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OPERATIONAL CONTINUITY

# ABB H+Line safety and reliability

## Switchboards and devices for medical locations



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# ABB technology and safety in hospital segment

Over ten years' experience, state-of-the-art solutions offered to the most important Italian hospitals, a complete and performing range of products: this is H+Line, an ABB products range specific for group 2 medical locations, where operational continuity and reliability are key requirements for patients' and medical staff's safety and protection.

## **Helpful for designers**

What Standards say is explained by everybody. ABB tells what Standards don't say. The "Practical guide for group 2 medical locations" can be a useful daily tool to be consulted for supporting designers and installers in each step of the design and installation process of group 2 medical locations electrical plants

The document has been developed in a tight collaboration with ABB customers. The aim is to add practical solutions, ideas and plant design suggestions coming from the field to fundamental standards.

Thus the "Practical guide to group 2 medical locations" turns into a real help, full of examples, and a useful tool even for the ones designing hospital plants for the first time ever. In the practical guide, ABB customers will find at their complete disposal all the expertise of a leading company which has always been promoting and sustaining safety.



Azienda Ospedaliera - Polo Universitario



# Range overview

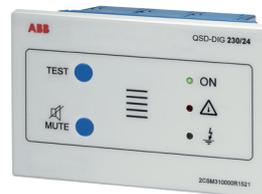
A wide range of reliable products assuring patients' and medical staff's safety in intensive care units, operating theatres, first aid and day hospital premises, ambulatories, nursing homes, dentist's and vet's.



**01 ISOLTESTER-DIG**  
Insulation monitoring device  
for 230 V AC IT-M circuits



**02 SELVTESTER-24**  
Insulation monitoring device  
for 24 V AC/DC SELV circuits  
supplying scialytic lamps



**03 QSD-DIG 230/24**  
Remote signalling panel with luminous  
and acoustic fault indicators



**04 TI**  
Medical insulating transformers  
supplying IT-M networks



**05 QSO**  
Wall-mounted and floor standing  
operating heatres switchboards to  
supply and protect medical locations



# QSO Switchboards - S series

## Details which make a difference

In order to satisfy the needs of group 2 medical locations, ABB supplies preassembled wall-mounted and floor standing QSO electrical switchboards, complete with TI insulating transformer and ISOLTESTER-DIG-RZ insulation monitoring device to detect and signal promptly the first fault to earth.



**Transparent cover panel**

A split opening in the cover panel enables to operate on the modular devices without opening the compartment beneath where the transformer and the terminal block are placed.

**S750 DR-K miniature circuit-breakers**

The S750 DR main circuit-breaker placed in the upstream IT section of the insulation transformer ensures total selectivity up to 10 kA with all downstream circuit-breakers. They can be equipped with a signalling contact in order to remotely control the status of the lever.

**Reduced depth**

The narrow depth of the enclosure makes the installation easier even inside cupboards, compartments or recesses, thanks to the ArTu M series single-piece structure.

**Terminal block**

All terminal blocks have been studied in such a way as to guarantee correct connections between all switchboard equipment, ensuring mechanical separation between the circuits.

Transparent  
cover panel

S750 DR-K  
miniature  
circuit-breakers

Reduced  
depth

Terminal  
block



# QSO Switchboards - M and L series

## Details which make a difference

S750 DR-K  
miniature  
circuit-breakers

S200 residual  
miniature  
circuit-breakers

OVR surge  
protection  
device

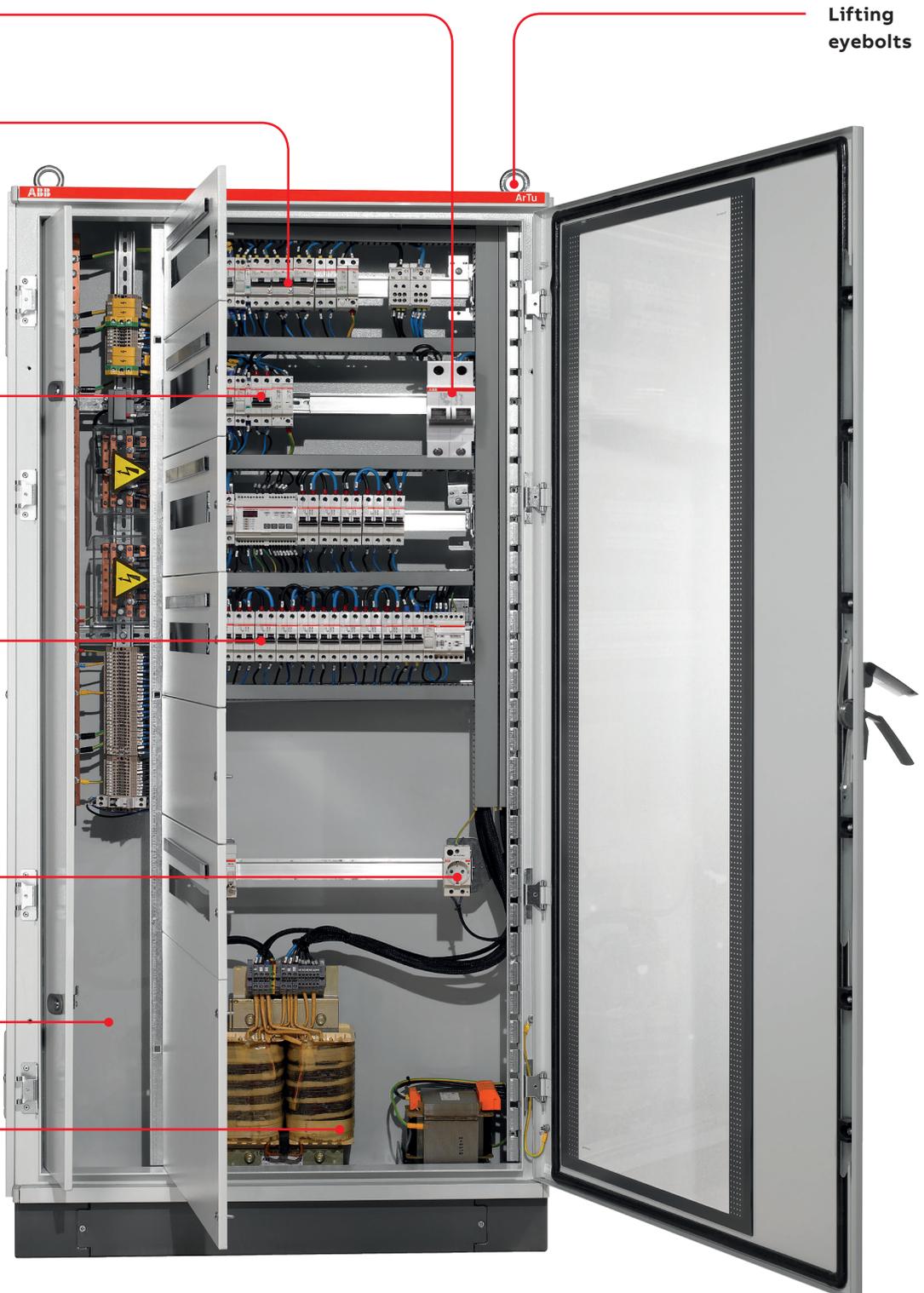
DS200  
residual current  
breaker with  
overcurrent  
protection

M1175-FL  
schuko socket  
outlet

Cable  
container

TI  
insulating  
transformer

Lifting  
eyebolts



Safety lock

ArTu  
Structure

Free  
modules

ISOLTESTER  
DIG-RZ  
insulation  
monitoring  
device

SELVTESTER-24  
insulation  
monitoring  
device

Alarms  
monitoring



# QSO Switchboards - M and L series

## Details which make a difference

### S200 miniature circuit-breakers

These protect the downstream circuits of the IT-M section against overloads and short-circuits, assuring reliability and safety during the operations.

### OVR surge protection device

It has been designed in order to safeguard the electrical systems and equipment from any transient and impulsive over-voltages.

OVR surge protective devices, installed in both the emergency and safety sections, are coordinated with suitable back up protection in order to avoid circuit overloads during the devices useful life. All surge protective devices are equipped with removable cartridges and signalling contacts in order to optimize maintenance operations, and operational continuity.

### S750 DR-K miniature circuit-breakers

The S750 DR main circuit-breaker placed in the upstream IT-M section of the insulation transformer ensures total selectivity up to 10 kA with all downstream circuit-breakers. Furthermore it protects the insulating transformers from overloads.

They can be equipped with a signalling contact in order to remotely control the status of the lever (see page 51 for the S750 DR selectivity table).

### M1175-FL schuko socket outlet

QSO switchboards are equipped with a socket outlet which is useful to supply measurement devices and tools used during maintenance. This socket is protected by an integrated fuse and is equipped with an indicator lamp that allows detecting whenever the auxiliary circuit has been supplied, even in the darkness.

### Cable container

ArTu K series floor standing switchboards are equipped with a cable container that makes installation and wiring easier, both for the electrical systems distributed along the false ceiling, as under the floor.

It is possible to reach any terminal block in a comfortable way. Finally, there is a copper equipotential bonding busbar which may lodge up to 20 additional connections, providing grounding connections to all the external masses which are present in the medical premises, and avoiding the creation of further cascade sub-nodes that are not allowed.



### TI insulating transformer

Specifically designed and assembled for medical use according to the EN 61558-2-15, it ensures protection against indirect contacts without the need to interrupt the circuit automatically upon the first grounding fault. Thanks to its two PT100 temperature probes, on primary and secondary winding, it is possible to monitor the transformer over temperature produced by any eventual overload, and therefore anticipating any breakdown. The transformer is mounted on the base of the switchboard in order to ease handling and installation operations.

### DS200 residual current breaker with overcurrent protection

They protect emergency section TN-S terminal circuits from any direct and indirect contacts. These lines feed the lighting system, the radiological and the general purpose socket outlets, mounted outside the patients' environment.

### Lifting eyebolts

They allow immediate and safe wall fastening.

### ISOLTESTER-DIG-RZ insulation monitoring device

This is an insulation monitoring device for group 2 medical locations fully compliant with the IEC 60364-7-710 reference standard. It integrates all the performances established by the reference standard, such as overload and overcurrent monitoring, together with traditional IT system earthing insulation measurement.

### Safety lock

This is a door with a key lock system in order to avoid undesired interventions by non authorized personnel.

### SELVTESTER-24 insulation monitoring device

QSO "Premium" are equipped with 24 V SELV line supplying the scialytic lamp.

SELVTESTER-24 monitors extremely low voltage circuits. IEC 60364-7-710 reference standard does not impose monitoring of such circuits, but, it is possible that during regular handling of the lamp some conductors, detaching themselves from the terminals, may enter into contact with the metal housing. Therefore SELVTESTER-24 detects the damage as soon as it happens, and consequently improve operational continuity.

### Alarms monitoring

High end configurations are equipped with I/O modules for alarms management. In particular it is possible to control the status of the main circuit-breaker and signalling contacts of the OVR and ISOLTESTER-DIG, by means of the KNX bus.

### ArTu Structure

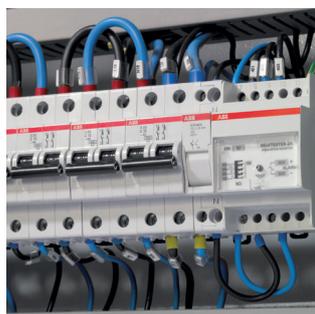
Floor standing QSO switchboards are composed of modular ArTu K series enclosures. The switchboards are equipped with venting grooves that guarantee proper natural convection, useful to dissipate the heat produced by the transformer during its normal functioning.

### Free modules

Switchboard flexibility is ensured by the possibility of inserting further equipment that may be necessary to complete the system or for possible future expansions.

### E210 indicator lamp

Thanks to the green LED indicator lamp it is possible to see in a blink whether the switchboard is supplied or not.



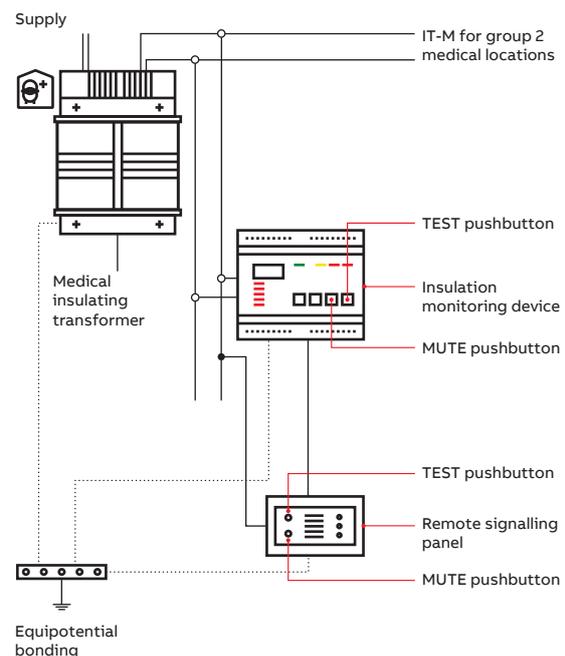
# QSO Switchboards and devices for medical locations

Protection by electrical separation as laid down by IEC 60364 reference standard (user electrical plants with a rated voltage of no more than 1000 V in alternating current and 1500 V in direct current) prevents the generation of hazardous currents due to contacts with earths under voltage because of a fault in the main insulation of the circuit.

By using insulating transformers, the protection against indirect contacts can be guaranteed without having to automatically break the circuit at the first fault to earth. Insulating transformers are therefore suitable for use in plants where the sudden and automatic breaking of the service may have serious implications: examples of these applications are plants for medical and surgery rooms (in accordance with IEC 60364-7-710 reference standard where specific electromedical devices perform patients' monitoring and attending functions. To meet the special needs of these fields of application, ABB supplies preassembled wall-mounted and floor-standing QSO switchboards, complete with an insulation transformer and an ISOLTESTER-DIG device to detect and signal the first fault to earth.

