Operating instructions

Multichannel Calibrator PASCAL 100 and PASCAL 100/IS

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Documenting Multivariable Multichannel Calibrator PASCAL100 / PASCAL100/IS

WIKA

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Prior to starting any work, read the operating instructions!
Keep for later use!

Contents

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Declarations of conformity can be found online at www.wika.com.

1 General Information

- The Multichannel Calibrator model Pascal 100 or Pascal 100/IS described in the operating instructions has been manufactured using state-of-the-art technology.
  All components are subject to stringent quality and environmental criteria during production. Our management systems are certified to ISO 9001 and ISO 14001.

- These operating instructions contain important information on handling the Multichannel Calibrator model Pascal 100 or Pascal 100/IS. Working safely requires that all safety instructions and work instructions are observed.

- Observe the relevant local accident prevention regulations and general safety regulations for the range of use of the Multichannel Calibrator model Pascal 100 or Pascal 100/IS.

- The operating instructions are part of the instrument and must be kept in the immediate vicinity of the Multichannel Calibrator model Pascal 100 or Pascal 100/IS and readily accessible to skilled personnel at any time.

- Skilled personnel must have carefully read and understood the operating instructions, prior to beginning any work.

- The manufacturer's liability is void in the case of any damage caused by using the product contrary to its intended use, non-compliance with these operating instructions, assignment of insufficiently qualified skilled personnel or unauthorised modifications to the Pascal 100 or Pascal 100/IS.

- The general terms and conditions, contained in the sales documentation, shall apply.

- Subject to technical modifications.

- Factory calibrations/DKD/DAkks calibrations are carried out in accordance with international standards.

- Further information:

  - Internet address: www.wika.de / www.wika.com
  - Relevant Data Sheet: CT 18.01
  - Application consultant: Tel.: (+49) 9372/132-9986
    Fax: (+49) 9372/132-8767
    E-Mail: testequip@wika.de

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Explanation of symbols

WARNING!
... indicates a potentially dangerous situation, which can result in serious injury or death, if not avoided.

Information
... points out useful tips, recommendations and information for efficient and trouble -free operation.

WARNING!
... indicates a potentially dangerous situation in a potentially explosive atmosphere, resulting in serious injury or death, if not avoided.

2 Safety

WARNING!
Before installation, commissioning and operation, ensure that the appropriate reference pressure sensor has been selected in terms of measuring range, design and specific measuring conditions. Serious injuries and/or damage can occur should these not be observed.

Further important safety instructions can be found in the individual chapters of these operating instructions.

2.1 Intended use

The Multichannel Calibrator model Pascal 100 or Pascal 100 IS gauge can be used as a calibration instrument and also for any application which requires accuracy pressure measurement.

The Multichannel Calibrator model Pascal 100 or Pascal 100/IS has been designed and built solely for the intended use described here, and may only be used accordingly.

The technical specifications contained in these operating instructions must be observed.
Improper handling or operation of the Multichannel Calibrator model Pascal 100 or Pascal 100/IS outside of its technical specifications requires the instrument to be shut down immediately and inspected by an authorised WIKA service engineer.

Handle electronic precision measuring instruments with the required care (protect from strong magnetic fields, static electricity and extreme temperatures, do not insert any objects into the instrument or its openings). Plugs and sockets must be protected from contamination.

If the Multichannel Calibrator model Pascal 100 or Pascal 100/IS is transported from a cold into a warm environment, the formation of condensation may result in the instrument malfunctioning. Before putting it back into operation, wait for the instrument temperature and the room temperature to equalise.

The manufacturer shall not be liable for claims of any type based on operation contrary to the intended use.

2.2 Personnel qualification

WARNING!
Risk of injury should qualification be insufficient!
Improper handling can result in considerable injury and damage to equipment.

- The activities described in these operating instructions may only be carried out by skilled personnel who have the qualifications described below.

Skilled personnel
Skilled personnel are understood to be personnel who, based on their technical training, knowledge of measurement and control technology and on their experience and knowledge of country-specific regulations, current standards and directives, are capable of carrying out the work described and independently recognising potential hazards.

Special operating conditions require further appropriate knowledge, e.g. of aggressive media.

2.3 Additional safety instructions for instruments with ATEX approval only Pascal 100/IS

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WARNING!
Non-observance of these instructions and their contents may result in the loss of explosion protection.

- Battery operation:
  Use only the rechargeable battery which is supplied by WIKA! Only charge the battery outside of the hazardous area!

- Operation of the serial interface in the hazardous area is prohibited.

Further hazardous area safety instructions!
Observe the operating information and the relevant country-specific regulations concerning use in hazardous areas (e.g. EN IEC 60079-14).

The Pascal 100/IS intrinsically safe multichannel calibrator has been designed for use in Ex Hazardous Areas. These are areas where potentially flammable or explosive vapors may occur. These areas are referred to as hazardous (classified) locations in the United States, as Hazardous Locations in Canada, as Potentially Explosive Atmospheres in Europe and as Explosive Gas Atmospheres by most of the rest of the world. The Pascal 100/IS intrinsically safe multichannel calibrator is designed as intrinsically safe. This means that connecting the Pascal 100/IS intrinsically safe multichannel calibrator to equipment that is used within intrinsically safe circuits will not cause an ignition capable arc as long as the entity parameters are suitably matched.

Information/Approval for hazardous locations:

WARNING!

- **Ex Hazardous Areas**
  An Ex-hazardous area as used in this manual refers to an area made hazardous by the potential presence of flammable or explosive vapors. These areas are also referred to as hazardous locations.

II 2G
Ex ib IIC T4 Gb - Tamb: -10°C / 50°C

WARNING!
Only gauges powered by batteries are approved for use in hazardous locations. Use only the rechargeable battery which is supplied by WIKA! Only charge the battery outside of the hazardous area!

2.4 Special hazards

WARNING!

- When measuring pressure, make sure that the process pressure line is shut off and depressurised before it is connected to or disconnected from the pressure module.
- Disconnect test leads before changing to another measurement or generation function.
- Observe the working conditions in accordance with chapter "3. Specifications".
- Always operate the device within its overload limits.
- To ensure problem-free operation, only operate the Multichannel Calibrator model Pascal 100 or Pascal 100/IS on battery power. Only use the mains connection for charging the Hand-held pressure calibrators batteries.
- Do not apply a voltage greater than the specified voltage to the instrument. See chapter "3. Specifications".
- Make sure that the test probes never contact a voltage source while the test leads are connected to the current terminals.
- Do not use the calibrator if it is damaged. Before using the multichannel calibrator, check that there are no cracks or missing plastic parts on the case. Pay particular attention to the insulation of the connectors.
- Select the proper function and correct measuring range for the measurement.
- Inspect the test leads for damaged insulation or exposed metal. Check the continuity of the test leads. Damaged test leads should be replaced before using the multichannel calibrator.
- When using test probes keep fingers away from the test probe contacts. Keep your fingers behind the test probes' finger guards.
- First connect the common lead, and then the live lead. When disconnecting, remove the live test lead first.
- Do not use the multichannel calibrator if it is not working properly. The instrument protection might be compromised. If in doubt, have the instrument checked.
- Do not operate the calibrator in areas with explosive gases, vapours or dust.
- To avoid false readings, which could lead to possible electric shock or personal injury, charge the rechargeable battery as soon as the battery indicator appears.

- In order to avoid any possible damage to the multichannel calibrator or the test equipment, use the correct leads, the correct function and the correct range for the measuring application.

2.5 Labelling / safety marks

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Explanation of symbols

Pascal 100 and Pascal 100/IS

Before mounting and commissioning the Multichannel Calibrator model Pascal 100 or Pascal 100/IS, ensure you read the operating instructions!

CE, Communauté Européenne
Instruments bearing this mark comply with the relevant European directives.

This marking on the instruments indicates that they must not be disposed of in domestic waste. The disposal is carried out by return to the manufacturer or by the corresponding municipal authorities. See Directive 2002/96/EC.

Only Pascal 100/IS

ATEX European Explosion Protection Directive
(Atmosphère = AT, explosible = Ex)
Instruments bearing this mark comply with the requirements of the European Directive 94/9/CE (ATEX) on explosion protection.

3 Specifications

Base instrument

Indication	
Display	Touchscreen + 5 keys
Dimensions	320 x 240 Dots Dot size: 0.34 x 0.34 mm (0.013 x 0.013 inch)
Backlight	LED
Electrical input and output	
Number and type	banana-plug inputs for electrical parameters, resistance thermometers and thermocouples
Resistance thermometer (RTD)	Pt100 (385, 3616, 3906, 3926, 3923), Pt200, Pt500, Pt1000 (385, 3916), Ni100, Ni120, Cu10, Cu100
Thermocouples	Types J, K, T, F, R, S, B, U, L, N, E, C
Voltage signal	input: DC ±100 mV, ±2 V, ±80 V output: DC 20 V
Current signal	input: DC ±100 mA [1)] output: DC 20 mA
Frequency signal	0 ... 50,000 Hz
Pulses signal	1 ... 999,999
Resistance	0 ... 10,000 Ω
Voltage supply	DC 24 V
HART® communication	
HART® module	based on HART® universal and common practice commands
Resistance	HART® resistance 250 Ω (activatable)
Loop current	max. DC 24 mA
Voltage supply	DC 24 V
Pressure connection	1/8 BSP (female)
Permissible media	clean, dry, non-corrosive gases
Temperature compensation	-10 … +50 °C
Temperature coefficient	0.001 % of reading/°C, outside of 19 ... 23 °C
Units	bar, mbar, psi, psf, Pa, hPa, kPa, MPa, torr, atm, kg/cm², kg/m², mmHg (0 °C), cmHg (0 °C), mHg (0 °C), inHg (0 °C), mmH_2O (4 °C), cmH_2O (4 °C), mH_2O (4 °C), inH_2O (4 °C), ftH_2O (4 °C)
Voltage supply	
Battery type	rechargeable battery NiMH
Battery life (fully-charged)	8 hours for typical usage
Power supply	AC 100 ... 240 V, 50/60 Hz
Permissible ambient conditions	
Operating temperature	-10 ... +50 °C (14 ... 122 °F)
Storage temperature	-30 ... +80 °C (-22 ... +176 °F)
Relative humidity	Operating humidity: 10 ... 90 % r. h. (no condensation) Storage humidity: 0 ... 90 % r. h. (no condensation)

Case

Material	Front panel aluminium
Ingress protection	IP 54
Dimensions	330 x 270 x 170 mm (13 x 10.6 x 7 inch)
Weight	6 kg (13 lbs 2 oz)

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Ignition protection type for model Pascal 100/IS

