rehlko

# REHLKO *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 |
| TS_765_02 | 13/05/2024 | Input and Output currents changed to ‘per module’ |
| TS_765_03 | 18/03/2025 | Standards Added |
| TS_765_04 | 04/08/2025 | Battery charging ratings updated |
| TS_765_05 | 01/10/2025 | Addition of 500 and 750kva, contents & minor corrections |
| TS_765_06 | 06/05/2026 | Rebranded to Rehlko |
| TS_765_07 | 13/10/2026 | Weights of frame with individual modules added |
| | | |

## Useful Contacts

### UK

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

### IRELAND

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|---|---|
| www.ups.rehlko.ie | Rehlko web site |
| ieinfo.ups@rehlko.com | Service department, technical queries, hardware sales and extended warranty agreements |

### SINGAPORE

| | |
|---|---|
| www.ups.rehlko.sg | Rehlko web site |
| salesups.sg@rehlko.com | Hardware sales |
| serviceups.sg@rehlko.com | Contract customer support, maintenance contracts renewals |

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## Contents


REHLKO MF SERIES DESCRIPTION 2
- Model Range 2
- Key Features 3

MF SERIES WITH DISTRIBUTED BYPASS 5
- Mechanical Characteristics MF Series with Distributed Bypass 6
  - Rehlko MF1500 DPA – 500 kVA Frame 6
  - Rehlko MF1500 DPA – 750 kVA Frame 6
  - Rehlko MF1500 DPA – 1000 kVA Frame 7
  - Rehlko MF1500 DPA – 1250 kVA Frame 7
  - Rehlko MF1500 DPA – 1500 kVA Frame 8
  - Rehlko MF1500 DPA – 250 kVA Power Module 9

GENERAL SPECIFICATIONS 10

ELECTRICAL CHARACTERISTICS 11

INPUT CHARACTERISTICS 11

EFFICIENCY CHARACTERISTICS 12

OUTPUT CHARACTERISTICS 13

STATIC BYPASS CHARACTERISTICS 14

BATTERY AND ENERGY STORAGE CHARACTERISTICS 14

POWER EXCHANGER 18

REMOTE CONTROL AND MONITORING 20

UPS CONTROL AND MONITORING 21
- System Control Panel 21
- Module Control Panel 21

INSTALLATION AND PLANNING 22

UPS FOOTPRINT AND CLEARANCES 23

CABLE PLANNING 24
- Single Input Feed with Separate Battery Connection 25
- Single Input Feed Common Battery Connection 26
- Heat Dissipation 27

STANDARD FEATURES 27
- Cold Start 27
- UPS power walk-in when transferring back from batteries to utility 27
- Synchronization Feature 28
- Castell Key Interlock 28
- External Maintenance Bypass Switch and Output Switch connections 28


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## REHLKO 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 Rehlko MF Series provides a continuous flow of clean, sustainable power. The UPS is based on 250 kW power modules with scalable power up to 2000 kW or 1750 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 Rehlko 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 Rehlko MF Series UPS is compliant with the IEC 62040-3 (VFI-SS-111) standards.

Rehlko 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 Rehlko 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, up to five 250 kW modules in the 1250 kW Frame, up to four 250 kW modules in the 1000 kW Frame, up to three 250 kW modules in the 750 kW Frame and up to two 250 kW modules can be fitted in the 500 kW Frame. Thanks to the advanced Rehlko 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 1500 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.

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## 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.

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**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. Rehlko 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 r**eal-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 senor input

**Power Exchanger - Grid-support option and Demand response functionality** is an energy management function available on the MF Series family enabling the UPS to interact with the grid and supply (upon external request) ancillary grid services.

**AI Load profile optimization:** MF Series UPS family has been assessed and confronted with design developing an **outstanding proven AI Ready performance**.

Through this **Frequency Regulation Function** (FRF) UPS can reduce/increase the input power flowing from grid to the UPS or even to reverse the flow and inject power back into the grid (back-feed), while maintaining constant the output power.

**Sustainable Self-Test functionalities, even with NO-LOAD situation**. UPS modules can be powered from input grid supply or from Battery storage energy to execute the full-load self-test. This functionality support commissioning, site implementation and thermal on-site loses simulation test for cooling systems.

**Flexible to integrate several back-up power sources**, including traditional valve-regulated lead acid (VRLA), Lithium-Ion solutions and new energy storage chemistries, as Nickel-Zinc (NiZn) ready.

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## 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.

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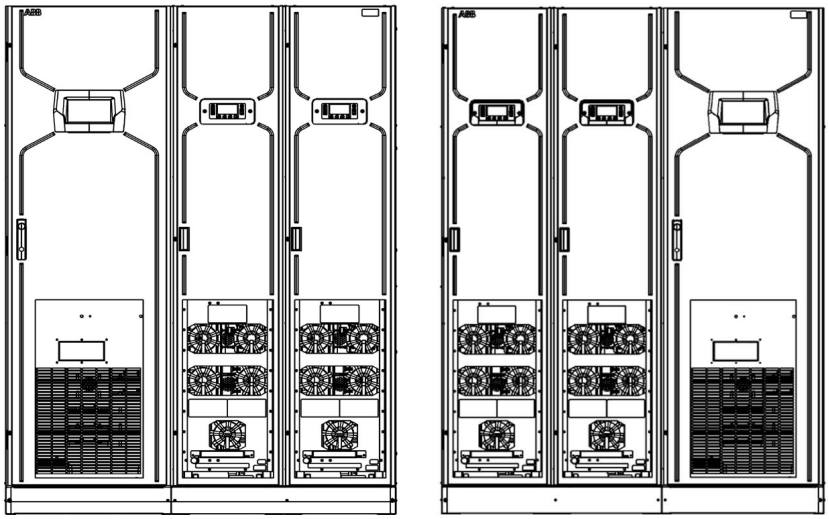
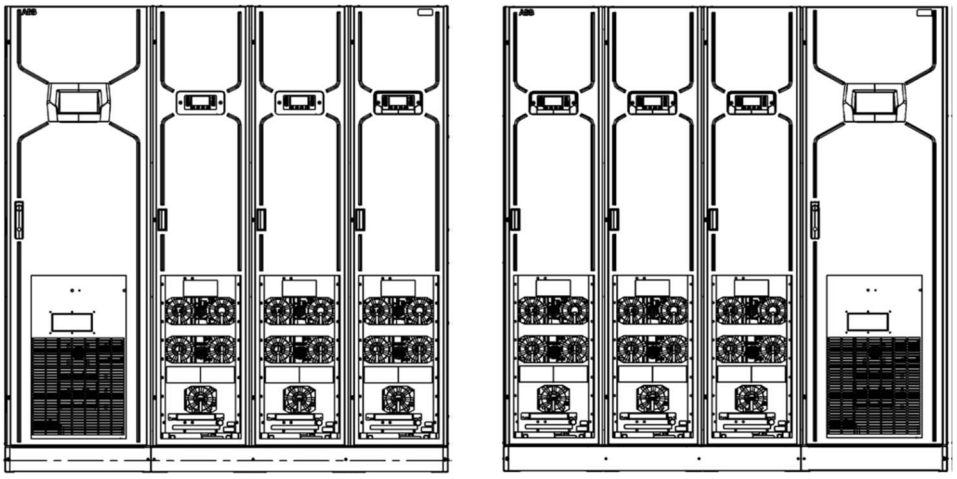
## Mechanical Characteristics MF Series with Distributed Bypass

### Rehlko MF1500 DPA – 500 kVA Frame



| 500kVA / 500kW Frame | 1 Module | 2 Module |
|---|---|---|
| System power rating (per cabinet) (kVA/kW) | 250 | 500 |
| Maximum cabinet rating | 500 kVA / 500 kW (up to 2 power modules) | |
| UPS Frame Dimensions (W x D x H) mm | 1422 x 1000 x 2000 | |
| Weight (without power modules) kg | 385 | |
| Weight (with power modules) kg | 740 | 1094 |

