

KOHLER®

UNINTERRUPTIBLE
POWER



KOHLER *MF* Series

Distributed Bypass

Modular high power three-phase uninterruptible power supply

(250 - 1500 kVA/kW)
Scalable to 6000 kVA/kW

Technical specification

Document Control

ISSUE	DATE	REVISION SUMMARY
TS_765_01	20/11/2023	Rebranded International version

Useful Contacts

UK

www.kohler-ups.co.uk	Kohler Uninterruptible Power web site
ukservice.ups@kohler.com	Service department – booking service, fault reporting etc.
uktechnicalsupport.ups@kohler.com	Technical queries
uksales.ups@kohler.com	Hardware sales
ukservicesales.ups@kohler.com	Extended warranty agreements etc

IRELAND

www.kohler-ups.ie	Kohler Uninterruptible Power web site
ieinfo.ups@kohler.com	Service department, technical queries, hardware sales and extended warranty agreements

SINGAPORE

www.kohler-ups.sg	Kohler Uninterruptible Power web site
salesups.sg@kohler.com	Hardware sales
serviceups.sg@kohler.com	Contract customer support, maintenance contracts renewals

All product, product specifications and data are subject to change without notice to improve reliability, function, design or otherwise.
Kohler Uninterruptible Power has taken every precaution to produce an accurate, complete and easy to understand specification document and will assume no responsibility nor liability for direct, indirect or accidental personal or material damage due to any misinterpretation of, or accidental errors, in this manual.

© 2023 Kohler Uninterruptible Power

This manual may not be copied or reproduced without written permission of Kohler Uninterruptible Power

KOHLER MF Series DESCRIPTION

Three phase double conversion uninterruptible power supply for critical environments that have high power demands. The UPS is specially designed for modern data storage infrastructures such as enterprises, colocation, cloud, internet, media, and telecommunications data centres.

The Kohler MF Series provides a continuous flow of clean, sustainable power. The UPS is based on 250 kW power modules with scalable power up to 1500 kW or 1250 N+1 for redundancy in a single system and up to 4 units can be connected to provide a total of 6 MW capacity.

The Kohler MF Series UPS incorporates the latest technological developments in power engineering. Representing a completely new generation of high power three phase UPS systems, its advanced double conversion VFI (Voltage and Frequency Independent) topology is optimised to provide the highest availability and energy efficiency for a UPS system of this type. The Kohler MF Series UPS is compliant with the IEC 62040-3 (VFI-SS-111) standards.

Kohler Uninterruptible Power Ltd. specialises in the installation and maintenance of Uninterruptible Power Systems, emergency lighting inverters and standby generators. This powerful UPS is just one example of our wide range of state-of-the-art power protection devices that will provide your critical equipment with a steady and reliable power supply for many years.

Model range

The Kohler MF Series is a truly expandable system, based on a number of plug-in 250 kW UPS modules installed in a purpose-designed cabinet. Up to six 250 kW modules in the 1500 kW frame and up to four 250 kW modules can be fitted in the 1000 kW Frame, thanks to the advanced Kohler MF Series system design, if a cabinet is not fully populated it is possible to add further UPS modules to increase the system capacity without having to power-down the system or in any way disrupt the load. Using the 1000 kW frame as an example, if a system is initially purchased with only two UPS modules fitted, an additional four modules can be installed later as and when required. Depending on the system redundancy and existing load demand, this 'hot-swappable' design also allows individual modules to be exchanged while the equipment remains fully operational without having to transfer the load to the unprotected bypass supply.

Further expansion is made possible by connecting up to four UPS cabinets in parallel to provide a total system output of up to 6.0 MW.



Key Features

Uninterruptible power – power capacity and redundancy on demand



Up to 1500 kW power protection in a single UPS by paralleling power modules of 250 kW. Power modules can be slid in, adding power capacity, or providing internal redundancy (N+1).



Readiness for parallel redundant system configurations (2N, 2(N+1), 3N/2) securing uptime and reliability

Maximized availability and resiliency



Proven technology and maximized availability based on power modules of 250 kW that include all necessary functional parts, such as rectifier, inverter, battery converter, static bypass, and back-feed protection. The UPS architecture provides fully redundant critical components and shares the load equally among the power modules.



Concurrently maintainable power modules for continuous uptime. The power module is online swappable while the load is secured in double conversion mode. Insertion or removal of the power module is smooth and simple thanks to wheels and guide rails. Further, the power module plug-in concept supports easy and safe power connection, thus eliminating electrical hazards.



Fail-safe startup of the system without human intervention by testing of power modules before applying to the critical load.



Fault-tolerant UPS operation. If one power module fails, the others take up the load - without impacting the power supply.



Minimized energy losses, heat dissipation and electricity cost while the critical load is protected by the UPS in double conversion or ECO modes. The UPS achieves an efficiency of up to 97.4% in double conversion mode and 99 % in ECO mode.



Flexible operation optimizes UPS efficiency and reduces power loss when the load is low compared to the UPS total capacity. KUP Xtra VFI mode can improve system efficiency by optimizing the number of power modules used in double conversion mode to feed the load.



Simply and safe installation. The UPS is provided with pre-engineered power frames consisting of metal busbars – which eliminate wiring entirely – and slide-in power modules with safe, plug-in connections that remove any hazard.



Ease to operate and manage real-time monitoring is provided by the local system display or in the control room via the web application.



Design life of up to 15 years reduces the cost of systems replacements over the infrastructure lifespan



Control and monitoring features, I/O dry ports, dry inputs for remote shutdown, generator, operational and external switchgear, castell interlock function, preconfigured battery temperature sensor input

MF Series with Distributed Bypass

The MF Series double conversion online modular UPS with distributed bypass benefits from all the advantages of DPA Technology . The key features of this UPS are:

- Distributed static bypass switches
- Each UPS module can operate autonomously
- Redundant critical components and paths serving the load; no single points of failure
- UPS modules can be online-swapped without impacting the load
- Redundant power configuration (N+1) with common or separate batteries
- Smart load sharing between the active UPS modules
- Continuous and redundant control and monitoring on module and system level

Power capacity and redundancy can be tailored to suit with up to 6000 kW power protection available in a single UPS system by paralleling power modules of 250 kW. Additional power modules can be slid in, adding power capacity or providing internal redundancy (N+1).

