DATA SHEET

Selectable Insulation Monitor, SIM-Q MKII

- 3 functions: Normal, Fast and Test
- Easy adjustment and verification
- 2000 µF leakage capacitance
- Working voltage up to 690 V AC and up to 1000 V DC
- IEC 61557-8
- Class approval

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1. Data sheet

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1.1 Contents

1.1.1 Application

The SIM-Q MKII continuously monitors the insulation resistance between the connected network (IT network) and Functional Earth (FE).

Due to the SIM-Q MKII's unique measuring principle, it is able to measure the insulation resistance in both AC and DC networks and compensate for both high leakage capacitance and DC components.

1.1.2 Measuring principle

The SIM-Q MKII uses a patented measuring method, where a ±25 V DC voltage is superimposed to the system that is monitored. To be able to eliminate the influence from the monitored network capacitances and AC/DC components, the SIM-Q MKII performs an automatic measuring cycle that compensates for these.

1.1.3 Basic operation

The functionality of the product is to measure and monitor the insulation resistance between the network and FE. While doing this, it ignores disturbances such as capacitance, DC voltages and very low frequency variations (5 to 200 Hz).

Functionality

The green power indicator is ON when auxiliary power is connected. The insulation resistance is then measured continuously and is readable on the meter (not in test mode).

- When the measured resistance is lower than the set point, a relay is activated and the amber warning indicator is ON.
- When the measured resistance is higher than the set point, the relay is deactivated and the amber warning indication is turned OFF.

Indicators

The measuring can be monitored by looking at the indicators:

Indicator	General functionality	Remarks
Power - top LED 	**ON when power is connected** FLASHING when powering up	If OFF, check power and wiring
Status - middle LED 	**ON when measurement is valid** FLASHING when measurement failed/not steady/changing mode	If the status indicator is flashing for a longer period of time (longer than the maximum measuring time), it can be an indication of too high capacitance on the measured network. If so, shift range from 500 µF to 2000 µF.
Warning - bottom LED 	**OFF when measuring is higher than set point** ON when measuring is lower than set point	WARNING LED normally follows RELAY operation, within an on/off delay of max. 30 seconds (see delay section).
Meter	**Showing actual measurement**	When a measuring cycle has failed, the last valid measuring is still shown on the meter.

Set point adjustment

The warning set point is adjusted by means of a screwdriver on the rear of the housing.

When powering up the product, the first 10 seconds (default) are used to show the actual set point configured on the meter. Also in test mode, the actual set point is shown on the meter, and it can be reconfigured on the rear of the housing.

If needed, the precise set point can be preset in the product from DEIF before delivery (fixed set point).

Relay output

One changeover relay contact. By means of a built-in DIP switch located under the rear cover the relay can be configured to either:

- NE (normally energised contact). Recommended for alarm purposes. In case of an auxiliary supply drop-out, the contact is activated immediately. It is recommended to supply the SIM-Q MKII from a separate source if this type is used.
- ND (normally de-energised contact). Recommended for control purposes. Also recommended if the auxiliary supply for the SIM-Q MKII is taken from the same power system under supervision. An auxiliary supply failure will not result in an unwanted activation of the relay contact.

1.1.4 Selectable functionality

Selection of operation mode

Depending on the actual situation, the optimal mode can be selected. Monitoring mode is the recommended mode for normal, long-term monitoring.

- **Normal mode (IMD type: AC/DC)**
  - Long measuring cycles and relatively long response time, but immune to disturbances.
  - Depending on the capacitance and DC levels, the response time can be between 10 and 7000 seconds (2 hours).
- **Fast mode (IMD type: AC)**
  - Short response time. Used for fault location when several groups must be switched in/out.
  - The measurement does not compensate for capacitance and DC levels!
- **Test mode**
  - Used for self-test of warning/relay function and adjustment of set point. When the mode is selected, the relay is activated and the meter shows the actual set point value.
  - Use the knob on the rear side of the housing to adjust the set point to the desired value, and then select monitoring mode for measuring (not possible if fixed set point is ordered).

Changing mode

Note that by changing from normal mode, the measuring sequence is stopped and then a new measuring sequence is started when returning to normal mode.

