SIM-Q MKII

4921230028H

Selectable Insulation Monitor

Data sheet

Improve Tomorrow

1. Data sheet

1. Data sheet

- 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

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).

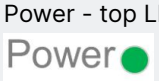
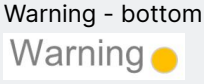
Functionality

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**	WARNING LED normally follows RELAY operation, within an on/off delay of max. 30 seconds (see delay section).

Indicator	General functionality	Remarks
	ON when measuring is lower than set point	
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	Range	Remarks
Power on delay	15 s	0 to 30 s	When powering up the product.
Warning OFF delay	4 s	0 to 30 s	Delay between warning indication and relay operation.

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	Range	Remarks
1: Fast mode sequence	Deactivated	0 to 30 s	For the selected time: • The measured insulation resistance is shown on the meter. • The relay is deactivated. • The warning LED is set according to the insulation resistance and set point. • The 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 s	0 to 30 s	For the selected time: • The set point is shown on the meter. • The relay is deactivated. • The warning LED is off. • The 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 MΩ or 0 to 1 MΩ or 0 to 1000 kΩ measuring range
- NE or ND relay
- 500 µF or 2000 µF 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
  - If the installation contains frequency converters that work below 20 Hz, then the SIM-Q MKII with option LF should be used. This is because it provides reliable measurements down to 5 Hz.
- 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 table

1000 to 0 kΩ scales	1 to 0 MΩ scales	10 to 0 MΩ scales	Typically used for network voltage*
10 to 0 kΩ	0.010 to 0 MΩ	0.100 to 0 MΩ	100 V AC
11 to 0 kΩ	0.011 to 0 MΩ	0.110 to 0 MΩ	110 V AC
12 to 0 kΩ	-	-	120 V AC
22 to 0 kΩ	0.022 to 0 MΩ	0.220 to 0 MΩ	220 V AC
23 to 0 kΩ	0.023 to 0 MΩ	0.230 to 0 MΩ	230 V AC
24 to 0 kΩ	-	-	240 V AC
38 to 0 kΩ	0.038 to 0 MΩ	0.380 to 0 MΩ	380 V AC
40 to 0 kΩ	0.040 to 0 MΩ	0.400 to 0 MΩ	400 V AC
42 to 0 kΩ	0.042 to 0 MΩ	0.415 to 0 MΩ	415 V AC
44 to 0 kΩ	0.044 to 0 MΩ	0.440 to 0 MΩ	440 V AC
45 to 0 kΩ	0.045 to 0 MΩ	0.450 to 0 MΩ	450 V AC
48 to 0 kΩ	0.048 to 0 MΩ	0.480 to 0 MΩ	480 V AC
50 to 0 kΩ	0.050 to 0 MΩ	0.500 to 0 MΩ	500 V AC
60 to 0 kΩ	0.060 to 0 MΩ	0.600 to 0 MΩ	600 V AC
66 to 0 kΩ	0.066 to 0 MΩ	0.660 to 0 MΩ	660 V AC
69 to 0 kΩ	0.069 to 0 MΩ	0.690 to 0 MΩ	690 V AC
100 to 0 kΩ	0.100 to 0 MΩ	1.000 to 0 MΩ	-