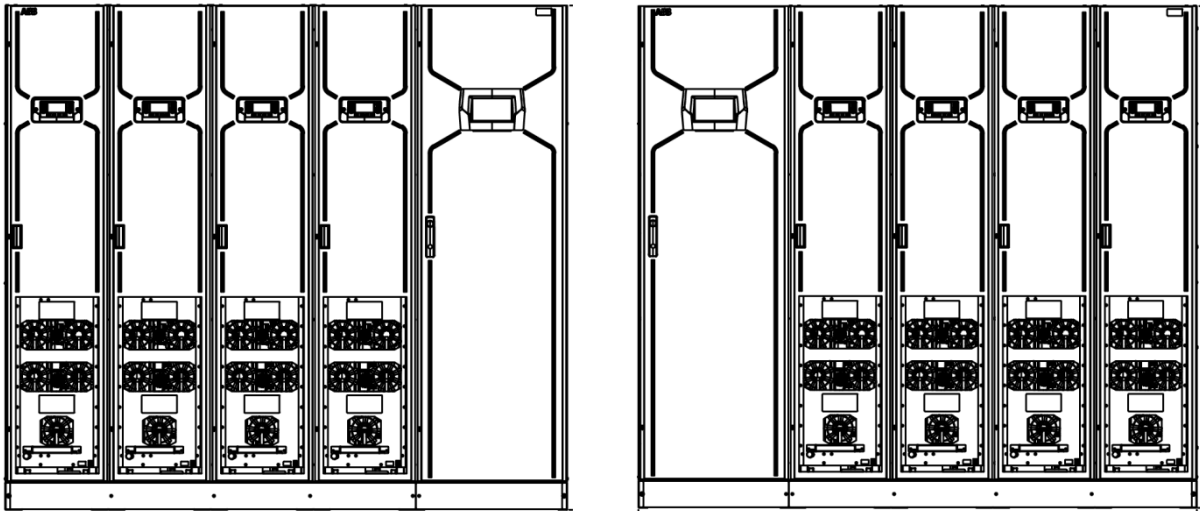
With a 97.6 percent UPS module efficiency, 97.4 percent system efficiency in double conversion mode and 99 percent efficiency in ECO mode, the MF Series family are sure to cut your energy bill. The Xtra VFI double conversion mode improves efficiency under low-load conditions, making further savings.

Simply and safe installation is guaranteed as the UPS is provided with pre-engineered power frames that accommodate the modules and busbars that eliminate wiring entirely. Slide-in power modules with safe, plug-in connections remove any electrical hazard. To make external cabling easier, top or bottom cable entry can be chosen.

Maintenance and monitoring is easy too: Module replacement takes just a few minutes and maintenance can be performed in the comfort and safety of a separate room. Modules can be safely re-inserted without powering down. Real-time monitoring is provided by the local system display or a display on each module. The system can also be monitored remotely via the web application.

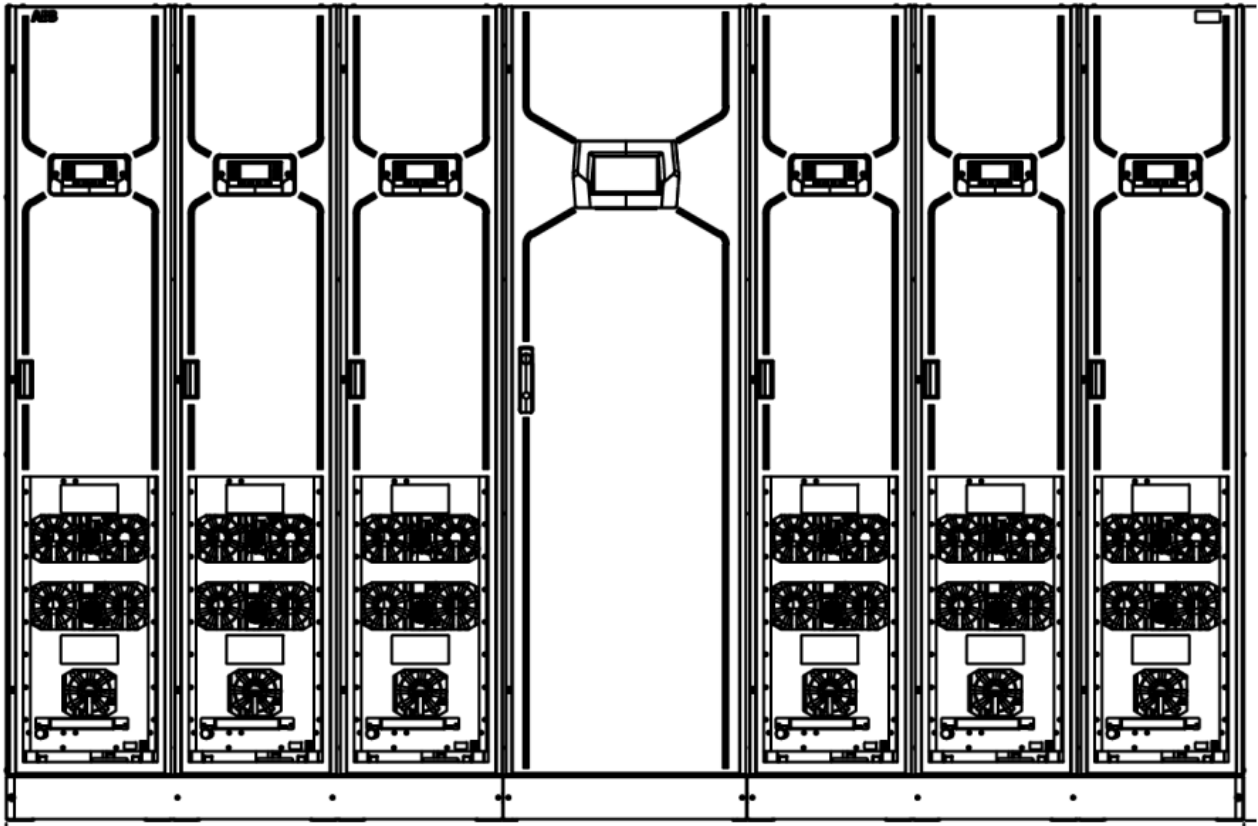
A variety of options for energy backup delivers the flexibility that users seek: The MF Series UPS can be installed with module-specific backup energy media for highest availability or a common battery for the whole UPS rack to optimize cost. The MF Series is also compatible with multiple lithium-ion batteries – a good option for those who look for further space savings without compromise in backup time. In addition, the system is ready for new energy storage technologies available in the market.

