

MASTERGUARD

Uninterruptible
Power Supply Systems
Series C



Important:

The technical specifications contained in this catalog are provided as general information. The Instruction Manual and the information specified on the actual products are binding for installation, operation and maintenance.

Product designations

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Uninterruptible Power Supply Systems Catalog UPS · 2001

UPS Systems 10 kVA to 30 kVA Series C

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UPS Systems

MASTERGUARD protects

No matter how “impure” your power supply system might be, MASTERGUARD provides protection. The Uninterruptible Power Supply uses on-line technology, the most reliable of its kind in this sector. MASTERGUARD smoothes out all irregularities in the power system, makes brief power disruptions harmless and has sufficient reserves to bridge even prolonged power outages (Fig. 1).

Applications

- Data processing equipment and systems
- Computer centers
- Communications equipment
- ISDN systems
- Process control units
- Control rooms/Scada systems
- Drives in continuous production processes
- Production and automation systems
- Life-support systems in hospitals
- Air-traffic control systems
- Safety systems in power stations
- Broadcasting studios
- Transport systems
- Personal computers
- Workstations
- Servers and networks
- and many others

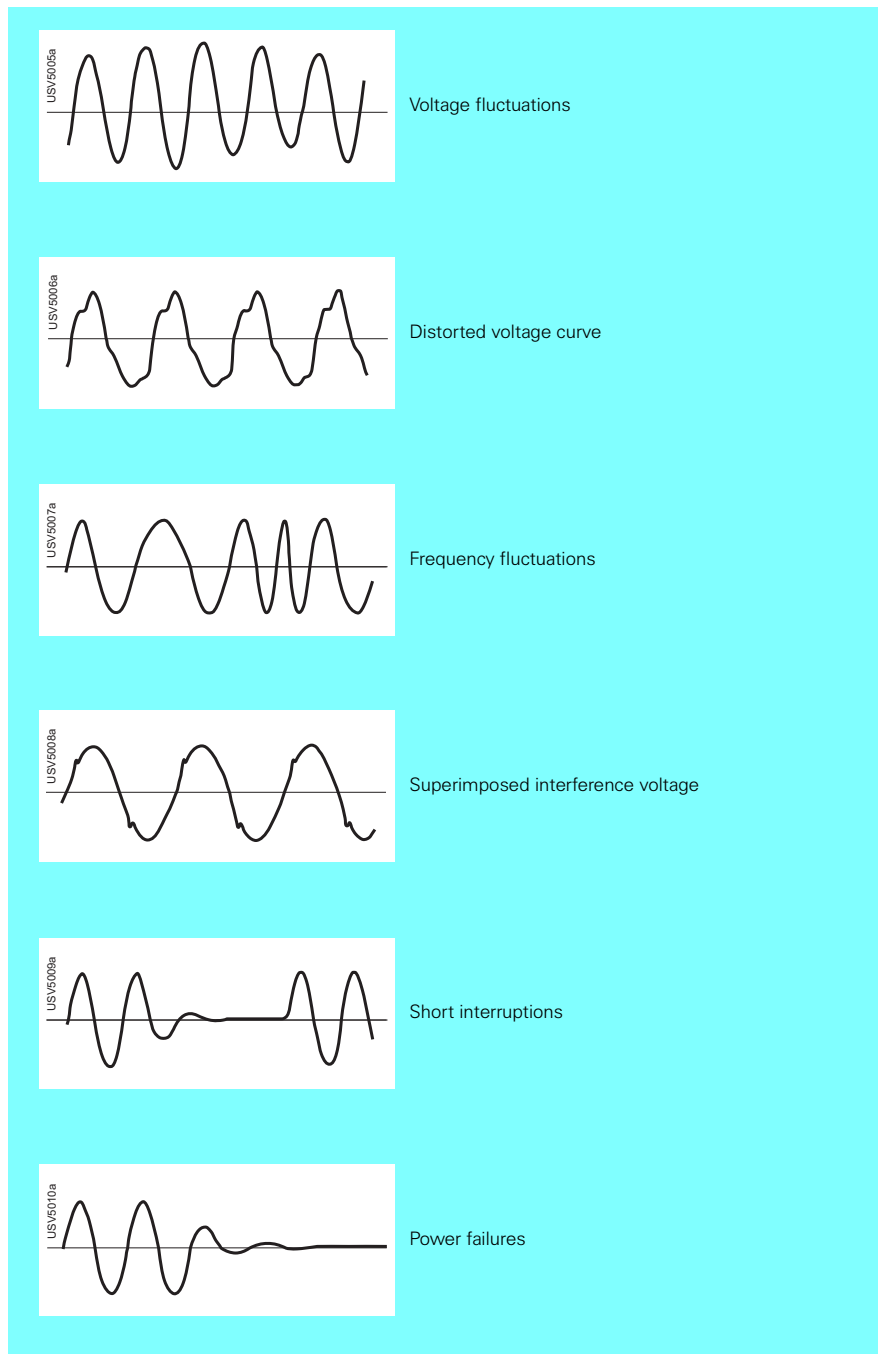


Fig. 1
Types of power-supply disturbances

- Real on-line UPS with the double-conversion principle

System overview of Series C



Fig. 2
MASTERGUARD Series C 30 kVA

Introduction

An advanced system of UPS units and batteries with outstanding benefits for the customer is now available to ensure the uninterrupted supply of power to electrical equipment with an AC-voltage mains connection in the power range 10 to 30 kVA. Individual units have an output of up to 30 kVA but several units can be connected in parallel to provide a total output of up to 240 kVA and/or to increase redundancy.

The units function using the principle of online, double-conversion, thus avoiding any interruptions of any kind whatsoever and ensuring a constantly high quality of supply. The use of batteries with back-up times of 10 minutes, 15 minutes, 30 minutes or 60 minutes ensures a system which reliably bridges power failures.

System components

- UPS unit, power conditioner
- Parallel operation kit
- Battery system
- Battery measuring devices
- Profibus-DP interface
- Computer interfaces
- Contact interfaces
- Air filters
- EMC and line filters
- UPS management and service software
- Separate service manual by-pass switch
- System cubicle

- Remote control board
- Telemonitoring via network / Internet (IP)
- Connecting accessories

Special features

- Real online operation provides complete decoupling of the load from all irregularities in the mains supply
- Energy-saving due to a high level of efficiency, even during partial-load operation
- Electrical isolation for absolute protection of the loads (option)
- The input reactive power of the UPS is almost zero because input $\cos \varphi \approx 1$
- The UPS units can simply be connected in parallel, retrofitting is also possible
- Skids allow easy installation
- Connect, switch on and the UPS goes to work immediately
- Parameterization with Windows PC
- Internal barriers at the connection interfaces provide complete protection for the user
- Clear operating and display concept
 - No operator intervention needed during operation
 - Clear indication of status, load utilization and battery quality by means of simple LED display
 - Fault indicator and audible alarm
- Event memory for fault analysis
- Battery conditioning for improving the condition of the battery
- Detection of defective battery blocks
- Battery maintenance by an automatic battery management system with the benefits of maximised battery life
- Automatic battery circuit test
- Temperature-compensated charging
- EMC limits in accordance with European legal requirements and standards
- Software interfaces for all current computer operating systems
- Automatic bypass for increased availability of the power supply
- Compact design, low weight
- Low noise generation
- High degree of reliability
- IGBT power transistors
- Highly integrated digital electronics
- Especially suitable for non-linear computer loads

Environmental protection

The latest regulations relating to environmental protection are taken into consideration during design, development and production. The environment management system has been certified according to DIN EN ISO 14 001.