QSO switchboards represent the ideal solution for all medical locations classified by the IEC 60364-7-710 reference standard, as group 2 medical locations (anaesthesia, surgery, preoperative preparation, surgical plaster applications, postoperative wakening, heart catheterizations, intensive care, angiography and blood flow tests, premature births) where the use of an IT-M (Medical IT) system is mandatory. In addition, they are suitable for installation in any further medical locations and any other room where the automatic breaking of the service at the first fault to earth is dangerous or inconvenient: industrial laboratories, craft workshops (jewellery' and the like), test laboratories, school laboratories, research institutes and any other room with similar problems.

## IT-M system



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# Protection, control and operational continuity

The new QSO operating theatre switchboards are the ideal solution to supply operating theatres and group 2 medical locations according to the IEC 60364-7-710 reference standard.

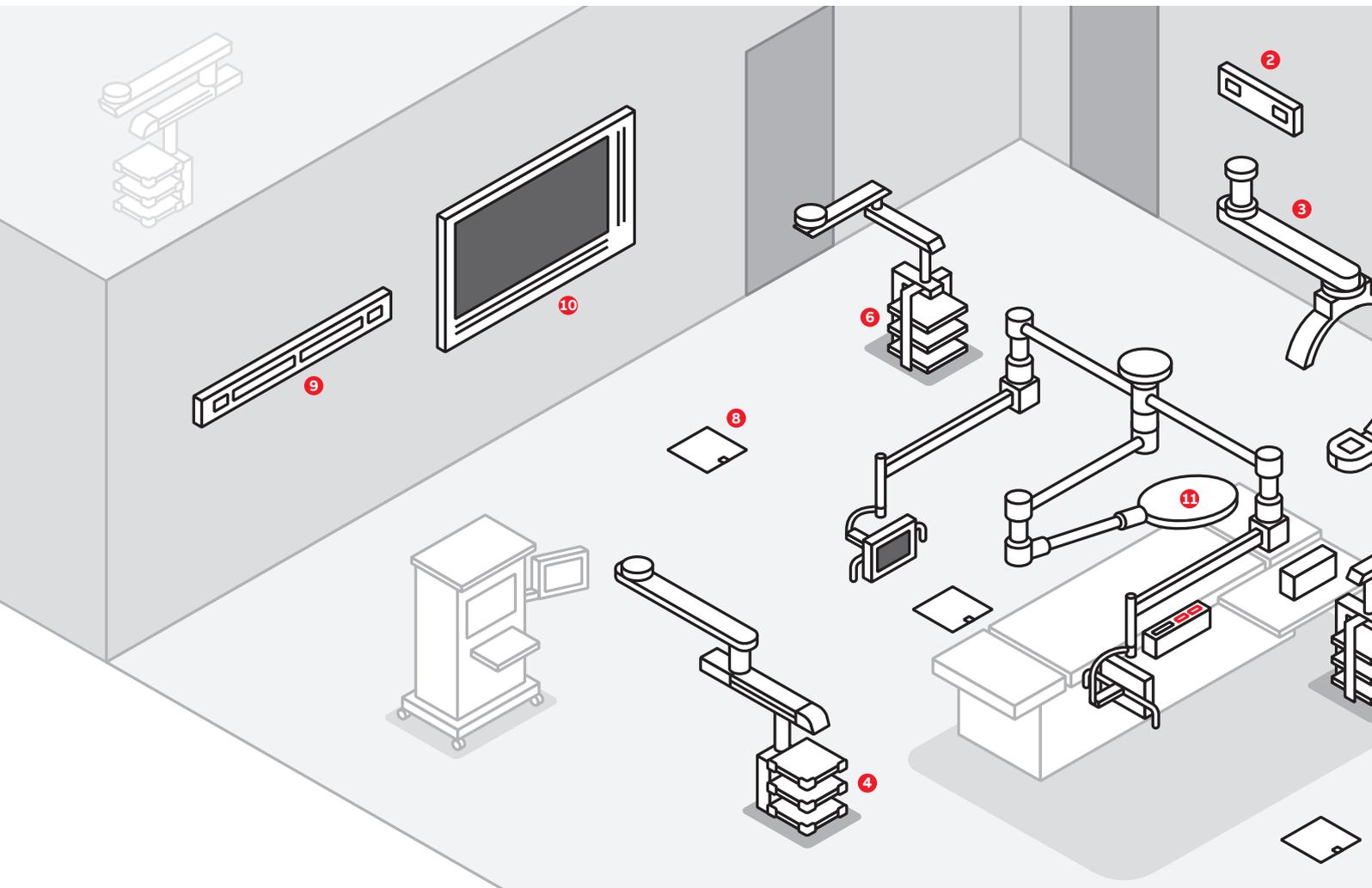
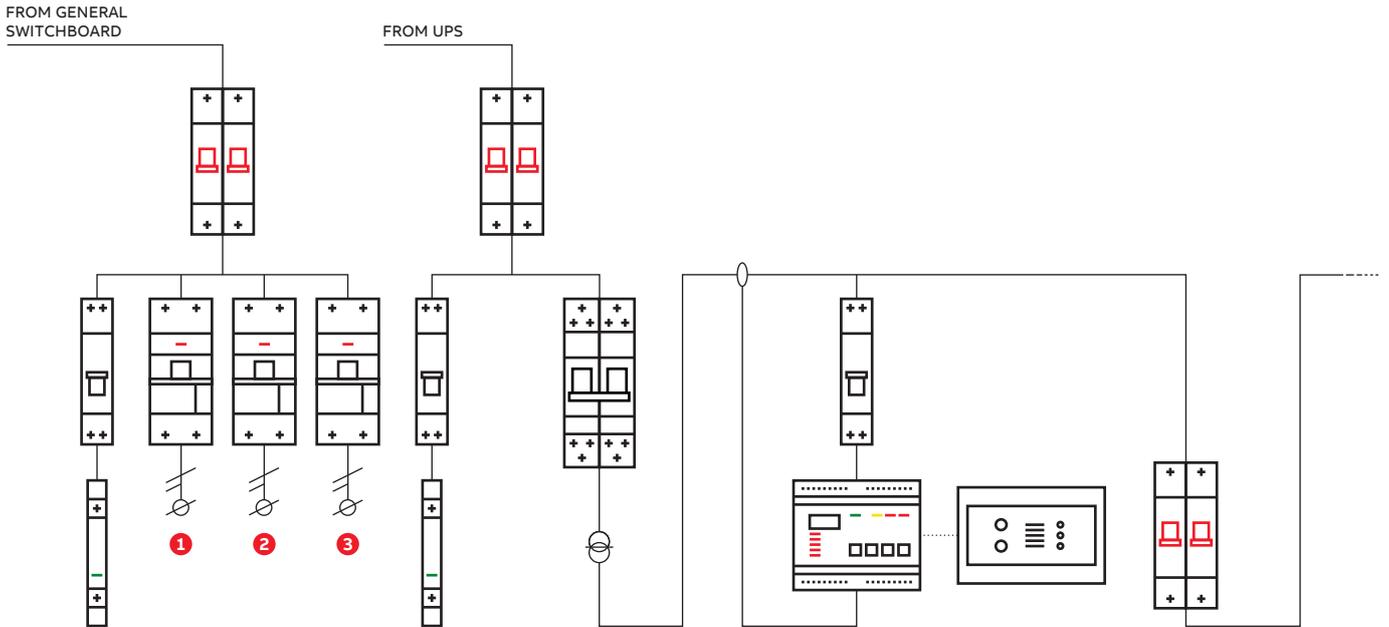
All the switchboards are wired by ABB, and are equipped with the declaration of conformity which is necessary for the system initial start up, guaranteeing the installer full conformity for plant performance.

Compactness, total protection selectivity and maximum ergonomics and simplicity during maintenance operations make QSO range the most suitable product to guarantee service continuity at medical locations.

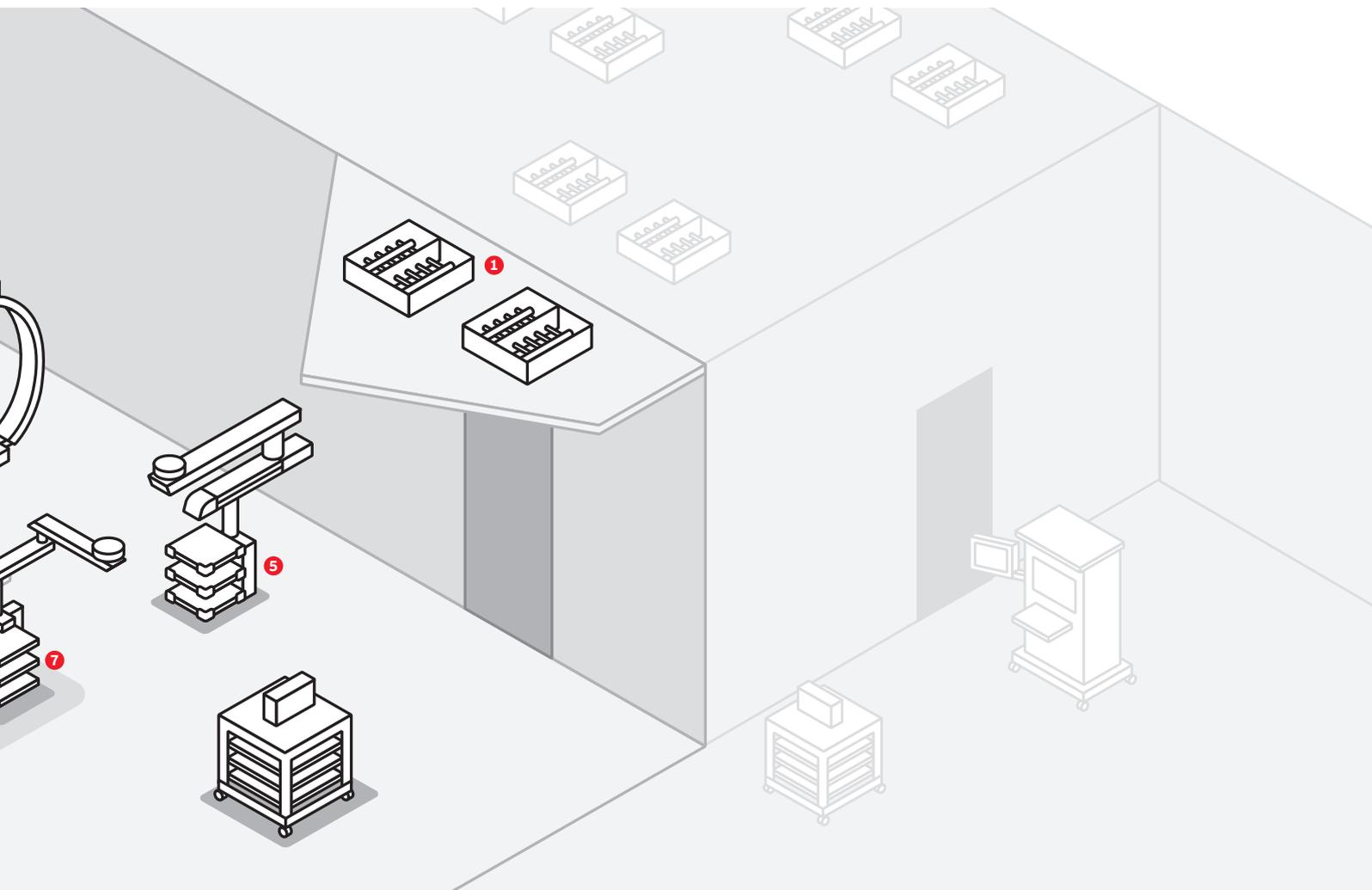
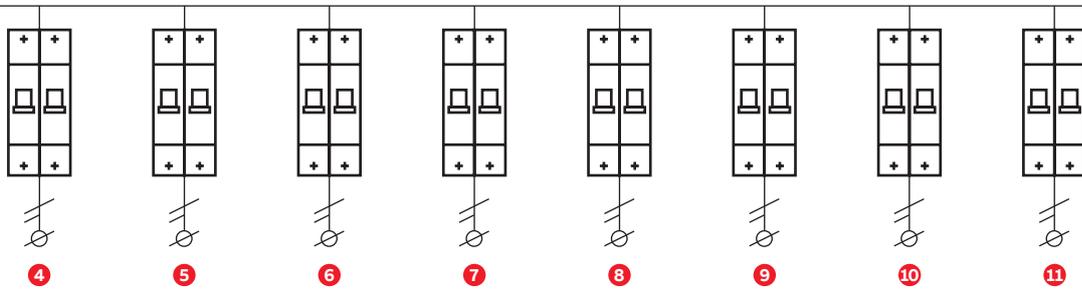


# QSO S

01 Wall-mounted switchboards of 3 kVA and 5 kVA for applications such as surgery ambulatories, recovery rooms, test laboratories, dentist's and vet's

