.

So:
PID source Gain = (max Feed-fwd PID x 85%) / max PAD 0 = (10000 x 0.85) / 2047 = 4.153

Set PID target as Speed ref 1.

Note: When the ramp function is enabled, Speed ref 1 is not available. In order to have it available, it is necessary to set the parameter Enable ramp = Disable.

For PID target set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4 “List of high-priority parameters” (Speed ref 1 has the decimal number 42).
To obtain the correct value it must be added the decimal number 8192 (fixed offset)

**PID target** = 8192 + 42 = 8234

Set **PID out scale** so that, along with the max. analog value on **Analog input 2** (Feed-fwd PID = 8500) and with **Enable PI PID** e **Enable PD PID** = disable, **Speed ref 1** is the same at 2550rpm.

**Speed ref 1** will be set in **RPM x 4**, so:

**PID out scale** = (2550 x 4) / 8500 = 1.2

Set **PI central v sel** = 1.
Set **PI central v 1** = 1

In the absence of a correction carried out from the PI block of the regulator, the line speed reference (Feed-forward) must be multiplied by 1 and sent directly to the speed regulator of the drive.

This application operates by using proportional control. The correction will be indicated in percentage according to the line speed, from 0 to the maximum.

Program **PI top limit** and **PI bottom limit** so that the max. correction of PI block corresponds at 20% of line speed.

**PI top limit** and **PI bottom limit** parameters are the maximum and minimum multiplier factor of Feed forward value.

At the max. line speed it will correspond 2550rpm of the motor (max. feed-forward).

Max. correction = 2550 x 20% = 510rpm

\[
2550 + 510 = 3060 \text{rpm} \quad \longrightarrow \quad \text{PI top limit} = \frac{3060}{2550} = 1.2
\]

\[
2550 - 510 = 2040 \text{rpm} \quad \longrightarrow \quad \text{PI bottom limit} = \frac{2040}{2550} = 0.80
\]

which will to multiply the setting of **PI central v 1** (= 1) by + 20% (1.2) and - 20% (0.80).

With this configuration, having a correction proportional to the line speed, the PI block is not able to apply tension at speed = 0. In order to apply tension in stop conditions, it is necessary to use on the PD block.

The gains of the single components have to be set with loaded machine; it is possible to start tests with values below indicated (default values):

Set **PI P gain PID** = 10%
Set **PI I gain PID** = 10%
Set **PD P gain PID** = 10%

In case use the derivative component for forcing the regulator output during velocity changes of the system, programming for example:

**PD D gain PID** = 5%
**PD D filter PID** = 20ms

If not necessary, keep these parameters = 0.

In case it is necessary to carry out a references cascade for another drive, set **PID output** on an analog output, for example:
Analog output 1 / Select output 1= PID output
(with Real FF PID = 10000 count, Analog output 1 = 10V).

**Note:** If it is necessary, a system with the integral regulation enabled, with feed-forward = 0, and the need to apply tension of the system with null error also when the machine is stopped, please refer to the paragraph “Generic PID”.
Winder/Unwinder control with dancer

Machine data:

Max. line speed = 400m/min
Rated speed of the motor winder/unwinder Vn = 3000rpm
Max. diameter of the winder/unwinder = 700mm
Min. diameter of the winder/unwinder = 100mm
Reduction ratio motor-coil = 0.5
One pitch dancer
Dancer stroke from the lower limit switch to the position of electric 0 = 160mm
The drive of the winder/unwinder must be sent the analog signals regarding line speed and the position of the dancer (whose potentiometer will be supplied between the terminals -10V... +10V) and the digital commands regarding the enabling of the PID control.
The regulator output will be sent to the speed reference 1.
Drive setting: (below are only the parameters regarding the PID function)

Input/output

Set Analog input 1 as input for the cursor of the dancer.
Analog input 1 / Select input 1 = PID Feed-back
Set Analog input 2 as line speed input (feed-forward).
To set the feed-forward on an analog input, seeing that this one is not directly accesible in the list of high-priority parameters, it is necessary to pass through a supporting parameter PAD 0.....PAD 15.

**Analog input 2 / Select input 2 = PAD 0**

Set **Digital input 1** as enabling input of the PI block of the PID

**Digital input 1 = Enable PI PID**

Set **Digital input 2** as enabling input of the PI block of the PID

**Digital input 2 = Enable PD PID**

Set **Digital input 3** as enabling input of the calculation function of initial diameter.

**Digital input 3 = Diameter calc**

Set **Digital output 1** as signalling “ phase of calculation of starting diameter “.

**Digital output 1 = Diameter calc st**

**Parameters**

Set **Speed base value** equal to the rated speed of the motor.

**Speed base value = 3000rpm**

Set **PID source** as **PAD 0**.

(PAD 0 has been used as supporting parameter of the feed-forward reading on Analog input 2)

For **PID source**, set the parameter number to which it will be associated, choosing it from the list of the paragraph 10.4. “List of high-priority parameters” (PAD 0 had the decimal number 503). To obtain the correct value it must be added the decimal number 8192 (fixed offset):

**PID source = (8192 + 503) = 8695**

Set **Gain source** and **PID out scale** so that, the max. analog value on **Analog input 2** and without the PID correction (Enable PI PID e Enable PD PID = Disable), the peripheral speed of the swift in conditions of minimum diameter (soul) is the same of the max. line speed.

Calculation of the motor speed in the condition above mentionned:

\[ V_p = \pi \times \Phi_{\text{min}} \times \omega \times R \]

where:

- \(V_p\) = peripheral speed of the coil = line speed
- \(\Phi_{\text{min}}\) = min. diameter of the coil [m]
- \(\omega\) = angular speed of the motor [rpm]
- \(R\) = reduction ratio motor-coil

\[ \omega = \frac{V_p}{\pi \times \Phi_{\text{min}} \times R} = \frac{400}{(\pi \times 0.1 \times 0.5)} = 2546\text{rpm} \approx 2550\text{rpm} \]
Maintaining a 15% margin as to the saturation limit of the regulator (10000 count), it is necessary to set **PID source Gain** so that **Feed-fwd PID** reaches, along with the max. analog value on **Analog input 2**, 85% of its max. value.

When an analog input is set on a PAD parameter, this will have a max. value +/- 2047.

So:

**PID source Gain** = (max **Feed-fwd PID** x 85%) / max **PAD 0** = (10000 x 0.85) / 2047 = 4.153

The speed reference of the motor is set in **RPM** x 4, so program as follows:

**PID out scale** = (2550 x 4) / (10000 x 0.85) = 1.2

Set **PID target** as 1 **Speed ref 1**.

**Note:** When the ramp function has been enabled, **Speed ref 1** is not available. To keep it available it is necessary to set the parameter **Enable ramp** = Disable.

For **PID target** set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4. **“List of high-priority parameters”** (**Speed ref 1** has the decimal number 42).

To obtain the correct value it must be added the decimal number 8192 (fixed offset):

**PID source** = (8192 + 42) = 8234

Set **PI central v sel** = 0.

With this configuration, having a correction proportional to the line speed, the PI block is not able to position the dancer at speed = 0. In order to do the drawing in stop conditions, it is necessary to use the PD block.

As previously stated, the procedure determines the theoretical multiplier factor (**PI output PID**) of feed-forward as relation of the diameter calculated. In order to send to the drive the correct speed angular value.

**Note:** When **PI central v sel** = 0 has been selected and the the PI block has been disabled, the system keeps in memory, or reset automatically in case of switching off, the last value calculated for **PI output PID**. If it would be necessary to set the value in order to have at the output an incorrect reference and so equal to the feed-forward, it is possible to configure a digital input as correction reset.

So configure:

**Digital input 4 = PI central v S0**

**PI central v 1** = 1.00

Bringing the digital input to logical high level, the **PI output PID** will be reset.

Set **PI top lim** and **PI bottom lim** according to the ratio diameters coil.

Parameters **PI top lim** and **PI bottom lim** can be considered as multiplier factors, respectively max. and min. of the feed-forward.

Considering that the angular speed of the motor and the corresponding reference, change inversely to the unwinder/winder diameter;

Set: **PI top lim** = 1  **PI bottom lim** = Φ<sub>min</sub> / Φ<sub>max</sub> = 100 / 700 = 0.14

Below is an explanation of above settings.

Calculation of the angular speed of the motor:

ω<sub>max</sub> = Vl / (π x Φ<sub>min</sub> x R)  and  ω<sub>min</sub> = Vl / (π x Φ<sub>max</sub> x R)
where:
\( \omega_{\text{max}} \) = angular speed of the motor in conditions of min. diameter [rpm]
\( \omega_{\text{min}} \) = angular speed of the motor in conditions of max. diameter [rpm]
\( V_l \) = line speed
\( \Phi_{\text{min}} \) = min. diameter of the core [m]
\( \Phi_{\text{max}} \) = max. diameter of the core [m]
\( R \) = gear reduction ratio motor-winder/unwinder

So:
\[ \frac{\omega_{\text{max}}}{\omega_{\text{min}}} = \frac{\Phi_{\text{max}}}{\Phi_{\text{min}}} \]
from which
\[ \omega_{\text{min}} = \left( \frac{\Phi_{\text{min}}}{\Phi_{\text{max}}} \right) \times \omega_{\text{max}} \]

Considering that the parameters \textbf{PI top lim} and \textbf{PI bottom lim} can be seen as multiplier factors of min. and max. of the feed-forward.
Multiplying the feed-forward by \textbf{PI top lim} = 1, gives the max. speed reference concerning the minimum diameter.
Multiplying the feed-forward by \textbf{PI bottom lim} = 0.14, gives the min. speed reference concerning the max. diameter.

This application operates by using the proportional-integral regulation.
The gains of a single component will be experimentally set with a loaded machine. It is possible to begin the tests with the values below:
Set \textbf{PI P gain PID} = 15%
Set \textbf{PI I gain PID} = 8%
Set \textbf{PD P gain PID} = 5%

In this case, use the derivative component for forcing the regulator output during velocity changes of the system.
Programming for example:
\textbf{PD D gain PID} = 20%
\textbf{PD D filter PID} = 20ms
In case it is necessary to carry out a reference cascade for another drive, program \textbf{PID output} on an analog output, for example:
\textbf{Analog output 1 / Select output 1} = \textbf{PID output}
(with \textbf{Real FF PID} = 10000 count, \textbf{Analog output 1} = 10V).

\textbf{Parameters regarding the calculation function of the initial diameter}
This function is always necessary when one has to control an unwinder or when the starting diameter is unknown.
Set \textbf{Positioning spd} at the value in rpm with which the initial positioning of the dancer has to be done. For example:
\textbf{Positioning spd} = 15rpm
The polarity of the reference assigned to \textbf{Positioning speed} will be anyway (winder/unwinder) equal to the one functioning as a winder.
If for example one has to control an unwinder and the speed reference in standard functioning is positive, assign to \textbf{Positioning spd} a negative value.
Set **Max deviation** at a value slightly lower than the one correspondent to the position of max. mechanical sealing allowed by the dancer.

During commissioning, it is always necessary to carry out the self calibration of the analog inputs of the drive. In particular the one regarding analog input 1, with dancer in its position of lower fullrange. This position is automatically assigned to the value 10000. So in order to guarantee a precise calculation it might be assigned:

**Max deviation** = 8000 (Default value)

Set **Gear box ratio** equal to the reduction ratio between the motor and the winder/unwinder:

**Gear box ratio** = 0.5

Set **Dancer constant** to the value in mm correspondent to the total accumulation of material in the dancer:

\[
Dancer \text{ constant} = (\Delta L \times 2) \times 2 = (160 \times 2) \times 2 = 640 \text{mm}
\]

*Figure 6.16.3.11: Diameter calculation*

Measure of **Dancer constant:**

Set the keypad of the drive on the parameter **PID feed-back.**

Measure and multiply by 2, the distance between the lower mechanical fullrange and the position of the dancer so that in the parameter **PID feed-back** will display 0 (position of 0 electric).

As the dancer has only one pitch, multiply the above calculated value by 2.

In this case set:

**Dancer constant** = 640mm

Programm **Minimum diameter** equal to the minimum value of the core diameter [cm]:

**Minimum diameter** = 10cm
Use of the diameter sensor

The diameter sensor can be used in case of unwinder system with automatic gear. In these cases, it is necessary to know the value of the starting diameter, in order to calculate the reference of the angular speed of the motor, before the insertion of the new core.

The transducer must set in order to supply a voltage signal proportional to the roll diameter.

Figure 6.16.3.13: Relation between transducer signal and coil signal
Example:
\[ \Phi_{\text{min}} = 90 \text{ mm} \quad \text{transducer output} = 1 \text{V} \]
\[ \Phi_{\text{max}} = 900 \text{ mm} \quad \text{transducer output} = 10 \text{V} \]
\[ \Phi = 450 \text{ mm} \quad \text{transducer output} = 5 \text{V} \]

The analog input to which the sensor is connected, must be programmed as **PI central V3**.
The parameter **PI central v sel**, must be set \( = 3 \).

When **Enable PI PID** = disable, the value of **PI central V3** is written in **PI output PID** and used as multiplier factor of the feed-forward.

As previously described in the instruction book, the setting of PI output PID depends on the diameters ratio, so the voltage signal proportional to the diameter will be automatically recalculated with the formula:

\[ \text{PI central V3} = \left( \frac{\Phi_0}{\Phi_1} \right) \]

Where: \( \Phi_0 \) = minimum winder diameter  
\( \Phi_1 \) = actual diameter

Setting resolution = 3 digits after the comma (also if in **PI central V3** are displayed only 2 digits after the comma).

**Note!** During commissioning, it is necessary to verify that the signal coming from the sensor as proportional to the diameter and that its maximum value is corresponding to 10V (carry out the autotune of the analog input).

It is necessary to verify that **PI top lim** and **PI bottom lim** had been programmed.
**Pressure control for pumps and extruders**

![Diagram of pressure control](image)

*Figure 6.16.3.14: Pressure control for pumps and extruder*

**Machine Data:**

Nominal speed of the extruder motor $V_n = 3000\text{rpm}$
Pressure transducer $0... +10\text{V}$

The extruder slave drive must be sent analog signals concerning speed reference, the pressure transducer, the setting of potentiometer for pressure (supplied between $0\text{V... -10V}$) and the digital commands concerning the enabling of the PID control.

The regulator output must be sent to the speed reference 1.
Setting of the drive: (below are only the parameters regarding the PID function)

**Input/output**

Set **Analog input 1** as input for the pressure transducer.

**Analog input 1 / Select input 1 = PID Feed-back**

Set **Analog input 2** as input for the ramp block. The output of the ramp block must be used as speed reference. (feed-forward).

**Analog input 2 / Select input 2 = Ramp ref 1**
Set Analog input 3 as input for the pressure setting (PID offset 0).

**Analog input 3 / Select input 3 / PID offset 0**

Set Digital input 1 as enabling input for the PI block of the PID

**Digital input 1 = Enable PI PID**

Set Digital input 2 as enabling input for the PD block of the PID

**Digital input 2 = Enable PD PID**

**Parameters**

Set Speed base value equal to the motor nominal speed.

**Speed base value = 3000rpm**

Set PID source as Ramp output.

For PID source set the parameter number to which it will be associated, choosing it from the list of section 10.4. “List of high priority parameters” (Ramp output has the decimal number113).

To obtain the correct value it must be added the decimal value 8192 (fixed offset):

**PID source = (8192 + 113) = 8305**

Set PID source Gain so that Feed-fwd PID, along with the maximum value of Ramp output (corresponding to the maximum value of the analog input 2), reaches 100% of its value = 10000.

The ramp reference and its output automatically acquire their maximum value from the setting of Speed base value. Therefore it must be taken into consideration that each writing or reading of any parameter concerning the speed is defined as RPM x 4.

So: **PID source Gain = max Feed-fwd PID / (Speed base value x 4) = 10000 / (3000 x 4) = 0.833**

Set PID target as Speed ref 1.

**Note:** When the ramp function is enabled, Speed ref 1 is not available. In order to make it available it is necessary to set the parameter Enable ramp = Disable. (This setting allows the working of the ramp block, but disconnects its output from the speed reference 1).

For PID target, set the parameter number to which it will be associated, choosing it from the list of the section 10.4. “List of high priority parameters” (Speed ref 1 has the decimal number 42). To obtain the correct value it must be added the decimal value 8192 (fixed offset):

**PID target = 8192 + 42 = 8234**

Set PID out scale so that the maximum analog value on Analog input 2 (Feed-fwd PID = 10000) and with Enable PI PID and Enable PD PID = Disable, Speed ref 1 were equal to 3000rpm.

The Speed ref 1 must be set as RPM x 4, then:

**PID out scale = (3000 x 4) / 10000 = 1.2**

Set PI central v sel = 1.

Set PI central v 1 = 1

In absence of correction performed by the PI block of the regulator, the line reference speed (Feed-forward) must be multiplied x 1 and sent directly to the speed regulator of the drive.