Our environment-friendly design, for example, contributes to the preservation of raw materials and our battery management system ensures a long life for the battery. The materials are marked to facilitate recycling.

Power dissipation from the power section is reduced to a minimum with the latest technology. This enables, for example, the selection of a significantly smaller air-conditioning system, thus reducing customers' operating costs.

Quality management

The quality management system for development, manufacturing, sales and service is certified according to DIN EN ISO 9001.

Internal redundancy, e.g. redundant fans, and the use of highly integrated components increase the MTBF (mean time between failures) to more than 30 years.

- Increased input-voltage range, resulting in
 - fewer battery cycles
 - fewer switching processes
 - higher availability of the overall system

MASTERGUARD Series C UPS Systems 10 kVA to 30 kVA

Description of Series C

Design

The UPS Series C units are ready-to-connect systems with a functional design. They contain a modular power section, a control module, a battery charger, an electronic bypass, measuring and filtering devices complete with a termination panel. The cubicle is sealed against high frequencies and fulfils the maximum EMC protection requirements. A system-specific battery cabinet can be mounted next to the UPS unit.

Design features

- Low weight
- Space-saving modular frame construction with easily removable panels
- Control panel on front of unit
- Detachable front panel with safety lock which can be locked at the top, plus all-round conductive contacts to stop interfering electromagnetic radiation
- Enclosed floor panel with penetration for connecting cables in accordance with DIN EN 50 091-1-1; 50 091-1-2
- Skids for low floor load due to their large contact surface. These also facilitate transport, even if the floor is uneven.
- Transport rollers or wheels can be fitted to the skids if necessary
- There is space underneath the housing for the forks of a fork-lift truck
- When the front panel is detached, the manual bypass switch (service bypass) is accessible. The termination panel is covered (in accordance with the DIN VDE 0106 safety regulation)
- The built-in manual bypass switch (service bypass) can be used to disconnect the power electronics
- The termination panel is completely segregated to prevent touching of live components
- The control panel can be opened outwards for service purposes
- Air inlet via ventilation holes at the front; air outlet at top of back panel
- Fans with low noise generation for remove heat
- Air-filter pads can be mounted at the air inlet
- All parts of the cubicle can be recycled.

The UPS basically consists of several power components, filtering and measuring devices and wound components together with a termination panel (Fig. 3).

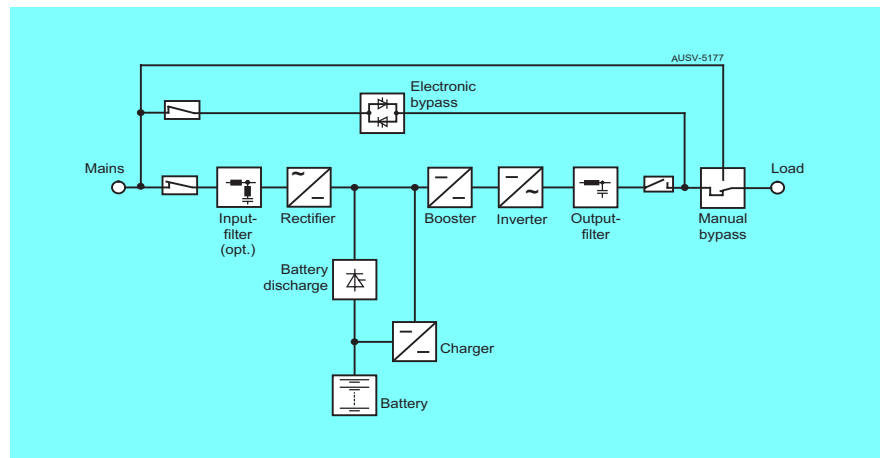


Fig. 3
Overview of components in the UPS units

Power components

The power section consists of the following components:

- Mains input filter
- Input rectifier and battery management module
- Inverter and output filter circuit
- Electronic bypass
- Manual service bypass switch (SB) with which the power electronics can be disconnected for servicing purposes
- EMC filter

Input filter

The input filter reduces the phase effect of the input current by filtering the harmonics.

Rectifier and battery management module

The active single-phase rectifier modules supply the necessary DC voltage for the step-up controller and the battery charger.

The battery manager provides a complete package of functions with the following basic benefits:

- Maximum reliability of the battery supply is optimised
- The battery's service life is increased in comparison to other methods

Features of the battery manager

- Active filtering of the superimposed AC current to $< 1\%$, thus reducing ageing of the battery
- Charging only when necessary
- Limitation of charging current reduces the temperature rise of the battery

- Temperature-dependent charging prevents excessive or insufficient charging, thus increasing battery availability
- Discharge-time indicator
- Overdischarge protection prevents cell reversal of weaker cells
- Parameterizable battery circuit tests to detect faults in the battery circuit
- Automatic calibration of the programmed battery curves after a discharge test
- Warning if battery temperature is too high
- Modified charging with ageing of the battery (self-learning effect)

Options

With measuring modules (BMM) connected to the battery blocks, enhanced battery management is possible with the following functions:

- Defined charging to reduce stress on the battery
- Detection and recording of the current battery quality
- Detection and localization of defective battery blocks and their connectors

- Battery maintenance by means of automatic battery management with the benefit of maximum battery service life
- New type of DC-link concept for reliable battery availability

Description of Series C

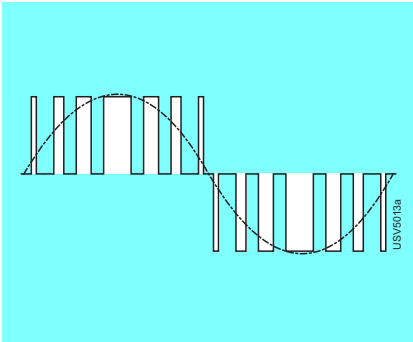


Fig. 4
Principle of pulse-width modulation

Inverter and output filter circuit

The IGBT inverter generates a precise symmetrical, three-phase voltage system by means of high-frequency pulse-width modulation (PWM) (Fig. 4). Due to the use of modern electronic components with a high pulse frequency, the audible noise of the UPS is drastically reduced. A further result of this high pulse frequency is that the closed-loop control system can intervene very quickly. This produces a high-quality output-voltage waveform, even in the case of non-sinusoidal current input of the load (non-linear loads). The salient functional characteristics of the open-loop and closed-loop control systems of the inverter are as follows:

- Digital closed-loop voltage and frequency control with a high dynamic response, i.e.
 - Low distortion factor of the output voltage, even in the case of non-linear loads
 - High peak currents
 - Active correction of the waveform
 - Quartz-controlled internal frequency
 - Soft synchronization and parameterizable synchronization speed
 - Synchronizing of inverter to mains giving load supply redundancy
 - Provision of high output short circuit rating

The output filter circuit provides a sinusoidal output voltage with a very low output voltage distortion factor.

Electronic bypass

A thyristor switch is the main component of the electronic bypass..

The bypass is completely independent of other components and therefore provides a redundant alternative supply circuit. It provides the load with an uninterrupted supply during the following situations:

- Manual switchover from inverter to bypass operation
- Overload of the inverter or inverter fault
- Short-circuits in the load

Battery

The UPS units with outputs ranging from 10 kVA to 30 kVA are supplied with battery cubicles as a standard. These battery cubicles enable back-up times of between 10 minutes for a power output 30 kVA and 63 minutes for a power output of 10 kVA. For special customer requirements such as vented lead-acid batteries, nickel-cadmium batteries in cubicles or battery racks, we will be pleased to design a complete UPS/battery system.

