

Type DIM-Q

REPLACEMENT

Insulation monitor

4921230018C

- **Monitoring of insulation resistance on an AC network**
- **Working voltage up to 690V AC, withstands up to 1000V DC**
- **Measuring range 0...1Mohm or 0...10Mohm**
- **Alarm on exceeding the adjusted set point**
- **Interchangeable scales**
- **AC auxiliary voltage**

Application

The DIM-Q is used for supervision of the insulation resistance between an insulated voltage distribution network (IT network) and earth cable/safety cable. The instrument is applicable in conjunction with single phase networks and 3-phase networks with/without neutral for voltages up to 690V AC.

This type of insulation measurement is only carried out on AC networks where the neutral/star point of the generator or supply transformer is **not** earthed.

The DIM-Q can be used for marine installations and other types of insulated voltage networks, e.g. containers.

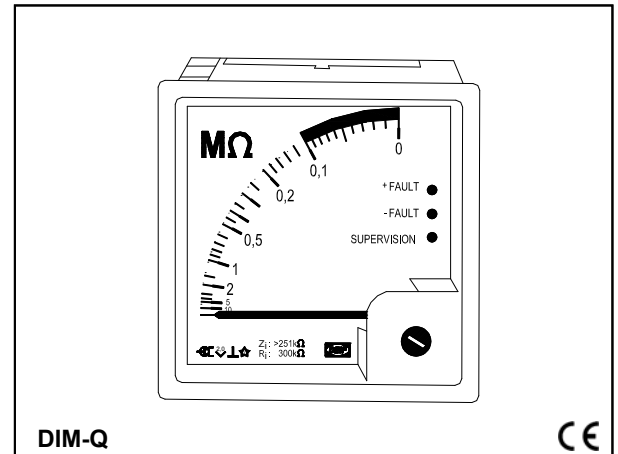
An AC auxiliary voltage is required for the instrument. This may be selected independently of the monitored network, or the DIM-Q can be supplied by the monitored network. If the DIM-Q is supplied from a separate voltage source, the network can also be monitored in power-down condition.

Because of the measuring method used, the DIM-Q is able to measure the insulation correctly on an AC power network containing all kinds of loads, such as frequency converters, valves with rectifiers, thyristor controlled thrusters, switch mode power supplies, transformers, generators etc. The difficulty regarding some of the above-mentioned loads is that an insulation error in e.g. a frequency converter is often located after the rectifier and before the AC output of the converter. This kind of fault will result in a high DC voltage between the power system and the safety cable, which will interrupt the measurement on insulation monitors based on a traditional measuring method.

Measurement

The insulation is monitored between the complete AC network - irrespective of number of wires - and a safety cable.

The measurement is carried out by applying a DC voltage between a point on the safety cable and a point on the AC network. So it is a condition for monitoring of the complete network that the remaining parts are galvanically connected. This is normally achieved via the windings of the generator or the supply transformer and also by the connected loads. If measurement of cables disconnected at both ends is required, the



individual wires are connected mutually by means of choke coils.

Note:

Only one insulation monitor can be connected to the same IT power system.

Measuring principle

The DIM-Q is using the traditional measuring method, superimposing of a DC voltage on the system under supervision, but to be able to handle situations where a DC voltage is imposed on the system, the DIM-Q is performing an automatic DC offset adjustment to eliminate the influence from an external DC voltage.

The internal DC voltage generator is based on a 28V voltage source with an internal resistance >251kΩ. When this test voltage is superimposed on the power system under supervision, leakages between the power system and earth (safety cable) will induce a current, the size of which expresses the insulation resistance.

Indicators

The main indicator is the instrument. Besides the instrument the DIM-Q is equipped with 3 LED indicators, 1 green and 2 red LEDs.

Only the green indicator marked SUPERVISION is lit when the unit is connected to auxiliary supply and no insulation error is detected. If the DIM-Q detects a change in the insulation measurement, the SUPERVISION LED starts flashing with a fast rate. If the insulation error detected is fluctuating, the internal integration time is automatically extended, which is indicated by a slower flash rate. As long as the SUPERVISION LED is flashing, the latest measured value is kept and indicated on the instrument until a new value is found, then the reading on the instrument is updated.

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The 2 red LED indicators marked +FAULT and -FAULT are illuminated, if an insulation error below the set point is detected. If a DC voltage (component) occurs on the system together with an insulation error, the +FAULT or the -FAULT LED is illuminated, indicating the polarity of the DC voltage. This function will indicate the reason for the insulation error. In case only one red LED is illuminated, the fault is to be found in a load with a built-in rectifier, e.g. a frequency converter.

