

## Data Sheet

Rev. 2010-08-13

### mc<sup>2</sup>66 PSU

PSU

960/04      440W, internal 2x 220W PSU + 1x 220W redundant PSU

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## Related Products

| Parameter                  | Description  | Name     |
|----------------------------|--|----------|
| mc <sup>2</sup> 66 Console |  | 960/01   |
| Power cable                | available in different lengths up to 10m,<br>(conductor area per power line 4.0mm <sup>2</sup> ) | 288.7850 |

## General

| Parameter                         | Conditions                   | Min. | Typ. | Max. | Unit |
|-----------------------------------|------------------------------|------|------|------|------|
| <b>Mechanical data</b>            |                              |      |      |      |      |
| Height                            |                              |      | 3    |      | U    |
| Width                             |                              |      | 19   |      | "    |
| Depth                             | incl. handles and connectors |      | 500  |      | mm   |
| Additional rack space at the rear | for power cable              |      | 150  |      | mm   |
| Weight                            |                              |      | 9.25 |      | kg   |

## Specifications

| Parameter                    | Conditions                        | Min. | Typ. | Max. | Unit            |
|------------------------------|-----------------------------------|------|------|------|-----------------|
| <b>Input</b>                 |                                   |      |      |      |                 |
| Input voltage                |                                   | 85   |      | 264  | V <sub>AC</sub> |
|                              |                                   | 170  |      | 370  | V <sub>DC</sub> |
| Input frequency              |                                   | 47   |      | 63   | Hz              |
| Input current                | @ 115 VAC                         |      |      | 8    | A               |
|                              | @ 230 VAC                         |      |      | 4    | A               |
| Input inrush current         | @ 115 VAC                         |      |      | 30   | A               |
|                              | @ 230 VAC                         |      |      | 60   | A               |
| Power factor                 |                                   |      | 0.99 |      |                 |
| Fuse                         | per mains terminal, slow blow     |      | 4    |      | AT              |
| <b>Output</b>                |                                   |      |      |      |                 |
| Main supply                  | output of PSU                     |      | 13.0 | 15.0 | V               |
|                              | input of console                  | 11.3 | 12.0 | 13.0 | V               |
|                              |                                   |      | 25   | 36   | A               |
| Control system supply        | output of PSU, normal function    |      | 12.6 | 14.6 | V               |
|                              | input of console, normal function | 10.5 |      |      | V               |
|                              | output of PSU, power down         |      | 12.0 |      | V               |
|                              | input of console, power down      | 10.5 |      |      | V               |
|                              |                                   |      | 5.2  |      | A               |
| Hold up time                 |                                   | 20   |      |      | ms              |
| <b>Additional signals</b>    |                                   |      |      |      |                 |
| Main supply sense            |                                   |      | ±0.5 |      | V               |
| Control system ON/OFF output | high pulse                        | 0    |      | 10   | mA              |
| Error output                 | low for normal operation          | 0    |      | 10   | mA              |
| Spare 1&2 outputs            |                                   | 0    |      | 10   | mA              |
| Control system ON input      | low for normal operation          | 0    |      | 12   | V               |
| <b>General</b>               |                                   |      |      |      |                 |
| Efficiency                   | full load                         | 80   |      |      | %               |

## Environmental

| Parameter   | Conditions  | Min. | Typ. | Max. | Unit  |
|---|---|------|------|------|-------|
| <b>Temperature</b>                                |   |      |      |      |       |
| Operating temperature without fan will get active | main supply 25A, control system supply 5A, three internal supplies are active | 0    |      | 25   | °C    |
| Operating temperature with fan will get active    | main supply 25A, control system supply 5A, three internal supplies are active | 25   |      | 40   | °C    |
| High temperature protection                       | measured internally, fan will get active                                      |      | 56   |      | °C    |
|   | measured internally, fan will get inactive                                    |      | 42   |      | °C    |
| Over temperature protection                       | Shuts down, auto recovers, measured internally                                |      | 110  |      | °C    |
| Fan life expectancy                               | fan exhaust temperature 40°C  |      | 8    |      | years |
| Storage temperature                               |   | -20  |      | +70  | °C    |

## Power Up/Down Unit

| Parameter                   | Conditions   | Min.  | Typ. | Max. | Unit  |
|-----------------------------|--|---|------|------|-------|
| Energy storage              |  |   |      |      |       |
| Storage medium              |  | Capacitor                                     |      |      |       |
| Stored energy               |  |   | 1800 |      | J     |
| Capacitor life expectancy   | @ 25°C   |   | 10   |      | years |
| Power up / Shut down cycles |  | 500000  |      |      | #     |
| Capacitor check             | automatically every startup after several hours being switched off | short circuit<br>low capacity<br>over voltage |      |      |       |
| Power up                    |  |   |      |      |       |
| Capacitor charge time       | after several days being switched off                              |   | 40   |      | s     |
|                             | shortly after shut down  |   | 15   |      | s     |
| Power up indicator          | yellow LED   | shows capacitor charge time                   |      |      |       |
| Power down                  |  |   |      |      |       |
| Shut down current           |  |   |      | 5    | A     |
| Power down time             | @ 5A   |   |      | 18   | s     |
| Power down indicator        | yellow LED   | shows control system shut down time           |      |      |       |

