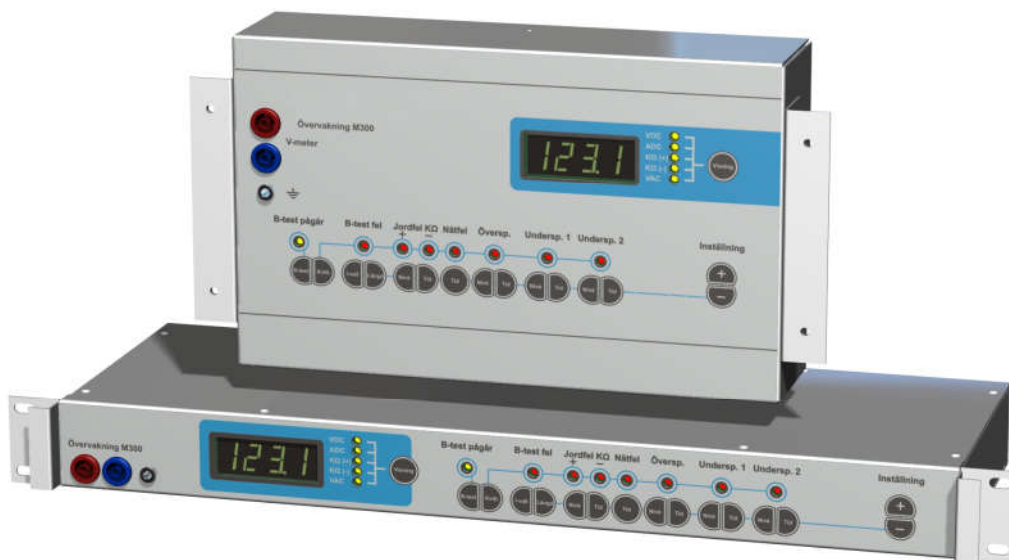


# Monitoring M-series

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## Manual 19" and Wall English



Manual for M-series monitoring unit  
with firmware ver. 102 and later.

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## Foreword

M-series are monitoring units for DC-systems with voltage range 9 – 300 VDC. For monitoring of DC-voltage, DC-current, earth fault and AC-voltage and also triggering of battery test. Settings are easily made with buttons on the front panel and momentary value/setting is shown in the display. For advanced settings there is a service menu. M-series is available both as 19" and wall-mount.

## Difference between the M-series models

	M100	M200	M300
Display of DC-voltage	•	•	•
Display of current			•
Display of AC-voltage			•
Display of earth fault value	•	•	•
High DC voltage alarm	•	•	•
Low DC voltage alarm 1	•	•	•
Low DC voltage alarm 2	•	•	•
Earth fault	•	•	•
Battery test (circuit/capacity)			•
Mains fault			•
Powered by DC	•	•	•
Separate relays for every alarm		•	•
Sum alarm relay	•	•	•

The front panels are different according to illustration below. M300 has all that M100/M200 offers and also display of current, mains voltage and buttons for battery test (start/stop, interval, length) and mains fault delay. Levels for battery test and mains fault are adjusted in the service menu (see other chapter).



## Installation 19”

### Unpack

Open box and find follow parts:

- 1 pcs. monitoring unit M-series
- 1 pcs. manual
- 1 pcs. set of male connectors for connection on backside
- 1 pcs. connected cable for earth fault sensing
- 1 pcs. set of attached nuts and washers on earth bolt

Install the unit in the 19” rack and connect safety earth cable, DC-power and signaling cables.

**Never do a high-pot test without disconnecting the earth fault sensor cable.**

**Disconnect this cable before doing the test.**

The unit starts automatically when DC-power is connected.

## Installation Wall

### Unpack

Open box and find follow parts:

- 1 pcs. monitoring unit M-series
- 1 pcs. manual
- 1 pcs. set of male connectors for connection inside
- 1 pcs. connected cable for earth fault sensing
- Option: 2 pcs. of brackets for door-mounting incl. screws and washers

### Wall-mounting

Unscrew the screws on the four sides and remove the front panel. Fasten the back side against the wall by using the four holes at each corner inside. Connect the cables for safety earth (preferably the same screw as for earth sensor), DC-power and signaling. Use the wire pull protections. Finally fasten the front panel again with the four screws.