PowerExchanger is a function available on the MF Series enabling the UPS to interact with the grid and supply (upon external request) ancillary grid services. Through this frequency regulation function (FRF) the UPS can reduce/increase the input power flowing from the grid to the UPS or even reverse the flow and inject power back into the grid (back-feed), while maintaining constant output power.

Mechanical Characteristics MF Series with Distributed Bypass
KOHLER MF1500 DPA – 1000 kVA Frame


The modules can be on the right-hand side or left-hand side of the central Connections section UPS Section

1000kVA / 1000kW Frame	1 Module	2 Module	3 Module	4 Module
System power rating (per cabinet) (kVA/kW)	250	500	750	1000
Maximum cabinet rating	1000 kVA / 1000 kW (up to 4 power modules)			
UPS type	On-Line, transformerless, Modular, DPA			
Parallel capability	Up to 4 Frames – 4MVA/4 MW			
Battery	Housed external to the UPS. Dimensions/weight/design is specific to application			
Performance specification	VFI-SS-111			
UPS Frame Dimensions (W x D x H) mm	2235 x 1000 x 2000			
Weight (without power modules) kg	550			
Weight (with power modules) kg	900	1250	1600	1950
UPS cabinet colour	RAL 9005 (Black)			
Ingress protection	IP 20			
Cable entry	Top or Bottom (To be defined at Order)			
Ventilation	Front to Top			
Service access	Front			
Installation clearances mm	Front 1500mm, Top 500mm, Rear 0mm			
Heat dissipation - 1000kW linear load (W)	35578			
Heat dissipation - 500kW linear load (W)	13426			
Heat dissipation - 250kW linear load (W)	7053			
Heat dissipation - 0kW linear load (W)	4000			
Cooling airflow (m ³ /h) - EN 62040-1-1	7576			

KOHLER MF1500 DPA – 1500 kVA Frame


1500 kVA / 1500 kW Frame	1 Module	2 Module	3 Module	4 Module	5 Module	6 Module
System power rating (per cabinet) (kVA/kW)	250	500	750	1000	1250	1500
Maximum cabinet rating	1500 kVA / 1500 kW (up to 6 power modules)					
UPS type	On-Line, transformerless, Modular, DPA					
Parallel capability	Up to 4 Frames - 6MVA / 6 MW					
Battery	Housed external to the UPS. Dimensions/weight/design is specific to application					
Performance specification	VFI-SS-111					
UPS Frame Dimensions (W x D x H) mm	3045 x 1000 x 2000					
Weight (without power modules) kg	845					
Weight (with power modules) kg	1195	1540	1895	2245	2595	2945
UPS cabinet colour	RAL 9005 (Black)					
Ingress protection	IP 20					
Cable entry	Top or Bottom (To be defined at Order)					
Ventilation	Front to Top					
Service access	Front					
Installation clearances mm	Front 1500mm, Top 500mm, Rear 0mm					
Heat dissipation - 1500kW linear load (W)	53367					
Heat dissipation - 750kW linear load (W)	20140					
Heat dissipation - 375kW linear load (W)	10580					
Heat dissipation - 0kW linear load (W)	6000					
Cooling airflow (m ³ /h) - EN 62040-1-1	11364					

KOHLER MF1500 DPA – 250 kVA Power Module



250 KVA / 250 kW Power Module	1 Module
System power rating (per cabinet) (kVA/kW)	250
Module Input Fuse (Type gRL/gS)	500A
Module type	On-Line, transformerless, Modular, DPA
Dimensions (W x D x H) mm	356 x 1000 x 1825
Weight kg	350
Ventilation	Forced ventilation with fan failure detection and fan speed regulation. N+1 fan redundancy
Service Access	Removable power modules with 360° access*

General Specifications

Environment & Electromagnetic Compatibility	
Environmental service conditions	Indoor unconditioned
Climatic class	3K2
Pollution degree	2
UV resistance	N.A
Ambient operating temperature range	0-40°C
Ambient storage temperature range (see note)	-25-70°C
Relative humidity range	<95% (non-condensing)
Altitude without derating	up to 1000m
Altitude with derating	up to 5000m
Vibration	according to EN60721-3-2
Emission	C3
Immunity	C3

Note: Elevated storage temperatures may impact useful life, specifically for the UPS capacitors. Ideal storage temperature is between +5 and +35°C and at relative humidity of up to 75%. Long term storage in an environment with high humidity should be avoided. Likewise, one should avoid storage in environments that contain halogenated gases (and other hazardous gases), spray or oil as well as exposure to any radiation.

Electrical Specifications MF Series with Distributed Bypass

Input Characteristics

Input AC Power Distribution				
Input AC power distribution system compatibility (earthing system)	TN-S, TN-C, TN-C-S			
Input AC power distribution system wiring	3 Phase + Neutral + PE			
Overvoltage category	II			
Input rated conditional short circuit current (Icc)	120 kA			
Additional information	Single UPS Mains input connection (rectifier and internal bypass fed by separate circuits within each power module).**			
Input Voltage & Frequency				
Input rated voltage	380, 400 or 415 VAC (Phase to Phase) 220, 230 or 240 VAC (Phase to Neutral)			
Input voltage tolerance 40°C @ 400VAC	Load <100% (-10%, + 15%) Load <80% (-20%, + 15%) Load <60% (-30%, + 15%)			
Input rated frequency	50Hz or 60Hz			
Input frequency tolerance	40Hz or 70Hz (nominal Frequency + 10Hz)			
Input Current and Overload Characteristics		1000 kVA	1250 kVA	1500 kVA
Maximum input rated current - 400V - (batteries charged) *		1496A	1870A	2245A
Maximum input rated current - 400V - (batteries charging)		1511A	1889A	2267A
Total harmonic distortion (THDi), 100 % load - normal mode - linear load (at 400V input voltage; input THDU < 2%; tolerance of ±0.3% may apply)		<3%		
Total harmonic distortion (THDi), 100 % load - normal mode - non-linear load (at 400V input voltage; input THDU < 2%; tolerance of ±0.3% may apply)		<3%		
Rectifier input in-rush (% of rated current against time)		<100%		
Rectifier input power factor (rated linear load; rated non-linear load)		0.99 100% load		

*Maximum input rated current – 380V and 415V please contact Kohler ** To fully isolate a UPS Frame, we recommend an external bypass is provided – housed in external switchgear separate to the UPS frame.

