

INSTRUCTION MANUAL

BU: EPBP – GPG: DIN Rail Products

Devices for the permanent control of insulation on supply lines for medical locations

ISOLTESTER-DIG-RZ/RS/PLUS





More information than that reported in this manual can be found at the below reported link:

<https://new.abb.com/low-voltage/products/system-pro-m/abb-h-plus-line>

General

ISOLTESTER-DIG is a device for controlling the supply lines of medical practice places (installations with insulated neutral IT-M) which allows the insulation control towards earth of the supply network so as the thermal and electric overload of the transformer.

In such a way it accomplishes what it is required by the specific standards regarding the present applications.

The insulation resistance control is being made by applying a measure signal between the insulated line and the earth. By measuring the current flowing to earth it is possible to supervise the insulation level

The actual state of the art of measures allows the correct measure of the insulation value, even in presence of great disturbances with high harmonic components and direct current components.

The ISOLTESTER-DIG-RZ type uses a direct-current component control signal. In order to reduce the problems generated by the presence of direct current components in the line (presence of rectifiers, etc.,) this device is fitted with a digital filter capable to identify the direct current component of the measure from other direct current components present in the line possibly.

To avoid that some noises of the network influencing the device's operation, the ISOLTESTER-DIG-PLUS uses a codified signal. In this way, any level of noise does not influence the measure. This version can be installed also in direct current network. ISOLTESTER-DIG have a wide range of programming with the front keys and the digital LED type display of 3 digits for visualising of measuring and programming parameters.

The instrument is fitted with 2 temperature inputs (one of them is optional) for thermal probes PT100 or PTC (DIN 44081) type, for controlling the thermal overload of the insulation transformer, and 1 measuring current input, by an external CT, for controlling the line's overload.

The outputs can be used with the remote signalling panels type QSD-DIG230/24. There is a relay output programmable by the user.

In ISOLTESTER-DIG-PLUS/RS there is one RS485 serial port output for a bidirectional communication with a control system (PLC, PC, etc.). The communication protocol is the MODBUS-RTU (see specific manual).

The instrument complies with the following standards: EN 61557-8 – Annex A / IEC 60364-7-710 / CEI 64.8/7-710 V2 / UNE 20615

Code	Model	Voltage [V]	Frequency [Hz]	Firmware version
2CSM244000R1501	ISOLTESTER-DIG-RZ	115-230	50-60	51.L
2CSM341000R1501	ISOLTESTER-DIG-PLUS	115-230	50-60	55.A
2CSM256833R1521	ISOLTESTER-DIG-RS	115-230	50-60	54.A

Accessories

Remote flush-mounted signal panel (universal box E503) type **QSD-DIG 230/24**.

Installation

The installation must be carried out “in absence of voltage” by qualified and authorized personnel only. Before installing, make it sure that the instrument has not suffered any damage due to transport. It has to be verified that the supply voltage is compatible with the product’s defined supply voltage.

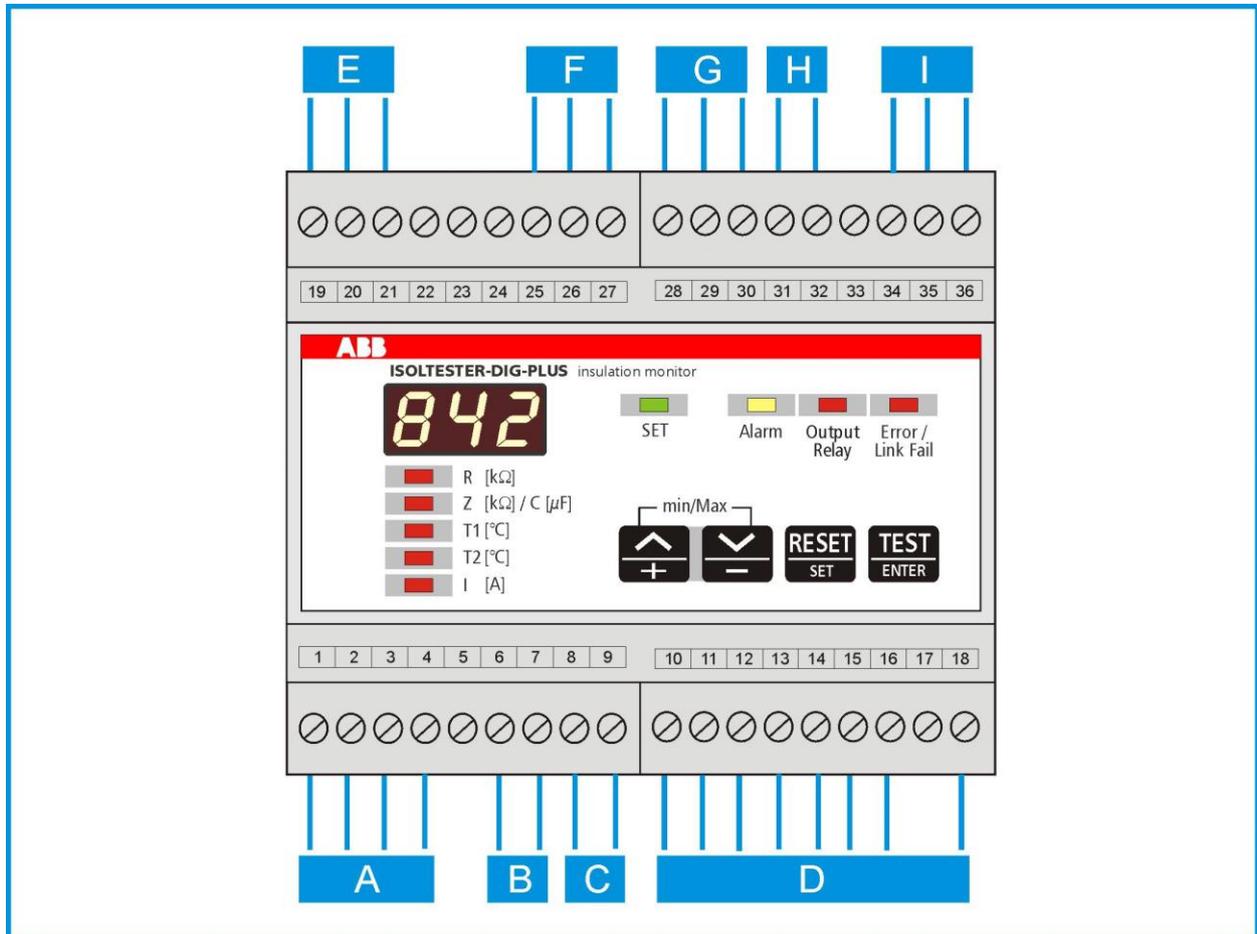
Each independent line can use one control device only.

The modular instrument (6 modules 17,50mm) is fitted of sealable transparent cover, to be mounted on DIN rail mounting 35mm.