Delays

To minimise unnecessary relay operation, delays have been added to the product functionality:

Description:	Default time:	Remarks:
Power on delay	15 seconds	When powering up the product (0 to 30 seconds)
Warning OFF delay	4 seconds	Delay between warning indication and relay operation (0 to 30 seconds)

Power-up options

When you power up the product, some start-up sequences can be selected for your needed variation of the SIM-Q MKII. These can be customised during ordering:

Description:	Default time:	Remarks:
1: Fast mode sequence	Deactivated	For the selected time (0 to 30 seconds), the measured insulation resistance is shown on the meter, relay is deactivated, warning LED is set according to insulation resistance and set point and status LED is flashing. **This mode can be used for special testing purposes or 1:1 replacement of SIM-Q products as spare parts!**
2: Show set point sequence	10 seconds	For the selected time (0 to 30 seconds), the set point is shown on the meter, relay is deactivated, warning LED is off and status LED is flashing. **This mode can be used for fast verification of set point setting.**

1.1.5 Product flexibility

The product can be changed/ordered to custom specifications. The following is possible:

On-site possibilities:

- Scale change
- 0 to 10 Mohm or 0 to 1 Mohm or 0 to 1000 kohm measuring range
- NE or ND relay
- 500 uF or 2000 uF capacitance range

Pre-delivery possibilities:

- Red section on scale (see Red section table below)
- Aux. ranges: 24 V DC, 110 V AC, 230 V AC or 450 V AC

Options:

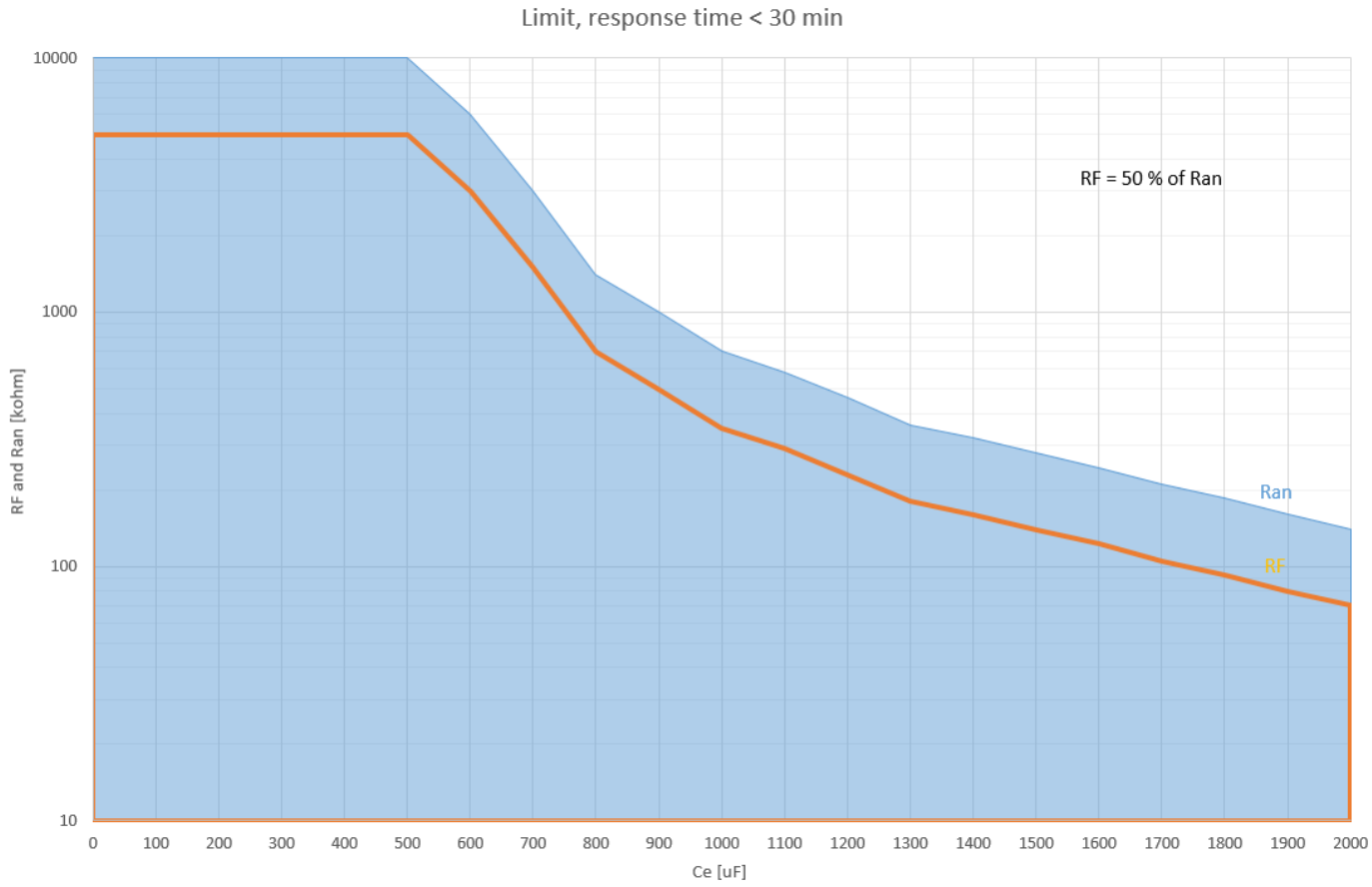
- OG Optional Graphics: Custom-designed scale/design/logo
- RP Red marker Pointer (only without anti-glare glass)
- LF Low Frequency option for extended low frequency range
- AG Anti-Glare front glass (only without red marker pointer)
- AS Advanced Settings:
  - Programmed fixed set point, default = OFF
  - Power-up fast mode: 0 to 30 seconds, default = 0
  - Power-up set point: 0 to 30 seconds, default = 10
  - Power-up delay: 0 to 30 seconds, default = 15
  - Warning delay OFF: 0 to 30 seconds, default = 4