In this application, the regulator makes a proportional-integral control.

Set **PI top limit** and **PI bottom limit** in order to obtain maximum correction of the PI block equal to the 100% of the speed reference.
The parameters, **PI top limit** and **PI bottom limit** could be considered as the multiplier factor respectively maximum and minimum of the feed-forward.

**PI top limit** = 1  
**PI bottom limit** = 0

In this application the regulator uses a proportional-integral type of control.
The gains of the various components must be set with the load on the machine. A reference, it is possible to start the test with the values below (default values):

Set **PI P gain PID** = 10%  
Set **PI I gain PID** = 20%  
Set **PD P gain PID** = 10%

If necessary, use the derivative component for forcing the regulator output during velocity changes of the system, setting for example:  
**PD D gain PID** = 5%  
**PD D filter PID** = 20ms  
If not necessary, keep these parameters = 0.
**6.16.3.11 Generic PID**

Drive settings: (here below are reported only the ones concerning the PID function)

**Input/output**

Set **Analog input 1** as input of the variable which has to be regulated (Feed-back).

Analog input 1 / Select input 1 = PID Feed-back

Set **Analog input 2** as input of the offset signal (**PID offset 0**).

Analog input 2 / Select input 2 / PID offset 0

Set **Digital input 1** as input for the enabling of the PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** as input for the enabling of the PD block of the PID

Digital input 2 = Enable PD PID

**Parameters**

In case it necessary to use the regulator as “Generic PID”, independent from the feed-forward function, the parameter **Feed-fwd PID** must be set at its maximum value. In order to do this it is necessary to go through a PAD parameter.

Set **PID source** come **PAD 0**.

On **PID source** it must be set the parameter number which has to be associated, choosing it from the list of the section 10.4. “List of high priority parameters” (PAD 0 has the decimal number 503).

To obtain the value, it must be added to the decimal value 8192 (fixed offset):

**PID source** = (8192 + 503) = 8695

Set **PAD 0** = 10000

(The parameter **PAD 0** is situated in the menu “Special Function”).

**Note:** Setting **PAD 0** = -10000, the output regulator polarity will be overturned.

Set **PID source Gain** = 1

Set **PID target** with the parameter number that has to be addressed to the output regulator.

To obtain the value it must be added the decimal value 8192.

The parameters that can be addressed are the ones described in the list of the section 10.4. “List of high priority parameters”.

Set **PID out scale** according to the parameter to which the regulator output has been addressed.

From the section 10.4. “List of high priority parameters” comes out that:

The parameters concerning the speed are expressed as [SPD].

For all the drive sizes, the rated current will be 2000 [CURR], so:

**PID out scale** = 2000/ max. output PID = 2000/ 10000 = 0.2
**Note:** In case it would be necessary to use the drive with a provisory current higher than the rated current of the drive, it is possible to increase the above described value of PID out scale. For example, if one wants to obtain 1.5 times the size, one has to set:

**PID out scale** = \(0.2 \times 1.5 = 0.3\)

In this case it is necessary to enable the function of overload control “**Overload contr**” setting correctly the values **Overload current**, **Overload time**, **Base current** and **Pause Time**.

The firmware of the drive does not perform a control on the polarity of the value sent, for this reason, if it is not necessary to address the regulator output on parameters “**Unsigned**”, then set the PID output so that it can be positive.

**PID out. sign PID** = Only positive

The parameters “**Unsigned**”, for example the current limits **T current lim +** and **T current lim -**, are indicated in the “**List of high priority parameters**” with the symbol “**U16**”.

*Set **PI central v sel** = 1.*
*Set **PI central v 1** = 0*

In this configuration, when executing the transition Off / On of the parameters for the enabling of the PID function, the regulator output starts from 0.
If it is necessary to retain the last value calculated also when the machine is disabled, it necessary to use a digital input programmed as:

**Digital input xx = PI central v S0**
*PI central v 1 = 0*

When the digital input is at a low logic level (L), the last value calculated is stored. Applying a high logic level (H) will reset the value.

*Set **PI top lim** and **PI bottom lim** in order to obtain a correction of the PID block equal to 100% of its maximum value.*

**PI top lim** = 1
**PI bottom lim** = -1

In this configuration the PID block output will be either positive and negative.
Setting **PI top lim** = 0, the positive part is blocked.
Setting **PI bottom lim** = 0, the negative part is blocked.

The gains of the various components must be set experimentally with the machine loaded.
It is possible to start the test with the following values:

*Set **PI P gain PID** = 10%*
*Set **PI I gain PID** = 4%*
*Set **PD P gain PID** = 10%*

Use the derivative component as damping component of the system, setting for example:

**PD D gain PID** = 5%
**PD D filter PID** = 20ms
If not necessary maintain these parameters = 0.
6.16.3.12 Application note

Dynamic modification of the integral gain of the PI block

In standard dancer applications, where there is not a build up of material, the PI gains are set to a constant value. Where dancers are used in conjunction with material winding, the gains are compromise between low gain setting at large diameter, and high gain settings at a small diameter. Using the drawing as an example, it can be seen that with a large diameter roll, the amount of material to move the dancer requires only a fraction of a turn. At a small diameter, or empty roll, the center of the roll must rotate a whole turn to move the same amount of material. Since the PI regulator is used to provide the correction in rpm to maintain the dancer position, having the gain set by a single value is inadequate when used with a winder.

Better dancer control is realized if the gain of the PI is modified dynamically based on diameter. This can be accomplished using LINKS function.

In case of higher ratio diameters, PI I gain PID could be dynamically changed according to the actual diameter. At the moment this functionality has not been implemented as specific function.

For example to control a winder having a diameters ratio of 1/10.
The function LINK 1 is used to get a connection between the diameter and the value of the integral component of the PI block.
The integral component of the regulator must have a behaviour inversely proportional to the diameter.
The value of the parameter PI output PID already follows this behaviour. Infact, it changes according to the relation \( \Phi_0 / \Phi_{act} \).
Where: \( \Phi_0 \) = minimum roll diamenter
\( \Phi_{act} \) = actual roll diameter

The operation to carry out through the LINK parameter is:
**PI output PID \times KI = PI I gain PID**
Where KI corresponds to the value of the integral component on minimum diameter condition.
For example, if at min diameter, the maximum speed with steady dancer in electric zero position with **PI I gain PID = 40%**.
The LINK source must be associated to **PI output PID** [n° 771]:

**Source link 1** = 8192 + 771 = 8963

The LINK destination must be associated to the value of the integral component= parameter **PI I gain PID** [n° 764]:

**Destination link 1** = 8192 + 764 = 8956

The multiplier factor must be set to the value defined by the functioning tests above mentioned.

**Mul gain link 1** = 40

It will be necessary to set:

- **Div gain link 1** = 1000 *
- **Input max link 1** = 1000 *
- **Input min link 1** = 100 **
- **Input offset link 1** = 0
- **Output offset link 1** = 0
- **Input absolute link 1** = OFF

* The value 1000 is defined by **PI top lim** which will be in this case = 1 (correspondent to a maximum value of **PI output PID** = 1000).

** The value 100 is defined by **PI bottom lim** which will be in this case = 0.1 (correspondent to a minimum value of **PI output PID** = 100).

With this configuration at minimum diameter it will correspond an integral gain = 40% and at maximum diameter it will correspond to an integral gain = 4%, between the two setpoints the gain will change with an hyperbolic characteristic.

![Figure 6.16.3.16: Relation between PI I gain PID and PI I output PID](image)

The value of **PI I gain PID** will be displayed in the relative parameter of the submenu **PI controls**.

If necessary, using the LINK 2, it is possible to modify, dynamically, the proportional gain **P gain PID**.
Figure 6.16.3.17: General description of the PID blocks
6.17 TORQUE WINDER FUNCTION

The center wind function inside the DV300 converters is used to control winders and unwinders whose tension regulation is carried out via an open or closed loop control.

Apart from calculation functions for torque, diameter, compensation and Taper tension, the system foresees the calculation of the motor speed reference. Such function allows to use the drive on the four regulation quadrants controlling both winders and unwinders, and to control the motor with a peripheral speed proportional to the diameter in case of a break of the wound material.

The torque is adjusted according to the motor flux, thus meaning that the system is suitable to control motors with a constant torque-power ratio.

The closed loop regulation foresees an analog input for the loading cell 0…10V, 0…20mA, 4…20mA.

The output of the center wind function is sent directly to the current limits; the specific parameters T current lim +/- and the limits set by the programmable overload function are anyway active in order to protect both the inverter and the motor; among the three possible settings the one with the lowest value is always the most important.

**Input / Output**

**Line spd source**
Line speed sampling parameter. It is used exclusively for the diameter calculation. The speed threshold, **Ref speed thr**, under which the calculation procedure is blocked, refers to **Ref line speed**. It can be programmed as analog input or encoder input.

**Ref spd source**
Line reference sampling parameter. It is used exclusively for the calculation of:
- the inertia compensations
- the line speed reference.

It can be programmed as analog input or encoder input.

**Analog inputs**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension ref</td>
<td>Per cent tension reference; 10V (20mA) = 100%.</td>
</tr>
<tr>
<td>Tension red</td>
<td>Per cent decrease in the Taper tension; 10V (20mA) = 100%.</td>
</tr>
<tr>
<td>Diam preset 3</td>
<td>Setting of the starting diameter; 10V (20mA) = max. diameter.</td>
</tr>
</tbody>
</table>

**Analog outputs**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll diameter</td>
<td>Present diameter; 10V = max. diameter.</td>
</tr>
<tr>
<td>Act tension ref</td>
<td>Tension reference decreased by the Taper percentage; 10V = 100% Tension ref.</td>
</tr>
<tr>
<td>Torque current</td>
<td>Request for torque current; 5V = drive size.</td>
</tr>
<tr>
<td>W reference</td>
<td>Reference for angular speed, 10V = 100% Base omega.</td>
</tr>
<tr>
<td>Actual comp</td>
<td>Active compensation monitor (it sums up static, dynamic and inertial frictions); 5V = drive size.</td>
</tr>
</tbody>
</table>

**Digital inputs**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque winder En</td>
<td>Enabling of the center wind function.</td>
</tr>
<tr>
<td>Diam calc Dis</td>
<td>Enabling of the diameter calculation.</td>
</tr>
<tr>
<td>Diam inc/dec En</td>
<td>If enabled and if winder, the calculated diameter can never decrease; if unwinder the calculated diameter can never increase. It is used to improve the system stability.</td>
</tr>
<tr>
<td>Wind/unwind</td>
<td>Winder/unwinder selection: 0 = winder, 1 = unwinder.</td>
</tr>
<tr>
<td>Winder side</td>
<td>Selection of the winding/unwinding side: 0 = up, 1 = down</td>
</tr>
</tbody>
</table>
**DV-300 Adjustable Speed Drives**

**—— FUNCTION DESCRIPTION ——**

- **Diam preset sel 0**: LSD digital input; preselection of the starting diameter.
- **Diam preset sel 1**: MSD digital input; preselection of the starting diameter.
- **Diam reset**: Reset of the calculated diameter.
- **Taper Enable**: Enabling of the Taper function.
- **Speed match**: Coil “launching” phase command for automatic switching.
- **Line acc status**: Active acceleration.
- **Line dec status**: Active deceleration.
- **Line fstp status**: Fast deceleration.

The last three parameters are inputs sending to the drive the status of the line speed: they are used when the internal calculation procedure for the line acceleration is disabled.

- **Speed demand En**: Enabling of the speed reference calculation.
- **Closed loop En**: Enabling of the closed loop control.

**Digital outputs**

- **Diameter reached**: Indication: the diameter threshold has been overcome.
- **Spd match compl**: Indication: the “launching” speed has been reached.

### 6.17.1 Diameter calculation

**OPTIONS**

**Torque winder**

<table>
<thead>
<tr>
<th>Diam Calculatio</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[1154]</td>
<td>Roll diameter [m]</td>
</tr>
<tr>
<td>[1160]</td>
<td>Line speed [%]</td>
</tr>
<tr>
<td>[1286]</td>
<td>Ref line speed [%]</td>
</tr>
<tr>
<td>[1161]</td>
<td>Diam calc Dis</td>
</tr>
<tr>
<td>[1205]</td>
<td>Diam inc/dec En</td>
</tr>
<tr>
<td>[1187]</td>
<td>Wind/unwind</td>
</tr>
<tr>
<td>[799]</td>
<td>Minimum diameter [mm]</td>
</tr>
<tr>
<td>[1153]</td>
<td>Maximum diameter [m]</td>
</tr>
<tr>
<td>[1204]</td>
<td>Line spd source</td>
</tr>
<tr>
<td>[1284]</td>
<td>Ref spd source</td>
</tr>
<tr>
<td>[1156]</td>
<td>Line speed gain</td>
</tr>
<tr>
<td>[1285]</td>
<td>Ref speed gain</td>
</tr>
<tr>
<td>[1163]</td>
<td>Base omega [rpm]</td>
</tr>
<tr>
<td>[1155]</td>
<td>Ref speed thr [%]</td>
</tr>
<tr>
<td>[1162]</td>
<td>Diam filter [ms]</td>
</tr>
<tr>
<td>[1206]</td>
<td>Diam init filter [ms]</td>
</tr>
<tr>
<td>[1207]</td>
<td>Diam stdy delay [ms]</td>
</tr>
<tr>
<td>[1157]</td>
<td>Diam reset</td>
</tr>
<tr>
<td>[1158]</td>
<td>Diam thr [%]</td>
</tr>
<tr>
<td>[1159]</td>
<td>Diam reached</td>
</tr>
<tr>
<td>[1168]</td>
<td>Diam preset sel</td>
</tr>
<tr>
<td>[1164]</td>
<td>Diam preset 0 [m]</td>
</tr>
<tr>
<td>[1165]</td>
<td>Diam preset 1 [m]</td>
</tr>
<tr>
<td>[1166]</td>
<td>Diam preset 2 [m]</td>
</tr>
<tr>
<td>[1167]</td>
<td>Diam preset 3 [m]</td>
</tr>
</tbody>
</table>
### Parameter Description

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll diameter [m]</td>
<td>1154</td>
<td>0.000 32.000</td>
<td>****</td>
</tr>
<tr>
<td>Line speed [%]</td>
<td>1160</td>
<td>0.00 200.00</td>
<td></td>
</tr>
<tr>
<td>Ref line speed [%]</td>
<td>1286</td>
<td>0.00 200.00</td>
<td></td>
</tr>
<tr>
<td>Diam calc Dis</td>
<td>1161</td>
<td>0 1 ON (1) ON (1)</td>
<td></td>
</tr>
<tr>
<td>Diam inc/dec En</td>
<td>1205</td>
<td>0 1 Enabled (0) Enabled (0)</td>
<td></td>
</tr>
<tr>
<td>Wind/unwind</td>
<td>1187</td>
<td>0 1 Winder (0) Winder (0)</td>
<td></td>
</tr>
<tr>
<td>Minimum diameter [mm]</td>
<td>799</td>
<td>1 2000 100 100</td>
<td></td>
</tr>
<tr>
<td>Maximum diameter [m]</td>
<td>1153</td>
<td>0.000 32.000 1.000 1.000</td>
<td></td>
</tr>
<tr>
<td>Line spd source</td>
<td>1204</td>
<td>0 65535 0 0</td>
<td></td>
</tr>
<tr>
<td>Ref spd source</td>
<td>1284</td>
<td>0 65535 0 0</td>
<td></td>
</tr>
<tr>
<td>Line speed gain</td>
<td>1156</td>
<td>0 32767 0 0</td>
<td></td>
</tr>
<tr>
<td>Ref speed gain</td>
<td>1285</td>
<td>0 32767 0 0</td>
<td></td>
</tr>
<tr>
<td>Base omega [rpm]</td>
<td>1163</td>
<td>0 8191 1500 1500</td>
<td></td>
</tr>
<tr>
<td>Ref speed thr [%]</td>
<td>1155</td>
<td>0 150.00 5 5</td>
<td></td>
</tr>
<tr>
<td>Diam filter [ms]</td>
<td>1162</td>
<td>0 5000 100 100</td>
<td></td>
</tr>
<tr>
<td>Diam init filter [ms]</td>
<td>1206</td>
<td>0 5000 100 100</td>
<td></td>
</tr>
<tr>
<td>Diam stdy delay [ms]</td>
<td>1207</td>
<td>0 60000 0 0</td>
<td></td>
</tr>
<tr>
<td>Diam reset</td>
<td>1157</td>
<td>0 1 0 0</td>
<td></td>
</tr>
<tr>
<td>Diam thr [%]</td>
<td>1158</td>
<td>0 150.00 10 10</td>
<td></td>
</tr>
<tr>
<td>Diam reached</td>
<td>1159</td>
<td>0 1</td>
<td>**</td>
</tr>
<tr>
<td>Diam preset sel</td>
<td>1168</td>
<td>0 3 0 0</td>
<td></td>
</tr>
<tr>
<td>Diam preset 0 [m]</td>
<td>1164</td>
<td>0.000 32.000 0 0</td>
<td></td>
</tr>
<tr>
<td>Diam preset 1 [m]</td>
<td>1165</td>
<td>0.000 32.000 0 0</td>
<td></td>
</tr>
<tr>
<td>Diam preset 2 [m]</td>
<td>1166</td>
<td>0.000 32.000 0 0</td>
<td></td>
</tr>
<tr>
<td>Diam preset 3 [m]</td>
<td>1167</td>
<td>0.000 32.000 0 0</td>
<td>***</td>
</tr>
</tbody>
</table>

* This parameter can be set on a programmable digital input.
** This parameter can be set on a programmable digital output.
*** This parameter can be set on a programmable analog input.
**** This parameter can be set on a programmable analog output.

