



EPSITRON®
Switched-Mode Power Supply with Integrated
UPS Charger and Controller
787-1675

Version 1.0.0

© 2013 by WAGO Kontakttechnik GmbH & Co. KG
All rights reserved.

WAGO Kontakttechnik GmbH & Co. KG

Hansastraße 27
D-32423 Minden

Phone: +49 (0) 571/8 87 – 0
Fax: +49 (0) 571/8 87 – 1 69

E-Mail: info@wago.com

Web: <http://www.wago.com>

Technical Support

Phone: +49 (0) 571/8 87 – 5 55
Fax: +49 (0) 571/8 87 – 85 55

E-Mail: support@wago.com

Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

E-Mail: documentation@wago.com

We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally protected by trademark or patent.

Table of Contents

1	Notes about this Documentation.....	5
1.1	Copyright.....	5
1.2	Symbols.....	6
1.3	Number Notation.....	8
1.4	Font Conventions.....	8
2	Important Notes	9
2.1	Legal Bases	9
2.1.1	Subject to Changes	9
2.1.2	Personnel Qualifications.....	9
2.1.3	Use of the 787 Series in Compliance with Underlying Provisions	9
2.1.4	Technical Condition of Specified Devices.....	10
2.2	Safety Advice (Precautions).....	11
3	Device Description	13
3.1	View	14
3.2	Connectors.....	15
3.2.1	Supply.....	15
3.2.2	Load.....	15
3.2.3	Battery, Control and Signaling Contacts	16
3.2.4	RS-232 Interface.....	16
3.3	Display Elements	17
3.4	Operating Elements	18
3.4.1	Rotary Switch for Output Voltage.....	18
3.4.2	Rotary Switch for Timed Buffer Mode	18
3.5	Technical Data	19
3.5.1	Device Data	19
3.5.2	Technical Data "Input"	19
3.5.3	Technical Data "Output"	20
3.5.3.1	Technical Data for the Output during Operation with Mains System.....	20
3.5.3.2	Technical Data for the Output during Battery Mode.....	20
3.5.4	Technical Data "Signaling"	22
3.5.5	Technical Data "Interface"	22
3.5.6	Technical Data "Ambient Conditions"	23
3.5.7	Miscellaneous Data	23
3.6	Approvals	24
3.7	Standards and Guidelines	25
4	Mounting.....	26
4.1	Mounting the <i>EPSITRON</i> ® Device on the DIN 35 Rail.....	26
4.2	Removing the <i>EPSITRON</i> ® Device from the DIN 35 Rail.....	26
5	Connect Devices	27
5.1	Connection Example	27
6	Function Description	28
6.1	Tripping of Circuit Breakers	28
6.2	Signaling via LEDs	29
6.3	Signaling via the Signal Outputs.....	29

6.4	Automatic Detection of Battery Modules	30
6.4.1	Battery Charging	30
6.4.1.1	Connecting the 787 Series Battery Modules	30
6.4.1.2	Connecting a Battery Module from a Third-Party Manufacturer ..	31
6.5	Battery Testing	31
6.5.1	Charging	31
6.5.2	Presence Test	31
6.5.3	Quality Test	32
6.5.4	Replacement	32
6.6	Battery Mode.....	32
6.6.1	Switch-On Threshold for Battery Mode.....	33
6.6.2	Timed Battery Mode.....	33
6.6.3	Battery Mode in the IPC Mode ("PC Mode")	33
6.6.3.1	Delay Time	34
6.6.3.2	Shut Down PC	35
6.6.3.3	PC Idle (Off) Time.....	35
6.6.4	Deactivating the Battery Mode.....	36
6.6.5	Deep Discharge Protection during Battery Mode	36
6.6.6	Recommended Battery Modules	37
	List of Figures	38
	List of Tables.....	39

1 Notes about this Documentation

Note



Keep this documentation!

The operating instructions are part of the product and shall be kept for the entire lifetime of the device. They shall be transferred to each subsequent owner or user of the device. Care must also be taken to ensure that any supplement to these instructions are included, if applicable.

This documentation applies to the switched-mode power supply with integrated ups charger and controller 787-1675.

1.1 Copyright

This Manual, including all figures and illustrations, is copyright-protected. Any further use of this Manual by third parties that violate pertinent copyright provisions is prohibited. Reproduction, translation, electronic and phototechnical filing/archiving (e.g., photocopying) as well as any amendments require the written consent of WAGO Kontakttechnik GmbH & Co. KG, Minden, Germany. Non-observance will involve the right to assert damage claims.

1.2 Symbols

 **DANGER****Personal Injury!**

Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

 **DANGER****Personal Injury Caused by Electric Current!**

Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

 **WARNING****Personal Injury!**

Indicates a moderate-risk, potentially hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION****Personal Injury!**

Indicates a low-risk, potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE**Damage to Property!**

Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

NOTICE**Damage to Property Caused by Electrostatic Discharge (ESD)!**

Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

Note**Important Note!**

Indicates a potential malfunction which, if not avoided, however, will not result in damage to property.

Information



Additional Information:

Refers to additional information which is not an integral part of this documentation (e.g., the Internet).

1.3 Number Notation

Table 1: Number notation

Number code	Example	Note
Decimal	100	Normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	In quotation marks, nibble separated with dots (.)

1.4 Font Conventions

Table 2: Font conventions

Font type	Indicates
<i>italic</i>	Names of paths and data files are marked in italic-type. e.g.: <i>C:\Programme\WAGO-I/O-CHECK</i>
Menu	Menu items are marked in bold letters. e.g.: Save
>	A greater-than sign between two names means the selection of a menu item from a menu. e.g.: File > New
Input	Designation of input or optional fields are marked in bold letters, e.g.: Start of measurement range
“Value”	Input or selective values are marked in inverted commas. e.g.: Enter the value “4 mA” under Start of measurement range .
[Button]	Pushbuttons in dialog boxes are marked with bold letters in square brackets. e.g.: [Input]
[Key]	Keys are marked with bold letters in square brackets. e.g.: [F5]

2 Important Notes

This section includes an overall summary of the most important safety requirements and notes that are mentioned in each individual section. To protect your health and prevent damage to devices as well, it is imperative to read and carefully follow the safety guidelines.

