



GE Industrial Systems

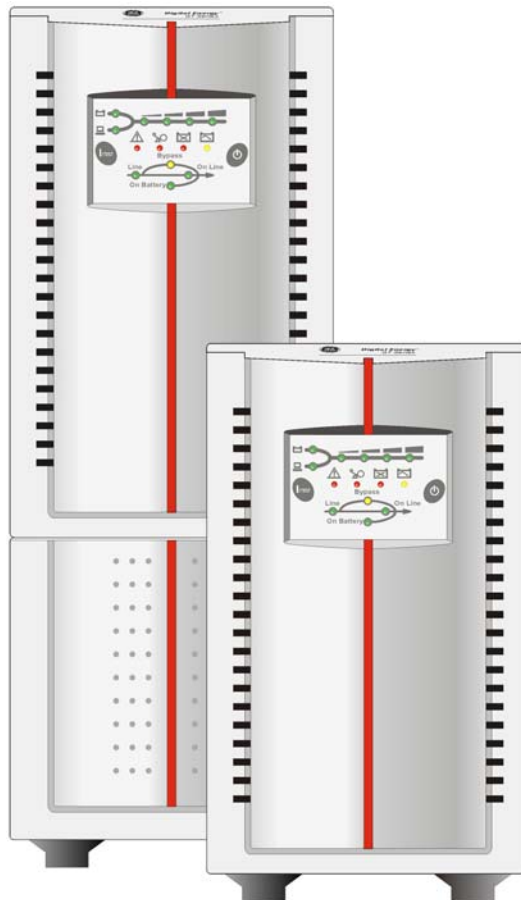
Product Description

# Digital Energy™ GT Series

On-Line Uninterruptible Power Supply

1000, 1500, 2000, 3000 VA

UL-version



Manufactured by:

GE Consumer & Industrial  
Electrical Equipment  
Bonham, Texas  
USA  
General Electric Company

Telephone 903 640 7900  
Fax 903 640 0535  
Website [www.geindustrial.com](http://www.geindustrial.com)





## Contents:

1.	Introduction .....	2
2.	Functional Explanation .....	2
2.1	Principles of Operation	
2.2	Normal Conditions	
2.3	Utility Failure	
2.4	Bypass Operation	
3.	External Description .....	4
3.1	Operating Panel and Rear Panel	
3.2	Enclosure	
3.3	Dimensions	
3.4	Weight	
4.	Electrical Specifications.....	5
4.1	Ratings	
4.2	Input Converter	
4.3	Output Converter	
4.4	Bypass	
4.5	General Design Criteria	
5.	Performance Characteristics.....	6
5.1	Efficiency	
5.2	No-load Power Consumption	
5.3	Environment	
5.4	Runtimes	
5.5	Overload Capability	
5.6	Standard Features	
6.	Communication Interface .....	8
6.1	Principle of Operation	
6.2	Pin Functions	
6.3	Dry Contact	
6.4	SNMP plug-in Interface Card (optional)	
7.	Batteries.....	10
8.	Options .....	11
8.1	SNMP Interface Card	
8.2	TVSS - Transient Voltage Surge Suppressor	
8.3	Longer Runtimes	
9.	Transport / Storage.....	11

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# 1 - Introduction

The **GE (General Electric) Digital Energy™ GT Series UPS** is a compact, truly on-line system (VFI, Voltage and Frequency Independent) which incorporates the most advanced power electronics technology to provide exceptional protection for electrical equipment.

Each **GE Digital Energy™ UPS** is thoroughly tested and conforms within tolerance to the following specifications. (Data are mean values and are subject to change without notice.) Information applies to all models unless otherwise specified.

# 2 - Functional Explanation

## 2.1 Principles of Operation

The **Digital Energy™ GT Series UPS** stores electric energy in batteries housed in the unit. This allows the UPS to supply output power even when the incoming mains power is cut off completely. Energy is stored as Direct Current (DC), while input and output energy are Alternating Current (AC) in sine wave form. Therefore the UPS contains an input converter (AC to DC) and an output converter (DC to AC) (See fig.1).