Options

- Parallel operation
Parallel operation of up to eight UPS units of the same size is made possible by means of a parallel operation kit. All Series C units can be retrofitted simply and quickly with this kit.
- With high-frequency filters, the EMC interference emitted by the UPS units can be reduced even lower to the limits indicated in EN 55 022, Class B.
- As an option, one or two additional battery chargers can be added to reduce the charging time of the batteries.
- The UPS cubicle can be supplied with an increased degree of protection grade of IP 31 and with filter pads for the air inlet.

Electronics

Like the power section, the electronics have a modular design. The electronic assemblies are assigned to the individual power modules. The electronics of the bypass are completely separate and autonomous. The control panel and the unit's interfaces form a separate component. The unit's interfaces are electrically isolated from the power section and electronics (safe isolation in accordance with EN 60 950).

Thanks to the use of digital signal processors and ASICs, only a few components are necessary, the result being a very high level of reliability.

Service functions

The diagnostic and indication system has the following special features to aid servicing:

- Real-time clock: Events are stored in real time. They can then be read out via the service interface on the control panel.
- Elapsed time counter: This records the elapsed hours of UPS operation, giving an indication of when maintenance is necessary.
- Indication of current battery quality by the battery manager
- Servicing and monitoring software, PowerProtection VIS, for Windows PCs (95/98/NT/2000).

The diagnostic system contains a non-volatile memory which constantly collects information from the UPS. If required, this information can be read out via the service interface.

The alarms and fault signals are shown as numerical codes.

Typical alarms include

- Power failure
- Residual battery time reached
- Inverter overheating
- Service life of fan expired.

Typical fault signals include

- Interrupted battery circuit
- Inverter fault
- Bypass defect.

MASTERGUARD Series C UPS Systems 10 kVA to 30 kVA

Description of Series C

Services

The MASTERGUARD maintenance service provides a wide range of services in order to ensure that the high performance of your MASTERGUARD Series C is maintained over a period of many years. These services are available worldwide through our local partners.

• Trained personnel

For commissioning, maintenance, repairs and other servicing tasks, specialists trained and certified in the MASTERGUARD Training Center are always on stand-by.

• Help desk

24 hours every day of the year, we take your calls and immediately put you in contact with the responsible specialists. A telephone hotline is provided to answer your technical questions.

• Spare parts

For the Series C, we guarantee the supply of spare parts for a minimum period of 10 years. It is possible to order parts round the clock and they will be dispatched within 12 hours. On request, they can be sent by courier.

• Training

MASTERGUARD trains users and service technicians according to customer requirements. Trainees are taught the underlying theoretical aspects for using Series C and also undergo practical training in order to assimilate first-hand knowledge of these UPS devices.

• Warranty extension

For Series C units, it is possible to extend the warranty period. Thanks to the new UPS concept, the unique battery management system and the proven technology, you can extend your warranty period on request provided you have a maintenance contract with us.

- High economic efficiency due to
 - high level of efficiency even with partial load and non-linear load
 - input power factor virtually unity

• Full servicing with LIFE2000

Our full service offer with coverage of a maintenance contract is more than just a hotline, a shorter reaction time or a spare-parts service. In addition to regular inspections and maintenance of your UPS system, you can expect an immediate reaction from the MASTERGUARD service team. Thanks to LIFE2000, 24-hour protection is possible. Your UPS uses a direct connection via modem to report all events directly to the MASTERGUARD service center. Outside normal hours, the report is automatically passed on to the service technician responsible. He can then start with the diagnosis immediately with the help of a notebook computer and then initiate specific measures to rectify the problem. LIFE2000 keeps you up to date on all aspects of your power supply by means of a quarterly service report. With the "Plus" package, you can include the delivery of system components, modules, spare parts and batteries in the maintenance contract. This helps you to keep a close eye on all the costs for absolutely reliable power supply.

Control and indicating panel

A clearly laid-out control and indication panel provides the operator with key status information for the UPS. It is designed as a membrane-type keyboard (see Fig. 5) and the indicators provide an overview of the following:

- Status of the mains supply (LINE LED)
- Status of the UPS unit and battery
- Back-up time of the battery in the event of a power failure (LED strip)
- Utilization level of the UPS and
- Causes of faults when problems occur.

The numerical display indicates the battery back-up time and the fault codes for diagnosis. If there are several items of information, they are shown in sequence.

Alarms (ALARM LED) and faults (FAULT LED) are indicated by yellow or red LEDs respectively.

A key-operated switch is used to switch between UPS operation (ONLINE LED) and the bypass (BYPASS LED).

An audible signal indicates any faults which occur. It can be cancelled with the TEST/RESET key.

For servicing purposes, there is an RS232 service interface on the control panel.

The TEST/RESET key is for

- resetting the audible signal after fault signals
- outputting alarms from the fault memory on the two-digit display
- testing the indicator lamps.

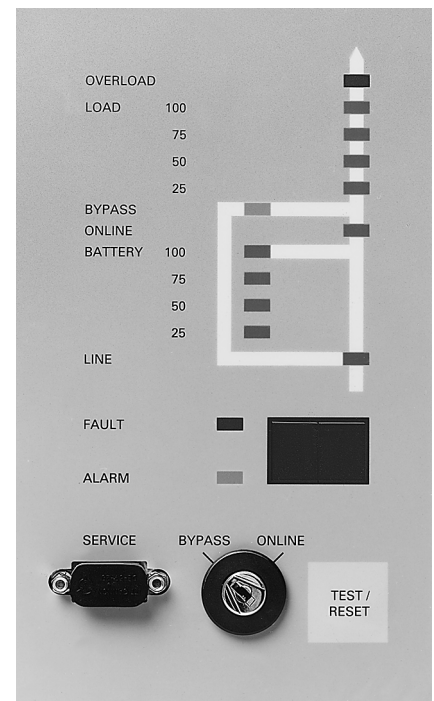


Fig. 5
Control and indicator panel

Description of Series C

Interfaces

The UPS is equipped with various interfaces (see table below).

A plug-in port for the service interface is provided on the front of the control panel.

The other data interfaces are provided on the control panel (see table below). They can be accessed internally.

The UPS Emergency OFF signal can be used via potential-free contacts.

Using the interfaces

A multi-transceiver is provided for the contact interface. The multi-transceiver is connected to the X4 contact interface in the UPS. For further details, see section "COT interface module," in Catalog Series S.

The X2 interface allows the MP21 multiplexer or the SNMP adapter, SC21, to be connected. More details are provided in a separate document.

The X5 interface is used for shared monitoring on a PC in the case of multiblock UPS systems. It is connected to the PC by means of an additional RS 485/232 converter and suitable cables. More details can be obtained on request.

Parallel operation

Up to eight units with the same output voltage and rating can be operated in parallel. The parallel connecting kits needed for this (1 for each UPS unit) include the necessary connecting cables (length: 5 m for each unit). In this way, it is possible to increase the total output and provide redundancy, e.g. (n+1) operation. Each UPS has its own battery. The load outputs of the individual UPS units must be connected to a common load point via separate isolators. The function of the integrated manual service bypass can be used up to the rated current of the UPS unit.