Wiring diagram

Connecting terminals

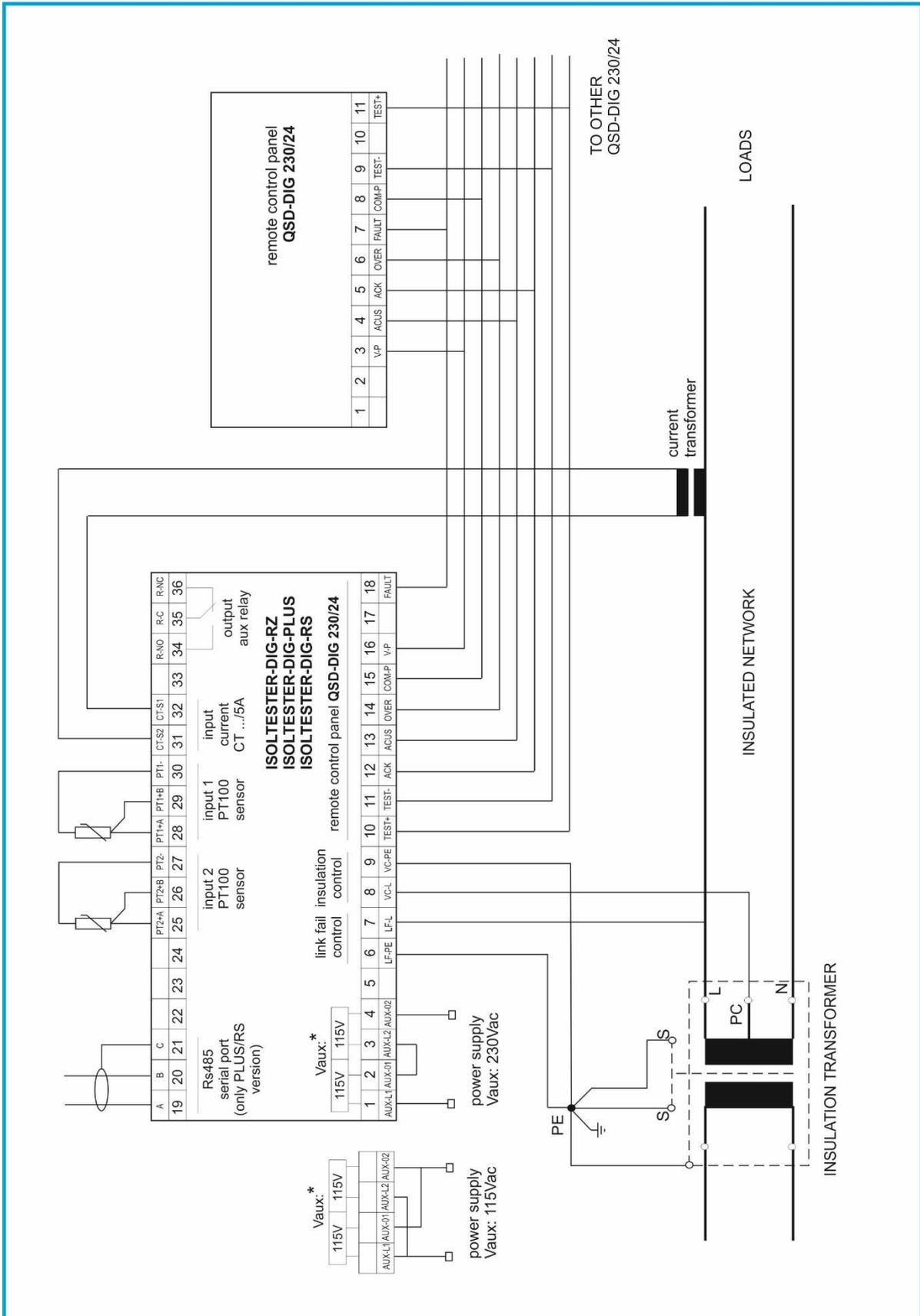
(only PLUS/RS)



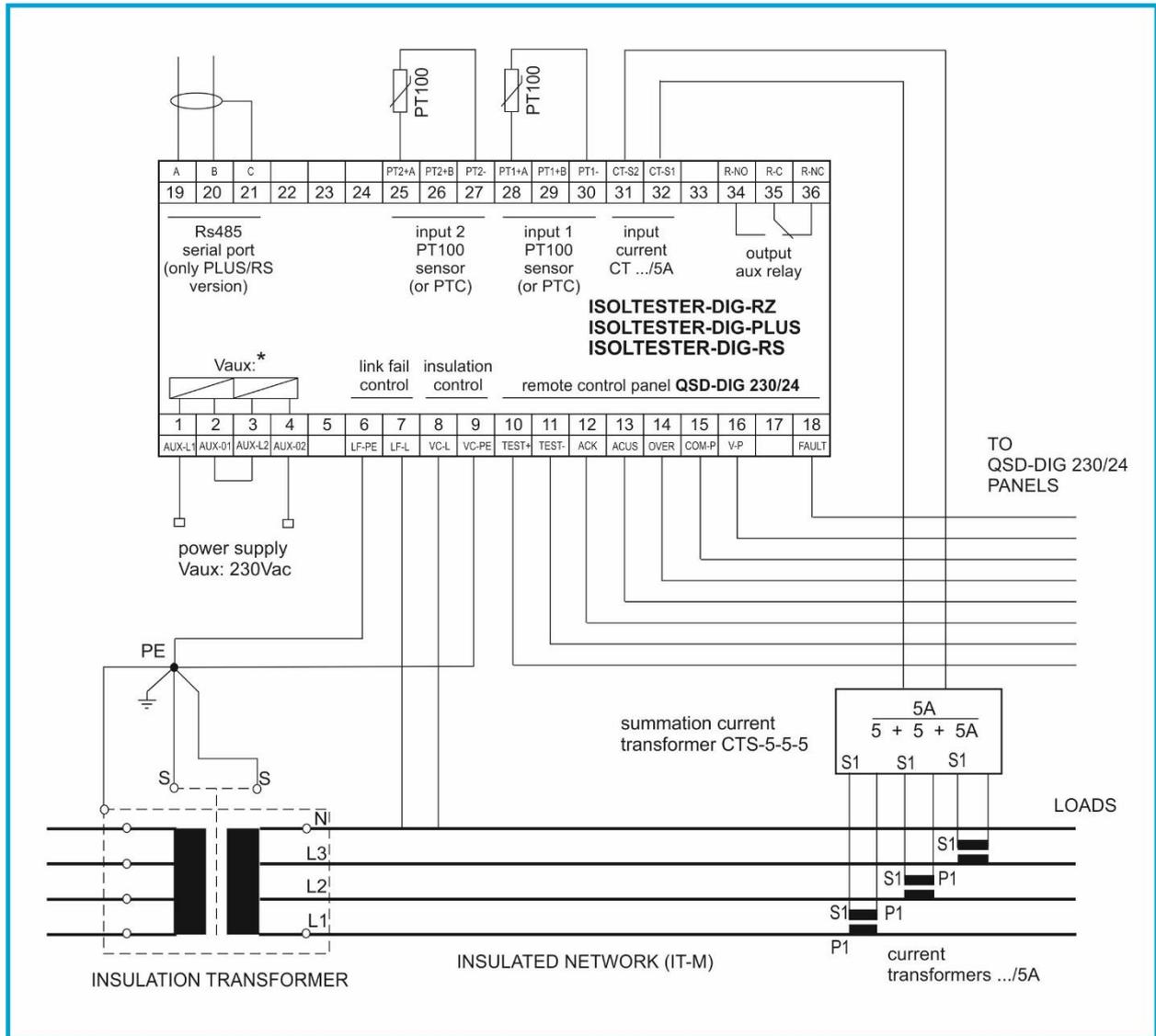
- A. Auxiliary power supply (rated voltage 115 / 230V 50-60Hz)
- B. Link fail function input (permanent control of network connection)
- C. Measure input for resistance and insulation impedance
- D. Connection to remote signal panels type QSD-DIG230/24
- E. Serial port RS485 (only ISOLTESTER-DIG-PLUS/RS)
- F. Thermal probe input 2 for PT100 or PTC
- G. Thermal probe input 1 for PT100 or PTC
- H. Current measuring input with external current transformer .../5 A