ATEX directive	Ex II 2G Ex ib IIC T4 Gb - T_{amb}: -10 ... +50 °C
Connection values	
Max. voltage	U_0 = 29.7 V
Max. current	I_0 = 31 mA
Max. power	P_0 = 0.92 W
Max. effective internal capacitance	C_0 = 69 nF
Max. effective internal inductance	L_0 = 30 mH
Power supply circuit	
Max. voltage	U_i = 30 V
Max. current	I_i = 100 mA
Max. power	P_i = 0.75 W
Max. effective internal capacitance	C_i = negligible
Max. effective internal inductance	L_i = negligible

Approvals and certificates

CE conformity	
EMC directive	EN 61326-1 (2006) EN 55011 (2007) EN 61000-4-2 (2009) EN 61000-4-3 (2002) + A1 (2008) + A2 (2010)
ATEX directive	Ex II 2G Ex ib IIC T4 Gb - T_{amb}: -10 ... +50 °C
Certificate	
Calibration	3.1 calibration certificate per DIN EN 10204 option: ACCREDIA calibration certificate

Approvals and certificates, see website

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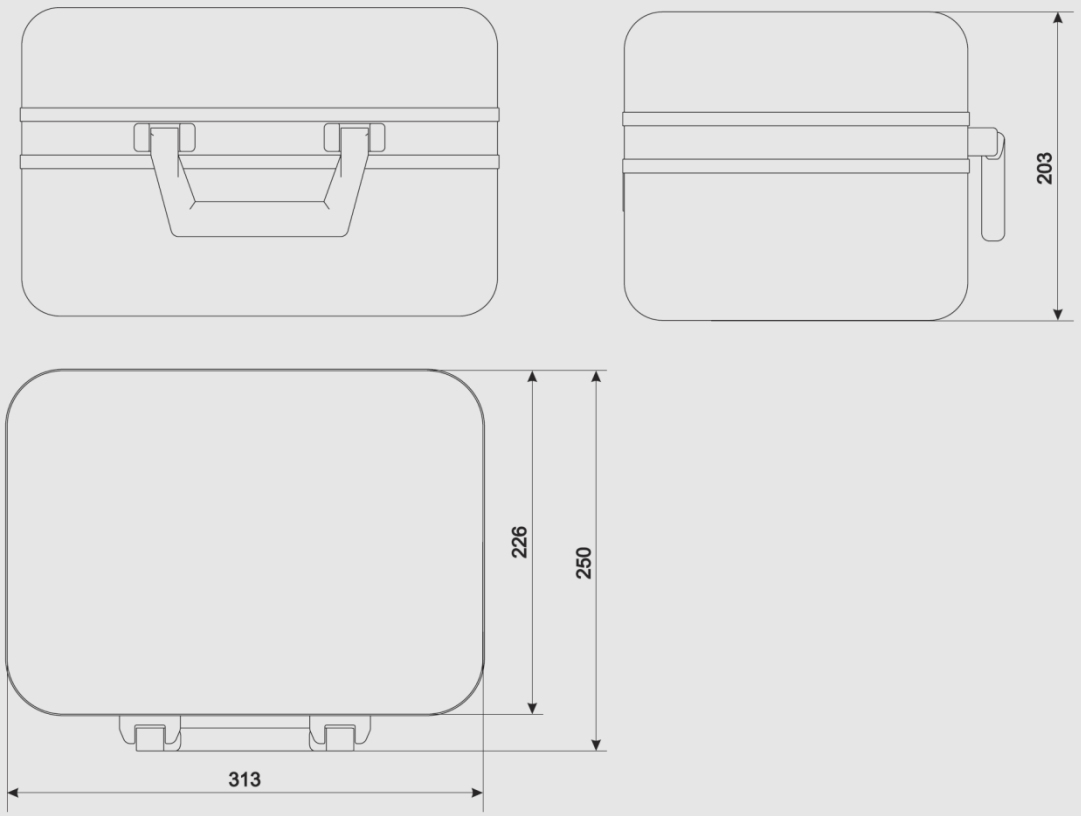
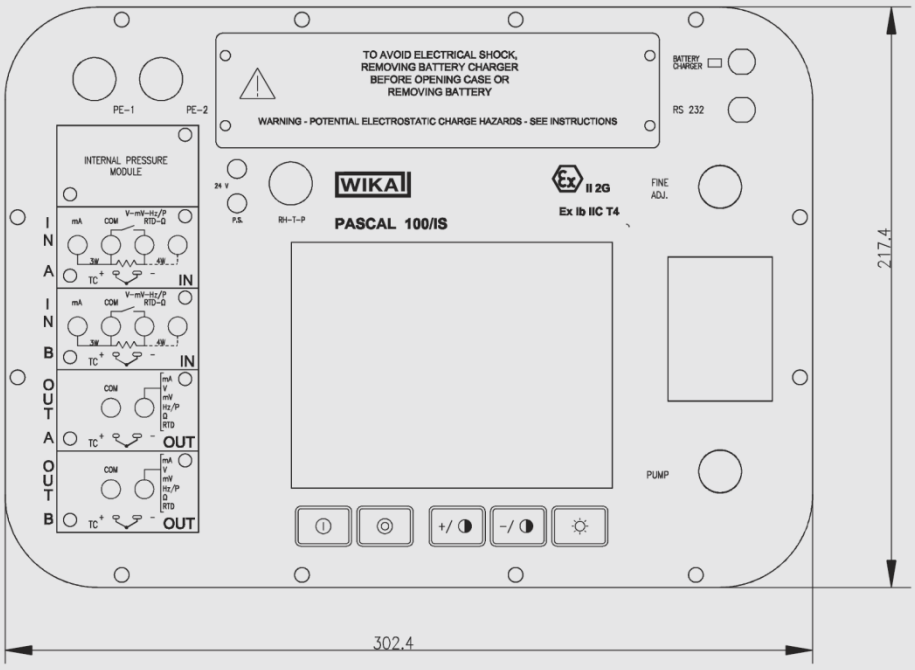
Case model Pascal 100 and Pascal 100/IS



Front panel model Pascal 100/IS



For further specifications see WIKA data sheet CT 18.01 and the order documentation.

4 Design and Function

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4.1 Description

Pascal 100 or Pascal 100/IS is the Professional Advanced Scandura Calibrator of latest generation.
User friendly interface by a wide display with an industrial touch screen through which it is possible to manage the instrument completely.
The operations are simplified thanks to the touch screen: the display changes in a dynamic way according to the user selections, following test by step the operator during the calibration process, decreasing the learning time and the human errors.
The touch screen can be operated by nude or gloved hands: dirty parts can be easily removed with a cloth or a sponge. The touch screen can be locked during the measurement process to avoid unintentional pressing of keys
The backlight illumination with LED guarantees a perfect view in case of low environmental visibility.
Five keys are present below the touch screen : turn on/off of the instrument, contrast settings and backlight.
Pascal 100 or Pascal 100/IS consists of two parts: pressure part and electrical one.
The pressure part consists of:

- 1 a pneumatic distribution block
- 2 internal manual vacuum/pressure generator with fine adjustment
- 3 up to four internal pressure sensors with overpressure valves.

The electrical part consists of up to four electrical module (2 input (IN) and 2 output (OUT) for the measurement and generation of mA, mV, V, Hz, Ohm, Pulse, TC/RTD.

On the front panel of the instrument there are several connectors for:

- recharging the battery
- RS232 port
- Connection to the external pressure transducers
- Connection for the environment parameters (temperature, humidity and atmospheric pressure)

Moreover there are the connections to provide 24 V d.c. power supply to the device under test.
The Pascal 100 or Pascal 100/IS is powered with an internal battery pack. The battery allows 8 hours of standard operation before recharging.

Operating Pascal 100 or Pascal 100/IS user is able to calibrate the whole industrial instrumentation like for example:

- Electronic and pneumatic pressure/vacuum transmitter
- Electronic and pneumatic differential pressure transmitter
- Electronic and pneumatic temperature transmitter (thermocouple and RTD)
- Signal converter V, mV, mA, Hz, Pulse, ohm
- Signal converter I/P and P/I
- Signal isolator mA, mV
- Mathematical Device (adder, subtractor, multiplier, divider)
- Manometer, Pressure switch
- Temperature monitor switch
- Thermocouple and thermoresistance
- Compensation device (up to 4 in-out signals)
- Electronic and pneumatic receiver
- Electronic and pneumatic controller
- Electronic and pneumatic recorder
- Miscellaneous instrument

Pascal 100 or Pascal 100/IS includes different modules and can be ordered with different hardware configurations.

The hardware configuration depends on the installation of different functional modules:

- Two electrical/temperature IN modules (IN A & IN B)
- Two electrical/temperature OUT modules (OUT A & OUT B)
- Two pressure modules
  (each one can support two internal and one external transducer. Total 6 sensors)
- One environment parameters module
  (atmospheric pressure, ambient temperature and relative humidity)
- One power supply 24 V d.c.
- One RS-232 communication port
- One connection for recharging the battery
- One hand pump for pressure or vacuum generation
- One fine adjustment for a good regulation of pressure or vacuum
- One set of valves for sensor protection against overpressure

Battery Life
In order to preserve battery life is recommended to keep the battery charger connected for no more than 36 hours

Functional module
A functional module is a hardware component that allows the Pascal 100 or Pascal 100/IS to perform some operations like for example measurement and generation of electrical signals and pressure.

4.2 Scope of delivery

- Portable multifunction calibrator model Pascal 100 or Pascal 100/IS
- Operating instructions
- AC adapter
- Pascal report software
- RS-232 interface cable
- RS-232 to USB adapter
- Electrical kit order no. 241076
- Pneumatic pressure kit order no. 241028 and 241029
  (Depending on pressure range)
- 3.1 calibration certificate per DIN EN 10204

Cross-check scope of delivery with delivery note.

4.3 Power supply

Charging
To avoid false measurements, charge the rechargeable batteries as soon as the battery indicator appears. If the batteries run too low the Pascal 100 or Pascal 100/IS will automatically shut down.

Use only the original AC/DC converter which is supplied by WIKA

5 Transport, packaging and storage

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5.1 Transport

Check the Multichannel Calibrator model Pascal 100 or Pascal 100/IS for any damage that may have been caused by transport. Obvious damage must be reported immediately.

5.2 Packaging

Do not remove packaging until just before mounting.
Keep the packaging as it will provide optimum protection during transport (e.g. sending for calibration).