2.1 Legal Bases

2.1.1 Subject to Changes

WAGO Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications that serve to increase the efficiency of technical progress. WAGO Kontakttechnik GmbH & Co. KG owns all rights arising from the granting of patents or from the legal protection of utility patents. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

2.1.2 Personnel Qualifications

All sequences implemented on 787 Series devices may only be carried out by electrical specialists with sufficient knowledge in automation. The specialists must be familiar with the current norms and guidelines for the devices and automated environments.

2.1.3 Use of the 787 Series in Compliance with Underlying Provisions

The *EPSITRON*® 787 Series power supply system provides direct current to electric or electronic devices, such as industrial control systems or display, communication and measuring devices.

The devices have been developed for use in an environment that meets the IP20 protection class criteria. Protection against finger injury and solid impurities up to 12.5 mm diameter is assured; protection against water damage is not ensured. Unless otherwise specified, operation of the components in wet and dusty environments is prohibited.

The devices are designed for installation in an enclosure. Under no circumstances may they be used in control systems for planes or nuclear facilities, as any malfunction in these applications could result in severe injuries or risk of death.

2.1.4 Technical Condition of Specified Devices

The components to be supplied Ex Works, are equipped with hardware and software configurations, which meet the individual application requirements. WAGO Kontakttechnik GmbH & Co. KG will be exempted from any liability in case of changes in hardware or software as well as to non-compliant usage of components.

Please send your request for modified and new hardware or software configurations directly to WAGO Kontakttechnik GmbH & Co. KG.

2.2 Safety Advice (Precautions)

For installing and operating purposes of the relevant device to your system the following safety precautions shall be observed:



DANGER

Do not work on components while energized!

All power sources to the device shall be switched off prior to performing any installation, repair or maintenance work.



DANGER

Installation only in appropriate housings, cabinets or in electrical operation rooms!

Always install devices of the 787 Series in enclosures, cabinets or electrical equipment rooms which can be closed and locked. Ensure that access to this equipment/these rooms is possible only by authorized specialists with the appropriate key or tools.



DANGER

Voltage present at the load terminals, even on loss of power supply!

Voltage continues to be present at the load terminals even when there is a loss of power supply and the device switches to the buffer mode! Therefore, never touch the load terminals! In this case, always remove the jumper between R0 and R1 to de-energize the load terminals!

DANGER

Do not use these devices in control systems for planes, trains or nuclear facilities!

Never use these devices in control systems for planes, trains or nuclear facilities, as any malfunction in these applications can result in severe injuries or risk of death!

NOTICE

Switch off power supply to defective device!

Switch off power supply to the device immediately if the device malfunctions or is damaged! Control systems connected to the device may also be damaged! Return the defective device directly to WAGO.

NOTICE**Protect the components against materials having seeping and insulating properties!**

The components are not resistant to materials having seeping and insulating properties such as: aerosols, silicones and triglycerides (found in some hand creams). If you cannot exclude that such materials will appear in the component environment, then install the components in an enclosure being resistant to the above-mentioned materials. Clean tools and materials are imperative for handling devices/modules.

NOTICE**Cleaning only with permitted materials!**

Clean soiled contacts using oil-free compressed air or with ethyl alcohol and leather cloths.

NOTICE**Do not use any contact spray!**

Do not use any contact spray. The spray may impair contact area functionality in connection with contamination.

NOTICE**Do not reverse the polarity of connection lines!**

Avoid reverse polarity of data and power supply lines, as this may damage the devices involved.

NOTICE**Avoid electrostatic discharge!**

The devices are equipped with electronic components that you may destroy by electrostatic discharge when you touch. Pay attention while handling the devices to good grounding of the environment (persons, job and packing).

3 Device Description

The switched-mode power supply with integrated ups charger and controller 787-1675, in the following named as uninterruptible power supply system (UPS), ensures that power is always supplied. If the mains power is lost, all of the electrical loads connected to the system will continue to operate reliably.

The system consists of two function units:

- an AC/DC power supply unit with an integrated charger and controller and
- a 24V DC battery module for buffering (not included in the scope of supply).

All of the components that can be used to set up an uninterruptible power supply system are optimally matched to and compatible with one another. These components can be quickly installed and are immediately ready for operation.

Any 787-87x Series battery modules that are connected to the system are detected automatically by the UPS.

Information



Battery module not included in the scope of supply!

The scope of supply for this device does not include the battery module. The device will only continue to operate properly when at least one battery module is connected. The WAGO range of products includes compatible *EPSITRON*® 787-87x Series battery modules.

The system can also be integrated into an existing topology via several signaling contacts and a serial interface.

Critical operating states are signaled at an early stage, before the 24 V system power collapses and the device shuts down.