### Rehlko MF1500 DPA – 750 kVA Frame



| 750kVA / 750kW Frame | 1 Module | 2 Module | 3 Module |
|---|---|---|---|
| System power rating (per cabinet) (kVA/kW) | 250 | 500 | 750 |
| Maximum cabinet rating | 750 kVA / 750 kW (up to 3 power modules) | | |
| UPS Frame Dimensions (W x D x H) mm | 1829 x 1000 x 2000 | | |
| Weight (without power modules) kg | 466 | | |
| Weight (with power modules) kg | 821 | 1176 | 1530 |

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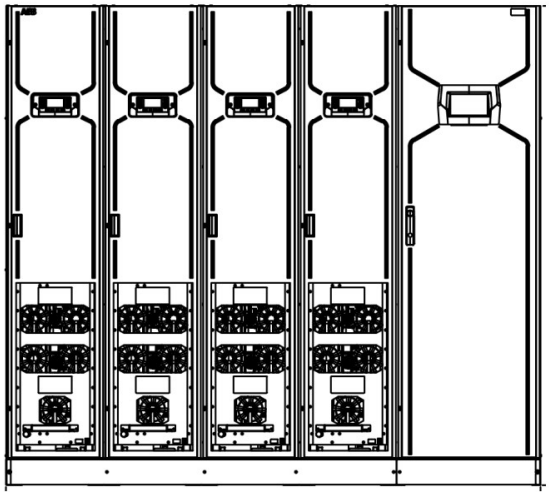
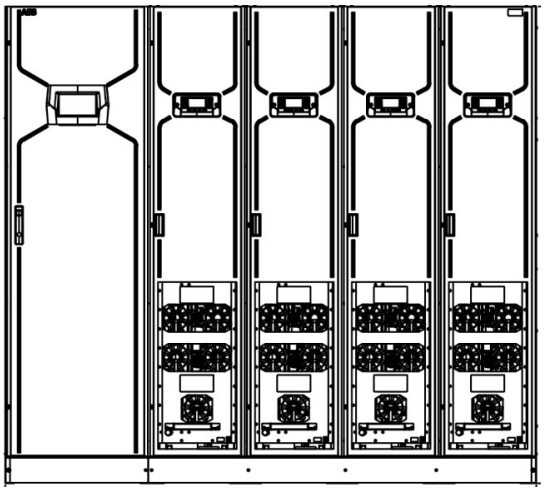
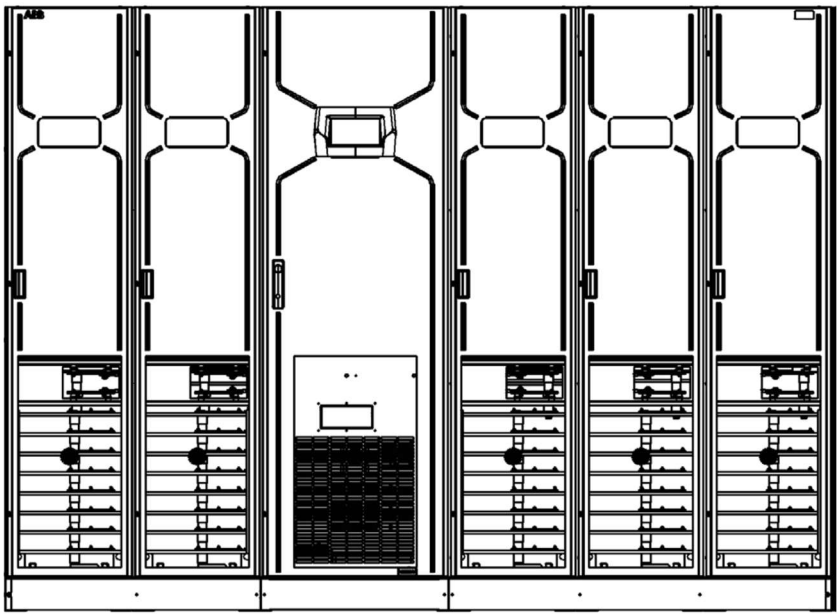
## Rehlko MF1500 DPA – 1000 kVA Frame





| 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 Frame Dimensions (W x D x H) mm | 2236 x 1000 x 2000 | | | |
| Weight (without power modules) kg | 547 | | | |
| Weight (with power modules) kg | 902 | 1256 | 1611 | 1965 |

## Rehlko MF1500 DPA – 1250 kVA Frame



| 1250 kVA / 1250 kW Frame | 1 Module | 2 Module | 3 Module | 4 Module | 5 Module |
|---|---|---|---|---|---|
| System power rating (per cabinet) (VA/kW) | 250 | 500 | 750 | 1000 | 1250 |
| Maximum cabinet rating | 1250 kVA / 1250 kW (up to 6 power modules) | | | | |
| UPS Frame Dimensions (W x D x H) mm | 2643 x 1000 x 2000 | | | | |
| Weight (without power modules) kg | 760 | | | | |
| Weight (with power modules) kg | 1115 | 1470 | 1824 | 2179 | 2533 |

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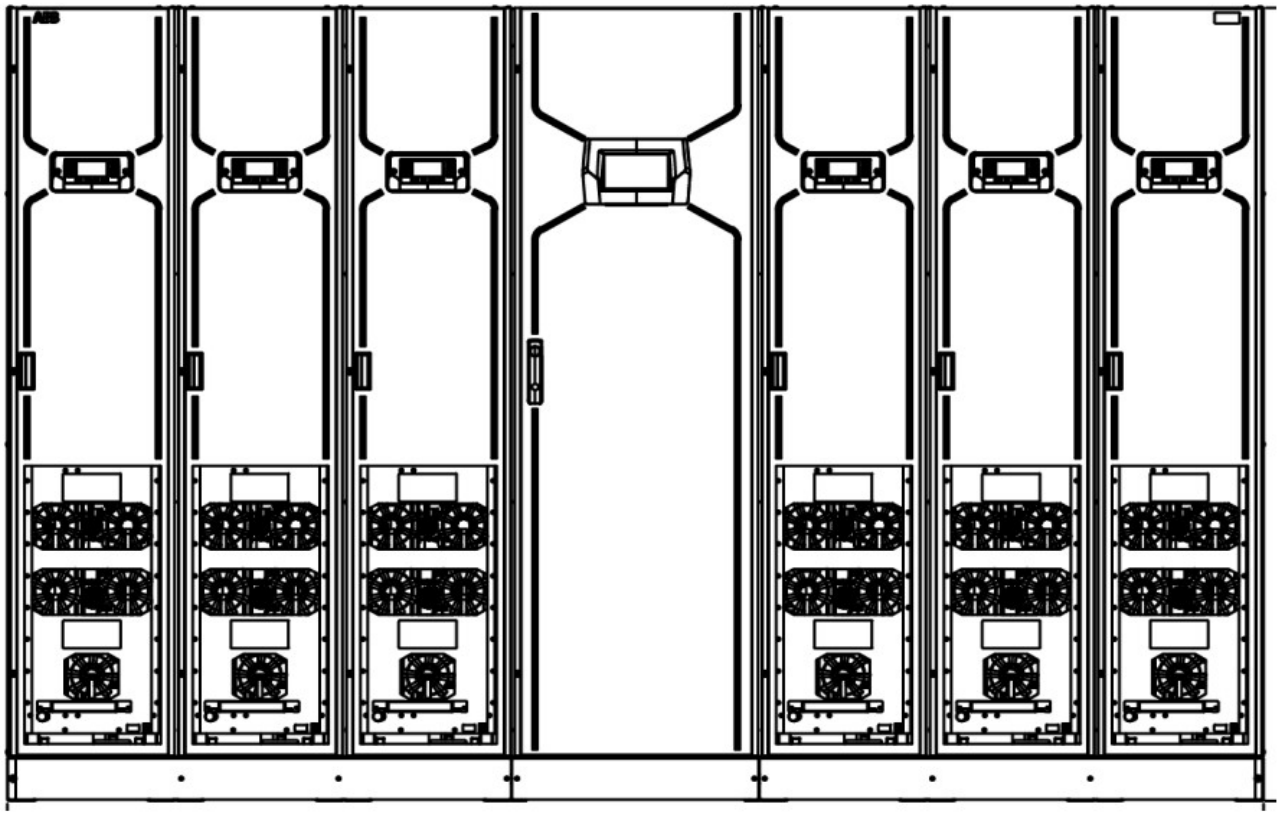
## Rehlko MF1500 DPA – 1500 kVA Frame



| 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 Frame Dimensions (W x D x H) mm | 3050 x 1000 x 2000 | | | | | |
| Weight (without power modules) kg | 895 | | | | | |
| Weight (with power modules) kg | 1250 | 1604 | 1959 | 2313 | 2668 | 3022 |

