

# Digital Panel Meters Modular Indicator and Controller Type USC-DIN



- Front protection degree: IP 20
- Linearization of V and A inputs up to 16 points

- Multi-input modular signal's conditioner
- 0.1% RDG basic accuracy
- TRMS AC current and voltage measurements
- AC/DC current measurements; selectable full scales (200µA to 5A)
- AC/DC voltage measurements; selectable full scales (200mV to 500V)
- °C or °F temperature measurements (Pt100-250-500-1000, Ni100, TC J-K-S-T-E)
- Resistance measurements; selectable full scales (20 to 20k )
- Dual rate, speed, frequency and period measurement (0.001Hz to 50kHz)
- Up to 4 independent alarm set-points (optional)
- 20mA/10VDC analog output (optional)
- Serial port RS485 or RS232 (optional)
- MODBUS, JBUS communication protocol

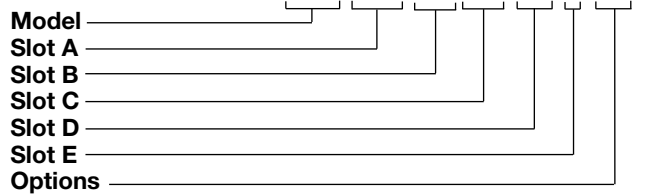
## Product Description

µp-based signal conditioner, for current, voltage, temperature, resistance, rate, frequency, speed and period measurements. Measuring ranges and functions easily programmable from the PC by means of optional UscSoft software available on

request. UscSoft includes programming, display and min-max functions. Conditioner housing for DIN-rail mounting with front protection degree: IP 20. All displaying and programming data are referred to UscSoft.

## How to order

**USC XXX XX XX XX X XX**



## How to order

**UscSoft-kit**

**UscSoft-kit:** software plus communication cable for programming USC by means of PC.

**UscSoft:** software for programming USC by means of PC, downloadable from [www.carlogavazzi.com](http://www.carlogavazzi.com).

## Type Selection

Slot A (measuring inputs)	Slot B (communication)	Slot C (communication and alarm)	Slot D (communication)
<b>LSX:</b> signal inputs: 0.2-2-20mA DC/AC; 0.2-2-20V DC/AC  <b>LSE/ LSF:</b> signal inputs: + AUX: 0.2-2-20mA DC/AC; 0.2-2-20V DC/AC  <b>HSX:</b> signal inputs: 0.2-2-5A DC/AC; 20-200-500V DC/AC (**)  <b>TRX:</b> signal inputs: TC temperature probes (J-K-S-T-E, Pt100-250-500-1000) and resistance (0.02-0.2-2-20k )  <b>TF1:</b> 0.001Hz to 50kHz for DC signals: PNP, NPN, NAMUR, TTL, free of voltage, contacts, voltages up to 14VDC  <b>TF2:</b> 0.001Hz to 50kHz for AC signals: pick-up, voltages up to 500VAC	<b>XX:</b> None <b>SX:</b> Serial port RS485 <b>SY:</b> Serial port RS232  <b>(*):</b> The two analogue outputs cannot be used at the same time. It is possible to plug in only one module by signal conditioner.  <b>(**):</b> Special version HSX01 with same signal input range as HSX and extended Max. indication of 0.24-2.4-6A DC/AC 24-240-600V DC/AC is available on request.	<b>XX:</b> None <b>R1:</b> Single relay output, (AC1-8AAC, 250VAC) <b>R2:</b> Dual relay output, (AC1-8AAC, 250VAC) <b>R4:</b> Dual relay output, (AC1-8AAC, 250VAC) + dual open collector output (NPN, 100mA) <b>R5:</b> 4 Relay outputs (AC1-5AAC, 250VAC) <b>AV(*):</b> Single analogue output: 0 to 20mA DC and 0 to 10V DC	<b>XX:</b> None <b>AV(*):</b> Single analogue output, 0 to 20mA DC and 0 to 10V DC  <b>Slot E (power supply)</b> <b>H:</b> 90 to 260V AC/DC <b>L:</b> 18 to 60V AC/DC (24 to 48V AC/DC ± 25% according to UL) <b>3:</b> 10 to 28V DC (12 to 24V DC ± 15% according to UL)  <b>Options</b> <b>XX:</b> None <b>TX:</b> Tropicalization



## Input specifications

<b>Analogue inputs</b> BQ LSX module BQ LSE/LSF module BQ HSX module BQ TRX module BQ TRX module BQTF1 module BQTF2 module	Channels and variable 1, mA and V DC/AC 1, mA and V DC/AC + AUX 1, A and V DC/AC 1, temperature 1, resistance 2, frequency 2, frequency	<b>Max and min indication</b>  <b>Measurements</b>  Coupling type Crest factor  <b>Input impedance</b>  <b>Frequency</b>  <b>Overload</b>  <b>Compensation</b>  RTD    TC	See table "Measurement accuracy, temperature drifts and max min indications"  Current, voltage, temperature, resistance and frequency. For the current and voltage measurements: TRMS measurement of distorted sine waves. Direct $\leq 3$ ; $A_{Pmax}=1.7In$ ; $V_{Pmax}=1.7Un$  See table "input impedances and overloads"  40 to 440 Hz  See table "input impedances and overloads"  Only temperature measurement module. - For Pt 100-250-500-1000, 3-wire connection: up to 10 - For resistance measur. with 20 range: up to max 0.1 - For resistance measurements with 200 range: up to max 10 Internal cold junction, within temperature range from 0 to +50°C. Automatic or manual compensation from 0 to 50°C.
<b>Digital inputs</b> Number of inputs Use  Contact reading signal  Close contact resistance Open contact resistance Insulation	Incl. in the measuring module 1 (voltage-free) key-pad lock Display hold Reset of latch alarms BQ xxx: <0.1mA, <3.5V DC BQ LSE/BQ LSF: <2.5mA, <14V DC BQTF1: <6mA, <7VDC BQTF2: <0.25mA, <3VDC Max 1k Min 500k (BQTFx: 100k ) Non-insulated		
<b>Accuracy</b> (display, RS485)	See table "Measuring accuracy", temperature drifts and minimum-maximum indications"		
<b>Additional errors</b> Humidity  Input frequency Magnetic field	0.3% RDG (BQTFx: 0.05%), 60% to 90% R.H. 0.4% RDG, 62 to 440 Hz 0.5% RDG (BQTFx: 0.05%) @ 400 A/m		
<b>Temperature drift</b>	See table "Measurement accuracy, temperature drifts, and max/min indications"		
<b>Sampling rate</b>	500 samples/s @ 50 Hz (escl. BQTFx)		
<b>Display refresh time</b>	200 msec @ 50Hz (escl. BQTFx)		

## Measurement accuracy, temp. drifts, max and min indications

All accuracies and min/max indications are referred to an ambient temp. range of 25°C ±5°C, rel. humidity 60% and scale ratio (electrical/displayed scale) equal to 1. The conversion into °F is obtained acting on the electrical/displayed scale ratio.

Module	Inputs	Type	Accuracy	Temp. drift	Min. indication (■)	Max. indicat. (■)
BQ LSX/ BQ LSE/ BQ LSF	-200µA to +200µA -2mA to +2mA -20mA to +20mA -200mV to +200mV -2V to +2V -20V to +20V	DC/AC	DC: ±(0.1%RDG+3DGT) 0% to 25% FS; ±(0.1%RDG+2DGT) 25% to 110% FS. TRMS (da 45 a 65Hz)*: ±(0.3%RDG+3DGT) 0% to 25% FS; ±(0.3%RDG+2DGT) 25% to 110% FS.	±150 ppm/°C	- 200.0 - 2.000 - 20.00 - 200.0 - 2.000 - 20.00	+ 200.0 + 2.000 + 20.00 + 200.0 + 2.000 + 20.00

\* <45Hz >65Hz= ±(0.5%RDG+3DGT) 0% to 25% FS; ±(0.5%RDG+2DGT) 25% to 110% FS.