The **Digital Energy™ GT Series UPS** is a SECOND GENERATION On-Line UPS with:

- \* a capacitor bank in the DC line
- \* battery not in line with the DC link, resulting in:
  - enhanced battery life
  - optimal battery charging
- \* full wave input converter with power factor correction
- \* extremely wide input voltage and input frequency tolerance
- \* no inrush current at start up

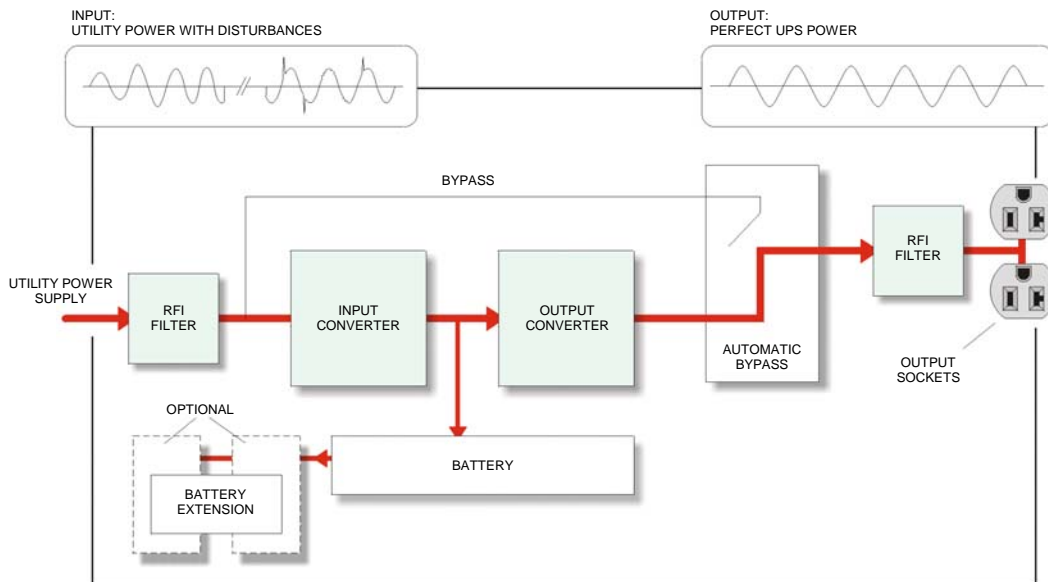


Figure 1 Block diagram of the **Digital Energy™ GT Series 1000-3000 UPS, mains present**



## 2.2 Normal Conditions

Under normal input conditions (see section 4.2) energy from the utility is channelled through the input converter, which supplies the battery charger and output converter, this keeps the battery fully charged. Surges and spikes are blocked completely at the input converter and very unstable utility power can be connected. The output converter synthesizes a completely new AC output sine wave to supply the load (electrical equipment).

## 2.3 Utility Failure

In the event of a utility power failure (i.e. mains absent or outside tolerance) the output converter uses the energy reserve stored in the battery to continue to produce AC power, ensuring uninterrupted output (fig. 2). No interruption or alteration will ever be noticed in the output power.

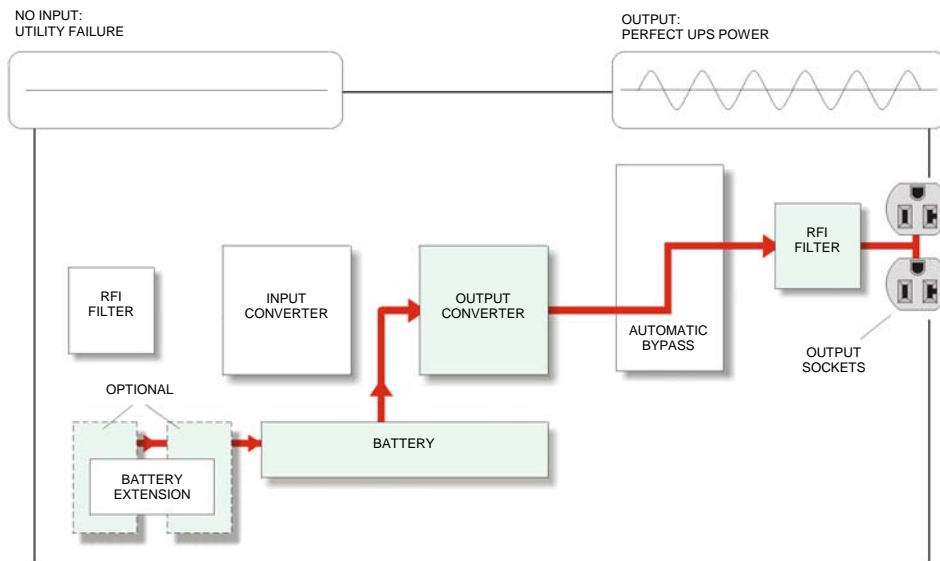


Figure 2 Block diagram of the **Digital Energy™ GT Series 1000-3000**, utility failure

In the event of an extended utility failure, the output converter will stop when the battery energy has been depleted. At this point, the UPS is no longer able to power the connected equipment.