- I. Programmable auxiliary relay output (changeover contact 250V 5A)

Wiring diagram for single phase IT-M lines with insulating transformer and central intake of the secondary

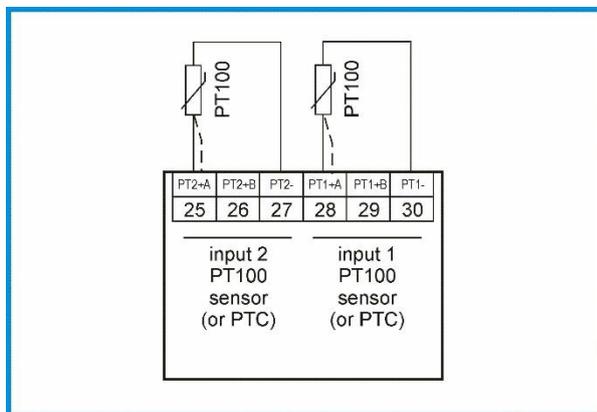


Wiring diagram for three phase IT-M lines

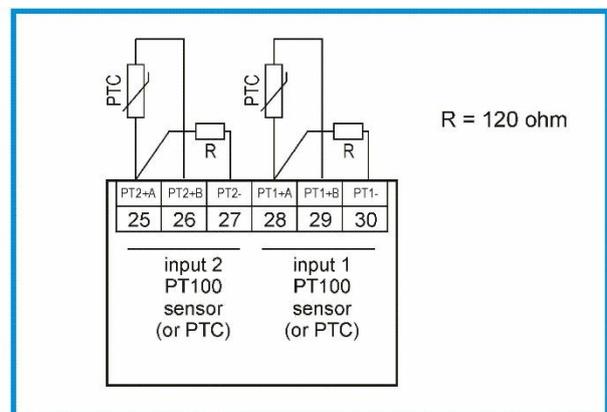


Wiring diagram for thermal probes

PT100 type



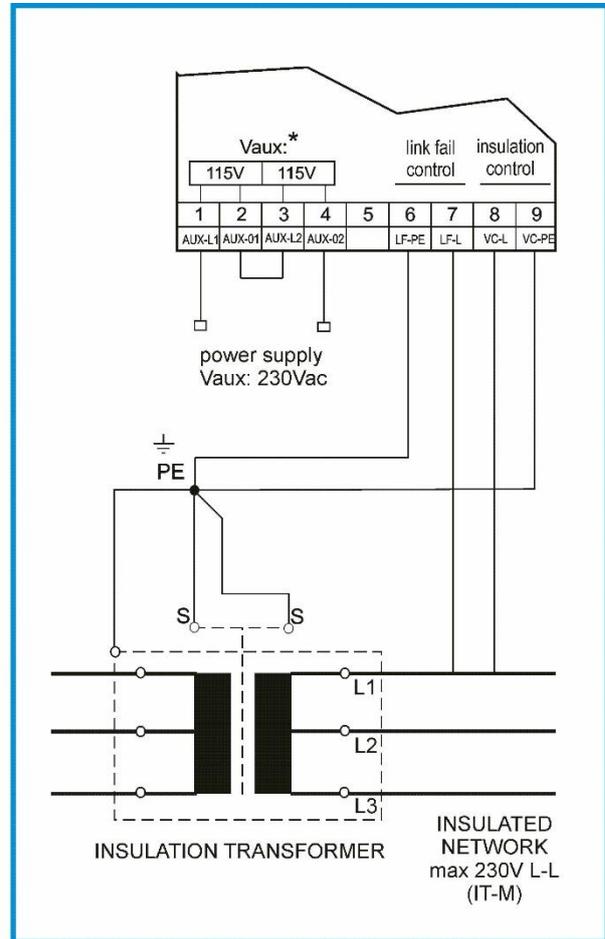
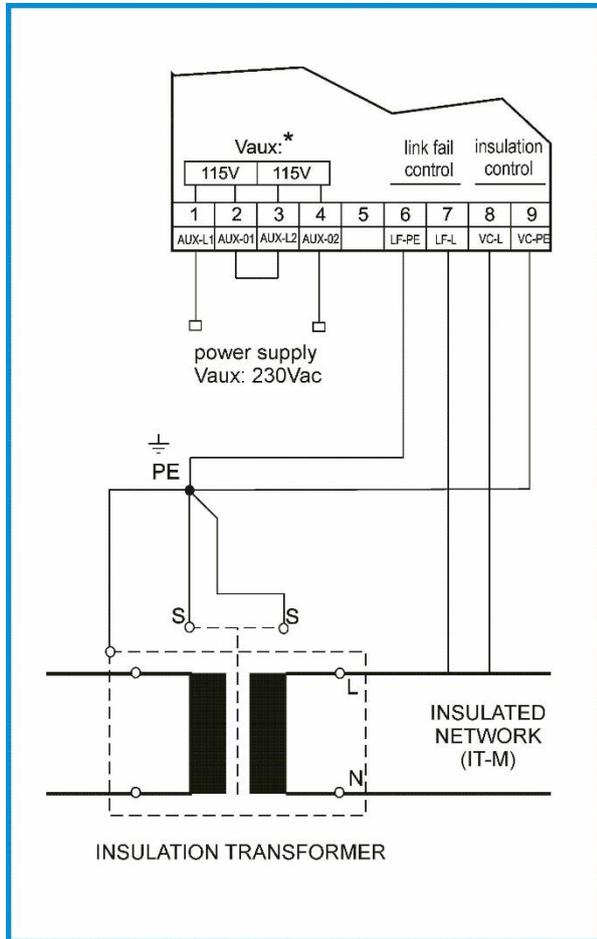
PTC type



Wiring diagram for measuring section

Single phase IT-M lines with transformer without central tap on secondary

Three phase IT-M lines without neutral



Wiring diagram description

Auxiliary power supply

Terminals 1-2-3-4

The section of power supply is made with double input 115 V of rated voltage ($110 \div 127 \text{ V } -15\% +10\%$).

To supply the instrument with 230 V, connect the two sections in series ($220 \div 240 \text{ V } -15\% +10\%$).

To supply the instrument at 115 V connect the two section in parallel.

Link fail control

Terminals 6-7

The two terminals must be connected between one phase of the insulated line and the equipotential node (PE). The maximum voltage is 250 V (see insulation control).

Insulation control

Terminals 8-9

The two terminals must be connected between the centre tap of the transformer or to one phase of insulated line and the equipotential node (PE)

The maximum voltage is 230 V AC for ISOLTESTER-DIG-RZ and 250 V AC/DC for ISOLTESTER-DIG-PLUS/RS. Consequently the single phase network could be 230V (250), the three-phase 3 wires 230 V phase-phase, whilst the three-phase 4 wires will be max. 230 V phase-neutral.