Name Type/form Identification code	Connectable system(s)	Parameterizable for	Comments
Combined interface RS 232 and potential-free contacts ¹⁾ /Sub-D, 25-pole, female X2	PC with PowerProtect or service PC (USS®) via RS 232 and/or monitoring system Control system via potential-free contacts		Contacts: Contact rating 24 V, 1 A Additional SELV power source 12 V DC, 50 mA available ²⁾
Contact interface Potential-free contacts ¹⁾ /Sub-D, 9-pole, female X4	PC with PowerProtect NET, PCs/workstations via multiplexer Computer network with SNMP via adapter	AS/400	Contact rating 24 V, 1 A Additional SELV power source 12 V DC, 50 mA available ²⁾
PC interface RS 485 (serial) / Sub-D, 9-pole, female X5	PC with PowerProtect VIS for UPS multiblock application		Cannot be used with service interface
Service interface RS 232 (serial) / Sub-D, 9-pole, female X3	Service PC (USS®)		Cannot be used with PC interface

- 1) Signals:
AC fail (power failure)
Bypass active (electronic bypass on)
Low battery
Common alarm

- 2) The 12 V DC, 50 mA power source from combined interface and contact interface may only be subjected for one load.

Additional interfaces

A separate assembly for integrating the UPS into Profibus-DP networks is available.

Scope of supply

UPS unit on a pallet, 1 accompanying set of operating instructions, servicing/monitoring software (PowerProtect VIS) on CD-ROM.

MASTERGUARD Series C UPS Systems 10 kVA to 30 kVA

UPS system configurations

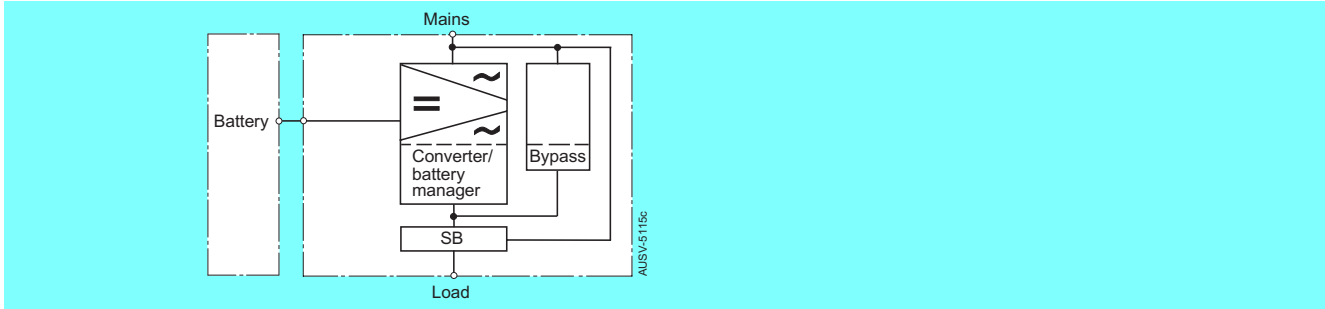


Fig. 6
UPS 10 to 30 kVA, separate battery in battery cubicles/racks, 60 min. back-up time or more, 1 mains connection

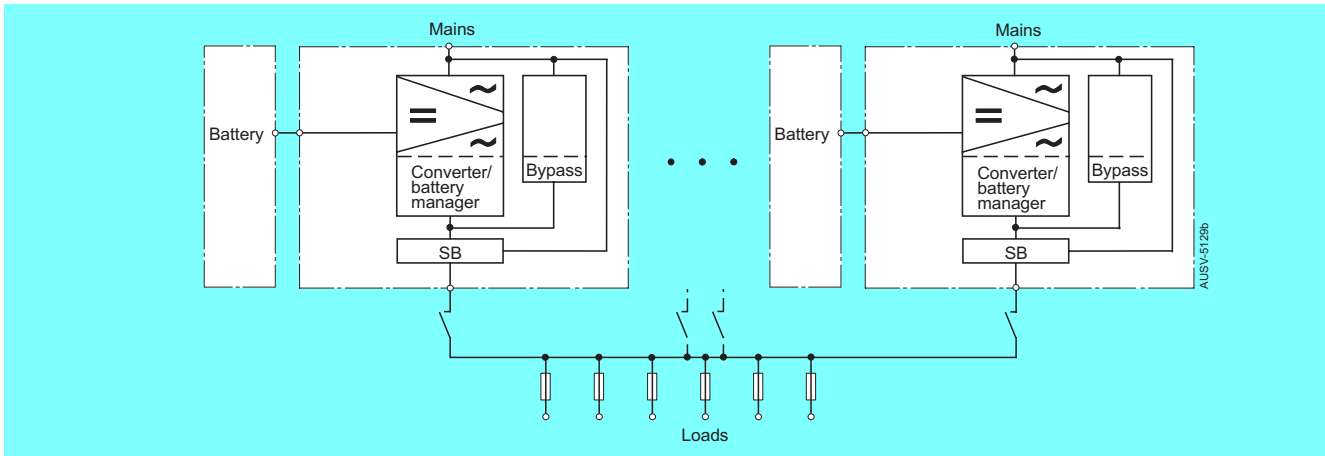


Fig. 7
Multiblock UPS system with one battery per UPS block, consisting of 2 to 8 identical UPS blocks, 10 to 30 kVA block size. Load capability of the integrated service bypass up to the rated load of the UPS block.

MASTERGUARD Series C UPS Systems 10 kVA to 30 kVA

Technical data

UPS unit	Type	C6210	C6215	C6220	C6230	
	Rated power kVA	10	15	20	30	
Input						
Mains supply	Standard Option	For both rectifier and bypass Separately for rectifier and bypass				
Supply voltage		3 AC/N 380, 400 V +15 %/-30 % 415 V +10 %/-30 %		3 AC/N 380, 400 V ±15 % ¹⁾ , 415 V +10 %/-15 % (-30 % at derating)		
Supply frequency	Hz	50 or 60 ±5 %				
cos φ		> 0.96	> 0.97	> 0.97	> 0.97	
Apparent power	without battery charging with battery charging	kVA kVA	9 10	13 14.5	18 20	27 30
Phase effect	6-pulse	•	•	•	•	
Current distortion factor		< 25 % with harmonic-free 50 Hz mains (better than VDEW recommendation) ²⁾				
Mains configuration		Symmetrical three-phase mains, e.g. TN-C, TN-S, TN-C-S, IT optional				
Battery						
Rated battery voltage	V	216 – 384	252 – 384	336 – 384	336 – 384	
Number of cells	for lead-acid batteries	108 – 192	126 – 192	168 – 192	168 – 192	
Minimum final discharge voltage	V	173 – 307	202 – 307	269 – 307	269 – 307	
Static voltage tolerance		1 %				
Input power of inverter	at nominal load	kW	8.7	13	17	25.5
Output						
Rated voltage		3 AC/N 400 V , 380 V or 415 V parameterizable				
Voltage tolerance	static dynamic	±1 % at balanced load ±3 % at 50 % unbalanced load ±4 % at 100 % unbalanced load (single-phase) ±6.5 % at 100 % load step				
Recovery time	ms	< 10				
Rated frequency	Hz	50/60				
Frequency tolerance	self-clocked line-clocked	±0.1 % ±1 % (adjustable to ±2 %, ±3 % or ±4%)				
Frequency change rate	Hz/s	0.1 (adjustable to 1 or 2 Hz/s)				
Phase displacement	at balanced load at 50 % unbalanced load at 100 % unbalanced load	°el °el °el	≤1 ≤3 ≤4			
Voltage distortion factor	with linear load with non-linear load	< 4 % < 8 %				
Permissible non-linear load	acc. to EN 50 091-1	100 %				
Permissible crest factor of load current		max. 3				
Overload capability (three-phase)	up to 5 min. up to 30 s	1.25 × I _N 1.5 × I _N				
Short-circuit current	three-phase	3 × I _N for 10 ms, clearing acc. to EN 50 091-1, -2 and -3 1.5 × I _N for 5 s				
Rated apparent power	at cos φ _{ind} = 0.8	kVA	10	15	20	30
Rated active power		kW	8	12	16	24
Rated current	at 400 V, cos φ _{ind} = 0.8	A	14	22	29	43

1) Lower tolerance limit of 380 V not for continuous operation.