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## Rehlko 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 | 354 |

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## GENERAL SPECIFICATIONS

| General UPS Cabinet Specifications | |
|---|---|
| UPS cabinet colour | Standard RAL 9005 (other colours, as option, on-demand) |
| Ingress protection | IP20 |
| Cable Entry | Bottom, Top, or Mix<br>Flange connections as option, on demand |
| Ventilation | Front to top airflow |
| Service access | Front and top |

| Electromagnetic Compatibility | |
|---|---|
| Emission | C3 |
| Immunity | C3 |

| Environment characteristics | |
|---|---|
| Environmental service conditions | Indoor unconditioned, free from any corrosive gases and/or conductive dust.<br>(according to IEC 62040-4:2013) |
| Climatic class | 3K2 (according to IEC 60721-3-3:2019) |
| Pollution degree | Level 2 (according to IEC 60664-1:2020/AMD1:2025) |
| UV resistance | N.A |
| Ambient operating temperature range | 0-40oC without declared values derating |
| Relative humidity range | <95% (non-condensing) |
| Ambient storage temperature range (see note) | -25-70oC<br>(with humidity ≤90%, non-condensing) |
| Altitude without derating | up to 1000m |
| Altitude with derating | up to 3000m<br>Above 2000 m operation, conformal coated option must be included. |
| Vibration | according to EN60721-3-2 |
| Audible noise emission | 76 dBA @Temp. room of 25 °C (according to IEC 62040-3:2021)<br>78 dBA @Temp. room of 40 °C (according to IEC 62040-3:2021) |
| Seismic Certification | ASCE 7-16 and 2018 IBC Seismic and Special Seismic Certification Site Class D<br>(ICC-ES AC156) (2) EN 60068-3-3; IEEE 693-2018 |

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.

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## ELECTRICAL CHARACTERISTICS

| Power Rating | 500kW | 750kW | 1000kW | 1250kW | 1500kW |
|---|---|---|---|---|---|
| Power Module rating kW | 250 | | | | |
| No. Power Modules per Frame | 2 | 3 | 4 | 5 | 6 |
| Parallel system capability<br>(Frames full with 250kW modules) | Up to 7 UPS Frames | Up to 6 UPS Frames | Up to 6 UPS Frames | Up to 4 UPS Frames | Up to 4 UPS Frames |
| Topology | Online double conversion VFI-SS-111 | | | | |
| Back-feed protection | Built in as standard | | | | |
| Redundant power supply for the IT load | Fully compatible with all redundancy architectures: N (Tier 1); N+1 (Tier 2); 2N or N+N (Tier 3 and Tier 4); 2(N+1); Catcher; 4N/3; 5N/4, distributed redundancy and other redundancy architecture configurations. | | | | |
| 1. Standards<br>2. Safety<br>3. EMC<br>4. Performance<br>5. Environmental<br>6. Manufacturing<br>7. Energy Efficient<br>8. PEP Eco Passport<br>9. CE Mark | 1. IEC/EN 62040-1<br>2. IEC/EN 62040-2; Class C3<br>3. VFI SS 111 - IEC/EN 62040-3<br>4. IEC 62040-4<br>5. ISO 9001:2015, ISO 14001:2015, OHSAS18001<br>6. SEAI- Triple E Product Registered & ACA Approval<br>7. PEP-PCR-ed3-EN-2015 04 02 Product Environmental Profile certification in compliance with ISO 14025:2010 «Environmental labels and declarations.<br>8. Type III environmental declarations».<br>9. According to with EU Directives 2006 95 2004 108 and through compliance with standards IEC/EN 62040-1: General rules for electric safety; IEC/EN 62040-2: Electromagnetic compatibility and immunity (EMC); IEC/EN 62040-3: Performances and testing rules. | | | | |

## 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<br>Optional (3W connection kit): 3ph + PE |
| Overvoltage category<br>(as per IEC 62040-1 - overvoltage category) | Category II (As standard)<br>Category III with Optional SPD,<br>to be mandatory included (or inside UPS by factory UPS frame installed Options or External to UPS, located on mains incoming protection panel) |
| Input rated conditional short circuit current (Icc) | 120 kA |
| Additional information | Single UPS Mains input connection |
| **Input Voltage & Frequency** | |
| Input rated voltage | 380, 400 or 415 VAC (Phase to Phase)<br>220, 230 or 240 VAC (Phase to Neutral) |
| Input voltage tolerance 40°C @ 400VAC | Load <100% (-10%, + 15%)<br>Load <80% (-20%, + 15%)<br>Load <60% (-30%, + 15%) |
| Input rated frequency | 50Hz or 60Hz |
| Input frequency tolerance | 40Hz or 70Hz (nominal Frequency +_10Hz) |
| Slew rate | 1 Hz/s |

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| Input Current and Overload Characteristics | |
|---|---|
| Maximum input rated current - 400V (batteries 100% charged) * | 378A Per 250 kVA module |
| Maximum input rated current - 400V (batteries charging) * | 420A Per 250 kVA module |
| 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) | 100% load |

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

## 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 | 97.2% |
| Eco Mode VFD efficiency – 100% load | 99.0% |

According to IEC 62040-3 (UPS performance standard): Efficiency tolerance +/-0.2 %

All AC/AC efficiency VFI declared at system level, data refers without battery charging current, @nominal input conditions with nominal frequency and with resistive load. At 25ºC Ambient temperature.

The 97.4% @400V efficiency point is declared at 25ºC Ambient temperature with nominal frequency and with resistive load

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## 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<br>Optional (3W connection kit): 3ph + PE |
| **Output Voltage** | |
| Output rated voltage | 380, 400 or 415 VAC (Phase to Phase)<br>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 – stored energy mode -100 % step load - linear | <4%, (<200ms) |
| Voltage transient and recovery time – stored energy mode -100 % step load – non-linear | <4%, (<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** | |
| Output rated current - 400V* | 362A Per 250 kVA module |
| Inverter overload capability | 110% load: Continuous **<br>125% load: 10 minutes<br>150% load: 1 minute |
| Output overload – Battery Mode<br>**Worst scenario with battery close to end of discharge (Measured at 400Vdc)** | 105% load: 10 minutes<br>110% load: 5 minutes<br>120% load :1 minute |
| Output current limitation, "short circuit current"<br>(% or rated current / time duration, Ph – N 230V)<br>Short circuit tolerance: +/- 0.15 x In | 2.8 x In, 40 ms (default)<br>2.5 x In, 100 ms<br>2.3 x In, 150 ms<br>2.2 x In, 200 ms<br>2.1 x In, 250 ms<br>2.1 x In, 300 ms |
| Output current limitation, "short circuit current"<br>(% or rated current / time duration, Ph – Ph 400V)<br>Short circuit tolerance: +/- 0.15 x In | 2.4 x In, 40 ms (default)<br>2.2 x In, 100 ms<br>2.1 x In, 150 ms<br>2.0 x In, 200 ms<br>1.9 x In, 250 ms<br>1.9 x In, 300 ms |
| Fault clearing capability<br>(normal mode / stored energy mode, 400V rated voltage) | 2274A 500 kW System<br>3411A 750kW System<br>4060A 1000kW System<br>5074A 1250kW System<br>6087A 1500kW System |