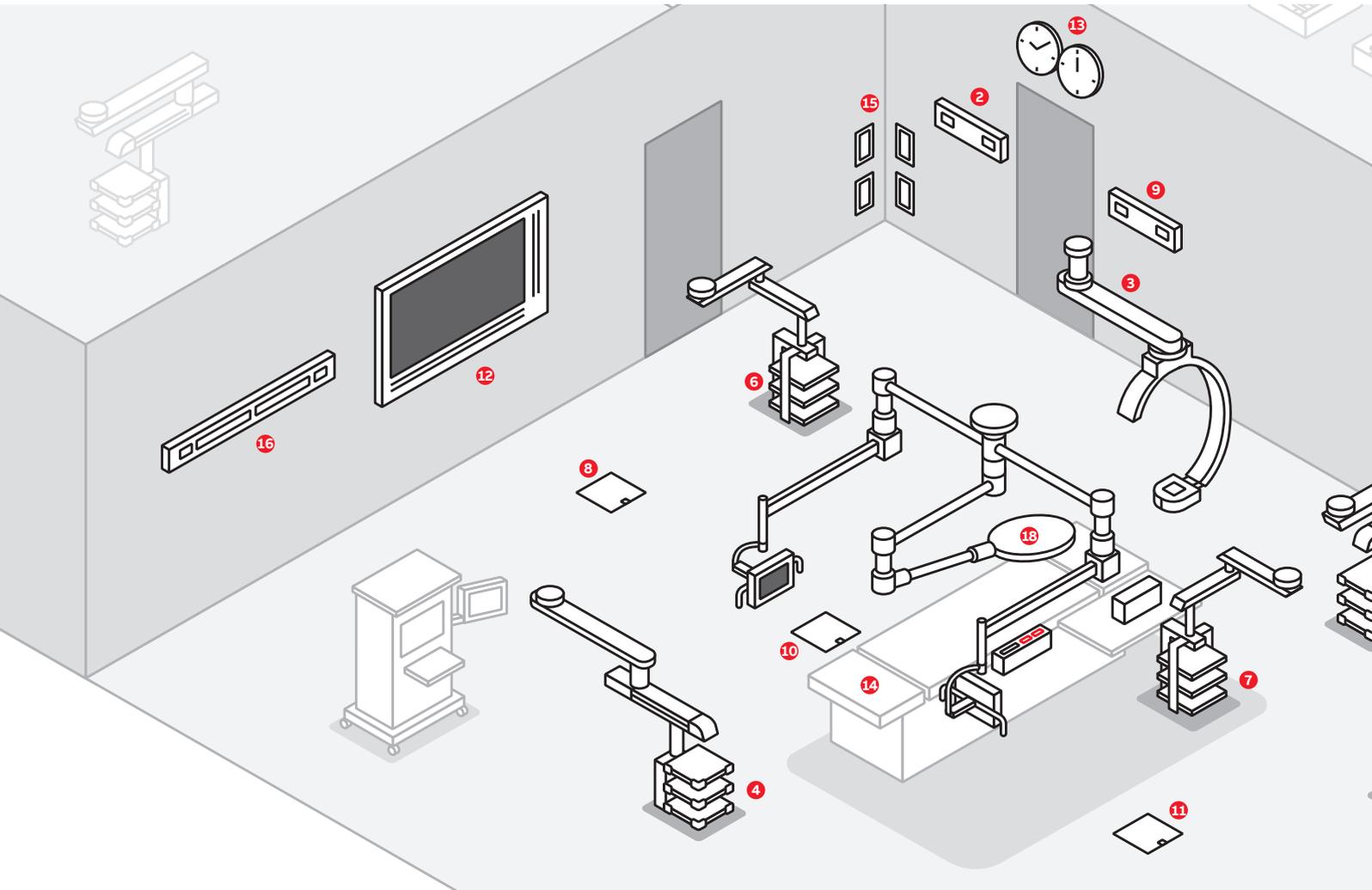
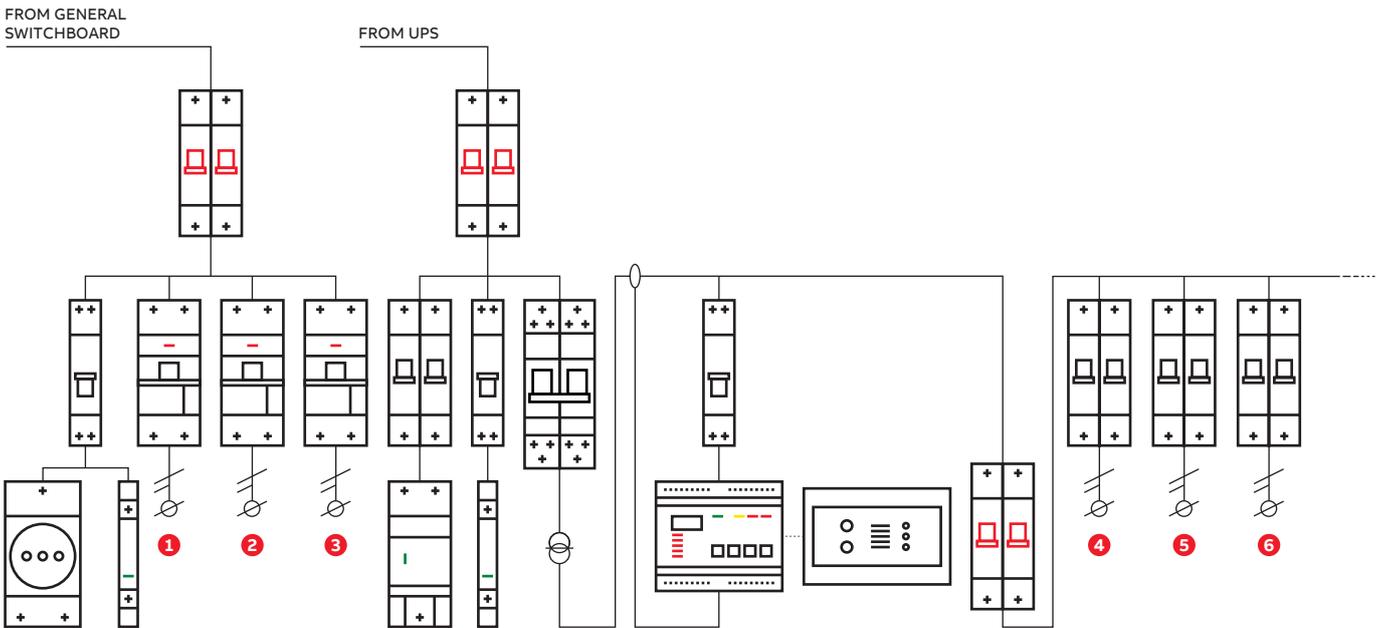


- 1** Lighting circuit
- 2** General purpose sockets
- 3** Radiological sockets
- 4** Surgical up-mount 1
- 5** Surgical up-mount 2
- 6** Anaesthetist's up-mount 1
- 7** Anaesthetist's up-mount 2
- 8** Medical sockets group
- 9** Bed-head
- 10** Negatoscope screen
- 11** Scalytic lamp

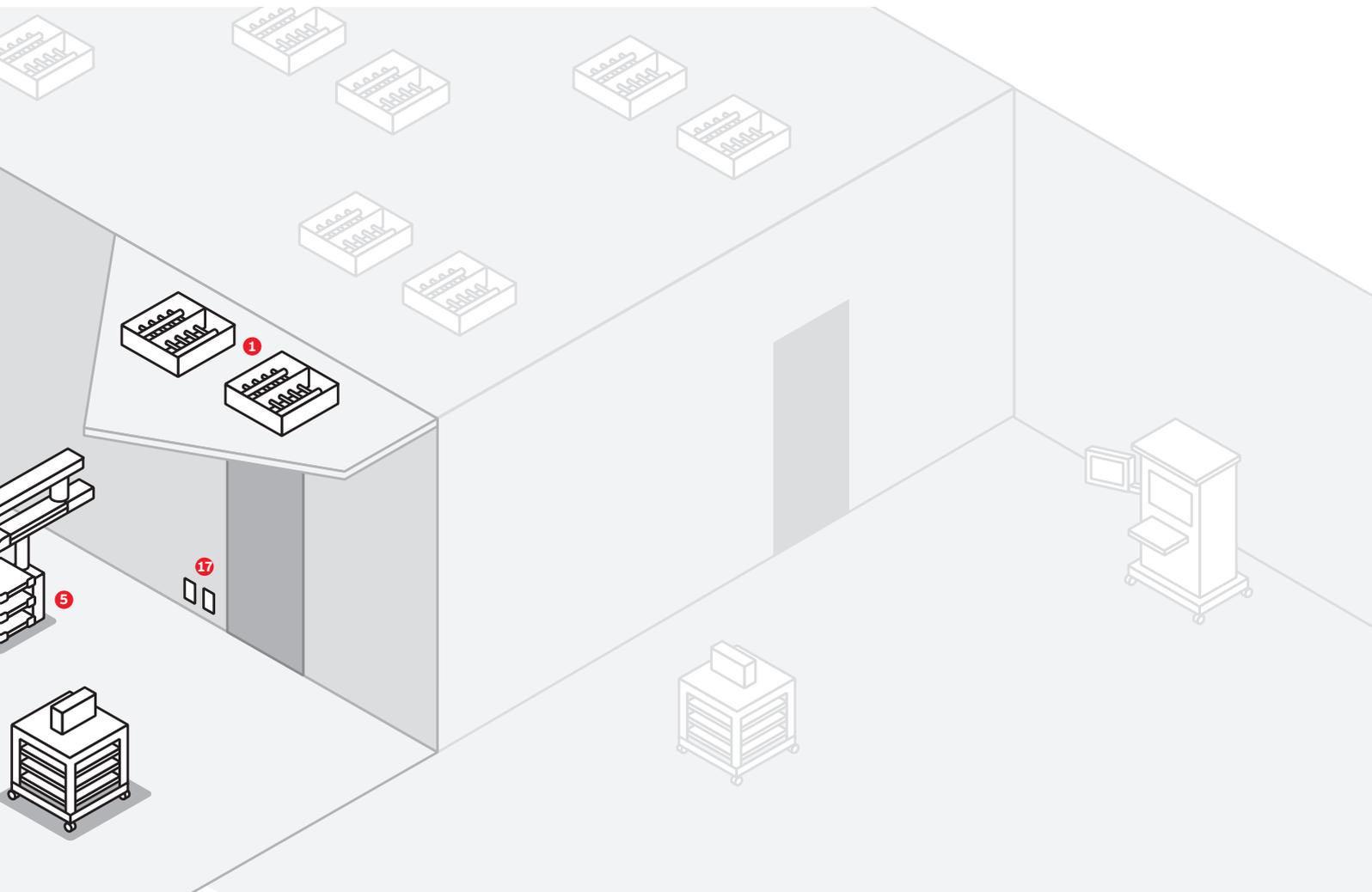
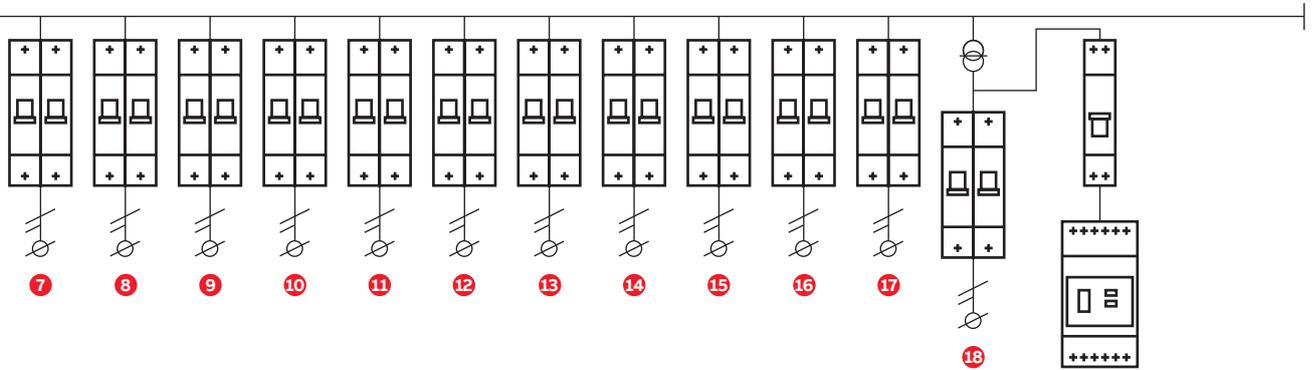


# QSO M

Floor standing switchboards of 3 kVA, 5 kVA and 7,5 kVA, for day hospital premises, medium-size operating theatres, intensive care units.