3.1 View

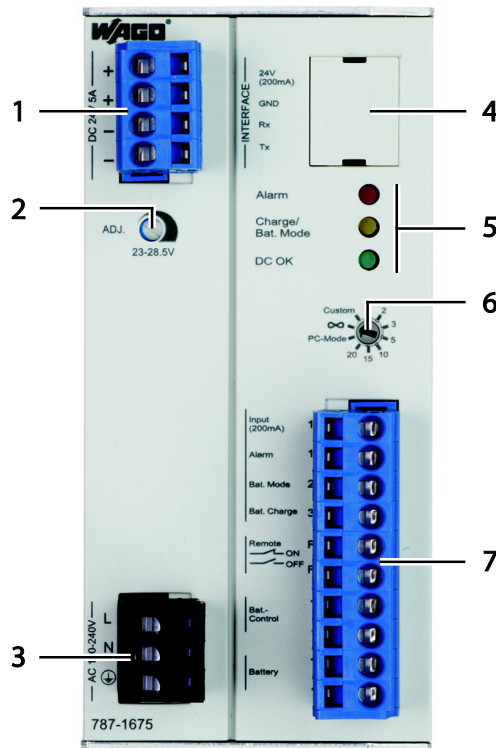


Figure 1: View of device


Table 3: Legend for "View" figure

No.	Designation	Reference
1	CAGE CLAMP® connections for 24 VDC output voltage	"Device description" > "Connections" > "Load"
2	Rotary switch for setting the output voltage	"Device Description" > "Operating Elements" > "Rotary Switch for Output Voltage"
3	CAGE CLAMP® connections for 100 ... 240 VAC input voltage	"Device Description" > "Connections" > "Power Supply"
4	RS-232 serial interface	"Device Description" > "Connections" > "RS-232 Interface"
5	LEDs	"Device Description" > "Display Elements"
6	Rotary switch for setting the timed buffer mode	"Device Description" > "Operating Elements" > "Rotary Switch for Timed Buffer Mode"
7	CAGE CLAMP® connections for battery, control and signaling contacts	"Device Description" > "Operating Elements" > "Battery, Control and Signaling Contacts"

3.2 Connectors


3.2.1 Supply

Table 4: Power supply connections

 <p>Figure 2: Supply connection</p>	No.	Designation	Function
	1	L	Input voltage: 100 ... 240 VAC
	2	N	N-conductor
	3	PE	Ground conductor

3.2.2 Load

Table 5: Terminals – Load

 <p>Figure 3: Load terminals</p>	No.	Designation	Function
	1	+	Output voltage: 24 VDC
	2	+	Output voltage: 24 VDC
	3	-	Reference potential 0 V
	4	-	Reference potential 0 V

3.2.3 Battery, Control and Signaling Contacts

Table 6: Connections – Battery, control and signaling contacts

No.	Designation	Function
1	B)	Battery connection 0 V
2	B)	Battery connection 24 V
3	°C	Signal line for "Bat. Control"
4	°C	Signal line for "Bat. Control"
5	R0	Remote shutdown in Buffer mode
6	R1	Remote shutdown in Buffer mode
7	34	Signal output "Bat.Charge"
8	24	Signal output "Bat.Mode"
9	14	Signal output "Alarm"
10	13	External supply voltage 24 VDC for signal outputs 7, 8 and 9.

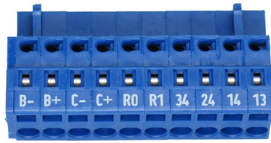


Figure 4: Battery, control and signaling contacts

3.2.4 RS-232 Interface

Table 7: Connections – RS-232 interface

No.	Designation	Function
1	1	Transmitter (Tx)
2	2	Receiver (Rx)
3	3	Reference potential 0V
4	4	Output voltage: 24 VDC

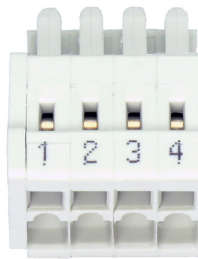


Figure 5: RS-232 interface

3.3 Display Elements

The unit is equipped with three LEDs, which indicate the following statuses:

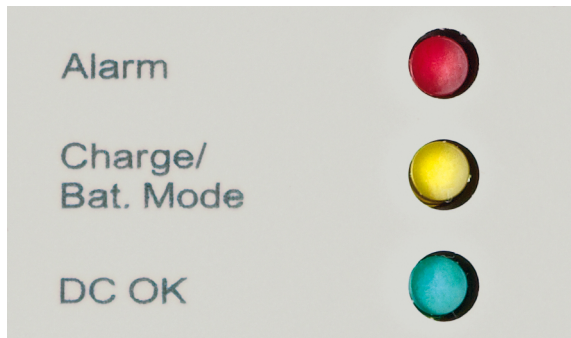


Figure 6: Display elements

Table 8: Legend for "Indicators" figure

No.	LED	Designation	Explanation:
1	red	Alarm	The unit is faulted, or the Battery mode is being terminated.
2	yellow	Charge/ Bat. Mode	The unit is charging the batteries, or is operating in the Battery mode.
3	green	DC OK	The unit is ready for use.

Note



Further signaling possible!

Other statuses can also be indicated if an error occurs. For information about this, refer to the "Operating Statuses" table given in this manual.

3.4 Operating Elements

3.4.1 Rotary Switch for Output Voltage

The unit is set at the factory for an output voltage of 24 VDC. You can change this value using the rotary switch. The output voltage can be set to any value between 23 ... 28.5 VDC.



Figure 7: Rotary switch for output voltage

3.4.2 Rotary Switch for Timed Buffer Mode

The unit is set at the factory for battery operation for an indefinite period of time. You can change this value using the rotary switch. Besides set time periods from 1 ... 20 minutes, the following settings can also be made:

- **PC Mode:** The unit operates based on a time sequence, which shuts down an IPC, a control system or display and operator panel in a controlled manner when battery operation is ended. All default values can be set individually using the "759-870 V2" configuration software (starting from Version 2.5).
- **Indefinite mode ("∞"):** Power supply is maintained until the deep discharge threshold is reached.
- **Custom mode:** The timed Battery mode can be set individually using the "759-870 V2" configuration software (starting from Version 2.5).

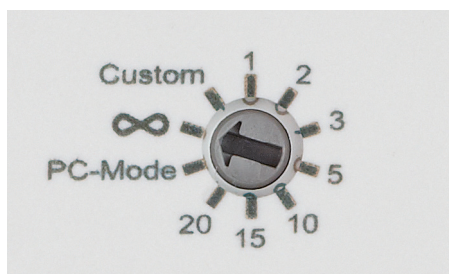


Figure 8: Rotary switch for battery operation

3.5 Technical Data

3.5.1 Device Data

Table 9: Device data

Width	60 mm/2.36 in.
Height	127 mm
Height from upper-edge of DIN 35 rail	135.5 mm
Weight	800 g

3.5.2 Technical Data "Input"

Table 10: Technical data - "Input"