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| 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 output rated current – 380V and 415V please contact Rehlko

**110% Continuous inverter overload at rated input voltage window: 380/400/415 V, (50/60Hz); <35°C room ambient temperature

Note that operating above 100% of Inverter nominal capacity would raise an Overload Alarm

## STATIC BYPASS CHARACTERISTICS

| Static Bypass Switch | |
|---|---|
| Rated Current - 400V* | 362A Per 250 kVA module |
| Bypass Overload (% of rated current / time duration) | 110% load: continuous<br>140% load: 10 minutes<br>190% load: 2 minutes |
| Dynamic behaviour - manual transfer time bypass-to-inverter (and inverter-to-bypass) | Instantaneously |
| Conditional short circuit current Icc | 120kA |
| Bypass voltage tolerance (% of rated voltage @ 400V) | -20% + 15% |
| Bypass fault clearing capability (% of rated current/ time duration) | 15 In / 20ms |

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

## BATTERY AND ENERGY STORAGE CHARACTERISTICS

| Battery charger | |
|---|---|
| Max. Charge current | 187.5A (d.c) per module |
| Max. Charge power | 75 kW (d.c) per module |
| Max. Fault current rating | 100kA (d.c) |
| Battery ripple current max. | 400mA RMS |
| Nominal voltage (total) | 480 VDC - 600 VDC |
| Stored energy time (back-up time at 100 % rated load) | Extended autonomy times without derating.<br>Refer to battery autonomy calculators for correct sizing |
| Ambient reference temperature (To secure maximal service life) | Battery type dependent: Lithium ion: 25°C, VRLA: 20°C, NiCd: Refer to manufacturer provided information |

| Additional Battery Information | |
|---|---|
| End of discharge voltage (EOD) | 3.20 V/Cell Samsung<br>2.80V/cell Vision<br>1.65 V/Cell VLRA<br>1.05 V/Cell Ni-Cd |
| 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. Could run by Power Module (250kW) or at frame UPS full capacity power level |

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| VRLA | |
|---|---|
| Design life | Ref to battery manufacturer provided information |
| Quantity of cells per string | VRLA 12 V: 40-50 blocks/ 240-300 cells |
| Nominal voltage (total) | 480 VDC - 600 VDC |
| Max. discharge current @EOD 240cells | 649.5A per 250kW module |
| Stored energy time (back-up time at 100 % rated load) | Extended autonomy times without derating.<br>Refer to battery autonomy calculators for correct sizing |
| Restored energy time (re-charge time to 90 % capacity) | 10 hours (varies on amount and size of used batteries |
| Ambient reference temperature (To secure maximal service life) | 20°C |
| Charge voltage (float) | 2.23 V/Cell |
| End of discharge voltage | 1.65 V/Cell |
| Battery temperature compensation | Supported by standard UPS. Temperature sensor available as option |

| Nickel Zinc - ZincFive | |
|---|---|
| Battery Cab | BC2 |
| Number of Cabinets | 1 |
| Design Life | 15 |
| Quantity of cells per string | 8 cells; 38 modules |
| Nominal range | 383 VDC - 585 VDC |
| Nominal Capacity | 80 |
| Stored Energy time | Suitable for short autonomies |
| Ambient reference temperature (To secure maximum service life) | 20-35ºC |
| Restored energy time (re-charge time to 90 % capacity) | 4hrs @22A charge current |
| Max. discharge current @EOD | 687A per 250kW module |

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| Lithium-Ion Samsung and Vision | | | | | | | |
|---|---|---|---|---|---|---|---|
| Battery Configuration | Samsung | Vision | | | | | |
| | 136S | TP100 | TP110 | TP120 | TP200 | TP220 | TP240 |
| Minimum No. Of Cabinets | 1 | 2 | | | 1 | | |
| Energy storage type | No integrated batteries, external energy needed | | | | | | |
| Design life | 15 years | | | | | | |
| Quantity of cells per string | 136 Cells<br>17 mods | 160S1P cells<br>10 mods | 176S1P cells<br>11 mods | 192S1P cells<br>12 mods | 160S2P cells<br>10 mods | 176S1P cells<br>11 mods | 192S1P cells<br>12 mods |
| Nominal voltage (total) Vdc | 516.8 | 512 | 563.2 | 614.4 | 512 | 563.2 | 614.4 |
| Nominal Capacity Ah | 67 | 50 | 50 | 50 | 100 | 100 | 100 |
| Stored energy time (back-up time at 100 % rated load) | Extended autonomy times without derating.<br>Refer to battery autonomy calculators for correct sizing | | | | | | |
| Max. discharge current @EOD 240cells | 649.5A per 250kW module | | | | | | |
| Restored energy time (re-charge time to 90 % capacity) Hrs | 3<br>@22A charge | 2.7<br>@25A Charge | | | 2.7<br>@50A Charge | | |
| Ambient reference temperature (To secure maximal service life) | 18-28ºC | 20-25ºC | | | | | |
| Maximum discharge current @EOD | 1000kW<br>2406A<br>1250kW<br>3008A<br>1500kW<br>3609A<br>1750kW<br>4211A<br>2000kW<br>4812A | 1000kW<br>2337A<br>1250kW<br>2922A<br>1500kW<br>3506A<br>1750kW<br>4091A<br>2000kW<br>4676 | 1000kW<br>2125A<br>1250kW<br>2656A<br>1500kW<br>3187A<br>1750kW<br>3718A<br>2000kW<br>4250 | 1000kW<br>1948A<br>1250kW<br>2435A<br>1500kW<br>2922A<br>1750kW<br>3409A<br>2000kW<br>3896 | 1000kW<br>2337A<br>1250kW<br>2922A<br>1500kW<br>3506A<br>1750kW<br>4091A<br>2000kW<br>4674 | 1000kW<br>2125A<br>1250kW<br>2656A<br>1500kW<br>3187A<br>1750kW<br>3718A<br>2000A<br>4250 | 1000kW<br>1948A<br>1250kW<br>2435A<br>1500kW<br>2922A<br>1750kW<br>3409A<br>2000kW<br>3896A |

| Lithium-Ion Ampace P100 | | | | | |
|---|---|---|---|---|---|
| Battery Configuration | | Ampace P100 | | | |
| | | 6C 12 Modules | 6C 11 Modules | 6C 10 Modules | 6C 9 Modules |
| Minimum No. Of Cabinets | | 1 | 1 | 1 | 1 |
| Design life | | 15 years | | | |
| Quantity of cells per string | | 192S2P | 176S2P | 160S2P | 144S2P |
| Nominal voltage (total) Vdc | | 614.4 | 563.2 | 512 | 460.8 |
| Minimum voltage Vdc | | 537.6 | 492.8 | 448 | 403.2 |
| Nominal Capacity Ah | | 104 | 104 | 104 | 104 |
| Restored time to 90% SOC | | 1H@104A | | | |
| Ambient reference temperature (To secure maximal service life) | | 20-30ºC | | | |
| Maximum discharge current @EOD | 1000kW<br>1250kW<br>1500kW<br>1750kW<br>2000kW | 1948A<br>2448A<br>2937A<br>3427A<br>3916A | 2136A<br>2670A<br>3204A<br>3738A<br>4272A | 2350A<br>2937A<br>3524A<br>4111A<br>4700A | 2611A<br>3263A<br>3916A<br>4568A<br>5222A |

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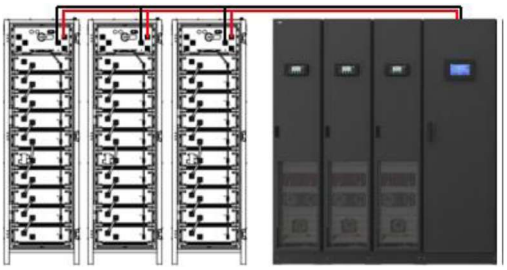
## Ampace PU-100 Sizing basic guide

### Common battery configuration (Optional «Common Battery connection kit» installed at UPS Frame)



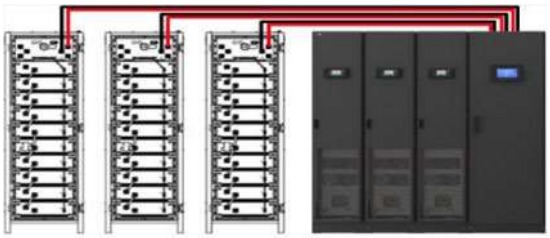
Note: Dedicated per-frame-size Optional - Common Battery connection kit should be added on the MF Series UPS cabinet.