Connection to remote signal panel type QSD-DIG 230/24

Terminals 10-11-12-13-14-15-16-18

The maximum voltage on these conductors is 24 V.

RS485 serial port (only ISOLTESTER-DIG-PLUS/RS)

Terminals 19-20-21

The serial bus is on the A-B terminals (19-20), the C terminal (21) is a ground signal that can be connected to the RS485 shield (if present). MODBUS-RTU is the standard used protocol (see the relative manual).

Thermal probe input 2

Terminals 25-26-27

It's possible to use PT100 (EN 60751) or PTC (DIN 44081) sensor type.

If PT100 with 3 wires is used, it is required to connect a compensation conductor at the same probe terminal.

With the PTC it's necessary to use an external resistor of 120 Ω min $\frac{1}{4}$ W.

Thermal probe input 1

Terminals 28-29-30

It's possible to use PT100 sensor (EN 60751) or PTC sensor (DIN 44081).

If PT100 with 3 wires is used, it is required to connect a compensation conductor at the same probe terminal.

With the PTC it's necessary to use an external resistor of 120 Ω min $\frac{1}{4}$ W.

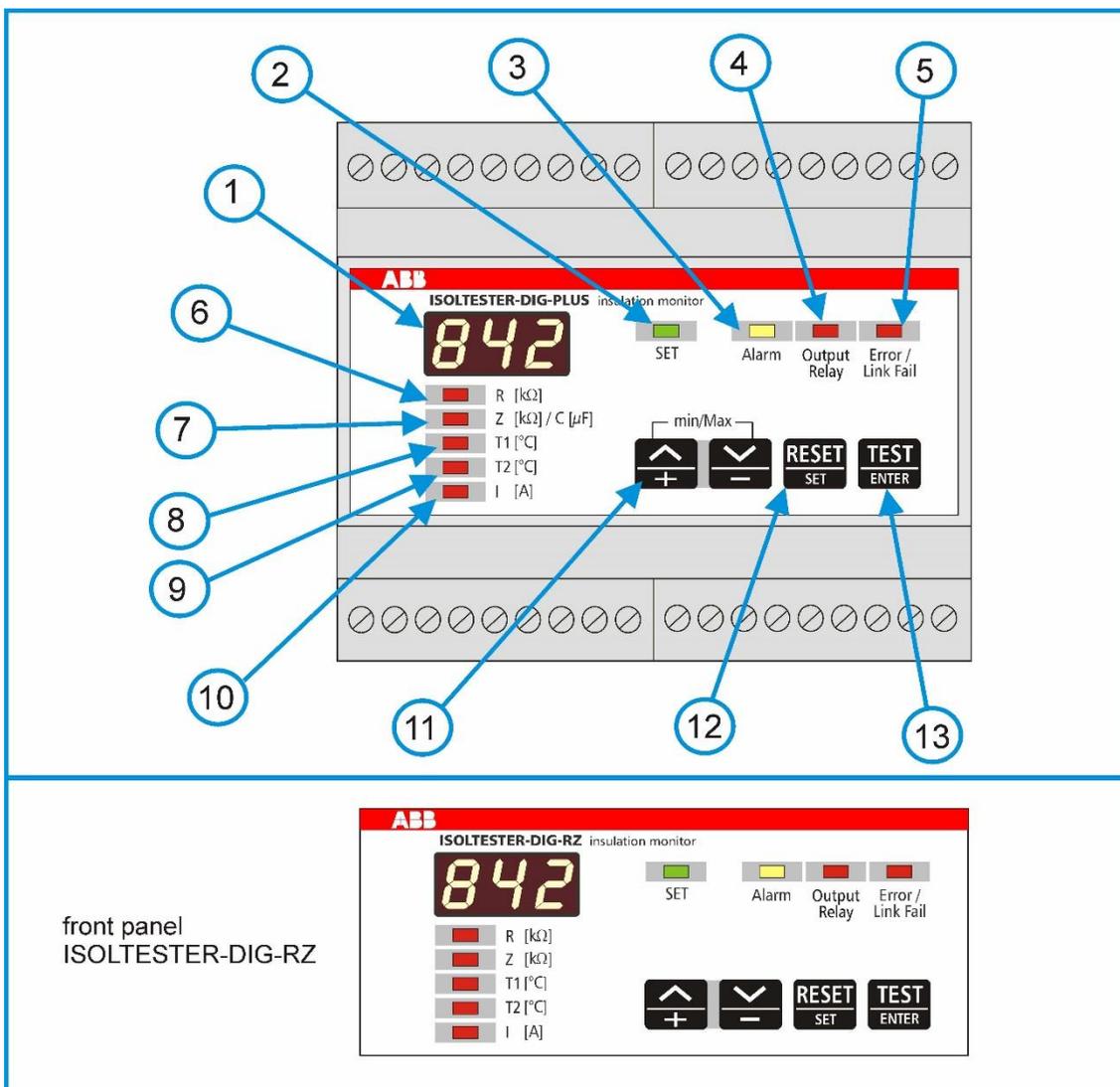
Measuring current input
Terminals 31-32

Connection to external current transformer with secondary 5 A (the transformation ratio is programmable). The current is measured in absolute value: A possible inversion of S1-S2 is not of great importance.

Output auxiliary relay
Terminals 34-35-36

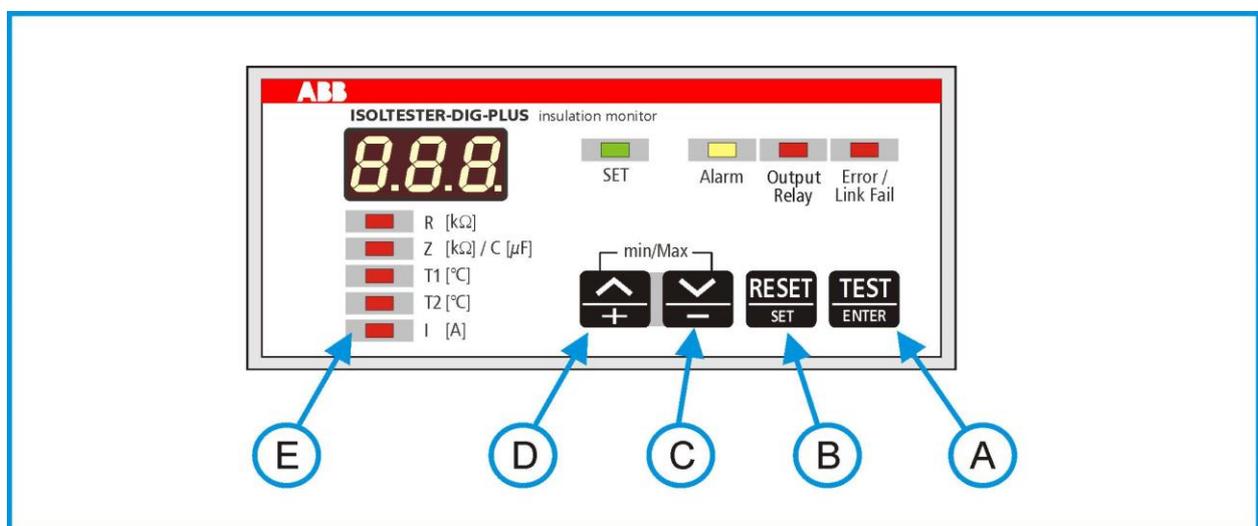
Voltage free changeover contact with programmable functions. Contact range: 250V 5A resistive load.