### Door mounting

Unscrew the screws on the four sides and remove the front panel. Fasten the mounting brackets (option) with the screws. Fasten the front panel against the door. Connect the cables for safety earth (preferably the same screw as for earth sensor), DC-power and signaling. Use the wire pull protections. Fasten the back side using the screws.

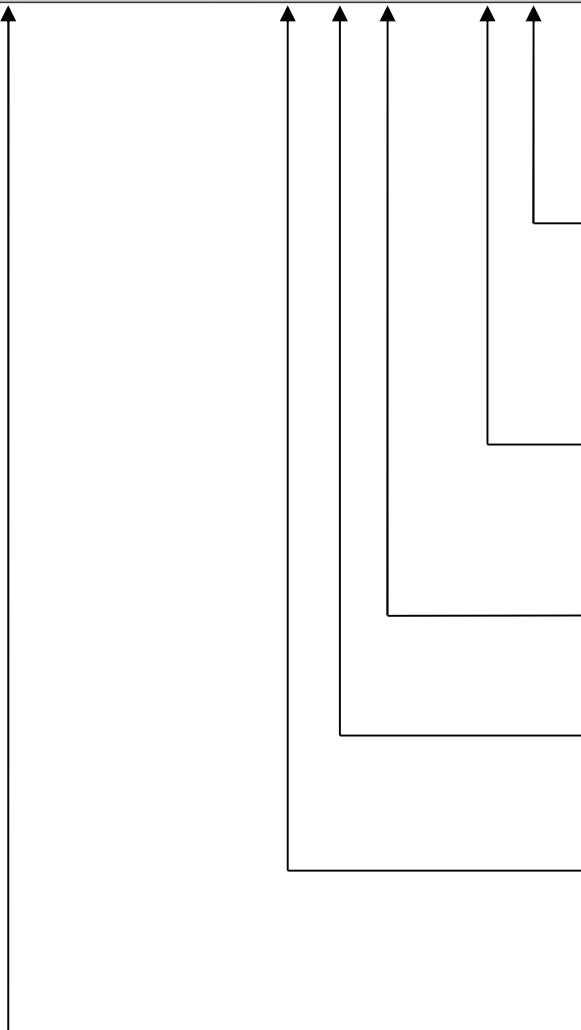
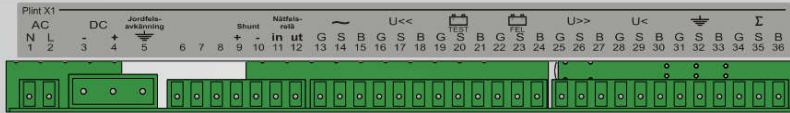
**Never do a high-pot test without disconnecting the earth fault sensor cable.**

**Disconnect this cable before doing the test.**

The unit starts automatically when DC-power is connected.

## Connections left

Illustration for M300 19". M100/200 has fewer connections which is shown by the label on the unit. The wall model has the corresponding connectors internally as the 19". For connection of the safety earth on Wall model use the same screw as for earth fault sensing.



**Mains alarm relay in/out (only M300)**, Used with external main fault relay. UT gives 5V which are connected to the relay and returned to IN. The input can be inverted with a setting in the service menu. Do not use at the same time as AC-input (see below).

**Shunt +/- (only M300)**, for connection of current shunt. The shunt must be connected to minus side. Different values for shunts can be used. Max 60mV. The unit is precalibrated for 100A/60mV. Calibration for other shunts are made in the service menu.