Efficiency Characteristics

Efficiency	
Double conversion efficiency - 100% rated load	96.5%
Double conversion efficiency - 75% rated load	97.0%
Double conversion efficiency - 50% rated load	97.4%
Double conversion efficiency - 25% rated load	97.3%

Note: performance is stated is in accordance with EN standard for UPS Performance EN62040-1

Output Characteristics

Output AC Power Distribution				
Output AC power distribution system compatibility (earthing system)	TN-S, TN-C, TN-C-S, TT			
Output AC power distribution system wiring	3 Phase + Neutral + PE			
Output Voltage				
Output rated voltage	380, 400 or 415 VAC (Phase to Phase) 220, 230 or 240 VAC (Phase to Neutral)			
Output voltage variation - normal mode	+/- 1%			
Output voltage variation - battery mode	+/- 1%			
Total harmonic distortion (THDU), 100 % load - normal mode - linear load	<2%			
Total harmonic distortion (THDU), 100 % load - normal mode - non-linear load	<4%			
Total harmonic distortion (THDU), 100 % load - battery mode - linear load	<2%			
Total harmonic distortion (THDU), 100 % load - battery mode - non-linear load	<4%			
Voltage transient and recovery time - 100 % step load - linear	<4%, (<200ms)			
Voltage transient and recovery time - 100 % step load - non-linear	<4%, (<200ms)			
Voltage transient and recovery time - transfer normal mode / battery mode	<1%, (<200ms)			
Output Frequency				
Output rated frequency	50Hz or 60Hz			
Output frequency variation - normal mode	+/- 2% or 4% selectable (Synchronised with mains, allowing for transfer to static bypass)			
Output frequency variation - battery mode	+/- 0.1%			
Output frequency variation - free-running	+/- 0.1%			
Synchronization (max ± % range of rated frequency)	+/- 2% or 4% selectable			
Max synch. phase error (referred to a 360° cycle)	2°			
Output Current		1000 kVA	1250 kVA	1500 kVA
Output rated current - 400V*		1450A	1812A	2174A
Inverter overload capability		110% load: 60 minutes 125% load : 10 minutes 150% load : 1 minute		
Output current limitation, "short circuit current" (% or rated current / time duration, 400V rated voltage)		2.8 x In, 40ms (default) 2.5 x In, 100ms 2.1 x In, 250ms		
Fault clearing capability (normal mode / stored energy mode, 400V rated voltage)		4060A	5074A	6087A
Output Power Factor				
Load power factor - rated	1.0			
Load power factor - displacement (permissible lead-lag range)	0.6 lag to 0.8 lead			

*Maximum input rated current – 380V and 415V please contact Kohler

Static Bypass Characteristics

Static Bypass Switch	1000 kVA	1250 kVA	1500 kVA
Rated Current - 400V*	1450A	1812A	2174A
VFD Efficiency at 100% rated load	99%		
Bypass Overload (% of rated current / time duration)	110% load: continuous 140% load: 10 minutes 190% load: 2 minutes		
Bypass voltage tolerance (% of rated voltage @ 400V)	-10% + 15%		
Bypass fault clearing capability (% of rated current/ time duration @ 400V)	20 In / 10ms		

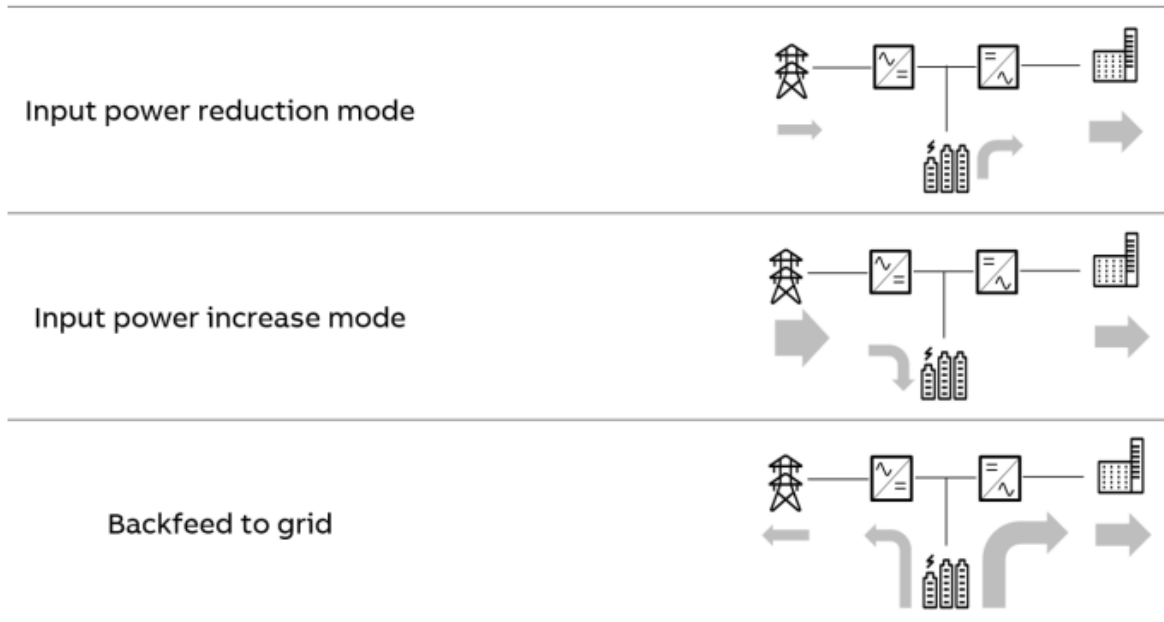
*Maximum Input Rated Current – 380V and 415V please contact Kohler