If a DC voltage is detected, but the alarm limit value is not yet reached, the +FAULT or the -FAULT LED will flash to indicate that there is a DC component higher than 50V DC between the power system and earth (PE), but no insulation error below the alarm limit value yet.

Leakage capacitors

The DIM-Q measures the insulation on a power system with total leakage capacitors of max. 50 μ F or of max. 500 μ F.

Response time after a reset

If a leakage capacitor is <1 μ F and the insulation resistance does not fluctuate, the response time will be \leq 10 seconds. For further information on response times - see the table below.

Insulation resistance between P and PE	Leakage capacitor on an IT power system	
	k Ω	50 μ F
0	6 sec.	10 sec.
10	6 sec.	125 sec.
100	200 sec.	1000 sec.
1000	200 sec.	1750 sec.
10000	200 sec.	1750 sec.

If a test button is implemented (see the connection diagram) it is recommended to reset the DIM-Q by disconnecting and reconnecting the auxiliary supply (reset time 1 second) in connection with activation of the test button to obtain a response time of 6 seconds. If the DIM-Q is set to 500 μ F, the response time in connection with a test will likewise be 6 seconds.

Response time on duty

Settings 50 μ F or 500 μ F with actual leakage capacitor 1 μ F:

Step in insulation error

- From 1M Ω to 1k Ω : Response time max. 10 seconds
- From 1k Ω to 1M Ω : Response time max. 10 seconds

Setting 50 μ F with actual leakage capacitor 50 μ F:

- From 1M Ω to 1k Ω : Response time max. 120 seconds
- From 1k Ω to 1M Ω : Response time max. 240 seconds

Setting 500 μ F with actual leakage capacitor 500 μ F:

- From 1M Ω to 1k Ω : Response time max. 800 seconds
- From 1k Ω to 1M Ω : Response time max. 1600 seconds

Note:

If the insulation error is fluctuating (indicated by a flashing SUPERVISION LED), the above response times will be prolonged.

Power-up

The first 15 seconds after a power-up the DIM-Q is turned into a fast measuring mode. This mode is useful when a switchboard test is carried out, or if the set point has to be adjusted to match a test resistor (see above regarding reset of the DIM-Q). After 15 seconds the DIM-Q is automatically turned

into normal measuring mode. If there is a leakage capacitor in the system the DIM-Q will indicate an insulation error for the first 15 seconds after a power-up. If the set point is exceeded the 2 red LEDs will be lit, but the relay output is inhibited for the first 15 seconds after power-up.

Measuring range/scales

1...0M Ω corresponding to 22k Ω at scale centre

10...0M Ω corresponding to 220k Ω at scale centre

The range from the lowest permissible insulation resistance to zero is marked in red, see Fig. 1 and 2.

Scale exchange is possible through a slot in the top of the instrument. The DIM-Q is quickly adapted (by means of a built-in switch) to measuring range 1...0M Ω or 10...0M Ω .

Standard scales

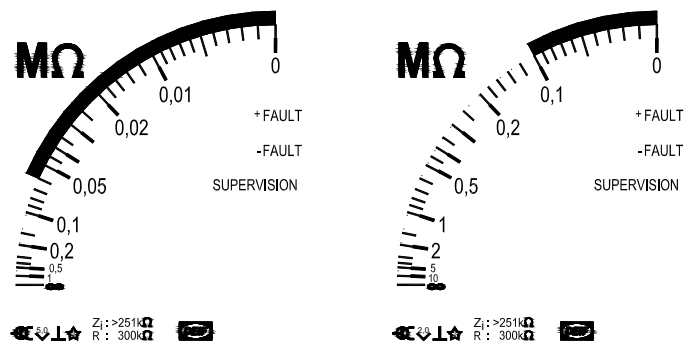


Fig. 1, 1...0M Ω scale

Fig. 2, 10...0M Ω scale

Example:

Fig. 1 above shows a standard 1...0M Ω scale with a standard red section from 0 to 60k Ω .

Fig. 2 above shows a standard 10...0M Ω scale with a standard red section from 0 to 100k Ω .

Red section

1...0M Ω scales	10...0M Ω scales
10...0k Ω	100...0k Ω
11...0k Ω	110...0k Ω
22...0k Ω	220...0k Ω
23...0k Ω	230...0k Ω
38...0k Ω	380...0k Ω
40...0k Ω	400...0k Ω
42...0k Ω	415...0k Ω
44...0k Ω	440...0k Ω
45...0k Ω	450...0k Ω
48...0k Ω	480...0k Ω
60...0k Ω	600...0k Ω
66...0k Ω	660...0k Ω
69...0k Ω	690...0k Ω
	1..0M Ω

In case none of the standard red sections indicated in the table above are applicable for the designer, the required red section must be specified when ordering.