**Earth fault sensing**, connects to the safety earth bolt. Disconnect when doing hi-pot test.

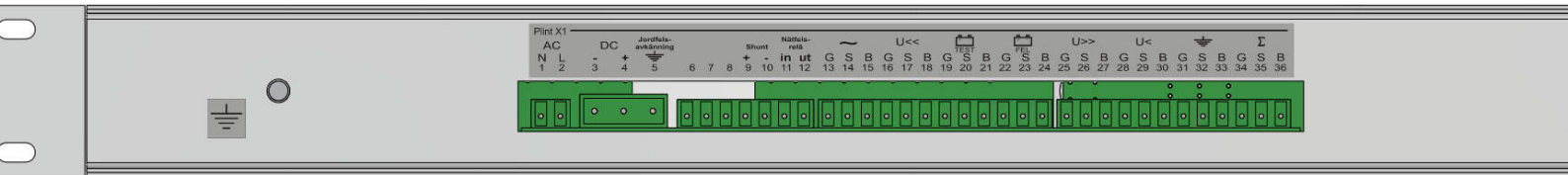
**DC**, for powering the unit and for measuring of DC-voltage. Depending on model: 9-36VDC, 30-75VDC or 70-300VDC.

**AC N and L (only M300)**, for connecting of mains voltage to measure voltage level and mains fault. Not used for powering the unit. Do not use at the same time as external main fault relay (see above).

**Earth stud**, connection of safety earth and earth fault sensor.

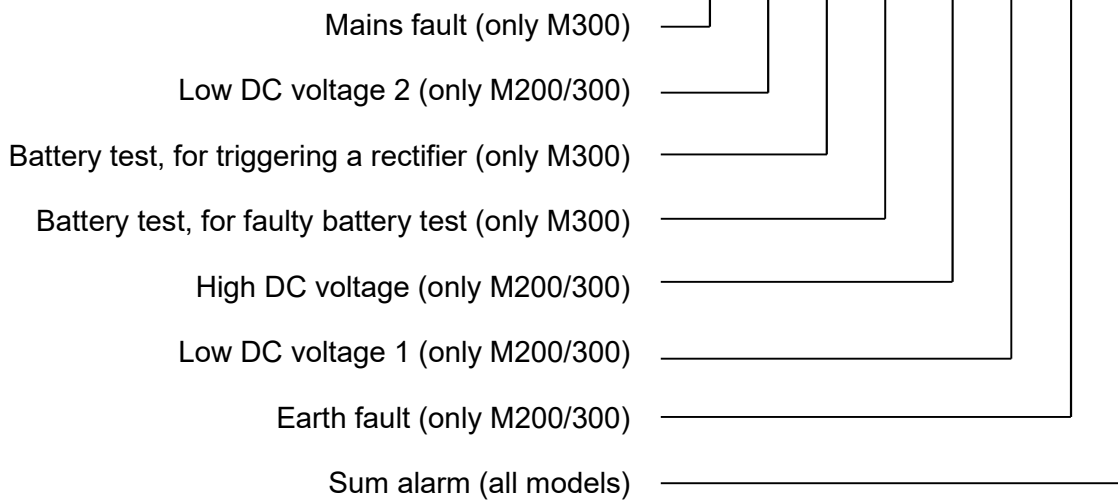
### Connections left

Illustration for M300 19". M100/200 has fewer connections which is shown by the label on the unit. The wall model has the corresponding connectors internally as the 19".



### Relay outputs

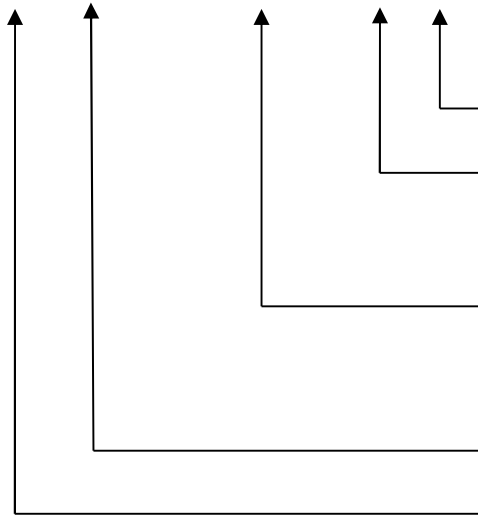
- B** open when alarm
- S** closed when alarm
- G** common



## Front panel

Below is explanation of front panel. The different models in the M-series are different in form and function and all features may not be present on delivered unit.