Battery and Energy Storage Characteristics

Battery and Energy Storage			
Energy storage type	VRLA (Lead Acid) battery. Available housed in matching battery cabinets or closed/open stands. Size dependant on application. Li-ion: Housed in purpose designed cabinet including for BMS (Battery management system)		
Technology	Lithium ion, VRLA, NiCd		
Design life	Lithium ion: 15 years. VRLA, NiCd: Ref to battery manufacturer provided information		
Quantity of cells per string	Lithium ion: 136 cells / 17 modules max 6 frames of 17 modules per string VRLA 12V: 40-50 blocks/ 240-300 cells* NiCd: 400-500 cells		
Nominal voltage (total)	480 VDC - 600 VDC		
Nominal capacity (C10)	Battery type dependent Lithium ion: 67 Ah		
Stored energy time (back-up time at 100 % rated load)	Extended autonomy times without derating. Refer to battery autonomy calculators for correct sizing		
Restored energy time (re-charge time to 90 % capacity)	Lithium ion: 3 hours, VRLA: 10 hours (varies on amount and size of used batteries) NiCd: 10 hours		
Ambient reference temperature (To secure maximal service life)	Battery type dependent: Lithium ion: 25°C, VRLA: 20°C, NiCd: Refer to manufacturer provided information		
Nominal discharge current	2182A - 1745 A (d.c)	2727A - 2182 A (d.c)	3272A- 3054 A(d.c)
Fault current rating	200kA (d.c)		
Charge voltage (float, boost) and tolerance band	4.20 V/Cell Lithium ion, 2.23 V/Cell VLRA, 1.40 V/Cell NiCd		
End of discharge voltage	3.20 V/Cell Lithium ion, 1.68 V/Cell VLRA, 1.05 V/Cell Ni-Cd		
Charge current limit (or range)	750A (d.c)	938A (d.c)	1125A (d.c)
Charge power limit	300 kW (d.c)	375A kW (d.c)	450A kW (d.c)
Battery ripple current max.	400mA RMS		
Cable voltage drop recommendation	1%		
Battery temperature compensation	Supported by standard UPS. Temperature sensor available as option		
Battery test	Automatic battery test performed by UPS		

Power Exchanger

PowerExchanger is a function enabling the UPS to interact with the grid and supply (upon external request) ancillary grid services. Through this function the UPS is able to reduce/increase the input power absorbed from the grid or even to inject power into the grid (backfeed), while maintaining constant the output power.



Input power reduction mode

Activation power (input reduction)	From actual load down to 0%
Response time from activation request	< 1 Second
Input power reduction duration	Modbus RTU: until minimum state of charge is reached dry contact: 0-200, selectable
Deactivation ramp	Modbus RTU: instantaneous control, dynamic setpoint dry contact: 0-100%, selectable
Battery minimum state of charge*	0-100%, selectable
Battery type compatibility	VRLA, Li-Ion**, NiCd
Communication with external gateways	Modbus RTU or dry contact***
Activation	Dedicated Module 1 license

*defines the minimum level beyond which the input power reduction mode is inhibited

** valid for Li-Ion batteries officially compatible with this UPS, lithium iron phosphate battery is recommended.

*** if dry contact communication is selected, the activation power is a predefined setpoint (programmable)

Input power increase mode

Input power increase	Max 75Kw/UPS module, on top of actual load. (limitations may apply depending on initial battery state of charge)
Response time from activation request	< 1 Second
Input power increase duration	Modbus RTU: until minimum state of charge is reached dry contact: 0-200, selectable
Deactivation ramp	Modbus RTU: instantaneous control, dynamic setpoint dry contact: 0-100%, selectable
Battery maximum charge status*	0-100%, selectable
Battery type compatibility	Li-Ion**
Communication with external gateways	Modbus RTU or dry contact***
Activation	Dedicated Module 1 license

* during input power increase mode the battery is charged, therefore to enable this mode the battery should be normally kept in a partial state of charge; this parameter specifies the maximum charge allowed (100% equals then to disabling the function). The initial state of charge and the amount of battery capacity installed influences the amount of power increase.

** valid for Li-Ion batteries officially compatible with this UPS, lithium iron phosphate battery is recommended.

*** if dry contact communication is selected, the activation power is a predefined setpoint (programmable).

Backfeed to Grid

Activation power (backfeed to grid)	Up to 175kW/UPS module exported towards the grid
Response time from activation request	< 1 Second
Backfeed to grid duration	Modbus RTU: until minimum state of charge is reached dry contact: 0-200, selectable
Deactivation ramp	Modbus RTU: instantaneous control, dynamic setpoint dry contact: 0-100%, selectable
Battery maximum charge status*	0-100%, selectable
Battery type compatibility	VRLA, Li-Ion**, NiCd
Communication with external gateways	Modbus RTU or dry contact***
Activation	Dedicated Module 1 license

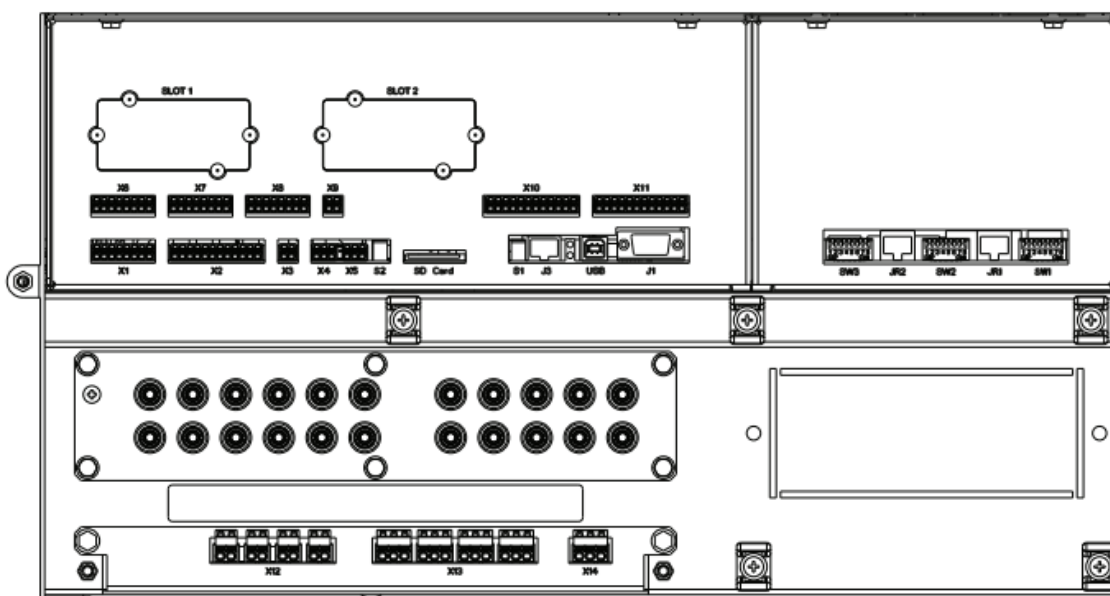
* defines the minimum level beyond which the back feed reduction mode is inhibited