Indications and buttons description



1. Display to visualise the settings and the parameters under the control
2. Green SET LED to signal the instrument programming condition
3. Yellow ALARM LED to signal the alarm of parameter value beyond of threshold
4. Red LED OUTPUT RELAY to signal the condition of the auxiliary relay
5. Red LED ERROR / LINK FAIL to signal the alarm of internal failure, lack of connection of the line under control, thermal probe type PT100 open or in short circuit
6. Red LED R to signal the visualisation of the insulation resistance parameter (k Ω); flashing led if the parameter is beyond of threshold
7. Red LED Z to signal the visualisation of the insulation impedance C (only for ISOLTESTER-DIG-PLUS version), also with line capacity, flashing led if the parameter is beyond of threshold)
8. Red LED T1 to signal the visualisation of the transformer's temperature parameter, flashing led if the parameter is beyond of threshold
9. Red LED T2 to signal the visualisation of the temperature parameter of the second probe, flashing led if the parameter is beyond of threshold
10. Red LED I to signal the visualisation of the line's current, flashing led if the parameter is beyond of threshold
11. +/- | UP/DOWN keys to select the parameter to display, to configure the setting of the instrument and to visualise the maximum and minimum values stored.
12. RESET | SET key to accede to the instrument programming, to silence the alarms and to delete the values stored
13. TEST | ENTER key to test the instrument and the QSD-DIG230/24 remote signal panel; to confirm the settings of the SETUP

Key functions and programming description



Key functions

With normal operation the + and – keys (**D** and **C**) allows to select the parameter to be visualized on the display and indicated by **E** led.

ATTENTION: if a measure is not enabled (for example the T2 temperature input is not enabled), the relative LED will remain off. If only the resistance measure is enabled, the visualisation will be fixed.

The visualisation of the capacity line C (only ISOLTESTER-DIG-PLUS version) follows the visualisation of the impedance Z and it's indicated with the blinking of the message CAP (cap) alternating with the measure. After 8 seconds without pressing any key, the visualisation comes back, automatically, to the impedance Z.

The **B** key allows silencing the acoustic signalling of the connected QSD-DIG230/24 panels. The function is the same as the SILENCE function in the remote panels.

In minimum and maximum visualisation mode this key allows the deleting of stored values (only ISOLTESTER-DIG-PLUS/RS version).

The **A** (TEST) key allows the functional test of the instrument simulating a low insulation: holding pressed the key it will appear on the display the simulated value of insulating resistance that it will go down (up to 0) causing the alarm trip for low resistance. The instrument comes back to the effective measure value when the key is released.

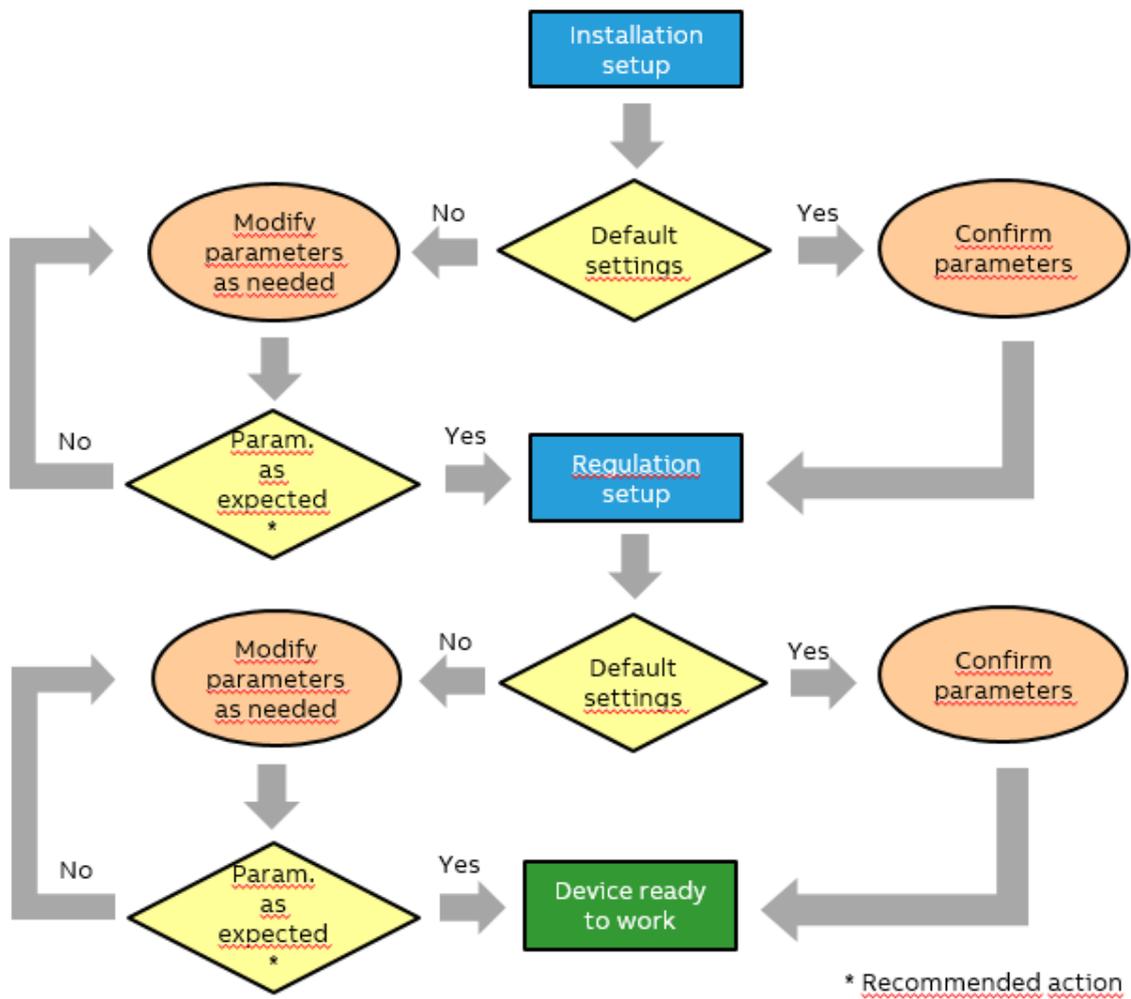
The visualization of minimum and maximum measured values of the different monitored electrical parameters is only possible with ISOLTESTER-DIG-PLUS/RS.

By pressing at the same time the **D – C** keys will accede to the visualisation of the minimum and maximum memorised values that will be displayed with a continuous flashing. With the **C** key it is possible to visualise the values of the various parameters.

During the visualisation of the maximum and minimum values, it's possible to reset the memorised values, by pressing the **B** key (RESET): keep pressed the key during 3 seconds at least, until the message **RES (RES)** appears on the display in order to confirm the cancellation. To escape from the minimum and maximum visualisation it's necessary to wait 8 seconds without pressing any key.