Nominal input voltage	100 ... 240 VAC
Input voltage range AC	85 ... 264 VAC
Input voltage derating AC	-1.5 %/VAC < 110 VAC
Input voltage range DC	120 ... 372 VDC
Input voltage derating DC	-1 %/VDC < 150 VDC
Frequency range	47 ... 63 Hz/ 0 Hz
Input current I _e	1.1 A for 230 VAC; 2.2 A for 100 VAC
Inrush current	less than 30 A
Turn-on time	less than 100 ms
Transient overvoltage protection:	Varistor
Discharge current to PE	1 mA
Input fuse (internal)	4 A, slow
Recommended backup fusing:	6 A, 10 A or 16 A (Characteristic B or C)
Input modules	CAGE CLAMP [®] , 721 Series; 0.08 mm ² ... 2.5 mm ² ; AWG 28 ... 12

3.5.3 Technical Data "Output"

Table 11: Technical data - "Output"

Recovery stability	maximum 35 VDC
Overvoltage Protection	38 VDC
Parallel connection of several modules	yes, with a maximum of two modules decoupled from one another
Series connection of several modules	yes, without any restrictions
Output nominal current	5 A
Tripping of fuses	Maximum B4 power circuit breakers
Output terminals	CAGE CLAMP®, 721 Series; 0.08 mm ² ... 2.5 mm ² ; AWG 28 ... 12
Line length	≤ 3 m

3.5.3.1 Technical Data for the Output during Operation with Mains System

Table 12: Technical data for the output during operation with the mains system

Nominal output voltage	24 VDC, SELV
Output voltage range	23 ... 28.5 VDC
Output current limit	starting at approx. 1.1 x nominal current, constant current
Adjustment accuracy	less than 1 % Static load change 10 ... 90 %
Maximum power loss at nominal load, - 100VAC input voltage and fully charged battery	22 W
Maximum power loss at nominal load, - 230VAC input voltage and fully charged battery	17 W
Maximum power loss at nominal load, - 90VAC input voltage, battery being charged	30 W
Efficiency	typically 88 %
Residual ripple	typically 50 mV _{SS}

3.5.3.2 Technical Data for the Output during Battery Mode

Table 13: Technical data for the output during Battery mode

Output voltage	24 VDC, SELV
Output voltage range	U _{BAT} -0.5 V (27.5 ... 19 VDC)
Output current limit	starting at approx. 1.1 x nominal current
Maximum power loss at nominal load	5.2 W
Maximum power loss during open-circuit operation	3.2 W
Remote shutdown	yes

Table 13: Technical data for the output during Battery mode

Switching of capacitive loads	maximum 10000 µF
Adjustable buffer time	1, 2, 3, 5, 10, 15 and 20 minutes; "PC mode"; "∞"; "Custom" (can be set via the RS-232 interface and the "759-870 V2" configuration software)
Reverse voltage protection	yes
Charging characteristics	Three-stage charging process, IUoU characteristic
Charging current	0.3 ... 0.6 ADC
End-of-charge voltage	26 ... 29.5 VDC, temperature-controlled. These values can be set using the software.
Battery presence test	1 x per minute
Remaining power test	every 10 minutes
Deep discharge protection	19 VDC
Message threshold "Battery power very low"	20.4 VDC
Parallel connection of battery modules	yes, maximum of three. The "Battery control" signal lines may only be connected to one battery module.
Output terminals	CAGE CLAMP®, 721 Series; 0.08 mm ² ... 2.5 mm ² ; AWG 28 ... 12
Line length	≤ 3 m

3.5.4 Technical Data "Signaling"

Table 14: Technical data - "Signaling"

LEDs	green/red/yellow
Supply for signal outputs "Bat. Alarm", "Bat. Mode" and "Bat. Charge"	maximum 30 V, current limited to 200 mA
Signal output "Bat. Alarm"	Maximum 30 V. Contact open: Fault/ Replacement of the battery module; Signal options can be configured via the RS-232 interface
Signal output "Bat. Mode"	Maximum 30 V. Contact closed: Battery mode; Signal options can be configured via the RS-232 interface
Signal output "Bat. Charge"	Maximum 30 V. Contact closed: Battery being charged; Signal options can be set via the RS-232 interface
Signal terminals	CAGE CLAMP®, 721 Series; 0.08 mm ² ... 2.5 mm ² ; AWG 28 ... 12
Line length	≤ 3 m

3.5.5 Technical Data "Interface"

Table 15: Technical Data: Interface

Interface standard	RS-232
Data lines	TxD/RxD
Control lines	none
Output voltage	24 VDC
Reference potential	0 VAC
Baud rate	9600 baud
Data bits	8
Stopbits	1
Parity	none
Protocol	On request
Configuration Software	759-870 V2, from Version 2.5 (available free of charge at www.wago.com)
Interface modules	CAGE CLAMP®, 734 Series; 0.08 mm ² ... 0.5 mm ² ; AWG 28 ... 20
Line length	≤ 3 m

3.5.6 Technical Data "Ambient Conditions"

Table 16: Technical data - "Ambient conditions"

Storage temperature	-25 °C ... +85 °C
Ambient operating temperature	-25 °C ... +70 °C
Derating	-3 %/K (> +50 °C)
Convection cooling	yes
Relative humidity (without condensation)	30 ... 85 %
Requisite minimum spacing (lateral)	0 mm
Requisite minimum spacing (top/bottom)	50 mm/1.96 in.


3.5.7 Miscellaneous Data

Table 17: Miscellaneous data

Test voltage Primary Secondary	4200 VDC
Degree of protection	IP20
Protection class (acc. to EM 61140)	I (with PE conductor)
Cooling	Natural convection cooling
Pollution degree	2
Climatic category:	3+K3
MTBF	more than 500,000 hours

3.6 Approvals

The following approvals have been awarded to the uninterruptible power supply system 787-1675:

 Conformity Marking

3.7 Standards and Guidelines

The uninterruptible power supply system 787-1675 complies with the following standards and guidelines:

Low-voltage power supplies, DC output Part 3: Electromagnetic compatibility (EMC)	IEC 61204-3:2000
--------------------------------------------------------------------------------------------	------------------

Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1100 V – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units	IEC 61558-2-16:2009
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------

Information technology equipment – Safety – Part 1: General requirements	IEC 60950-1:2009
-----------------------------------------------------------------------------------	------------------

EC EMC Directive	2004/108/EC
------------------	-------------

EC Low Voltage directive (LVD)	2006/95/EC
--------------------------------	------------

4 Mounting

The *EPSITRON*® device is designed for mounting on a DIN 35 rail.