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

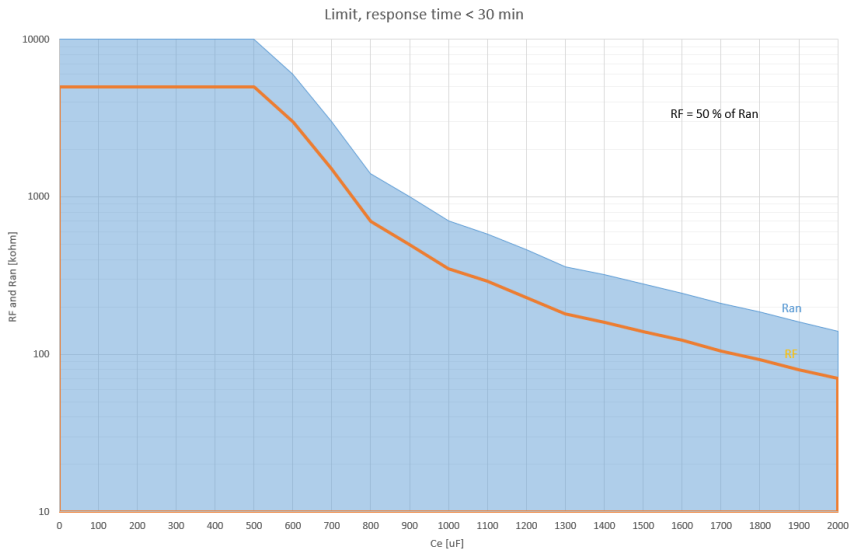
1.1.6 Response time graphs

IEC 61557-8 specifies a test response time, t_{an}, of ≤ 30 minutes under test conditions where RF is reduced from infinity to 50% of R_{an}.

Symbol	Name	Definition
t_{an}	Response time	The time required by an insulation monitoring device to respond under specified conditions.
R_F	Insulation resistance	The resistance in the system being monitored, including the resistance of all the appliances connected to earth.
R_{an}	Specified response value	The value of the insulation resistance, permanently set or adjustable, on the device. It is monitored if the insulation resistance falls below this limit.
C_e	System leakage capacitance	The maximum permissible value of the total capacitance to earth for the system being monitored. This includes any connected appliances, up to which value the insulation monitoring device can work as specified and within a response time not exceeding 30 min.

Limit, response time < 30 minutes

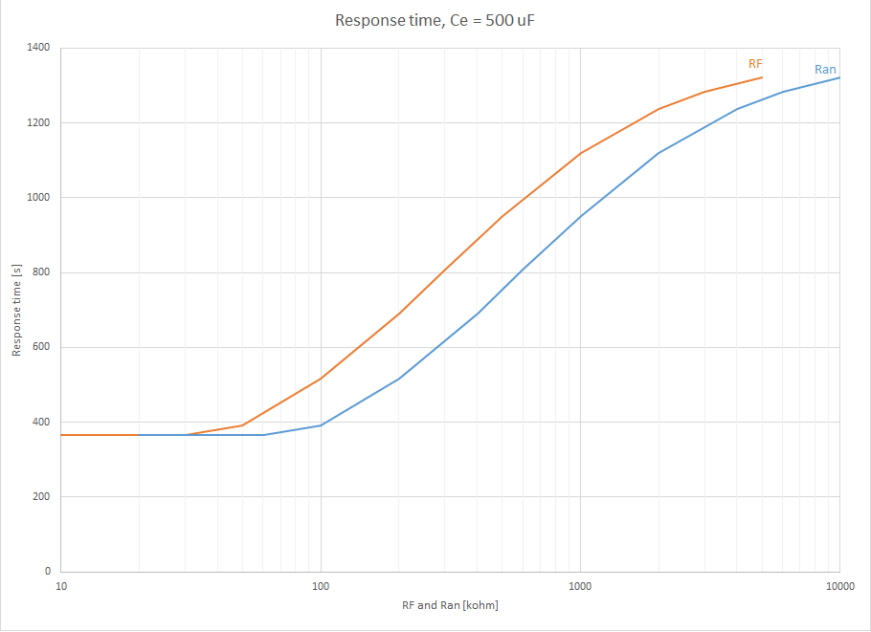
Outside the blue area on the graph below, the product will still perform, but it will not meet the 30 minutes response time limit stated in IEC 61557-8. Note when a set point (R_{an}) is selected in systems with 2000 µF setting, the resulting response time can be greater than 30 minutes.



Response time, C_e 500 µF

The graph shows the test response time, t_{an}, taken for an insulation resistance value, R_F, suddenly reduced to 50% of the R_{an} set point to be measured on the device, in a system where C_e is 500 µF.

The graph below illustrates that there are no restrictions when the set point (R_{an}) is selected with the 500 µF settings.



Examples

Example 1:

R_{an} is set to 600 kΩ.
RF is initially set to infinity (more than 10 MΩ).
RF is set to 300 kΩ (50% of R_{an}).
The response time of the device to indicate the RF value is approximately 800 seconds.