Red section

1000...0 KΩ SCALES	10...0 MΩ SCALES	TYPICALLY USED FOR MAINS VOLTAGE *)
10...0 kΩ	0.100...0 MΩ	100V AC
11...0 kΩ	0.110...0 MΩ	110V AC
22...0 kΩ	0.220...0 MΩ	220V AC
23...0 kΩ	0.230...0 MΩ	230V AC
38...0 kΩ	0.380...0 MΩ	380V AC
40...0 kΩ	0.400...0 MΩ	400V AC
42...0 kΩ	0.415...0 MΩ	415V AC
44...0 kΩ	0.440...0 MΩ	440V AC
45...0 kΩ	0.450...0 MΩ	450V AC
48...0 kΩ	0.480...0 MΩ	480V AC
60...0 kΩ	0.600...0 MΩ	600V AC
66...0 kΩ	0.660...0 MΩ	660V AC
69...0 kΩ	0.690...0 MΩ	690V AC
-	1.000...0 MΩ	-

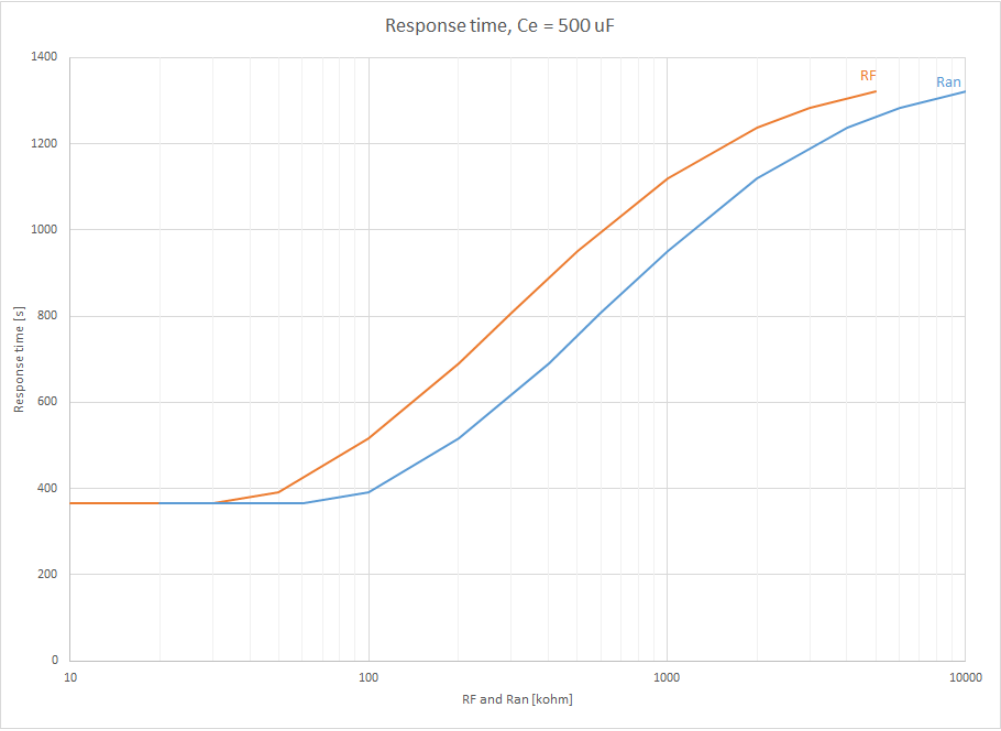
*) The scale selected is not limited to a certain mains voltage, but often either 0.1 kΩ/V or 1 kΩ/V is used.