(■) The min. indication for TRMS measurement (AC or DC) is 0; it is possible to modify the decimal point position.



## Measurement accuracy, temp. drifts, max and min indications (cont.)

All accuracies and min/max indications are referred to an ambient temp. range of 25°C ±5°C, rel. humidity 60% and scale ratio (electrical/displayed scale) equal to 1. The conversion into °F is obtained acting on the electrical/displayed scale ratio.

Module	Inputs	Type	Accuracy	Temp. drift	Min. indication (■)	Max. indicat. (■)
BQ HSX	-200mA to +200mA -2A to +2A -5A to +5A -20V to +20V -200V to +200V -500V to +500V	DC/AC	DC: ±(0.1%RDG+3DGT) 0% to 25% FS; ±(0.1%RDG+2DGT) 25% to 110% FS. TRMS (45 to 65Hz)*: ±(0.3%RDG+3DGT) 0% to 25% FS; ±(0.3%RDG+2DGT) 25% to 110% FS.	±150 ppm/°C	- 200.0 - 2.000 - 5.000 - 20.00 - 200.0 - 500.0	+ 200.0 + 2.000 + 5.000 + 20.00 + 200.0 + 500.0
BQ TRX Thermo- couple	-50°C to +760°C -58 °F to +1400 °F -200°C to +1260°C -328 °F to +2300°F -200°C to +1000°C -328°F to +1832°F -50°C to +1750°C -58°F to +3182°F -200°C to +400°C -328°F to +752°F	J J K K E E S S T T	±(0.2%RDG+1DGT) ±(0.2%RDG+2DGT) ±(0.2%RDG+2DGT) ±(0.2%RDG+4DGT) ±(0.2%RDG+2DGT) ±(0.2%RDG+4DGT) ±(0.2%RDG+2DGT) ±(0.2%RDG+4DGT) ±(0.2%RDG+2DGT) ±(0.2%RDG+4DGT)	±150 ppm/°C	- 50°C - 58°F - 200°C - 328°F - 200°C - 328°F - 50°C - 58°F - 200°C - 328°F	+ 760°C + 1400°F + 1260°C + 2300°F + 1000°C + 1832°F + 1750°C + 3182°F + 400°C + 752°F

\* <45Hz >65Hz= ±(0.5%RDG+3DGT) 0% to 25% FS; ±(0.5%RDG+2DGT) 25% to 110% FS.

(■) The min. indication for TRMS measurement (AC or DC) is 0; it is possible to modify the decimal point position.

Module	Inputs	Type	Accuracy	Temp. drift	Min. indication	Max. indicat.
BQ TRX Ther- moresis- tance	-200°C to +850°C -328°F to +1562°F -200.0°C to +200.0°C -328°F to +392°F -200.0°C to +200.0°C -328°F to +392°F -200.0°C to +200.0°C -328°F to +392°F -200.0°C to +200.0°C -328°F to +392°F -60°C to +180°C -76°F to +356°F	Pt100 Pt100 Pt100 Pt100 Pt250 Pt250 Pt500 Pt500 Pt1000 Pt1000 Ni100 Ni100	±(0.2%RDG +2DGT) ±(0.2%RDG +4DGT) ±(0.5%RDG +5DGT) ±(0.5%RDG +5DGT) ±(0.5%RDG +5DGT) ±(0.5%RDG +5DGT) ±(0.5%RDG +5DGT) ±(0.5%RDG +5DGT) ±(0.5%RDG +5DGT) ±(0.5%RDG +5DGT) ±(0.5%RDG +1DGT) ±(0.5%RDG +2DGT)	±150 ppm/°C	- 200 - 328 - 200.0 - 328.0 - 200.0 - 328.0 - 200.0 - 328.0 - 200.0 - 328.0 - 60 - 76	+ 850 + 1562 + 200.0 + 392.0 + 200.0 + 392.0 + 200.0 + 392.0 + 200.0 + 392.0 + 180 + 356
BQ TRX Resis- tance	0 to 20 0 to 200 0 to 2000 0 to 20.00k		±(0.2%RDG+2DGT) 25% to 110% FS ±(0.2%RDG+3DGT) 0% to 25% FS	±150 ppm/°C	0 0 0 0	20.0 (■) 200.0 (■) 2000 (■) 20.00 (■)
BQ TF1	NPN (DC) PNP (DC) NAMUR (DC) TTL (DC): high level >4V low level <2 Free of voltage con- tact (DC)		0.001% RDG ±3 digit	± 50 ppm/°C	0.000 (*) 00.00 (*) 000.0 (*) 0000 (*)	9.999 99.99 999.9 9999
BQ TF2	Pick-up (AC) Voltage (AC) 2VAC to 100VAC Voltage (AC) 9VAC to 500VAC		0.001% RDG ±3 digit	± 50 ppm/°C	0.000 (*) 00.00 (*) 000.0 (*) 0000 (*)	9.999 99.99 999.9 9999

(■) It is possible to modify the decimal point position.

(\*) The min indication is -9.99999, ..., -999999 in case of "rotation speed detection" function

## Input impedances and overloads

Module	Inputs	Type	Impedance	Overload (continuous)	Overloads (1s)
BQ LSX/ BQ LSE/ BQ LSF	-200 $\mu$ A to +200 $\mu$ A -2mA to +2mA -20mA to +20mA -200mV to +200mV -2V to +2V -20V to +20V	DC/AC DC/AC DC/AC DC/AC DC/AC DC/AC	2,2k 22 22 2,2k 200k 200k	5mA 50mA 50mA 10V 50V 50V	10mA 150mA 150mA 20V 100V 100V
BQ HSX	-200mA to +200mA -2A to +2A -5A to +5A -20V to +20V -200V to +200V -500V to +500V	DC/AC DC/AC DC/AC DC/AC DC/AC DC/AC	1 0.012 0.012 2M 2M 2M	0.8A 7.5A 7.5A 750V 750V 750V	1A 100A 100A 1000V 1000V 1000V
BQ TRX Thermo- couple	-50°C to +760°C -58 °F to +1400 °F -200°C to +1260°C -328 °F to +2300°F -200°C to +1000°C -328°F to +1832°F -50°C to +1750°C -58°F to +3182°F -200°C to +400°C -328°F to +752°F	J J K K E E S S T T	$I_{LK} < 0.5\mu A$	Max 5V	Max 10V
BQ TRX Thermo- resistance	-200°C to +850°C -328°F to +1562°F -200.0°C to +200,0°C -328°F to +392°F -200.0°C to +200,0°C -328°F to +392°F -60°C to +180°C -76°F to +356°F	Pt100 Pt100 Pt250/Pt100 Pt250/Pt100 Pt1000/Pt500 Pt1000/Pt500 Ni100 Ni100	800 $\mu$ A (*) 800 $\mu$ A (*) 90 $\mu$ A (*) 90 $\mu$ A (*) 800 $\mu$ A (*) 800 $\mu$ A (*) 800 $\mu$ A (*) 800 $\mu$ A (*)	Max 5V	Max 10V
BQ TRX Resistance	0 to 20 0 to 200 0 to 2000 0 to 20.00k		800 $\mu$ A (*) 90 $\mu$ A (*) 800 $\mu$ A (*) 90 $\mu$ A (*)	Max 5V	Max 10V
BQ TF1	NPN (DC) PNP (DC) NAMUR (DC) TTL (DC) Free of voltage contact (DC)		600 $\Omega$ 600 $\Omega$ 600 $\Omega$ 600 $\Omega$	15 VAC/DC 15 VAC/DC 15 VAC/DC 15 VAC/DC 15 VAC/DC	20 VAC/DC 20 VAC/DC 20 VAC/DC 20 VAC/DC 20 VAC/DC
BQ TF2	Pick-up (AC) Voltage (AC) up to 100VAC Voltage (AC) up to 500VAC		220 k $\Omega$ 950 k $\Omega$	120 VAC/DC 600 VAC/DC	200 VAC/DC 600 VAC/DC