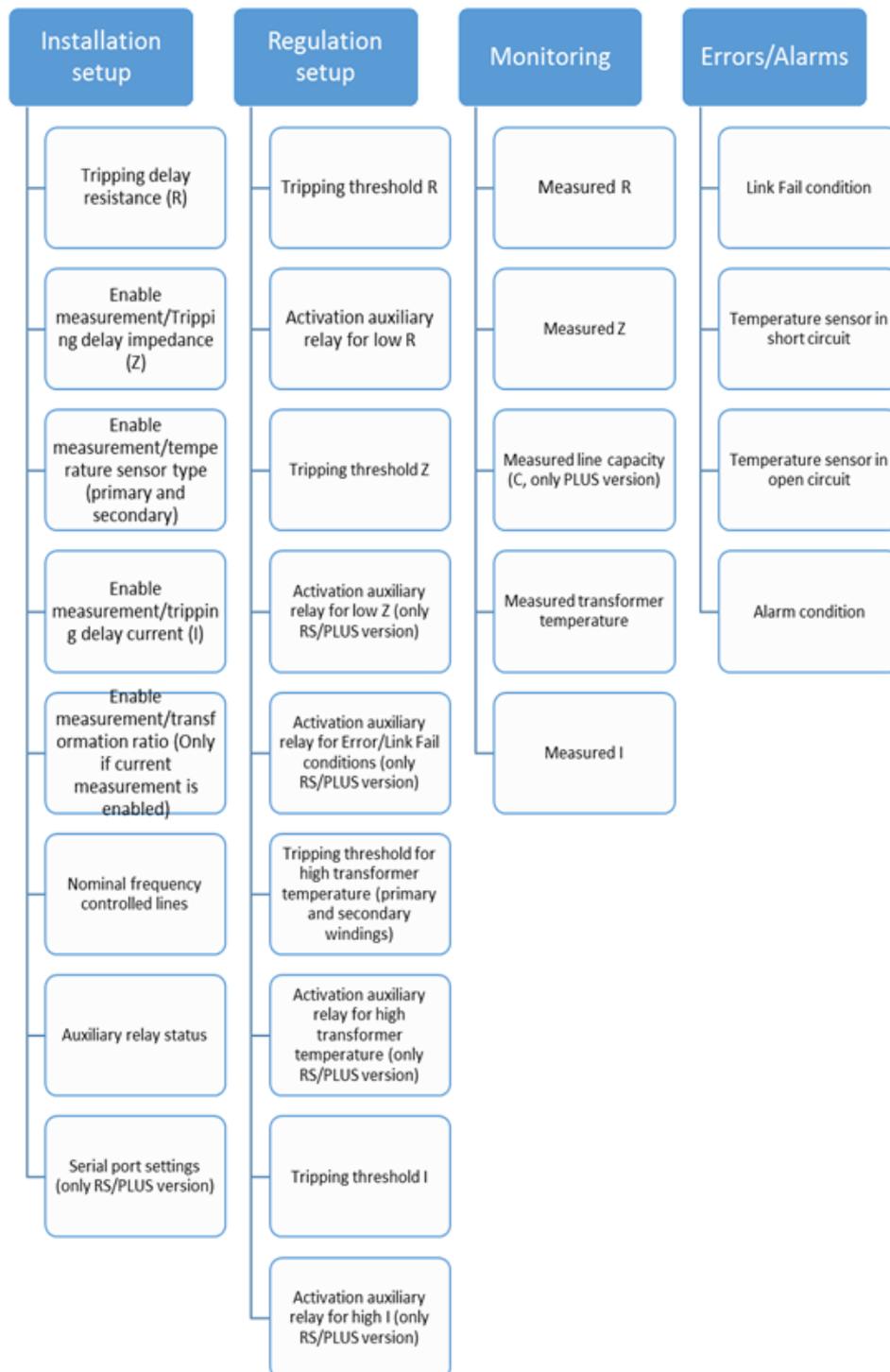
Operative steps

Below it is reported a flow diagram showing recommended steps and actions to be done in order to verify if the device is working as expected.



Programming

The SETUP menu (programming) is subdivided in two sections: in the first one it's possible to set the condition of basic functioning (installation), whilst in the second it is possible to set the tripping threshold levels and the activation mode of the auxiliary relay (regulation).



Menu setup

Installation

To enter the installation **SETUP** press the **C - B (SET / -)** keys simultaneously for **at least 3 seconds**. The glowing of the LED **SET** confirms the entrance in the SETUP. It's possible to modify the parameters setting with the **A-B** keys. Press the **A** key (**ENTER**) to confirm. The setup is cyclic: after the last parameter, the setup comes back to the first.

To escape from the **SETUP** it's necessary to wait 8 seconds without pressing any key.

Press **A** or **B** keys to increase or decrease the values respectively (the variation is being made unit by unit). In order to speed up the operation, keep the **B** or **C** keys pressed, the variation will be made by tens and hundreds. To increase or decrease the value by unit, it is necessary to release and to press the key again.

The OFF selection is selectable under the minimum of the scale of the parameter's setting. The indication of the parameter's setting blinks alternatively with a help message.

Function	Signalling	Setting (default)	Display indication		
			Parameter	Flash	
Tripping delay	low insulation resistance	led SET + led R	<u>1</u> ÷ 4 seconds	0...4	DLY
Measure enabling / trip delay	low insulation impedance	led SET + led Z	<u>off</u> / 1 ÷ 4 seconds	Off 0...4	DLY
Measure enabling / probe type	temperature input T1:	led SET + led T1	<u>off</u> / PTC / PT100	OFF pTc pT1	MOD
Measure enabling / probe type	temperature input T2:	led SET + led T2	<u>off</u> / PTC / PT100	OFF pTc pT1	MOD
Measure enabling / trip delay	high current I	led SET + led I	<u>off</u> / 1 ÷ 60 seconds	Off 0...60	DLY
Measure enabling / transformation rate	external current transformer	led SET + led I	<u>off</u> / 1 ÷ 40	Off 1...40	CT
Nominal frequency network under control		led SET	<u>50</u> / 60 Hz	50_ / 60_	FRE
Not activated auxiliary relay status	Fail Safe function	led SET + led OUPUT RELAY blinking	<u>De-energized</u> / excited (fail safe on)	NOP / NCL	SET

	address network	led SET	<u>1</u> ÷ 255 Id address	1 ... 255	ID
Serial port setting (only PLUS/RS version)	baud rate	led SET	<u>2400</u>	2.40	BDR
			4800	4.80	
			9600	9.60	
			<u>19200</u> baud	19.2	
parity, data bit, stop bit	led SET	<u>none,8,1</u>	N81	PAR	
		none,8,2	N82		
		even,8,1	E81		
		odd,8,1	O81		

The default parameters are underlined.

The meaning of the delay for the resistance and the insulation impedance is an elaboration time for the internal filter. This time could be increased in presence of strong disturbances in the line under control.

Regulation

To enter the configuration SETUP keep pressed the **B key (SET)** for at least **3 seconds**.

It's possible to modify the parameters setting with the **A-B** keys. Press the **A key (ENTER)** to confirm. The setup is cyclic: after the last parameter, the setup comes back to the first.