** valid for Li-Ion batteries officially compatible with this UPS, lithium iron phosphate battery is recommended.

*** if dry contact communication is selected, the activation power is a predefined setpoint (programmable)

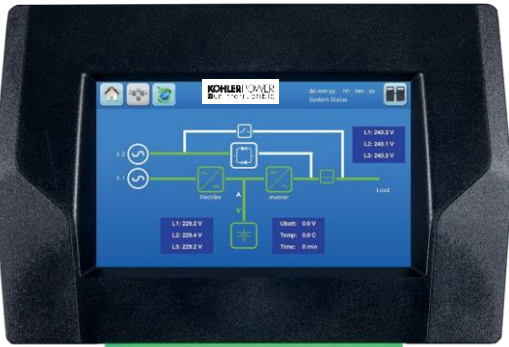
Remote Control and Monitoring

Communications - Hard Wired (fitted as standard)	
Inputs dry ports X1, X7, X8	X1 / X7 / X8 can hold Cable from 0.2mm ² – 1.5mm ² All X1 / X7 / X8 are inputs, cable max. R 50Ω at 10mA X1 (4 inputs): Generator operation ON, External output breaker, external manual bypass, remote shut down X7-X8 (8 inputs) are programmable inputs
High voltage input port X12	X12 terminals can hold Cable from 0.2mm ² – 1.5mm ² X12 are inputs rated: Min. 87 Vac – Max. 277 Vac 50Hz/60Hz X12 are programmable inputs
Input analog port X6	X6 can hold Cable from 0.2mm ² – 1.5mm ² All X6 are analogue inputs, designed for sensors with standard industry output 1-24Vdc or 4-20mA
Input battery temperature sensor X3	X3 can hold Cable from 0.2mm ² – 1.5mm ²
Modbus communication power X4	X4 terminals can hold Cable from 0.2mm ² – 1.5mm ² X4 are differential 5V RS485 signals
CAN bus communication port X5	X5 terminals can hold Cable from 0.2mm ² – 1.5mm ² X5 are differential 5V RS485 signals
Output dry port X2,X10, X11	X2, X10 and X11 terminals can hold Cable from 0.2mm ² – 1.5mm ² X2, X10 and X11 are potential free contacts and are rated: Max 30Vac/1A; 60Vdc/0.5A. X2 (4 outputs) : common alarm, battery low, load on inverter, main failure X10,X11 (8 outputs) are programmable outputs
High voltage output power X13	X13 terminals can hold Cable from 0.2mm ² – 1.5mm ² X13 are output rated: Max. 5A @ 277 Vac or 5A @ 30VDC X13 are programmable outputs
Output + 24dc X9	X9 can hold Cable from 0.2mm ² – 1.5mm ² X9 is an output port rated: 24Vdc @ 100mA Max
Synchronization input port X14	X14 terminals can hold Cable from 0.2mm ² – 1.5mm ² X14 are inputs and are rated: Max. 415 Vac
Communications - Network Card Options	
Slot 1	SNMP Card or Modbus TCP/IP or Modbus RS-485
Slot 2	SNMP Card or Modbus TCP/IP or Modbus RS-485

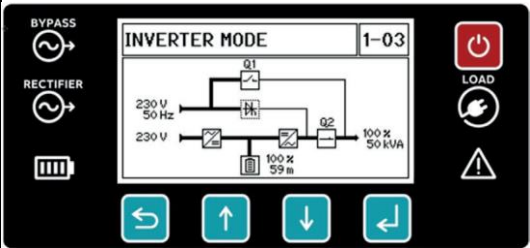


UPS Control and Monitoring

System Control Panel

	<p>Each UPS system has a system graphical display. It is a 7" touchscreen display enabling the operator to perform:</p> <ul style="list-style-type: none"> • Monitoring and measuring of the power flow through the UPS system, individual power modules and batteries • Monitoring of UPS operational status, events, and alarm history • If the system control panel fails each module can still be operated using their own panel • UPS setting configuration • UPS Data
---	--

Module Control Panel

	<p>The power module has its own control panel consisting of an LCD display, control and navigation buttons and led status indicators. The LCD display shall display:</p> <ul style="list-style-type: none"> • Mimic diagram of the power module showing the rectifier, battery, static bypass, inverter status and the input, bypass, battery, and output measurements: voltage, frequency, power • Power module status: off, disconnected, inverter mode, bypass mode, battery mode, stand-by mode • Power module location: Power frame and power module number
---	---

The control and navigation buttons shall allow the user to perform settings and adjustments, monitor the voltages, currents, frequencies, power measurements and scroll the main and sub-menus in the UPS module.

The user shall be able to identify the status of the bypass, rectifier, battery and UPS output and the alarm by reading the LED indicators. The LEDs are always active even if the display is in screensaver mode. Please refer to the OPM for more information.

Installation and Planning

INSTALLATION PLANNING

The following *guidelines* should be considered when planning a suitable UPS location and working environment.

Location considerations summary

- The UPS equipment must be installed and transported in an upright position.
- The floor at the installed location and en-route from the off-loading point must be able to safely take the weight of the UPS and battery equipment.
- The floor material where the UPS is to be located should be non-flammable.
- Local fire protection standards must be respected.
- The appropriate power supplies must be accessible so that the UPS cabling can be performed easily.

Environmental considerations summary

- Avoid high ambient temperature, moisture, and humidity. The prescribed limits are humidity (<90% non-condensing) and temperature (0°C to +40°C and ideally 18°C to 25°C).
- A battery temperature of 20°C is recommended for VRLA to achieve a long battery life.
- Any prescribed air-cooling flow must be available. Ensure the air conditioning system can provide enough air cooling to keep the room at, or below, the maximum desired temperature.
- No dust or corrosive/explosive gases should be present.
- The location must be vibration-free.