5.3 Storage

Permissible conditions at the place of storage:

- Storage temperature: -30 ... +80 °C
- Relative Humidity: 10 ... 90 % r. H. (non-condensing)

Avoid exposure to the following factors:

- Direct sunlight or proximity to hot objects
- Mechanical vibration, mechanical shock (putting it down hard)
- Soot, vapour, dust and corrosive gases
- Potentially explosive environments, flammable atmospheres

Store the instrument in its original packaging in a location that fulfills the conditions listed above. If the original packaging is not available, pack and store the instrument as described below:

1. Wrap the instrument in an antistatic plastic film.
2. Place the instrument, along with shock-absorbent material, in the packaging.
3. If stored for a prolonged period of time (more than 30 days), place a bag, containing a desiccant, inside the packaging.

6 Commissioning, operation

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6.1 Commissioning

6.1.1 Instrument Overview

1 Connectors for **external P transducer**
2 **Pressure modules**
3 **IN** electrical/temperature modules
4 **OUT** electrical/temperature modules
5 **Power ON**
6 **Power OFF**
7 **Contrast +**
8 **Contrast –**
9 **Back light** OFF (Lamp)
10 **Hand pump** (vacuum/21 bar)
11 **Pneumatic distribution**
12 **Fine adjustment**
13 Connector **RS-232**
14 Connector for **battery charger**
15 **Battery**
16 **Environmental Parameter** Connector
17 **Loop power supply** – 24 V d.c.

6.1.2 Functional Modules

The functional modules can be classified according to their assignments:

- Electrical and temperature signals measurement
- Pressure measurement, (2 different modules, up to 4 internal pressure sensors and 2 connectors for external pressure sensor)
- Electrical and temperature signals generation/simulation
- Pressure generation and regulation
- Environmental parameters measurement

Many different configurations are available according to the specific requirements of the user.

6.1.2.1 Input module for electrical/temperature signals

The input module for electrical/temperature parameters measurement is one of those modules inserted from the instrument's front panel; two slides drive the module into its position. It is possible to have up to two input modules in the same instrument: IN A and IN B. This terminology is used also by the software to carry out the connection between physical input IN and software channel. For example: if you connect a thermoresistance Pt100 to module IN A, the temperature measured by this thermoresistance can be displayed in any of the four software channels available. The following figure shows the pins connection in electrical/temperature IN module.

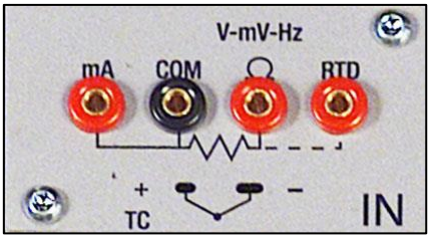

Figure 1 – Input panel module

6.1.2.2 Output module for electrical/temperature signals

The output module for electrical/temperature parameters generation or simulation is one of those inserted from the instrument's front panel; two slides drive the module into its position. It is possible to have up to two output modules in the same instrument: OUT A and OUT B. This terminology is used also by the software to carry out the connection between physical output OUT and software channel. For example: if you connect a signal-receiver to module output OUT A, the current 4…20 mA generated can be displayed in any of the four software channels available.
The following figure shows the output module for electrical/temperature parameters.

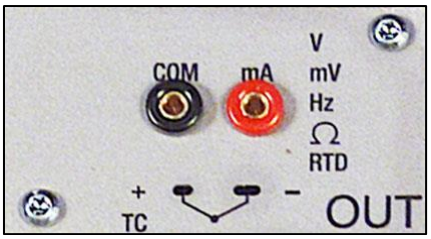

Figure 2 – Output panel module

The 2 INPUT cards and 2 OUTPUT cards are plug and play modules and can be installed by the user himself.

6.1.2.3 Pressure module

The pressure module is installed only at factory location in accordance with the Pascal 100 or Pascal 100/IS configuration required. It is possible to install two pressure modules, each one can support up to two internal and one external transducers. In total Pascal 100 can accommodate four internal and two external transducers. Transducer's selection with range and their resolutions are in the following table. If requested, one of the standard pressure modules can be changed with one high accuracy pressure module (with one high accuracy transducer).

Internal transducers *

Range	Precision (% FS)	Accuracy (% FS)	Typical Resolution
Gauge			
-60…+60 mbar	0,08	0,1	0,01 mbar
-500…+500 mbar	0,015	0,025	0,01 mbar
-900…+1500 bar	0,015	0,025	0;01 mbar
0…7 bar	0,015	0,025	0,1 mbar
0…21 bar	0,015	0,025	0;1 mbar
0…50 bar	0,015	0,025	1 mbar
0…100 bar	0,015	0,025	1 mbar
Absolute			
600…1300 mbar abs.	0,015	0,025	0,01 mbar
0…1500 mbar abs.	0,015	0,025	0,01 mbar
0…2500 mbar abs	0,015	0,025	0,01 mbar
0…2500 mbar abs	0,010	0,015	0,01 mbar
0…5 bar abs.	0,015	0,025	0,1 mbar
0…7 bar abs.	0,015	0,025	0,1 mbar
0…21 bar abs.	0,015	0,025	0,1 mbar
0…81 bar abs.	0,015	0,025	1 mbar
0…100 bar abs.	0,015	0,025	1 mbar

External transducers *

Range	Precision (% FS)	Accuracy (% FS)	Typical Resolution
Gauge			
-60…+60 mbar	0,1	0,15	0,01 mbar
-500…+500 mbar	0,015	0,025	0,01 mbar
-900…+1500 bar	0,015	0,025	0;01 mbar
0…7 bar	0,015	0,025	0,1 mbar
0…21 bar	0,015	0,025	0;1 mbar
0…50 bar	0,015	0,025	1 mbar
0…100 bar	0,015	0,025	1 mbar
0…200 bar	0,015	0,025	10 mbar
0…400 bar	0,015	0,025	100 mbar
0…700 bar	0,025	0,05	100 mbar
0…1000 bar	0,025	0,05	100 mbar
Absolute			
0…1500 mbar abs.	0,015	0,025	0,01 mbar
0…2500 mbar abs	0,015	0,025	0,01 mbar
0…5 bar abs.	0,015	0,025	0,1 mbar
0…7 bar abs.	0,015	0,025	0,1 mbar
0…21 bar abs.	0,015	0,025	0,1 mbar
0…81 bar abs.	0,015	0,025	1 mbar
0…100 bar abs.	0,015	0,025	1 mbar

*** Other ranges available on request**

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6.1.2.4 HART module

The HART module allows communication with HART instruments (usually transmitters) permitting to acquire digital measurements, instrument data and modifying settings. It can be inserted in the front panel in place of OUT A or OUT B module.
It is a fully galvanically isolated board (like IN and OUT modules) from internal electronics of the Pascal.
The module allow the 24V to supply directly the output loop for the transmitter.
Further, it can supply a 250Ω load resistance electronically switchable necessary to HART communication, permitting to avoid the use of an external one.
The following figure shows the pin connections in HART module:

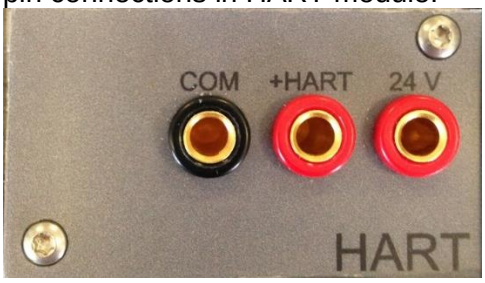

Figure 3 – HART module

6.1.2.4.1 HART wiring

Depending by several factors and combination that the user can found in a plant, there are many wiring possibility depending by:

- Using module internal or external Power Supply.
- Using internal or external load resistance.
- Simultaneous analog connection of AO TRX to one Input module for mA reading

Please consider, if the user enable the internal load resistance, this will be connected between the +HART and COM terminals.
Here same examples:

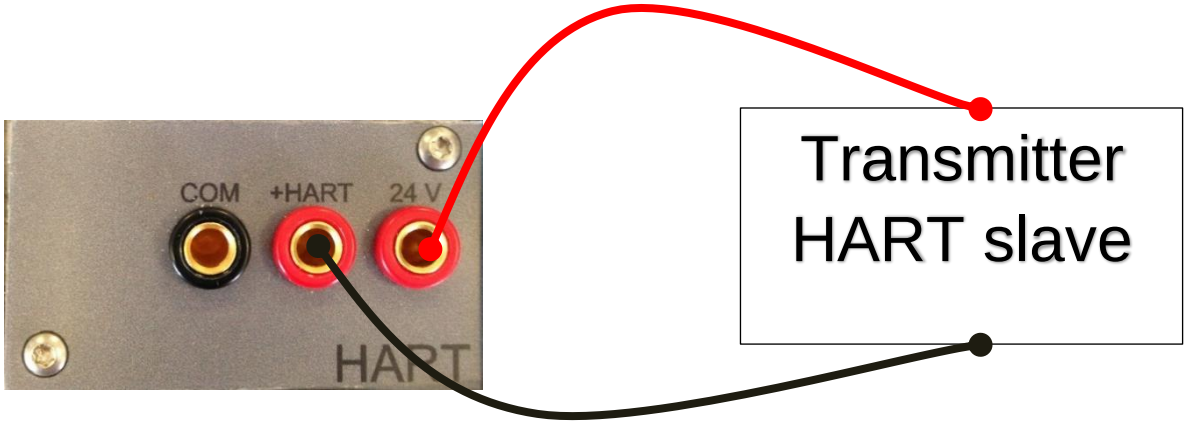

Figure 4 - Case 1: 24V from module, 250Ω from module

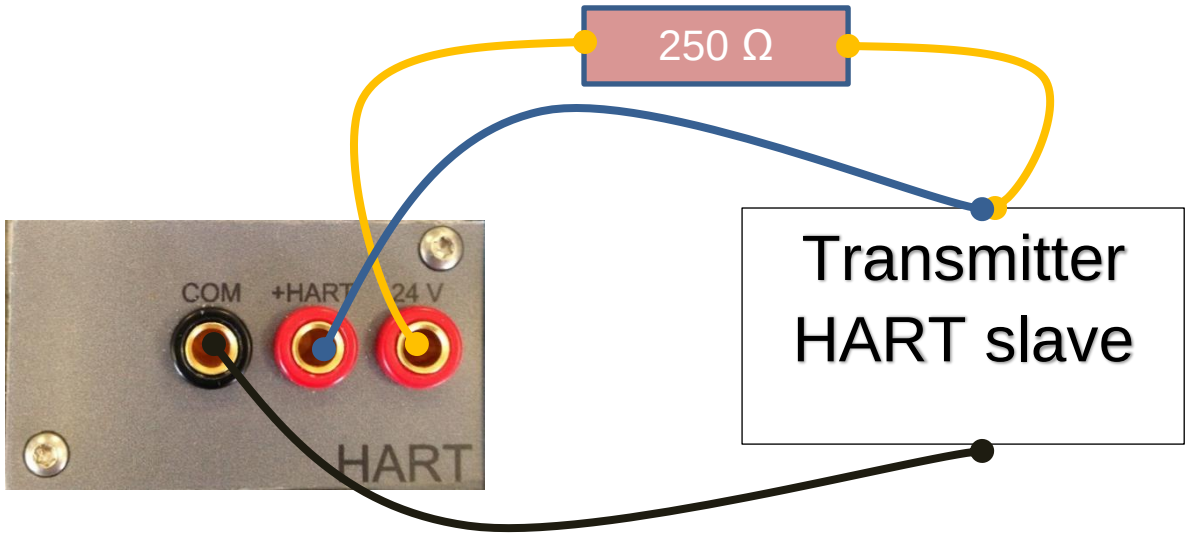

Figure 5 - Case 2: 24V from module, 250Ω external

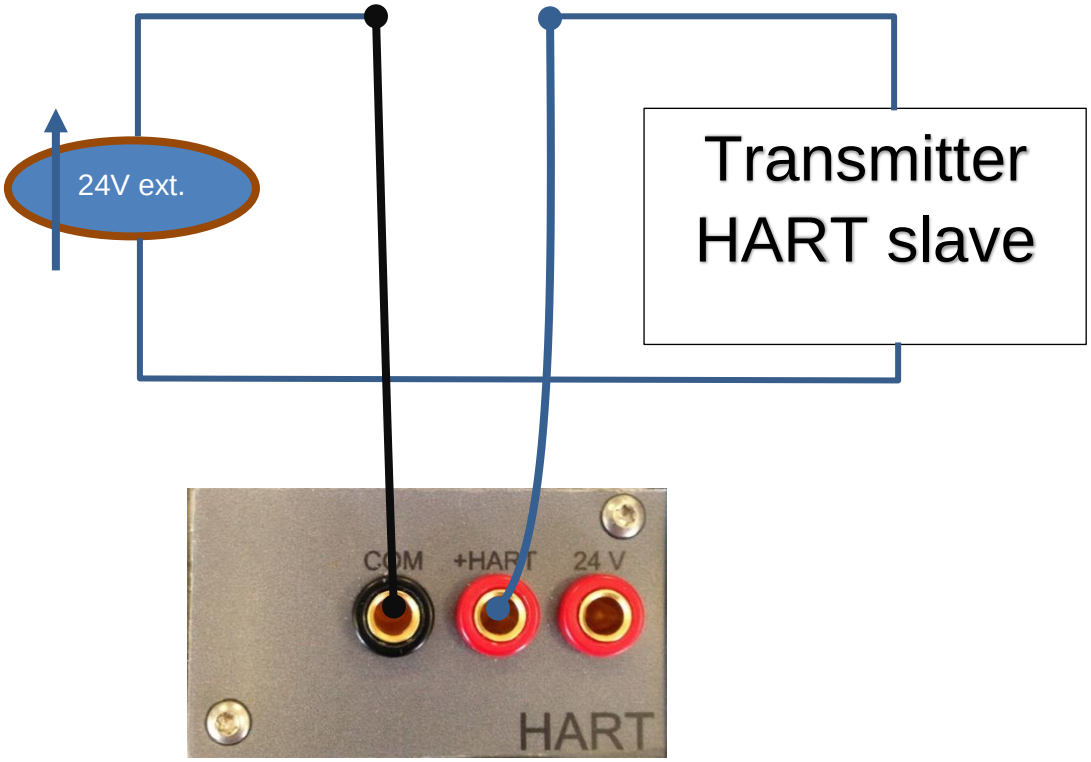

Figure 6 - Case 3: 24V external, 250Ω from module

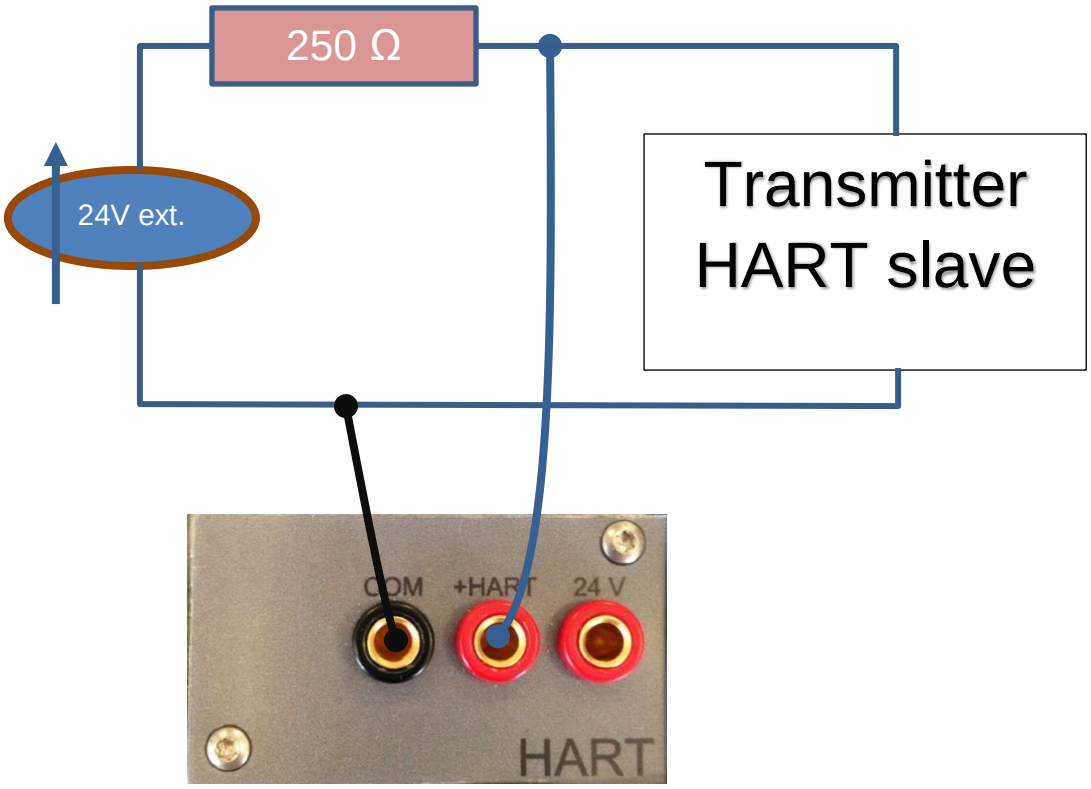

Figure 7 - Case 4: 24V external, 250Ω external

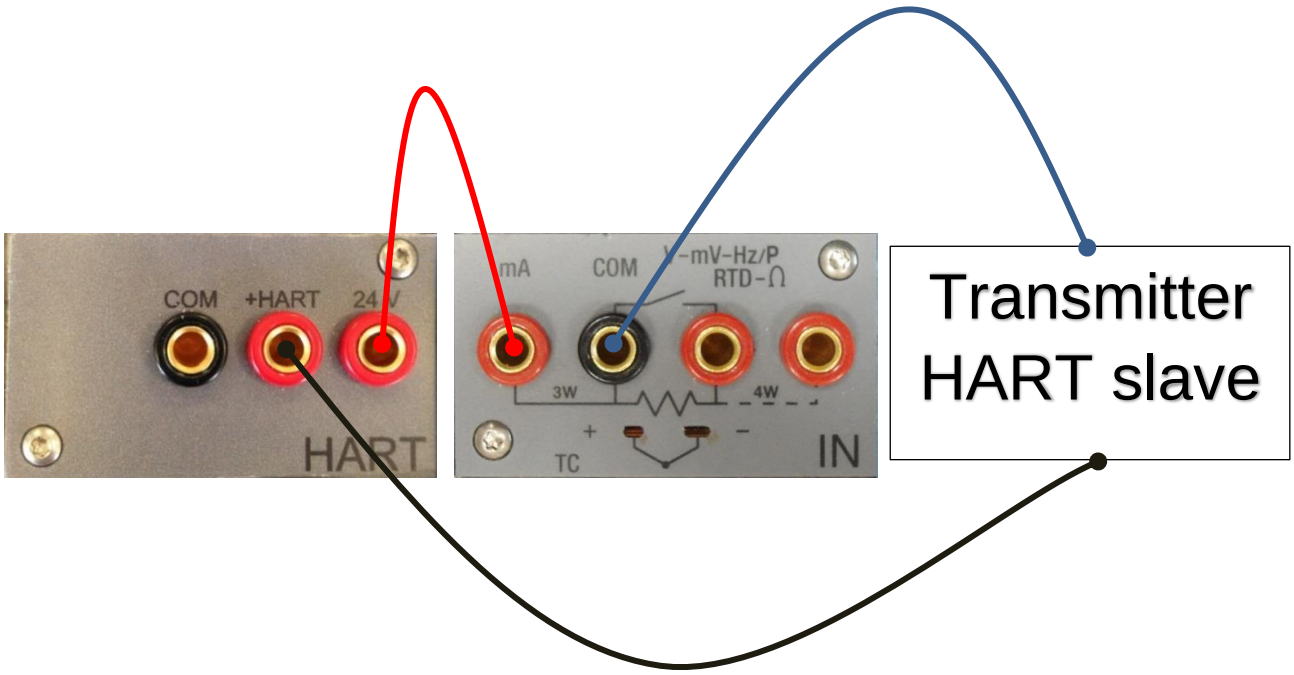

Figure 8 - Case 5: 24V from module, 250Ω from module, mA reading by IN module

6.1.2.5 Environmental parameters module (optional)

This module allows to measure: temperature, relative humidity and atmospheric pressure. These parameters represent the most important factors that affect the calibration results. This module is connected to Pascal 100 or Pascal 100/IS with a multiple pin connector present in Pascal 100 or Pascal 100/IS front panel. This module is plug & play and the relevant information about the environmental parameters are displayed on the status bar at the top of the screen. This information is automatically reported on the calibration report.

6.2 Pressure

6.2.1 Pneumatic circuit

Pascal 100 or Pascal 100/IS can be equipped with four internal and two external pressure sensors. The internal sensors work only with clean dry gas (like dry air) whereas the external sensors can work with gas or liquid. Gas is related to pneumatic circuit and liquid to hydraulic circuits.
Pascal 100 or Pascal 100/IS has a pneumatic circuit that gives possibility to execute a large number of calibration in an easy way for connecting the device under test. An integrated pump and a fine adjustment allow to generate the required pressure. The generated pressure, according to the model, can be distributed in parallel to all sensors. The sensors whose ranges are much lower than the maximum pressure generated in the pneumatic circuit are protected from overpressure by a mechanical valve that closes the circuit when the pressure gets over its range.
Switching the pressure-vacuum selector in the vacuum position is possible to generate vacuum (pressure under the barometric)

For example, if we want to measure a signal from pneumatic instrument 3 - 15 PSI or to measure high gas pressure over 21 bar and we use an internal sensor directly connected to the process, we must pay attention not to damage it by applying pressure over its range.