The inputs received by the diameter calculator are the angular speed of the controlled motor and the line speed. The latter can be measured through an analog input or an encoder.

The value of the calculated diameter can be sent to an analog output; via a digital output it is also possible to state the overcoming of a programmable threshold.

It is possible to select four values of the starting diameters; one value can derive from an analog input.

- **Roll diameter**: Monitor of the calculated diameter in [m].
- **Line speed**: Monitor of the line speed in [%].
- **Ref line speed**: Reference monitor for the line speed in [%].
- **Diam calc Dis**: Disabling of the diameter calculation (see also par. **Ref speed thr**). In case such function is temporarily disabled during the functioning period, the system stores the last calculated value.
- **Diam inc/dec En**: If enabled and if winder, the calculated diameter can never decrease; if unwinder the calculated diameter can never increase. It is used to improve the system stability.
- **Wind/unwind**: Winder/unwinder selection. If the selection is carried out via a digital input: 0V = winder, +24V = unwinder.
**Minimum diameter** Value of the minimum diameter in [mm].

**Maximum diameter** Value of the maximum diameter in [m].

**Line spd source** Number of the sampling parameter for the line speed. In order to obtain the real number to be set, it is necessary to add +2000H (8192 decimal) to the parameter number.

Programming example for the encoder 1 (connector XE1) on **Line speed source**:

```
OPTION Menu
  ------------> Torque winder
  ------------> Diam calculation
  ------------> Line speed source = 8619
```

Paragraph 10.4. “List of the high priority parameters” shows that **Enc 1 speed** has the decimal number 427. In order to obtain the value to be entered it is necessary to add 8192 decimal (fixed offset): 8192 + 427 = 8619

Programming example for the analog input 2 on **Line speed source**:

a) input programming on a PAD parameter

```
I/O CONFIG Menu
  ------------> Analog input
  ------------> Analog input 2
  ------------> Select input 2 = PAD 0
```

b) setting of **PAD 0** as a line speed input:

```
OPTION Menu
  ------------> Torque winder
  ------------> Diam calculation
  ------------> Line speed source = 8695
```

Paragraph 10.4. “List of the high priority parameters” shows that **PAD 0** has the decimal number 503. In order to obtain the value to be entered it is necessary to add 8192 decimal (fixed offset): 8192 + 503 = 8695

**Line speed gain** Calibration value for the line speed.

Its setting depends on the sampling parameter of the line speed; it is used to obtain “Line speed” = 100% at its maximum value

The calculation of **Line speed gain** must be carried out with the formula:

\[
\frac{32768 \times 16384}{(\text{maximum value of the sampling parameter} \times 8)} - 1
\]

Programming example for the encoder 1 (connector XE1) on **Line speed source**:

If the encoder has an unknown rotation speed, the input value of the encoder 1 can be read in the

```
MONITOR Menu
  ------------> Measurements
  ------------> Speed
  ------------> Speed in rpm
  ------------> Enc 1 speed
```
Remember that the drive internally converts the speed in \( \text{RPM} \times 4 \), therefore assuming to have maximum \textbf{Enc 1 speed} = 1500rpm:

**Line speed gain** = \( \left[ 32768 \times 16384 / (1500 \times 4 \times 8) - 1 \right] = 11184 \)

Programming example for the analog input 2 on **Line speed source**:

When an analog input is set on a PAD parameter, its maximum value is \(+ / - 2048\), therefore in order to have **Line speed** = 100%:

**Line speed gain** = \( \left[ 32768 \times 16384 / (2048 \times 8) - 1 \right] = 32767 \)

(In order to obtain a fine tuning it is necessary to carry out the self tuning procedure of the analog input).

**Ref spd source**

**Ref speed gain**

Their functions are similar to **Line speed source** and **Line speed gain**. They can set the signal used for the calculation of the inertia compensations and of the speed reference. With the exception of particular conditions, for example a difference between the line speed and the speed reference due to the presence of a loop on the material, such values are set on the same source with the same gains.

**Base omega**

Value in [rpm] corresponding to the maximum angular speed of the winder/unwinder (motor shaft side).

**Line speed thr**

Line speed detecting threshold in %.

When “Ref line speed” is lower than “Ref speed thr” the diameter calculation is stopped. The diameter is kept at a constant value. When “Ref line speed” overcomes the threshold, the diameter calculation is enabled with an initial filter corresponding to **Diam init filter** for the time set in **Diam stdy delay**. At the end of this time the filter will be set to **Diam filter**.

**Diam filter**

Filter on the diameter calculation in [ms].

**Diam init filter**

Initial filter on the diameter calculation in [ms].

**Diam stdy delay**

Time in [ms] during which the value of **Diam init filter** is kept active after **Line speed thr** has been overcome.

**Diam reset**

Diameter reset. When this parameter is enabled, the diameter gets a starting value selected with **Diam preset sel**.

**Diam thr**

Programmable diameter threshold as a percentage of **Maximum diameter**. The threshold overcoming is detected by **Diam reached** and it can be sent to a digital output.

**Diam reached**

Indication for the overcoming of the diameter threshold.

**Diam preset sel**

Selector of the starting diameter \([0 \ldots 3]\). **Diam preset sel** can be set directly via the keypad or serial line or via two digital inputs programmed as **Diam preset sel 0** and **Diam preset sel 1**, the selection in this case is carried out with a binary logic.

**Diam preset 0**

0 starting diameter in [m]. The setting of this value must be included between **Minimum diameter** and **Maximum diameter**.

**Diam preset 1**

1 starting diameter in [m]. The setting of this value must be included between **Minimum diameter** and **Maximum diameter**.

**Diam preset 2**

2 starting diameter in [m]. The setting of this value must be included between **Minimum diameter** and **Maximum diameter**.

**Diam preset 3**

3 starting diameter in [m]. The setting of this value must be included between **Minimum diameter** and **Maximum diameter**.

It can be assigned to an analog input, in this case 10V correspond to **Maximum diameter** and the voltage referring to the minimum diameter is \( = 10 \times (\text{Minimum diameter} / \text{Maximum diameter}) \).
6.17.2 Torque calculation

The torque calculator is made of three blocks:
1. Torque calculation according to the winder/unwinder ray and to the set tension: \( C = T \times r \)
2. Calculation of the static, dynamic and inertial compensations
3. If the Taper function is enabled, the calculation of the tension curve is made according to the ray.

The tension and Taper reduction references can be sent via an analog input, serial line or field bus. The calculation of the angular acceleration, necessary to the inertial compensations, can be carried out through an appropriate internal function or by stating via three digital inputs the acceleration, deceleration and fast deceleration conditions.

The connection to the PID function belongs to the compensation block. Such connection is necessary when a closed loop tension control with loading cell is carried out.

The calculation result is sent directly to the drive current limits and can be monitored in the parameters **In use Tcur lim** + and **In use Tcur lim** – of the LIMITS menu.

The standard parameters **T current lim** +/- and the limits set by the programmable overload function are anyway active in order to protect both the inverter and the motor; the settings with the lowest value is always the most important. It is also possible to set a specific current limit for the coil “launching” function during an automatic switching. The outcoming tension value and that of the calculated torque current can be monitored on the analog outputs.

**OPTIONS**

<table>
<thead>
<tr>
<th>Torque winder</th>
<th>Torque calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Parameter description" /></td>
<td><img src="image" alt="Parameter values" /></td>
</tr>
<tr>
<td>Parameter description</td>
<td>No.</td>
</tr>
<tr>
<td>Tension ref [%]</td>
<td>1180</td>
</tr>
<tr>
<td>Tension scale [%]</td>
<td>1181</td>
</tr>
<tr>
<td>Act tension ref [%]</td>
<td>1194</td>
</tr>
<tr>
<td>Torque current [%]</td>
<td>1193</td>
</tr>
</tbody>
</table>

* This parameter can be set on a programmable analog input.
** This parameter can be set on a programmable analog output.

**Tension ref**
Per cent tension reference.

**Tension scale**
Scale factor of the torque current in %.

This parameter is used when the value of the maximum winding torque has to be limited or when a closed loop control is used in order to adjust the torque current value to the real tension on the material measured by the loading cell.

As for tuning refer to paragraph *Application example*.

**Act tension ref**
Monitor of the % tension reference less the Taper percentage set via **Tension ref**; if the Taper function is not enabled, it corresponds to **Tension ref**.

**Torque current**
Monitor for the requirement of the torque current in %.
### 6.17.2.1 Compensations and closing of the tension loop

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>Int acc calc En</td>
<td>1183</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Torque winder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Torque calcul</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comp calcul</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time acc/dec min [s]</td>
<td>1182</td>
<td>0.15</td>
<td>300.00</td>
</tr>
<tr>
<td>Acc/dec filter [ms]</td>
<td>1212</td>
<td>0</td>
<td>5000</td>
</tr>
<tr>
<td>Line acc [%]</td>
<td>1184</td>
<td>0.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Line dec [%]</td>
<td>1185</td>
<td>0.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Line fast stop [%]</td>
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<td>Line acc status</td>
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</tr>
<tr>
<td>Line dec status</td>
<td>1189</td>
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<td>1</td>
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<tr>
<td>Line fstp status</td>
<td>1190</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Variable J comp [%]</td>
<td>1171</td>
<td>0.00</td>
<td>199.99</td>
</tr>
<tr>
<td>Constant J comp [%]</td>
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<td>+100.00</td>
</tr>
<tr>
<td>Act var J comp [%]</td>
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<td>-</td>
<td>200.00</td>
</tr>
<tr>
<td>Act const J comp [%]</td>
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<td>200.00</td>
</tr>
<tr>
<td>Mat width [%]</td>
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<td>100.00</td>
</tr>
<tr>
<td>Static f [%]</td>
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</tr>
<tr>
<td>Dinamic f [%]</td>
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<td>0.00</td>
<td>199.99</td>
</tr>
<tr>
<td>Static f Zero</td>
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<td>1</td>
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<tr>
<td>Actual comp [%]</td>
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<td>+200</td>
</tr>
<tr>
<td>Closed loop En</td>
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<td>0</td>
<td>1</td>
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<tr>
<td>Closed loop comp</td>
<td>1208</td>
<td>-32767</td>
<td>+32767</td>
</tr>
</tbody>
</table>

* This parameter can be set on a programmable digital input.
** This parameter can be set on a programmable digital output.
**Int acc calc En**  
Enabling of the calculation of the coil acceleration.

If enabled this function carries out the calculation of the angular acceleration inside the drive. In this case it is necessary to set just the value of **Time acc/dec min**. If disabled, it is necessary to set the parameters **Line acc %**, **Line dec %**, **Fast stop %** and **Time acc/dec min** and to supply the corresponding status indication to the digital inputs.

**Time acc/dec min**  
Time in [s] corresponding to the lower acceleration, deceleration and fast deceleration time.

**Acc/dec filter**  
Filter in [ms] on the calculation of the acceleration inside the drive.

**Line acc %**  
Acceleration time as a percentage of **Time acc/dec min**.

Ex:  
Acceleration = line deceleration = 10s  
Fast deceleration (fast stop) = 5s  
Time acc/dec min = 5s  
Line acc % = (5 / 10) x 100 = 50%

**Line dec %**  
Deceleration time as a percentage of **Time Acc/dec min**.

Ex:  
Acceleration = line deceleration = 10s  
Fast deceleration (fast stop) = 5s  
Time acc/dec min = 5s  
Line dec % = (5 / 10) x 100 = 50%

**Line fast stop %**  
Fast deceleration time as a percentage of **Time Acc/dec min**.

Ex:  
Acceleration = line deceleration = 10s  
Fast deceleration (fast stop) = 5s  
Time acc/dec min = 5s  
Line fast stop % = (5 / 5) x 100 = 100%

**Line acc status**  
Acceleration stating input.

**Line dec status**  
Deceleration stating input.

These two indications are combined with the drive digital outputs **Acc state** and **Dec state** (see fig. 6.17.1).

![Ramp output](https://via.placeholder.com/150)

**Figure 6.17.1: Acceleration and deceleration indication**

**Line fstp status**  
Indication of a fast deceleration.

**Variable J comp**  
Torque compensation due to the wound material as a percentage of the drive rated current. As for tuning see the paragraph **Application example**.
| **Constant J comp** | Compensation of the fixed section (motor, reducer, pin) as a percentage of the drive rated current. As for tuning see the paragraph *Application example*. |
| **Act var J comp** | Monitor for the active compensation of the variable section as a percentage of the drive rated current. |
| **Act const J comp** | Monitor for the active compensation of the fixed section as a percentage of the drive rated current. |
| **Mat width** | Width of the wound material as a percentage of the maximum width. |
| **Static f** | Compensation of the static frictions as a percentage of the drive rated current. As for tuning see the paragraph *Application example*. |
| **Dinamic f** | Compensation of the dynamic frictions as a percentage of the drive rated current. As for tuning see the paragraph *Application examples*. |
| **Static f Zero** | By setting the parameter on “Enabled”, the friction compensation is completely inserted for all speed values. When it set as “Disabled”, the static friction compensation is completely inserted with Ref line speed = 1.5%. |
| **Act comp** | Monitor for the active compensations (it sums up the static, dynamic and inertial frictions) as a percentage of the drive rated current. |
| **Closed loop En** | Enabling of the tension loop closing (to be used with a loading cell). |
| **Closed loop comp** | Monitor for the active compensation, output of the PID regulator used for the loop closing. |
6.17.2.2 Taper function

**OPTIONS**
- Torque winder
- Torque calculator
- Taper function

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taper enable</td>
<td>1176</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Init diameter [m]</td>
<td>1177</td>
<td>0.000</td>
<td>32.000</td>
</tr>
<tr>
<td>Final diameter [m]</td>
<td>1178</td>
<td>0.000</td>
<td>32.000</td>
</tr>
<tr>
<td>Tension ref [%]</td>
<td>1180</td>
<td>0.00</td>
<td>199.99</td>
</tr>
<tr>
<td>Tension red [%]</td>
<td>1179</td>
<td>0.00</td>
<td>199.99</td>
</tr>
<tr>
<td>Act tension ref [%]</td>
<td>1194</td>
<td>0.00</td>
<td>200.00</td>
</tr>
</tbody>
</table>

* This parameter can be set on a programmable digital input.
** This parameter can be set on a programmable analog input.
*** This parameter can be set on a programmable analog output.

![Diagram](image.png)

**Figure 6.17.2: Relation among the Taper function parameters**

- Taper enable: Enabling of Taper function.
- Init diameter: Diameter for the starting of the taper tension reduction in meters.
- Final diameter: Diameter for the ending of the taper tension reduction in meters.
- Tension ref: Tension reference in %.
- Tension red: Taper tension reduction as a percentage of Tension ref.
- Act tension ref: Monitor for the active tension reference as a percentage of Tension ref.
6.17.3 Calculation of the speed reference

The calculation and control of the reference for the motor angular speed allow to use the drive on the four regulation quadrants both with a winder and unwinder control and to control the motor with a peripheral speed proportional to the diameter in case the wound material breaks down.

Such program block contains also the control of the coil “launching” reference during the initial and automatic switching phases with a stopped line.

The calculator output can be addressed to one of the four possible speed references of the drive or on an analog output.