### Measurement connectors, display, display indicators and display button



Buttons for choosing what to display

Indicators for what is displayed

The display shows momentary values or adjustment value (by pressing adjustment button. VDC: 0-300VDC. ADC: depends on shunt. KΩ(+)/KΩ(-): 0-1000KΩ, above 1000KΩ display shows "----". VAC: 0-250VAC, above 250 VAC display shows "----".

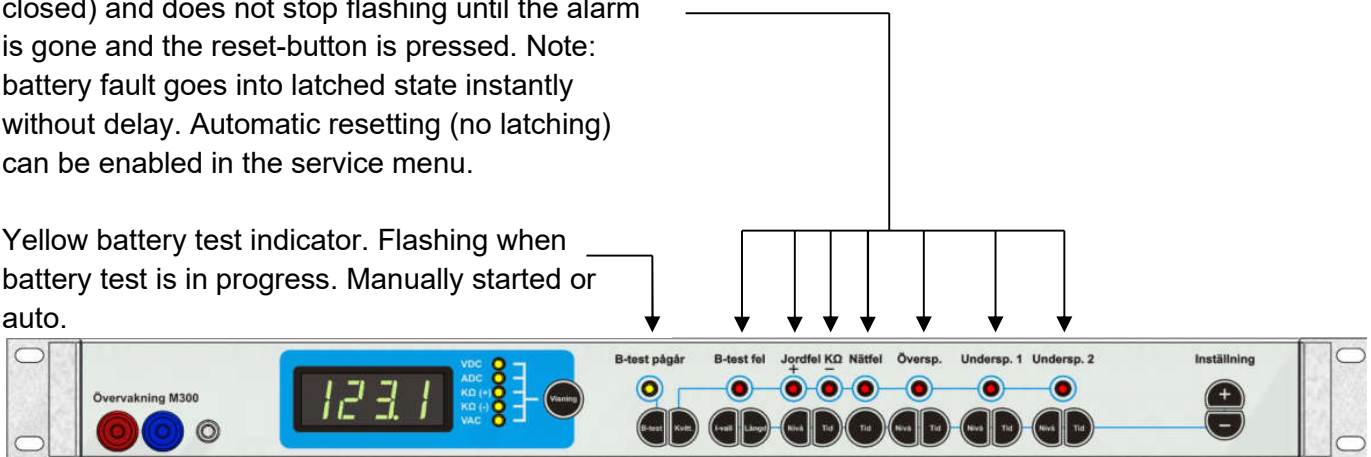
Earth connector (not for safety earth)

Measurement connector for V-meter. Short circuit protected.

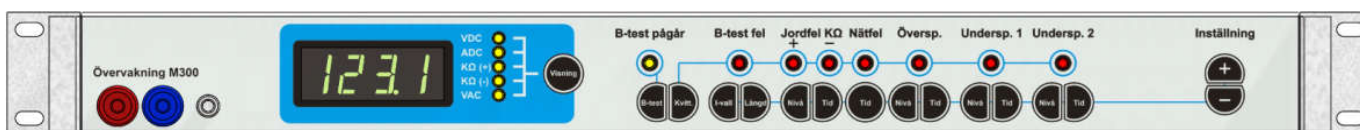
### Alarm indicators and the battery test indicator

Red alarm indicators. Flashes when each alarm has been triggered. If set delay is reached the indicator goes into latched state (and the relay is closed) and does not stop flashing until the alarm is gone and the reset-button is pressed. Note: battery fault goes into latched state instantly without delay. Automatic resetting (no latching) can be enabled in the service menu.

Yellow battery test indicator. Flashing when battery test is in progress. Manually started or auto.