1.1.6 Response time graphs

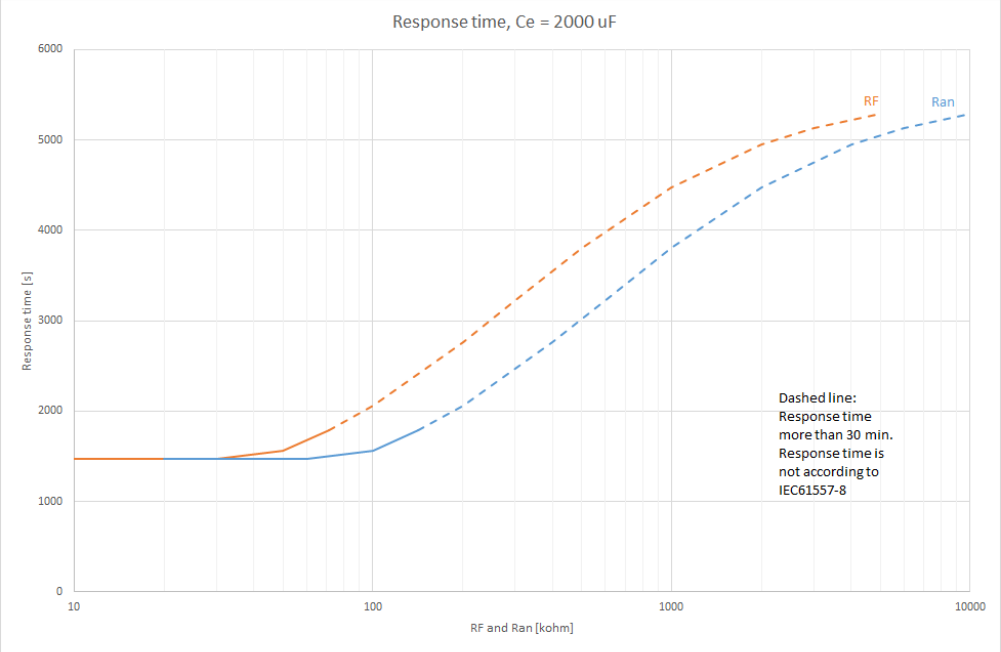


Outside the blue area above, the product will still perform but it will not meet the 30 minutes response time limit stated in IEC 61557-8.

So, when you select a set point (Ran) in systems with 2000 µF setting, be aware of the resulting response time.



Graph above: There are no restrictions when you select set point (Ran) in 500 µF settings.



Graph above: Beware of response time when you select set point (Ran) in 2000 µF settings.

1.1.7 Technical specifications

Measuring circuit	DC resistance (R_i):	300 kΩ ±1 %	
	AC impedance (Z_i):	251 kΩ ±1 % at 50 Hz	
	Measuring output voltage (Urn):	Typically: +/-25.5 V Max.: +/-27.3 V	
	Measurement current (Im)	Max.: 100 uA	
	Input voltage (U_N) :	0 to 690 V AC +20 % continuously (828 V AC) 0 to 1000 V DC	
	DC input voltage (U_{fg}):	Max. 1000 V DC continuously	
	Leakage capacitance:	Std.: Selectable C_e max. 500 µF or C_e max. 2000 µF leakage capacitor	LF: C_e max. 2000 µF leakage capacitor only!
	Frequency working range:	SIM-Q MKII: 20 to 500 Hz	SIM-Q MKII with LF option: 5 to 500 Hz
Meter	Measuring scale range (R_F):	1 MΩ to 0 Ω with scale centre at 0.022 MΩ. 1000 kΩ to 0 Ω with scale centre at 22 kΩ	10 MΩ to 0 Ω with scale centre at 220 kΩ
	Accuracy normal mode:	<15 % of readout value. Range 13 kΩ to 200 kΩ	<15 % of readout value Range 40 kΩ to 1.5 MΩ
	Accuracy fast mode:		
	Scale:	Exchangeable	
Indicators			
Power LED (Green)	Constant on: Normal operation Flashing: Power-up sequence		
Status LED (Green)	Depending on mode Constant on: Measurement is stable		

