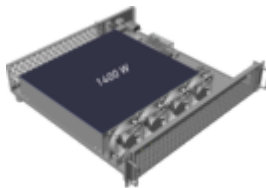


# Datasheet MAHP140-12C60

|                                                      |               |  |                                                                                     |
|------------------------------------------------------|---------------|--|-------------------------------------------------------------------------------------|
| Module                                               | MAHP140-12C60 |  |  |
| Order no.                                            | 23-063-000-04 |  |                                                                                     |
| Maximum input voltage U <sub>max</sub>               |               |  | 120 V                                                                               |
| Maximum load current I <sub>max</sub>                |               |  | 60 A                                                                                |
| Continuous power                                     |               |  | 1,400 W                                                                             |
| Resistance setting                                   |               |  | 0.033 Ω ... 66.667 Ω                                                                |
| Minimum input voltage U <sub>min</sub> <sup>1)</sup> |               |  | 1.6 V                                                                               |
| Rise and fall time fast                              |               |  | 200 μs                                                                              |
| Input capacity                                       |               |  | 6 μF                                                                                |

1. Minimum input voltage for maximum static load current.

## Series-Specific Data PMLA HP Variant

Series D, Rev. 1. Subject to technical changes.

The specified accuracies apply at an ambient temperature of  $23 \pm 5$  °C with connected sense lines and when the devices are used with clean voltages (ripple and noise < 0.1 %). Accuracy may worsen at voltages with higher interference values. Technical data may vary for special devices/modules.  
 \*Permissible voltages\* are positive or negative DC voltages.

| Channels and functions                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of channels per device                | max. 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Number of channels per system                | max. 96                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Total power per device                       | max. 2100 W                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Functions                                    | group addressing and name assignment<br>overcurrent protection<br>undervoltage protection<br>dynamic loads with list function<br>internal measurement data memory<br>discharge function for energy storage tests<br>SCPI programming with measurement function<br>MPP tracking<br>trigger model<br>SyncroLink for trigger synchronization<br>saving and loading device settings<br>watchdog in remote control mode<br>external control and monitor signals via I/O port |
| Operating modes                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Basic operating modes                        | CC, CV, CR, CP                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Combined operating modes                     | CC+CV, CP+CV, CR+CV, CP+CC, CR+CC, CV+CC                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Setting ranges                               | module-dependent                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| User interface                               | not available                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Current rise and fall times                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| at fast control speed                        | module-dependent                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| at slow control speed                        | ca. 1 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Accuracy of settings                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Voltage                                      | $\pm 0.1$ % of setting, $\pm 0.1$ % of range                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Current                                      | $\pm 0.2$ % of setting<br>$\pm 0.1$ % of range                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Resistance (at 5 ... 100 % of voltage range) | $\pm 1.4$ % of setting<br>$\pm 0.3$ % of current range                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Power (at U and I > 10 % of range)           | $\pm 0.7$ % of setting                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Power (at U or I > 5 ... 10 % of range)      | others: $\pm 2$ % of setting                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Resolution                                   | 12 bits                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Accuracy of adjustable protections           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Overcurrent protection                       | $\pm 0.2$ % of setting<br>$\pm 0.2$ % of range                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Undervoltage protection                      | $\pm 0.2$ % of setting, $\pm 0.2$ % of range                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Resolution                                   | 12 bits                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                                                               |                                                                                                                              |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Accuracy of measurement</b>                                |                                                                                                                              |
| Voltage                                                       | $\pm 0.1$ % of measured value, $\pm 0.05$ % of range                                                                         |
| Current                                                       | $\pm 0.2$ % of measured value<br>$\pm 0.05$ % of range                                                                       |
| Resistance                                                    | calculated from voltage and current values                                                                                   |
| Power                                                         | calculated from voltage and current values                                                                                   |
| Resolution                                                    | 16 bits                                                                                                                      |
| Sampling time                                                 | 100 $\mu$ s, not triggerable                                                                                                 |
| <b>Dynamic function (LIST)</b>                                |                                                                                                                              |
| Operating modes                                               | CC, CV, CR, CP                                                                                                               |
| Number of load levels                                         | max. 100, with corresponding ramp and dwell times                                                                            |
| Accuracy of load levels                                       | see accuracy of settings                                                                                                     |
| Dwell times                                                   | 0.2 ms ... 1000 s                                                                                                            |
| Ramp times                                                    | 0 ... 1000 s                                                                                                                 |
| Resolution                                                    | 0.2 ms                                                                                                                       |
| Accuracy of time settings                                     | $\pm 0.02$ %                                                                                                                 |
| <b>SyncroLink</b>                                             |                                                                                                                              |
| Synchronism between load channels (jitter) of the same system | max. 100 $\mu$ s                                                                                                             |
| Synchronism between load channels (jitter) to further systems | max. 250 $\mu$ s                                                                                                             |
| <b>Data acquisition in internal memory</b>                    |                                                                                                                              |
| Accuracy                                                      | see accuracy of measurement                                                                                                  |
| Resolution                                                    | 16 bits                                                                                                                      |
| Sample time                                                   | 0.2 ms ... 1000 s, resolution 0.2 ms                                                                                         |
| Data points                                                   | timestamp, voltage, current                                                                                                  |
| Number of data points                                         | max. 500                                                                                                                     |
| <b>Settings memory</b>                                        |                                                                                                                              |
| Number of memory positions (incl. programmed list)            | 10, selectable                                                                                                               |
| <b>I/O port: inputs and outputs</b>                           |                                                                                                                              |
| Inputs                                                        | digital control input for load input<br>analog control signal 0 ... 10 V                                                     |
| Digital input level                                           | 3 ... 30 V                                                                                                                   |
| Input resistance of analog inputs                             | > 10 k $\Omega$                                                                                                              |
| Outputs                                                       | analog voltage monitor output 0 ... 10 V<br>analog current monitor output 0 ... 10 V<br>digital status output for load input |