## Buttons



**B-test:** Start/stop battery test. If no battery test is in progress the battery test is started with the length that is set by using the "length-button". If pressed while battery test is in progress the battery test is stopped. Both manual and automatically started tests can be stopped.

**Reset:** Alarm reset. Flashing alarm indicators with no alarms active stops flashing.

**I-val:** Battery test interval. For setting of time between start of battery tests. Possible: Off, 1 day, 30 days, 90 days and 180 days.

**Length:** Battery test length. Possible: 5 sec (circuit test), 15 min, 30 min, 1 hour, 2 hours, 4 hours.

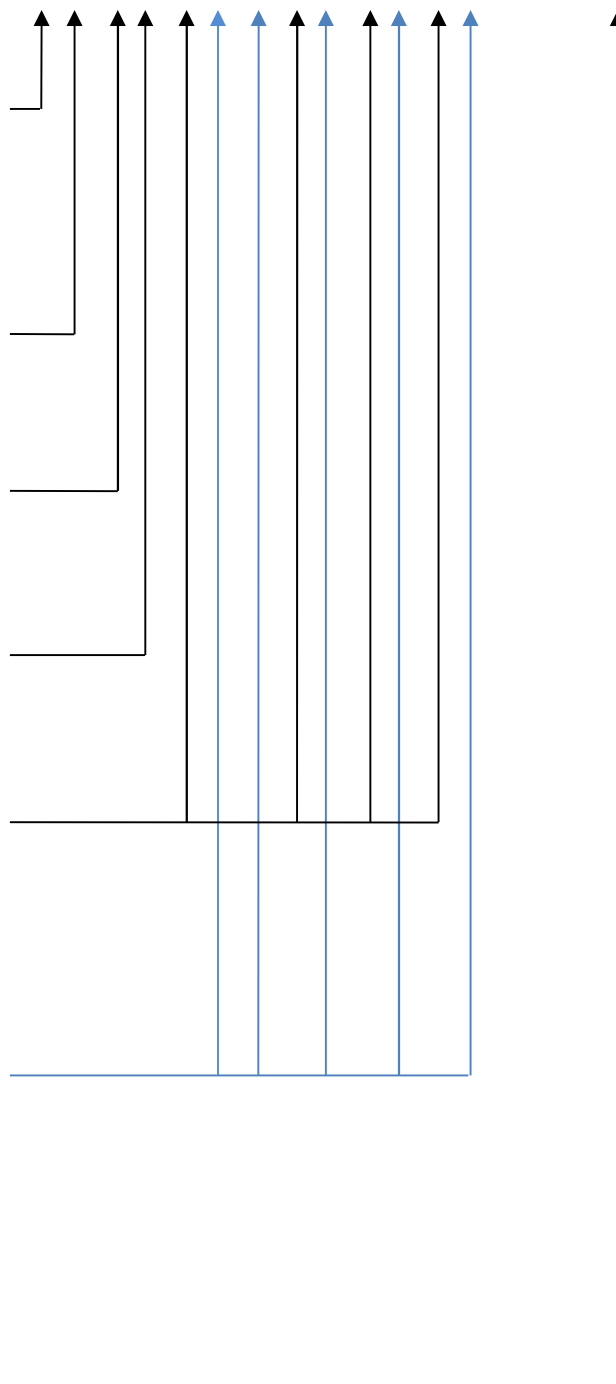
**Level buttons** for earth fault, high DC voltage, low DC voltage 1 and low DC voltage 2.

Earth fault: 50-1000Kohm.

High DC voltage, low DC voltage and low DC voltage 2: 1-300VDC

**Delay buttons.** Delay of earth fault, mains fault, high DC voltage, low DC voltage 1 and low DC voltage 2. Possible: 1-1800 sek. Above 1800 sec blocks the alarm and is indicated with "bloc" in the display. Blocking blocks both alarm indicators and relay.