Warning LED (Yellow)	Constant on = Warning Constant off = No warning Flashing = Change of warning state, warning relay on or off delay			
Function switch				
Normal mode	Normal position of the switch for supervision of the insulation (IMD type: AC/DC)			
Fast mode	Use this position during location of an insulation error to obtain short response time (IMD type: AC)			
Test mode	In this position, the SIM-Q MKII shows the set point (R_{an}) on the meter, and the relay coil is activated (no IMD function)			
Relay function	Set point (R_{an}):	Potmeter: 0 to 1 MΩ	Potmeter 0 to 10 MΩ	Fixed set point 0 to 10 MΩ
	Accuracy (see **Note 1**)	<15 % Range 13 kΩ to 200 kΩ	<15 % Range 40 kΩ to 1.5 MΩ	<15 % Range 13 kΩ to 8 MΩ
	Response time (t_{an}), normal mode, 500 uF	<15 s @ C_e = 1 µF <30 min @ C_e < 500 µF		
	Response time (t_{an}), normal mode, 2000 uF	<60 s @ C_e = 1 µF <30 min @ C_e = 2000 µF and R_{an} < 140 kΩ		
	Response time (t_{an}), fast mode	Standard version: <4 s @ C_e = 1 µF LF option: <10 s @ C_e = 1 µF		
	Relay output:	Changeover contact		
	Contact rating: (see **Note 4**)	AC1: 8 A, 250 V AC – DC1: 8 A, 24 V DC AC15: 3 A, 250 V AC – DC13: 3 A, 24 V DC Life mechanical: 2 x 10^7 operations Life electrical: 1 x 10^5 operations		
	Relay coupling:	Normally energised NE or normally de-energised ND		
General technical specifications				
Auxiliary voltage:	Select between: • 24 V DC -15 %/+25 % ≤4 W • 100, 110, 127 V AC ±20 % 40 to 70 Hz, ≤4 VA • 220, 230, 240 V AC ±20 % 40 to 70 Hz, ≤4 VA • 400, 450, 480 V AC ±20 % 40 to 70 Hz, ≤4 VA			
EMC (see **Note 2**):	To IEC/EN 61326-2-4 and IEC/EN 61000-4-18			
Galvanic separation:	Routine test: Meas. input 3300 V – 50 Hz – 2 s to all other groups Vaux. input 2200 V – 50 Hz – 2 s to all other groups Relay output 2200 V – 50 Hz – 2 s to all other groups			
Temperature:	Nominal: -10 to 55 °C, operating: -25 to 70 °C, storage: -25 to 70 °C			
Vibration	3-13.2 Hz, 2 mm_{pp}, 13.2-100 Hz, 0.7 g, to IEC/EN 60068-2-6			
Climate:	97 % RH, IEC/EN 60068-2-30, test Db			
Protection:	Front: IP52, rear: IP20, terminals: IP20. To IEC/EN 60529			
Safety (see **Note 3**):	600 V CAT III Pollution degree 2 according to IEC/EN 61010-1			
Connections:	Screw terminals: 2.5 mm^2 (multi-stranded), 4 mm^2 (single-stranded)			
Materials:	All plastic materials are self-extinguishing to UL94 (V0)			
Horizontal surface impact:	Rated energy level is IK06 (1J)			

Note 1: According to IEC 61557-8.

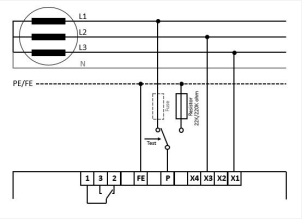
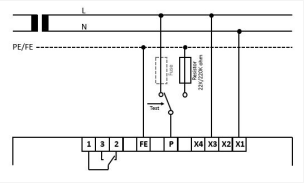
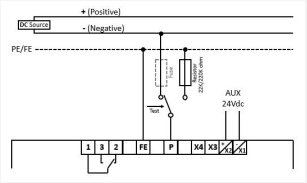
Note 2: The SIM-Q MKII is CE-marked for residential, commercial and light industry plus industrial environment. Regarding approvals, see our homepage, www.deif.com, and search for SIM-Q MKII under the menu Documentation.