|                                                             |                                                                                                                       |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>I/O port: accuracy analog control 0 ... 10 V</b>         |                                                                                                                       |
| Voltage                                                     | ±0.2 % of setting, ±0.1 % of range                                                                                    |
| Current                                                     | ±0.2 % of setting<br>±0.1 % of range                                                                                  |
| <b>I/O port: accuracy analog monitor outputs 0 ... 10 V</b> |                                                                                                                       |
| Voltage                                                     | ±0.1 % of analog measurement value, ±15 mV offset                                                                     |
| Current                                                     | ±0.2 % of measured value<br>±15 mV offset                                                                             |
| Load capability                                             | min. 2 kΩ                                                                                                             |
| <b>I/O port: permissible voltages</b>                       |                                                                                                                       |
| U <sub>in-io</sub> (GND - neg. load input)                  | max. 2 V                                                                                                              |
| U <sub>ioPE</sub> (GND - PE)                                | max. 40 V DC                                                                                                          |
| <b>Input</b>                                                |                                                                                                                       |
| Input resistance                                            | > 50 kΩ with load input switched off, diode function with reverse polarity up to rated current                        |
| Input capacity                                              | module-dependent                                                                                                      |
| Parallel operation                                          | up to 5 channels in analog master-slave mode (hardware-controlled)                                                    |
| Maximum input voltage U <sub>max</sub>                      | module-dependent                                                                                                      |
| Minimum input voltage U <sub>min</sub>                      | module-dependent                                                                                                      |
| <b>Input: permissible voltages</b>                          |                                                                                                                       |
| U <sub>in-PE</sub> (neg. load input - PE)                   | max. ±40 V DC                                                                                                         |
| U <sub>in+PE</sub> (pos. load input - PE)                   | max. U <sub>max</sub> + 40 V DC                                                                                       |
| U <sub>in-in-</sub> (neg. load inputs between channels)     | max. ±40 V DC                                                                                                         |
| <b>Power</b>                                                |                                                                                                                       |
| Continuous power                                            | module-dependent                                                                                                      |
| Derating                                                    | -1.2 %/°C for T <sub>a</sub> > 21 °C                                                                                  |
| <b>Protection and monitoring</b>                            |                                                                                                                       |
| Protective devices                                          | overcurrent, overpower, overtemperature                                                                               |
| Monitoring messages                                         | overvoltage indicator, polarity reversal indicator, undervoltage indicator (if input voltage is too low for set load) |
| <b>Connections</b>                                          |                                                                                                                       |
| Load input                                                  | FKS20/5-SM8 (flat copper bar, vertical, 20x5 mm with M8 screw)                                                        |
| Sense                                                       | Phoenix Contact GIC_2,5_HCV/_2-ST-7,62                                                                                |