(\*) Maximum measuring current generated for resistance equal to 0

## Output specifications

<p><b>RS422/RS485</b></p> <p>Serial output</p> <p>LED</p> <p>Connections Distance Terminalization</p> <p>Addresses</p> <p>Protocol Data (bidirectional) Dynamic (reading only)</p> <p>Static (reading/writing)</p> <p>Data format</p> <p>Baud rate</p> <p>Insulation</p>	<p><b>(on request)</b> Module: BR SX Bidirectional (static and dynamic variables). Display of data reception/transmission Multidrop, 2 or 4 wires, 1000 m Directly on the module by means of jumper 1 to 247, selectable by means of key-pad MODBUS RTU/JBUS</p> <p>Measurement, min value max value alarm status All programming parameters, min max reset reset of latch alarm 8 data bit, no parity, 1 stop bit selectable 4800, 9600, 19200 and 38400 bit/s</p> <p>By means of opto-couplers 4000 V<sub>rms</sub> output to measuring inputs 4000 V<sub>rms</sub> output to power supply input</p>	<p>Relay output BO R1, R2, R4</p> <p>Relay output BO R5</p> <p>Insulation</p> <p>Open collector output</p> <p>Insulation</p>	<p>2 open collector outputs). BO R5 (4 relay outputs) Type SPST AC 1: 8A, 250VAC DC 12: 5A, 24VDC AC 15: 2.5A, 250VAC DC 13: 2.5A, 24VDC Type SPST (NO) AC 1: 5A, 250VAC DC 12: 3A, 24VDC AC 15: 1,5A, 250VAC DC 13: 1,5A, 24VDC 4000 V<sub>RMS</sub> output to measuring input, 4000 V<sub>RMS</sub> output to power supply input. NPN transistor type V<sub>ON</sub> 1.2 VDC/ max. 100 mA V<sub>OFF</sub> 30 VDC max. By means of opto-couplers 4000 V<sub>RMS</sub> output to measuring input 4000 V<sub>RMS</sub> output to power supply input</p>
<p><b>RS232</b></p> <p>Serial output</p> <p>Connections Distance</p> <p>Data format</p> <p>Baud rate</p> <p>Other features</p>	<p><b>(on request)</b> Module: BR SY Bidirectional (static and dynamic variables) 3 wires, max. 15m 1 start bit, 8 data bit, no parity, 1 stop bit Selectable 4800, 9600, 19200 and 38400 bit/s Same as RS422/485</p>	<p>Analogue output</p> <p>Range Scaling factor</p> <p>Accuracy Response time Temperature drift Load: 20 mA output 10 V output Insulation</p>	<p><b>(on request)</b> Module: BO AV 0 to 20 mADC, 0 to 10 VDC Programmable within the entire retransmission range; allows to manage the retransmission of all the values from 0 to 20 mA / 0 to 10V ± 0.2% FS (@ 25°C ± 5°C) ≤ 10 ms ± 200 ppm/°C ≤ 700 ≥ 10 k By means of opto-couplers 4000V<sub>rms</sub> output to measuring input 4000V<sub>rms</sub> output to power supply input</p>
<p><b>Alarm outputs</b></p> <p>Alarm type</p> <p>Alarm set-point</p> <p>Hysteresis On-time delay Off-time delay Output status</p> <p>Min response time</p> <p>Output channels</p> <p>BO R2 (2 relay outputs).</p> <p>BO R4 (2 relay outputs +</p>	<p><b>(on request)</b> Over-range alarm, up alarm, down alarm, down alarm with start-up deactivation up alarm with latch, down alarm with latch Adjustable from 0 to 100% of displayed electric range 0 to 100% of displayed range 0 to 255 s 0 to 255 s Selectable: normally energized /de-energized 500 ms, with filter excluded, without alarm activation delay 1 with module BO R1 (relay output). 2, independent with module</p> <p>4, independent with module</p>	<p>Notes:</p> <p><b>Excitation output</b> BQ LSE Module Voltage BQ LSF Module Voltage BQTF1 Module Voltage 1 Voltage 2 Insulation</p>	<p>The two outputs cannot be used at the same time.</p> <p><b>(on request)</b> 13 VDC ±10%, max. 50 mA 25 VDC ±10%, max. 25 mA 8.2VDC ±10%, max 10mA. 13VDC ±10%, max 40mA. 25V<sub>RMS</sub> output to measuring input 4000 V<sub>RMS</sub> output to power supply input</p>



## Software functions

<b>Min / Max storage</b>	Automatic storage (in the EEPROM) of the minimum and maximum measured value from the previous memory reset	Displayed range of the variable	Programmable within the display range
<b>Password</b>  1st level 2nd level	Numeric code max 4 dgt 2 levels of data protection. 0 to 4999 completely protected. 5000 to 9999 access to programming is protected . Alarm set-points are directly programmable from the measuring mode.	Pulse per revolution	BQTFx only: programmable from 1 to 9999
		Input engineering unit	BQTFx only: programmable among Hz, kHz, rpm, krpm, rph, krph
<b>Measurement selection</b>	Depending on the module: measuring range and type of probe (resistance, RTD thermoresistance, TC thermocouple) or measuring type (TRMS or DC).	<b>Digital filter</b>	
		Filter operating range	0 to 9999
<b>Function (only BQTFx)</b>	Calculated functions of channel A and B: F1: scaled value of channel A; F2: 1/A; F3: A-B; F4: (A-B)/B*100; F5: A/B; F6: B/(A+B)+100; F7: rotation sensing.	Filtering coefficient	1 to 32
		<b>Scaling</b>	Selection of min value of the input range. Selection of max value of the input range. Selection of decimal point position. Selection of min display value. Selection of max display value.
<b>Integration time selection</b>	Automatic or from 100.0 to 999.9 ms only in the current and voltage measurement. (BQTFx excluded)	<b>Linearization</b>	
<b>Scaling factors</b> Operating mode  Electrical range  Decimal point position	Electrical scale compression, displayed scale compression/expansion (max. 2 without filter, up to 10 with filter) Programmable within the whole measuring range Programmable within the display range	Points	Up to 16
		Input range	Selectable by every single point
		Output range	Selectable by every single point
		<b>UscSoft</b>	Software for programming USC by means of PC (Windows 95, 98se, ME, XP) by means of serial port RS485 and relevant connection cable. The software is available in English, Spanish, Italian, German, French. See also "Programming of USC by means of PC" .