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Relay output

The DIM-Q is equipped with one change-over relay contact. By means of a built-in switch the relay can be configured to either:

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

Limitations

Max. one DIM-Q can be connected for each insulated network. If on the other hand the network is divided into a number of insulated networks, e.g. by means of transformers, one DIM-Q can be installed for each individual group.

Test

If a periodical test function is required, it can be achieved as shown on the connection diagrams. If a value less than the preset limit value is selected as test resistance, alarm is obtained upon activation of the test button. It is recommended to arrange the test button, so the DIM-Q will be reset just before the test is carried out; if not the test time can be as long as 300 seconds with a setting of 50µF and 1750 seconds with a setting of 500µF.

Warning:

If the installation is to be tested by means of a high-voltage "MEGGER", the measuring leads to the DIM-Q at terminal "P" must be disconnected before testing is carried out. Omitting this may result in damage to the DIM-Q, if the test voltage is higher than 1000V AC/DC. Besides the insulation test will be affected by the built-in DC voltage generator impedance (251kΩ).

Set point

The requested alarm limit value is set on an ohm scale on the rear of the instrument (see Fig. 3 below).

Note:

With a setting of 500µF an alarm will stay on until a new measurement is performed. This can take up to 1750 seconds, even if the insulation error has been corrected, so it is recommended to arrange a push-button close to the DIM-Q so a reset can be carried out.

Range "x10" is marked:

The scale values on the ohm scale are multiplied by 10.

Typical setting:

Insulation resistance corresponding to lower limit of the section marked with red on the scale.

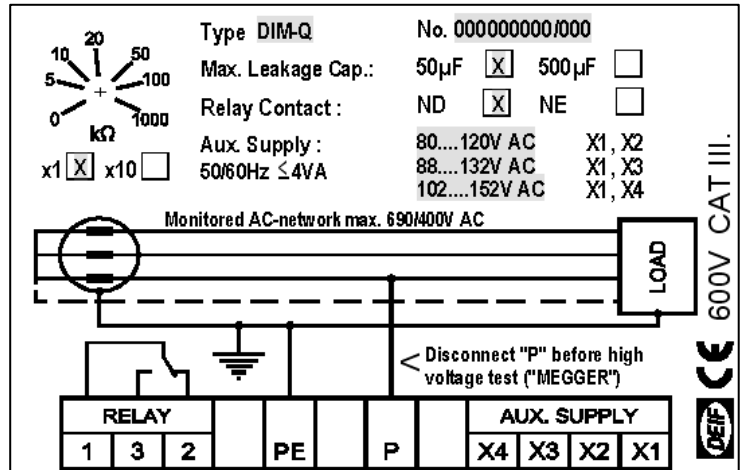
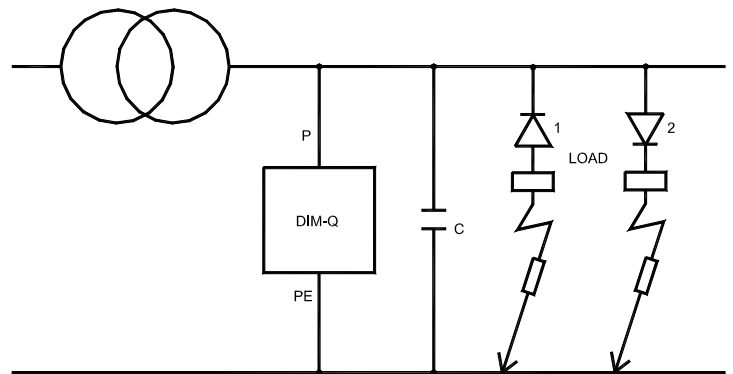


Fig. 3

Illustration of an insulation error in a load with rectifiers



The capacitor marked C illustrates the leakage capacitor.

The P and PE are connectors on the DIM-Q.

The diodes marked 1 and 2 illustrate the rectifier in the load.

If the situation is as illustrated at diode marked 2, the +FAULT LED is illuminated.

If the situation is as illustrated at diode marked 1, the -FAULT LED is illuminated.