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed demand En</td>
<td>1215</td>
<td>0  1</td>
<td>Factory American</td>
</tr>
<tr>
<td>Winder side</td>
<td>1201</td>
<td>0  1</td>
<td>Factory European</td>
</tr>
<tr>
<td>W gain [%]</td>
<td>1202</td>
<td>0  100</td>
<td></td>
</tr>
<tr>
<td>Speed match</td>
<td>1195</td>
<td>0  1</td>
<td></td>
</tr>
<tr>
<td>Spd match gain [%]</td>
<td>1200</td>
<td>0  150</td>
<td></td>
</tr>
<tr>
<td>Spd match acc [s]</td>
<td>1196</td>
<td>0.30 300.00</td>
<td></td>
</tr>
<tr>
<td>Spd match dec [s]</td>
<td>1197</td>
<td>0.30 300.00</td>
<td></td>
</tr>
<tr>
<td>Spd match compl</td>
<td>1203</td>
<td>0  1</td>
<td></td>
</tr>
<tr>
<td>Spd match torque [%]</td>
<td>1216</td>
<td>0  200</td>
<td></td>
</tr>
<tr>
<td>W offset [rpm]</td>
<td>1199</td>
<td>0  1000</td>
<td></td>
</tr>
<tr>
<td>Offset acc time [s]</td>
<td>1198</td>
<td>0.30 950.00</td>
<td></td>
</tr>
<tr>
<td>W target</td>
<td>1210</td>
<td>0  65535</td>
<td></td>
</tr>
<tr>
<td>W reference [rpm]</td>
<td>1217</td>
<td>-8192 +8192</td>
<td></td>
</tr>
<tr>
<td>Jog TW enable</td>
<td>1256</td>
<td>0  1</td>
<td></td>
</tr>
<tr>
<td>Jog TW speed [%]</td>
<td>1255</td>
<td>0  100</td>
<td></td>
</tr>
</tbody>
</table>

* This parameter can be set on a programmable digital input.
** This parameter can be set on a programmable digital output.
*** This parameter can be set on a programmable analog output.
<table>
<thead>
<tr>
<th><strong>Parameter</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed demand En</td>
<td>Speed reference calculation enabled.</td>
</tr>
<tr>
<td>Winder side</td>
<td>Selection of the winding/unwinding side: 0 = up, 1 = down.</td>
</tr>
<tr>
<td>W gain</td>
<td>Setting of the speed reference gain used to saturate the loop. Percentage of the increasing/decreasing value of the angular speed reference.</td>
</tr>
<tr>
<td>Speed match</td>
<td>Command of the coil “launching” phase for an automatic switching.</td>
</tr>
<tr>
<td>Spd match gain</td>
<td>Setting of the speed reference gain during the launching phase, 100% corresponds to a peripheral speed equal to the line speed.</td>
</tr>
<tr>
<td>Spd match acc</td>
<td>Motor acceleration time during the launching phase, in [s].</td>
</tr>
<tr>
<td>Spd match dec</td>
<td>Motor deceleration time in [s] if during the launching phase a stop command is given.</td>
</tr>
<tr>
<td>Spd match compl</td>
<td>Indication of a completed launching ramp, if it is programmed on a digital output it can be used to state that the coil can be changed.</td>
</tr>
<tr>
<td>Spd match torque</td>
<td>Setting of the torque current during the launching and change phase. The parameter is given as a percentage of the drive rated current.</td>
</tr>
<tr>
<td>W offset</td>
<td>Offset setting on the speed reference for the initial phase of the winder/unwinder when the line is stopped. The parameter is given in [rpm].</td>
</tr>
<tr>
<td>Offset acc time</td>
<td>Setting of the ramp for the initial phase when the machine is stopped. The parameter is given in [s]. It refers to Speed base value.</td>
</tr>
<tr>
<td>W target</td>
<td>Parameter number where the speed reference has to be addressed to. In order to obtain the real number to be set, it is necessary to add +2000H (8192 decimal) to the parameter number.</td>
</tr>
</tbody>
</table>

1. **Addressing example on the speed reference 2:**

   Option Menu
   
   ————> Torque winder
   
   ————> Speed demand
   
   ————> W target = 8235

   Paragraph 10.4. “List of the high priority parameters” shows that **Speed ref 2** has the decimal number 43. In order to obtain the value to be entered, it is necessary to add 8192 decimal (fixed offset): 8192 + 427 = 8235

<table>
<thead>
<tr>
<th><strong>Parameter</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>W reference</td>
<td>Monitor for the speed reference.</td>
</tr>
<tr>
<td>Jog TW enable</td>
<td>Jog function enabled.</td>
</tr>
<tr>
<td>Jog TW speed</td>
<td>Reference setting for Jog function. The parameter is given as a % of <strong>Line speed</strong>.</td>
</tr>
</tbody>
</table>
**Control of the speed reference**

In order to calculate the speed reference during the different functioning phases of the machine, a status logic has been developed. The status sequence and the operativeness is described in the figure 6.17.3.

**Status 1:**

Default status, this system condition is given when the drive is in a Stop condition. The speed reference is zero.

**Status 2:**

The system reaches this status when the Start command is given.

When the line is stopped, the initial phase reference $W_{\text{offset}}$ is assigned with the ramp time $\text{Offset acc time}$. When the line is started, the motor speed reference follows its profile with a value corresponding to:

\[
W_{\text{reference}} = \pm \text{Line speed} \times (\text{Minimum diameter} ÷ \text{Roll diameter}) \pm (W_{\text{gain}} \% + W_{\text{offset}})
\]

the sign of:

\[
\pm \text{Line speed} \times (\text{Minimum diameter} ÷ \text{Roll diameter})
\]

is positive if $\text{Wind/unwind} = \text{winder}$

is negative if $\text{Wind/unwind} = \text{unwinder}$

the sign of:

\[
\pm (W_{\text{gain}} \% + W_{\text{offset}})
\]

is usually positive, it could be changed only if during the acceleration or deceleration phases a torque inversion is required.

The polarity of $W_{\text{reference}}$ will be further inverted if $\text{Winder side} = 1$ (winding/unwinding down).

If during a Status 1 functioning period the system receives a Stop command $(\text{Start drive} = 0)$, the Status 5 is forced.
**Status 3:**

The system reaches this status if the command **Speed match = 1** and the Start command are given. Starting from a Stop condition, if these commands are given, the motor speed reference is set with:

\[ W_{reference} = \pm \text{Line speed} \times \left( \frac{\text{Min dia}}{\text{Roll dia}} \right) \pm (W\text{ gain} \% \times W\text{ offset}) \times \text{Spd match gain} \]

where \( W\text{ offset} \) is forced to 0 with a ramp time set to **Spd match acc**.

If during a Status 3 functioning period the command **Speed match** is set at zero, the Status 4 is forced. If during a Status 3 functioning period the system receives a Stop command (Start drive = 0), the Status 5 is forced.

**Status 4:**

The system reaches this status if starting from the Status 3 the command **Speed match** is set at zero. It usually happens simultaneously with the cutting and coil change command. In this status the motor speed reference is set to:

\[ W_{reference} = \pm \text{Line speed} \times \left( \frac{\text{Minimum diameter}}{\text{Roll diameter}} \right) \pm (W\text{ gain} \% + W\text{ offset}) \]

all the internal ramp times for the reference calculation are set at zero.

If during a Status 4 functioning period the system receives a Stop command (Start drive = 0), the Status 5 is set at zero.

**Status 5:**

The system reaches this status through the Status 2, 3, and 4 if it receives a Stop command (Start drive = 0). It usually happens:

a) after an automatic switching in order to stop the rotating coil.

   The speed reference is set at zero with a ramp time set to **Spd match dec**.

   The parameter **W offset** is immediately set at zero in order to slow down the coil starting from the present speed

b) After the line stop if the tension has to be removed (in this case the drive has to be disabled).

Anyway, when the speed = 0 has been reached, the system switches automatically to the Status 1.
**Status 6:**

The system reaches this status when the parameter **Jog TW enable** is enabled and the Start command has been given. The Jog command is used on unwinders in order to bring the coil material till the first nip roll. See figure 6.17.4.

**Jog TW enable** prepares the system for a particular functioning condition; in order to enable the coil rotation it is necessary to give the Start command, a following Stop will force the speed reference to 0 (see paragraph *Control logic*).

In the Status 6 the motor speed reference is set to:

\[ W \text{ reference} = Jog \text{ TW speed} \times \text{Minimum diameter} \div \text{Roll diameter} \]

It is possible to change the Jog speed sign by using the command **Winder side**.

If starting from the Status 6, **Jog TW enable** is disabled by keeping the Start command, the system switches to the Status 2.
6.17.4 Typical connection diagrams

Figure 6.17.5: Winder with an automatic switch and a closed loop tension regulation
Figure 6.17.6: Winder with an automatic switch and a closed loop tension regulation

(Interface card of the second encoder)
I/O expansion card on DV300 winder motor (connector XBA)

Figure 6.17.7: Winder with an automatic switch and a closed loop tension regulation
(I/O expansion card)
Figure 6.17.8: Winder with an automatic switch and a closed loop tension regulation

(I/O expansion card)
6.17.5 Control logic

This chapter describes the most common logic sequences:
1. Diameter initialization
2. Initial phase
3. Automatic switch
4. Coil stop
5. Jog function

Diameter initialization

This sequence is carried out before the starting of a winder/unwinder both with a coil initial phase when the line is stopped and during an automatic switching.

The diameter value set in Roll diameter depends on the parameters Diam preset 0, 1, 2, 3 and on Diam preset sel.

If 2-4 different values of the starting diameter have been set, the selection has to be carried out via some programmed digital inputs such as Diam preset sel 0 and Diam preset sel 1, or via the parameter Diam preset sel.

If the value of the starting diameter is set via an analog input, set Diam preset sel = 3.
Enable the parameter Diam reset for a time longer than 20ms.
Reset the digital input status before the start.

Initial phase

This sequence is carried out in order to start the initial phase with a stopped line.

Initialize the diameter value as stated above.
Enable the tension control and give the start command to the drive.

If the speed reference calculation is carried out inside the drive (Speed demand en = Enable) the initial phase is started with the reference set to W offset and with a ramp time Offset acc time.

Now the line can be started.
**Automatic switching**

This sequence carries out an automatic switching between two coils during a winding/unwinding period.

![Diagram of automatic switching between two coils during a winding/unwinding period](image)

**Figure 6.17.10: Automatic switching between two coils during a winding/unwinding period**

a) **Commands referring to the old coil:**

During the star rotation phase it is advisable to disable the diameter calculation of the coil functioning as **Diam calc dis** = 1 in order to avoid errors in the diameter calculation.

b) **Commands referring to the new coil:**

Initialize the diameter value as stated above.

Enable the command **Speed match**, **Torque winder en** and give the start command to the drive. The motor will increase the coil speed till a peripheral speed has been reached which corresponds to the line speed for **Spd match gain** with the ramp set to **Spd match acc**. After reaching such speed, the drive indicates the end of the launching phase with the parameter **Spd match compl**.

Disable the command **Spd match** simultaneously to the switching between the two coils.

Enable the diameter calculation: **Diam calc dis** = 0.

**Reel stop**

This sequence is used to stop the ended reel after carrying out the automatic switching.

Disabled the diameter calculation **Diam calc Dis** = 1 and Start command. The reel will decrease up to zero speed with the time set on **Spd match dec**.

At speed = 0 disabled **Torque winder en**.
**Jog function**

This sequence is used in particular on unwinders in order to bring the coil material till the first nip roll.

Initialize the diameter value as stated above.
Disable the diameter calculation. Enable **Jog TW enable**.
Use the Start/stop command to carry out the Jog function.
With the Start the motor increases the coil speed till reaching the peripheral speed set in **Jog TW speed** with the ramp time **Spd match acc**.
With the Stop the motor decreases its speed till reaching the 0 speed with the ramp time **Spd match dec**.
In order to change the rotation direction use the command **Winder side**.
6.17.6 Application example

Machine data:

Maximum line speed=400m/min  
Rated speed of the winder motor Vn=3000rpm  
Winder maximum diameter=0.7m  
Winder minimum diameter=100mm  
Motor - winder reduction ratio=0.5  
Line speed reference 0-10V from nip roll motor.  
Line acceleration/deceleration time =30sec.  
Fast deceleration time fast/stop=15 sec.  
Winder/unwinder selection via a digital input.  
Winding side selection (up/down) via a digital input.  
Tension setting via the analog input.

The winder/unwinder drive receives the analog signals referring to the line speed, to the tension setting, to the digital commands for the winder/unwinder selection, winding side (up/down), and to the diameter reset.  
Drive settings:(only the settings referring to the function Torque Winder are described)
PROGRAMMING OF ANALOG INPUTS

ANALOG INPUT 1

Tension ref

Tension reference in %; 10V (20mA)=100%

I/O CONFIG Menu

———> Analog input

———> Analog input 1

———> Select input 1 Tension ref:

ANALOG INPUT 2

If the parameter Line spd source has to be set on an analog input, as this parameter is not listed among the high priority parameters, it is necessary to pass through a support parameter PAD0…PAD15.

Line spd source: 10V (20mA)=100%

Programming of the analog input 2 on PAD 0:

I/O CONFIG Menu

———> Analog input

———> Analog input 2

———> Select input 2 = PAD 0

ANALOG INPUT 3

If the parameter Ref spd source has to be set on an analog input, as this parameter is not listed among the high priority parameters, it is necessary to pass through a support parameter PAD0…PAD15.

Ref spd source: 10V (20mA)=100%

Programming of the analog input 2 on PAD 1:

I/O CONFIG Menu

———> Analog input

———> Analog input 3

———> Select input 3 = PAD 1

PROGRAMMING OF DIGITAL INPUTS

DIGITAL INPUT 1

Diam calc Dis:

Disabling of the diameter calculation (see also par. Line speed thr). In case during the functioning period it is temporarily disabled, the system stores the last calculated value. This function has to be enabled only if the application requires it.

I/O CONFIG Menu

———> digital input

———> digital input 1: Diam calc Dis:

DIGITAL INPUT 2

Wind/unwind

Winder/unwinder selection. In case the selection is carried out via the digital input: 0V = Winder, +24V = Unwinder.
DIGITAL INPUT 3
Winder side
Selection of the winding/unwinding side: in case the selection is carried out via a digital input: 0 = UP, 1 = Down

DIGITAL INPUT 4
Diam reset
Diameter reset. When this parameter is enabled, the diameter gets the starting value selected with Diam preset sel.
If 2-4 different values of the starting diameter have been set, the selection has to be carried out via some programmed digital inputs such as: Diam preset sel 0 - Diam preset sel 0
If the value of the starting diameter is set via an analog input, set Diam preset sel = 3.
In case of a winder control, it is necessary to give a reset command every time a coil change is performed by setting the minimum diameter value (winder empty diam.)
In case of an unwinder control, it is necessary to give a reset command every time a coil change is performed by setting the maximum diameter value (winder maximum diam.).
Enable the parameter Diam reset for a time longer than 20ms.
Reset the digital input status before the start

DIGITAL INPUT 5
Diam preset sel 0

DIGITAL INPUT 6
Diam preset sel 1
In case of a system with a winder or unwinder control, it is possible to set in Diam preset 0 the value of the starting diameter; for the winder control a minimum diameter, for the unwinder control a maximum diameter. Set Diam preset sel = 0 (do not set any digital input as diam preset sel 0-diam preset 1). By starting the command of Diam reset the value of diam preset 0 is entered in Roll diameter.

OPTION Menu
-----> Torque winder

Torque winder En ; set Enable to enable the center wind function.
If the system requires it, it is possible to set this function (enable/disable) also via a digital input.

Setting of the parameters in the DIAMETER CALCULATION menu

PARAMETERS

OPTION Menu
-----> Torque winder
-----> Diam calculation

Wind/unwind
Winder/unwinder selection. Selection to be carried out only if the digital inputs are not set.

Minimum diameter
Minimum diameter value in [mm]. Set 100mm

Maximum diameter
Maximum diameter value in [m]. Set 0.7m

Line spd source
Number of the sampling parameter of the line speed. In order to get the real number to be set it is necessary to add +2000H (8192 decimal) to the parameter number.
Setting of **PAD 0** as a line speed input:

**OPTION Menu**

-----> Torque winder  
-----> Diam calculation  
-----> Line speed source = 8695

**Line speed gain**

Calibration value of the line speed. Its programming depends on the sampling parameter of the line speed; it is used to get “Line speed” = 100% of its maximum value.

The calculation of **Line speed gain** must be carried out with the formula:

\[ \frac{32768 \times 16384}{(\text{maximum value of the sampling parameter} \times 8)} - 1 \]

When this analog input is set on a PAD parameter, its maximum value is + / - 2048, therefore to have **Line speed** = 100%:

**Line speed gain** = \[ \frac{32768 \times 16384}{(2048 \times 8) - 1} \] = 32767

(A fine tuning can be obtained by carrying out the self tuning procedure of the analog input).

**Ref spd source**

Sampling parameter number relating to the line speed reference. In order to get the real number to be set it is necessary to add +2000H (8192 decimal) to the parameter number.

Setting of **PAD 0** as a line speed input:

**OPTION Menu**

-----> Torque winder  
-----> Diam calculation  
-----> Ref speed source = 8695

**Ref speed gain**

Gauging value of the line speed reference. The relative setting depends on the sampling parameter of the line speed reference and is used to obtain “Line speed” = 100% at its peak.

The calculation of **Ref speed gain** must be carried out with the formula:

\[ \frac{32768 \times 16384}{(\text{maximum value of the sampling parameter} \times 8)} - 1 \]

When this analog input is set on a PAD parameter, its maximum value is + / - 2048, therefore to have **Ref line spd** = 100%:

**Ref speed gain** = \[ \frac{32768 \times 16384}{(2048 \times 8) - 1} \] = 32767

(A fine tuning can be obtained by carrying out the self tuning procedure of the analog input).