## Cable Specification

| Parameter                                     | Conditions  | Min. | Typ. | Max. | Unit            |
|---|---|------|------|------|-----------------|
| Lines pairs, main supply                      |   | 2    |      |      | #               |
| Lines pairs, control system supply            |   | 1    |      |      | #               |
| Line pairs, supply sense                      |   |      | 1    |      | #               |
| Line pairs, control signals                   |   |      | 5    |      | #               |
| Cable resistance, main supply lines           | main supply 25A, both main supply lines in parallel, unidirectional |      |      | 0.03 | Ω               |
| Cable resistance, control system supply lines |   |      |      | 0.15 | Ω               |
| Conductor area, supply pairs                  | refer to cable length section                                       | 2.5  | 4.0  |      | mm <sup>2</sup> |
| Conductor area, control/sense pairs           |   | 0.25 |      |      | mm <sup>2</sup> |
| Cable length                                  | main supply 25A, conductor area per line 6.0mm <sup>2</sup>         |      |      | 16   | m               |
|   | main supply 25A, conductor area per line 4.0mm <sup>2</sup>         |      |      | 10   | m               |
|   | main supply 25A, conductor area per line 2.5mm <sup>2</sup>         |      |      | 6    | m               |

## Indicators

| Parameter        | Conditions        | ON   | OFF   |
|------------------|-------------------|--|---|
| MAINS [1..3]     |                   | mains ok   | mains failure   |
| PSU [1..3]       |                   | int. PSU ok  | int. PSU error  |
| POWER UP         |                   | while charging internal capacity for power down  | int. capacity is full charged   |
| OPERATION        |                   | normal operation   | while power down or error   |
| POWER DOWN       |                   | while power down   | never except of power down  |
| HIGH TEMPERATURE |                   | int. temperature has reached more than 56°C, Fan is active till temperature has fallen below 42°C                | int. temperature is lower than 56°C or has fallen below 42°C after a temperature above 56°C |
| ERROR            | MAINS Error       | at least one main connection has failed, with only one failed main connection normal operation is still possible | all MAINS are ok  |
|                  | PSU Error         | at least one int. PSU has failed, with only one failed PSU normal operation is still possible                    | all internal PSUs are ok  |
|                  | Capacitor Error   | capacitor is shorted, has a too low capacity or has been overcharged   | capacitor is ok   |
|                  | Signal Line Error | Operation monitoring signal of control system failed   | Operation monitoring signal is ok   |

## Further particulars/explanatory notes

### Indicators explanation

#### MAINS

The PSU has three terminals for the main supply at the rear. Therefore it is possible to realize a phase redundancy if every of the terminals is connected to a different phase.

Each phase has a green indicator at the front. If one main supply is missing the associated indicator will extinguish.

#### PSU

Internally the PSU is equipped with three power supplies in parallel, everyone with its own mains terminal at the rear. For proper operation only two of them are necessary, the third one is for redundancy.

Each internal power supply has a green indicator at the front if no error has occurred.

If one main supply is missing also the corresponding PSU indicator will extinguish.

### STATUS

#### Power Up / Operation / Power down

If at least two main supplies are connected the power up sequence will start. Therefore the Power up indicator will shine between 15s and 40s and the internal high value capacitor will be charged. Nevertheless the operation will start immediately and the operation indicator will shine immediately. After disconnecting the main supplies the power down cycle will occur and the power down indicator will shine for 18s max. In the meantime the operation indicator will extinguish and the console will be off. Only the control system computer inside the console will get power from the PSU to ensure a proper shut down for the operation system.

#### High Temperature

This PSU works properly with convection cooling only, if the ambience temperature is below 25°C and the load is 25A max. at the mains. For higher temperatures or current loads a fan will kick in once internal temperature exceeds 56°C. After that its rotation speed will decrease until an internal temperature of 42°C is reached at which the fan will stop.

A yellow indicator will shine if the fan is active.

If only two internal power supplies are working the fan will stay active below an ambient temperature of 25°C.

### Error

Several errors can be detected internally (see the following list) and the red indicator will blink if this occurs. In most cases normal work is still possible but you should contact the service and shut down the control system manually after work.

- **MAINS Error**  
occurs if one or more main supplies are lost. This error condition will be true as long as at least one main supply is lost.  
**Normal work is still possible if at least two mains are still available.**
- **PSU Error**  
occurs if one or more PSUs are not working. This error condition will be true as long as at least one PSU is lost.  
**Normal work is still possible if at least two PSUs are still in work.**
- **Capacitor Over voltage**  
occurs if the internal charge regulator causes an over voltage condition at the high value capacitor. This error condition will be permanent till the next restart of the PSU!  
**Normal work is still possible, the power down cycle should work fine, but only once after this error has occurred.** Please contact Lawo for service!
- **Capacitor shorted**  
occurs if the internal charge regulator is not able to charge the high value capacitor within one minute. This error condition will be permanent till the next restart of the PSU!  
**The power down cycle will not work properly; you should shut down the control system manually!**
- **Capacitor low capacity**  
occurs if the capacity test of the high value capacitor results in a too low capacity.  
**The power down cycle will not work properly; you should shut down the control system manually!**
- **Signal line error**  
occurs if the operation monitoring signal from the control system fails while normal operation. This can happen by a bad connection between the desk and the PSU or by an operation system failure.  
**The power down cycle will not work properly; you should shut down the control system manually!**

### Important!

Do never connect/disconnect the cable from PSU to desk while the PSU is in operation!