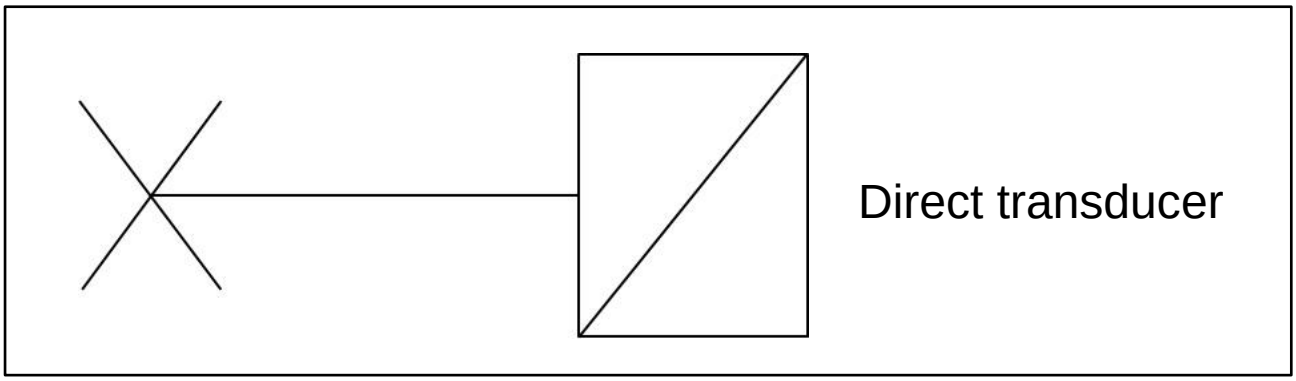

Figure 9 – Direct transducer

There are three different pneumatic schemes available in a standard Pascal 100 or Pascal 100/IS configuration:

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- This is an example of pneumatic circuit with two sensors in parallel to the pump. One of them is protected by an overpressure valve, the other one is not protected because it has a full-scale equal to the maximum pressure generated by the pump. See following:

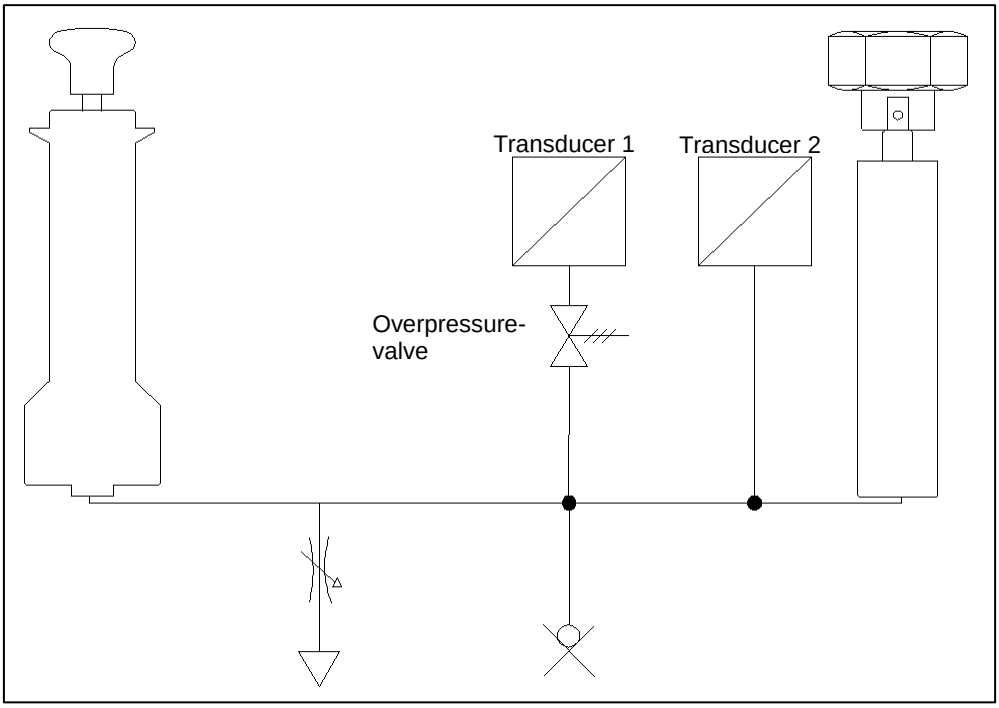

Figure 10 – Circuit with two sensors in parallel

- This is an example of pneumatic circuit with two sensors: one sensor connected in parallel to the pump with over pressure protection, and one sensor directly connected for measuring the external pressure signals without overpressure protection. See following:

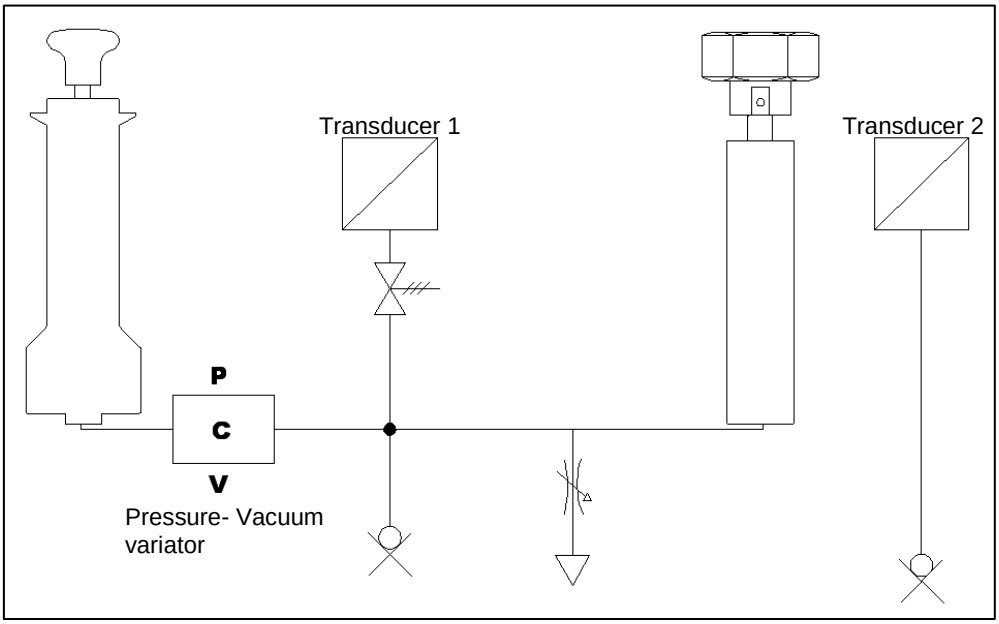

Figure 11 - Circuit with transducer connected to process

- This is an example of pneumatic circuit with four sensors: three of them are connected in parallel to the pumps and one straight to external. Two of them are protected by overpressure valves, the other one is not protected because it has its full-scale equal to the maximum pressure generated by pump. See following:

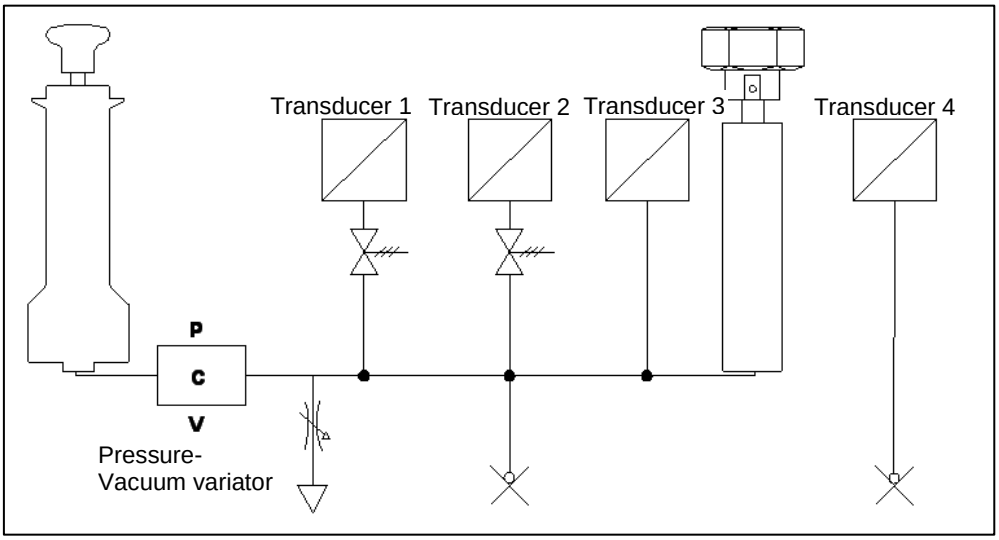

Figure 12 - Circuit with four transducers

6.3 Electrical

The Pascal 100 or Pascal 100/IS is a multifunction calibrator.
The electrical modules can be maximum four, two of them are input modules (IN A – IN B), and the other two are output modules (OUT A – OUT B).

6.3.1 Electrical measurements

The instrument is able to measure voltage, current, resistance and frequency. To optimise the resolution and get better measurement results, there are three ranges for voltage measurement, two for resistance measurements, one range for current and three ranges for frequency.
Ranges of measurement and resolutions are specified in following table:

Range	Max resolution
Voltage	
(-100…100) mV	0,0001 mV
(-2…2) V	0,000001 V
(-80…80) V	0,00001 V
Current	
(-100…100) mA	0,0001 mA
Resistance	
(0…400) Ω	0,001 Ω
(0…10000) Ω	0,01 Ω
Frequency	
(0,4…50000) Hz	0,001 Hz
Pulse	
0,4…20 Hz	-
Contact	
Open - Closed	-

Table 1 - Range of input signals

6.3.2 Thermocouple measurements

The electrical module measures signals from the thermocouple and shows it in different engineering units (°C, °F, K).