2) VDEW: association of German power stations

MASTERGUARD Series C

UPS Systems 10 kVA to 30 kVA

Technical data

UPS unit	Type	C6210	C6215	C6220	C6230
	Rated power kVA	10	15	20	30
Permissible ambient temp.	during operation during storage	0 °C to +40 °C, load reduction at higher temperatures -40 °C to +70 °C			
Climatic category acc. to DIN IEC 721		Better than 3K2, however observe notes on installation site, page 11 Inspection acc. to DIN IEC 68-2			
Cooling		F (built-in fan)			
Immunity to electrical interference		EN 50 091-2, IEC 61 000-4-2 Electrostatic discharge -3 Electromagnetic fields -4 Transient -6 Sinusoidal fault variables, continuous wave			
Emitted interference (EMC)	Standard Option	EN 50 091-2, Tables 2 and 4 EN 55 022, class B			
Degree of cubicle protection acc. to EN 60 529 (previously DIN 40 050)	basic version special versions	IP 21 IP 31 with air filter pads			
Humidity		acc. to EN 60 068-2-56			
Insulation group		IIIa			
Installation altitude		Up to 1000 m above sea level Above that, reduction of load (see page 11)			
Cubicle color		Ergo grey (similar to RAL 7044, silk grey)			
Dimensions		See chapter "Dimension Drawings"			
Efficiency	at 100 % load at 75 % load at 50 % load at 25 % load	% 92 91 89 84	% 92 92 91 86	% 92 92 92 89	% 91 91 90 87
Power loss P_v	at rated load at 75 % rated load	kW 0.7 0.6	kW 1.0 0.8	kW 1.4 1.0	kW 2.4 1.8
Conversion: Power loss in BTU/h = $P_v/[kW] \times 3412$	at 50 % rated load during idling	kW 0.5 0.4	kW 0.6 0.5	kW 0.7 0.5	kW 1.3 0.85
Air requirement		m ³ /h	500	500	500
Electronic bypass					
Maximum permissible overload current for 10 ms with external bypass fuse F1 selective		A	200	350	600
Statistically determined MTBF (Mean Time Between Failures)		>30 years			
Noise level (acc. to DIN 45 635)		dB (A)	<50	<50	<56
Weight without battery		approx. kg	142	142	152

Configuration and installation

Installation site

The following requirements must be complied with when an installation site is selected:

- Ambient temperature between 0 °C and + 40 °C for UPS units without batteries
- Ambient temperature for lead-acid batteries (in the UPS unit or in the battery cubicle), in accordance with the recommendations of the battery manufacturers, is between + 15 °C and + 25 °C.
- Avoid exposing the batteries and battery cubicle to more than one hour of direct sunlight per day.
- Avoid harmful environmental influences such as
 - vibrations
 - dust
 - corrosive atmosphere
- Clearance between the top of cubicle and ceiling at least 20 cm
- Clearance of rear from wall 10 cm. Side clearance not necessary.
- Take heat dissipation into consideration
- Ensure that floor can carry the load
- Units supplied with transport rollers on request

Bottom cable entry: The cables can be fed from the rear to the bottom (the distance of the bottom edge of the rear side from the floor is 100 mm) or through a false-floor on the site.

Signal, power and battery cables should be segregated from each other.

With regard to battery cubicles, the special stipulations of DIN VDE 0510 Part 2 as well as the instructions for handling the battery are to be observed.

Installation altitude

If units are installed at altitudes over 1000 m above sea level, the load must be reduced as shown in Fig. 8 because of the air's reduced cooling effect.

It is not necessary to reduce the load for installation altitudes up to 2000 m above sea level as long as the ambient temperature does not exceed + 30 °C.

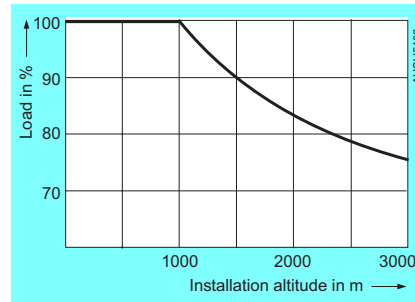


Fig. 8
Permissible load in relation to installation altitude

Ambient temperature

The units without batteries can be operated without restriction within the range 0 °C to 40 °C. If they are operated continuously at higher temperatures, the load must be reduced.

Temperature	Up to 40 °C	45 °C	50 °C
Permissible load	100 %	88 %	76 %

Transport

Each UPS unit is delivered on a pallet suitable for fork-lift trucks. The UPS units themselves can also be lifted with a fork-lift truck. Thanks to the provision of sliding tracks, they can also be pushed off the pallet onto a lifting device.

The pallet dimensions are given in the section "Dimension drawings."

Connection

The Series C UPS units can be operated in all symmetrical three-phase power systems (TN, optional IT). Fig. 9 shows the power connections to the mains and loads and also the connection of the battery cubicle. The bypass and rectifier are supplied via terminals U1, V1, W1 and N1.

When the external cable ratings are being planned, it is necessary to take account of local conditions, regulations, as well as considering voltage drops due to the cable lengths. The values shown in the following tables are recommended values for copper conductors with plastic insulation at ambient temperatures of up to + 40 °C and cable lengths of up to 100 m. The listed current and connection values are applicable for a rated voltage of 400 V, the rated load and the maximum battery charging current. The selected load fuses are determined according to DIN 57 636 Part 21.

The neutral should be designed with the same cross-section as a single phase. If most of the loads are non-linear (e.g. computer loads), the N conductor must be increased in accordance with the table. The N1 and N3 terminals are each therefore double terminals.

The power cables from the mains and to the load must be connected as a clockwise rotating field.

Connecting a battery

If an external battery is connected to a UPS units, super-fast battery fuses in line with DIN 43 620 must be used in order to provide short-circuit protection for the UPS batteries. A set of battery fuses is included in the MASTERGUARD battery systems for the Series C. These fuses can be inserted in the suitable fuse isolator of the battery cubicle. For the types of fuses, see the following tables relating to configuration and installation.

MASTERGUARD Series C UPS Systems 10 kVA to 30 kVA

Configuration and installation

UPS units	Type	C6210	C6215	C6220	C6230
	Rated power kVA	10	15	20	30
Supply from one mains U1, V1, W1, N1 for rectifier and bypass		1) 2)	1) 2)	1) 2)	1) 2)
Minimum conductor cross-section		2.5 mm ²	4 mm ²	6 mm ²	10 mm ²
Max. permissible conductor cross-section per terminal		16 mm ² 25 mm ²	16 mm ² 25 mm ²	16 mm ² 25 mm ²	35 mm ² 50 mm ²
Maximum current		17 A	22 A	29 A	44 A
Prescribed fuse type gL, to the mains (F1)		20 A	25 A	35 A	50 A
Battery connection C ₂ , D ₂		1) 2)	1) 2)	1) 2)	1) 2)
Minimum conductor cross-section		16 mm ²	16 mm ²	16 mm ²	35 mm ²
Max. permissible conductor cross-section		16 mm ² 25 mm ²	16 mm ² 25 mm ²	16 mm ² 25 mm ²	35 mm ² 35 mm ²
Maximum current at final discharge		56 A	56 A	56 A	56 A
Fuse	EFEN type	2 x 00B	2 x 00B	2 x 00B	2 x 00D
Load connection U3, V3, W3, N3					
Minimum conductor cross-section		2.5 mm ²	4 mm ²	6 mm ²	10 mm ²
Max. permissible conductor cross-section		6 mm ²	6 mm ²	6 mm ²	35 mm ²
Maximum current		14 A	22 A	29 A	44 A
Permissible selective fuse for the load if bypass ready		10 A	16 A	20 A	25 A
Increase factor for the cross-section of the N to N1 and N3 in the case of a non-linear load		1.6	1.6	1.6	1.6