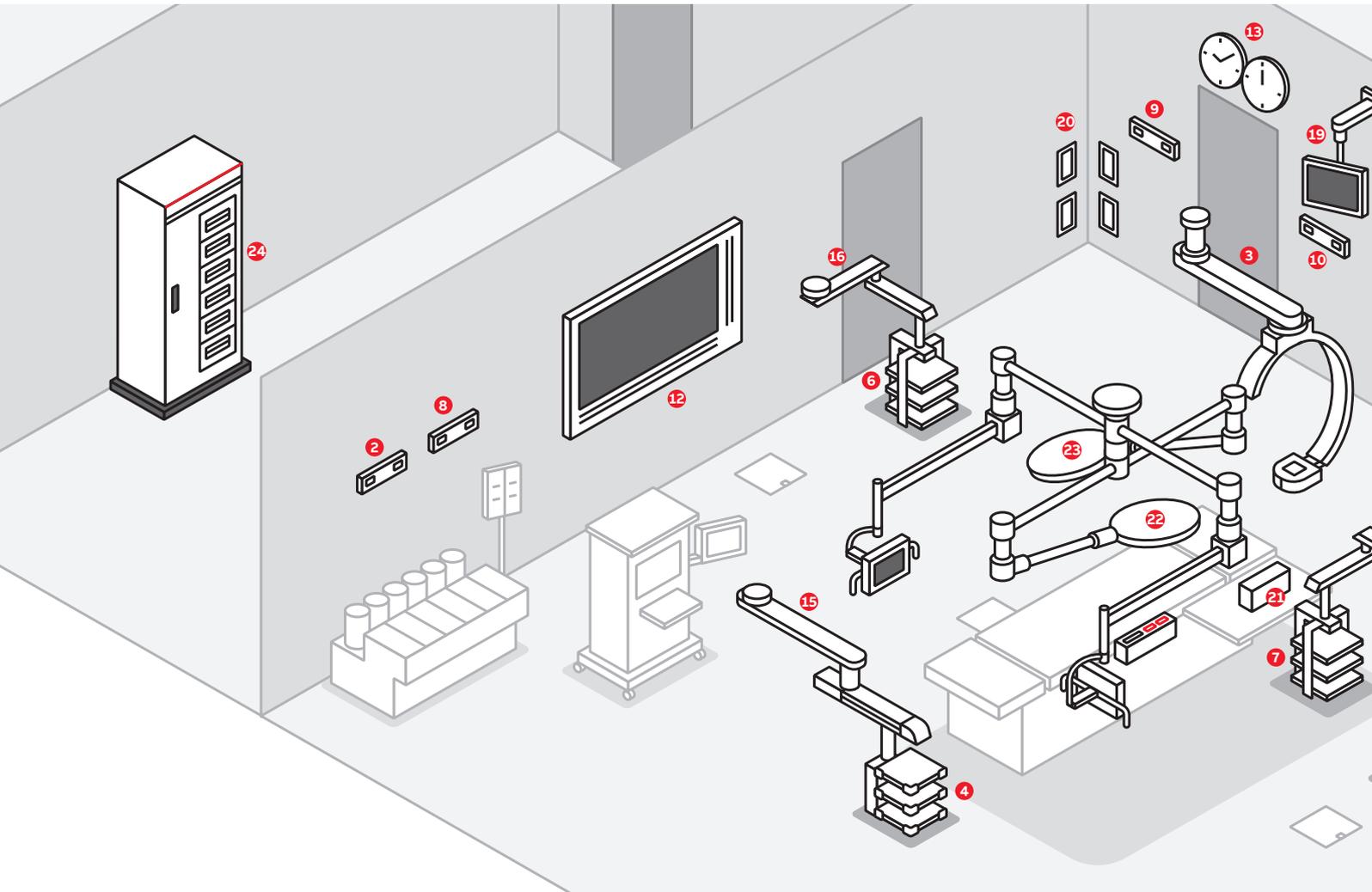
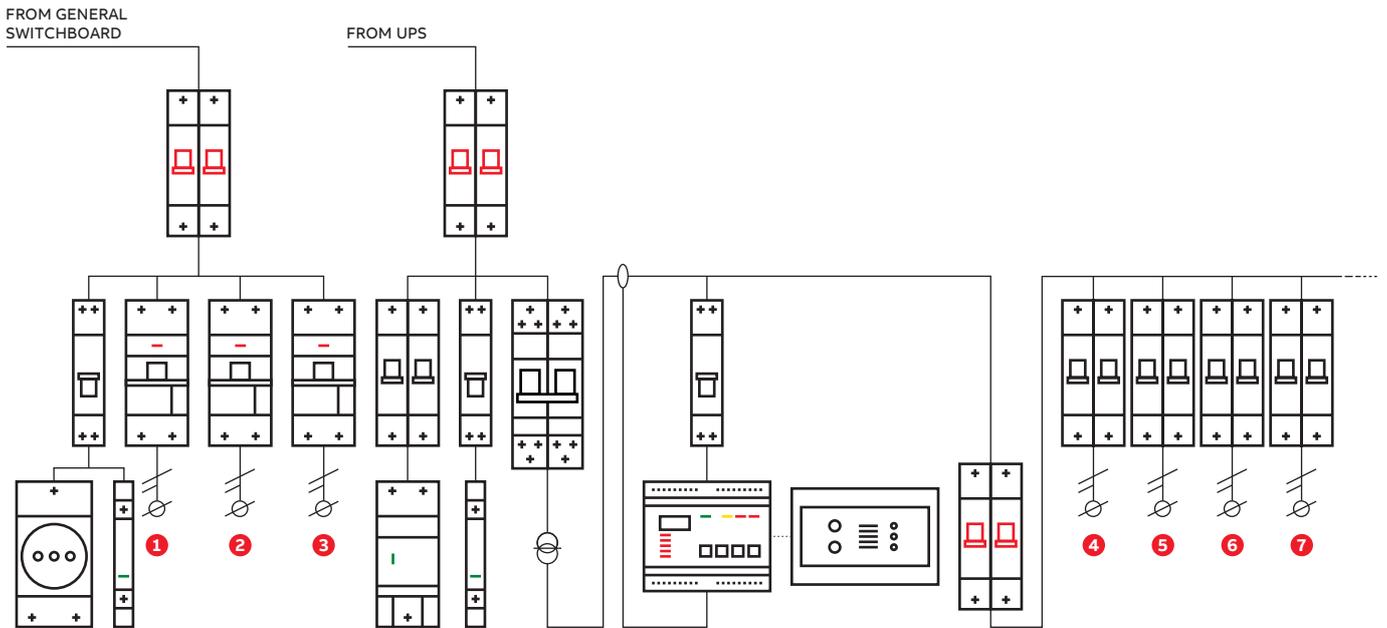


- |                                    |                                    |                          |
|------------------------------------|------------------------------------|--------------------------|
| <b>1</b> Lighting circuit          | <b>7</b> Anaesthetist's up-mount 2 | <b>13</b> Stopwatch      |
| <b>2</b> General purpose sockets   | <b>8</b> Medical plugs group 1     | <b>14</b> Electric bed   |
| <b>3</b> Radiological sockets      | <b>9</b> Medical plugs group 2     | <b>15</b> Reserve        |
| <b>4</b> Surgical up-mount 1       | <b>10</b> Medical plugs group 3    | <b>16</b> Bed-head       |
| <b>5</b> Surgical up-mount 2       | <b>11</b> Medical plugs group 4    | <b>17</b> Various        |
| <b>6</b> Anaesthetist's up-mount 1 | <b>12</b> Negatoscope screen       | <b>18</b> Scialytic lamp |

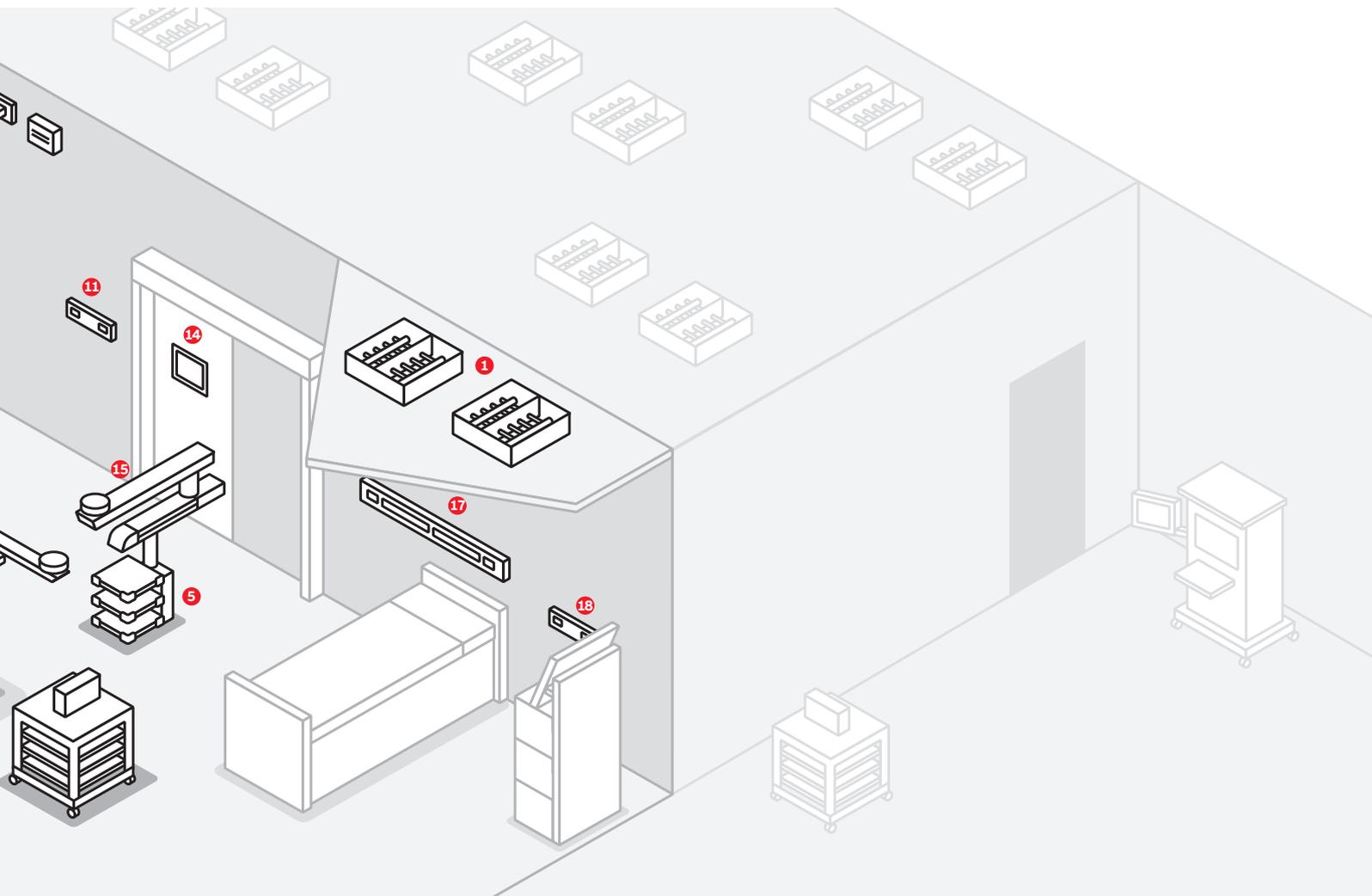
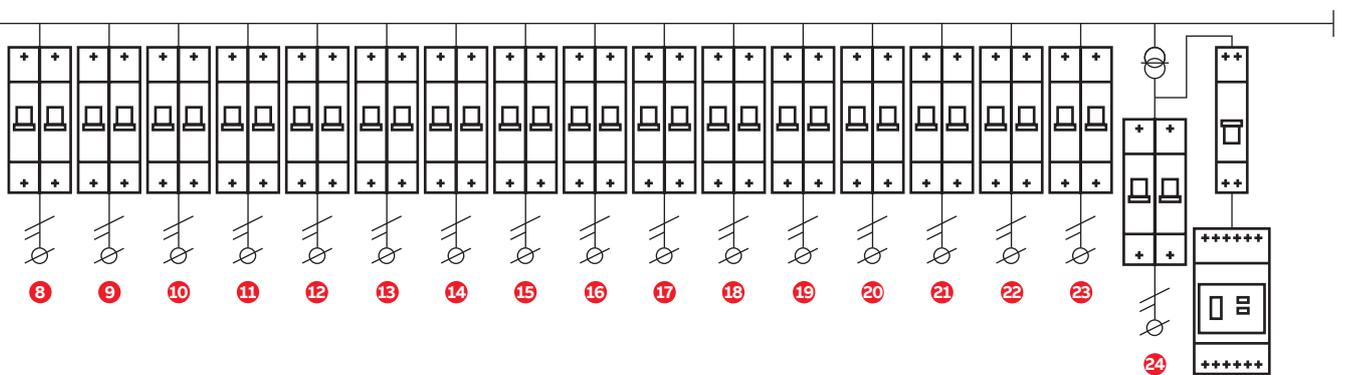


# QSO L

Floor standing switchboards of 7,5 kVA and 10 kVA for operating theatres, intensive care units, cardiac surgeries, long-term hospitalizations.



- 1 Lighting circuit
- 2 General purpose sockets
- 3 Radiological sockets
- 4 Surgical up-mount 1
- 5 Surgical up-mount 2
- 6 Anaesthetist's up-mount 1
- 7 Anaesthetist's up-mount 2
- 8 Medical plugs group 1
- 9 Medical plugs group 2
- 10 Medical plugs group 3
- 11 Medical plugs group 4
- 12 Negatoscope screen
- 13 Stopwatch
- 14 Motorized door
- 15 Surgical up-mount motor
- 16 Anaesthetist's up-mount motor
- 17 Bed plug
- 18 Various
- 19 TV and radio plugs
- 20 Reserve
- 21 Infusion pump
- 22 Scalytic lamp 1
- 23 Scalytic lamp 2
- 24 Local section switchboard supply





- **Safety and service continuity:** thanks to certified insulation transformer, QSO portfolio is a complete and high performing solution to assure safety and operation continuity in group 2 medical locations where patient's life is the most important thing
- **Flexibility:** available in different versions (S, M and L sizes; Classic and Premium series), customizable to meet any customer need
- **Reliability:** the quality of ABB technology in every component
- **Compact size:** limited overall dimensions
- **Completeness:** 24 V line control, PT100 probes embedded
- **Effectiveness:** complete electrical network monitoring



# ISOLTESTER-DIG

## Medical insulation monitoring devices

ISOLTESTER-DIG is the insulation monitoring device specifically designed by ABB for group 2 medical locations. ISOLTESTER-DIG measures the insulation to earth in IT-M network and the thermal and electrical overload of the insulation transformer, in accordance with the international standards: EN 61557-1, EN 61557-8 and IEC 60364-7-710.

### Functioning principle

Insulation resistance is measured by applying a direct current signal between insulated line and earth and determining the dispersion current generated. Effective measurement is granted thanks to a digital filter integrated in the device even if interferences and harmonic components occur.

### Programming

Through its LCD display and four selection keys, the device offers easy programming possibilities by setting intervention thresholds without making any for the complete monitoring of all electrical parameters. ISOLTESTER-DIG tests the thermal and electrical overload of the medical insulation transformer, managing two temperature thresholds coming from both PT100 and PTC probes. By controlling temperature, the overload of the transformer can be monitored and the automatic circuit-breaker downstream of the secondary can be avoided. All faulty conditions are remotely controlled thanks to QSD-DIG 230/24 remote signalling panels, granting a proper prompt technical supervision.