When the utility power is re-established within tolerance, the input converter will be supplied again by the utility and the batteries will be recharged, making them ready to support future power failures.

## 2.4 Bypass Operation

If the output converter is unable to deliver the demanded output power (overload, over temperature) the bypass switch will automatically transfer the load to the mains. It will switch back to output converter when the overload has been removed. If bypass operation is caused by over temperature, the unit will switch back when the temperature has dropped below alarm level.

When the normal situation is restored, the load will be transferred back to the output converter.

The transfer time is less than 4 msec and is sufficient to allow to the connected equipment to ride through. Computer equipment can ride through 10-20 msec outage.



If a utility power failure occurs during bypass operation, the UPS will switch back to inverter and eventually, when the batteries are depleted, output power is lost. If the UPS functions under overload conditions it may not be able to protect the load.

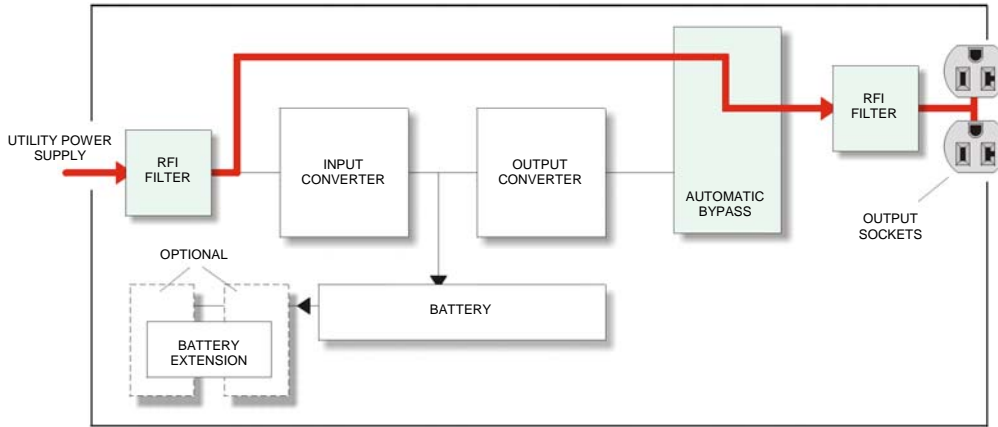


Figure 3 Bypass operation



### 3.1 Operating Panel and Rear View



Figure 4 Operating panel and rear view **Digital Energy™ GT Series 1000 –1500 - 2000 - 3000**

#### FRONT

Line	green LED
On Line	green LED
Bypass	yellow LED
On Battery	green LED
Overload	red LED
Battery low	yellow LED
Replace battery	red LED
Fault	red LED
Load level meter	4 green LED's
Battery level meter	4 green LED's
Push-buttons	power on - 3 functions: - power on, - battery test - mute buzzer - power off

#### REAR

Output receptacles (NEMA-type)	1kVA: 4x5-15R 1.5kVA: 3x5-15R, 3x5-20R, 1xL5-20R 2kVA: 6x5-20R, 1xL5-20R 3kVA: 6x5-20R, 1xL5-30R
Input	1kVA: IEC320; 1.5/2/3kVA: fixed cord 6ft.
Input fuse	TCB (thermal circuit breaker)
SNMP slot	for optional SNMP adapter
Surge protector slot	for optional Transient Voltage Surge Suppressor (to protect telephone and network line)
Comm. interface	RS232 and dry contact
Fan(s)	electronically controlled
DC Connector	to connect optional battery pack
Output fuse	circuit breaker (3kVA only)

### 3.2 Enclosure

Construction	:	steel/plastic
Colour	:	RAL 9006 (aluminium grey) - front panel; RAL 9010 (white) - cabinet
Protection	:	IP 20

<b>Digital Energy™ GT Series model :</b>	1000T UL	1500T UL	2000T UL	3000T UL
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### 3.3 Dimensions