- 1) With connector sleeves in acc. with DIN 46 228 for finely stranded conductors
2) Standard conductors without connector sleeves

12

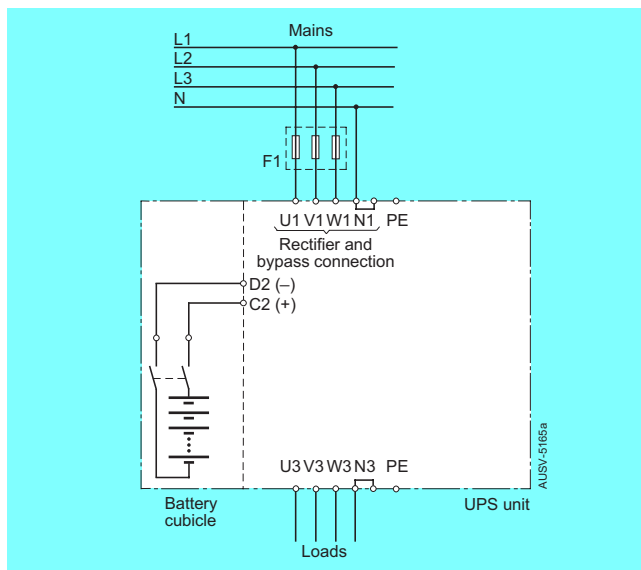


Fig. 9
Connections in the case of one mains supply.
Battery connection only in the case of an external battery cubicle

MASTERGUARD Series C UPS Systems 10 kVA to 30 kVA

Selection and ordering data

Version			Order No. extension	Order No. 6 S U 6 2 □ □ - 0 □ □ □ 0 - □ A A 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16								
Basic version	Type	Power										
UPS, I/O, 3/3 ph, 380/ 400 /415 V, 50 /60 Hz	C6210 C6215 C6220 C6230	10 kVA 15 kVA 20 kVA 30 kVA	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>1</td><td>0</td></tr><tr><td>1</td><td>5</td></tr><tr><td>2</td><td>0</td></tr><tr><td>3</td><td>0</td></tr></table>	1	0	1	5	2	0	3	0	
1	0											
1	5											
2	0											
3	0											
Options	Battery charger	Standard with one additional charger with two additional chargers	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>A</td></tr><tr><td>B</td></tr><tr><td>C</td></tr></table>	A	B	C						
	A											
	B											
	C											
Parallel operation	No (single block) Yes (parallel block)	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>A</td></tr><tr><td>B</td></tr></table>	A	B								
A												
B												
EMC – filters	Basic version to EN 50 901-2 EN 55 022, Class B	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>0</td></tr><tr><td>4</td></tr></table>	0	4								
0												
4												
Degree of protection	IP 21 = Standard IP 21 + air filter IP 31 + air filter	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>0</td></tr><tr><td>1</td></tr><tr><td>5</td></tr></table>	0	1	5							
0												
1												
5												
				1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 6 S U 6 2 □ □ - 0 □ □ □ 0 - □ A A 0								
External additional modules	Battery, as an option with BVM Isolation transformer Second mains supply External harmonics filter External service bypass (manual bypass)											

MASTERGUARD Series C Battery Cubicles 10 kVA to 30 kVA

Battery systems

Overview

System batteries in a cubicle for the UPS Series C are only supplied at the present time as sealed, maintenance-free lead-acid batteries with a service life of 6 to 9 years in accordance with Eurobat.

Batteries from approved quality manufacturers are used. Other lead-acid batteries can be used with the UPS. Nickel-cadmium batteries can also be used.

Operating method

The batteries connect in parallel with the DC link of the converter. During normal operation, the battery is charged whenever this becomes necessary. This is controlled by the battery manager of the UPS unit. The inverter is supplied by the rectifier.

In the event of a mains failure, the power supply to the inverter is maintained by the battery without any interruption. The battery is discharged until the permissible lower battery voltage (final battery discharge voltage) has been reached. This operational status is limited to a specific length of time by the design of the battery (back-up time) and the level of the actual discharge power.

The back-up time of the battery can be increased by switching off non-critical loads.

When the power has been restored, the rectifier switches on again and begins to supply the inverter and charge the battery.

The battery manager of the UPS charges the battery and provides the following features:

- AC component of the charging current $\ll 1\%$
- Temperature-dependent charging
- Limitation of charging current
- etc. (see "Battery management" section – Description of Series C)

Applications

Battery cubicles with sealed lead-acid batteries are a compact, and economic solution for providing fixed-location batteries (see Fig. 10) matching the UPS. The UPS unit and the battery cubicle are installed next to each other, thus forming an integrated unit. The batteries are matched to the requirements of the UPS Series C.

Description

The UPS output and the desired back-up time determine the number of battery cubicles required. The battery cubicle and the UPS cubicle are of a matching design.

The UPS battery consists of a variable number of battery blocks. These battery blocks are located and fixed in place on coated and therefore insulated mounting rails on different levels (see Fig. 11). Between the blocks, vertical ventilation areas ensure efficient heat dissipation. The blocks are interconnected with high-current connectors having acid-resistant insulations. The battery terminals and the connectors are insulated so that personnel are protected against electrical shock even if the front panel is open. The cables in the cubicles are specially protected against earth faults and short-circuits.

The fuse isolator Q1/Q2 (Fig. 12) is for electrically isolating the battery and the UPS unit and also for protecting the battery circuit. Super-fast fuses are inserted in the positive and negative current path.

The power cables leading to the UPS are connected at the fuse isolator in the upper part of the cubicle. The cables are brought in through the base of the cubicles (see dimension drawings).



Fig. 10
Battery cubicle Series C

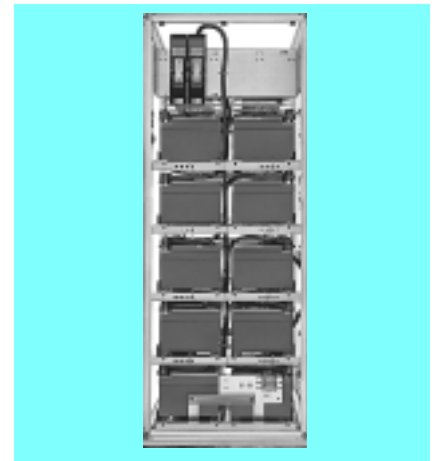


Fig. 11
Battery cubicle, internal view

Service life

The service life of the battery is highly dependent on the ambient temperature. A temperature of $+20\text{ }^{\circ}\text{C}$ to $+25\text{ }^{\circ}\text{C}$ is recommended. For every $10\text{ }^{\circ}\text{C}$ of temperature increase, the life cycle of the battery is reduced by half due to the internal chemical processes.

Options

The battery cubicle and the UPS unit can be supplied with degree of protection IP 31.

In the case of extended battery management, the battery cubicle is equipped with measuring devices on the battery blocks. The data link to the PC for monitoring and evaluation is in the form of fiber-optic cables.