**Line speed**

Monitor of the line speed in [%]. After programming line speed source and line speed gain it is possible to control the tuning by checking that with a line speed at its maximum value the parameter line speed = 100%.

**Ref line speed**

Line reference Monitor.
**Base omega**  
Value in [rpm] corresponding to the maximum angular speed of the winder/unwinder (motor shaft side).

\[ V_p = \pi \times \Phi_{\text{min}} \times \omega \times R \]

where :

- \( V_p \) = peripheral speed
- \( \Phi_{\text{min}} \) = winder minimum diameter (mm)
- \( \omega \) = motor angular speed
- \( R \) = reduction ratio

\[ \omega = \frac{V_p}{\pi \times \Phi_{\text{min}} \times R} = \frac{400}{(3.14 \times 0.1 \times 0.5)} = 2547 \text{rpm} \]

Base omega = set 2547rpm.

**Ref speed thr**  
Line speed detecting threshold in %.

When “Line speed” is lower than “Line speed thr” the diameter calculation is disabled.

When “Line speed” is higher than the threshold, the diameter calculation is enabled with an initial filter corresponding to **Diam init filter** for the time set in **Diam stdy delay**.

At the end of this time the filter is set to **Diam filter**.

Maximum line speed = 400m/min. Line speed thr=5% (the diameter calculation is automatically enabled at 20m/min).

**Setting of the parameters in the SPEED DEMAND menu**

**PARAMETERS**

- **OPTION Menu**
  - Torque winder
  - Speed demand

- **Speed demand En**  
  Enabling of the speed reference calculation; set **Enable**

- **Winder side**  
  Selection of the winding/unwinding side. Selection to be carried out only if the digital inputs are not set. 0 = up, 1 = down

- **W gain**  
  Setting of the speed reference gain used for the loop saturation. Parameter given as a percentage of the increase/decrease of the angular speed reference.

  **W gain** = 30% (set this starting value)

- **W offset**  
  Offset setting on the speed reference for the winder/unwinder initial phase with a stopped line. Parameter in [rpm].

  **W offset** = 50rpm (check with the material)

- **Offset acc time**  
  Setting of the initial phase ramp with a stopped machine. Parameter in [s]. The acc time refers to the parameter **speed base value**

- **W target**  
  Parameter number which the speed reference has to be addressed to. In order to obtain the real number to be set it is necessary to add 2000H (8192 decimal) to the parameter number.

  **W target** : set 2 as a speed reference:

  **OPTION Menu**

  - Torque winder
  - Speed demand

  **W target** = 8235

Paragraph 10.4. “List of the high priority parameters” shows that **Speed ref 2** has the decimal number 43. In order to obtain the value to be entered add 8192 decimal (fixed offset): 8192 + 427 = 8235

**W reference:**  
It is possible to use it as a monitor for the speed reference.
Setting of the parameters in the COMP CALCULATION menu

OPTION Menu

————> Torque winder

————> torque calculation

————> comp calculation

Static f: Compensation of the static frictions as a percentage of the drive rated current

· Check that the parameters Static f and Dinamic f=0
· Set the tension (tension ref)=0
· The diameter calculation function is blocked (enable the programmed digital input as Dis diam calc)
· Operations to be carried out without line reference, jog function and materials on the machine (the compensation of the static frictions is completely entered only when the line speed is higher than 1.5%).
· Stopped winder/unwinder motor within the current limit (In use t curr lim+/-=0)
· Gradually increase the value of Static f. The motor will start rotating. Set a suitable value so that the winder/unwinder can rotate with a speed near to the zero (it must always be within the current limit. The led Ilim on the keypad is lighted)

Dinamic f: Compensation of the dynamic frictions as a percentage of the drive rated current

· Set the maximum line speed reference, check that the minimum diameter has been set in roll diameter (if not carry out a Diam reset on the minimum diameter)
· Set temporarily the parameter Static f with a value of 10-20%. The motor speed will increase reaching the speed Base omega (the converter in this phase has to overcome the current limit).
· When the motor reaches its rated speed, set the parameter Static f with its previously tuned value. The speed will start decreasing.
· Increase gradually the parameter Dinamic f till the speed ends its decreasing phase and the motor rotates at a constant speed.
· Increase the speed by increasing temporarily the parameter Static f. Reset the parameter Static f with its right value. The motor must keep the reached speed.
· In a negative case, reset the parameter Dinamic f and repeat the tests till the required conditions have been reached.

Static f Zero By setting the parameter on “Enabled”, the friction compensation is completely inserted for all speed values. When it set as “Disabled”, the static friction compensation is completely inserted with Ref line speed = 1.5%.

Int acc calc En Enabling of the calculation for the coil acceleration.
If enabled, this function calculates the angular acceleration inside the drive. In this case it is necessary to set just the value of Time acc/dec min. If disabled, the parameters Line acc % - dec % - fast stop % and Time acc/dec min have to be set and the digital inputs have to be supplied with the suitable indications.
**Time acc/dec min**  
Set the time in [s] corresponding to the lowest acceleration, deceleration and fast deceleration time.  
Set time acc/dec min = 15 sec (time required for a fast deceleration)

**Acc/dec filter**  
Filter in [ms] on the acceleration calculation inside the drive  
Set = 30 msec

**Mat width**  
Width of the wound material as a percentage of the maximum width. Set = 100%

**Constant J comp**  
Compensation of the fixed section (motor, reducer, core) as a percentage of the drive rated current. Increase the value till the motor can increase the speed following the line reference. During this phase the converter has always to be within the current limit.  
- Diameter calculation function disabled (enable the programmed digital input as Dis diam calc)  
- Operations to be carried out without material on the machine,  
- Install the empty winder (check that the parameter Roll diameter = min. diam). Check that the parameters Constant J comp - Variable J comp = 0  
- Set the tension (tension ref) = 0  
- Minimum jog function and line reference  
- Carry out some changes on the line reference.  
- Increase gradually the value of the parameter Constant J comp till the winder/unwinder is able to follow the line speed reference.

**Variable J comp**  
Torque compensation due to the wound material as a percentage of the drive rated current.  
- Operation to be carried out without material on the machine  
- Install a full coil on the winder (check that the parameter Roll diameter = max. diam.).  
- Follow the same procedure as the one carried out for the tuning of Constant J comp

**Act var J comp**  
Monitor for the compensation of the variable section as a percentage of the drive rated current.

**Act const J comp**  
Monitor for the compensation of the fixed section as a percentage of the drive rated current.

**Act comp**  
Monitor for the compensations (it sums up static, dynamic and inertial frictions) as a percentage of the drive rated current.
**Machine data**

Maximum line speed=400m/min  
Rated speed of the winder motor$V_n=3000$rpm  
Winder maximum diameter=0.7m  
Winder minimum diameter=100mm  
Motor-winder reduction ratio=0.5  
Line speed reference 0-10V from nip roll motor.  
Line acceleration/deceleration time =30sec.  
Fast deceleration time fast/stop=15 sec.  
Winder/unwinder selection via a digital input.  
Winding side selection (up/down) via a digital input.  
Tension setting via the analog input.

Set all the parameters as stated in the previous example. After testing the machine with an open loop material, carry out such settings for the tuning with a loading cell.
ANALOG INPUT 3

**Pid feed back**  Input of the loading cell; 10V (20mA)=100%
I/O CONFIG Menu
   ————> Analog input
   ————> Analog input 3 **Pid feed back**

**Closed loop En**  Closing of the tension loop enabled (to be used with a loading cell).
Set the parameter **Closed loop En=** enable

**Closed loop comp**  Monitor for the present compensation on the output of the PID regulator used for the loop closing.

DIGITAL INPUT
Programming of a digital input to enable the PID function
I/O CONFIG Menu
   ————> digital input
   ————> digital input 7: **enable PI-PD PID**

Setting of Pid parameters

Set **Pid Source** as **PAD 1**.
**Pid source**=(8192+504)=8696
PARAMETERS
OPTION Menu
   ————> PID
   ————> Pid source
   ————> Pid source=8695

Set **PAD 1** =10000
(Pad 1 is in the “Special function” menu)

Set **Pid source gain** =1

Set **PID target** as the parameter **Closed loop comp**
The parameter Closed loop comp has the decimal number 1208
In order to obtain the value to be entered add 8192 decimal (fixed offset)
**PID target**=8192+1208=9400

Set **Pid out scale**
**Pid out scale**=(max .value of closed loop comp)/max oPID output
**Pid out scale**=10000/10000=1
Set **PI top lim** and **Pi bottom lim** in order to have a 100% correction of its maximum value.
**PI top lim**=1
**Pi bottom lim**=-1
With this configuration the regulator output is positive and negative.
The gains of the several components have to be set experimentally with a loaded machine.
It is possible to start the tests with the values below:

- set **PI P gain PID=10%**
- set **PI I gain PID=4%**
- set **PD P gain PID=5%**
- set **PD D gain PID=0%**
- **PD D filter PID=20msec**

Set **PI central vsel=1**
Set **PI central v 1=0**

With this configuration, when the switching ON/OFF of the parameters enabling the PID function is carried out, the regulator output starts from 0.

Before enabling the PID regulator and the loop closing it is necessary to check the matching between the set tension and the tension measured by the loading cell.
The loading cell has to be tuned in order to have an analog output =10V connected to the maximum tension on the required material.

With a loaded machine start the winder/unwinder by setting a tension of 50%.
Check the values of the parameters **Act tension ref** (0, 100%, tension set in the Torque winder menu) and **Pid feedback** (0, 10000, loading cell feedback in the PID menu). The two values must be the same.

If not, act on the parameter **Tension scale** till the two parameters reach the same values.

After this parameterization has been carried out, it is possible to start the tests with the material.
Improve the system stability via the different components of the blocks PI and PD PID.
**Provisions**

In order to make the commissioning procedure easier and uniform, the system contains a clause referring to the speed and torque directions to be respected:

As a general rule the winder speed and the torque direction are considered positive with a upper winding side.

All the possible system configurations stated in the examples below refer to this clause.

**Note!** The polarity of the line speed reference is not important, because the system states the output reference polarity only according to the parameters Wind/unwind and Winder side.

1. **Drive used as a winder – winding side = up**

If the speed demand function is used, the system creates a positive speed reference; it is therefore necessary to connect the motor so that, with this polarity, the coil winds the material starting from the upper side. The winding torque is positive.
2. **Drive used as a winder – winding side = down**

![Figure 6.17.14: Drive used as a winder – winding side = down](image)

If the speed demand function is used, the system creates a negative speed reference; it is therefore necessary to connect the motor so that, with this polarity, the coil winds the material starting from the lower side. The winding torque is negative.

3. **Drive used as an unwinder – unwinding side = up**

![Figure 6.17.15: Drive used as an unwinder – unwinding side = up](image)

If the speed demand function is used, the system creates a negative speed reference; it is therefore necessary to connect the motor so that, with this polarity, the coil unwinds the material starting from the upper side. The unwinding torque is positive.
4. Drive used as an unwinder – unwinding side = down

If the speed demand function is used, the system creates a positive speed reference; it is therefore necessary to connect the motor so that, with this polarity, the coil unwinds the material starting from the lower side. The unwinding torque is negative.
6.17.7 Block diagram
FUNCTION DESCRIPTION

- Internal variable
- Parameter
- I/O parameter

Tension ref

Radius

Tension red

Init diameter

Final diameter

f(x,y,z)

To PID function

Taper Enable

Act tension ref

Closed loop En

Act comp

Closed loop En comp

Radius

Tension scale

Act comp

Flux ref

Spd match torque

T current lim +/

Jog TW enable

Torque winder En

Torque current

Speed match

T current lim +/
--- FUNCTION DESCRIPTION ---

**Actual speed**

**Speed**

**Demand En**

**Start/stop**

**Speed match**

**Comp**

**Speed match gain**

**Wind/unwind**

**Torque request sign**

**Jog TW speed**

**Ref line spd**

**Jog TW enable**

**Minimum radius**

**Radius**

**Jog TW enable**

**W gain**

**W demand management**

**Wind/unwind request sign**

**Speed match comp**

**Spd demand status**

**W offset Offset**

**Acc/dec time management**

**Acc/dec time**

**W target**

**W reference**

**Winder side**

**Spd match acc**

**Spd match dec**

**Internal variable**

**Parameter**

**I/O parameter**
6.18 DRIVECOM

The DRIVECOM profile #21 “Power transmission,” defines the behavior of the drive if this is operated via the INTER-BUS-S field bus. The DRIVECOM menu of the DV-300 converter provides functions that were defined in the above standards and which are required to operate a motor with the converter. The DV-300 converters, however, have a considerably greater range of functions than is defined here. Apart from a few exceptions the parameters provided in this menu are described somewhere else in detail. We will therefore restrict this description to the Parameters function. See section 10, “Parameter list” and the above standard for further information on the parameters. When operating from a Bus, the parameters in the Drivecom group can also be accessed using the format and index specified in the above standard.

6.18.1 Control word, status word, malfunction code

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malfunction code</td>
<td>57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control word</td>
<td>55</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>Status word</td>
<td>56</td>
<td>0</td>
<td>65535</td>
</tr>
</tbody>
</table>

**Malfunction code**

Malfunction code according to DRIVECOM specification (Mandatory functions)

The code displayed indicates a particular failure. The meaning of the individual failures concerned is described in the section Programmable Alarms.

- 0000h **No failure**
- 1001h **Unknown**
- 2300h **Overcurrent**
- 3120h **Undervoltage**
- 3310h **Overvoltage**
- 3330h **Field loss**
- 4210h **Heatsink**
- 4310h **Overtemp motor**
- 5000h **Hardware**
- 5100h **Failure supply**
- 6110h **Dsp error**
- 6120h **Interrupt error**
- 7301h **Speed fbk loss**
- 7400h **Opt2**
- 7510h **Hw Opt 1 failure**
- 8110h **Bus loss**
- 9000h **External fault**
- 9009h **Enable seq err**

The code and the alarm are displayed in plain text in the event of a failure. The code is given in hexadecimal format.

**Control word**

Control word according to DRIVECOM specification (Mandatory functions)

**Status word**

Status word according to DRIVECOM specification (Mandatory functions).
6.18.2 Speed

**DRIVECOM**

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed input var [FF]</td>
<td>44</td>
<td>-2 P45, +2 P45</td>
<td>Factory American: 0, 0; Factory European: *</td>
</tr>
<tr>
<td>Speed ref var [FF]</td>
<td>115</td>
<td>-32768, +32767</td>
<td>**</td>
</tr>
<tr>
<td>Act speed value [FF]</td>
<td>119</td>
<td>-32768, +32767</td>
<td>***</td>
</tr>
<tr>
<td>Speed base value [FF]</td>
<td>45</td>
<td>1, 16383, 1500</td>
<td>1500</td>
</tr>
<tr>
<td>Speed input perc [%]</td>
<td>46</td>
<td>-32768, +32767</td>
<td>*</td>
</tr>
<tr>
<td>Percent ref var [%]</td>
<td>116</td>
<td>-32768, +32767</td>
<td>**</td>
</tr>
<tr>
<td>Act percentage [%]</td>
<td>120</td>
<td>-32768, +32767</td>
<td>***</td>
</tr>
</tbody>
</table>

* Factory set as Ramp ref and connected to analog input 1 (terminal 1 and 2). See reference values.
** Factory set as Speed ref and connected to the ramp output. See reference values.
*** Factory set as Motor speed and connected to analog output 1. See BASIC MENU.

**Speed input var** 1st ramp reference value. The value to be entered is based on the factor function.

**Speed ref var** 1st speed reference value. The value to be entered is based on the factor function.

**Act speed value** Speed actual value in the unit specified in the factor function.

**Speed base value** The **Speed base value** is given in the unit specified in the factor function. It is the base value for all speed values given as a percentage (reference values, adaptive speed regulation ...). A change in this parameter is only possible when the drive is disabled. (Enable drive = Disabled).

**Speed input perc** 1st ramp reference value. Defined as a percentage of the **Speed base value**

**Percent ref var** 1st speed reference value. Defined as a percentage of the **Speed base value**

**Act percentage** Speed actual value as a percentage of the **Speed base value**
6.18.3 Speed limitation

DRIVECOM

### Speed amount

| [1] | Speed min amount [FF] |
| [2] | Speed max amount [FF] |

### Speed min/max

| [5] | Speed min pos [FF] |
| [3] | Speed max pos [FF] |
| [6] | Speed min neg [FF] |
| [4] | Speed max neg [FF] |

<table>
<thead>
<tr>
<th>Parameter description</th>
<th>No.</th>
<th>Value min</th>
<th>Value max</th>
<th>Factory American</th>
<th>Factory European</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed min amount [FF]</td>
<td>1</td>
<td>0</td>
<td>2^{12}-1</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Speed max amount [FF]</td>
<td>2</td>
<td>0</td>
<td>2^{12}-1</td>
<td>5000</td>
<td>5000</td>
<td>-</td>
</tr>
<tr>
<td>Speed min pos [FF]</td>
<td>5</td>
<td>0</td>
<td>2^{12}-1</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Speed max pos [FF]</td>
<td>3</td>
<td>0</td>
<td>2^{12}-1</td>
<td>5000</td>
<td>5000</td>
<td>-</td>
</tr>
<tr>
<td>Speed min neg [FF]</td>
<td>6</td>
<td>0</td>
<td>2^{12}-1</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Speed max neg [FF]</td>
<td>4</td>
<td>0</td>
<td>2^{12}-1</td>
<td>5000</td>
<td>5000</td>
<td>-</td>
</tr>
</tbody>
</table>

**Speed min amount**

Defines the minimum speed for both rotation directions (with 6KDV3 ... Q4...).