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Thermocouple types, measuring range, linearity error and related resolutions are given in the following table:

Type	Range/°C	Resolution/°C Max
J	-210…1200	0,1
	-190…1200	0,01
K	-270…1370	0,1
	-160…1260	0,01
T	-270…400	0,1
	-130…400	0,01
F	0…1400	0,1
	0…1400	0,01
R	-50…1760	0,1
	150…1760	0,01
S	-50…1760	0,1
	170…1760	0,01
B	50…1820	0,1
	920...1820	0,01
U	-200…400	0,1
	-160…400	0,01
L	-200…760	0,1
	-200…760	0,01
N	-270…1300	0,1
	0…1300	0,01
E	-270…1000	0,1
	-200…1000	0,01
C	0…2300	0,1
	0…2000	0,01
M	-50…1410	0,1
	-50…1410	0,01

Table 2 – Thermocouple measurements table

It is possible to perform the measurement in two different ways: with internal reference (cold junction), with external reference cold junction by entering the reference value through the keyboard. When internal reference cold junction is selected, the ambient temperature is measured through the thermocouple pins using a special thermo resistance. This temperature value is used for compensation. The Standard connector Mignon for thermocouple is shown in Figure 1. The thermoresistance for compensation of the reference cold junction is integrated in the same connector.

6.3.3 Thermoresistance measurements

The electrical module measures signals from thermoresistance and shows it in different engineering units (°C, °F, K).
Thermoresistance types, measuring range and related resolutions are given in the following table:

Type	Range/°C	Resolution/°C Max
Pt100 (385)	-200…850	0,1
	-200…850	0,01
Pt100 (3916)	-200…850	0,1
	-200…850	0,01
Pt100 (3926)	-200…850	0,1
	-200…850	0,01
Pt100 (3902)	-200…650	0,1
	-200…650	0,01
Pt100 (3923)	-200…600	0,1
	-200…600	0,01
Pt100 JIS (3916)	-200…600	0,1
	-200…600	0,01
Pt200 (385)	-200…850	0,1
	-200…850	0,01
Pt500 (385)	-200…850	0,1
	-200…530	0,01
Pt1000 (385)	-200…850	0,1
	-200…850	0,01
Pt1000 (3916)	-200…850	0,1
	-200…850	0,01
Ni100 (617)	-60…180	0,1
	-60…180	0,01
Ni120 (672)	0…150	0,1
	0…150	0,01
Cu10 (42)	-70…150	0,1
	-70…150	0,01
Cu100	-180…150	0,1
	-180…150	0,01

Table 3 - Thermoresistance measurements table

It is possible to connect the thermoresistance according to the type of measurement: 2 wires, 3 wires and 4 wires. The two wires measurement is performed without any compensation of the connecting cables resistances; in this case the connection is among the two central (COM - Ω) pins. In the case of three wires connection the pin identified with the writing 3W must also be used. While for the four wires measurement, the most accurate of the above, is performed by using all four pins.

6.3.4 Generation of electrical parameters

The output module (OUT) allows to generate voltage, current, resistance and frequency.
For the voltage there are three different ranges with different resolutions. Resistance has two ranges while current and frequency have only one range. Ranges and resolutions are given in the following table:

Range	Max resolution
Voltage	
(0…100) mV	0,0001 mV
(0…2) V	0,000001 V
(0…20) V	0,00001 V
Current	
(0…20) mA	0,0001 mA
Resistance	
(0…400) Ω	0,001 Ω
(0…10000) Ω	0,01 Ω
Frequency	
(0,5…20000) Hz	0,001 Hz
Pulse	
(0,5…200) Hz / 9999999 impulse	

Table 4 – Range of output signals

6.3.5 Thermocouple simulation

Through the output module it is possible to simulate thermocouples. This function can be used to test and calibrate: thermocouple transmitters, analog or digital indicator. A thermoresistance Pt100, inserted in isothermal contact with the connectors, measures the ambient temperature for the cold junction compensation. It is possible to disable the automatic cold junction compensation and set out the reference temperature by the keyboard.
The instrument can simulate thermocouple types indicated in the following table:

Type	Range/°C	Resolution/°C Max
J	-210…1200	0,1
	-190…1200	0,01
K	-270…1370	0,1
	-160…1260	0,01
T	-270…400	0,1
	-130…400	0,01
F	0…1400	0,1
	0…1400	0,01
R	-50…1760	0,1
	150…1760	0,01
S	-50…1760	0,1
	170…1760	0,01
B	50…1820	0,1
	920…1820	0,01
U	-200…400	0,1
	-160…400	0,01
L	-200…760	0,1
	-200…760	0,01
N	-270…1300	0,1
	0…1300	0,01
E	-270…1000	0,1
	-200…1000	0,01
C	0…2300	0,1
	0…2000	0,01
M	-50…1410	0,1
	-50…1410	0,01

Table 5 – Thermocouple simulation table

6.3.6 Thermoresistance simulation

Through the output module (OUT) it is possible to simulate thermoresistance. This function can be used to check and calibrate: temperature transmitters – analogue or digital indicators.
The instrument can simulate thermoresistance types indicated in the following table:

Type	Range/°C	Resolution/°C Max
Pt100 (385)	-200…850	0,1
	-200…850	0,01
Pt100 (3916)	-200…850	0,1
	-200…850	0,01
Pt100 (3926)	-200…850	0,1
	-200…850	0,01
Pt100 (3902)	-200…650	0,1
	-200…650	0,01
Pt100 (3923)	-200…600	0,1
	-200…600	0,01
Pt100 JIS (3916)	-200…600	0,1
	-200…600	0,01
Pt200 (385)	-200…850	0,1
	-200…850	0,01
Pt500 (385)	-200…850	0,1
	-200…530	0,01
Pt1000 (385)	-200…850	0,1
	-200…850	0,01
Pt1000 (3916)	-200…850	0,1
	-200…850	0,01
Ni100 (617)	-60…180	0,1
	-60…180	0,01
Ni120 (672)	0…150	0,1
	0…150	0,01
Cu10 (42)	-70…150	0,1
	-70…150	0,01
Cu100	-180…150	0,1
	-180…150	0,01

Table 6 – Thermoresistance simulation table

Fast programming of the value to be simulated
In generation or simulation on any particular channel the simulated value can be rapidly changed by pressing immediately to the right of the simulated value where there is a sensitive square that pressed allows user to enter the value to simulate by a numerical keyboard.

6.4 User Interface

The Pascal 100 or Pascal 100/IS calibrator has a wide display with touch screen through which it is possible to set up the instrument.

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The following picture is a typical display of the Pascal 100 or Pascal 100/IS.
The top portion represents a status bar where are indicated:

- Number of calibration report saved in memory
- Power supply
- Ambient temperature
- Barometric pressure
- Relative humidity
- Battery charge status
- Data Logger status
- Date
- Time

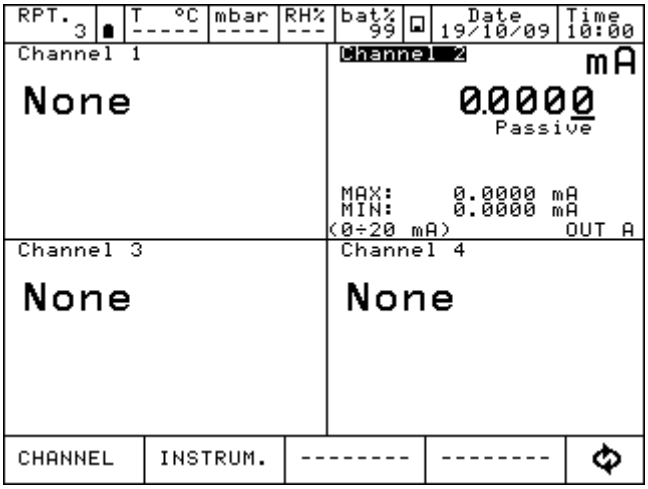

Figure 13 – Typical display of Pascal 100 or Pascal 100/IS

In the central part four software channels are available for selection and configuration according to the user requirement.

In the above screen, the instrument is set up for generating the current and to display it in the software channel 2. The other software channels are not assigned.

At the bottom part a dynamic menu is available, that changes according to the context.

6.4.1 Channel configuration

The assignment of a function to a software channel is a simple procedure that guides the operator step by step.
The channel assignments are very similar, therefore only one assignment will be shown as example. The following procedure shows how to set up the Pascal 100 or Pascal 100/IS for temperature measurement through a Pt100 thermo resistance connected to the input pins of the IN A module (using 4 wires measurement).
The selection of one of the four available software channels is made by pressing one of the four big channel displays, as shown in the figure below.

Channel selection
To verify if the channel has been correctly selected it is possible to check if the word “Channel”, in the respective channel block, is in a negative form (white on black background) or not. See figure below.

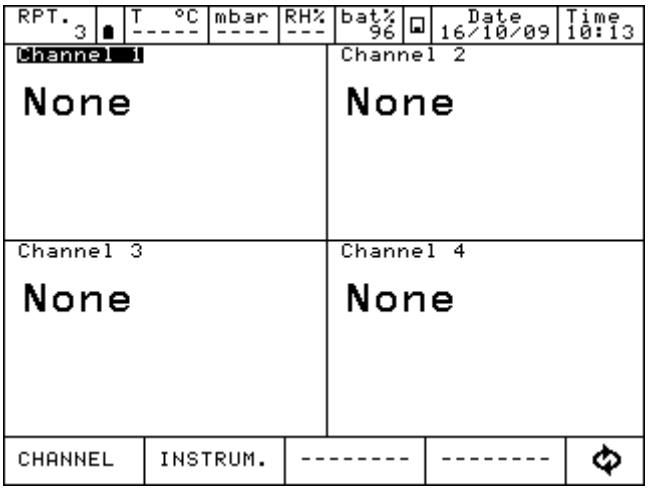

Figure 14 – Channel 1 selected

To continue the assignment procedure select CHANNEL menu and press ASSIGN.

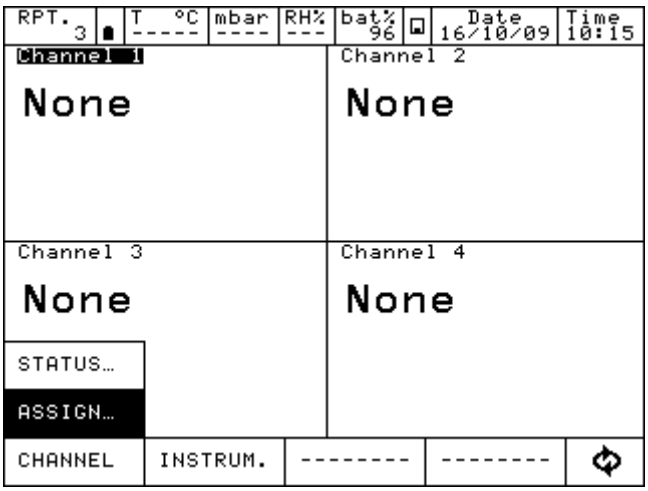

Figure 15 - Menu ASSIGN selected.

Automatically the program shows the following screen and remains in this position till the operator select what type of parameter to associate to Channel 1.