## Supply Specifications

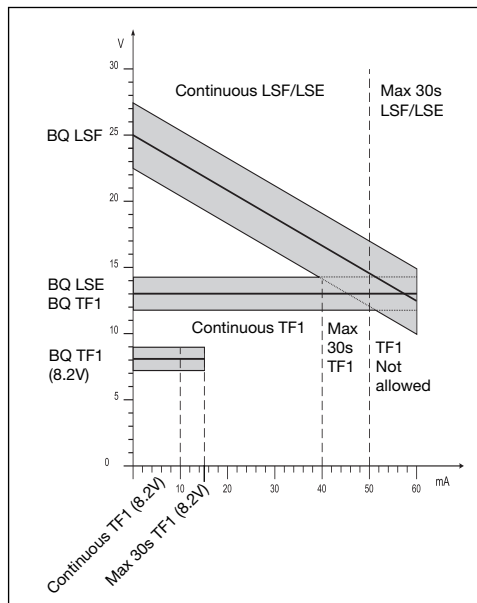
<b>AC/DC voltage</b>	90 to 260V (standard) 18 to 60V (on request) (24 to 48V AC/DC ± 25% according to UL)	<b>Energy consumption</b>	≤ 30VA/12W (90 to 260V) ≤ 20VA/12W (18 to 60V) ≤ 7.5W (10 to 28V)
<b>DC voltage only</b>	10 to 28V (on request) (12 to 24V DC ± 15% according to UL)		



## General Specifications

<b>Operating temperature</b>	0° to 50°C (32° to 122°F) (H.R. < 90% non-condensing)	<b>Safety Standards</b>	EN 61010-1, IEC 61010-1
<b>Storage temperature</b>	-10° to 60°C (14° to 140°F) (H.R. < 90% non-condensing)	<b>Connections</b>	Screw type Cable cross-section area Max. 2.5 mm <sup>2</sup> ; Min./Max. screws tightening torque: 0.4 Nm / 0.6 Nm
<b>Insulation reference voltage</b>	300 V <sub>RMS</sub> to ground (500V input)	<b>Housing</b>	Dimensions Material
<b>Insulation</b>	See table "Insulation between inputs and outputs"		44 x 113 x 107 mm PC-ABS, self-extinguishing: UL 94 V-0
<b>Dielectric strength</b>	4000 V <sub>RMS</sub> for 1 minute	<b>Protection degree</b>	IP20
<b>Rejection</b>		<b>Weight</b>	560 g approx (included all modules and packing)
NMRR	40 dB, 40 to 60 Hz	<b>Approvals</b>	CE, cCSA UL e cRU US
CMRR	100 dB, 40 to 60 Hz		
<b>EMC</b>	EN61000-6-2, IEC61000-6-2 EN61000-6-3, IEC61000-6-3		

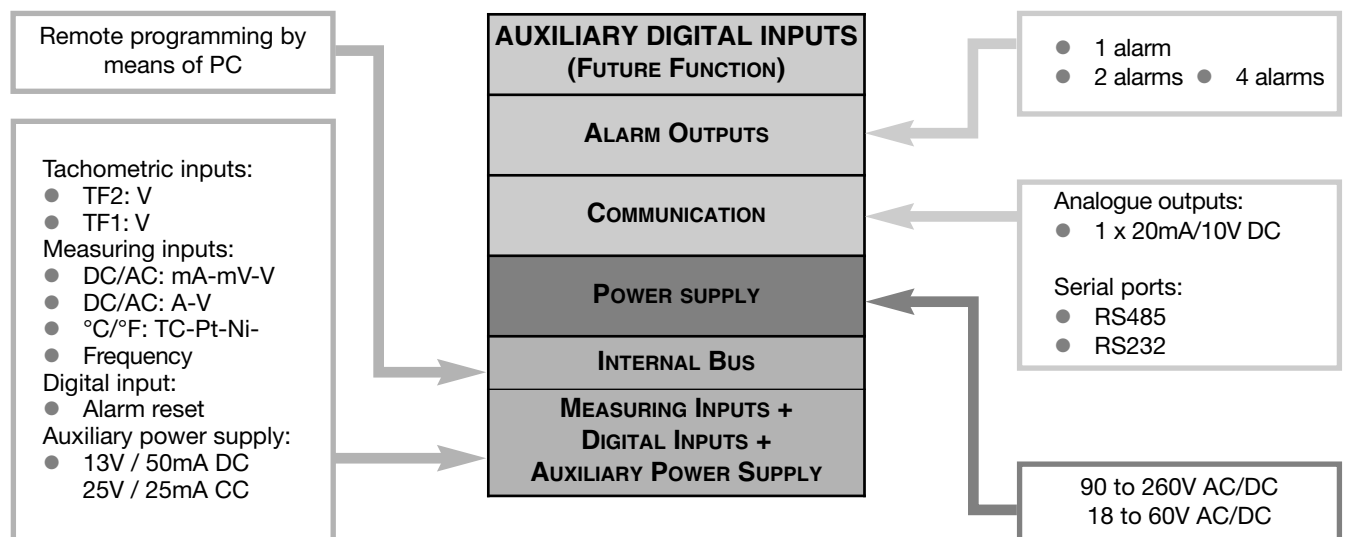
## Excitation output



## Insulation between inputs and outputs

	Meas. inputs	Relay out-put	Static out-put	Analogue output	Serial Port	AUX p.supply	90-260VAC/ DC p.supply	18-60VAC/ DC p.supply
Meas. inputs	-	4kV	4kV	4kV	4kV	25V	4kV	4kV
Relay Output	4kV	-	2kV	4kV	4kV	4kV	4kV	4kV
Static Output	4kV	2kV	-	4kV	4kV	4kV	4kV	4kV
Analogue Output	4kV	4kV	4kV	-	4kV	4kV	4kV	4kV
Serial Port	4kV	4kV	4kV	4kV	-	4kV	4kV	4kV
AUX p.supply	25V	4kV	4kV	4kV	4kV	-	4kV	4kV
90-260VAC/ DC p. supply	4kV	4kV	4kV	4kV	4kV	4kV	-	-
18-60VAC/ DC p. supply	4kV	4kV	4kV	4kV	4kV	4kV	-	-

## USC architecture





## Available modules

## Possible module combinations

Type	N. of ch.	Ordering code
UDS-DIN main unit		BD XX
DC/AC input: 200µA , 2mA, 20mA, 200mA, 2V, 20V	1	BQ LSX
DC/AC input: 200µA , 2mA, 20mA, 200mA, 2V, 20V + excitation output	1	BQ LSE/ BQ LSF
DC/AC input: 200mA, 2A, 5A, 20V, 200V, 500V	1	BQ HSX
Input: 20 , 200 , 2k , 20k	1	BQ TRX
TC: J-K-S-T-E, Pt100-250-500-1000	1	BQ TRX
Pulse signals input: 0.001Hz to 50kHz for DC signals	2	BQ TF1
Pulse signals input: 0.001Hz to 50kHz for AC signals	2	BQ TF2
Analogue output 0 to 20mA, 0 to 10VDC	1	BO AV
Relay output	1	BO R1
Relay output	2	BO R2
Outputs: 2 relays + 2 open collectors	4	BO R4
Relay output	4	BO R5
RS485 Serial Port	1	BR SX
RS232 Serial Port	1	BR SY
Power supply 18 to 60V AC/DC		BP L
Power supply 90 to 260V AC/DC		BP H
Power supply 10 to 28V DC		BP 3

Basic Unit	Slot				
	A	B	C	D	E
Measuring inputs: LSX, LSE, LSF, HSX, TRX, TF1, TF2	●				
RS485 serial port: SX		●			
RS232 serial port: SY		●			
Analogue output: AV (*)			●	●	
Relay outputs and/or open collector: R1, R2, R4, R5			●		
Power supply: H, L, 3					●

(\*) Up to 1 module max.