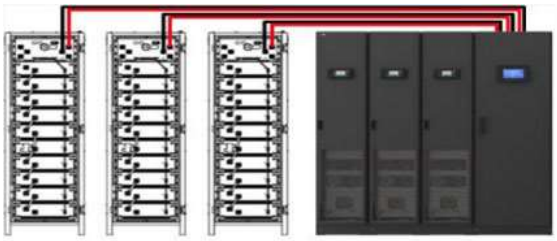
Battery cabinets are connected in common configuration to the frame.

| MF Series Family - Common battery config. - Ampace Sizing for 5 min EOL | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power Rating | | 500 | 750 | 1000 | 1250 | 1500 | 2000 |
| PU-100 cabinet | | 2 | 3 | 4 | 4 | 5 | 7 |
| Nº Battery Modules per cabinet | | 10 | 10 | 10 | 12 | 12 | 12 |
| Master Kit required | | 1 | 1 | 1 | 1 | 1 | 1 |
| EOL 10 years | [min] | 8.7 | 8.7 | 9.68 | 9.29 | 9.68 | 9.32 |
| Voltage range | [Vdc] | 400 - 576 | 400 - 576 | 400 - 576 | 480 - 691 | 480 - 691 | 440 - 634 |
| Max current | [kAdc] | 1.3 | 2.0 | 2.6 | 3.0 | 3.3 | 4.7 |

| MF Series Family - Common battery config. - Ampace Sizing for 10 min EOL | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power Rating | | 500 | 750 | 1000 | 1250 | 1500 | 2000 |
| PU-100 cabinet | | 2 | 3 | 4 | 5 | 6 | 7 |
| Nº Battery Modules per cabinet | | 12 | 12 | 11 | 11 | 11 | 12 |
| Master Kit required | | 1 | 1 | 1 | 1 | 1 | 1 |
| EOL 10 years | [min] | 10.4 | 10.4 | 10.65 | 10.65 | 10.65 | 10.17 |
| Voltage range | [Vdc] | 480 - 691 | 480 - 691 | 440 - 634 | 440 - 634 | 440 - 634 | 480 - 691 |
| Max current | [kAdc] | 1.1 | 1.6 | 2.2 | 2.7 | 3.2 | 4.4 |

### Separate battery configuration (Standard from factory - Separate battery per each UPS Module)





| Ampace Sizing for 5 min EOL | | |
|---|---|---|
| Power Rating | | 250kW |
| PU-100 cabinet | | 1 |
| Nº Battery Modules per cabinet | | 10 |
| Master Kit required | | 1 |
| EOL 10 years | [min] | 8.7 |
| Voltage range | [Vdc] | 400-576 |
| Max current | [kAdc] | 0.7 |

| Ampace Sizing for 10 min EOL | | |
|---|---|---|
| Power Rating | | 250kW |
| PU-100 cabinet | | 1 |
| Nº Battery Modules per cabinet | | 12 |
| Master Kit required | | 1 |
| EOL 10 years | [min] | 8.4 |
| Voltage range | [Vdc] | 480-691 |
| Max current | [kAdc] | 0.6 |

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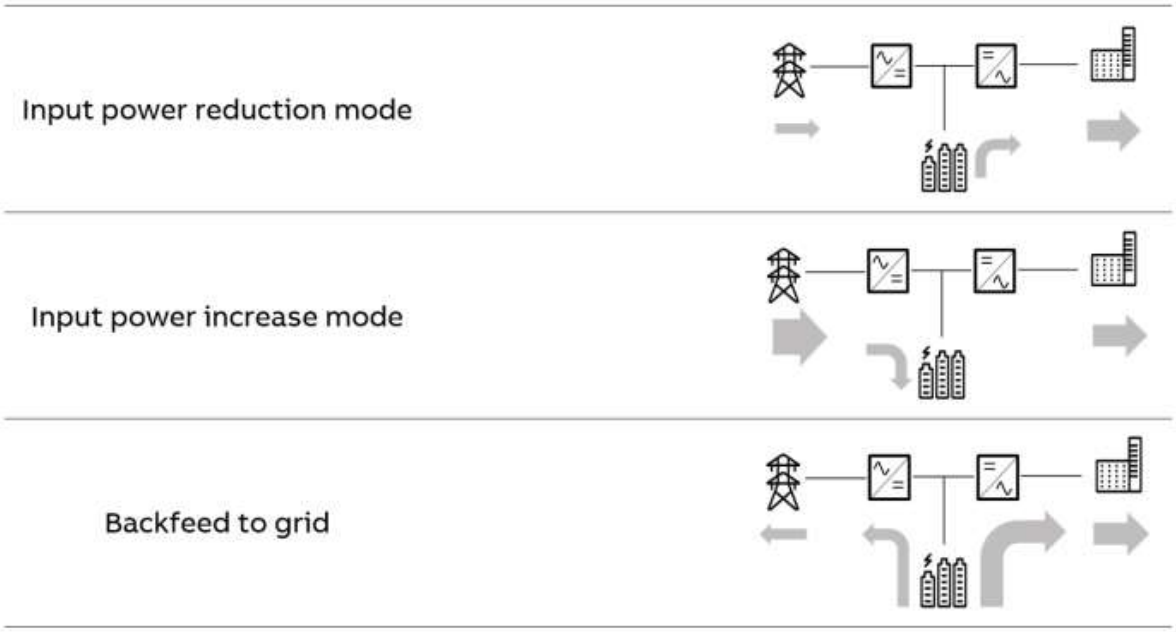
## POWER EXCHANGER

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)

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### 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)