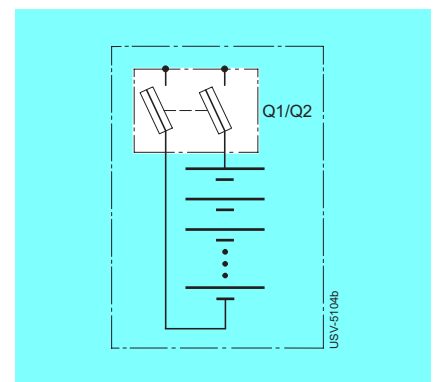


Fig. 12
Block diagram of the battery cubicle

MASTERGUARD Series C

Battery cubicles 10 kVA to 30 kVA

Battery systems

Standards, regulations

The battery cubicles comply with the requirements for installation of fixed-location battery systems according to DIN VDE 0510 Part 2. The flow rate of the cooling air should correspond to the minimum values specified in this standard. The handling regulations of the battery should be adhered to.

Installation, connection

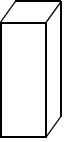


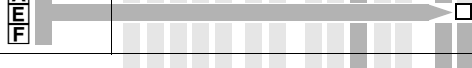
The battery cubicle is easy to install and connect. The cubicle is designed for mounting on the right-hand side of the UPS unit (viewed from front of unit).

Prefabricated connecting cables for mounting the cubicle on the right-hand side of the UPS unit are included in the scope of supply of the battery cubicle. The connections must be made in accordance with the instructions supplied. The battery cubicle can also be installed independently of the UPS unit. Longer connecting cables are needed for this (not supplied).

The battery cubicles referred to below can be operated with different UPS units of Series C. The back-up times are shown in the table.

Design features

- Space-saving modular rack construction with easily removable panels
- Detachable panel with safety lock which can be locked at the top.
- Closed floor panel with penetration for the connecting cables in accordance with DIN EN 50 091-1-1; 50 091-1-2
- Sliding tracks for low floor load due to the large contact surface, thus facilitating transport on unstable or uneven floors.
- Transport rollers or wheels can be mounted on the sliding tracks if necessary.
- There is space underneath the housing for the forks of a fork-lift truck.

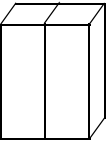
Battery cubicles						
Battery cubicles with maintenance-free lead-acid batteries						
Service life 6 to 9 years						
Dimensions Height x Width	Back-up time in minutes for a rated UPS output of kVA			Order No. extension	Order No.	Weight
mm Depth 650 mm	10	15	20		6 S U 6 6 1 2 - 0 A □ 0 0 - □ □ A 1	kg
					1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	
1 cubicle 1425 x 520						
	11 14 23 29	7 12 15	7 9	A D L P		approx. 255 approx. 284 approx. 356 approx. 399
Degrees of protection			IP 21 IP 31	2 4		
Battery management	Standard PowerProtect Batt with battery measuring modules and software packages PPGraph and PPBatt* }			A E F		
					1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	
					6 S U 6 6 1 2 - 0 A □ 0 0 - □ □ A 1	

* **E** = 3 battery measuring modules only up to 24 battery blocks (value A or D in column 10 of order-no.) + fiber-optic-cable converter
 * **F** = 4 battery measuring modules from 25 to 32 battery blocks (value L or P in column 10 of order-no.) + fiber-optic-cable converter

MASTERGUARD Series C

Battery cubicles 10 kVA to 30 kVA

Battery systems

Battery cubicles Battery cubicles with maintenance-free lead-acid batteries Service life 6 to 9 years							
Dimensions Height x Width mm Depth 650 mm	Back-up time in minutes for a rated UPS output of kVA				Order No. extension	Order No. 6 S U 6 6 1 2 - 0 B □ 0 0 - □ □ A 2 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	Weight kg
2 cubicles 1425 x 520 each							
	50 63	25 32	15 20	8 10	L P → □	approx. 580 total approx. 640 total	
Degrees of protection				IP 21 IP 31	2 4 → □		
Battery management	Standard PowerProtect Batt with battery measuring modules and software packages PPGraph and PPBatt*				A F → □		
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 6 S U 6 6 1 2 - 0 B □ 0 0 - □ □ A 2							

***F** = 4 battery measuring modules from 25 to 32 battery blocks (value P in column 10 of order-no.) + fiber-optic-cable converter

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Scope of supply

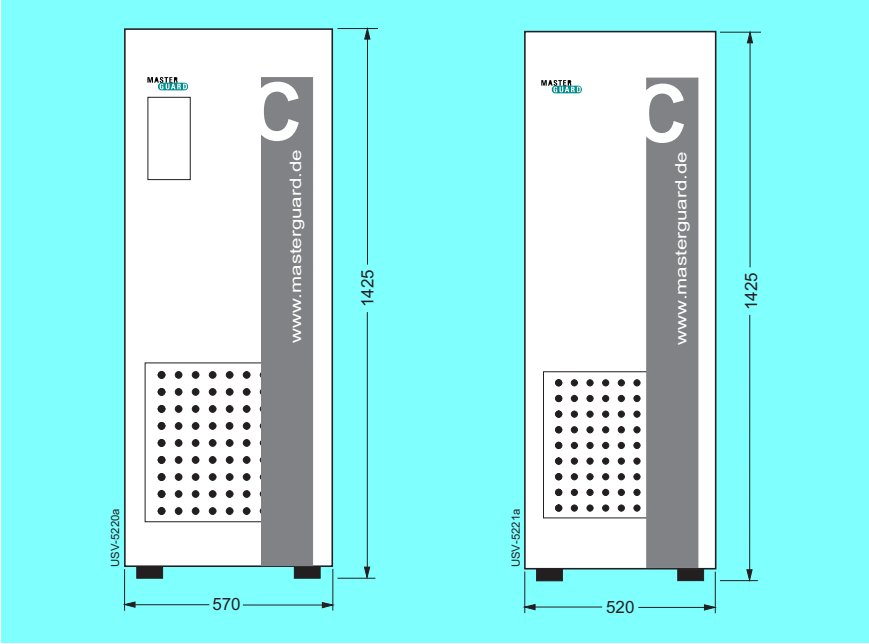
- All connecting cables between the batteries
- Connecting cable between the battery and UPS unit; the cable length is for mounting the battery cubicle on the right-hand side of the UPS unit.

The battery fuses are included in the scope of supply.

The types of fuses must be defined according to the MASTERGUARD UPS Series C type and announced within the order.