**Button (+) and button (-),** press each adjustment button to the left and press these buttons to increase (+) and decrease

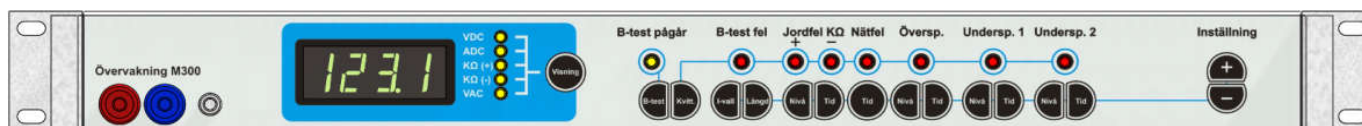


## Service menu

The service menu is used for calibration and other settings. It is used when testing the unit before leaving the factory and can be used when the installer wants to adapt the units in a more advanced way than is being offered by only using the normal settings. Use the service menu with care.

### Enter/exit the service menu and navigation

Enter the service menu by holding in the level buttons for high DC voltage and for low DC voltage 2. The display shows an animation. Keep holding the buttons until "On" is displayed. Release the buttons. The number "0" is shown which is the service menu.



Navigate to the menus with +/- . Then push the button "Display" and use +/- to change the setting. Available menus are listed on next page.

The service menu is exit the same way as it is entered. By holding in the level buttons for high DC voltage and for low DC voltage 2. The display shows an animation. Keep holding the buttons until "Off" is displayed. Release the buttons.

The service menu is automatically shut off after 5 minutes of no button presses.



## List of service menu settings

Choose the menu by pressing +/- . Start adjusting the setting by pressing Display button and +/- .

### 0 LED/indicator test.

All indicators on the front panel and all segments in the 4-digit display is lit.

### 1 Relay-test.

Press the Display button and push +/- to test each relay. Which relay that is tested is indicated on the indicators for each alarm and also with words in the 4-digit display.

### 2 Set all levels to factory default.

Recalls the factory defaults for high DC voltage, low DC voltage 1, low DC voltage 2 and battery test depending on selected nominal voltage. Press display button and use +/- .

**Voltage**    High DC voltage    Low DC voltage 1    Low DC voltage 2    Battery test

<b>12 V</b>	14.0 V	11.4 V	10.2 V	11.8 V
<b>24 V</b>	28.0 V	22.8 V	20.4 V	23.5 V
<b>36 V</b>	41.9 V	34.2 V	30.6 V	35.3 V
<b>48 V</b>	55.9 V	45.6 V	40.8 V	47.0 V
<b>60 V</b>	69.9 V	57.0 V	51.0 V	58.8 V
<b>108 V</b>	125.8 V	102.6 V	91.8 V	105.8 V
<b>120 V</b>	139.8 V	114.0 V	102.0 V	117.6 V
<b>216 V</b>	251.6 V	205.2 V	183.6 V	211.7 V

The nominal voltage is set from factory if specified by order specifications. If no order specification is told then the voltages are: 12-24: 24V, 36-60V: 48V, 110-220V: 108V.

### 3 M-series model.

M100, M200 or M300. Governs the different choices possible for display values and which alarm can be used. Press Display button and use +/- . The correct model is set from the factory.

## **4 Calibration of DC-voltage.**

Connect calibrated V-meter in the V-meter output. Press Display button and use +/- to set the same value in display as the V-meter is showing. Release Display button. Calibration is finished. Calibration of earth fault display is recommended after calibration of voltage. The unit is calibrated before delivery from factory.

## **5 Calibration of earth fault.**

Check that no earth fault is present or disconnect the earth fault sensing cable. Press Display button (without holding) to start the calibration. The display shows an animation and the calibration is done automatically. The calibration is done when "done" is shown in the display. Make sure the calibration of DC-voltage is done before calibration of earth fault. The unit is calibrated before delivery from factory.

## **6 Calibration of current display zero-value (only M300).**

This menu is not active in units with firmware ver. 102 and later. The Display button can be pressed and Done will be shown in order to replicate earlier versions but it doesn't do anything.