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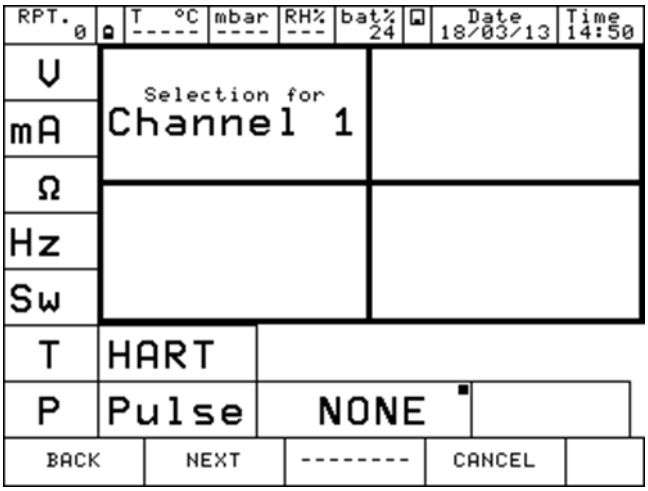

Figure 16 – Parameter selection

The possible choices are:

- V (Voltage)
- mA (Current)
- Ω (Resistance)
- Hz (Frequency)
- Sw (Switch (Open/Closed))
- T (Temperature)
- P (Pressure)
- HART (Hart communication) [Only when the module is fitted]
- PULSE (Pulse)
- NONE (No selection)

Previous set-up
A small black square in the top right side of the selection of the Figure 16 – Parameter selection, NONE, shows the last configuration of the selected channel. To maintain the same setting press NEXT.

Once a particular parameter is selected, for example pressing “T” for temperature, the instrument asks for the channel role:

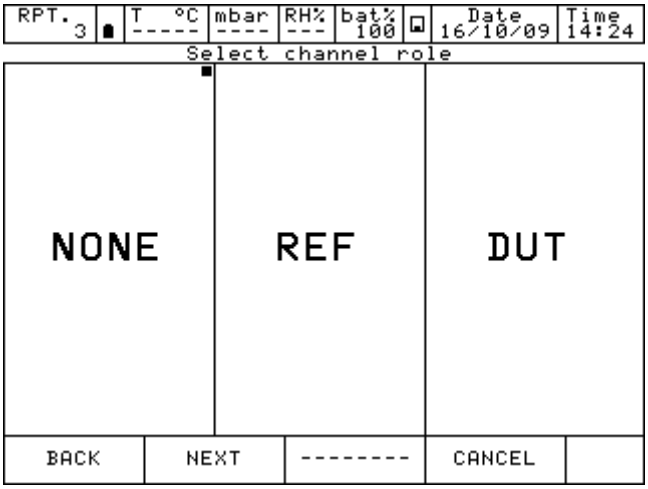

Figure 17 – Channel role selection

NONE to use the channel for simple measurement
REF to use the channel as reference in a comparison calibration
DUT to use the channel as measurement of a **D**evice **U**nder **T**est in a comparison calibration

Press one of the above button (NONE, REF, DUT) to define the channel role**.**

Pressing REF or DUT the procedure continues as shown below**:**
I/O to assign a particular I/O module to the software channel.
KEYBOARD to setup by keyboard a particular value read from an external instrument (i.e. analogue gauge).

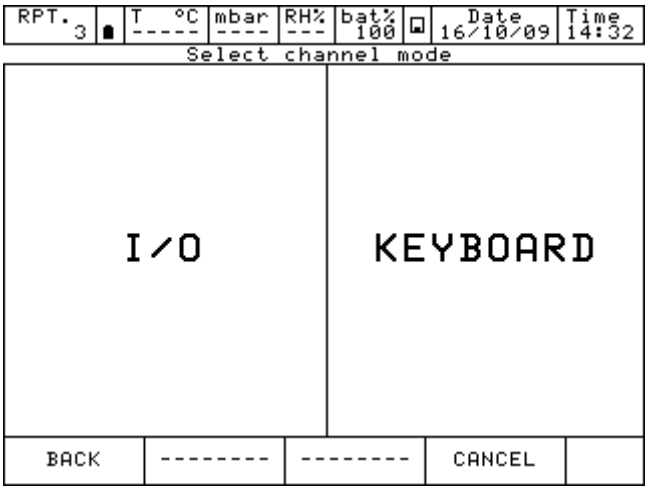

Figure 18 – Channel mode selection

By selecting I/O the instrument requires now to specify whether to measure a signal or to perform a simulation: for example Measure.

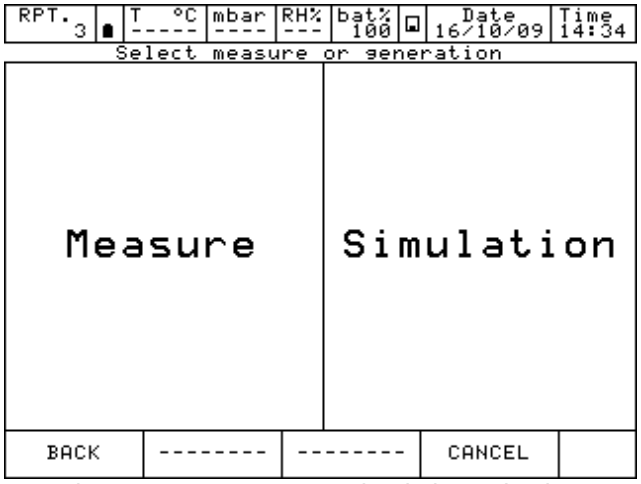

Figure 19 – Measure or Simulation selection

At this point the operator needs to select on which physical channel the thermoresistance has to be connected, example IN A.

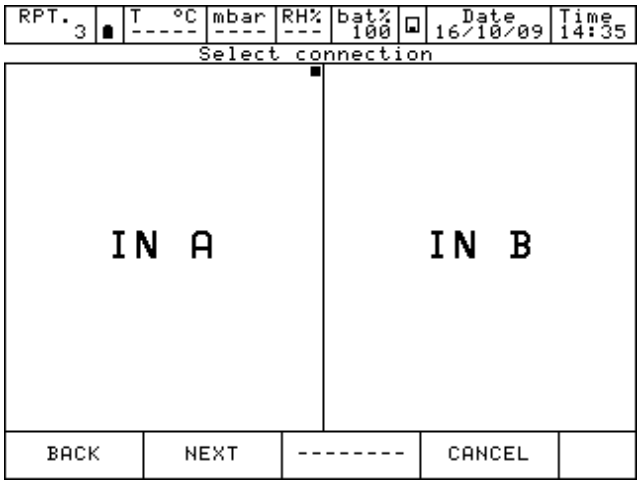

Figure 20 – Input module selection

It is necessary now to select a thermocouple (Tc) or a thermoresistance (Rtd):

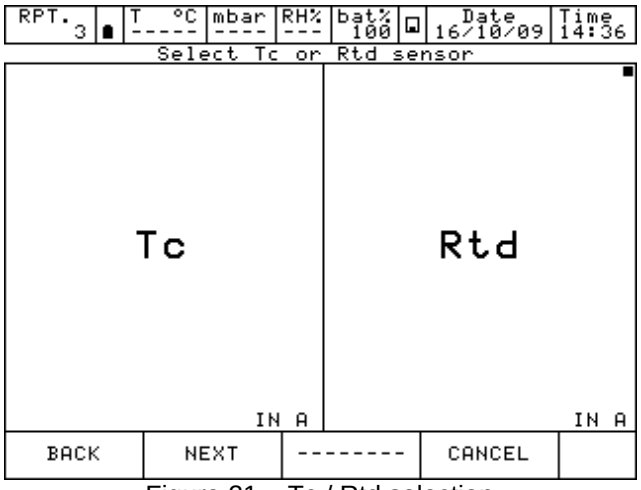

Figure 21 – Tc / Rtd selection

Selecting RTD the page for the thermoresistance set up is shown. Fourteen RTD's types are available, plus one RTD User (with coefficient defined by the user).

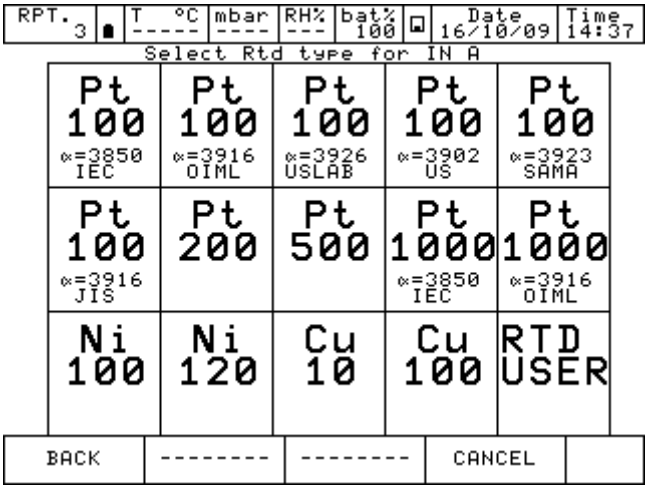

Figure 22 – Rtd type selection

Once the type of thermoresistance connected to the input IN A is identified, the operator must indicate the measurement mode: 2 wires, 3 wires or 4 wires measurement; the engineering unit (°C, °F, K) and related number of decimal.

Measurements of RTD - 4 wires
If possible it is recommended to perform RTD measurement with four wires to eliminate parasite resistances of the connecting cables. All specifications for thermoresistance aim for four wires measurement.

RTD USER must be selected when the operator needs to measure a non-standard RTD in agreement with the following formula:
If $T \geq 0$ °C $R(t) = Ro * (1 + A * t + B * T^2)$
If $T < 0$ °C $R(t) = Ro * (1 + A * t + B * T^2 + C (t - 100) * t^3)$

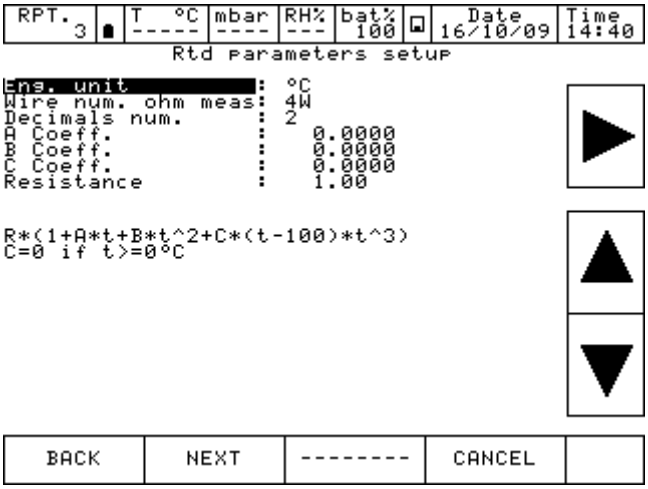

Figure 23 – RTD parameters setup

Once RTD USER is selected, it is possible to set the parameter of the RTD used.