Note 3: If FE is disconnected from the SIM-Q MKII, the safety is 300 V CAT III.

If U_N > 690 V, overvoltage category must be CAT II.

Note 4: Ambient temperature above 55 °C requires wiring to be rated for 105 °C.

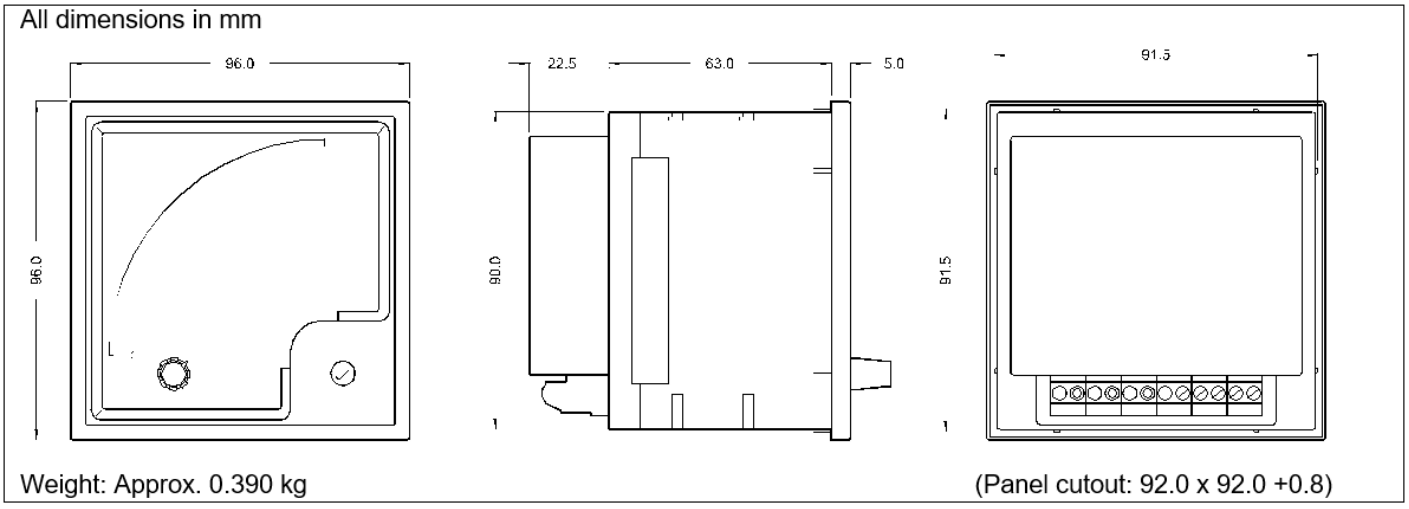
1.1.8 Connections

3-phase, AC	1-phase, AC	1-phase, DC
		

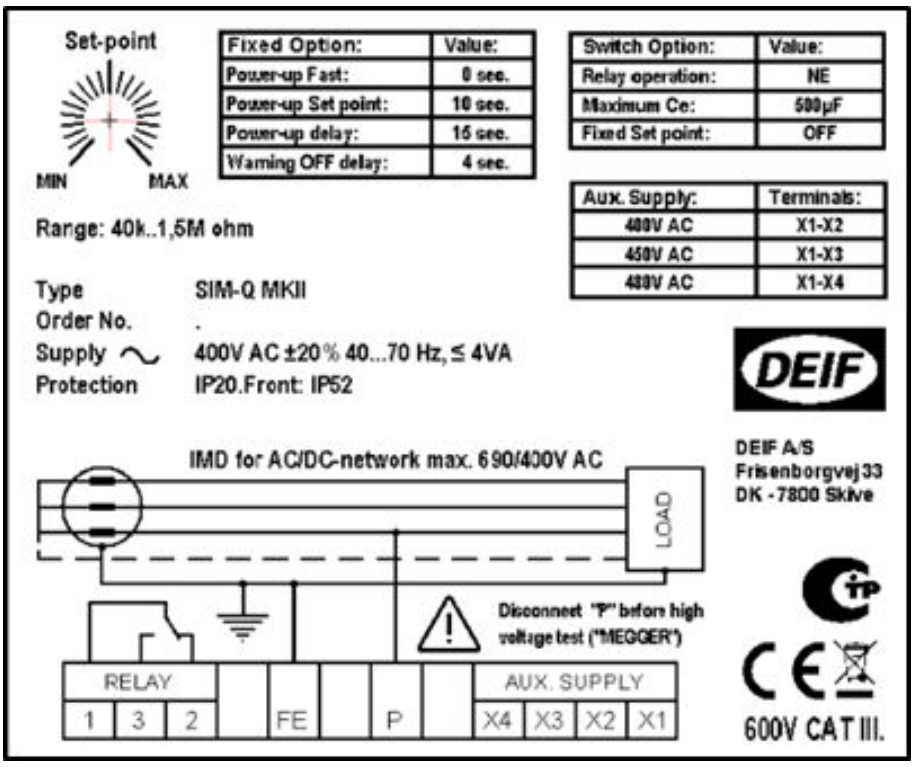
Recommended fuse size: max 2 A.