4.1 Mounting the *EPSITRON*® Device on the DIN 35 Rail

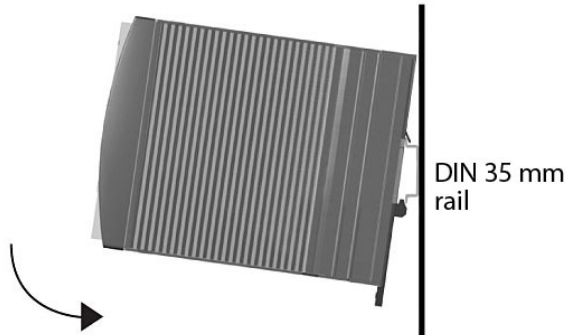


Figure 9: Mounting the device on the DIN 35 rail.

Place the *EPSITRON*® device with its DIN rail guide on the top edge of the DIN rail and press it down until it locks into place.

Lightly shake the *EPSITRON*® device to ensure that it is correctly locked into place.

4.2 Removing the *EPSITRON*® Device from the DIN 35 Rail

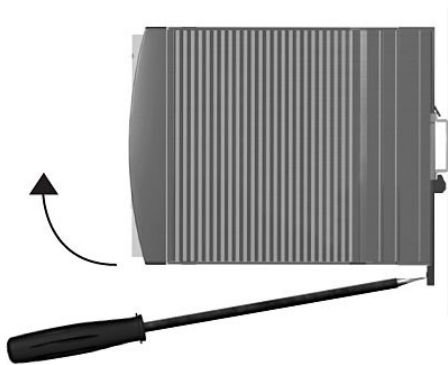


Figure 10: Removing the device from the DIN 35 rail.

Use a screwdriver to open the snap-on catch and detach the *EPSITRON*® device from the bottom edge of the DIN rail.

5 Connect Devices

5.1 Connection Example

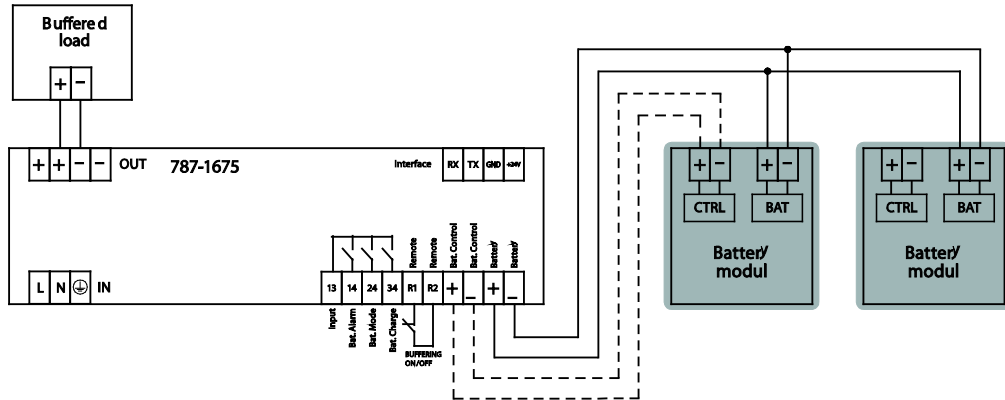


Figure 11: Connection example

6 Function Description

6.1 Tripping of Circuit Breakers

Table 18: Tripping of circuit breakers

Cross Section	Length	Fuse								
		W 2	W 3	W 4	W 6	W 10	C 2	C 4	C 6	C 10
0.75 mm ² / AWG 18	40 m									
	20 m	X	X							
1.5 mm ² / AWG 16	40 m	X	X							
		X	X							
	20 m	X	X	X						
		X	X	X						
2.5 mm ² / AWG 14	40 m	X	X	X						
		X	X	X						
	20 m	X	X	X						
		X	X	X						

Rapid magnetic trip is possible only up to the B4 characteristic.

NOTICE

An appropriate circuit breaker must be selected.

The line lengths listed here have been established through experiments at approx. 25 °C and serve as reference values to determine appropriate circuit breakers for the DC side. Always check in advance whether the given information also applies to your conditions!

6.2 Signaling via LEDs

The table below contains all of the LED signals that can occur on the device:

Table 19: Operating statuses, signaling and reactions.

Description	LED		
	green	yellow	red
The unit is in normal operation, output voltage is greater than 20.4 V and the battery is charged.	On	Off	Off
The unit is in normal operation and the battery is being charged (charging < 85 % of rated capacity).	On	On	Off
The unit is in normal operation and Battery mode is not possible (negative presence test, or no connection for remote shutdown R0/R1)	On	Off	On
The unit is in normal operation. Battery replacement is recommended.	On	Off	blinks slowly
The unit is in the Battery mode and the battery voltage is greater than 20.4 V.	On	blinks slowly	Off
The unit is in the Battery mode and the battery voltage is less than 20.4 V.	On	blinks quickly	Off
The unit's deep discharge protection system has terminated the Battery mode (battery voltage ≤ 19.2 V); signaling will be continued for a maximum of 10 hours.	Off	Off	blinks slowly
The unit is operating in the Battery mode and the DC output has been de-activated on account of excessive current.	Off	on/ off/ blinks	blinks slowly

6.3 Signaling via the Signal Outputs

There are three signal outputs on the unit that can be used to read off the specific operating status. These signal outputs are preconfigured at the factory with the following operating statuses:

- **Signal output "Bat. Alarm":** The contact is open when buffer operation is not possible, or when battery replacement is recommended.
- **Signal output "Bat. Mode":** The contact is closed when the unit is in the Battery mode.
- **Signal output "Bat. Charge":** The contact is closed when the battery is being charged.