## Used calculation formulas

Only for TRMS Measurements

Instantaneous effective voltage (TRMS)

$$V_1 = \sqrt{\frac{1}{n} \cdot \sum_1^n (V_1)_i^2}$$

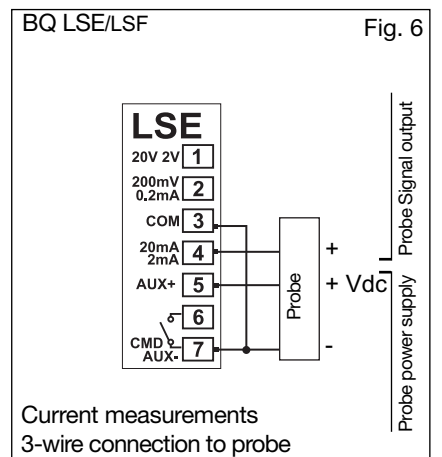
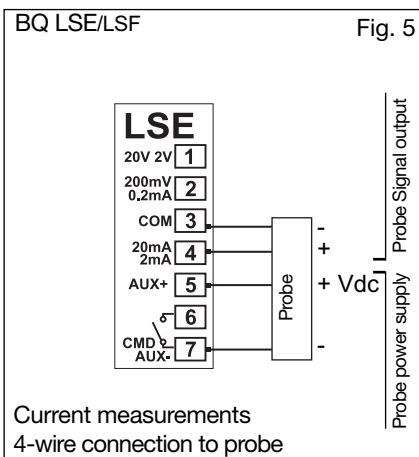
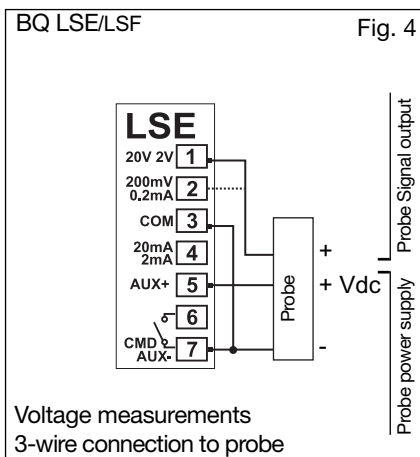
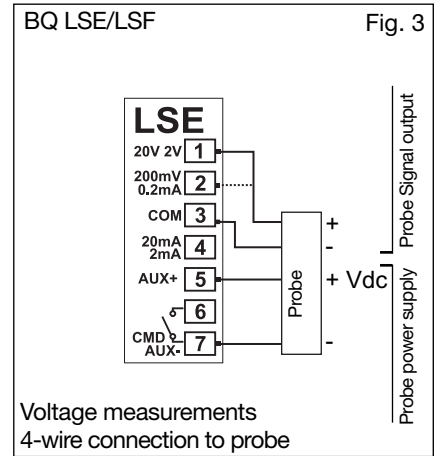
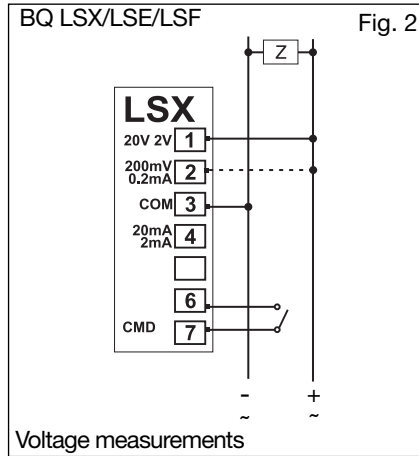
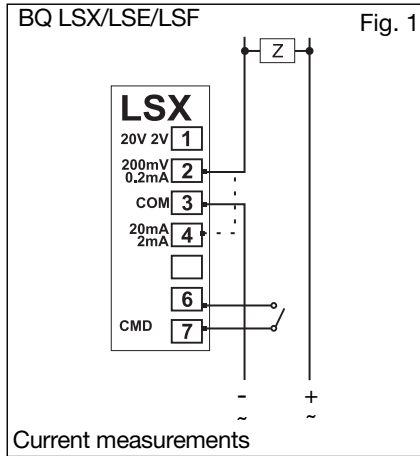
Instantaneous effective current (TRMS)

$$A_1 = \sqrt{\frac{1}{n} \cdot \sum_1^n (A_1)_i^2}$$

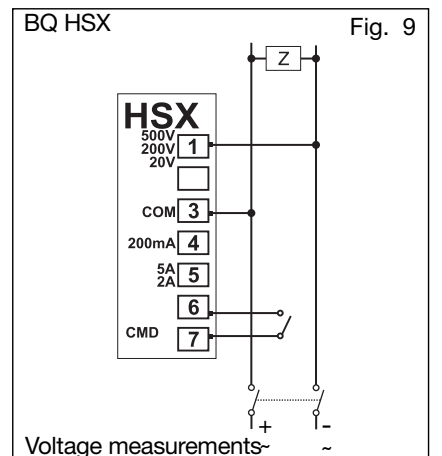
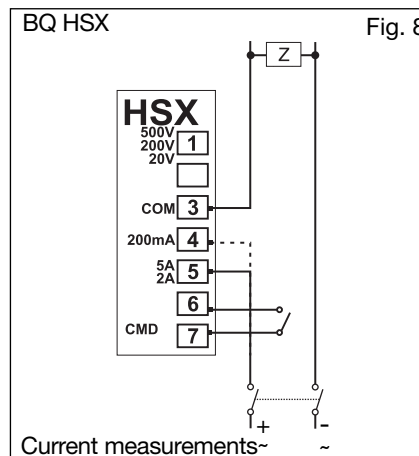
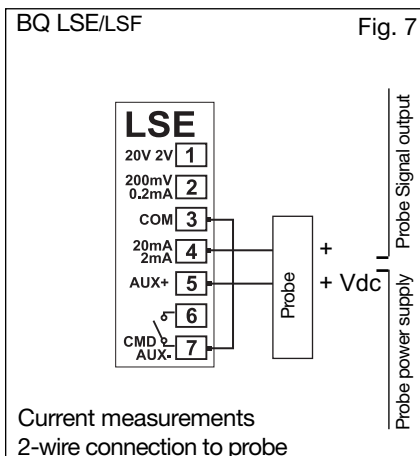


# Wiring diagrams

## Process signal wiring diagrams

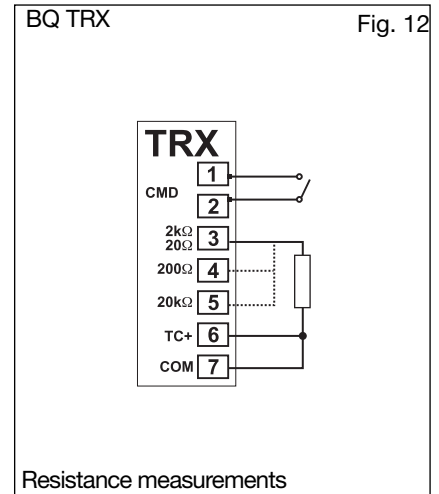
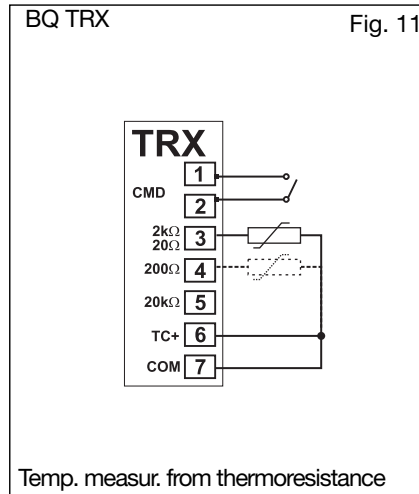
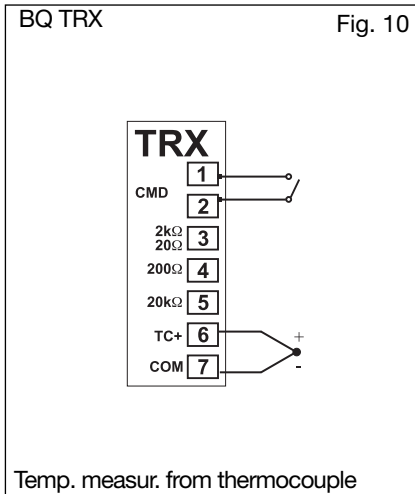