- Option PowerProtect Batt includes
 - 3 resp. 4 pcs. battery measuring modules (BVM)
 - fiber-optic cable, 10 m length
 - converter fiber-optic to RS232
 - software PP Meter, PP Archive, PP Graph

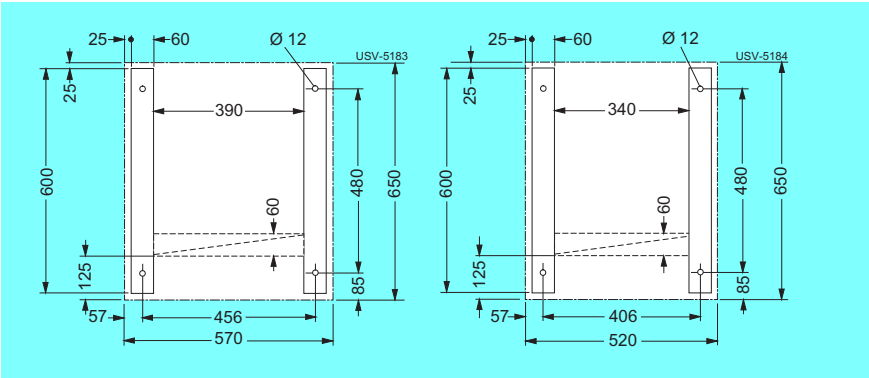
Dimension drawings



UPS

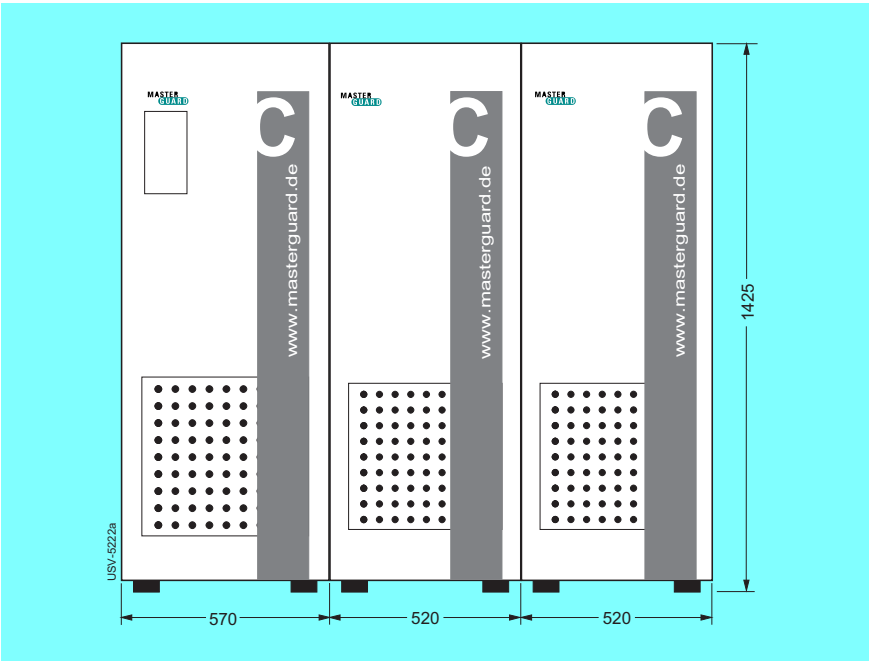
Battery cubicle

Pallet dimensions, on-site installation:
 UPS, battery cubicles
 w x d x h in mm: 730 x 740 x 120



View of base UPS

View of base battery cubicle



Series C System: UPS + 2 battery cubicles on the right hand side

Conditions of sale and delivery

In Germany

Subject to the General Conditions of Supply and Delivery for Products and Services of the Electrical and Electronic Industry.

The prices are in Euro ex works, excluding packaging. The latter is charged for at cost.

Value added tax is not included in the prices. It is invoiced separately at the legally specified rate.

Outside Germany

General Conditions of Supply and Delivery for Products and Services of the Electrical and Electronic Industry and to any other conditions agreed upon with recipients of Masterguard price lists.



The technical data, dimensions and weights are subject to change unless otherwise stated on the individual pages of this catalog.

The illustrations are for reference only.

We reserve the right to adjust the prices and shall charge the prices applying on the date of delivery.

Quality and Environmental Management

Quality Management

The MASTERGUARD quality management system for development, production, sales and service is certified after DIN EN ISO 9001.

The quality goals of MASTERGUARD GmbH commit to a distinct customer and process orientation. Product quality will be complemented through quality in logistics and service.

Environmental Management

The environmental management system for development, production, sales and service is certified after DIN EN ISO 14001.

Therewith the MASTERGUARD GmbH has itself committed to operational and product related pollution control.

Our sup-suppliers will be valued as an important link in the chain of consideration of resources by integration of thought of environment.

Pollution Control

High quality, modern product design, progressive production technique and efficient resource management will result in the optimal utilization of raw material and maximum reliability.

For example, through the newest technologies the power loss will be minimized. Labeled and for environmental compatibility especial chosen material enhance service life as well as the chance of recycling. Unique solutions like battery management enhance the lifetime and reduce maintenance cost.

Standards

Standards relating to uninterruptible power supply units and systems

DIN EN ISO 9001	Quality management system
DIN EN ISO 140001	Environment management system
DIN IEC 721	Climatic categories
DIN VDE 0100	Specifications for erecting heavy-current installations with rated voltages of up to 1000 V
DIN VDE 0106	Protection against electric shock, classification of electrical and electronic equipment
DIN VDE 0510	Accumulators and battery systems
DIN VDE 0532	Transformers and reactor coils
DIN VDE 0558	Semiconductor converters and their application, e.g. uninterruptible power supply systems (UPS)
DIN 40 040	Utilization category and reliability data for components in telecommunications engineering and electronics
DIN 41 772	Converters, semiconductor rectifiers
DIN 45 635	Noise measurement on machines
DIN 54 840	Marking of plastic components
DIN 57 636, Part 21	Selectivity of fuses
EN 50 091	UPS product standard
EN 55 022	Radio interference of electrical equipment and installations
EN 60 529	IP degree of protection
EN 60 950	Safety
IEC 61000	Electrical interference immunity
SN 36 350-2	Requirements for the environment
VDI 2243	Design of technical products suitable for recycling

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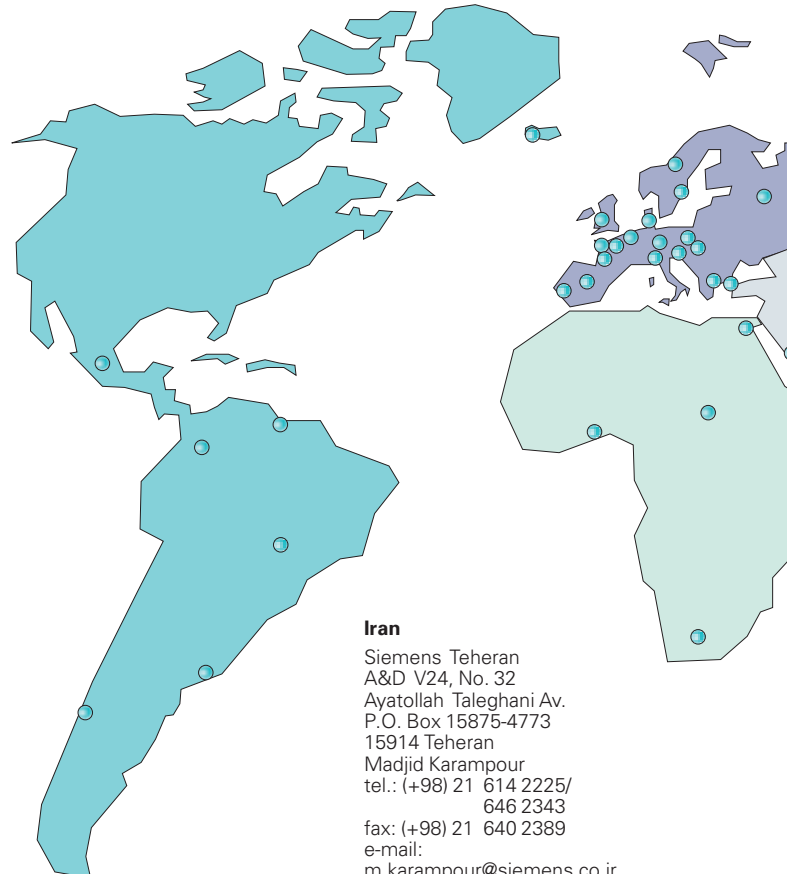
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