Dimensions (HxWxD, inches)	:	9.5 x 5.5 x 14.4	14.7 x 5.5 x 16.7
Shipping dimensions (HxWxD, inches)	:	12.8 x 9.5 x 19.9	19.4 x 9.8 x 23.8
Dimensions (HxWxD, mm)	:	242 x 140 x 366	373 x 140 x 425
Shipping dimensions (HxWxD, mm)	:	326 x 241 x 506	493 x 249 x 605

### 3.4 Weight

Weight (kg / lbs):	:	15 / 33	30 / 66.0
Shipping weight (kg / lbs)	:	18 / 39.6	33 / 72.7



## 4 - Electrical Specifications

Digital Energy™ GT Series model : 1000T                      1500T                      2000T                      3000T

### 4.1 Ratings

Voltage Amperes (VA)	:	1000	1500	2000	3000
with computer type load					
Watts (W) with resistive load, pf. 0.8	:	800	1200	1600	2400

### 4.2 Input

AC input voltage, nominal	:	120 Vac single phase			
AC input voltage range	:				
at 100% load	:	80~138 V			
at 70% load	:	65~80 V (programmable)			
Minimum start-up AC voltage	:	50Vac (at any load)			
High voltage protection	:	above 138Vac the <b>GT Series UPS</b> will disconnect the mains and switch to battery operation			
Input current (A), fully charged,					
at 120Vac input voltage	:	8.6	11.5	16.7	24.6
Input frequency, nominal	:	50 or 60 Hz (auto-selectable)			
Input frequency range	:	45~65 Hz			
Input current waveform	:	sine wave			
Input power factor	:	≥ 0.97 (full computer load, fully charged)			
Input protection breaker (A)	:	15	20	30	40

### 4.3 Output

AC output voltage, nominal	:	120 Vac single phase			
AC output voltage tolerance	:	± 2% (static)			
Output frequency	:	50 or 60 Hz, auto-selectable (default at cold start 60 Hz)			
Output frequency range (free running)	:	nominal ± 0.05Hz			
Output frequency range (sync. to util.)	:	nominal ± 5Hz			
Output waveform	:	pure sine wave			
Harmonic distortion, linear load	:	< 3%	< 3%	< 3%	< 4%
Harmonic distortion, computer load	:		< 6%		
Power factor	:		0.8		
Crest factor (peak to RMS current):	:		3:1		
Output protection breaker	:	n.a.	n.a.	n.a.	15Ax2

### 4.4 Bypass

AC input voltage range	:	65 - 135 Vac
Frequency tracking rate (slew rate)	:	>1Hz/sec - <5 Hz/sec.
Frequency tracking range	:	nominal ± 10%
Phase difference	:	no phase difference – the unit is single loop
Transfer time inverter < > bypass	:	< 4 msec.

### 4.5 General Design Criteria

Safety	:	UL/cUL, TÜV/GS
EMC - Electromagnetic compatibility	:	FCC Class A (1.5/2/3kVA)/B(1kVA) CISPR PUB 22 Class B; TÜV/EMC; CE
Altitude	:	3000 meters

Note: The **GT Series UPS** is intended for use in normal domestic and office situations



## 5 - Performance Characteristics

Digital Energy™ GT Series model	:	<b>1000T</b>	<b>1500T</b>	<b>2000T</b>	<b>3000T</b>
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### 5.1 Efficiency (battery fully charged)

Normal operation (AC-AC) at full linear load, %	:	≥ 87	≥ 87	≥ 87	≥ 87
Battery operation (DC-AC) At full linear load, %	:	85	85	85	85
Max. heat output (W/h) 100% load Normal operation (AC-AC)	:	120	240	240	360

### 5.2 No-load Power Consumption (battery fully charged)

Normal operation (AC-AC) (W)	:	<35	<70	<70	<105
Battery operation (DC-AC) (W)	:	<40	<80	<80	<120

### 5.3 Environment

Audible noise at 1 meter, db(A)	:	40	42	42	45
the audible noise is load and temperature dependent					
Ambient temperature	:	0 ~ +40°C (32 ~ 104°F)			
Relative humidity	:	0 - 95% (non-condensing)			

### 5.4 Runtimes, ratings given for 25°C (77°F)

Runtime (min. @typical load in W)					
Half computer load	:	14 @ 400W	14 @ 600W	14 @ 800W	14 @ 1200W
Full computer load	:	5 @ 800W	5 @ 1200W	5 @ 1600W	5 @ 2400W

Units connected to battery cabinets will have longer runtimes. See section 8.3.