To escape from the **SETUP** it's necessary to wait 8 seconds without pressing any key.

Press **A** or **B** keys to increase or decrease the values respectively (the variation is being made unit by unit). In order to speed up the operation, keep the **B** or **C** keys pressed, the variation will be made by tens and hundreds. To increase or decrease the value by unit, it is necessary to release and to press the key again.

Function (if activated)	Signalling	Configuration (<u>default</u>)	display indication	
			Parameter	Flash
Tripping threshold insulation resistance low	led R	<u>50</u> ÷ 500 kΩ	50...500	SET
Auxiliary relay activation for low resistance (only PLUS version)	led R + led OUTPUT RELAY flashing	<u>off</u> / on	ON / Off	REL
Tripping threshold low insulation impedance	led Z	<u>off</u> / 50 ÷ 500kΩ	OFF / 50...500	SET

Auxiliary relay activation for low impedance(only PLUS/RS version)	led Z + led OUTPUT RELAY flashing	<u>off</u> / on	ON / Off	REL
Auxiliary relay activation for error condition and Link Fail	led OUTPUT RELAY + led ERROR/LINK FAIL flashing	<u>off</u> / on	ON / Off	REL
Tripping threshold high temperature T1:				
If PT100 selected	led T1	<u>off</u> / 20 ÷ 200 °C	OFF / 20...200	SET
If PTC selected	led T1	<u>off</u> / on	ON / Off	REL
Auxiliary relay activation for high temperature T1(only PLUS/RS version)	led T1 + led OUTPUT RELAY flashing	<u>off</u> / on	ON / Off	REL
Tripping threshold high temperature T2:				
If PT100 selected	led T2	<u>off</u> / 20 ÷ 200 °C	OFF / 20...200	SET
If PTC selected	led T2	<u>off</u> / on	ON / Off	REL
Auxiliary relay activation for high temperature T2 (only PLUS/RS version)	led T2 + led OUTPUT RELAY flashing	<u>off</u> / on	ON / Off	REL
Tripping threshold high current I	led I	<u>off</u> / 00,0 ÷ 99,9 A	OFF / 00.0...99.9	SET
Auxiliary relay activation for high current I (only PLUS/RS version)	led I + led OUTPUT RELAY flashing	<u>off</u> / on	ON / Off	REL

The default parameters are underlined.

In order to come back to default settings when the instrument is being switched on press the **TEST** and **RESET** keys simultaneously to come back to the default value for all SETUP. After 4 seconds it will appear the following messages: DEF, VAL, INI, YES (DEF, VAL, INI, YES). When the instrument is switched on again, the SETUP parameters will come back to default values.

Operation of the device

In the normal condition of operation the instrument shows the measure of the selected parameter. It is possible to select all of available measurements (if enabled) with the + / - keys. By pressing + / - keys simultaneously it will enter the maximum and minimum visualisation and it is possible to see the measurement flashing on the display.

If the probes used are PTC the value showed will be only TLO (low temperature), HOT (temperature near to the tripping threshold) or THI (high temperature).

If a measured parameter exceeds the maximum end-scale, on the display it will appear the message HI_ (hi_ HIGH).

The OUPUT RELAY led will glow only if the auxiliary relay is activated.

The visualisation of the enabled measure parameters could be substituted by an error message (the ERROR /LINK FAIL LED glows). The signalling are the following:

Measured parameter (if activated)	Visualisation		Error condition (Led ERROR)	Visualisation	
	Led	Display		Led	Display
Insulation resistance	led R	0...999 / HI_ 0...999 / HI_		led R	LF_ LF_
Insulation impedance	led Z	0...999 / HI_ 0...999 / HI_	Link Fail	led Z	LF_ LF_
Line capacity (only PLUS version)	led Z	0...9,90/HI_ 0...999/HI_	CAP CAP	led Z	LF_ LF_
T1 temperature (PT100)	led T1	0...200 / HI_ 0...200 / HI_	probe in short circuit	led T1	SHr (short) SHR
T1 temperature (PT100)	led T1	0...200 / HI_ 0...200 / HI_	probe open circuit	led T1	OPE (open) ope
T1 temperature (PTC)	led T1	TLO / HOT / THI TLO / HOT / THI	-	-	- -
T2 temperature (PT100)	led T2	0...200 / HI_ 0...200 / HI_	probe in short circuit	led T2	SHr (short) SHR
T2 temperature (PT100)	led T2	0...200 / HI_ 0...200 / HI_	probe open circuit	led T2	OPE (open) ope
T2 temperature (PTC)	led T2	TLO / HOT / THI TLO / HOT / THI	-	-	- -
Current I	led I	0...99,9 / HI_ 0...99,9 / HI_	-	-	- -

The glowing of the LED ALARM indicates the condition of a parameter beyond threshold. The LED of the signalled parameter will flash if the visualisation is not selected. The signalling are the following:

Measured parameter (if activated)	Visualisation	Alarm conditions			
		Display	Flashing signalling		
Insulation resistance	led R	50...999 / HI_ (high) 50...999 / HI_	0 ... 499 0...499	led R	ALR ALR
Insulation impedance	led Z	0...999 / HI_ (high) 0...999 / HI_	0 ... 499 0...499	led Z	ALR ALR
Line capacity (only PLUS version)	led Z	0...9,90 / HI_ CAP 0...9,90/hi_ CAP	-	-	-
T1 temperature (PT100)	led T1	0...200 / HI_ (high) 0...200 / HI_	30...200 / Hi_ 30...200 / HI_	led T1	ALR ALR
T1 temperature (PTC)	led T1	TLO (low temp.) / HOT TLO / HOT	THI (high temp.) THI	led T1	ALR ALR
T2 temperature: (PT100)	led T2	0...200 / HI_ (high) 0...200 / HI_	30...200 / Hi_ 30...200 / HI_	led T2	ALR ALR
T2 temperature: (PTC)	led T2	TLO (low temp.) / HOT TLO / HOT	THI (high temp.) THI	led T2	ALR ALR
Current I	led I	0...99,9 / Hi_ (high) 0...99,9 / Hi_	1...99,9 / Hi_ 1...99,9 / Hi_	led I	ALR ALR

NOTES:

