# Pulse Plating Reverse (PPR) Rectifiers


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# PPR - PULSE PLATING REVERSE

Q1 Series: 100A/300A to 250A/750A - Open case

## Main Features:

- IGBT Technology
- Modular configurations
- High speed polarity switching
- Current ripple: less than 2%
- Efficiency 87%
- Manual or automatic operation
- Flexible pattern definition
- Voltage and current control
- Energy Saving
- Compact size & lightweight
- Air or water cooled


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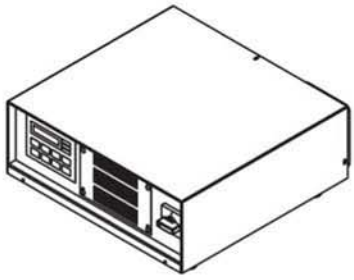
## Q SERIES

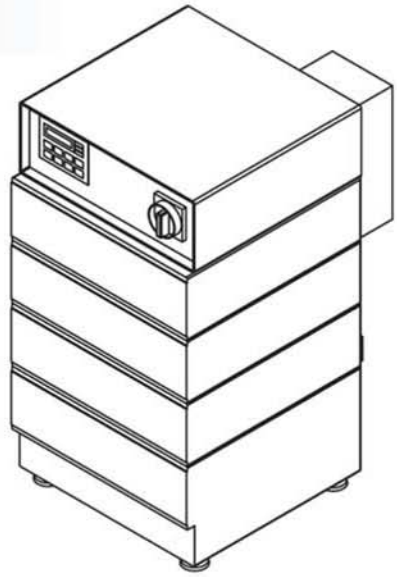


### Q1 Series

| Output current | |
|---|---|
| 100/300 A | |
| 150/450 A | |
| 200/600 A | |
| 250/750 A | |
| **Dimensions*** | |
| Width: | 424 mm |
| Height: | 186,5 mm |
| Depth: | 403 mm |
| **Weight** | |
| Air: | 25 Kg |
| Water: | 25 Kg |

### Q3 Series

| Output current | |
|---|---|
| 300/900 A | |
| 400/1200 A | |
| **Dimensions*** | |
| Width: | 424 mm |
| Height: | 633 mm |
| Depth: | 429 mm |
| **Weight** | |
| Air: | 102 Kg |
| Water: | 112 Kg |



### Q4 Series

| Output current | |
|---|---|
| 500/1500 A | |
| 600/1800 A | |
| **Dimensions*** | |
| Width: | 424 mm |
| Height: | 765 mm |
| Depth: | 429 mm |
| **Weight** | |
| Air: | 122 Kg |
| Water: | 136 Kg |

*Unless otherwise specified, general tolerance = ± 0.15 mm

## OPERATION MODES

### Manual Mode

Each rectifier has an operator panel, which includes a 1 line by 16 character display, a keyboard with 8 keys and 8 led indicators, allowing start/stop, automatic/manual, volt/ampere mode and incr/decr manual functions. It also provides display of actual current and voltage values (positive & negative), partial and total ampere meter values and fault messages (i.e. overvoltage or phase loss).


The rectifier can be operated in either current or voltage mode, and it is possible to be used in normal DC mode. It is also possible to define a pulse pattern (up to 6 different phases) using the keyboard. This pattern is saved in a EEPROM type memory, and can be manually started/stopped from the keyboard.

### Automatic Mode

The rectifier is controlled by a host PC/PLC or other control system using BTA-ASCII, Profibus DP, DeviceNet, etc. Automatic operation provides the classic side-side PCB mode by running 2 machines in Master & Slave configuration in any synchronized working mode with a pattern composed of 2 pulses (one positive and one negative). It is possible to run the rectifier with complex pulse patterns or normal DC.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## TECHNICAL SPECIFICATIONS