## Wirings for high-level signals

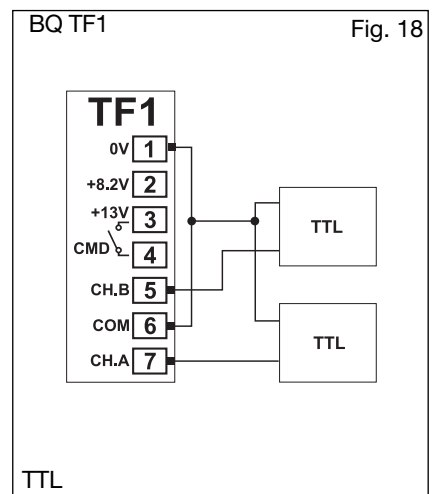
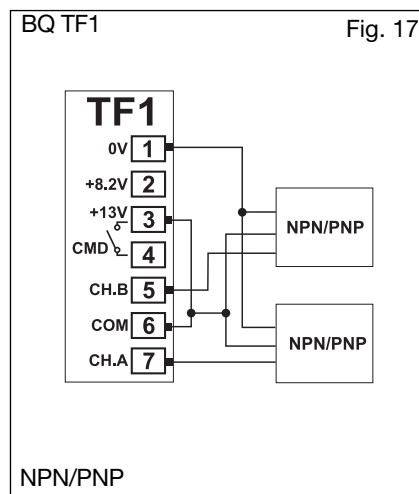
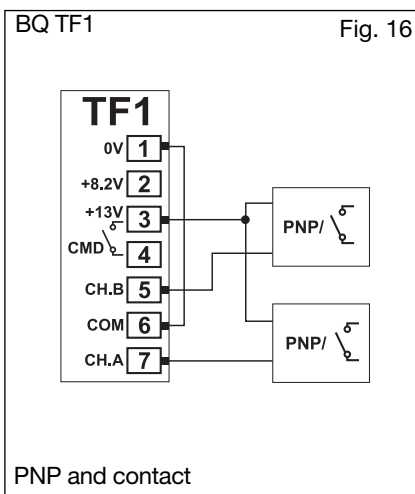
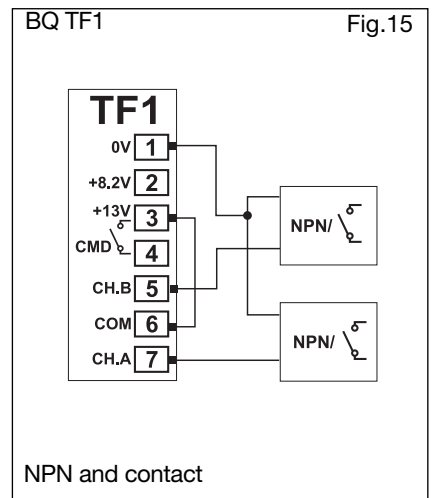
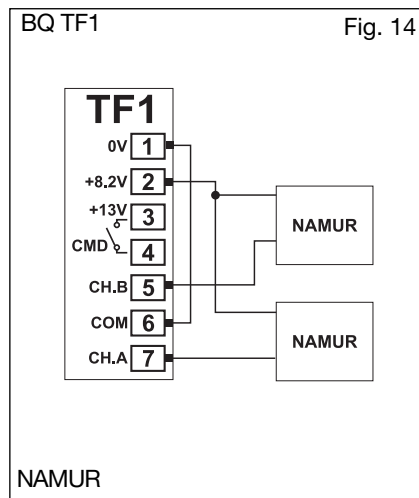
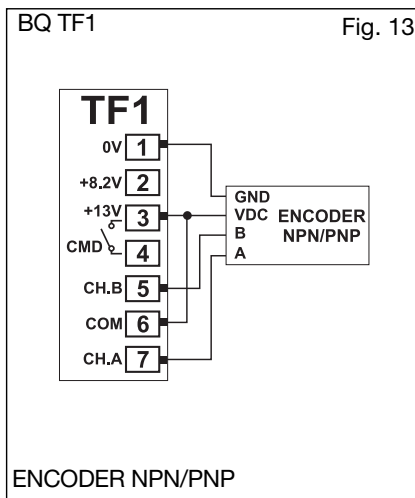


## Wiring diagrams (cont.)

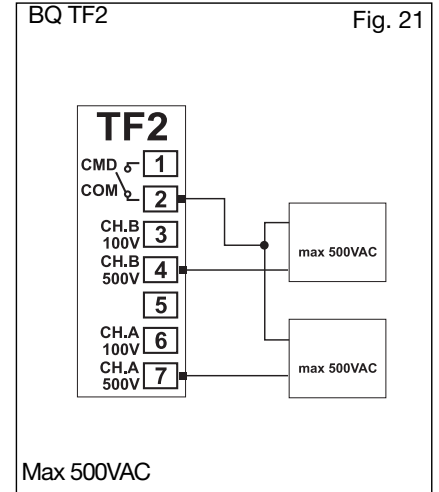
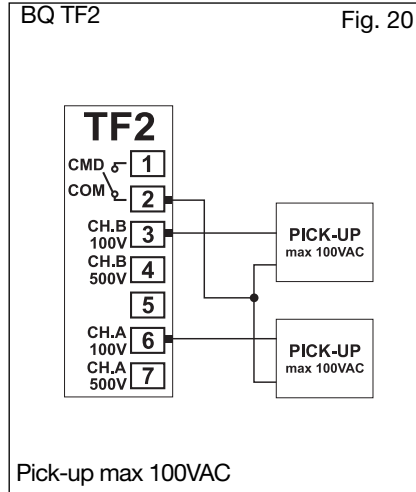
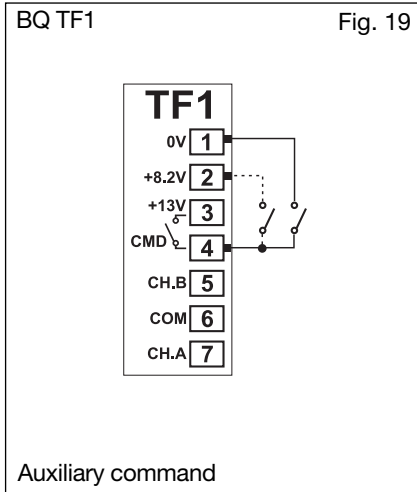
### Wiring diagrams for temperature measurements



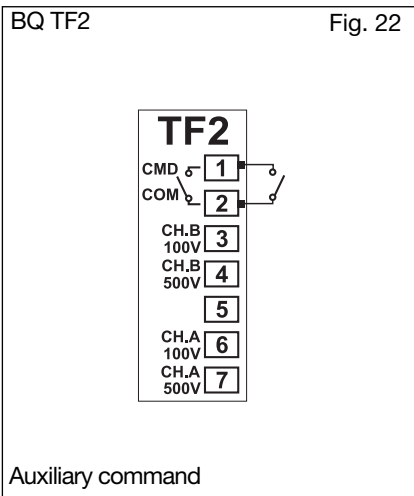
### Wiring diagrams for frequency measurements



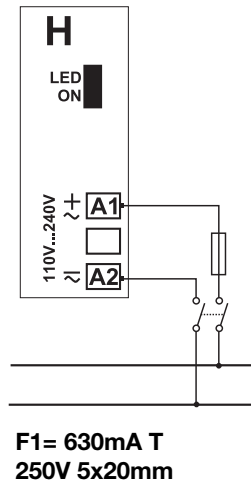
## Wiring diagrams (cont.)