Enabling measurements

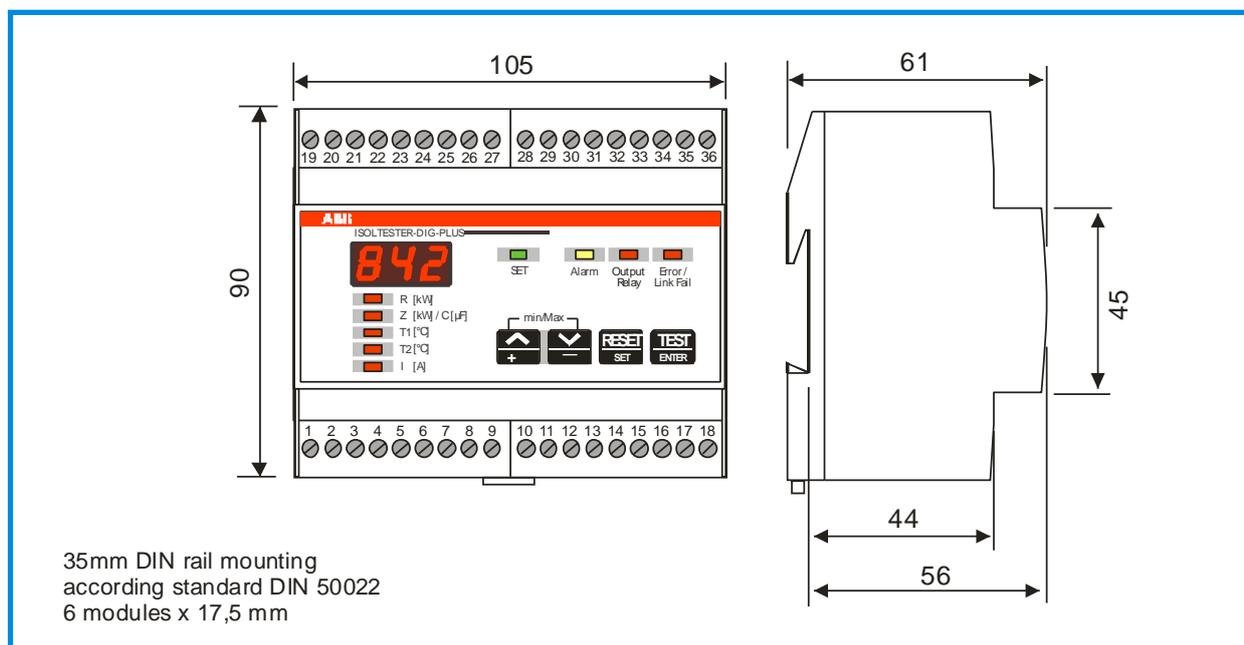
If the measurements are not enabled in the installation SETUP, the insulation resistance R is the only measured parameter always enabled. In this condition no modification will be done by pressing the + and – key.

Limits of the impedance measure with the ISOLTESTER-DIG-RZ/RS type

The insulation impedance measured Z is not required by the standards of reference for insulation controllers.

In presence of disturbances in the network under control, the insulation impedance measurement might be not reliable (by the presence of high harmonic components at the control signal frequency of 2500Hz). In this condition it is advised to avoid enabling the tripping threshold on the impedance or to use the ISOLTESTER-DIG-PLUS type that has a sophisticated control system, which is not influenced by the network disturbances.

Overall dimensions



Technical features

Name	Description
Auxiliary supply voltage	115 - 230 V 50-60Hz (110÷127V / 220÷240V -15% +10%)
Maximum consumption	5 VA
Voltage of the line under control	ISOLTESTER-DIG-RZ: 24÷230 V 50-60 Hz ISOLTESTER-DIG-PLUS/RS: 24÷250 V 50÷400 Hz / dc
Maximum measuring current	1 mA
Maximum measuring voltage	24V
Control signal type	ISOLTESTER-DIG-RZ/RS: direct component with digital filter ISOLTESTER-DIG-PLUS: codified signal
Internal impedance	200 kΩ
Insulation measure	0 ÷ 999 kΩ / HIGH - resolution 1 kΩ, accuracy 5% ± 1 digit

Impedance measure	0 ÷ 999 kΩ / HIGH - resolution 1 kΩ, accuracy 5% ± 1 digit ISOLTESTER-DIG-RZ/RS:(test signal 2500 Hz) ISOLTESTER-DIG-PLUS: (test signal variable)
Temperature measures	2 inputs from thermo probe type Rd PT100 at 2 or 3 wires - 0÷200°C, - resolution 1°C, accuracy 2 % ± 1 digit - or from PTC (DIN 44081)
Current measure	from external CT with secondary 5A , accuracy 5% ± 1 digit, (transformation ratio value 1÷40)
Capacity measure	ISOLTESTER-DIG-RZ/RS: - ISOLTESTER-DIG-PLUS: 0 ÷ 9,9 μF, resolution 0,1 μF
Tripping threshold	low insulation resistance 50÷500 kΩ - hysteresis 10% - delay settable, automatic reset – typical tripping delay: 3 seconds, max 8 seconds
	low insulation impedance (possible to unable) 50 ÷ 500 kΩ - hysteresis 10% - delay settable, automatic reset – typical tripping time:3 seconds, max 8 seconds
	over temperature input 1 (possible to unable) 30÷200°C with PT100 - hysteresis 10%, automatic reset - (with PTC depending on the probe)
Diagnostic signalling	over temperature input 2 (possible to unable) 30 ÷200°C with PT100 - hysteresis 10%, automatic reset - (with PTC depending on the probe)
	over load current 1 ÷ 99,9 A – delay settable 1...60 seconds, automatic reset
	Instrument out of line (link fail), thermal probe PT100 open or short circuit, internal error
Outputs	output to supply QSD-DIG230/24 panel (up to 4 remote signal panel), max 24Vdc
	output for QSD-DIG230/24 signalling panel for low insulation, over temperature transformer, insulation and overload of the line
	ISOLTESTER-DIG-RZ: auxiliary relay output, NO-C-NC 5A 250Vac,to enable for low insulation ISOLTESTER-DIG-PLUS/RS auxiliary relay output with programmable function, NO-C-NC 5A 250Vac,to enable for low insulation, low impedance, over temperature 1 and 2, over load, link fail or error, fail safe function
Visualisation	ISOLTESTER-DIG-PLUS/RS: serial port RS485, standard protocol MODBUS-RTU, baud rate 2,4-4,8-9,6-19,2 kbps / n,8,1 – n,8,2 – e,8,1 – o,8,1
	insulation resistance value and signalling of value over maximum scale
	measured temperature value by measure channel 1 and 2 and signalling of value over maximum scale
	measured current value and signalling of value over maximum scale
	insulation impedance value and signalling of value over maximum scale
	ISOLTESTER-DIG-PLUS: line ground capacity value
	programming parameter

	instrument off line (link fail), PT100 temperature probe error and internal error
	output status
	ISOLTESTER-DIG-PLUS/RS: storing of minimum insulation, maximum temperature and maximum current
Dimension, weight	self-extinguishing thermoplastic enclosure - DIN 35mm mounting dimension 6 modules, protection by sealable transparent cover - ISOLTESTER-DIG-RZ/RS: 0,4 kg / ISOLTESTER-DIG-PLUS: 0,5 kg
Connection	screw terminals max cross section 2,5 mm ²
Protection degree	IP50 frontal side, IP20 enclosure
Environmental	operating temperature -10 ÷ 60 °C , storage temperature -25 ÷ 70 °C, humidity < 95%
Insulation	2,5 kV 60 sec.
Standards	safety CEI-EN 61010-1 of product CEI-EN 61557-8 Annex A / CEI 64.8/7-710 V2/ IEC 60364-7-710 / UNE 20615 electromagnetic compatibility CEI-EN 61326-1

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ABB group
Electrification
Products Division
Business Unit
Building Products

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Contact the technical assistance or refer to specific document for application don't described in this manual.

Remark

In consideration of the evolution of the products and standards, the company reserves the right to modify at any time the features of the product described in this literature, therefore we recommend to always verify them beforehand. The manufacturer's liability for damages resulting from product defects "may be reduced or deleted (...) when the damage is attributable jointly to a product defect and to the negligence of the injured party or to a third party for whom the injured one is responsible" (Article 8, 85/374/CEE)

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