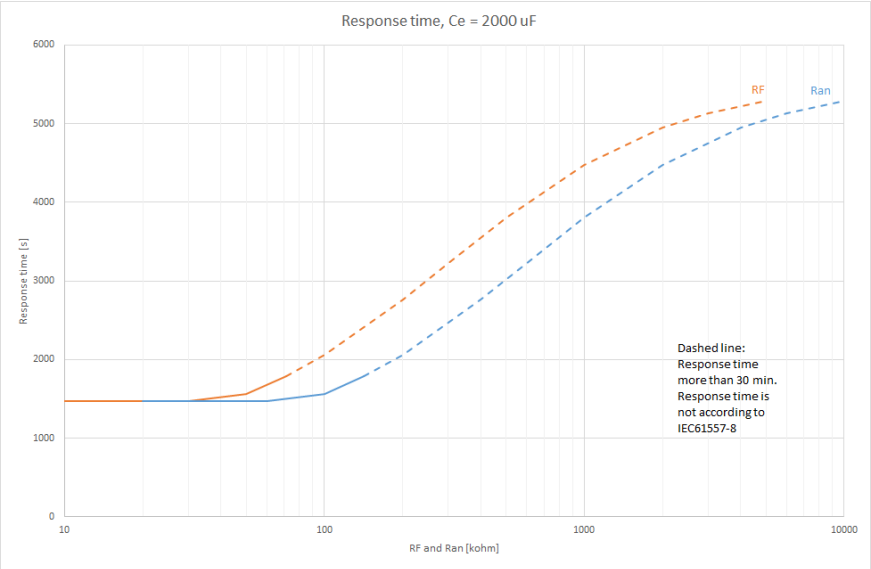
Example 2:

R_{an} is set to 3 MΩ.
RF is initially set to infinity (more than 10 MΩ).
RF is set to 1.5 MΩ (50% of R_{an}).
The response time of the device to indicate the RF value is approximately 1180 seconds.

Response time, C_e 2000 µF

The graph shows the test response time, t_{an}, taken for a insulation resistance value, R_F, suddenly reduced to 50% of the R_{an} set point to be measured on the device, in a system where C_e is 2000uF.

Be careful of the response time when the set point (R_{an}) is selected with 2000 µF settings.



If the installation has frequency converters that work below 20 Hz, the SIM-Q MKII with option LF should be used instead, as it provides reliable measurements down to 5 Hz.

Examples

Example 1:

R_{an} is set to 120 kΩ.
RF is initially set to infinity (more than 10 MΩ).
RF is set to 60 kΩ (50% of R_{an}).
The response time of the device to indicate the RF value is approximately 1700 seconds (less than 30 minutes).

Example 2:

R_{an} is set to 500 kΩ.
RF is initially set to infinity (more than 10 MΩ).
RF is set to 250 kΩ (50% of R_{an}).
The response time of the device to indicate the RF value is approximately 3000 seconds (more than 30 minutes).

1.1.7 Technical specifications

Refer to IEC 61577 for definitions of the technical symbols in brackets.

Measuring circuit	DC resistance (R_i):	300 kΩ ±1 %	
	AC impedance (Z_i):	251 kΩ ±1 % at 50 Hz	
	Measuring output voltage (U_m):	Typically: +/-25.5 V Max.: +/-27.3 V	
	Measurement current (I_m):	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 (see **Note 1**)	
	System leakage capacitance (C_e):	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 (A): (See **Note 2**)	<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 µF	<15 s @ C_e = 1 µF <30 min @ C_e < 500 µF		
	Response time (t_{an}), normal mode, 2000 µF	<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:	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 (U_s) and nominal frequency (f_n):	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 3**)	To EN 61326-1:2013 and EN 61326-2-4:2013			
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: (See **Note 4)**	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 EN IEC 60068-2-6			
Shock:	50 g, 11 ms, half sine Tested with 3 impacts in each direction in all 3 axes. A total of 18 impacts per test. To EN IEC 60062-2-27			
Climate:	55 °C 97 % RH, EN IEC 60068-2-30, test Db			
Protection:	Front: IP52, rear: IP20, terminals: IP20. To EN IEC 60529			
Safety: (See **Note 5**)	600 V CAT III Pollution degree 2 according to EN IEC 61010-1 LVD: EN 61010-1:2010+A1:2019+A1/AC:2019, EN 61010-2-030:2010, EN 61557-8:2015 and EN 60529:1991+A1:2000+A2:2013+AC:1993+AC:2016-12+A2/AC:2019-02			
Connections:	Screw terminals: 2.5 mm^2 (multi-stranded), 4 mm^2 (single-stranded)			
Materials:	All plastic materials are self-extinguishing to UL 94 V-0 RoHS: EN IEC 63000:2018			
Horizontal surface impact:	Rated energy level is IK06 (1J)			