### 5.5 Overload Capability

Overload protection	:	Fully protected against overload and short circuits.
Overload behaviour: synchronized	:	~105% ±3% - continuous ~125% ±4% - 3 minutes ~150% ±5% - 30 seconds (linear load only) >150% ±5% - 0.5 seconds
not-synchronized	:	<70% continuous >70% shutdown after 24 hours of overload warning





## 5.6 Standard Features

### Wide AC input voltage window

Minimizes the need for battery operation

### High voltage protection

Above the maximum input voltage, the **GT Series UPS** will protect itself and the load by disconnecting the mains and switching to battery operation. Reducing the mains voltage will recover the normal situation.

### Power factor 1.0 input

The AC input current drawn by the UPS is less than that supplied to the load. Contrary to UPSs and computers without this feature, no disturbances, which may cause problems to other electrical equipment, are fed back to the mains. This feature will become mandatory within a few years.

### No UPS inrush current

When switching on, the UPS causes no inrush current. Inrush currents result in voltage dips on the mains, which can disturb other equipment or even blow the fuse of the distribution board.

### Battery start (cold start)

Allows you to switch on the unit while the mains input is absent.



## 6 - Communication Interface

### 6.1 Principle of Operation

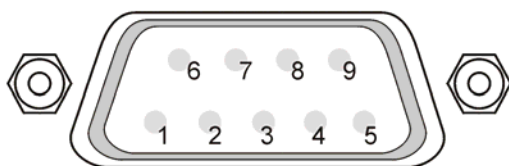
The **GT Series UPS** is equipped with a communications interface, providing RS232 and dry contact protocols in one sub-D 9-pin female connector located at the back of the unit. The interface port enables advanced communication between the UPS and the computer (interface kit required).

For specific information on **GE Digital Energy™** connectivity products please contact your local dealer or Internet: [www.geindustrial.com/industrialsystems/gede/index.html](http://www.geindustrial.com/industrialsystems/gede/index.html)

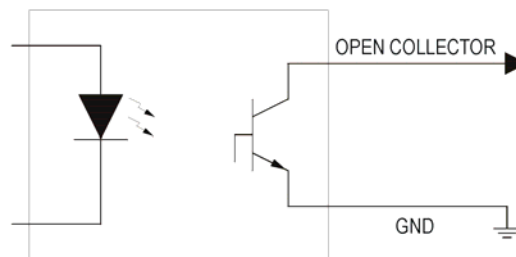
The interface cable should be shielded.

The pin assignment of the interface connector is defined as follows:

PIN	ASSIGNMENT DESCRIPTION	
	RS-232	Dry Contact
1		Low battery (Open collector)
2	UPS TxD (typical RS-232 level)	
3	UPS RxD (typical RS-232 level)	Remote shutdown (5~12V)
4	Reserved for PNP	
5	GND	GND
6	Reserved for PNP	Reserved
7	Reserved for PNP	Reserved
8		Utility Fail (Open collector)
9		



Pin Assignment



Open Collector Circuit

The maximum voltage and current on pin 1,8 is 30VDC, 10mA.



## 6.2 RS232

The **RS-232 communication port** provides the following functions:

- 1 - Monitoring charger status
- 2 - Monitoring battery status and condition
- 3 - Monitoring inverter status
- 4 - Monitoring UPS status
- 5 - Monitoring the AC utility status
- 6 - Turn on/off UPS on schedule for power saving
- 7 - Adjust transfer voltage

### Pin Assignment:

- Pin 2 : PC receives line RS-232 data from UPS.
- Pin 3 : PC transmits line RS-232 data to UPS.
- Pin 5 : Signal ground.
- Pin 4,6,7 : Reserved for plug and play function.

The UPS data is provided at 2400 bps baud rate and made up of 8-bit, 1 stop-bit and no parity bit. All information is encoded in ASCII format.

### Hardware:

Baud rate	2400 bps
Data length	8 bits
Stop bit	1 bit
Parity	none

### Cabling:

Standard sub-D 9 cable (UPS side: male, PC side: female)

## 6.3 Dry Contact

The communication port on the UPS can be connected to a computer. This port allows the computer to monitor the UPS status and control the operation of the UPS in some conditions.