| Part Number | | Air / Water | Q1A100 / Q1W100 | Q1A150 / Q1W150 | Q1A200 / Q1W200 | Q1A250 / Q1W250 | Q3A300 / Q3W300 | Q3A400 / Q3W400 | Q4A500 / Q4W500 | Q4A600 / Q4W600 |
|---|---|---|---|---|---|---|---|---|---|---|
| Output | Max. continuous DC current (positive/negative) | A | 100 | 150 | 200 | 250 | 300 | 400 | 500 | 600 |
| | Average pulsed current | A | 108 | 162 | 261 | 240 | 324 | 432 | 540 | 848 |
| | Max. pulsed current (positive/negative) | A | 300 | 450 | 600 | 750 | 900 | 1200 | 1500 | 1800 |
| | Voltage | V | 0 - 16 V Standard | | | | | | | |
| | Hardware control method | | Current control | | | | | | | |
| | Current control accuracy | | ± 2% of rated value | | | | | | | |
| | Current regulation range | % | 5 - 100% of max. current | | | | | | | |
| | Voltage regulation range | % | 20 - 100% of max. voltage | | | | | | | |
| | Ripple of current | % | < 2% of regulation range | | | | | | | |
| | Efficiency | % | 87% depending on output current | | | | | | | |
| | Positive ⟷ negative switching time | A/µs | 0.2 A/µs ( at 0.1 mH inductance load) | | | | | | | |
| | Pulse Width (positive/negative) | ms | 1-100ms | | | | | | | |
| | Positive:Negative duty ratio | | 1:3 Standard. It can be any value under which the calculated avg. current between positive and negative is not higher than the avg. pulsed current | | | | | | | |
| | Secondary withstand voltage | V/min | 500 - Secondary/Ground | | | | | | | |
| Input | Mains Voltage | V | 480 V +/- 10% (on request 230 V / 380 V) | | | | | | | |
| | Mains Frequency | Hz | 50/60 | | | | | | | |
| | Phase number<br>Neutral | | 3<br>NOT USED | | | | | | | |
| | Primary power | Kw | 1.9 | 2.9 | 3.9 | 4.8 | 5.8 | 7.7 | 9.6 | 11.5 |
| | Primary current | A | 2.1 | 3.2 | 4.2 | 5.3 | 6.3 | 8.4 | 10.5 | 12.6 |
| | Leakage current | mA | < 12 | | | | | | | |
| | Primary withstand voltage | V/min | 2000 - Primary/Secondary and Primary/Ground | | | | | | | |
| Main Circuit System | | | IGBT PWM inverter system | | | | | | | |
| Cooling System | | | Air / Water | | | | | | | |
| Water Flow | | Lt/h | 50 | 50 | 100 | 100 | 100 | 150 | 150 | 150 |
| Working modes | | | DC, Pulse, Pulse Reverse | | | | | | | |
| Operation conditions | Location | | Indoors (not exposed to rain, wind & direct sunlight) | | | | | | | |
| | Environment Temperature | | 0 - 40 °C (32-104 °F) | | | | | | | |
| | Relative Humidity | % | 15- 85 non-condensing | | | | | | | |
| | Altitude | m | <= 2000 | | | | | | | |
| Protections | | | Over Voltage, Phase Loss, Surge, Thermal | | | | | | | |
| Degree of protection | | Air | IP33 | | | | | | | |
| | | Water | IP43 | | | | | | | |
| Conformity of EU Directives | | | 73/23/CEE 89/336/CEE 89/392/CEE | | | | | | | |
| Communication ports | | | RS232 point to point, RS485, Profibus-DP, DeviceNet (under development) | | | | | | | |
| Communication protocols | | | BTA-ASCII protocol for RS485 network (2 wires) | | | | | | | |
| | | | Modbus-RTU protocol for a RS485 network | | | | | | | |
| | | | PROFIBUS-DP protocol for PROFIBUS-DP network | | | | | | | |
| | | | DeviceNet protocol for DeviceNet network (under development) | | | | | | | |

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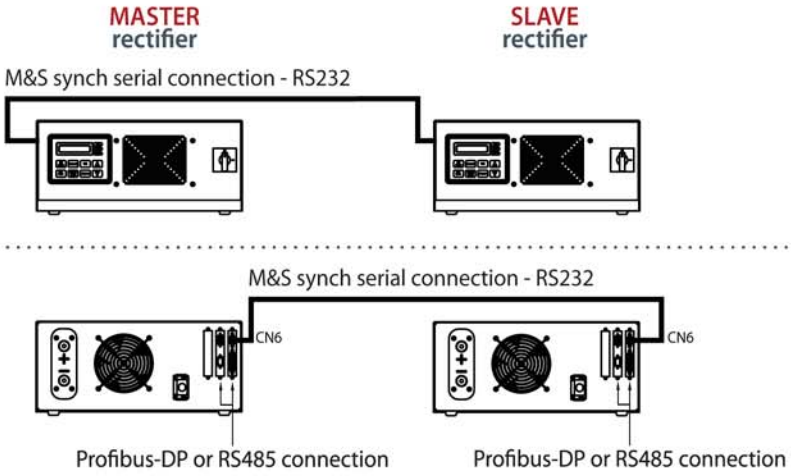
## MASTER & SLAVE CONFIGURATION

In order to provide synchronized pulse operation for dual output applications such as PCB plating, BTA rectifiers can be connected in a Master & Slave configuration.

Synchronized working processes can be performed in 2 different modes:

*Synchronous* - Synchronized pulses
*Asynchronous* - Pulses 180° out of phase

The following diagram shows the connection for the M&S configuration:




## WAVEFORM GENERATION

PPR machines are able to generate complex waveforms, composed of a sequence of patterns, each one containing a specified duration and a sequence of phases. Each phase has an optional ramp, voltage or current value and its proper duration.

The following figures are examples of different waveforms:

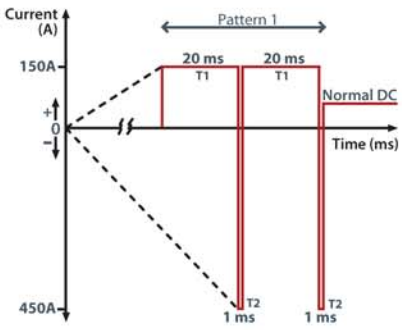



**FIG. 1**
Single machine 150A/450A.

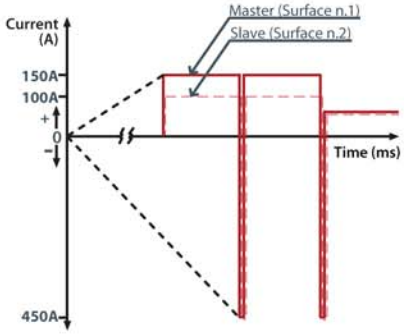



**FIG. 2**
2 machines 150A/450A in Master & Slave configuration. Each one requiring different positive current.
*- Synchronous mode*

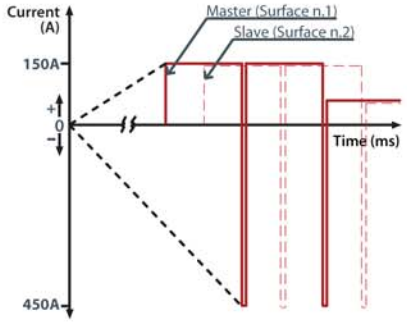



**FIG. 3**
2 machines 150A/450A in Master & Slave configuration.
*- Asynchronous mode*

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