Note 1: DC networks also need to take into consideration U_m. Typically low voltage DC networks (sub 100V) will have circuitry that will eliminate the U_m voltage and therefore SIMQ-MKII can not be used in these scenarios.

Note 2: According to IEC 61557-8.

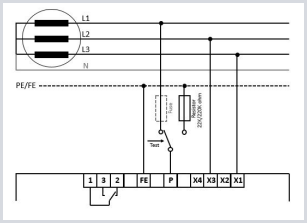
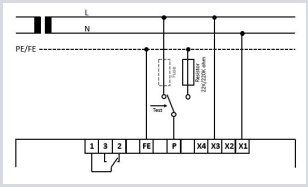
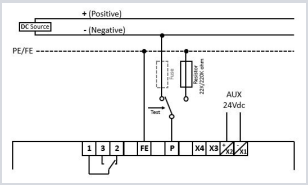
Note 3: The SIM-Q MKII is CE-marked for residential, commercial and light industry plus industrial environment. Regarding approvals, see our homepage, www.deif.com, and search for SIM-Q MKII under the menu Documentation.

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

Note 5: If FE is disconnected from the SIM-Q MKII, the safety is 300 V CAT III.

If U_N > 690 V, over-voltage category must be CAT II.

1.1.8 Connections

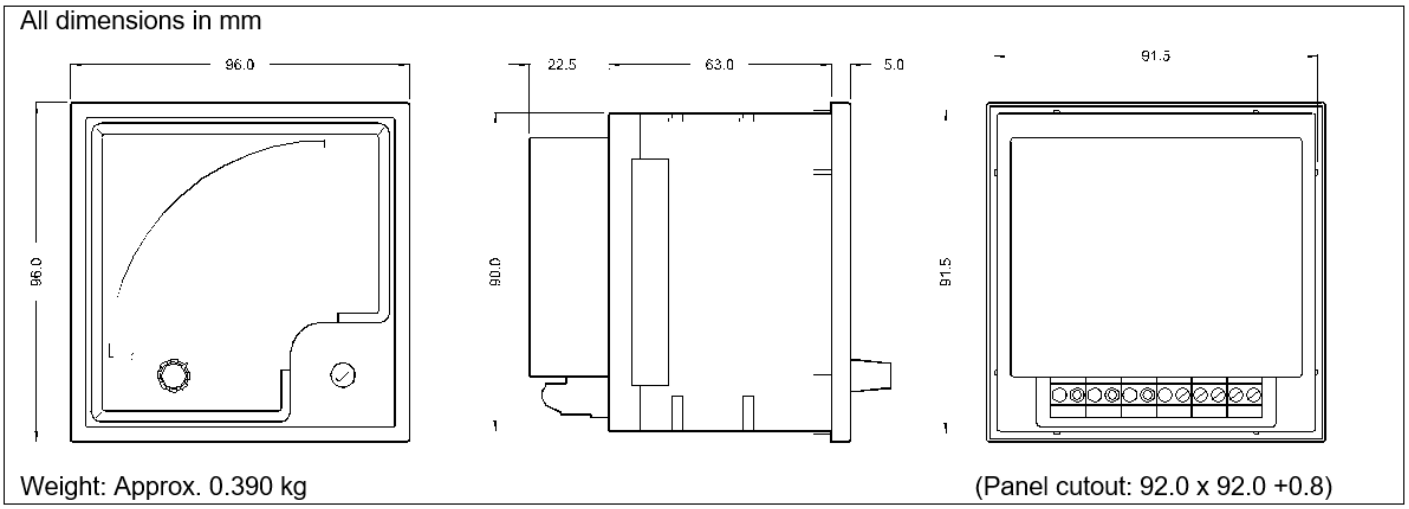
3-phase, AC	1-phase, AC	1-phase, DC
		

Recommended fuse size: max 2 A.