### Self-testing system

Error-Link Fail system checks device proper functioning and controls wiring presence and properness at the end of the terminal blocks: it prevents the possibility to operate in group 2 medical locations when the insulation monitoring device is disconnected.

### For better integration and improved monitoring

Thanks to the RS485 serial port, the ISOLTESTER-DIG-RS is able to communicate with the supervision system via ModbusRTU in order to collect all the required information of the monitored IT-M system in a centralized place. It also improves the monitoring activity with the possibility of logging measurements (max. and min. values). Logs can then be sent to the centralized control system via the communication protocol.

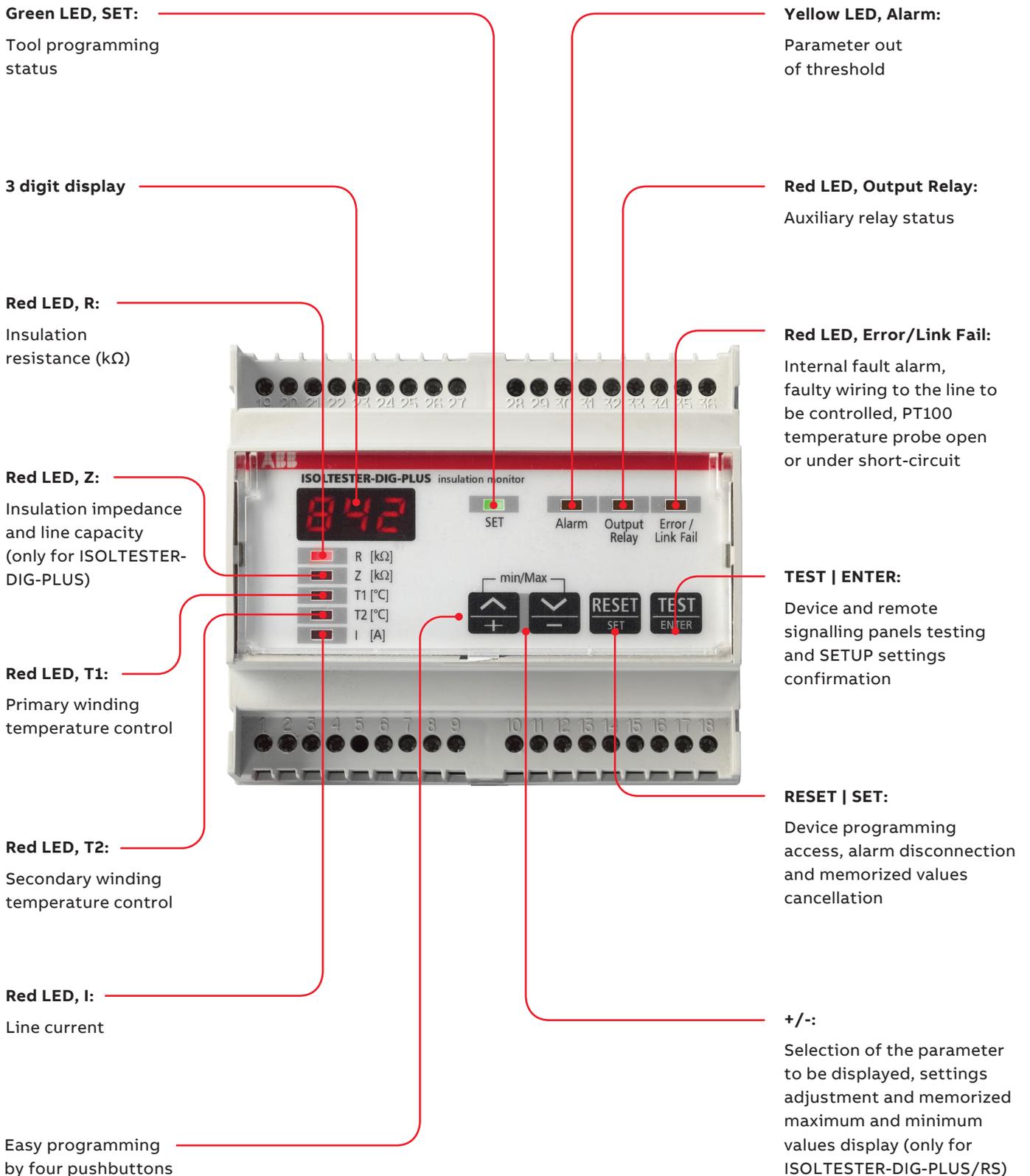
### For higher safety

Thanks to a codified signal, the new ISOLTESTER-DIG-PLUS IT networks insulation monitoring device grants absolute reliability of measurement in any operational condition, even if high network interferences occur. Furthermore it is fitted with a RS485 serial port through which it can be perfectly integrated with communication systems such as PLC/PC by using ModbusRTU protocol. The measurement of network maximum and minimum values enables a wider monitoring and an easier plant checking in case of any fault. Finally, the programmable output relay allows to manage any warning condition signalled in a dedicated way.

- **Quality:** the recognized standard in hospital insulation control
- **Flexibility:** adjustable intervention thresholds according to all the parameters monitored
- **Completeness:** all electrical and thermal parameters controlled by a single device
- **Integration:** alarms sent up to 4 medical locations attended by medical and healthy staff, thanks to remote signalling panels. Only for RS and PLUS versions, ability to interact with supervising systems through ModbusRTU protocol via RS485 serial port

# ISOLTESTER-DIG

## Frontal operators functioning



# ISOLTESTER-DIG-PLUS

## The solution to unwanted alarms

Wherever it is necessary to guarantee safety and operational continuity and prevent power supply interruptions, such as in hospitals and in other medical locations, insulation transformers and devices detecting and signalling any first fault to earth have to be used.

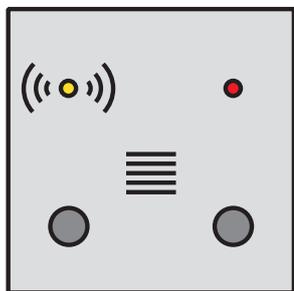


Operating theaters equipment can generate interference within the network



A traditional monitoring device can generate an unwanted alarm in operating theaters

Risks arising from the use of a traditional insulation monitor:



**Impossibility to distinguish between interference and real fault**

**Carelessness of the medical staff**

**Unjustified intervention of specialized technical staff**

ISOLTESTER-DIG-PLUS is the device for insulation monitoring in IT-M networks. It ensures absolute reliability of measurement by means of a codified signal able to detect interferences generated by common equipment in operating theatres and avoid unwanted alarms signalling.

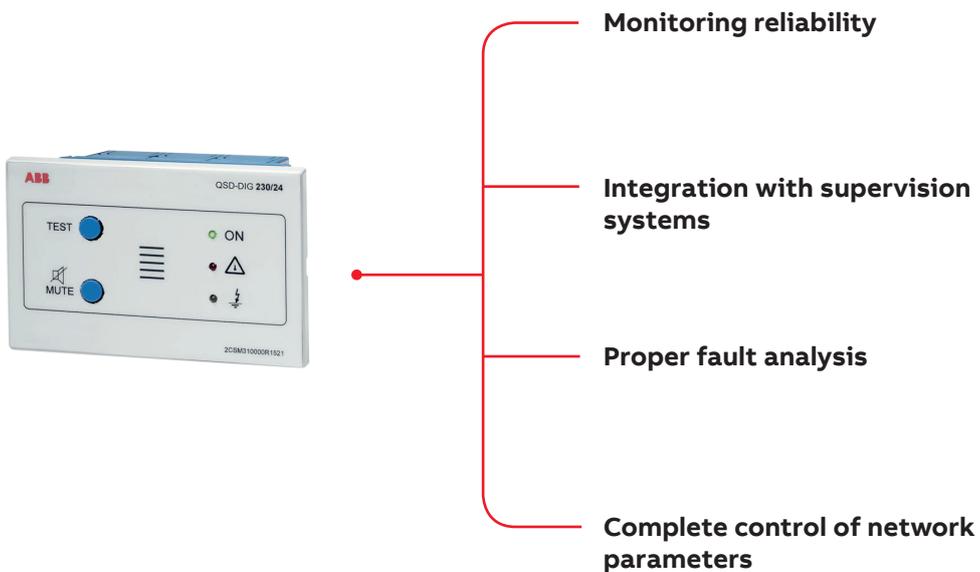


Despite network interferences...



ISOLTESTER-DIG-PLUS avoids unwanted alarms.

Advantages of ISOLTESTER-DIG-PLUS:



# SELVTESTER-24

## Medical insulation monitoring device for scialytic lamps

SELVTESTER-24 tests the insulation to earth of 24 V AC/DC SELV circuits dedicated to scialytic lamps supply. Scialytic lamps insulation has to be monitored in order to prevent detaching from conductors when being moved. The conductors, by contact with the metal structure of the lamp, may transfer a potential of over 250 V, resulting in damage to equipment and people.

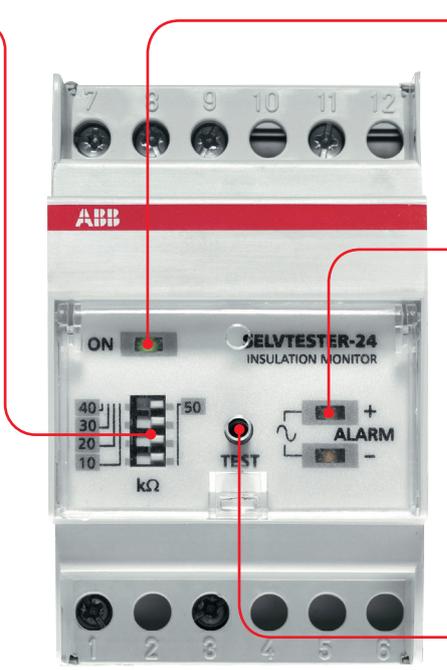
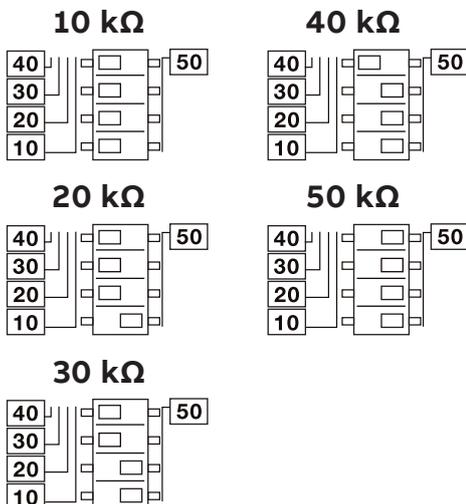
SELVTESTER-24 measures the variation in potential of the two network polarities with reference to earth in order to signal when insulation drops below a set value, through the frontal microbreakers, identifying the faulty pole in direct current. The output signal can be connected to QSD-DIG 230/24 remote signalling panel. The frontal panel of the device carries out test pushbutton, status indicator and two LEDs for low insulation signalling.

- **Flexibility:** programmable alarm threshold
- **Intelligence:** recognition of faulty pole in direct current
- **Compact size:** fits into just 3 modules
- **Practicality:** extremely easy to install and use
- **Integration:** ideal complement for ISOLTESTER-DIG

### Frontal operators functioning

#### Microbreakers

The front microbreakers allow the threshold to be set in the range 10 to 50 kΩ, as shown in the picture below.



#### Green LED ON

Indication that the instrument is working properly

#### Yellow LED ALARM

Low insulation alarm signal; in the case of a line to be monitored, with alternating current the two LEDs light up, whereas with direct current only the LED of the polarity below the activation threshold lights up.

#### TEST pushbutton

Instrument correct functioning test

# QSD-DIG 230/24

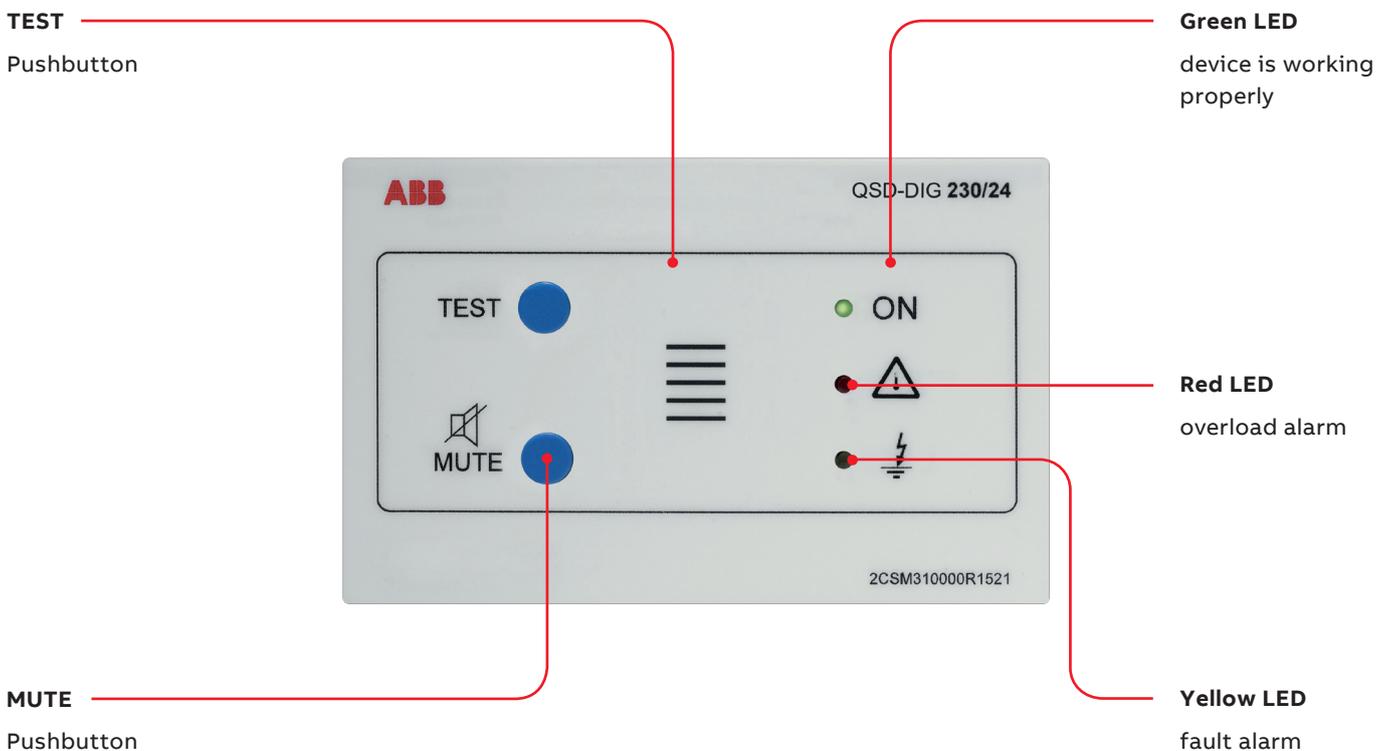
## Remote signalling panel

QSD-DIG 230/24 remote signalling panel enables to send alarm signals from the insulation monitoring devices to all the medical locations attended by medical staff, as laid down by reference standards.