A lower value than the defined value is not possible, regardless of the reference value set. It has an effect on the input of the ramp. If the **Speed min amount** parameter is changed, the **Speed min pos** and **Speed min neg** parameters are set to the same value. If one of these two parameters is changed later, the last change is valid. The current value for positive rotation (clockwise) is shown in the display of the keypad. The value to be entered is based on the factor function.

**Speed max amount**

Defines the maximum speed for both rotation directions (with 6KDV3 ... Q4...).

The function has an effect on the input of the speed regulator and therefore takes into account the reference value that comes from the ramp as well as the directly defined values (see Figure 6.4.2.1). If the **Speed max amount** is changed, the **Speed max pos** and **Speed max neg** parameters are set to the same value. If one of these two parameters is changed later, the last change is valid. The current value for positive rotation (clockwise) is shown in the display of the keypad. The value to be entered is based on the factor function.

**Speed min pos**

Defines the minimum speed for the clockwise rotation of the motor. A lower value than the defined value is not possible, regardless of the reference value. The function has an effect on the input of the ramp (see Figure 6.4.1.1). The value to be entered is based on the factor function.

**Speed max pos**

Defines the maximum speed for the clockwise rotation of the motor. The function has an effect on the input of the speed regulator, and therefore takes into consideration the reference value that comes from the ramp as well as those that are entered directly (see Figure 6.4.2.1). The value to be entered is based on the factor function.
**Speed min neg**

Defines the minimum speed for the anti-clockwise rotation of the motor (with 6KDV3... Q4...). A lower value than the defined value is not possible, regardless of the reference value. The function has an effect on the input of the ramp (see Figure 6.4.1.1). The value to be entered is based on the factor function.

**Speed max neg**

Defines the maximum speed for the anti-clockwise rotation of the motor (with 6KDV3... Q4...). The function has an effect on the input of the speed regulator, and therefore takes into consideration the reference value that comes from the ramp as well as the those that are entered directly (see Figure 6.4.2.1). The value to be entered is based on the factor function.

### 6.18.4 Acceleration / Deceleration

<table>
<thead>
<tr>
<th>Parameter Description</th>
<th>No.</th>
<th>Value</th>
<th>Standard Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acc delta speed [FF]</td>
<td>21</td>
<td>0 232-1 100 100</td>
<td></td>
</tr>
<tr>
<td>Acc delta time [s]</td>
<td>22</td>
<td>0 65535 1 1</td>
<td></td>
</tr>
<tr>
<td>Dec delta speed [FF]</td>
<td>29</td>
<td>0 232-1 100 100</td>
<td></td>
</tr>
<tr>
<td>Dec delta time [s]</td>
<td>30</td>
<td>0 65535 1 1</td>
<td></td>
</tr>
<tr>
<td>QStp delta speed [FF]</td>
<td>37</td>
<td>0 232-1 1000 1000</td>
<td></td>
</tr>
<tr>
<td>QStp delta time [s]</td>
<td>38</td>
<td>0 65535 1 1</td>
<td></td>
</tr>
<tr>
<td>Quick stop</td>
<td>343</td>
<td>0 1 No Quick stop No Quick stop</td>
<td></td>
</tr>
</tbody>
</table>

**Acc delta speed**

Has the same unit as the ramp reference value and is based on the factor function.

**Acc delta time**

Is defined in seconds. The ramp output follows the reference value directly if “0 s” is entered.

**Dec delta speed**

Has the same unit as the ramp reference value and is based on the factor function.

**Dec delta time**

Is defined in seconds. If “0 s” is entered, the ramp output follows the reference value directly.

**Qstp delta speed**

Has the same unit as the ramp reference value and is based on the factor function.
**Qstp delta time**  Is defined in seconds. If “0 s” is entered, the ramp output follows the reference value directly.

**Quick stop**  Activates the Quick stop ramp to stop the Drive.

The acceleration of the drive is defined as a quotient of the **Acc delta speed** and **Acc delta time** parameters. It is the same for both rotation directions of the motor.

The deceleration of the drive is defined as a quotient of the **Dec delta speed** and **Dec delta time** parameters. It is the same for both rotation directions of the motor.

The Quick stop function provides a second deceleration ramp for braking the drive to halt in the event of an emergency. The deceleration of the drive using the Quick stop function is defined as a quotient of the Qstp delta speed and Qstp delta time. It is the same for both rotation directions of the motor. This function is only available via the serial interface or BUS.

**6.18.5 Factor function**

<table>
<thead>
<tr>
<th>DRIVECOM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face value fact</strong></td>
</tr>
<tr>
<td>[54]</td>
</tr>
<tr>
<td>[53]</td>
</tr>
<tr>
<td><strong>Dimension fact</strong></td>
</tr>
<tr>
<td>[50]</td>
</tr>
<tr>
<td>[51]</td>
</tr>
<tr>
<td>[52]</td>
</tr>
</tbody>
</table>

The factor function contains two factors, the Dimension factor and Face value factor. They are both expressed as fraction numbers.

The dimension factor enables the drive speed to be defined in a machine-related dimension, e.g. kg/h or m/min. Further information and examples are given in the section on the Configuration menu.
Parameter description | No. | Value | Standard Configuration
|----------------------|-----|-------|----------------------
|                      |     | min   | max     | Factory American | Factory European |
| Face value num       | 54  | 1     | 32767  | 1                 | 1                 |
| Face value den       | 53  | 1     | 32767  | 1                 | 1                 |
| Dim factor num       | 50  | 1     | 65535  | 1                 | 1                 |
| Dim factor den       | 51  | 1     | 231-1  | 1                 | 1                 |
| Dim factor text      | 52  | rpm   | rpm    | rpm               | rpm               |

**Dim factor num**  
Numerator of the dimension factor

**Dim factor den**  
Denominator of the dimension factor

**Dim factor text**  
Unit of the dimension factor. This text is shown in the display of the keypad when the reference value is shown. Possible characters: / % & + - . 0..9 : <= > ? A...Z [ ] a...z

**Face value num**  
Numerator of the reference value factor.

**Face value den**  
Denominator of the reference value factor.

See example in section 6.11.6, “Dimension factor, Face value factor”, on how to make the calculation.

### 6.19 SERVICE

The SERVICE menu is only accessible for the service personnel of the manufacturer.
7- MAINTENANCE

7.1 CARE

The DV-300 converters must be installed according to the relevant installation regulations. They do not require any particular care. They should not be cleaned with a wet or moist cloth. The power supply must be switched off before cleaning.

7.2 SERVICE

The screws of all terminals on the device should be tightened two weeks after initial commissioning. This should be repeated once a year.

7.3 REPAIRS

Repairs on the device should be made by your supplier’s trained personnel. If you carry out a repair of your own, observe the following points:
- When ordering spare parts, do not only state the device type but also the device number (nameplate). It is also useful to state the type of regulator card and the software version of the operating system
- When exchanging cards, ensure that the positions of switches and jumpers are observed. This particularly applies to switch SW15 on the regulator card. This sets the rated current of the converter.

Note! The manufacturer does not accept any liability for any device parts that are destroyed due to the incorrect position of switch SW15.

7.4 CUSTOMER SERVICE

For customer service, please contact your systems supplier or GE Consumer & Industrial, 41 Woodford Avenue Plainville - CT 06062
www.geelectrical.com/drives
8 - TROUBLESHOOTING

The following describes possible faults and their causes.

Failure alarms in the keypad display

<table>
<thead>
<tr>
<th>FAILURE ALARM</th>
<th>POSSIBLE CAUSES</th>
</tr>
</thead>
</table>
| Failure supply | Fault in voltage supply = the voltages are below the permitted value
|                | CAUTION: switch off voltage before removing terminal strips. |
|                | In most cases the cause is in the external wiring. Pull out the plug-in terminal strips of the regulator card and enter the Reset command. If no other failures are reported, check your wiring for a short-circuit, in some cases with the cable shielding. |
|                | If this has not rectified the fault: remove the terminal strips of the I/O option card (if present) and try RESET once more. |
|                | If you are still unsuccessful: probably an internal fault. Contact your sales office. |
| Undervoltage   | Undervoltage on the power circuit |
|                | **Undervolt thr** parameter set incorrectly (possibly 400 V set, although the device is run on 230 V). Remedy: set parameter correctly and then acknowledge the failure via RESET. |
|                | The incoming voltage to the terminals U/V/W of the device is too low due to: |
|                | too low an AC input voltage |
|                | poor cable connections (e.g. terminals on contactor, choke, filter ... not properly fixed). Remedy: check connections. |
|                | Intervention of the line fuses |
|                | AC input voltage dips, or high distortion of the supply voltage |
|                | The converter has been enabled when the supply voltage is not present |
| Overvoltage    | Overvoltage of the armature circuit |
|                | **Max out voltage** parameter set too low. |
|                | The drive does not operate with a field weakening, even though the set speed can be reached only with a field weakening. Check the **Flux reg mode** parameter. |
| Overspeed      | Excessive motor speed in the feedback circuit. |
|                | Overspeed thr parameter set too low. |
|                | Check that the Speed fbk sel parameter has been selected consistently with the feedback used (Encoder 1, Encoder 2, Tacho, Armature). |
|                | If an encoder or tacho generator feedback circuit is used, check the relative wiring. |
FAILURE ALARM  POSSIBLE CAUSES

Heatsink
Heatsink temperature too high
Ambient temperature too high
Failure of device fan [with devices > 88 A (American), 110 A (European)]
Dirty heatsink

Overtemp Motor
Motor overtemperature (signaled by the thermistor to the terminals 78/79)
The motor is not provided with a thermistor: no jumper between the terminals 78 and 79
Cable between thermistor connection on motor and terminals 78 and 79 interrupted.
Overheating of motor:
Load cycle too extreme
Ambient temperature at site of motor too high
Motor has an external fan: fan failed
Motor does not have an external fan: too large a load at low speeds. The cooling effect of the fan on the motor shaft is too low for this load cycle. Change cycle or fit external fan.

External fault
External failure, reported on terminal 15
If the “External fault” message is not used: connection missing between terminals 16 and 18 (reference point) and/or 15 and 19.
If the “External fault” message is used:
The signal on terminal 15 is missing (15...30V to terminal 16).
With external voltage supply: reference points must be connected with each other!

Brake fault
Error in the brake opening or closing sequence after the Brake control has been enabled.
Refer to chapter 6.14.8 and check that wiring, parameters and sequences of signals are correct.

Motor I2t ovrld
Excessive motor overload.
Refer to chapters 6.14.6 and 6.11.7 (Motor I2t ovrld alarm) and check the exactness of the data that have been entered. If these are correct, wait until the accumulator (Motor I2t accum) is zeroed before resetting the alarm and then enable the drive.

Drive I2t ovrld
Excessive drive overload.
Wait until the accumulator (Drive I2t accum) is zeroed before resetting the alarm and then enable the drive. No data can be configured for this alarm; however, reference should be made to chapter 6.14.6 for further information about calculating thresholds.
DV-300 Adjustable Speed Drives

--- TROUBLESHOOTING ---

FAILURE ALARM POSSIBLE CAUSES

Overcurrent
Overcurrent in the motor circuit
Short-circuit or ground fault at the output of the converter
Current regulator optimized incorrectly
**Overcurrent thr** parameter too low

Field loss
Too low field current
The field regulation is blocked
The conductors in the field circuit are interrupted
Field fuses are active

Delta frequency
Excessive difference between the frequency of the three-phase power supply input and the value measured the instant this is guaranteed.
Delta freq thres parameter set too low.
Check that the frequency of the three-phase power supply remains constant or in any case within the threshold limit throughout drive operation.

Speed fbk loss
No speed feedback signal
The conductors of the feedback signal are interrupted
One or several encoder channels are missing (conductor interruption, no encoder power supply)

Opt2 failure
Failure on the option card 2
Try a RESET. If you are still unsuccessful: probable internal fault. Contact your sales office

Bus loss
Failure in the Bus connection (only with interface Bus option card)
Check the Bus connection
EMC compatibility problems
Try a RESET. If you are still unsuccessful: probable internal fault. Contact your sales office

Hw opt1 failure
Failure on the option card 1
Try a RESET. If you are still unsuccessful: probable internal fault. Contact your sales office
FAILURE ALARM       POSSIBLE CAUSES

Enable seq err

Drive is powered up or Reset with Enable input connected to 24 V (picked up) and the Drive is configured to run from the terminals. Refer to CONFIGURATION/Main commands.
Other faults

FAILURE  POSSIBLE CAUSES

The motor is not turning

Failure alarm is displayed: see table above
Once the error has been rectified give the RESET command
Keypad display is dark: voltage supply to terminals U2/V2 missing or internal fuse blown or missing
Enable and/or start command missing
Converter not accepting commands: incorrect or wrongly selected operating mode
Protective device of the power supply has tripped: protective device incorrectly sized or fault on the thyristor bridge
The analog input used for the reference value was not assigned or assigned differently
Negative reference with 6KDV3 ... Q2. The reference for the biquadrant converters must always be positive!

The motor is turning in a wrong way

Wrong polarity of the reference sign (with 6KDV3 ... Q4)
The motor is connected in a wrong way.
ATTENTION: when the motor turns in a wrong way but the rotation direction can be changed, remember to change both the armature or field conductors and the two encoder connections (A+ with A- or B+ with B-). Using a tachometer change the conductor polarity.

The motor does not reach the rated speed

Drive is within speed limitation. Remedy: check Speed max amount, Speed max pos and Speed max neg parameters
Drive working at current limit (LED I Limit lit) Possible causes:
Motor overloaded
Converter sized too small
Flux reduction selected via Torque reduct
The entered value for the number of encoder pulses is too high. Remedy: check the parameters concerned (Encoder 1 pulses when using plug connector XE1 or Encoder 2 pulses with plug connector XE2) and set correct value.
Wrong adaptation of the tachometer voltage. Check the voltage field choice (jumpers to the terminals A/B/C). Check the Tacho scale parameter.
A correction value reduces the main reference value. Remedy: check the configuration
The factor function is set incorrectly.
FAILURE          POSSIBLE CAUSES

The motor reaches the maximum speed immediately
Reference value set via terminals: Check whether the value varies from min. to max. value.
Potentiometer used for reference value setting: is there a 0V connection present?
Encoder/tachometer not connected, or incorrectly connected or not supplied:
Preset the Actual spd parameter in the DRIVE STATUS menu.
With the regulator disabled turn the motor clockwise (viewed from the front of the
shaft). The value indicated must be positive.
If the indicated value does not change or if inexplicable values are shown, check the
power supply and the cabling of the encoder/tachometer.
If the indicated value is negative, reverse the encoder connections. Exchange channel
A+ and A- or B+ and B-. Using a tachometer change the conductor polarity.

The motor accelerates too slowly
Ramp set incorrectly
Motor running at max. current
    Motor overloaded
    Converter too small

The motor decelerates too slowly
Ramp values and times incorrectly set
Braking current too low
With twoquadrant drives: moment of inertia too high.

The motor turns slowly even though the reference value = zero
Minimum speed selected
Interference due to unused analog input. Remedy: set unused analog inputs to OFF
Disconnect reference value on used analog input
    If drive now stands still, the effect is due to the cable resistance
    of the 0V cable.
    If the drive is still turning: check if the speed reference is zero.
    If it is not zero set Offset input xx parameter so that the drive
    stands still. If it is zero set Spd offset parameter.

The motor thermic is active
Overloaded motor
Motor thermic protection relay incorrectly scaled

The motor is not supplying the max torque and the max power
Drive working at current limit
    Check whether the value for Full load curr in the CONFIGURATION
    menu is set correctly
    Check the value for the current limitation
FAILURE    POSSIBLE CAUSES

The speed during acceleration with max. current is not linear
Reduce the Speed I and Speed P proportionally. If this does not lead to an improvement, optimize the regulator (see chapter 5.3.6).

Speed oscillating
Check Speed P and Speed I parameter
If the operating point is in the field weak range, check the Fld reg P gain and Fld reg I gain parameters and eventually Voltage P and Voltage I parameters.
Remedy: Optimize the regulator as previously described

Drive not reacting to adaptive speed regulation
Adaptive speed regulation not enabled. Enable spd adap = Enabled

Motor potentiometer function not executed
Function not enabled. Enable motor pot = Enabled
With operation via the terminal strip: Motor pot up and/or Motor pot down were not assigned to a digital input

Jog operation not possible
A start command is still present
Function not enabled. Enable jog = Enabled
With operation via terminal strip: Jog + and/or Jog - were not assigned to a digital input.