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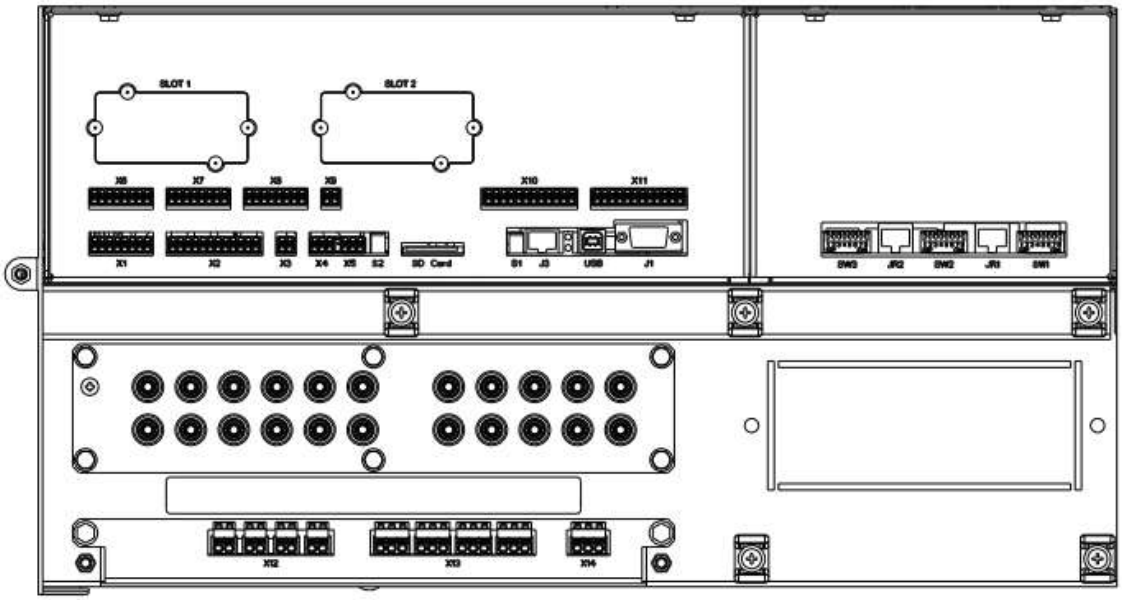
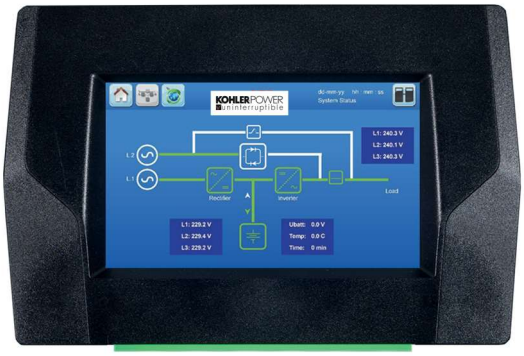
## REMOTE CONTROL AND MONITORING

| Communications - Hard Wired (fitted as standard) | |
|---|---|
| Inputs dry ports X1, X7, X8 | X1 / X7 / X8 can hold Cable from 0.2mm2 – 1.5mm$^2$<br>All X1 / X7 / X8 are inputs, cable max. R 50Ω at 10mA<br>X1 (4 inputs): Generator operation ON, External output breaker, external manual bypass, remote shut down<br>X7-X8 (8 inputs) are programmable inputs |
| High voltage input port X12 | X12 terminals can hold Cable from 0.2mm2 – 1.5mm$^2$<br>X12 are inputs rated: Min. 87 Vac – Max. 277 Vac 50Hz/60Hz<br>X12 are programmable inputs |
| Input analog port X6 | X6 can hold Cable from 0.2mm2 – 1.5mm$^2$<br>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 0.2mm2 – 1.5mm$^2$ |
| Modbus communication power X4 | X4 terminals can hold Cable from 0.2mm2 – 1.5mm$^2$<br>X4 are differential 5V RS485 signals |
| CAN bus communication port X5 | X5 terminals can hold Cable from 0.2mm2 – 1.5mm$^2$<br>X5 are differential 5V RS485 signals |
| Output dry port X2,X10, X11 | X2, X10 and X11 terminals can hold Cable from 0.2mm2 – 1.5mm$^2$<br>X2, X10 and X11 are potential free contacts and are rated: Max 30Vac/1A; 60Vdc/0.5A.<br>X2 (4 outputs) : common alarm, battery low, load on inverter, main failure<br>X10,X11 (8 outputs) are programmable outputs |
| High voltage output power X13 | X13 terminals can hold Cable from 0.2mm2 – 1.5mm2<br>X13 are output rated: Max. 5A @ 277 Vac or 5A @ 30VDC<br>X13 are programmable outputs |
| Output + 24dc X9 | X9 can hold Cable from 0.2mm2 – 1.5mm2<br>X9 is an output port rated: 24Vdc @ 100mA Max |
| Synchronization input port X14 | X14 terminals can hold Cable from 0.2mm2 – 1.5mm$^2$<br>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

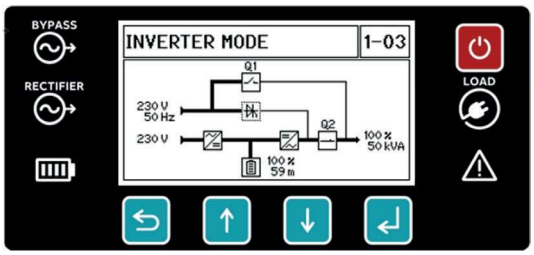
## System Control Panel




Each UPS system has a system graphical display. It is a 7” touchscreen display enabling the operator to perform:

- 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




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:

- 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.

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# 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 Rehlko Ltd. For installation advice and support if necessary.

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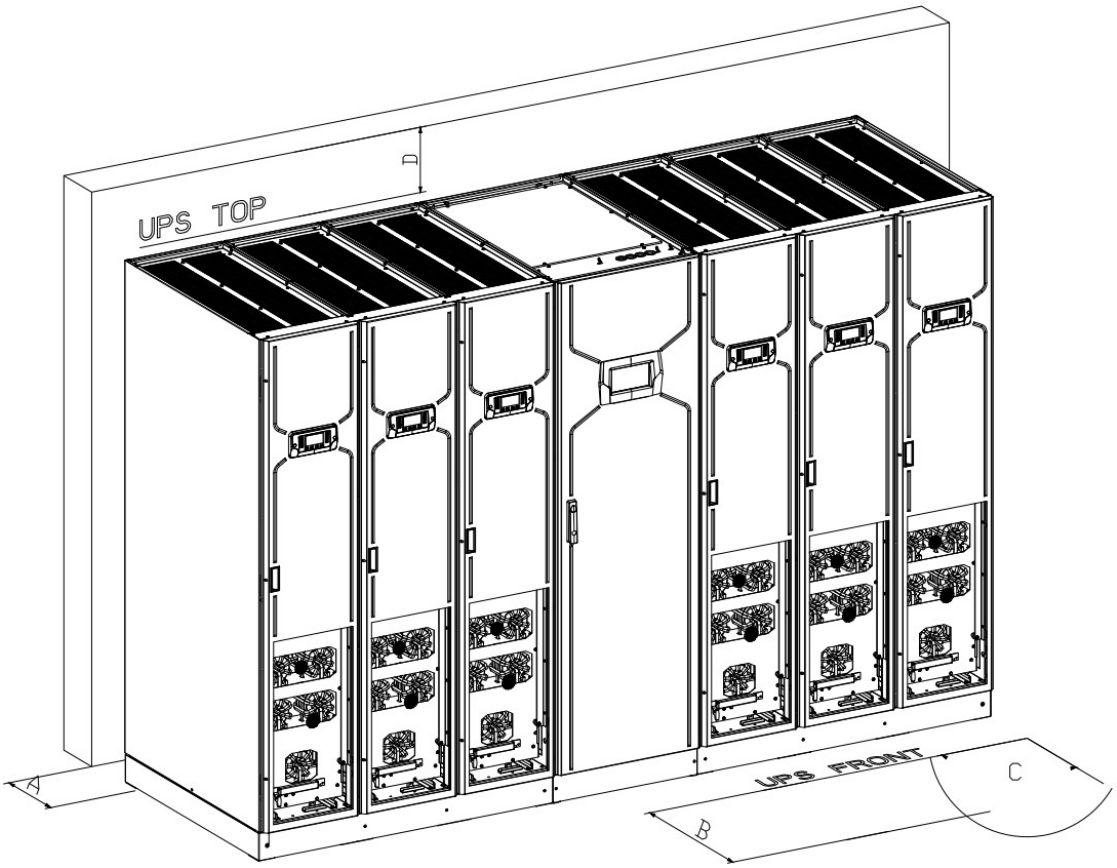
## UPS FOOTPRINT AND CLEARANCES

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 1,200mm can be accepted if the power module is removed by 2 service engineers.