UPS Cabinet Installation

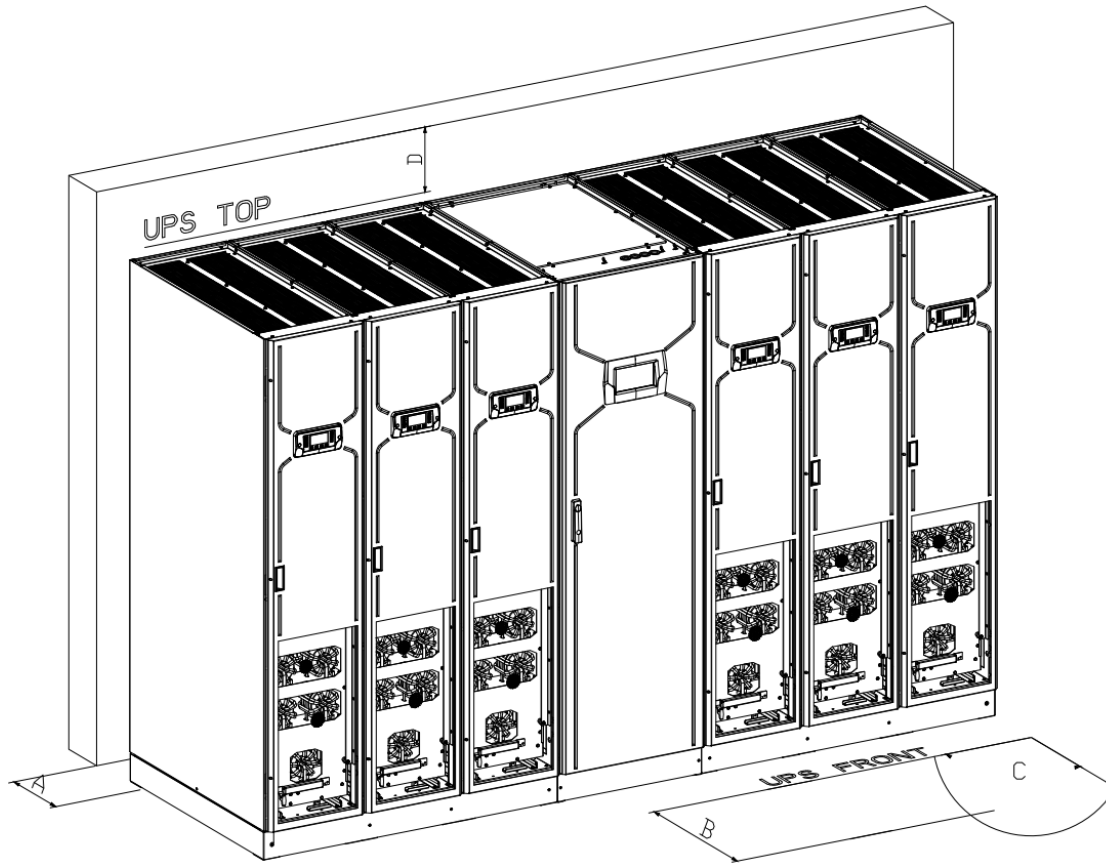
Before moving the UPS to its final position, carry out any necessary pre-installation cabling (power and control cables) to ensure that full cable access is available once the UPS is placed in-situ. Top or bottom cable access is possible, or a combination of the two.

Battery Installation

The battery system should be contained in a purpose-designed cabinet or mounted on a suitable open or closed battery rack. The battery cabinet can be positioned on either side of the UPS cabinet and they can also be in a separate room or location. If the batteries are to be mounted on external battery racks, rather than cabinet mounted, the battery must be sized to consider the voltage drop between the battery installation and UPS. Contact Kohler Uninterruptible Power Ltd. For installation advice and support if necessary.

UPS FOOTPRINT AND CLEARANCES

The minimum needed clearances to allow sufficient airflow on the UPS system and to allow proper services and maintenance shall be respected as reported below



UPS Clearances	
A - Rear clearance for ventilation	0 mm (Can be positioned against a wall)
B - Front clearance to allow door to open	1500 mm *
C - Maximum door opening angle	95 °
D - Top clearance	500 mm

*Front clearance of 1,200 can be accepted if the power module is removed by 2 service engineers.

Cable Planning

The UPS cabinets are designed for a single input feed, where the UPS input mains supply is connected internally to the UPS bypass terminal. The first diagram below, shows the batteries being connected 'Separately' to each Power Module and the second diagram below, shows the batteries being connected in a 'Common' arrangement to the UPS Frame.

It is the customer's responsibility to design and install the UPS supply and distribution circuits and provide the external fuses, isolators and cables required to connect the UPS input and output power supplies.

The information provided in this section should assist in the planning and preparation of the UPS power cabling.

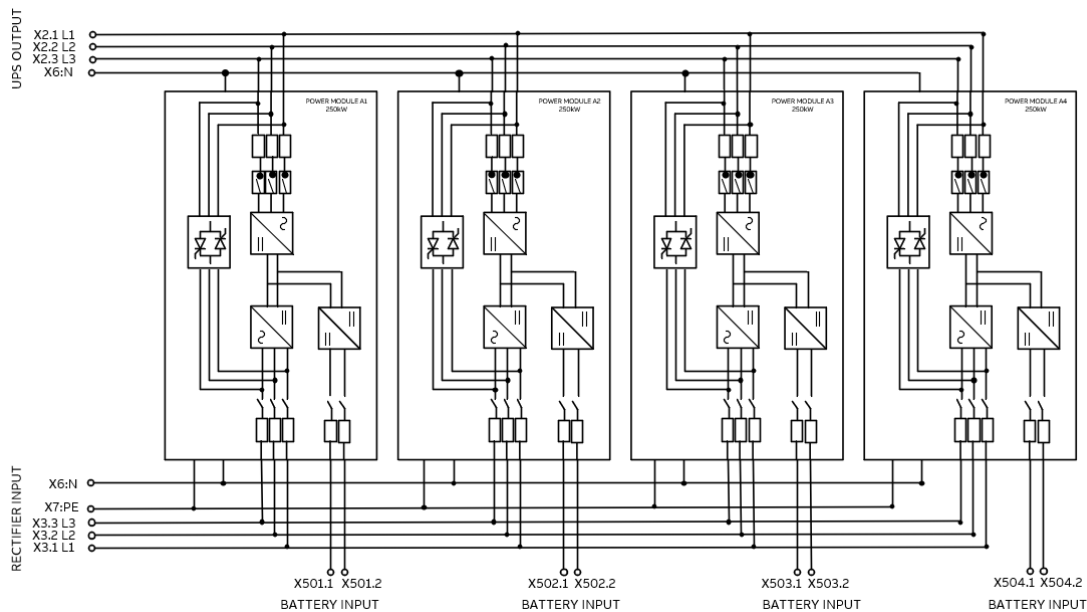
As shown below, the UPS input mains should be connected to the UPS system via a circuit breaker or fused device. The input device provides a means of isolating the UPS from the utility mains supply and must be suitably rated to provide overload protection for the UPS. Similarly, the UPS output should be connected to the load equipment via a suitably protected UPS system output panel.