Technical specifications

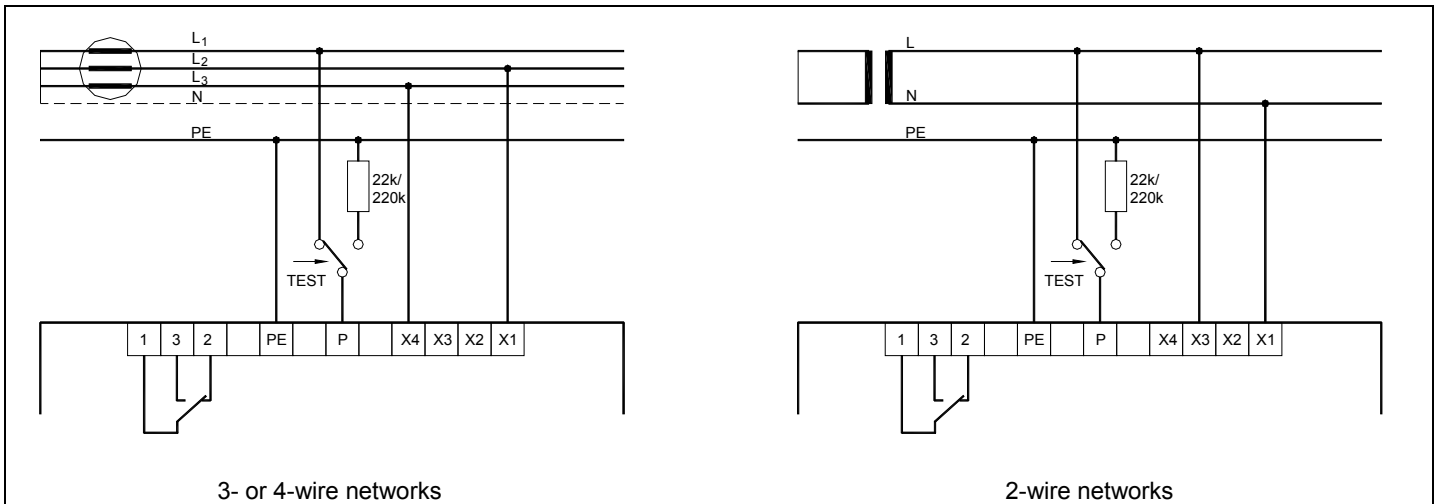
Measuring circuit	DC resistance (R_i):	300k Ω \pm 1%
	AC impedance (Z_i):	251k Ω \pm 1% at 50Hz
	Measuring voltage:	\pm 28V DC \pm 5%
	Mains voltage / leakage cap.:	Max. 690V AC +20% continuously / max. 1000V DC continuously / max. 50 μ F leakage capacitor or max. 500 μ F leakage capacitor
Instrument	Measuring range:	1M Ω / 10M Ω
	- Accuracy:	\pm 5% of scale length (1M Ω) / \pm 2% of scale length (10M Ω)
	- Temperature drift:	Max. 0.5% of scale length per 10°C
	- Aux. supply influence:	Max. 0.2% of scale length at U_s +20...-15% Max. 5.0% at scale centre at U_s -15...-20%
	- Response time:	Depends on the actual insulation error / leakage capacitor (see section <i>Response time</i>)
	Scale:	Exchangeable, with red section
Indicators		
Green LED marked SUPERVISION	The indicator is illuminated when the unit is connected to auxiliary supply and no insulation error is detected. If the DIM-Q detects a change in the measurement, the SUPERVISION LED starts flashing with a fast flash rate. If the integration time is changed to a higher value during the offset procedure, it will be indicated by a slower and slower flash rate. As long as the SUPERVISION LED is flashing, the last reading is kept.	
Red LEDs marked +FAULT -FAULT	AC: Both indicators are illuminated, if a DC potential free insulation error below the set point is detected. If there is a DC component on the system, the +FAULT LED or the -FAULT LED is illuminated, indicating the polarity of the DC voltage. If a DC voltage >50V DC is detected, but the insulation error is higher than the set point, the +FAULT LED or the -FAULT LED will flash to indicate that there is a DC component between the power system and earth (safety cable).	
Relay function	Set point:	0...1000k Ω / 0...10000k Ω corresponding to 22k Ω / 220k Ω at scale centre
	- Accuracy:	\pm 5% of scale length for potentiometer
	- Reproduceability:	\pm 1% of scale length for potentiometer
	- Hysteresis:	\pm 1% of scale length for potentiometer
	- Temperature drift:	Max. 0.2% of scale length for potentiometer per 10°C
	- Voltage drift:	Max. 0.2% of scale length for potentiometer at U_s \pm 20%
	- Response time:	Same as instrument
	Relay output:	Change-over contact
	Contact rating:	AC1: 8A, 250V AC – DC1: 8A, 24V DC AC15: 3A, 250V AC – DC13: 3A, 24V DC Life mechanical: 2 x 10 ⁷ operations Life electrical: 1 x 10 ⁵ operations
Relay coupling:	Normally energized NE or normally de-energized ND	
General technical specifications		
Auxiliary voltage:	100-110-127V AC or 220-230-240V AC or 400-450-480V AC \pm 20% 40...70Hz (\leq 4VA)	
EMC: (See Note 1)	To IEC 61000-6-1, 61000-6-2, 61000-6-3, 61000-6-4, SS4361503 (PL4) and IEC 255-4 (class 3)	
Galvanic separation:	Relay output / measuring circuit / aux. voltage: 3.25kV - 50Hz - 1 min.	
Temperature:	-10...55°C (nominal), -25...60°C (operating), -25...65°C (storage)	
Climate:	Class HUE, to DIN 40040	
Protection:	Instrument: IP52 / IP54. Electronics: IP20. Terminals: IP20. To IEC 529 and EN 60529	
Connections:	Screw terminals: 2.5 mm ² (multi-stranded), 4 mm ² (single-stranded)	
Materials:	All plastic materials are self-extinguishing to UL94 (V0)	