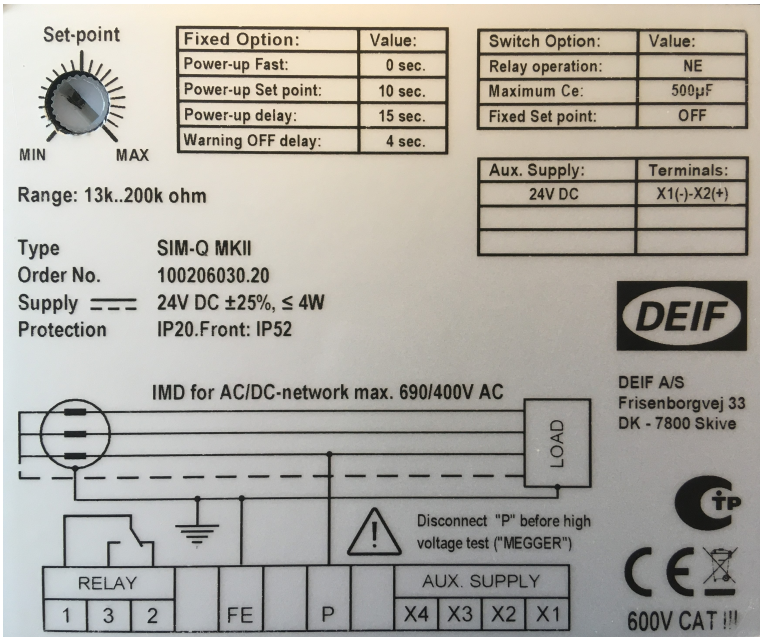
Diagrams above: Typical connection and recommended self-test circuit (according to IEC 61557-8). Use 220 kΩ test resistor for 0 to 10 MΩ range and 22 kΩ test resistor for 0 to 1 MΩ range.

NOTE
SIM-Q MKII insulation monitoring devices shall not be connected in parallel due to the measuring principle. Correct insulation measuring is only possible when only one instrument is connected at a time.

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.
SIM-Q MKII, 24 V DC	01	SIM-Q MKII, aux. voltage 24 V DC	2961740050-01
SIM-Q MKII, 100/110/127 V AC	02	SIM-Q MKII, aux. voltage 100/110/127 V AC	2961740050-02
SIM-Q MKII, 220/230/240 V AC	03	SIM-Q MKII, aux. voltage 220/230/240 V AC	2961740050-03
SIM-Q MKII, 400/450/480 V AC	04	SIM-Q MKII, aux. voltage 400/450/480 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, 100/110/127 V AC	06	SIM-Q MKII, LF, aux. voltage 100/110/127 V AC	2961740050-06
SIM-Q MKII, LF, 220/230/240 V AC	07	SIM-Q MKII, LF, aux. voltage 220/230/240 V AC	2961740050-07
SIM-Q MKII, LF, 400/450/480 V AC	08	SIM-Q MKII, LF, aux. voltage 400/450/480 V AC	2961740050-08
SIM-Q MKII, CUSTOM, 24 V DC	09	SIM-Q MKII, CUSTOM, aux. voltage 24 V DC	2961740050-09
SIM-Q MKII, CUSTOM, 100/110/127 V AC	10	SIM-Q MKII, CUSTOM, aux. voltage 100/110/127 V AC	2961740050-10
SIM-Q MKII, CUSTOM, 220/230/240 V AC	11	SIM-Q MKII, CUSTOM, aux. voltage 220/230/240 V AC	2961740050-11
SIM-Q MKII, CUSTOM, 400/450/480 V AC	12	SIM-Q MKII, CUSTOM, aux. voltage 400/450/480 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

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.