## **7 Calibration of current display (only M300).**

Use calibrated A-meter as reference. Increase the current over the shunt to max. Press Display button and use +/- to set the same value in the display as the A-meter is showing. Release Display button. The calibration is now finished. If the display current value is still not correct try calibrating the zero-value first and retry calibrating the current display. The unit is calibrated for a 100A/60mV shunt from factory.

## **8 Calibration of mains voltage display (only M300).**

Connect external V-meter to the main voltage. Press Display button and use +/- to set the same value as the V-meter is showing. Release Display button. The calibration is now finished.

The unit is calibrated before delivery from factory.

## **9 Set battery test voltage level (only M300).**

Set this to a level just above the level the rectifier is set to when doing battery test. The monitoring unit triggers the rectifier to go to battery test level with the battery test relay. At the same time the monitoring unit is measuring the DC-voltage from the rectifier/battery. If the level set here is reached the battery fault alarm is triggered. The battery test level is set based on order specification. If no order specification is sent then the voltage is set by the following table: 12 V: 11.8 VDC

24 V: 23.5 VDC

36 V: 35.3 VDC

48 V: 47.0 VDC

60 V: 58.8 VDC

108 V: 105.8 VDC

120 V: 117.6 VDC

216 V: 211.7 VDC

## **10 Blocking of battery test alarm (only M300).**

When blocked the alarm indicator never flashed and the relay is never in alarm mode. Push the Display button and use + for On and – for Off.

On = alarm is blocked, Off = alarm is not blocked.

Factory default: Off or according to order specification.

## **11 Inverting of input for external mains alarm relay (only M300).**

When using an external main alarm relay the output "Mains alarm relay OUT" is connected to the mains alarm relay and then back into "Mains alarm relay IN". When the relay is closed the monitoring unit sense this and it is either taken as a fault or a non fault. Press the Display button and press + for On and – for Off.

On=Alarm is triggered when the relay is closed

Off=Alarm is triggered when the relay is open

If the external mains relay is not used and instead the AC-input to be used the invert function must be inactive (Off).

Factory default = Off.

## **12 Setting of mains fault level (only M300).**

Set at which level the main fault alarm is triggered. Possible: 1-250VAC. The level is only of use when using the AC-input and not the external mains fault relay. For correct level the inverting of the input must be "Off" (see 11). Press display button and use +/- to set level. Factory default= 190 VAC.

## **13** Setting of low input voltage protection level.

Press display and use +/- to set level. When DC voltage is below set level the unit shuts off. When the DC-voltage goes back above set voltage (plus hysteresis) the unit turns on. The level cannot be set more than 95% of the momentary DC-voltage. If the level anyway would be set above the possible DC-voltage supply level the level can be forced to 0 by disconnecting the DC-voltage and then pressing the Display button while connecting the DC-voltage again. Then use this service menu setting to set the voltage to the correct level again.

Factory default levels:

9-36 VDC: 9 VDC

30-75 VDC: 30 VDC

70-300 VDC: 70 VDC

The levels are based on each DC/DC converters minimum input voltage.

## **14** Setting of automatic alarm reset.

When an alarm is triggered the alarm indicator starts flashing. After set delay the relay is set to alarm mode and the alarm indicator goes into latched state. When the cause of the alarm is gone the relay is released but the alarm indicator keeps flashing until the "Reset" button is pressed. With automatic alarm reset the indicator never goes to the latched state and stops flashing when the cause of the alarm is gone. I.e. no need to ever press the Reset button.

Press the Display button and use + for On and – for Off.

Off = No automatic alarm reset (The indicator keeps on flashing)

On = Automatic alarm reset (The indicator stops flashing when cause of alarm is gone)

Factory default: Off or according to order specification.

## **15** Display of firmware version.

Press Display button to show version.

## **16** Setting of hysteresis for low DC voltage.

If the voltage is higher than set level the alarm is triggered. The voltage must then go below the set level minus this hysteresis level in order for the alarm to become inactive.