QSD-DIG 230/24 panel provides an acoustic and luminous signaling in case of low insulation or thermal and electrical overload. Moreover, it is provided with a TEST pushbutton to periodically check its operating status and a pushbutton for disconnecting the acoustic signal. It is assembled in universal 3-module flush-mounted boxes.

- **Compact size:** limited dimensions
- **Easy to install:** installation in a universal 3-module flush-mounted box type E503, in horizontal or vertical position
- **Reliability:** prompt fault recognition
- **Comfort:** simultaneous disconnection of more signalling panels
- **Operational efficiency:** both visual and acoustic signalling

### Frontal operators functioning



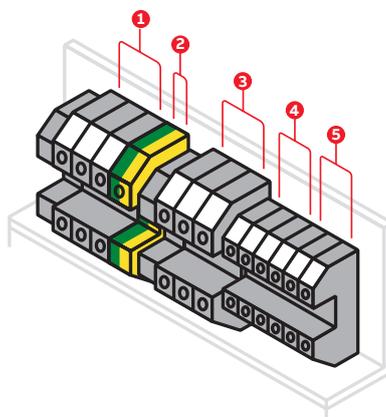
# TI

## Insulating transformers

Medical single-phase insulating transformers provide galvanic separation between the distribution network and the user load in accordance with the EN 61558-1 and EN 61558-2-15 reference standards concerning power supply in group 2 medical locations.

ABB medical insulating transformers combine conformity with reference standards to maximum performance and limited dimensions thanks to which it is thus possible to reduce switchboards costs. The range is made up of transformers with 3, 5, 7, 5 and 10 kVA power, available with two PT100 temperature probes, on the primary and the secondary winding, thus enabling continuous and precise temperature monitoring. ABB transformers are provided with a particular impregnation system which allows maximum heat dissipation thanks to the exclusive vacuum pressure technology. Finally, the insulating transformer has a metallic shield between the two windings allowing to reduce network interferences and harmonic components coming from the supply. Upon communication of the item serial number, ABB will provide the testing certificates of each medical insulation transformer.

- **Specialization:** especially designed for medical use
- **Compact size:** the overall dimensions of the insulation transformers installed in ABB QSO switchboards are the most compact on the market
- **Quality:** the insulation of the windings, realized with the exclusive vacuum pressure technology, guarantees maximum heat dissipation
- **Accessories:** versions available with PT100 probes



- 1 Primary winding**  
0-230: Primary  
SCH: Metallic shield
- 2 PE**
- 3 Secondary winding**  
0-230: Secondary  
SCH: Central socket
- 4 Probe 1**  
1: to ISOLTESTER-DIG 28 terminal block  
2: to ISOLTESTER-DIG 28 terminal block  
3: to ISOLTESTER-DIG 30 terminal block
- 5 Probe 2**  
4: to ISOLTESTER-DIG 25 terminal block  
5: to ISOLTESTER-DIG 25 terminal block  
6: to ISOLTESTER-DIG 27 terminal block



**Serial number**  
printed on the label attached at the metallic base, to be provided when requesting testing certificate

# QSO Switchboards

## Technical features

Type	Power [kVA]	Installation	TN-S section feeder lines	IT-M section feeder lines	Net weight [kg]
QSO 3S Classic	3	wall mounted		2x10A+5x16A+1x25A	73
QSO 5S Classic	5	wall mounted		2x10A+5x16A+1x25A	88
QSO 3S Premium	3	wall mounted	1X10A+2x16A	2x10A+5x16A+1x25A	75
QSO 5S Premium	5	wall mounted	1X10A+2x16A	2x10A+5x16A+1x25A	90
QSO 3M Classic	3	floor standing	1x10A	3x10A+7x16A	126
QSO 5M Classic	5	floor standing	1x10A	3x10A+7x16A	141
QSO 7.5M Classic	7.5	floor standing	1x10A	3x10A+7x16A	147.5
QSO 3M Premium	3	floor standing	1X10A+2x16A	6x10A+8x16A+1x25A	127
QSO 5M Premium	5	floor standing	1X10A+2x16A	6x10A+8x16A+1x25A	142
QSO 7.5M Premium	7.5	floor standing	1X10A+2x16A	6x10A+8x16A+1x25A	147.5
QSO 10L Classic	10	floor standing	1X10A+2x16A	6x10A+9x16A	190
QSO 7.5L Premium	7.5	floor standing	1X10A+2x16A	6x10A+11x16A+3x25A+1x32A	168
QSO 10L Premium	10	floor standing	1X10A+2x16A	6x10A+11x16A+3x25A+1x32A	193.5

	Wall-mounted QSO	Wall-mounted QSO Floor standing QSO
Operating rated voltage (Ue )		230 V ~ ± 15%
Network rated frequency		50 - 60 Hz
Number of phases		1 + N ~ / PE
Rated voltage of service auxiliary circuits		24 - 230 V ~
Insulation rated voltage (Ui)		300 V - *2500 V
Grounding power system		TT / TN-S
Expected maximum short circuit current for input terminals (Icc)		10 kA RMS Sym **
Maximum height		2000 m a. s. l.
Pollution level		1 ***
Impact resistance level (code IK) EN 50102		IK 09 (5kg - 200mm)
Humidity level related with temperature expressed in ° C	Internal mounting 50% with maximum temperature of +40°C	
Operating room air temperature		-5°C - +55°C
Transport and storage room air temperature		-25°C - +40°C
Protection level of the front IP EN 60529	QSO 3S Classic IP 40	QSO 3M Classic IP 54
	QSO 5S Classic IP 40	QSO 5M Classic IP 54
	QSO 3S Premium IP 40	QSO 5M Premium IP 54
	QSO 5S Premium IP 40	QSO 7.5M Premium IP 54
		QSO 10L Classic IP 54
		QSO 7.5L Premium IP 54
		QSO 10L Premium IP 54

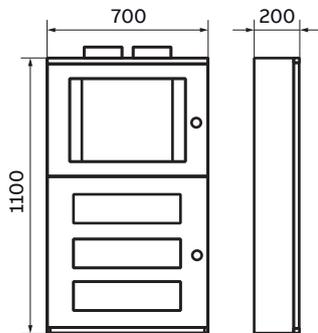
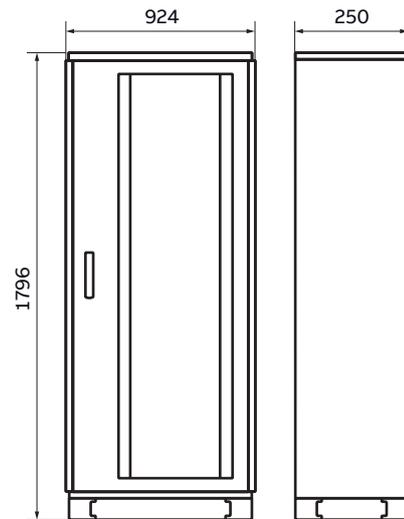
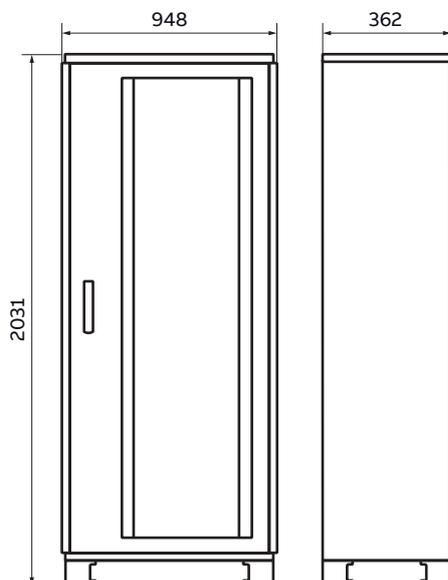
\* Dielectric strength testing voltage.

\*\* Value subject to upstream coordination with fuse NH 00 100A gL-gG

\*\*\* It corresponds to absence of pollution or only to dry pollution and non conducting pollution.

# QSO Switchboards

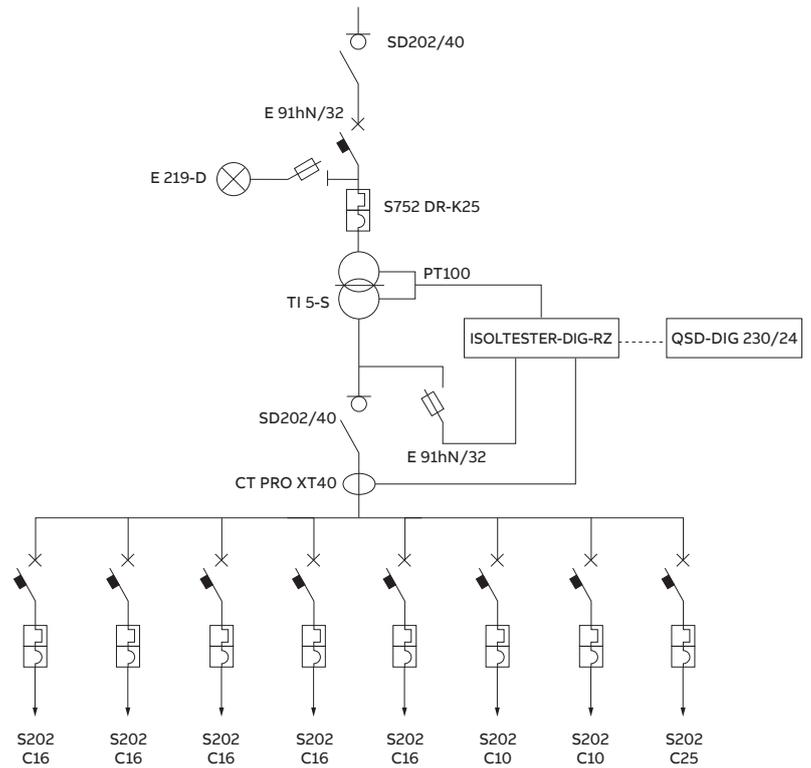
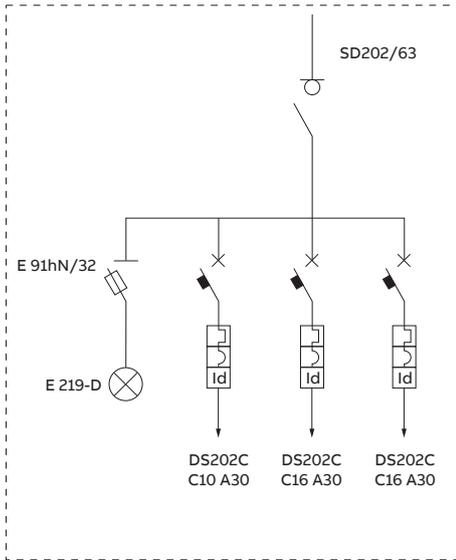
## Overall dimensions

**QSO S****QSO M****QSO L**

# QSO Switchboards

## Wiring diagrams

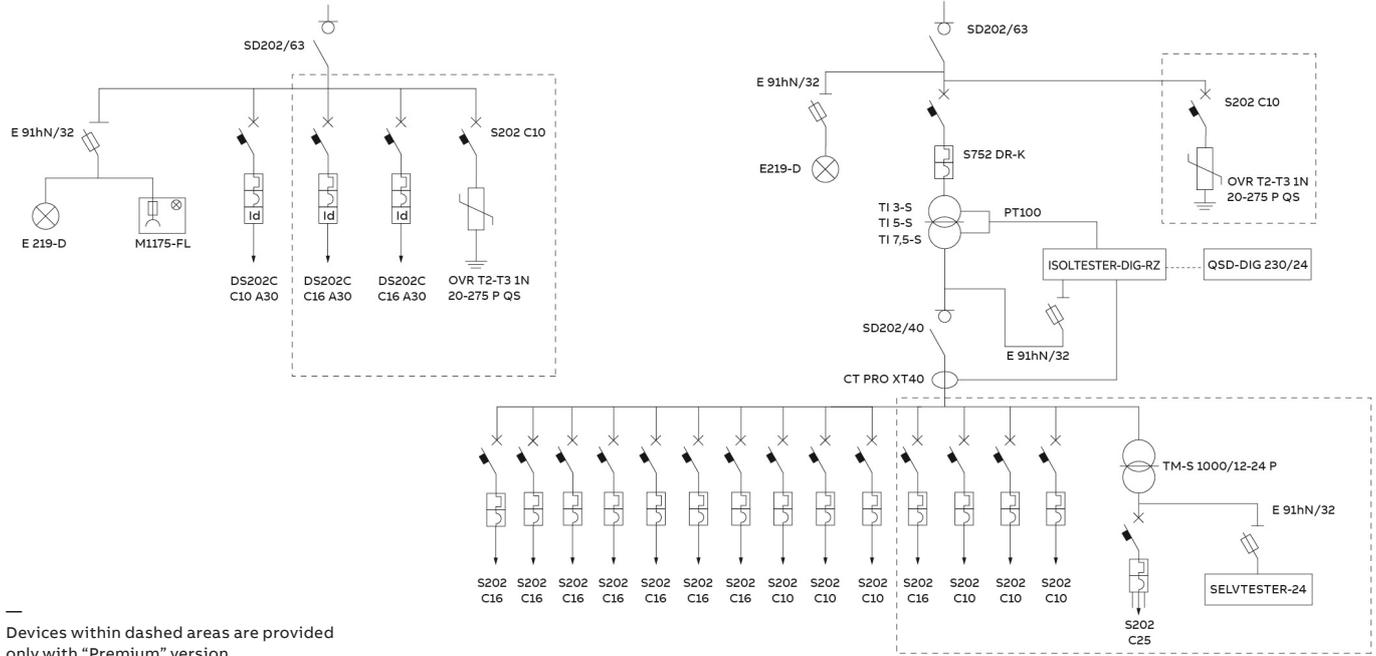
### QSO S diagram



Devices within dashed areas are provided only with "Premium" version.