The preconfigured operating modes can also be customized as required, for example, several events can be applied to one signal output.

The logics can be modified via the "759-870 V2" configuration software (starting from Version 2.5).

6.4 Automatic Detection of Battery Modules

The unit automatically detects 787-87x Series battery modules connected to the system, provided the "Bat. Control" (C+/C-) signal lines are connected. The internal temperature sensor can also be evaluated with these modules. The charging voltage can be re-adjusted as required during the float charge phase based on the measured temperature.

Note



Extend the service life of the battery modules used!

The service life of the battery modules used is reduced if the ambient conditions are not favorable. Always ensure therefore that the batteries are not used in excessive ambient temperatures. Information on this is given in the battery manufacturer's data sheet.

6.4.1 Battery Charging

The 787-87x Series battery modules are equipped with an internal temperature sensor of type NTC K164 (4.7 kΩ), which measures the temperature of the module. It is installed directly in each battery module.

6.4.1.1 Connecting the 787 Series Battery Modules

1. Ensure that the unit is not live by removing the power supply and the fuse in the battery module.
2. Connect the "Battery" (B+/B-) terminal of the unit to the "Battery" (+/-) terminal of the battery. Ensure that the polarity is correct!
3. Connect the "Bat. Control" (C+/C-) terminal of the unit to the "CTRL" (Ctrl+/Ctrl-) terminal of the battery. Again, ensure proper connection of the correct terminals (polarity)!
4. Re-install the fuse in its receptacle on the battery module.
5. Connect the power supply.

The green LED on the unit will then light up; the yellow LED may also light up.

Note



The red LED lights up when applying the power supply!

A fault is present if the red LED remains lit after power has been applied. If this happens, refer to the table "Signaling via LEDs" given in this manual!

6.4.1.2 Connecting a Battery Module from a Third-Party Manufacturer

Before connecting, check whether the battery module you wish to use is a rechargeable

- lead cell battery,
- lead-gel battery or
- lead-acid absorbed glass mat (AGM) battery

with a nominal voltage of 24 VDC. The unit may only be operated with these types of batteries!

1. Ensure that the unit is not live by removing the power supply and any fuse which may be present in the battery module.
2. Connect the "Battery" (B+/B-) terminal of the unit to the "Battery" (+/-) terminal of the battery. Ensure that the polarity is correct!
3. Re-install the fuse in its receptacle on the battery module.
4. Connect the power supply.

The green LED on the unit will then light up; the yellow LED may also light up.

Note



The red LED lights up when applying the power supply!

A fault is present if the red LED remains lit after power has been applied. If this happens, refer to the table "Signaling via LEDs" given in this manual!

6.5 Battery Testing

Different battery tests are carried out, depending on the operating status of the batteries. Corresponding alarms or messages are generated if the unit detects any abnormal conditions.

6.5.1 Charging

Batteries are charged during normal operation. The charge level is checked for this every 60 seconds. If the charge level for the batteries is less than 85 % the yellow LED lights up and the signal output "Bat. Charge" is activated.

6.5.2 Presence Test

The unit performs a presence test automatically every 60 seconds. This test checks whether the battery module is properly connected and operational. A brief and slight load is applied to the batteries during this test. This test is only performed when the unit is in normal operation.

If the unit determines negative results for the test, it is repeated again after only 30 seconds. The red LED lights up and the signal output "Bat. Alarm" is activated.

6.5.3 Quality Test

The service life of batteries is limited and can be between 2 - 5 years, depending on the ambient temperature. The residual service life of batteries of the 787 Series connected to the unit is calculated dynamically. A load is also applied to the batteries in defined cycles to ensure that the permissible voltage drop is not exceeded. This test thus ensures that the batteries being used are always ready for operation.

If the unit determines negative results for the test, the red LED flashes and the signal output "Bat. Alarm" is activated.

NOTICE

Replace any defective battery module at once!

Always replace any defective battery module at once! Proper, reliable operation of the connected loads can only be continued on a loss of power supply when intact, fault-free battery modules are used!

6.5.4 Replacement

If the battery service life has expired, the batteries used in the module must be replaced either in pairs, or the complete module must be replaced. Consult the instruction manual for this that came with your battery module.

6.6 Battery Mode

The unit switches over "bumplessly" to the Battery mode when there is a loss of power supply. The required 24 VDC power supply is then taken directly from the battery. The level of the output voltage depends on the charging level and the capacity of the battery.



DANGER

Voltage present at the load terminals, even on loss of power supply!

Voltage continues to be present at the load terminals even when there is a loss of power supply and the device switches to the buffer mode! Therefore, never touch the load terminals! In this case, always remove the jumper between R0 and R1 to de-energize the load terminals!

When the unit is in the Battery mode the yellow LED blinks slowly and the signal output "Bat. Mode" is activated.

In the Battery mode the unit is designed to

- maintain power supply for a set time period and
- to shut down an industrial PC connected to the system in a controlled manner and restart it.

The Windows software "759-870 V2" can be installed free of charge for individual configuration. The UPS and the PC are connected via the 787-892 communication cable.



Information

Observe the information given in the Help function for the "759-870 V2" configuration software!

Follow the information given in the Help function in the software to properly install the "759-870 V2" configuration software and use it for individually configuring your system. You can download the software free of charge at www.wago.com.

6.6.1 Switch-On Threshold for Battery Mode

Power supply is drawn from the battery when the output voltage drops below the set switch-on threshold. The factory default setting for the switch-on threshold is 22 V. You can also set this threshold using the "759-870 V2" configuration software, starting from Version 2.5, to custom values between 20 ... 25.5 V.

6.6.2 Timed Battery Mode

The unit is set at the factory for battery operation for an indefinite period of time. At this setting, the entire battery capacity is set to maintain the 24 V power supply. These values can, however, be changed. The following settings are possible:

- timed Battery mode from 1 – 20 minutes,
- indefinite Battery mode,
- individually defined (custom) Battery mode via the "759-870 V2" software
- Battery mode in the IPC mode (see following section).