Its major functions are some or all of the following:

- 1 - to broadcast a warning when the AC utility fails.
- 2 - to close the files before the battery is exhausted.
- 3 - to turn off the computer(s) connected to the UPS.

### Pin Assignment:

- Pin 1 : Normally open. When the battery voltage level is low, pin 1 and pin 5 are connected together via a photo coupler.
- Pin 3 : UPS will shut down when a high level (5~12V) is applied for at least 3.8 seconds.
- Pin 5 : Signal ground.
- Pin 6,7 : Reserved.
- Pin 8 : Normally open. When the AC utility fails, pin 8 and pin 5 are connected together via a photo coupler.

### Cabling:

A special cable should be used with a pin assignment as follows:

PC (female)	UPS (male)
Pin 1 -----	Pin 1 (battery Low)
Pin 3 -----	Pin 5 (GND)
Pin 4 -----	Pin 3 (Shutdown)
Pin 7 -----	Pin 6
Pin 7 -----	Pin 7
Pin 8 -----	Pin 8 (AC Fail)

Some computers may have a special connector to link this communication port, or require a special plug-in card, or need a special UPS monitoring software. Contact your local dealer for more information about different interface kits.



The dry contacts and (optional) SNMP card can be connected at the same time. However, if both are operating simultaneously the remote shutdown facility for the dry contacts will not be available. Battery low and AC failure functions remain unaffected.

### 6.4 SNMP Plug-in Card (optional)

SNMP (Simple Network Management Protocol) is the most popular protocol in the network. Via NMS (Network Management Station) you can detect the status of all facilities in the network.

An SNMP Interface Card can be plugged into the built-in SNMP slot on rear panel of the UPS. This optional interface unit can integrate the UPS into the network allowing you to easily monitoring the UPS status.

NOTE: Once you install the SNMP card in the UPS, you can not get any information from the UPS via RS232. i.e. only either an SNMP card or the RS232 port can be used as a communication interface. The dry contacts and (optional) SNMP card can be connected at the same time. However, if both are operating simultaneously the remote shutdown facility for the dry contacts will not be available. Battery low and AC failure functions remain unaffected.

The SNMP card also supports SHTTP protocol, you can use browser Microsoft IE or Netscape Communicator to monitor or configure the UPS. The SNMP card also supports Telnet and FTP for remote monitoring and firmware upgrading.

#### Specifications:

- 1 - Auto detecting 10/100M Network speed.
- 2 - Supporting protocol: TCP/IP, UDP, HTTP, ICMP, ARP, TELNET, BOOTP, DHCP, FTP and SNMPv1.
- 3 - Remote firmware upgradeable and configurable.
- 4 - Web server built-in, allow monitoring/controlling UPS via browser.
- 5 - VT100 terminal mode or Telnet to configure SNMP.

#### Functions:

- 1 - Schedule: Shutdown/Restart UPS, testing and control outlets.
- 2 - Testing: Scheduled testing of the battery can insure that the UPS will operate properly during a utility power failure.
- 3 - Event log: Auto-record the power event.
- 4 - Historical records: Keep records of UPS status in specified interval.
- 5 - Event handling: configure special action for each power event to meet your requirements.
- 6 - On/Off UPS: setup the power on/off timer.
- 7 - Outlet control: configure UPS outlets.

## 7 - Batteries - ratings given for 25°C (77°F)

Digital Energy™ GT Series model	1000T	1500T	2000T	3000T
Nominal battery voltage (V) / capacity	12 / 7	12 / 7	12 / 7	12 / 9
Nominal UPS internal DC voltage	36	72	72	72
Number of batteries	3	6	6	6
Type	sealed lead acid, VRLA			
Service life	up to 3 years (depending on operating conditions)			
Runtime	see section 5.4, Runtimes			
Battery recharge current, (A)	0.7~1.4	1.2~2.4	1.2~2.4	1.2~2.4
Typical batt. recharge current (A)	1	1.8	1.8	1.8
Battery recharge voltage (Vdc)	41.1 ± 1	82.2 ± 2	82.2 ± 2	82.2 ± 2
Battery recharge time	< 6 hours for 80% capacity			
Battery leakage current (mA)	<0.4			
Battery protection, fuse x2x2 (A)	25	30	30	30

Automatic (quick) battery test : The user can define a scheduled test through the data protection software

Long term storage: see chapter 9.