Internal speed reference values not carried out
Function not enabled. Enab multi spd = Enabled
With operation via terminal strip: Speed sel 0, Speed sel 1 and Speed sel 2 were not assigned to a digital input.

Multi-Ramp function not reacting
Function not enabled. Enab multi rmp = Enabled
With operation via terminal strip: Ramp sel 0 and Ramp sel 1 were not assigned to a digital input

Overload not possible
Function not enabled. Enable overload = Enabled
FAILURE POSSIBLE CAUSES

The Current regulator selftune procedure never finishes and continues over and over again.
Because of the motor inductance value, the routine is executing an endless loop. The inductance value is cycling between two values without an evolution of the algorithm.
Solution procedure:
1) verify the two displayed inductance values
2) insert the average value as motor inductance during the autotuning.
If the procedure does not end, repeat step 1) and 2).
DV-300 Converter Overview

DV-300 Drive Feedbacks & Status
- Ramp ref (%)
- Speed ref (%)
- Mains voltage
- Output voltage
- Flux current
- Ramp output (%)
- Actual spd (%)
- Mains frequency
- Motor current
- Field curr amps

Start & Stop Management
- Ramp ref (d)
- Ramp output (d)

Select Ramp / Speed Reference
- Rampref (d)
- Ramp output (d)

Speed / Current Regulator
- Speed ref (d)
- D actual spd (rpm)
- Speed Feedback
- Speed limit
- Cur limit state

Digital inputs Status
- Dig input term 1
- Dig input term 2
- Dig input term 3
- Dig input term 4
- Dig input term 5
- Dig input term 6
- Dig input term 7
- Dig input term 8
- Dig input term 9
- Dig input term 10
- Dig input term 11

Enable
- TBO A
- TBO B
- DRIVE

Field control
- Nom flux
- Field curr amps

Motor Control
- Motor curr
- Actual spd (d)

Motor nom flux
- Nom flux scale

Virtual dig out
- Virtual dig inp

01 CONTROL BLOCK DIAGRAMS
Digital Inputs/Outputs & Mapping
Standard and TBO cards

TBO card pos. A

Digital Inputs

TBO card pos. B (option)

Digital Outputs

1. Jig Requests
   - Enable
   - Enable

2. Motorpot Requests
   - Enable
   - Enable

3. Regulator Commands
   - Enable
   - Enable

4. Drive Relay Output
   - Relay
   - Inversion out
   - Inversion out

5. Drive healthy
   - Relay
   - Stop control

Digital Inputs /Outputs & Mapping
Standard and TBO cards
### Speed / Current Regulator Overview

**MAX Speed Limits**
- Speed limited
- Speed max set 1750 rpm
- Speed max set 1750 rpm
- Speed max set 1750 rpm
- Speed max set 1750 rpm

**From Speed Reference generation**
- Speed ref 2

**Speed Regulator**
- Droop compensation
- Load comp
- Speed ref 2
- T current ref

**Speed Feedback**
- Encoder 1:
  - Enc 1 speed
  - Encoder 1
- Encoder 2:
  - Enc 2 speed
  - Encoder 2
- Actual speed:
  - Actual spd (d)
  - Tacho
- Output voltage:
  - Output voltage
  - Armature
  - Speed ref (d)
  - Actual spd (d)
- Output voltage
- Speed ref (d)
- Encoder 1 speed
- Encoder 1
- Encoder 2 speed
- Encoder 2
- Actual spd (d)
- Tacho
- Output voltage

**Droop gain**
- 0 %

**T current ref**
- 0 %
Speed Feedback setting

- Armature Fbk Bypass
- Tacho
- CEMF
- Encoder 1 Sinusoidal
- Encoder 1 Digital
- XE1 connector
- XE2 connector
- Encoder 2 pulses
- Refresh enc 2
- Encoder 1 pulses
- Refresh enc 1
- Speed fbk sel
- Armature
- Encoder 1
- Encoder 2
- Tacho
- Enc 1speed
- PD output PID
- Encoder 1 state
- Encoder 2 state
- Speed offset
- Tacho scale
- Actual spd (d)
- Max. out voltage
- 500 V
- Motor max speed
- 2300 rpm
- Speed fbk error
- 22 %
- Enable fbk contr
- Disabled
- Flux weak speed
- 100 %
- Max. out voltage
- 500 V
- Motor max speed
- 2300 rpm
- Speed fbk error
- 22 %
- Enable fbk contr
- Disabled
- Flux weak speed
- 100 %

- Speed Feedback setting
Speed regulator
**Speed regulator PI part**

- **Speed P**
- **Adap P gains**
- **Speed ref (rpm)**
- **Adap I gains**
- **Enable spd adap**
- **Prop. filter**
- **Anti-windup**
- **Lock speed I**
- **Enable spd adap**
- **Speed I inuse**
- **Torque current limits**
- **Zero**
- **Lock speed reg**
- **Adap reference**
- **Speed Adaptive and Speed zero logic**
- **Adap I gains**
- **Adap P gains**
- **DV_Adp_spd**
- **Speed reg output**
- **Actual spd (rpm)**
- **Speed P in use**
- **0 ms**

This is an excerpt from the block diagram of the DV-300 Adjustable Speed Drives. The diagram illustrates the components and connections involved in the speed regulator PI part, including adaptive gains, proportional filter, anti-windup, and speed reference logic.
Speed adaptive and Speed zero logic

**Speed Adap function**
- Enable spd adap
- Set adap type: Speed

**Adap speed**
- Adap speed 1: 20.3%
- Adap speed 2: 40.7%

**Adap Pgain**
- Adap Pgain 1: 10%
- Adap Pgain 2: 10%
- Adap Pgain 3: 10%

**Adap I gain**
- Adap I gain 1: 1%
- Adap I gain 2: 1%
- Adap I gain 3: 1%

**Adap reference**
- 1000 rpm

**Sel. adap type**
- Speed

**Spd=0 Pgain**
- 10%

**Ref 0 level**
- 10 rpm

**Speed zero delay**
- 100 ms

**Enable spd=0 I**
- Disabled

**Enable spd=0 P**
- Enabled

**Enable spd=0 R**
- Enabled
Field current regulator

Flux current regulator

Flux Limits

Voltage reg P / Base

Voltage P 30 %
Voltage I 40 %

Voltage regulator

Max. flux curr 10 %

Field econ delay 0

Fluxcurrent max 100 %
Fluxcurrent min 70 %

Flux P / Ibase

Flux P base 3277
Flux I Base 3277

Voltage P base 1.8 A/V
Voltage I base 13.0909 A/V*ms

Enable flux reg

Flux regulator

Flux reference

Flux current %

Set flux/if 0
Resets flux/if 0

Speed zero level 10 rpm

Motor nom flux 10 A

Ifield cnst40 40 %
Ifield cnst90 90 %
Ifield cnst70 70 %

Nom flux curr 10 A

Spd=0 Thr

Flux controller

Flux current max

Flux current min

Speed ctrl

Field econ delay

Flux current reg

GEI-100332Ga

— BLOCK DIAGRAM —

Proprietary Information
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Motor parameters

Output Voltage / Torque

Constant Torque

Max. out voltage: 900 V

Rising Power

Constant Power

Speed

Run weak speed: 100 %

Speed base value: 1750 rpm

Motor max speed: 2900 rpm

Field regulator management

Run magnetic
Constant current

Flux flux out: 10 %

Flux current min: 70 %

Flux current max: 100 %

Motor parameters

Motor max speed: 2300 rpm

Flux weak speed: 100 %

Max. out voltage: 500 V

Speed base value: 1750 rpm

Motor max speed: 2900 rpm

Flux current min: 70 %

Flux current max: 100 %

Motor parameters

Motor nom flux: 10 A

Arm resistance: 0.55 Ohm

Arm inductance: 34.33 mH

Motor current: E int

Motor current: A (A1)

Motor current: H (A2)

Output voltage

Flux current

Motor nom flux: 10 A

E int

M

C1

D1

10

11

12

13

14

15

A

B

C

D

E

F

G

H

I

J

K

L

GE Motors and Industrial Systems
Salem, Va. USA

Proprietary Information

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03/10/97 -- GE User

07/20/98 -- GE User
Start and Stop management

From external sequence or digital commands:
- Digital Commands
  - Start/Stop
  - Trip input: Term 9
  - Trip input: Term 10

Trip mode:
- Stop & speed 0
- Fast stop & speed 0

Trip cont delay 0 ms

Management of relay 2 when set as STOP Control:
- R2NO 1
- R2COM 1

Digital Commands:
- Stop mode
- OFF

Trip delay 0 ms

Speed zero level 0 rpm

Enable Drive Start/Stop

Spd 0 trip delay 0 ms

Spd 0:
- Trip cont delay 0 ms
- Trip mode

Stop & speed 0
- Trip mode
- Fast stop & speed 0

Start and Stop management
Droop compensation

To Speed reference

Droop limit 1500 rpm

Decafilter 0 ms

Droop gain 0 %

Load comp 0 %

From digital setting or analog input

Current ref

Zero

Droop compensation
Inertia/Loss compensation

- Speed ref (g)
- Torque const: 1.80596 N*m/A
- Flux reference
- Friction: 0.001 N*m
- Inertia cfilter: 0 ms
- Inertia/Loss compensation
- Speed (rpm)
- +
- Ref 0level: 10 rpm
- -
- To speed regulator output
- Inertia: 0.005 Kg*m²
- Low pass filter
- Ax. qll filt fr
Functions

- LINKS
- PAD Parameters
- Taper Current Limits
- Dimension factor
  - Face value factor

- Test Generator
- JOG function
- Multispeed
- Motor potentiometer

- PID function
- Start - Stop Programming
LINKS Function

**LINK 1**
- **Source 1**: 0
- **Input absolute 1**: Off
- **Input offset 1**: 0
- **Input max 1**: 0
- **Gain 1**: 1
- **Output offset 1**: 0
- **Destination 1**: 0

**LINK 2**
- **Source 2**: 0
- **Input absolute 2**: Off
- **Input offset 2**: 0
- **Input min 2**: 0
- **Gain 2**: 1
- **Output offset 2**: 0
- **Destination 2**: 0

The diagram illustrates the flow of signals through the LINKS function, with specific values for each input and output parameter.
PAD parameters

General PAD

Pad0 0 Pad1 0 Pad2 0 Pad3 0 Pad4 0 Pad5 0 Pad6 0 Bitword pad A 0000h
Pad7 0 Pad8 0 Pad9 0 Pad10 0 Pad11 0 Pad12 0 Pad13 0 Pad14 0 Pad15 0 Bitword pad B 0000h
**Taper Current Limits**

- **In use T Cur Lim**
- **Lim speed 0 rpm**

![Graph showing Taper Current Limits](image_url)
Test Generator

Generator output

Generator Not Connected

Gen access

Gen frequency 0.1 Hz

Gen amplitude 0 %

Gen offset 0 %

Time

Gen access

Not Connected
JOG function

DRIVE KEYPAD
(or Digital inputs)

JOG REFERENCE SELECTION

Digital Commands

JoG Reference

Trip Input

Speed Input

JOg function

DV-300 Adjustable Speed Drives
Multi speed

<table>
<thead>
<tr>
<th>Speed set 0</th>
<th>Speed set 1</th>
<th>Speed set 2</th>
<th>Ramp ref 1</th>
<th>Ramp ref 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0 rpm</td>
<td>0 rpm</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Multi speed 1</td>
<td>0 rpm</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Multi speed 2</td>
<td>0 rpm</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>Multi speed 3</td>
<td>0 rpm</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Multi speed 4</td>
<td>0 rpm</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Multi speed 5</td>
<td>0 rpm</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>Multi speed 6</td>
<td>0 rpm</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Multi speed 7</td>
<td>0 rpm</td>
</tr>
</tbody>
</table>
Motor potentiometer

To Speed Reference

Motor potentiometer

Drive Keypad (or digital inputs)

Motor pot reset

Motor pot sign

Positive

Negative

Motor pot

This is an verified copy of standard documentation printed at
07/20/98. The master is located on vasald03/vss/InnovCtl.
Alarm mapping

External fault
- FL Latch
- EF Activity
- EF Overvoltage
- EF Activity

Delta frequency
- Delta freq thes
- EF Activity
- EF Ignored

Speed fbk loss
- SL Activity
- SL Ok relay open
- SL Hold off time

OPT2 failure
- SL Activity
- SL Ok relay open
- SL Hold off time

Bus loss
- SL Activity
- SL Ok relay open
- SL Hold off time

Hw optf failure
- SL Activity
- SL Ok relay open
- SL Hold off time

Enable seq err
- SL Activity
- SL Ok relay open
- SL Hold off time

Failure reset
- Failure reg del
- Failure reset
- Failure reg del

Failure code
- Failure code
- Failure code

TP2D_Alarm_map.vsd
9.2 POWER CIRCUIT BLOCK DIAGRAMS

Figure 9.2.1: Circuit block diagram: 6KDV3017Q4F ... to 6KDV3148Q4F - 6KDV3020Q4E ... to 6KDV3185Q4E
Figure 9.2.2: Circuit block diagram: 6KDV3224Q4F ... to 6KDV3450Q4F - 6KDV3280Q4E ... to 6KDV3650Q4E
Figure 9.2.3: Circuit block diagram: 6KDV3560Q4F ... to 6KDV3850Q4F - 6KDV3770Q4E ... to 6KDV310HQ4E
Figure 9.2.4: Circuit block diagram: 6KDV3017Q2B ... to 6KDV3148Q2B - 6KDV3020Q2A ... to 6KDV3185Q2A
Figure 9.2.5: Circuit block diagram: 6KDVT224Q2B ... to 6KDVT3450Q2B - 6KDVT3280Q2A ... to 6KDVT3650Q2A
Figure 9.2.6: Circuit block diagram: 6KDV3560Q2B ... to 6KDV3850Q2B - 6KDV3770Q2A ... to 6KDV310HQ2A
9.3 REGuLATION CARD

---

9.3 REGuLATION CARD

---

DV-300 Adjustable Speed Drives
10 - PARAMETER LISTS

10.1 COMPLETE MAIN MENU LIST

Explanation of tables:

White text on black background Menu/submenu

White text on black background in brackets Function not accessible via keypad. The status of the corresponding parameter is only displayed.

[FF] in the Parameter column Dimension based on the factor function

“No.” column Parameter number (decimal). The value 2000H (= decimal 8192) must be added to the number given in the “No.” column in order to obtain the index to access the parameter via Bus, RS485 or Opt2. The parameters in the Drivecom group can be accessed using the format and index specified in the DRIVECOM power transmission profile (#21).

“Format” column Internal parameter format:
I = Integer (Example: I16 = Integer 16 bit)
U = Unsigned (Example: U32 = unsigned 32 bit)
Float = Floating point

“Value” column Minimum, maximum and factory parameter values.
If “S” the value is depending on the size of the device.

“Keypad” column” c = Parameter available via keypad

“RS485/BUS/Opt2-M” column (low priority) Parameter available via RS485, field Bus or via the DGFC manual communication (see the DGFC user manual)
The numbers indicate what has to be sent via interface line in order to set the single parameters.

“Term.” column Parameter addressable to one of the analog or digital input/output terminals.
“Opt2-A” (Low priority)  “PDC” (High priority)  Parameter available via DGF asynchronous communication (see the DGF user manual GEI-100339) and/or the Process Data Channel (PDC).

When using a field bus interface, parameters whose range is [min=0; max=1] can be assigned to either Virtual digital inputs (if W access code exists) and/or Virtual digital outputs (if R access code exists).

The numbers indicate what has to be sent via interface line in order to set the single parameters.

Letter in brackets in the “Term.” column Analog level to be applied to the terminal in order to start the single function.

IA, QA, ID, QD in the “Term.” column The function can be accessed via a freely programmable analog or digital input or output.

IA = analog input
QA = analog output
ID = digital input
QD = digital output.

The eventually present number is the one by which the terminal is called.

H, L in the “Term.” column Level of the terminal signals (H=high, L=low) which enables the single function.

R/W/Z/C Access possibilities via the serial interface, Bus or Opt2 manual or asynchronous communication:

R = Read, W = Write, Z = Write only when drive disabled, 
C=Command parameter (the writing of any value causes the execution of a command).

X * Pyy The value of this parameter can correspond to min/max X times the value of the yy parameter.

Note! Parameters name listed in brackets are referred to previous firmware 7.X.