Note 1:

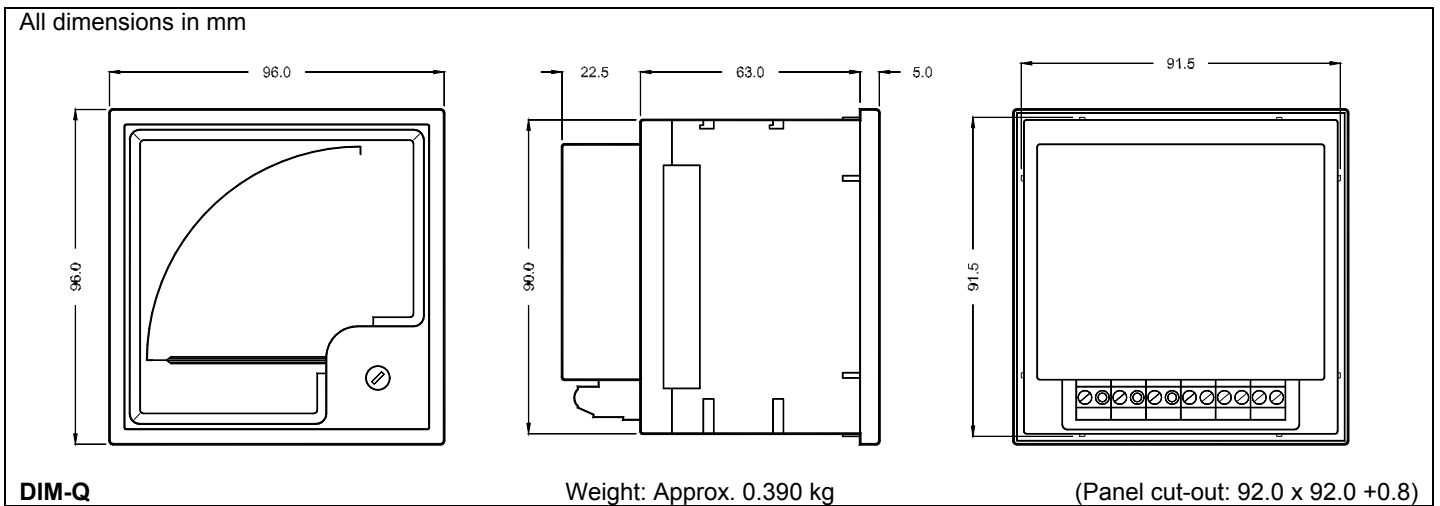
The DIM-Q is CE marked for residential, commercial and light industry plus industrial environment. Regarding approvals, please see our homepage, www.deif.com, search for DIM-Q under the menu Documentation.

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Connections



Dimensions

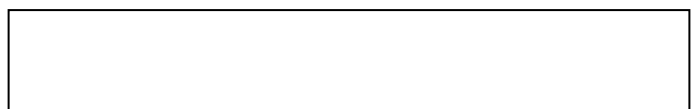


Order specifications

Example:					
Type	Scale range	Red section	Relay NE/ND	Max. leak. cap.	Auxiliary voltage
DIM-Q	1...0MΩ	With	NE	50μF	400V AC

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Due to our continuous development we reserve the right to supply equipment which may vary from the described.



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DEIF A/S, Frisenborgvej 33
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615

E-mail: deif@deif.com, URL: www.deif.com