Description	QSO 3S Classic	QSO 5S Classic	QSO 3S Premium	QSO 5S Premium
2P 40 A SD202/40 disconnecter	2	2	2	2
2P 63 A SD202/63 disconnecter			1	1
E 91hN/32 fuse-holder	2	2	3	3
E219-D green light indicator power supply presence	1	1	2	2
ISOLTESTER-DIG-RZ insulation monitoring device	1	1	1	1
6 kA 2P C10 S202 miniature circuit-breaker	2	2	2	2
6 kA 2P C16 S202 miniature circuit-breaker	5	5	5	5
6 kA 2P C25 S202 miniature circuit-breaker	1	1	1	1
25 kA 2P S752 DR-K25 miniature circuit-breaker	1	1	1	1
1N 10 A 0,03 A DS202 C C10 A30 residual current breaker with overcurrent protection			1	1
1N 16 A 0,03 A DS202 C C16 A30 residual current breaker with overcurrent protection			2	2
AMM damper set	4	4	4	4
CT PRO XT40 current transformer	1	1	1	1
Medical insulation transformer with 3000 VA 230/230 V TI 3-S probes	1		1	
Medical insulation transformer with 5000 VA 230/230 V TI 5-S probes				1
10 x 38 gG 2A E 9F10 GG2 fuse	4	4	6	6

QSO M diagram



Devices within dashed areas are provided only with "Premium" version.

Description	QSO 3M Classic	QSO 5M Classic	QSO 7,5M Classic	QSO 3M Premium	QSO 5M Premium	QSO 7,5M Premium
2P 63 A SD202/63 disconnector	3	3	3	3	3	3
E 91hN/32 fuse-holder	3	3	3	4	4	4
E219-D green light indicator power supply presence	2	2	2	2	2	2
ISOLTESTER-DIG-RZ insulation monitoring device	1	1	1	1	1	1
24 V SELVTESTER-24 insulation monitoring device				1	1	1
OVR T2-T3 1N 20-275 P QS surge protective device				2	2	2
6 kA 2P C10 S202 miniature circuit-breaker	3	3	3	8	8	8
6 kA 2P C16 S202 miniature circuit-breaker	7	7	7	8	8	8
6 kA 2P C25 S202 miniature circuit-breaker				1	1	1
M1175-FL 2P+T 16 A schucko socket with indicator lamp and fuse	1	1	1	1	1	1
25 kA 2P S752 DR-K25 miniature circuit-breaker	1	1		1	1	
25 kA 2P S752 DR-K40 miniature circuit-breaker			1			1
1N 10 A 0,03 A DS202 C C10 A30 residual current breaker with overcurrent protection	1	1	1	1	1	1
1N 16 A 0,03 A DS202 C C16 A30 residual current breaker with overcurrent protection				2	2	2
AMM damper set	4	4	4	8	8	8
CT PRO XT40 current transformer	1	1	1	1	1	1
TM-S 1000/12-24 P. 230-400V S. 24V control and safety transformer				1	1	1
Medical insulating transformer with 3000 VA 230/230 V TI 3-S probes	1			1		
Medical insulating transformer with 5000 VA 230/230 V TI 5-S probes		1			1	
Medical insulating transformer with 7500 VA 230/230 V TI 7,5-S probes			1			1
10 x 38 gG 2A E 9F10 GG2 fuse	6	6	6	8	8	8



# ISOLTESTER-DIG

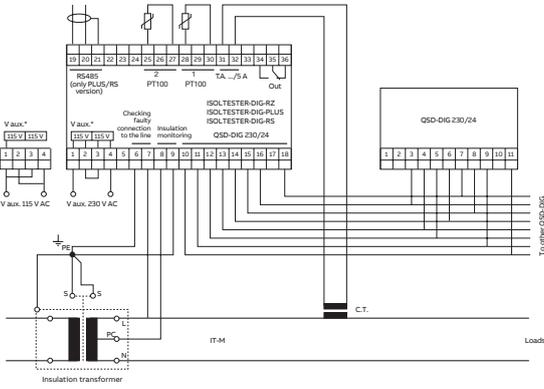
## Technical features

Technical features	ISOLTESTER-DIG-RZ	ISOLTESTER-DIG-PLUS/RS
Supply voltage/frequency	110 - 230 V/50-60 Hz	
Network voltage to be controlled	24 ÷ 230 V AC	
Maximum voltage measurement	24 V	
Maximum current measurement	1 mA	
Maximum internal resistance	100 kΩ	
Insulation voltage	2,5 kV/60 seconds	
Control signal type	Continuous component with digital filter	Codified composite signal (only PLUS)
Sensed measures	Insulation measurement range 0÷999 kΩ/HIGH - resolution 1 kΩ Temperature measurement by Rd PT100 or 2/3-wire thermal-probe - 0÷200°C, accuracy 2% Current measurement by external CT with secondary 5 A, accuracy 5% (selectable CT ratio 1÷40)	
Intervention threshold	Impedance measurement 0÷999 kΩ/HIGH - resolution 1 kΩ (test signal 2500 Hz)	Impedance measurement 0÷999 kΩ/HIGH - resolution 1 kΩ (variable composite signal)
	Low insulation 50÷500 kΩ, accuracy 5%, hysteresis 10%, settable delay	
	Overtemperature 30 ÷ 200°C, accuracy 2%	
	Current overload 1 ÷ 99.9 A, accuracy 2%	
	Low impedance (deactivable)	
Available outputs	Device not connected to the line (Error/Link-Fail)	
	Up to maximum 4 QSD panels for remote signalling	
Displays	Programmable auxiliary relay output NA-C-NC, 5A, 250 V AC	Programmable auxiliary relay output NA-C-NC, 5A, 250 V AC, RS 485 serial output, standard ModbusRTU protocol
	Insulation resistance value signalling over full scale and fault to earth	
	Measured temperature value 0 ÷ 200°C for channel 1	
	Measured temperature value 0 ÷ 200°C for channel 2	
	Measured current value 0 ÷ 99.9 A	
	Insulation impedance value (only PLUS)	
	Setting parameters	
	Device failing connection to the line (Error/Link-Fail)	
	Relay output status	
	Line-to-earth capacity value	
	Minimum insulation and maximum temperature and current values	
Connections	Maximum linkable section 2,5 mm <sup>2</sup>	
Operating temperature	-10...60 °C	
Storage temperature	-25...70 °C, humidity < 90%	
Overall dimensions	6 DIN MODULES	
Weight	0,4 kg	0,5 kg
Casing	Self-extinguishing plastic case to be assembled on 35 mm DIN rail, with transparent lead-sealable protective front cover	
Degree of protection	IP20	
Self-consumption	5 VA	
Reference standards	IEC 60364-7-710; EN 61557-1; IEC EN 61557-8	

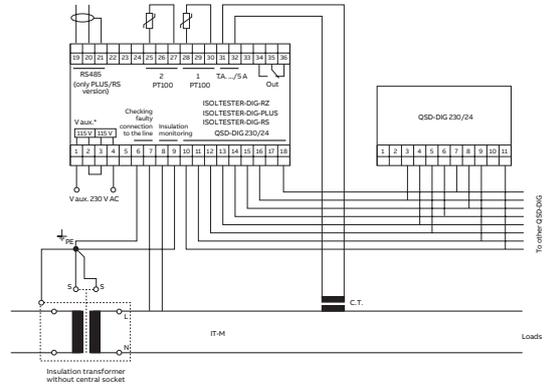
# ISOLTESTER-DIG

## Technical features

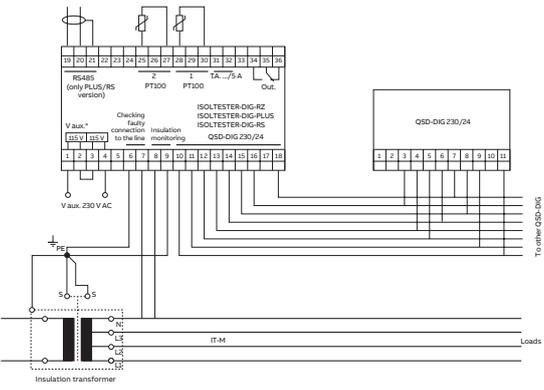
### Wiring diagrams



Transformer with central socket



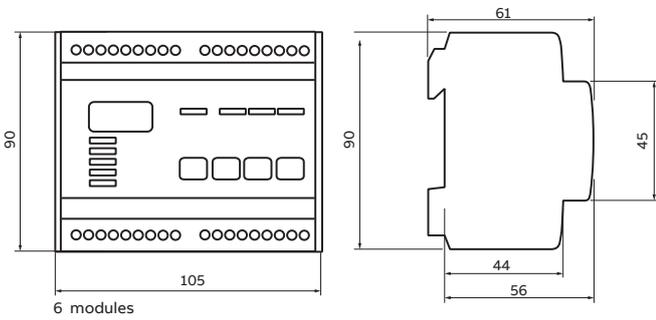
Transformer without central socket



3-phase transformer

\* Optional wiring of temperature probes and current transformers

### Overall dimensions

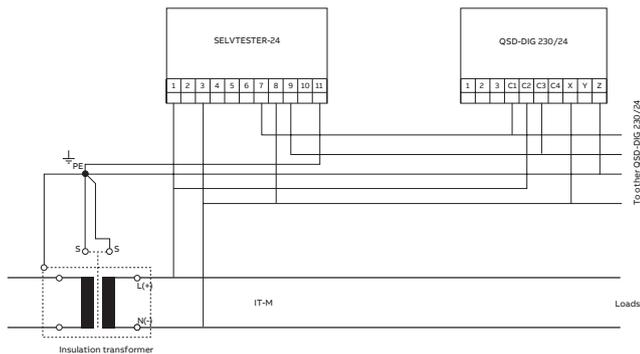


# SELVTESTER-24

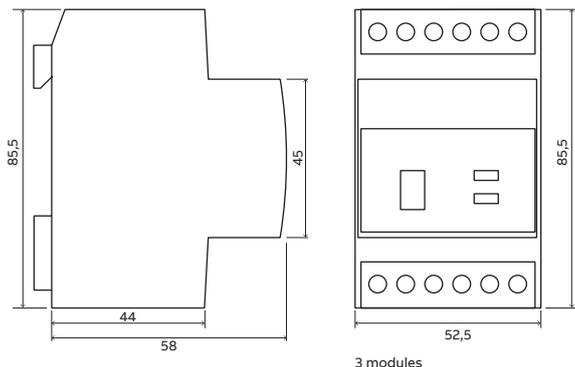
## Technical features

Technical features SELVTESTER-24	
Network voltage and auxiliary supply	24 V AC/DC
Frequency	50-60 Hz
Maximum self-consumption	3 VA
Maximum measurement current	0,5 mA
Internal impedance	50 k $\Omega$
Intervention threshold	10 $\div$ 50 k $\Omega$ 4 levels
Intervention delay	1 s
Signals	LED ON, LED ALARM +, LED ALARM -
Output maximum	24 V 1 A
Remote signalling panels	maximum 2 QSD-DIG 230/24
Operating temperature	-10 $\div$ 60 °C
Storage temperature	-20 $\div$ 70 °C
Relative humidity	$\leq$ 95%
Insulation test	2,5 kV 60 s / 4 kV imp. 1,2/50 $\mu$ s
Terminal blocks section	4 mm <sup>2</sup>
Degree of protection	front IP40 with cover / IP20 case
Modules	3
Weight	200 g
Reference standards	IEC 60364-7-710; EN 61557-1; EN 61557-8