Diagrams above: Typical connection and recommended self-test circuit (according to IEC 61557-8). Use 220 kΩ test resistor for 0 to 10 MΩ range and 22 kΩ test resistor for 0 to 1 MΩ range.

1.1.9 Dimensions



1.1.10 Label



Set point is adjusted in the top left corner.

1.1.11 Order specifications

Table 1.1 Variants:

Type	Variant no.	Description	Item no.	Note
SIM-Q MKII, 24 V DC	01	SIM-Q MKII, aux. voltage 24 V DC	2961740050-01	
SIM-Q MKII, 115 V AC	02	SIM-Q MKII, aux. voltage 115 V AC	2961740050-02	
SIM-Q MKII, 230 V AC	03	SIM-Q MKII, aux. voltage 230 V AC	2961740050-03	
SIM-Q MKII, 440 V AC	04	SIM-Q MKII, aux. voltage 440 V AC	2961740050-04	
SIM-Q MKII, LF, 24 V DC	05	SIM-Q MKII, LF, aux. voltage 24 V DC	2961740050-05	
SIM-Q MKII, LF, 115 V AC	06	SIM-Q MKII, LF, aux. voltage 115 V AC	2961740050-06	
SIM-Q MKII, LF, 230 V AC	07	SIM-Q MKII, LF, aux. voltage 230 V AC	2961740050-07	
SIM-Q MKII, LF, 440 V AC	08	SIM-Q MKII, LF, aux. voltage 440 V AC	2961740050-08	
SIM-Q MKII, 24 V DC	09	SIM-Q MKII, aux. voltage 24 V DC	2961740050-09	
SIM-Q MKII, 115 V AC	10	SIM-Q MKII, aux. voltage 115 V AC	2961740050-10	
SIM-Q MKII, 230 V AC	11	SIM-Q MKII, aux. voltage 230 V AC	2961740050-11	
SIM-Q MKII, 440 V AC	12	SIM-Q MKII, aux. voltage 440 V AC	2961740050-12	

Table 1.2 Available options:

Option	Description	Type	Note
AG: Anti-Glare	Anti-glare glass	Glass	
RP: Red Pointer	Red marking pointer	Glass	
LF: Low Frequency	Extended frequency range 5 to 500 Hz	Input filters	
AS: Advanced Setting	Programmed fixed set point	0 to 10 MΩ, default = OFF	
	Power-up fast mode	0 to 30 seconds, default = 0	
	Power-up set point	0 to 30 seconds, default = 10	
	Power-up delay	0 to 30 seconds, default = 15	
	Warning delay off	0 to 30 seconds, default = 4	
OG: Optional Graphics (scale)	For example red line, own logo, extra text	Scale design	

Table 1.3 Order specification:

Mandatory information							Additional options to a standard variant	
Item no.	**Type**	**Variant no.**	**Scale range**	**Red section***	**Relay NE/ND**	**Max. leakage capacity**	**Option**	**Option**

Table 1.4 Example:

Mandatory information							Additional options to a standard variant	
Item no.	**Type**	**Variant no.**	**Scale range**	**Red section***	**Relay NE/ND**	**Max. leakage capacity**	**Option**	**Option**
2961740060-04	SIM-Q MKII	04	1000 to 0 kΩ	44 to 0 kΩ	NE	500 µF	AG glass	

*See **Red section** table in the section "Product flexibility".

1.1.12 Disclaimer

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