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## 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 | 42 |
| Input Line L2 | X3.1: L2 | M12 Bolt Terminal | 42 |
| Input Line L3 | X3.1: L3 | M12 Bolt Terminal | 42 |
| Neutral Bar (Common Neutral) | X6: N | M12 Bolt Terminal | 42 |
| Earth Bar (Common Earth) | X7 : PE | M12 Bolt Terminal | 42 |
| Output Line L1 | X2.1: L1 | M12 Bolt Terminal | 42 |
| Output Line L2 | X2.1: L2 | M12 Bolt Terminal | 42 |
| Output Line L3 | X2.1: L3 | M12 Bolt Terminal | 42 |
| Battery Terminal + | X501.1: + | M12 Bolt Terminal | 42 |
| Battery Terminal - | X502.2: - | M12 Bolt Terminal | 42 |

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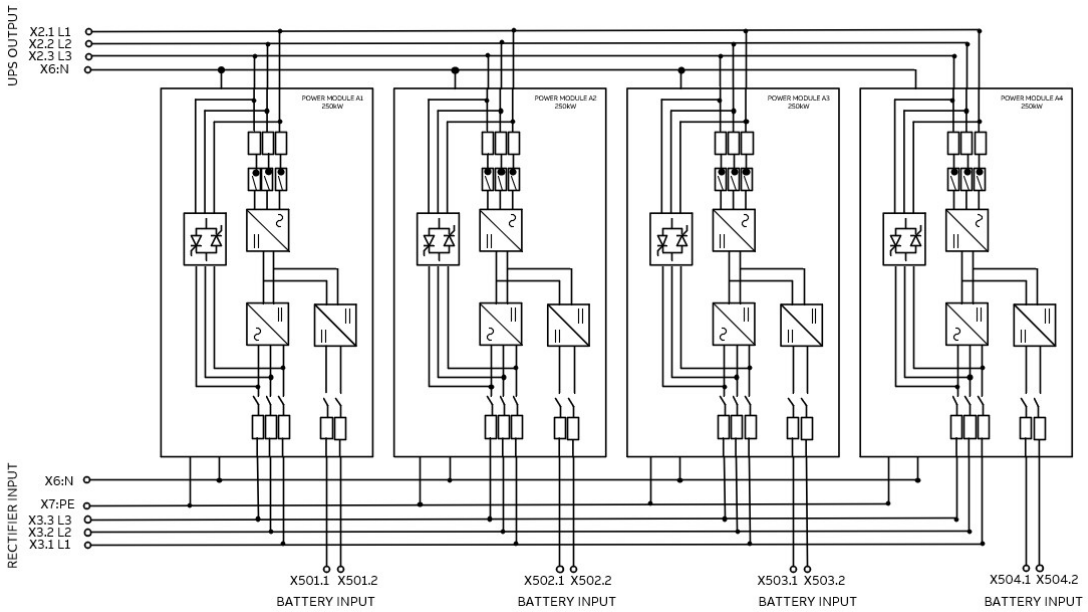
## Single Input Feed with Separate Battery Connection




**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 | 500kVA | 700kVA | 1000 kVA | 1250 kVA | 1500 kVA |
|---|---|---|---|---|---|
| Rectifier input fuse gL or MCCB | 800A | 1250A | 1600A | 2000A | 2500A |
| Rectifier input cable section (L1,L2,L3,N) | 4 x (2 x 300mm$^2$) | 4 x (3 x 300mm$^2$) | 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 | 800A | 1250A | 1600A | 2000A | 2500A |
| Output cable section (L1,L2,L3,N) | 4 x (2 x 300mm$^2$) | 4 x (3 x 300mm$^2$) | 4 x (4 x 300mm$^2$) | 4 x (5 x 300mm$^2$) | 4 x (6 x 300mm$^2$) |
| **Separate Battery** | | | | | |
| Battery input fuse gR or MCCB (Separate to each module) | 2x630A per module | | | | |
| Battery Cable section (+,-) (Separate to each module) | 4x185mm$^2$ per module | | | | |
| Earth cable section (PE) | 1 x 185mm$^2$ Per module | | | | |

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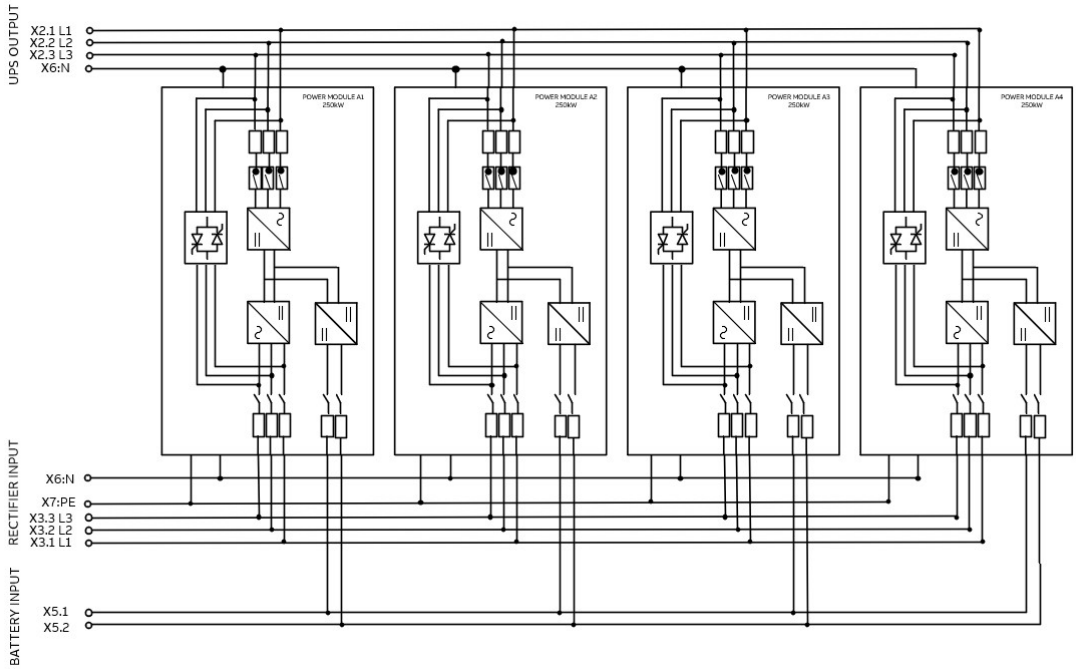
## Single Input Feed Common Battery Connection




**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 | 500kVA | 700kVA | 1000 kVA | 1250 kVA | 1500 kVA |
|---|---|---|---|---|---|
| Rectifier input fuse gL or MCCB | 800A | 1250A | 1600A | 2000A | 2500A |
| Rectifier input cable section (L1,L2,L3,N) | 4 x (2 x 300mm$^2$) | 4 x (3 x 300mm$^2$) | 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 | 800A | 1250A | 1600A | 2000A | 2500A |
| Output cable section (L1,L2,L3,N) | 4 x (2 x 300mm$^2$) | 4 x (3 x 300mm$^2$) | 4 x (4 x 300mm$^2$) | 4 x (5 x 300mm$^2$) | 4 x (6 x 300mm$^2$) |
| **Common Battery** | | | | | |
| Common connection Battery input fuse gR or MCCB. (1 input for full frame) | 1250A | 2000A | 2500A | 3200A | 4000A |
| Battery cable section, 2 poles, cable section (+) & (-) | 2x (2x 185$^2$mm) | 2x (3x 185$^2$mm) | 2x (4x 185$^2$mm) | 2x (5x 185$^2$mm) | 2x (6x 185$^2$mm) |
| Earth cable section (PE) | 2 x 185mm2 | 3 x 185mm2 | 4 x 185mm2 | 5 x 185mm2 | 6 x 185mm2 |