|                                                   |                                                                                                                                                                                              |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating conditions</b>                       |                                                                                                                                                                                              |
| Operating temperature                             | 5 ... 40 °C                                                                                                                                                                                  |
| Storage temperature                               | -25 ... 65 °                                                                                                                                                                                 |
| Max. operating height                             | 2000 m above sea level                                                                                                                                                                       |
| Pollution degree                                  | 2                                                                                                                                                                                            |
| Overvoltage category of mains                     | II                                                                                                                                                                                           |
| Max. humidity                                     | 80 % at 31 °C, decreasing linearly to 50 % at 40 °C                                                                                                                                          |
| Min. distance rear panel to wall or other objects | 70 cm                                                                                                                                                                                        |
| Cooling                                           | multi-stage air cooling, temperature-controlled, air inlet via the front panel, air outlet via the rear panel, suitable for gapless 19" mounting                                             |
| Noise                                             | max. 65 dB(A) at distance of 1 m                                                                                                                                                             |
| Mains voltage                                     | 1/N/PE AC 100 ... 240 V 50/60 Hz                                                                                                                                                             |
| Mains cable                                       | length max. 3 m, cross-section of mains connection wires min. 1 mm <sup>2</sup>                                                                                                              |
| Power consumption                                 | max. 75 VA                                                                                                                                                                                   |
| <b>Mechanics</b>                                  |                                                                                                                                                                                              |
| Housing                                           | 19", 2 U                                                                                                                                                                                     |
| Dimensions W x H x D                              | 485 x 109 x 485 mm                                                                                                                                                                           |
| Installation depth                                | 480 mm                                                                                                                                                                                       |
| Installation height                               | 89 mm                                                                                                                                                                                        |
| Weight                                            | max. 16 kg                                                                                                                                                                                   |
| Color front panel                                 | RAL7035 (light grey)                                                                                                                                                                         |
| Color back panel                                  | stainless steel                                                                                                                                                                              |
| Color cover                                       | RAL7037 (stone grey)                                                                                                                                                                         |
| <b>Safety and EMC</b>                             |                                                                                                                                                                                              |
| Protection class                                  | 1                                                                                                                                                                                            |
| Measurement category                              | 0                                                                                                                                                                                            |
| Electrical safety                                 | DIN EN 61010-1<br>DIN EN 61010-2-30                                                                                                                                                          |
| EMC, CE marking                                   | DIN EN 61326-1<br>DIN EN 55011<br>DIN EN 61000-3-2<br>DIN EN 61000-3-3                                                                                                                       |
| <b>Calibration</b>                                |                                                                                                                                                                                              |
| Recommended calibration interval                  | 2 years (empirical value as a guideline for the first period of use, can be adjusted depending on the intended use, duration of use, environmental conditions, relevance of the application) |
| FCC-PMLAxx                                        | factory calibration certificate                                                                                                                                                              |
| <b>Warranty</b>                                   |                                                                                                                                                                                              |
| Warranty                                          | 2 years                                                                                                                                                                                      |