Example:

voltage > voltage alarm level = alarm

voltage < voltage alarm level – hysteresis level = alarm inactive

Factory default: 0 VDC or according to order specification.

## **17** Setting of hysteresis for low DC voltage 1.

If the voltage is lower than set level the alarm is triggered. The voltage must then go above the set level plus this hysteresis level in order for the alarm to become inactive.

Example:

voltage < voltage alarm level = alarm

voltage > voltage alarm level + hysteresis level = alarm inactive

Factory default: 0 VDC or according to order specification.

## **18** Setting of hysteresis for low DC voltage 2.

If the voltage is lower than set level the alarm is triggered. The voltage must then go above the set level plus this hysteresis level in order for the alarm to become inactive.

Example:

voltage < voltage alarm level = alarm

voltage > voltage alarm level + hysteresis level = alarm inactive

Factory default: 0 VDC or according to order specification.

## **19** Setting of hysteresis for Earth fault.

If the earth fault is lower than set level the alarm is triggered. The earth fault must then go above the set level plus this hysteresis level in order for the alarm to become inactive.

Example:

earth fault < earth fault alarm level = alarm

earth fault > earth fault alarm level + hysteresis level = alarm inactive

Factory default: 0 KΩ or according to order specification.

## **20** Setting of hysteresis for Mains fault (only M300).

If the mains voltage is lower than set level the alarm is triggered. The mains voltage must then go above the set level plus this hysteresis level in order for the alarm to become inactive.

Example:

mains voltage < mains voltage alarm level = alarm

mains voltage > mains voltage alarm level + hysteresis level = alarm inactive

Factory default: 0 VAC or according to order specification.

## 21 **Setting of hysteresis for low input voltage protection.**

If the DC-voltage is lower than set level the unit shuts off. The DC-voltage must then go above the set level plus this hysteresis level in order for the unit to turn on.

Example:

DC-voltage < low input voltage protection level = unit shuts off

DC-voltage > low input voltage protection level + hysteresis level = unit turns on again

Factory default: 1 VDC

## 22 **Test of internal watchdog.**

If the monitoring unit is exposed to extreme transients or other extreme disturbances the microcontroller can freeze. An internal routine in the microcontroller will then restart the unit. Push the Display button. The unit will restart after 3 seconds.

## 23 **Test of external watchdog.**

If the monitoring unit is exposed to extreme transients or other extreme disturbances the microcontroller can freeze. An external circuit that complements the internal routine (see no. 22) will restart the unit.

Push the Display button. The unit will restart after 1.5 seconds.

## Technical data

### Input voltage

9-36 VDC, 18-75 VDC eller 70-300 VDC

### Alarm levels

High DC voltage/low DC voltage: Measuring the DC-voltage.

Alarm level possible: 1-300V.

Earth fault: Alarm level possible: 50-1000Kohm.

Delay of all alarms except battery test: 1-1800 sec or blocking.

Separate settings for level/delay:

High DC voltage, low DC voltage 1, low DC voltage 2,

earth fault +/-, battery test level (only M300), mains fault with AC-input (only M300).

### Relay connections

Potential free. Every relay has 3 connections. Common, alarm, and no alarm. When no DC-power to the unit the M-series sets alarm active on all relays.

Break capacity: 8A 230VAC

Relays for:

High DC voltage (only M200/300)

Low DC voltage 1 (only M200/300)

Low DC voltage 2 (only M200/300)

Earth fault (only M200/300)

Battery fault (only M300)

Battery test, triggering of rectifier (only M300)

Mains fault (only M300)

Sum alarm (all models)

### Mains fault (only M300)

By using AC-input or by using external mains fault relay (not included)

### Display

4 digit LED display.

### Dimensions

#### 19”:

Width 19” (482,6mm), height 1HE (44,45mm), depth 197mm incl. safety earth stud, 164,5mm excl. safety earth stud.

#### Wall:

Width without brackets 263mm, Width with brackets 305mm, height without cable protections 163mm, height with cable protections 172mm, depth 63 mm.