Note! The parameter number here indicated has to be intended as an offset value, that the user has always to add to the base value 2000H (= decimal 8192), in order to address parameters when a serial line/bus or the DGFC card are used. It also possible to accede to the DRIVECOM parameter with the DRIVECOM standard indexes.
### DV-300 Adjustable Speed Drives

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive ready</td>
<td>380</td>
<td>U16</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>R</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Quick stop</td>
<td>343</td>
<td>U16</td>
<td>0</td>
<td>1</td>
<td>No Quick stop</td>
<td>No Quick stop</td>
<td>R/W</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Start/Stop</td>
<td>315</td>
<td>U16</td>
<td>0</td>
<td>1</td>
<td>Stop (0)</td>
<td>Stop (0)</td>
<td>R/W</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Fast stop</td>
<td>316</td>
<td>U16</td>
<td>0</td>
<td>1</td>
<td>No Fast Stop</td>
<td>No Fast Stop</td>
<td>R/W</td>
<td>14</td>
<td>1</td>
</tr>
</tbody>
</table>

#### DRIVE STATUS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Format</th>
<th>Value</th>
<th>Access via</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp ref 1 [FF]</td>
<td>I16</td>
<td>-2</td>
<td>P45</td>
</tr>
<tr>
<td>Enable drive</td>
<td>U16</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Start/Stop</td>
<td>U16</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Output voltage [V]</td>
<td>Float</td>
<td>0</td>
<td>999</td>
</tr>
<tr>
<td>Motor current [%]</td>
<td>I16</td>
<td>-250</td>
<td>250</td>
</tr>
<tr>
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### TUNING

| R&L Search (Cur reg selftune) | U16 | 0 | 1 | OFF | OFF | ✓ | R/Z | - | - |
| Enable drive | U16 | 0 | 1 | Disabled | Disabled | ✓ | R/W | 1 | 0 |
| Start/Stop | U16 | 0 | 1 | Stop (0) | Stop (0) | ✓ | R/W | 1 | 0 |

### TUNING \ Speed self tune

| Fwd-Rev spd tune | U16 | 1 | 2 | Fwd | Fwd | ✓ | R/Z | - | - |
| Fwd direction | Direction | Direction | 1 |
| Rev direction | -1 | -1 | 2 |
| Test T curr lim [%] | U16 | 0 | S | 20 | 20 | ✓ | R/Z | - | - |
| Start | U16 | 0 | 65535 | - | - | ✓ | C | - | - |
| Inertia [kg*m*m] | Float | 0.001 | 999.999 | S | S | ✓ | R/W | - | - |
| Inertia Nw [kg*m*m] | Float | 0.001 | 999.999 | - | - | ✓ | R | - | - |
| Friction [N*m] | Float | 0.000 | 99.999 | S | S | ✓ | R/W | - | - |
| Friction Nw [N*m] | Float | 0.000 | 99.999 | - | - | ✓ | R | - | - |
| Speed P [%] | Float | 0.00 | 100.00 | S | S | ✓ | R/W | - | - |
| Speed P Nw [%] | Float | 0.00 | 100.00 | - | - | ✓ | R | - | - |
| Speed I [%] | Float | 0.00 | 100.00 | S | S | ✓ | R/W | - | - |
| Speed I Nw [%] | Float | 0.00 | 100.00 | - | - | ✓ | R | - | - |
| Take val | U16 | 0 | 65535 | - | - | ✓ | Z/C | - | - |

### TUNING

| Speed P [%] | Float | 0.00 | 100.00 | S | S | ✓ | R/W | - | - |
| Speed I [%] | Float | 0.00 | 100.00 | S | S | ✓ | R/W | - | - |
| Prop filter [ms] | U16 | 0 | 1000 | 0 | 0 | ✓ | R/W | - | - |
| Flux P [%] (Fld reg P gain [%]) | Float | 0.00 | 100.00 | 2.00 | 2.00 | ✓ | R/W | - | - |
| Flux I [%] (Fld reg I gain [%]) | Float | 0.00 | 100.00 | 1.00 | 1.00 | ✓ | R/W | - | - |
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**DV-300 Adjustable Speed Drives**
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- Ramp ref 2 [FF] 48 I16 -2 P45 +2 P45 0 0 ✓ R/W IA, QA R/W

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- Speed max amount [FF] 2 U32 0 232-1 5000 5000 ✓ R/Z - -

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- Speed max pos [FF] 3 U32 0 232-1 5000 5000 ✓ R/Z - -
- Speed min neg [FF] 6 U32 0 232-1 0 0 ✓ R/Z - -
- Speed max neg [FF] 4 U32 0 232-1 5000 5000 ✓ R/Z - -

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- T current ref 2 [%] 40 I16 -200 +200 0.00 0.00 ✓ R/W IA, QA - -
- T current ref type 715 U16 0 1 0 0 ✓ R/Z IA 0 L H R 0 1
- T current ref [%] 7 U16 0 200 150 150 ✓ R/W IA R/W
- T current ref + [%] 8 U16 0 200 150 150 ✓ R/W IA R/W
- T current ref - [%] 9 U16 0 200 150 150 ✓ R/W IA R/W
- Curr limit state 349 U16 0 1 - - ✓ R 0 1 QD L R 0 1
### PV-300 Adjustable Speed Drives

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## PARAMETER LISTS

### SPEED REGULAT \ Droop function

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<td>U16</td>
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### SPEED REGULAT \ Inertia/loss cp

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<td>Motor current [%]</td>
<td>R QA R</td>
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<td>Mot cur threshld [%]</td>
<td>R/W</td>
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<td>Mot cur th delay [ms]</td>
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<td>E int [V]</td>
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### FLUX REGULATION (FIELD CURRENT REGULATION)

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<td>Speed-0 f weak (Field economy)</td>
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<td>Flux current [%] (Field curr %)</td>
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<td>I field cnst 70</td>
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<td>I field cnst 90</td>
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<td>Speed P bypass [%]</td>
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**CONFIGURATION \ Speed fbk**

Motor max speed [rpm] 162 Float * 0 6553 1500 1500 ✓ R/Z - R
## Parameter List

### Speed fbk sel
- Encoder 1
- Encoder 2
- Tacho
- Armature

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### Configuration

#### Drive type
- Drive size [A]
- 2B + E (2Q + rev exciter)
- Size selection
- Software version
- Drive type

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- Dim factor num
- Dim factor den
- Dim factor text

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- Face value den

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**FUNCTIONS**

**Stop control**

**Brake control**

**I/n curve (Taper curr lim)**

**Test generator**

---

**GEI-100332Ga**

**PARAMETER LISTS**

---

**10**
## PARAMETER LISTS

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Accessible only with optional Field Bus card (see Bus card user manual)

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**Key Terms:**
- **RS485/ BUS/ Opt2-M**
- **Opt2-A/ PDC**
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**OPTIONS \ TORQUE WINDER \ Torque calculate**

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**OPTIONS \ TORQUE WINDER \ Comp calculate**

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**OPTIONS \ TORQUE WINDER \ Taper function**

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**OPTIONS ▼ TORQUE WINDER ▼ Speed demand**

| Speed demand En          | 1215 | U16    | 0   | 1 | Disabled (0) | Disabled (0) | ✓ | R/W | 1 | 0 | - | R/W |
| Winder side              | 1201 | U16    | 0   | 1 | Up (0) | Up (0) | ✓ | R/W | 1 | 0 | ID | R/W |
| W gain [%]               | 1202 | U16    | 0   | 100 | 0 | 0 | ✓ | R/W | - | - | - | - |
| Spd match                | 1195 | U16    | 0   | 1 | OFF (0) | OFF (0) | ✓ | R/W | 1 | 0 | ID | R/W |
| Spd match gain [%]       | 1200 | U16    | 0   | 150 | 100 | 100 | ✓ | R/W | - | - | - | - |
| Spd match acc [s]        | 1196 | Float  | 0.30 | 300.00 | 83.88 | 83.88 | ✓ | R/W | - | - | - | - |
| Spd match dec [s]        | 1197 | Float  | 0.30 | 300.00 | 83.88 | 83.88 | ✓ | R/W | - | - | - | - |
| Spd match compl          | 1203 | U16    | 0   | 1 | 200 | 100 | 100 | ✓ | R/W | - | - | - | - |
| Spd match torque [%]     | 1216 | U16    | 0   | 200 | 0 | 0 | ✓ | R/W | - | - | - | - |
| W offset [rpm]           | 1199 | I16    | 0   | 1000 | 0 | 0 | ✓ | R/W | - | - | - | - |
| Offset acc time [s]      | 1198 | Float  | 0.30 | 950.00 | 83.88 | 83.88 | ✓ | R/W | - | - | - | - |
| W target                 | 1210 | U16    | 0   | 65535 | 0 | 0 | ✓ | R/Z | - | - | - | - |
| W reference [rpm]        | 1217 | I16    | -8192 | +8192 | 0 | 0 | ✓ | R | QA | - | - | - | - |
| Jog TW enable            | 1256 | U16    | 0   | 1 | Disabled (0) | Disabled (0) | ✓ | R/W | 1 | 0 | ID | R/W |
| Jog TW speed [%]         | 1255 | I16    | 0   | 100 | 0 | 0 | ✓ | R/W | - | - | - | - |

**DRIVECOM**

| Malfunction code         | 57   | I16    | ✓ | R | 5100h | 5100h | - | - |
|                         |      |        |   |   | 3120h | 3120h | - | - |
|                         |      |        |   |   | 3310h | 3310h | - | - |
|                         |      |        |   |   | 2300h | 2300h | - | - |
|                         |      |        |   |   | 4210h | 4210h | - | - |
|                         |      |        |   |   | 5000h | 5000h | - | - |
|                         |      |        |   |   | 6110h | 6110h | - | - |
|                         |      |        |   |   | 6120h | 6120h | - | - |
|                         |      |        |   |   | 7301h | 7301h | - | - |
|                         |      |        |   |   | 9000h | 9000h | - | - |
|                         |      |        |   |   | 9009h | 9009h | - | - |

<p>| Control word            | 55   | U16    | ✓ | R/W | - | R/W |
|                        |      |        | 65535 | 0 | 0 | ✓ | R/W | IA, QA | - | - |
| Status word             | 56   | U16    | ✓ | R | - | R |
| Speed input var [FF]    | 44   | I16    | ✓ | R/W | +2 P45 | +2 P45 | IA, QA | - | - |
| Speed ref var [FF]      | 115  | I16    | ✓ | R | - | R |</p>
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## DV-300 Adjustable Speed Drives

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### DV-300 Adjustable Speed Drives

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**DV-300 Adjustable Speed Drives**

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**PARAMETER LISTS**

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**Bitword pad A**

| Pad A Bit 0 | U16 | 0 | 65535 | 0 | 0 | ✔ | R/W | ID*, QD* | R/W |
| Pad A Bit 1 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 2 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 3 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 4 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 5 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 6 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 7 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 8 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 9 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 10 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 11 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 12 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 13 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 14 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |
| Pad A Bit 15 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | ID, QD | R/W |

**Bitword pad B**

<p>| Pad B Bit 0 | U16 | 0 | 65535 | 0 | 0 | ✔ | R/W | QD* | R/W |
| Pad B Bit 1 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | QD | R |
| Pad B Bit 2 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | QD | R |
| Pad B Bit 3 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | QD | R |
| Pad B Bit 4 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | QD | R |
| Pad B Bit 5 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | QD | R |
| Pad B Bit 6 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | QD | R |
| Pad B Bit 7 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | QD | R |
| Pad B Bit 8 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | QD* | - |
| Pad B Bit 9 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | QD* | - |
| Pad B Bit 10 | U16 | 0 | 1 | 0 | 0 | ✔ | R/W | QD* | - |</p>
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## DV-300 Adjustable Speed Drives

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<td>628</td>
<td>FUNCTIONS \ Stop control</td>
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<tr>
<td>Tune value inp 1</td>
<td>73</td>
<td>I/O CONFIG \ Analog inputs \ Analog input 1</td>
</tr>
<tr>
<td>Tune value inp 2</td>
<td>78</td>
<td>I/O CONFIG \ Analog inputs \ Analog input 2</td>
</tr>
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<td>Tune value inp 3</td>
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<td>Undervolt thr [V]</td>
<td>481</td>
<td>START UP \ Alarms</td>
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<td>481</td>
<td>CONFIGURATION \ Prog alarms \ Undervoltage</td>
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<tr>
<td>Variable J comp [%]</td>
<td>1171</td>
<td>OPTIONS \ TORQUE WINDER \ Torque calculat \ Comp calculat</td>
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<tr>
<td>Virtual dig inp</td>
<td>582</td>
<td>MONITOR \ I/O</td>
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<td>Virtual dig out</td>
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<td>MONITOR \ I/O</td>
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<tr>
<td>Voltage I [%]</td>
<td>494</td>
<td>TUNING</td>
</tr>
<tr>
<td>Voltage I [%]</td>
<td>494</td>
<td>REG PARAMETERS \ Percent values \ Voltage reg</td>
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<td>Voltage I base [P%/V\cdot ms]</td>
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<td>REG PARAMETERS \ Base values \ Voltage reg</td>
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<td>Voltage P [%]</td>
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<td>TUNING</td>
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<td>REG PARAMETERS \ Percent values \ Voltage reg</td>
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<td>Voltage P base [P%/V]</td>
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<td>W offset [rpm]</td>
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<td>W reference [rpm]</td>
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<td>OPTIONS \ TORQUE WINDER \ Diam Calculatio</td>
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<td>Winder side</td>
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<td>Zero torque</td>
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# 10.4 List of High Priority Parameters

When a 6KCV300DGF is used a subset of the DV-300 parameters can be exchanged with the optional card through the automatic synchronous communication. For more details see the 6KCV300DGF technical documentation.

<table>
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<tr>
<th>Parameter</th>
<th>No.</th>
<th>Format</th>
<th>Value</th>
<th>Read/Write</th>
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### Parameter Lists

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<td>F act speed (rpm) [spd]</td>
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<td>R</td>
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<td>F act speed (d) [spd]</td>
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<td>I16</td>
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<td>R</td>
</tr>
</tbody>
</table>

**Note!**

1) **[SPD]** = Speed settings are xpressed in RPM * 4

2) **[CURR]** = Current settings are expressed in European Drive rated current / 2000 **[CURR]**
   = Motor Amps (2000 is **TOP_CURR**)

3) **[ENC_PLS]** = Encoders positions are expressed in pulses * 4

4) **[ENC_TIM]** = Encoders *last time* (s) are expressed in 50ns units (1=50nS)

5) Encoder 2 parameters (marked with “*“ in the table) can be read by the 6KCV300DGF only if the parameter **Speed fbk sel** = encoder 2

6) Encoder 1 parameters (marked with “*“ in the table) can be read by the 6KCV300DGF only if
   - the parameter **Speed fbk sel** = encoder 2 and
   - a digital encoder is used as encoder 1 (interfacing with the converter by means of the 6KDV300DES card)

7) **Speed reg output [%]** contains valid information even if the speed regulator is disabled (Enable speed reg = Disabled). If Speed reg output is enabled, it contains the sum of actual speed regulator output and T current ref 2.
### 11.1 HARDWARE CONFIGURATION (CARDS / DIP SWITCHES / JUMPERS)

The functionality and use of the DV-300 converter are the same for the whole device range. Different power and control cards are mounted depending on the output rated current. The following table indicates the card range for each converter type.

#### 6KDV3017... , 6KDV3020...

<table>
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<tr>
<th>Function</th>
<th>Type</th>
<th>Drawing</th>
<th>Converter size [A]</th>
<th>17...35</th>
<th>20...40</th>
<th>56</th>
<th>70</th>
<th>88...148</th>
<th>110...185</th>
<th>224...450</th>
<th>280...650</th>
<th>560...850</th>
<th>770...1050</th>
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<td>X*</td>
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<tr>
<td>I/O expansion</td>
<td>TBO (opt.)</td>
<td>ESE 2121</td>
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<td>X</td>
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</tr>
</tbody>
</table>

* Used only for 6KDV3017... (American sizes)

(-2B) Used only for 6KDV3...Q2B and 6KDV...Q4F version for two quadrant converter.
11.2. R-TPD32-GE REGULATION CARD

For more information see chapter 4.4.
**11.3 FIR1-... POWER/DRIVER CARDS**

* These components are mounted only on 6KDV3 ... Q4
**11.4 FIR2-... POWER/Driver CARD**

* These components are mounted only on 6KDV3 ... Q4
11.5 FIR3-32 POWER/DRIVER CARD

* These components are mounted only on 6KDV3 ... Q4
11.6 PBB POWER CONNECTION CARD

11.7 PFC1-32 FIELD CONVERTER
11.8 PFC2-31  FIELD CONVERTER

11.9 SN-FC  FIELD SNUBBER
11.10 SN4-31, SN5-31 SNUBBER

11.11 SW1-31 POWER SUPPLY CARD
11.12 SW2-32 POWER SUPPLY CARD

11.13 FL-31 FILTER
11.14 CN3 CONNECTION CARD

11.15 I/O OPTION CARD 6KCV300TBO
The instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser’s purposes, the matter should be referred to the GE company.

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*GEI-100332Ga*