6.6.3 Battery Mode in the IPC Mode ("PC Mode")

In the IPC mode the unit operates according to a defined time sequence in which an industrial PC, a control system or a display and operator panel is shut down in a controlled manner and then restarted. All of the set values can be changed (customized) using the "759-870 V2" configuration software. The following values can be set:

- **Delay time:** 1 – 7200 seconds

- **Shut down PC:** 1 – 600 seconds
- **PC idle (off) time:** 1 – 60 seconds

The time sequence for the individual actions is permanently defined.

6.6.3.1 Delay Time

The unit's output is not de-activated if power is restored within the set delay time. The signal output "Bat. Mode" remains inactive so that no signal is generated that would shut down the IPC. This is illustrated in the following flow chart:

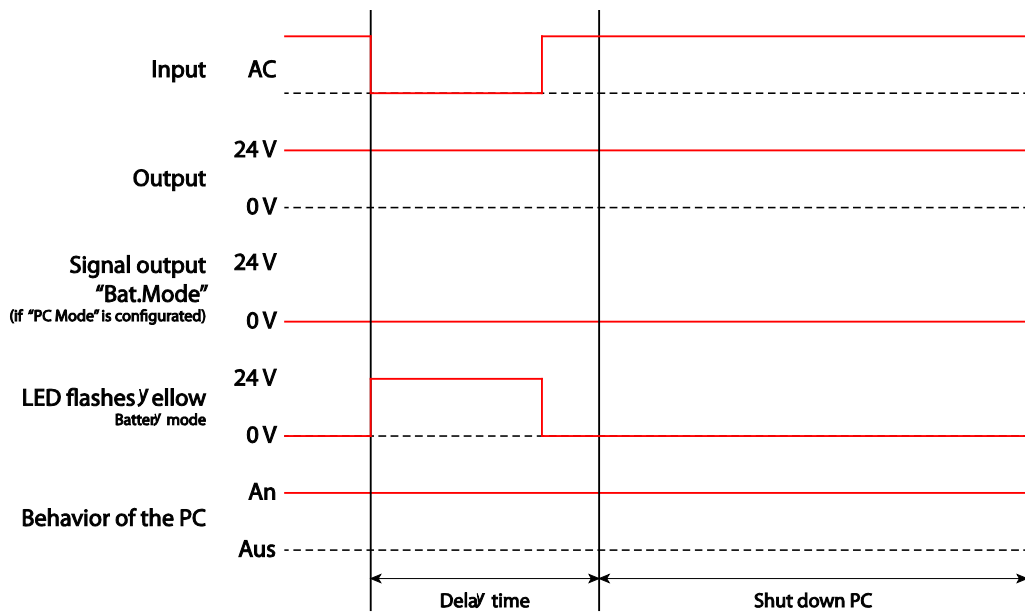


Figure 12: Flow chart – "Input voltage restored during the set delay time."

If the set delay time expires before power is restored, the output voltage and signal output are switched as shown in the flow chart below:

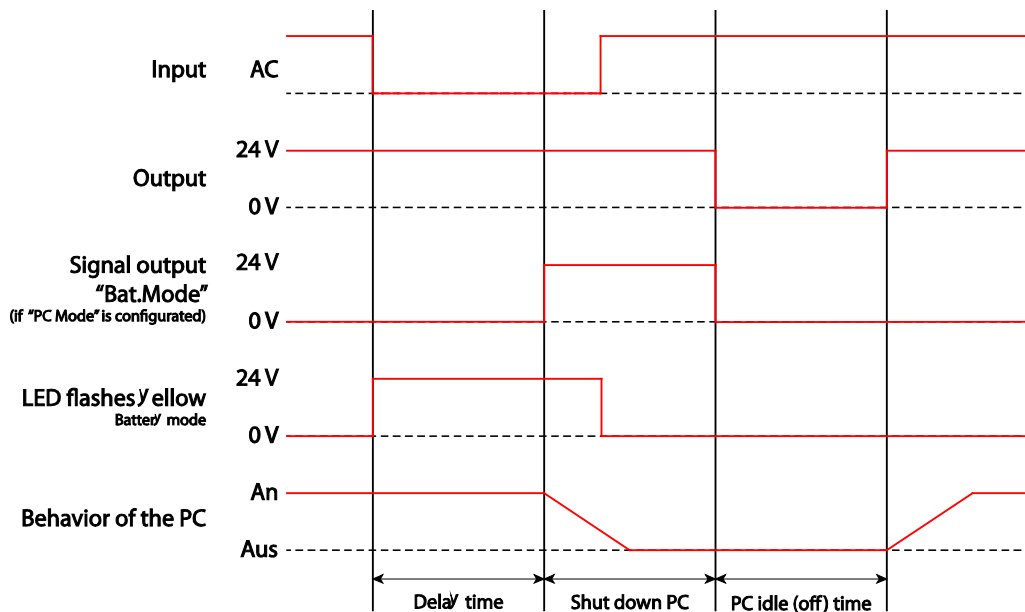


Figure 13: Flow chart – "Input voltage not restored before set delay time expires."

6.6.3.2 Shut Down PC

The signal output "Bat. Mode" is activated when the set delay time expires. This signal must be routed to an IPC connected to the system, a control system or a display and operator panel so that the device in question can be shut down in a controlled manner. The signal output remains activated until the time set in the field "Shut down PC" expires. Ample time should be allowed for by this time setting.

6.6.3.3 PC Idle (Off) Time

The output voltage is de-activated when the time set in the field "Shut down PC" expires. The time at which the output is re-activated depends on whether power supply has been restored:

- If voltage is restored before the time set in the field "Shut down PC" expires, the output is re-activated when the idle time has also expired. This ensures that the devices connected to the system cannot be restarted immediately after shutdown, even when power has been restored in the meantime.
- If voltage has not been restored before the time set in the field "Shut down PC" expires, the output is not re-activated until the voltage is restored.