### Wiring diagrams



### Overall dimensions

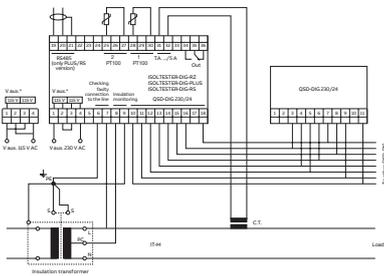


# QSD-DIG 230/24

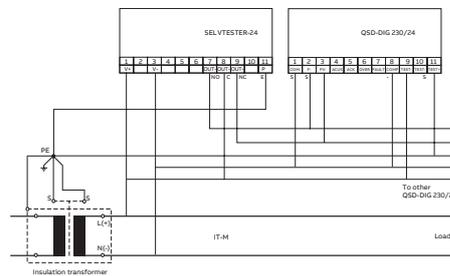
## Technical features

Technical features QSD-DIG 230/24	
Signals	Green LED NETWORK; Red LED overload ALARM; Yellow LED FAULT ALARM; Low insulation; Acoustic signaller; Emission 2400 Hz; Intermittence 2 Hz dB
Pushbuttons	Testing (TEST), acoustic disconnection (MUTE)
Terminal blocks section	2,5 mm <sup>2</sup>
Degree of protection	IP30
Installation	E503universal 3-module flush-mounted box
Weight 2	200 g
Operating temperature	-10 ÷ 60 °C, maximum humidity 95%
Storage temperature	-25 ÷ +80 °C
Insulation	2.500 V rms 50 Hz for 60 s
Connection	UTP cable (recommended)
Cable minimum section	0,35 mm <sup>2</sup> (maximum 300 m)
Reference standards	IEC 60364-7-710, EN 61557-1, EN 61557-8

### Wiring diagrams

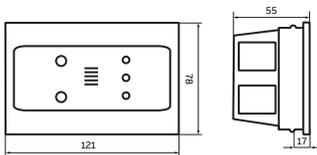


ISOLTESTER-DIG

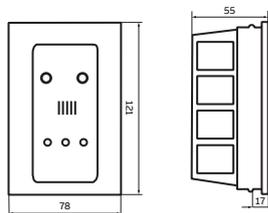


SELVTESTER-24

### Overall dimensions



QSD-DIG 230/24



QSD-DIG 230/24 V

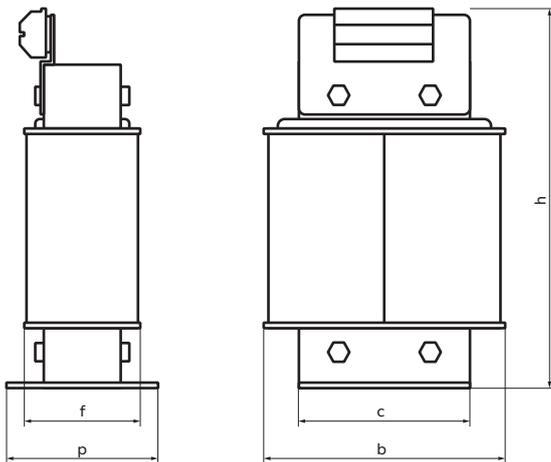
# TI

## Technical features

### Insulating transformer technical features

Power		3 kVA	5 kVA	7.5 kVA	10 kVA
Electrical protection class					
Thermal insulation class	[°C]	B 130	B 130	F 155	F 155
Maximum ambient temperature	[°C]	40	40	40	40
Primary voltage	[V]	230	230	230	230
Secondary voltage	[V]	230	230	230	230
Secondary current	[A]	13	21.7	32.6	43.5
Maximum inrush current	[A]	221	369	553	738
External secondary slow-blow fuse current	[A]	T 12,5	T 20	T 32	T 40
Maximum power dissipation	[W]	120	150	260	320
Frequency	[Hz]	50-60	50-60	50-60	50-60
Dispersion current to earth of the secondary winding	[mA]	< 0,5	< 0,5	< 0,5	< 0,5
Dispersion current to earth of the case	[mA]	< 0,5	< 0,5	< 0,5	< 0,5
Voltage drop in short-circuit		< 3%	< 3%	< 3%	< 3%
Primary no load current	[In]	< 3%	< 3%	< 3%	< 3%
Dispersion current between primary and secondary winding	[mA]	< 3,5	< 3,5	< 3,5	< 3,5
Dimensions (BxHxP)	[mm]	205 x 340 x 150	240 x 380 x 150	240 x 380 x 160	277 x 380 x 260
Weight	[kg]	29,5	44	50,5	73
Reference standards		EN 615588; EN 61558-2-15			

### Overall dimensions



	3 kVA	5 kVA	7,5 kVA	10 kVA
b [mm]	205	240	240	277
c [mm]	170	170	170	176
f [mm]	115	115	115	173
h [mm]	340	380	380	380
p [mm]	150	150	160	203



# Order codes



## QSO switchboards order codes

Type	Power (kVA)	BbN 8012542 EAN	ABB code
Operating theatre electrical switchboards, series S			
QSO 3S Classic	3	611226	2CSM261122R1551
QSO 5S Classic	5	736929	2CSM273692R1551
QSO 3S Premium	3	736028	2CSM273602R1551
QSO 5S Premium	5	736820	2CSM273682R1551
Operating theatre electrical switchboards, series M			
QSO 3M Classic	3	735922	2CSM273592R1551
QSO 5M Classic	5	736721	2CSM273672R1551
QSO 7,5M Classic	7.5	735823	2CSM273582R1551
QSO 3M Premium	3	736622	2CSM273662R1551
QSO 5M Premium	5	735724	2CSM273572R1551
QSO 7,5M Premium	7.5	736523	2CSM273652R1551
Operating theatre electrical switchboards, series L			
QSO 10L Classic	10	735625	2CSM273562R1551
QSO 7,5L Premium	7.5	736424	2CSM273642R1551
QSO 10L Premium	10	735526	2CSM273552R1551



## ISOLTESTER-DIG order codes

Type	BbN 8012542 EAN	ABB code
ISOLTESTER-DIG-RZ	884507	2CSM244000R1501
ISOLTESTER-DIG-RS	568339	2CSM256833R1521
ISOLTESTER-DIG-PLUS	884606	2CSM341000R1501



## SELVTESTER-24 order codes

Controlled network	Type	BbN 8012542 EAN	ABB code
IT-M SELV 24 V AC/DC	SELVTESTER-24	884705	2CSM211000R1511



#### QSD-DIG 230/24 order codes

Installation	Type	BbN 8012542 EAN	ABB code
Horizontal	QSD-DIG 230/24	730637	2CSM273063R1521
Vertical	QSD-DIG 230/24 V	570936	2CSM257093R1521



#### Medical insulating transformers order codes

Description	Type	PT100 Probes	BbN 8012542 EAN	ABB code
Insulating transformer 3 kVA	TI 3		2896005	2CSM110000R1541
Insulating transformer 5 kVA	TI 5		2896104	2CSM120000R1541
Insulating transformer 7,5 kVA	TI 7.5		2896203	2CSM130000R1541
Insulating transformer 10 kVA	TI 10		2521204	2CSM140000R1541
Insulating transformer 3 kVA	TI 3-S	•	2521402	2CSM210000R1541
Insulating transformer 5 kVA	TI 5-S	•	2521501	2CSM220000R1541
Insulating transformer 7,5 kVA	TI 7.5-S	•	2521600	2CSM230000R1541
Insulating transformer 10 kVA	TI 10-S	•	2521709	2CSM240000R1541
Anti-jamming dampers for transformers	AMM			2CSM900000R1541

# Questions and answers

## What does HI\_ which can be displayed on ISOLTESTER-DIG-RZ insulation monitoring device mean?

It means high insulation. ISOLTESTER-DIG-RZ displays, thanks to its three digit display, the real time insulation measurement up to 99 kΩ. HI appears whenever the detected insulation is higher than this value.

## What does LF\_ which can be displayed on ISOLTESTER-DIG-RZ insulation monitoring device mean?

It means “Link Fail”. ISOLTESTER-DIG-RZ display is capable of carrying out an internal self diagnosis to verify whether the measurement of the insulation is correctly performed. If the indication LF appears, it may mean that:

- The device has not been wired correctly. In this case it is necessary to verify the wiring according to the installation electrical scheme.
- There are electrical devices that discharge some direct current interference on the PE safety conductor which affects ISOLTESTER-DIG-RZ measuring signal.

In this case it is necessary to verify the dispersion by means of a tester. ABB has specifically developed ISOLTESTER-DIG-PLUS in order to operate also in a strongly interfered context.

## Which insulation value shall I set on ISOLTESTER-DIG as insulation threshold?

There are not normative prescription. It all depends on the level of protection you want for the system. The higher the threshold, the higher the protection. On the other hand, the higher the threshold, the higher the possibility to be warned. A useful recommendation may be of setting the threshold around 20% below the insulation measured in standard operating conditions.

## How do I enter ISOLTESTER-DIG setup menu?

Press “MINUS” and “SET/RESET” pushbutton simultaneously.

## How do I access the ISOLTESTER-DIG regulation menu?

Press “SET/RESET” pushbutton.

## How many signalling panels can I connect to each insulation monitor?

You can connect up to 4 remote parallel signalling panels, without adding any auxiliary supply.

## Is it possible to use the same QSO switchboards to feed two (or more) group 2 medical facilities?

The IEC 60364-7-710 reference standard does not allow this application. Any medical facility must be supplied by a dedicated medical insulating transformer. “For any group of functionally connected facilities at least an IT-M system is necessary” (article 710.512)

## Has the QSO switchboard got an integrated change-over device?

The QSO switchboards does not perform switching functions to safety power supply.

This functionality is required by the installation standard IEC 60364-7-710 (or by the relevant national rules) while the QSO distribution boards must comply with the IEC 61439 series of standards.

As the presence of the changeover in the group 2 switchboards is not yet necessary, though it could be one of the possible measures that can be used, the installer responsible for compliance with the IEC 60364-7-710 standard must do otherwise to guarantee this function.

## Shall I avoid the protection related with the insulation monitoring device by means of a fuse, in order to avoid the risk of the monitor being disconnected?

The protection of the insulation monitoring device is necessary to protect the device from short circuits, in particular at the end of the equipment useful life. Without a suitable protection, a fire could be produced which should damage seriously the switchboard. For these reasons, in accordance with the IEC 60364 reference standard, the switchboard manufacturer cannot ignore the duty of protection.

It is also true that the insulation monitoring device cannot be accidentally disconnected for several reasons:

- QSO Switchboards are equipped with a locked door. Only qualified and authorized personnel are expected to open it.
- The E 91hN/32 fuse holder that protects the insulation monitoring device has no disconnecting performance under load, and therefore, in order to open the handle it is necessary to operate on the circuit upstream, disconnecting this way the operating theatre from the supply.
- The E 91hN/32 fuse holder is sealed, and it may only be opened intentionally.

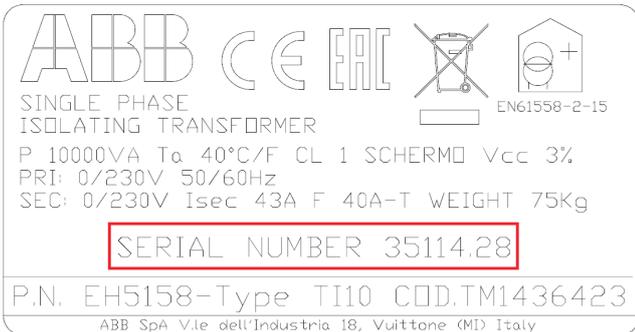
**How is it possible to connect 99 ISOLTESTER-DIG-PLUS to a single PLC with only few input channels?**

The connection between ISOLTESTER-DIG-PLUS and the PLC is via bus. This mean that no point to point connection is needed and only one PLC input is used.

**Does ABB release the QSO declaration of conformity?**  
Certainly.

**Is it possible to receive the test report related to the medical insulating transformer according to the IEC 60364-7-710 reference standard?**

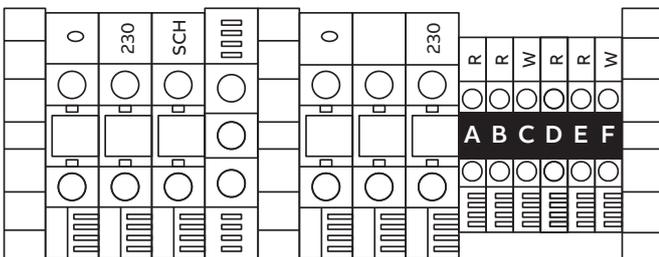
Certainly. It is enough to communicate the serial number printed on the label at the metallic base of the transformer, since the test reports on each produced unit are performed at the factory. The serial number is the seven digit number, as shown in the picture of the label below.



**How shall the PT100 temperature probes of the medical insulating transformer be connected?**

The temperature probes shall be connected to ISOLTESTER-DIG insulation monitoring device, as follows: - Connection of the primary winding temperature probe:

Terminal block	Description	ISOLTESTER terminal block
A-B	Sensor 1	28
C	Sensor 1	30
D-E	Sensor 2	25
F	Sensor 2	27



**Can I use any kind of insulating transformer in medical premises?**

General purpose insulating transformers are to be used in accordance with the EN 61558-2-4 reference standard "Particular requirements for general insulating transformers". The range of IT medical insulating transformers is in accordance with the EN 61558-2-15 reference standard "Particular requirements for insulating transformers for the supply of medical locations". This regulation prescribes additional requirements in order to safeguard the safety of the medical facilities. It is therefore not possible to use general purpose insulating transformers.

**Shall the insulating transformer be protected?**

All transformers shall be protected from short circuits and overloads according to the IEC 60364-1 reference standard. The protection shall be assigned by the manufacturer in order to guarantee suitable coordination.

**Can the upstream protection of insulation transformer be performed with an overcurrent protection device?**

In compliance with the instructions provided by the manufacturer, an overcurrent protection device can be therefore used to protect the upstream side of the insulation transformer. The 710.531 is satisfied if the rated current of the circuit breaker upstream is higher than the rated current of the transformer.

TI	[KVA]	3	5	7,5	10
Circuit breaker	[A]	25	25	40	50

**IEC 60364-7-710 reference standard requires that the medical transformer inrush current shall not be higher than 12 times the rated current. Why does the transformer technical specifications table shows a ratio of about 17 times (inrush current divided by rated current)?**

The rated current is not a RMS value, and therefore it is necessary to extract the peak value multiplying it by a factor root of two. Dividing the inrush current by the rated current RMS, the result shall be a ratio equal to 12.

**Additional information**

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