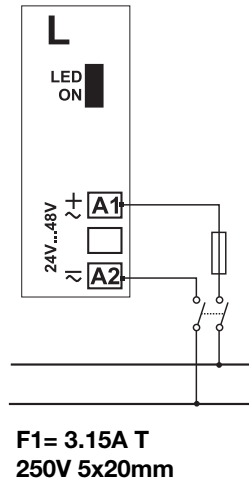
### Wiring diagrams for power supply



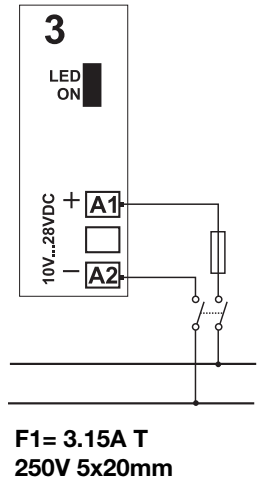
#### BP H: power supply



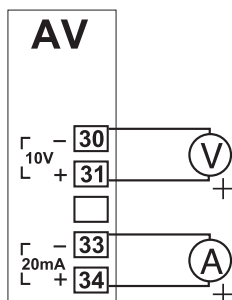
#### BP L: power supply



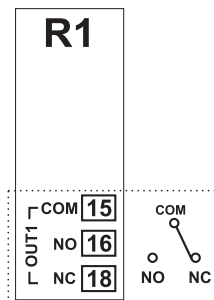
#### BP 3: power supply



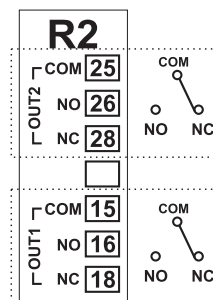
## Wiring diagrams of optional modules



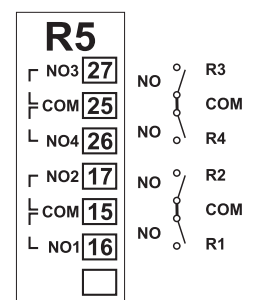
BO AV: analogue output  
(10V, 20mA DC)



BO R1: 1 relay output

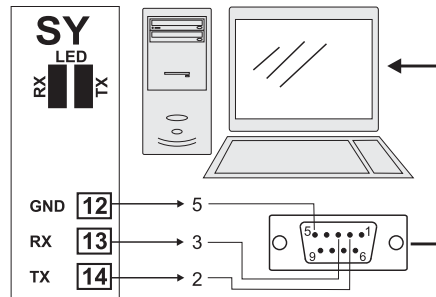
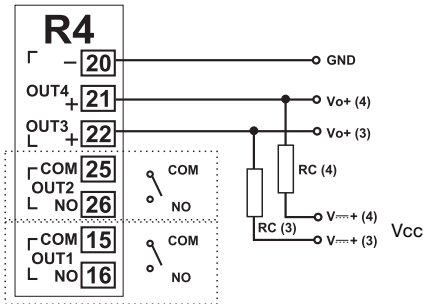


BO R2: 2 relay outputs



BO R5: 4 relay outputs

## Wiring diagrams of optional modules (cont.)



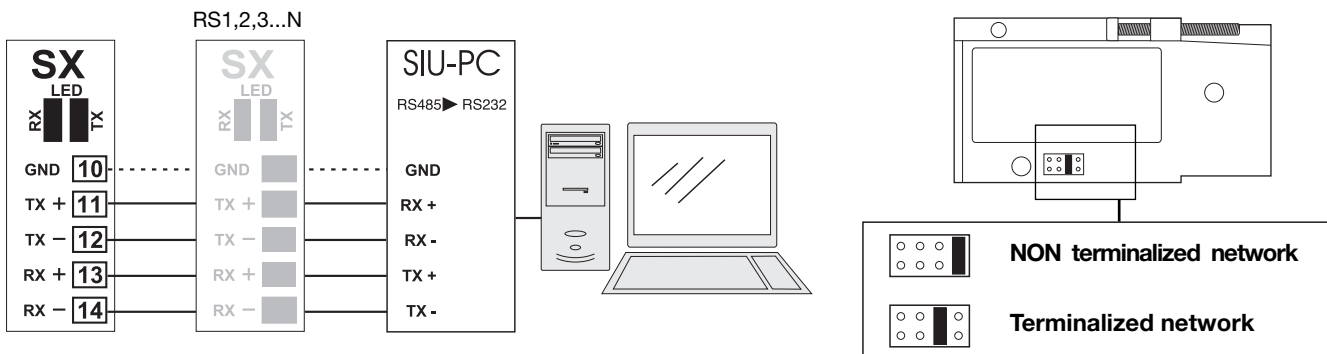
**BO SY:** RS232 direct connection to PC by means of COM port. RS232 has no terminalization.

**BO R4: dual relay output + dual open collector output:** the load resistances (Rc) must be designed so that the close contact current is lower than 100mA; the VDC voltage must be lower than or equal to 30VDC.

VDC: power supply output

Vo+: positive output (open collector transistor).

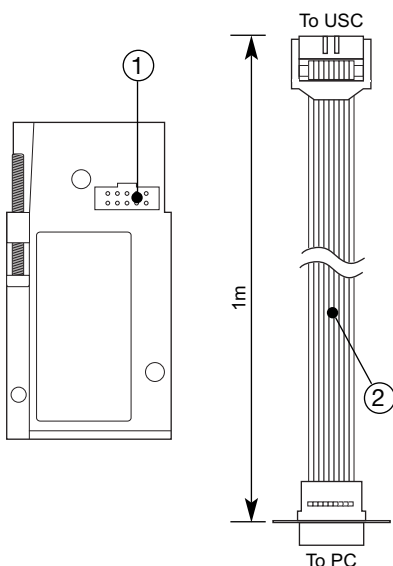
GND: ground (open collector transistor).



**BR SX: RS485 4-wire connection:** additional devices provided with RS485 port (indicated as RS1,2,3...N) are connected in parallel. The termination of the serial port is carried out only on the last instrument of the network. The serial module is provided with a jumper for the termination of the RS485 network as shown in the figure above.

**Note:** particular types of cables or plants may require an external termination. For the network connections use twisted cable type AWG26.