The tables below shows the maximum UPS input and output current for each set of cables together with the cable termination details. This is provided to assist the customer in selecting appropriately rated power cables and external switchgear.

Cable Terminations

Terminals Description	Label	Cable Size	Torque (Nm)
Input Line L1	X3.1: L1	M12 Bolt Terminal	50-75
Input Line L2	X3.1: L2	M12 Bolt Terminal	50-75
Input Line L3	X3.1: L3	M12 Bolt Terminal	50-75
Neutral Bar (Common Neutral)	X6: N	M12 Bolt Terminal	50-75
Earth Bar (Common Earth)	X7 : PE	M12 Bolt Terminal	50-75
Output Line L1	X2.1: L1	M12 Bolt Terminal	50-75
Output Line L2	X2.1: L2	M12 Bolt Terminal	50-75
Output Line L3	X2.1: L3	M12 Bolt Terminal	50-75
Battery Terminal +	X501.1: +	M12 Bolt Terminal	50-75
Battery Terminal -	X502.2: -	M12 Bolt Terminal	50-75

Single Input Feed with Separate Battery Connection



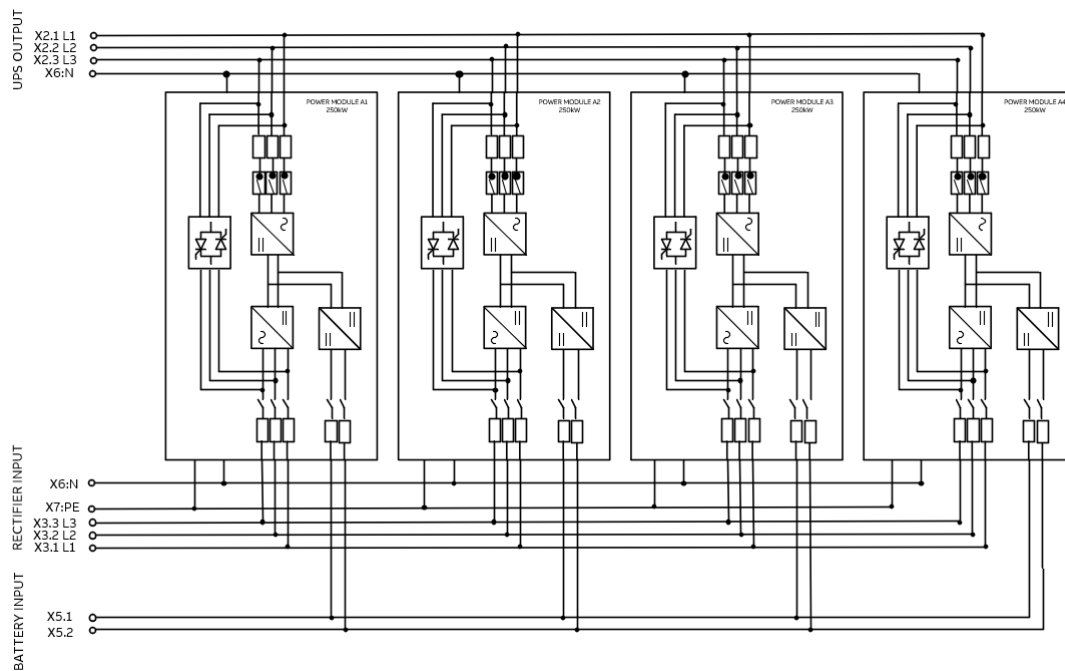
Note: The above Schematic shows are 1000kW Frame. If a 1500kW Frame is selected, the schematic would have an additional 2 power modules.

In a ‘Separate battery’ installation the UPS battery busbars are removed, and the individual battery positive and negative cables are connected directly to the modules’ battery circuit breaker (F3)

Input /output protection values calculated at 380V

Recommended external protection & Cables	1000 kVA	1250 kVA	1500 kVA
Rectifier input fuse gL or MCCB	1600A	2000A	2500A
Rectifier input cable section (L1,L2,L3,N)	4 x (4 x 300mm ²)	4 x (5 x 300mm ²)	4 x (6 x 300mm ²)
UPS output fuse gL or MCCB, 3P or 4P	1600A	2000A	2500A
Output cable section (L1,L2,L3,N)	4 x (4 x 300mm ²)	4 x (5 x 300mm ²)	4 x (6 x 300mm ²)
Battery input fuse gR or MCCB (Separate to each module)	2 x (4 x 630A)	2 x (5 x 630A)	2 x (6 x 630A)
Battery cable section (+,-) (Separate to each module)	2 x (8 x 185mm ²)	2 x (10x 185mm ²)	2 x (12x 185mm ²)
Earth cable section (PE)	4 x 185mm ² or 2 x 300mm ²	5 x 185mm ² or 3 x 300mm ²	5 x 185mm ² or 3 x 300mm ²

Single Input Feed Common Battery Connection



Note: The above Schematic shows a 1000 kW Frame. If a 1500 kW Frame is selected, the schematic would have an additional 2 modules

In a 'common battery' installation (as shown) the battery positive and negative cables are connected to the common battery busbars which are located adjacent to the UPS input/output mains busbars

Recommended external protection & Cables	1000 kVA	1250 kVA	1500 kVA
Rectifier input fuse gL or MCCB 3P	1600A	2000A	2500A
Rectifier input cable section (L1,L2,L3,N)	4 x (4 x 300mm ²)	4 x (5 x 300mm ²)	4 x (6 x 300mm ²)
UPS output fuse gL or MCCB, 3P or 4P	1600A	2000A	2500A
Output cable section (L1,L2,L3,N)	4 x (4 x 300mm ²)	4 x (5 x 300mm ²)	4 x (6 x 300mm ²)
Battery input fuse gR or MCCB (Common to the Frame)	2500A	3200A	4000A
Battery cable section (+,-) (Common to the Frame)	2 x (8 x 185mm ²) or 2 x (6 x 300mm ²)	2 x (10 x 185mm ²) or 2 x (7 x 300mm ²)	2 x (12 x 185mm ²) or 2 x (9 x 300mm ²)
Earth cable section (PE)	4 x 185mm ² or 3 x 300mm ²	5 x 185mm ² or 4 x 300mm ²	6 x 185mm ² or 5 x 300mm ²