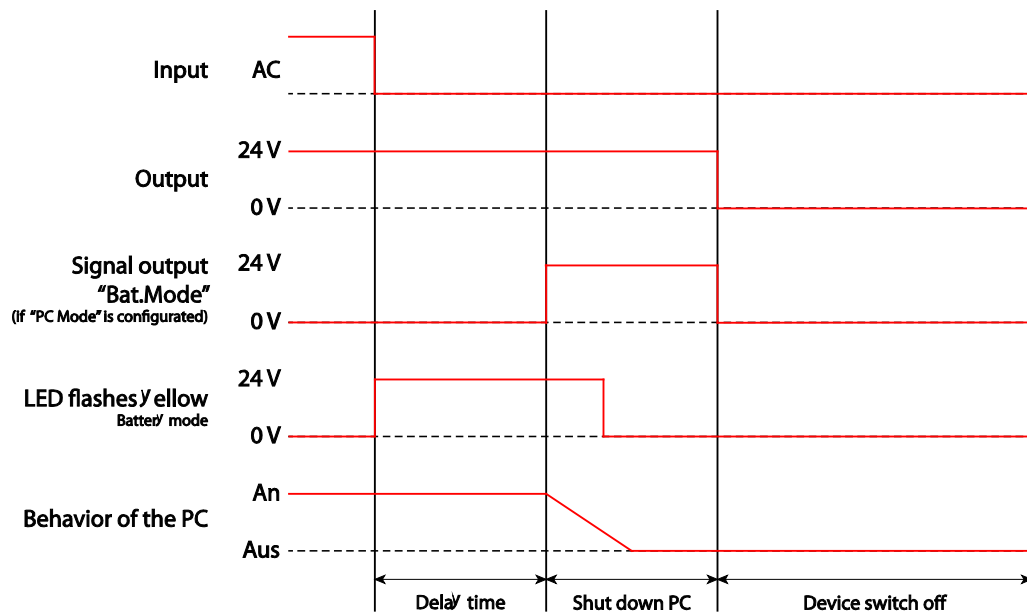


Figure 14: Flow chart – "Input voltage not restored before the set delay time expires."

6.6.4 Deactivating the Battery Mode

The Battery mode can be de-activated if the load connected to the system is not to be supplied from the battery module. This can be necessary, for example, when an EMERGENCY OFF button that is linked to the system is pressed.

To de-activate the Battery mode, disconnect the two contacts for the "Remote" input (R0/R1).

If this connection is not present during normal operation, the red LED will light up continuously and the signal output "Alarm" is activated. The Battery mode is not possible in this case.

6.6.5 Deep Discharge Protection during Battery Mode

The Battery mode is forcefully terminated at a voltage of 19.2 V to protect the batteries connected to the unit from deep discharge. The red LED flashes for 10 hours at maximum before the unit is shut down completely. The output is re-activated when power supply is restored.

Note



Recharge an empty battery at once!

Recharge an empty battery as quickly as possible when mains power is restored! Empty batteries lose around 3 % of their capacity per month (self-discharge)!

6.6.6 Recommended Battery Modules

WAGO offers a battery module designed especially for *EPSITRON*® devices. These are listed below:

Table 20: Recommended battery modules

Battery module	Capacity	Maximum output current*	Internal fuse	Maximum wire size
787-876	1.2 Ah	7.5 A	15 A, slow	1.5 mm ² /AWG 16
787-871	3.2 Ah	20 A	25 A, slow	1.5 mm ² /AWG 16
787-872	7.0 Ah	40 A	25 A, slow	2.5 mm ² /AWG 14
787-873	12 Ah	40 A	25 A, slow	2.5 mm ² /AWG 14

* Please note that the permanent output current at the unit is limited! For more detailed information refer to the technical data.

Regardless of the recommended battery modules, any type of lead-gel or lead-acid absorbed glass mat (AGM) battery can be used.

Information



Observe the data sheet!

Always observe the battery manufacturer's data sheet before purchasing a battery module. The data sheet contains more in-depth information and describes whether the corresponding module is suited for your use.

List of Figures

Figure 1: View of device	14
Figure 2: Supply connection.....	15
Figure 3: Load terminals	15
Figure 4: Battery, control and signaling contacts.....	16
Figure 5: RS-232 interface	16
Figure 6: Display elements.....	17
Figure 7: Rotary switch for output voltage	18
Figure 8: Rotary switch for battery operation	18
Figure 9: Mounting the device on the DIN 35 rail.....	26
Figure 10: Removing the device from the DIN 35 rail.....	26
Figure 11: Connection example	27
Figure 12: Flow chart – "Input voltage restored during the set delay time."	34
Figure 13: Flow chart – "Input voltage not restored before set delay time expires."	35
Figure 14: Flow chart – "Input voltage not restored before the set delay time expires."	36

List of Tables

Table 1: Number notation.....	8
Table 2: Font conventions	8
Table 3: Legend for "View" figure.....	14
Table 4: Power supply connections.....	15
Table 5: Terminals – Load	15
Table 6: Connections – Battery, control and signaling contacts	16
Table 7: Connections – RS-232 interface.....	16
Table 8: Legend for "Indicators" figure	17
Table 9: Device data.....	19
Table 10: Technical data - "Input"	19
Table 11: Technical data - "Output".....	20
Table 12: Technical data for the output during operation with the mains system	20
Table 13: Technical data for the output during Battery mode	20
Table 14: Technical data - "Signaling"	22
Table 15: Technical Data: Interface	22
Table 16: Technical data - "Ambient conditions"	23
Table 17: Miscellaneous data	23
Table 18: Tripping of circuit breakers.....	28
Table 19: Operating statuses, signaling and reactions.	29
Table 20: Recommended battery modules	37

WAGO Kontakttechnik GmbH & Co. KG
Postfach 2880 • D-32385 Minden
Hansastraße 27 • D-32423 Minden
Phone: +49/5 71/8 87 – 0
Fax: +49/5 71/8 87 – 1 69
E-Mail: info@wago.com
Internet: <http://www.wago.com>