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### Heat Dissipation

| UPS Power Rating | | 500kW | 750kW | 1000 kW | 1250 kW | 1500 kW |
|---|---|---|---|---|---|---|
| Maximum Airflow EN62040-1 | M3/h | 3788 | 5682 | 7576 | 9470 | 11364 |
| | CFM | 2230 | 3344 | 4459 | 5574 | 6688 |
| Heat Dissipation 25% Load | W | 3588 | 5381 | 7175 | 8969 | 10763 |
| | BTU/h | 12243 | 18360 | 24482 | 30603 | 36725 |
| Heat Dissipation 40% Load | W | 5233 | 7850 | 10467 | 13084 | 15700 |
| | BTU/h | 17855 | 26785 | 35715 | 44644 | 53570 |
| Heat Dissipation 50% Load | W | 6674 | 10010 | 13347 | 16684 | 20021 |
| | BTU/h | 22772 | 34155 | 45541 | 56928 | 68314 |
| Heat Dissipation 75% Load | W | 11439 | 17158 | 22877 | 28596 | 34316 |
| | BTU/h | 39031 | 58545 | 78060 | 97573 | 117091 |
| Heat Dissipation 100% Load | W | 18350 | 27524 | 36699 | 45874 | 55049 |
| | BTU/h | 62613 | 93916 | 125222 | 156528 | 187835 |
| Heat Dissipation No Load | W | 2000 | 3000 | 4000 | 5000 | 6000 |
| | BTU/h | 6824 | 10236 | 13647 | 17059 | 20471 |

## STANDARD FEATURES

### Cold Start

The cold start function allows starting a UPS (or UPS module) without the input mains present during the status UPS total off.

The start-up could then be performed directly sourcing from the battery to feed the inverter to supply the relevant load during a limited time (battery charge and load dependable).

### UPS power walk-in when transferring back from batteries to utility

It's possible to set a ramp-up on modules (rectifier walk-in activation) and a delay on connecting each system module to facilitate returns after mains failure without impacting on full power demand-in.

When system detects input mains (utility) restored to nominal values, the first module ramp-up will start after a configurable delay. Rectifier automatically starts with the walk -in as soon as the input mains is within tolerance. Meanwhile load is supported from Battery-Inverter operation. Every additional module will start (also ramp-up) after previous module, with configurable delay.

| UPS power walk-in | |
|---|---|
| First module ramp-up configurable delay | 1-20 Seconds |
| After first module full loaded, every additional module step-activation | 3 – 60 (set in 3 second steps) |
| **Example MF Series 1000kVA frame 4x250kW modules** | |
| "Fastest" configurable TOTAL walk-in for (4 x M250) example | First module starting after 1 sec.; Last one module starting after 10 sec.<br>Total sequence: (1 + 3 + 3 + 3 = 10 sec) |
| "Slowest" configurable TOTAL walk-in for (4 x M250) example | First module starting after 20 sec.; Last one module starting after 200 sec.<br>Total sequence: (20 + 60 + 60 + 60 = 200 sec) |

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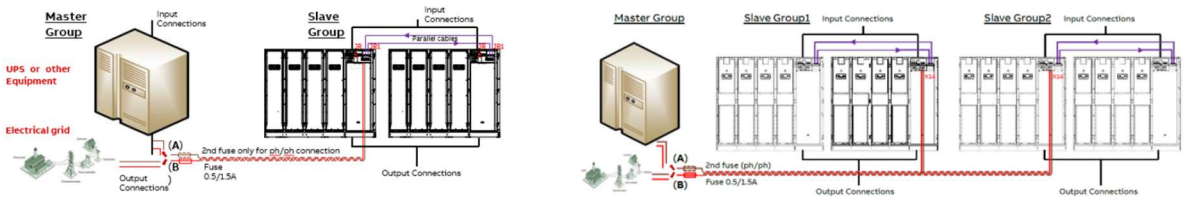
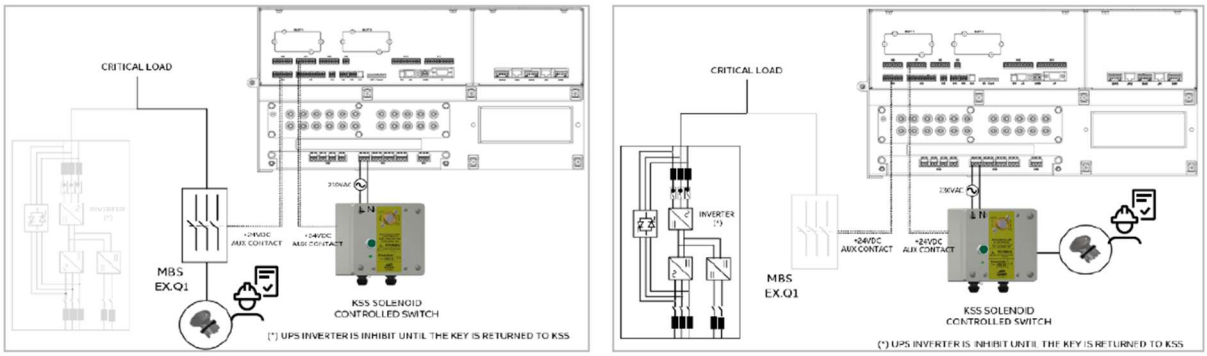
## Synchronization Feature

The MF Series Synchronization Feature enables to synchronize the output voltage of one or more UPS Slave-group/s (single UPS frame or a parallel system composed of multiple UPS frames) with any AC electrical line. For more information on the procedure and configuration, refer to the User/Installation product Manual.




## Castell Key Interlock

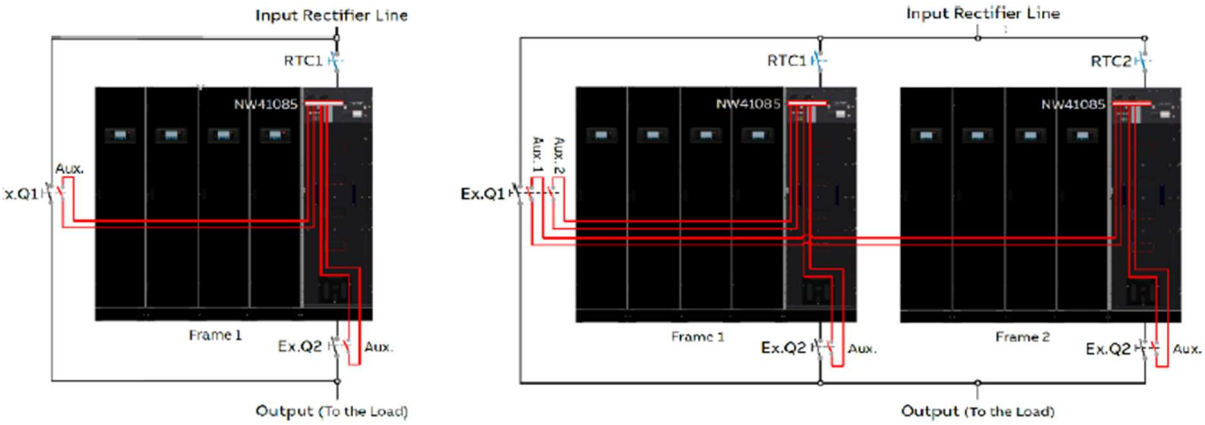
Castell key interlock functionality can be applied between UPS and the external manual bypass switch to avoid unnecessary switching between Modes of Operation producing an interruption of power supply for the critical load. The Castell key interlock is usually consisting of two locks (MBS & KSS Solenoid Switch) and one key.




The KSS interlock device is an external piece of hardware, not provided by Rehlko. Additional external wiring connections to interface unit and UPS secured power supply are required for the KSS interlock device. **See User Manual to see connections and more information**.

## External Maintenance Bypass Switch and Output Switch connections

The monitoring of the external maintenance bypass switch (EXT Q1) and the external output switch (EXT Q2) is mandatory for the UPS operation.




Therefore, the auxiliary contacts of EXTQ1 and EXT Q2 should be connected to the to the input dry port X1 in the communication interface.

For more information on the procedure and configuration, refer to the User Manual.