## Programming USC by means of PC

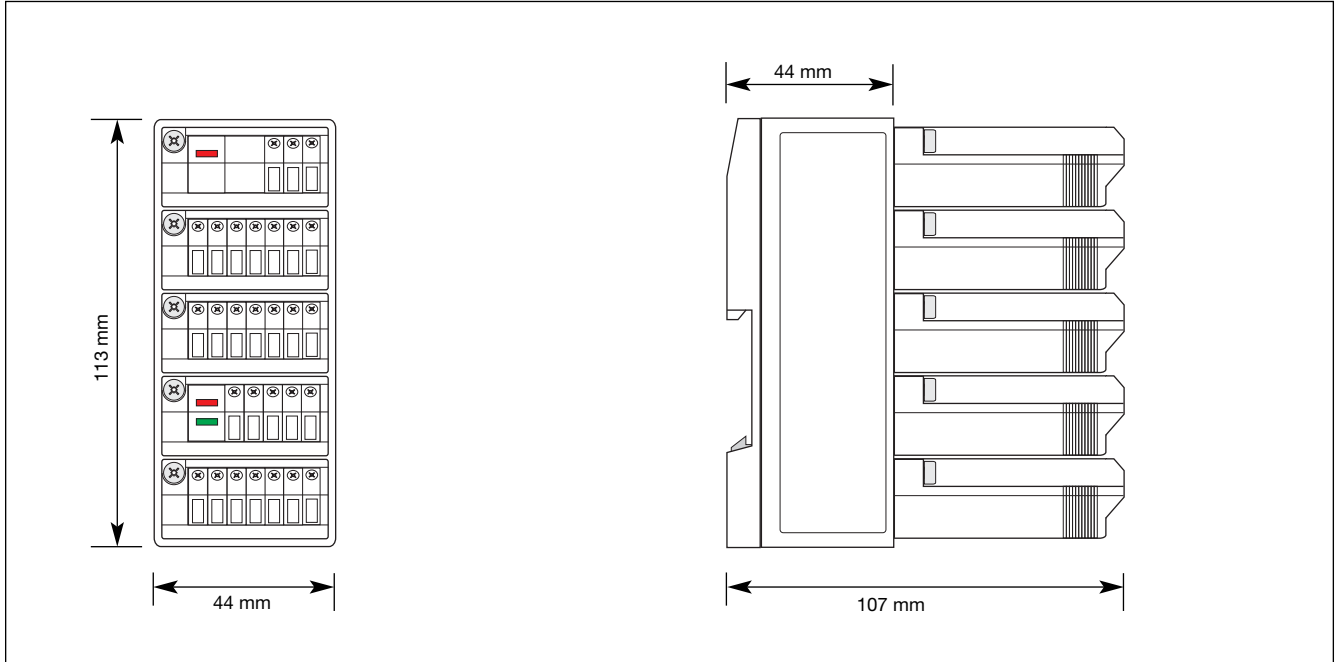


USC is programmable by PC by means of the UscSoft software (available on request). The user can program all parameters of USC that will be subsequently uploaded and set in the instrument by the RS485 network (BR SX).

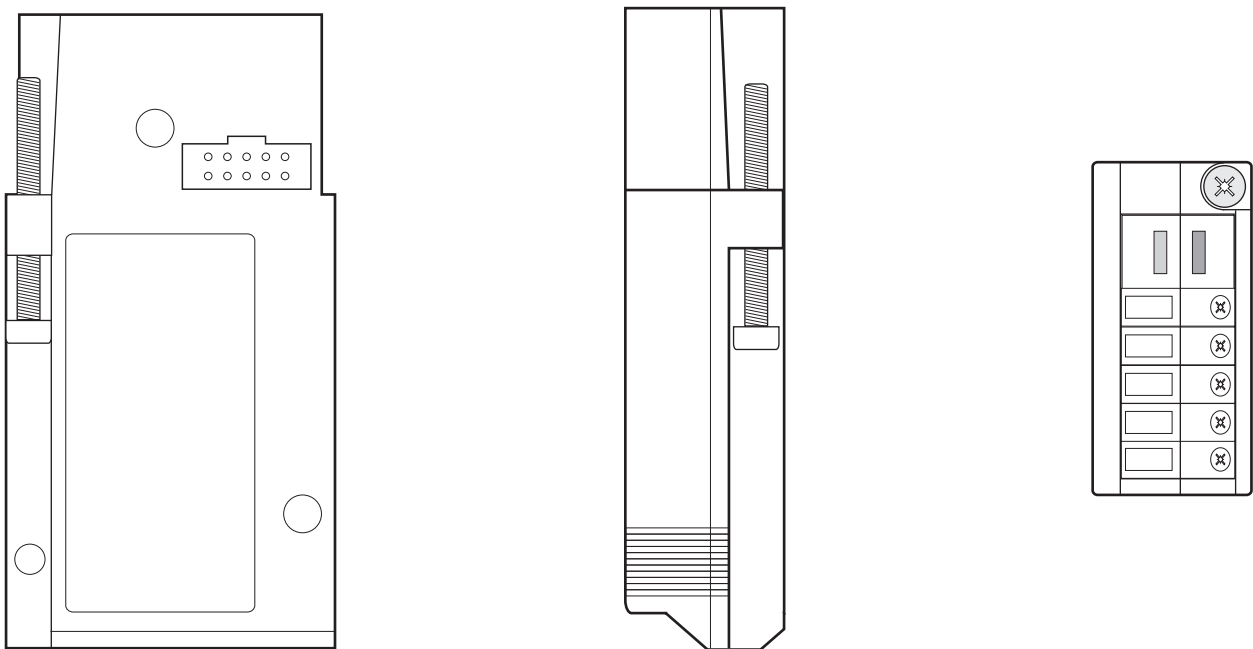
Should USC be without the RS485 serial module, all programming parameters will be uploaded and set in the instrument by the RS232 auxiliary serial connection (1) located on the side of the measuring input module using the special connection cable (2) available on request, as shown in the figures on the left. It is also possible to program the instrument using the connector (1) by means of the HyperTerminal Windows functions of a PC.

**Note:** the RS232 auxiliary port IS NOT insulated from the measuring inputs.

## Dimensions

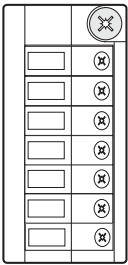


## Dimensions of optional module in scale 1:1



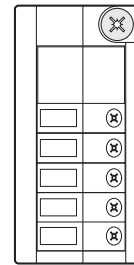
## Modules

### Input modules



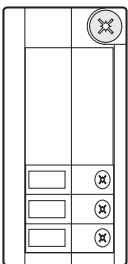
**BQ LSX, BQ LSE, BQ LSF, BQ HSX, BQ TRX, BQ TF1, BQ TF2**  
Measuring inputs

### Output modules

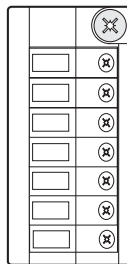


**BO AV**  
Single analogue output 10V, 20mA

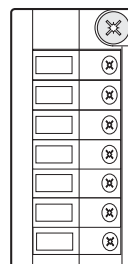
### Output modules



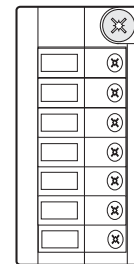
**BO R1**  
Single relay output



**BO R2**  
Dual relay output

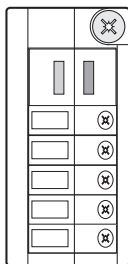


**BO R4**  
Dual relay output +  
Dual open collector

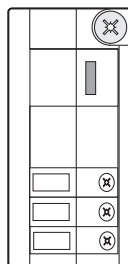


**BO R5**  
4-relay output

### Serial port modules

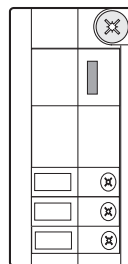


**BR SX**  
RS485 Serial port

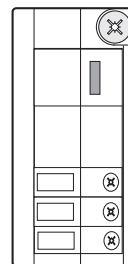


**BR SY**  
RS232 Serial port

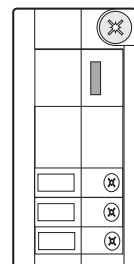
### Power supply modules



**BP H**  
Power supply:  
60 to 260V AC/DC



**BP L**  
Power supply:  
18 to 60V AC/DC



**BP 3**  
Power supply:  
10 to 28V DC