A = X * 10^{-3} °C^{-1}
B = X * 10^{-7} °C^{-2}
C = X * 10^{-12} °C^{-3}
Ro = Resistance @ t = 0,01 °C
X = Value

Next step is to define the measurement range. The range selection is necessary during the calibration procedure to define the relationship between the REF and DUT channels.

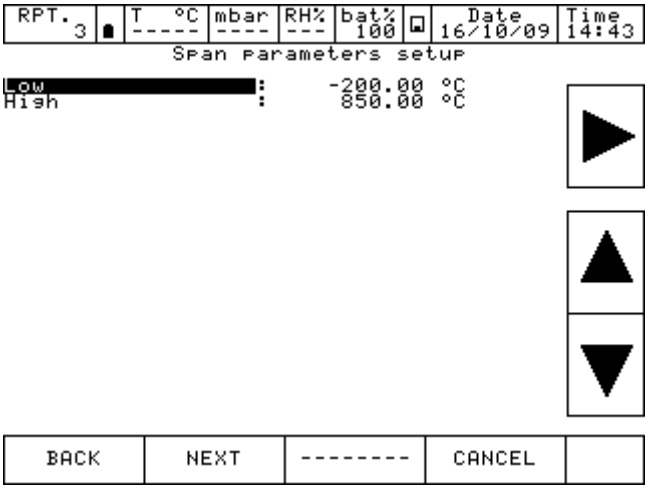

Figure 24 – Range setup

Now it is possible to conclude the procedure by pressing the YES button or come back to the previous step pressing NO.

Figure 25 – Channel setup confirmation

Once the YES key is pressed, the calibrator returns to the initial page where the user can proceed with the measurement/simulation, or assign another function to a different software channel following the same procedure.

6.4.2 Other assignments

6.4.2.1 Pressure measurement

The following procedure illustrates the setting of Pascal 100 or Pascal 100/IS for pressure measurement. The particular channel is selected by pressing one of the four big displays and then pressing CHANNEL and ASSIGN from the menu, as shown below:

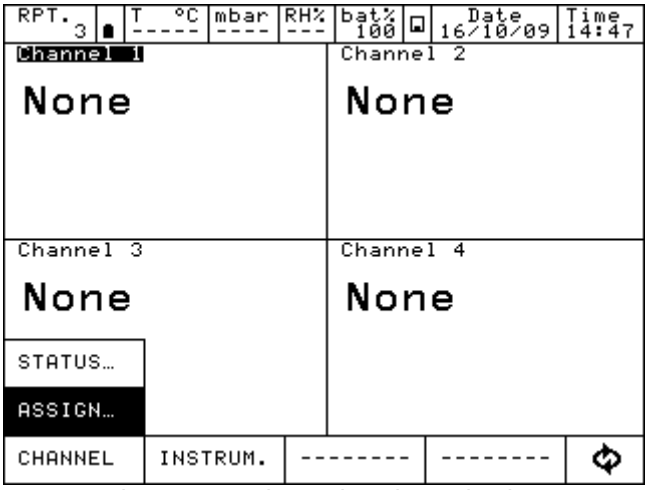

Figure 26 – Channel assign selection

Automatically the program shows the following screen and it remains in this position until the operator points out what type of parameter he desires to associate to a selected channel, for example to the Channel 1. In this case press P for pressure.

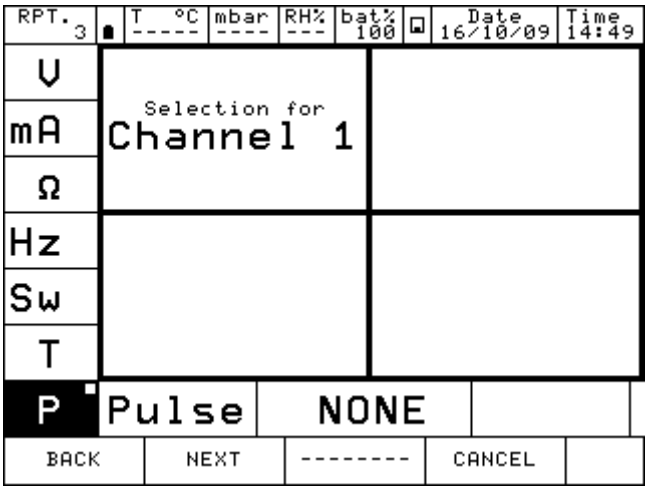

Figure 27 – Pressure parameter selection

The Pascal 100 or Pascal 100/IS can be equipped with up to two pressure modules and each of them can handle up to three pressure sensors, two internals and one external with standard accuracy.

The instrument requires the channel role:

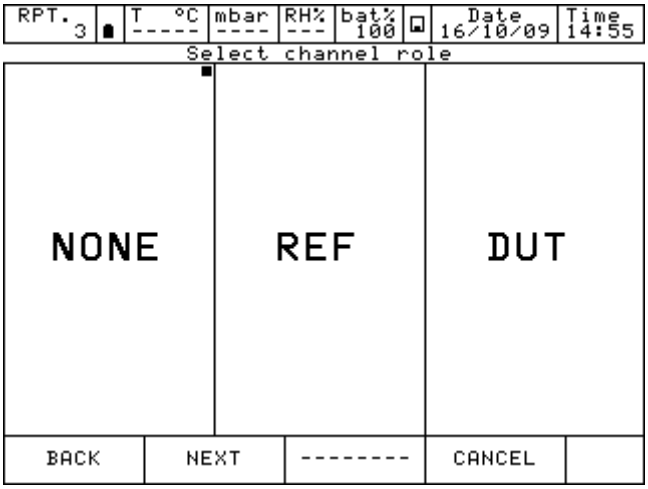

Figure 28 – Channel role selection

NONE to use the channel for simple measurement
REF to use the channel as reference in a comparison calibration
DUT to use the channel as measurement of a Device Under Test in a comparison calibration

Press one of the above button (NONE, REF, DUT) to define the channel role**.**

Pressing REF or DUT the procedure continues as shown below**:**
I/O to assign a particular I/O module to the software channel.
KEYBOARD to setup by keyboard a particular value read from an external instrument (i.e. analogue gauge).

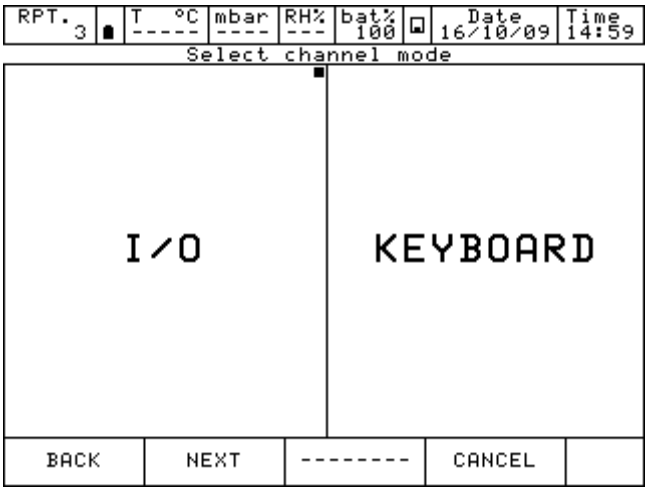

Figure 29 – Channel mode selection

By selecting I/O the procedure requires to select the type and the range of the sensor to be used.

The sensor is identified by the measurement range and the measurement mode (g = gauge pressure or a = absolute pressure). This information is displayed under the writing PE-1 (first external sensor) or PE-2 (second external sensor). See the the figure below as example:

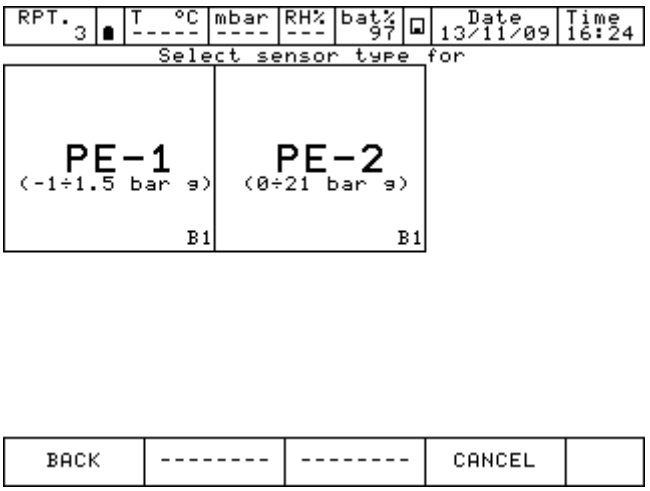

Figure 30 – Pressure sensor selection

When the sensor has been selected, the next page helps to set the engineering unit and related number of decimals.

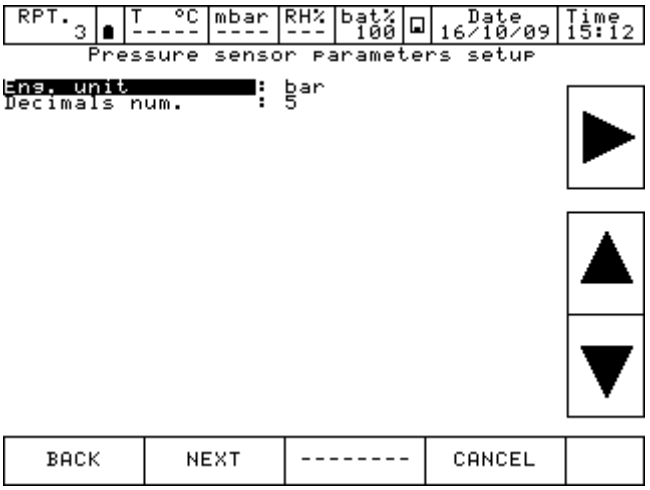

Figure 31 – Pressure sensor parameters selection

The pressure engineering units available are:

Measure unit					
bar	mbar	ftH_2O@4°C	inH_2O@4°C	inHg@0°C	psf
psi	atm	torr	mH_2O@4°C	cmH_2O@4°C	mmH_2O@4°C
mHg@0°C	cmHg@0°C	mmHg@0°C	kg/m^2@g_std	kg/cm^2@g_std	MPa
kPa	hPa	Pa			

The next screen shows the Span parameter (measuring range). For default the sensor has its maximum range equal to the measuring range (Span). If the Span has to be redefined, or to be reduced, the same can be changed by using a numeric keyboard. The redefinition of the Span is used during a calibration for comparison where a relationship between a REF and a DUT channel has to be done.

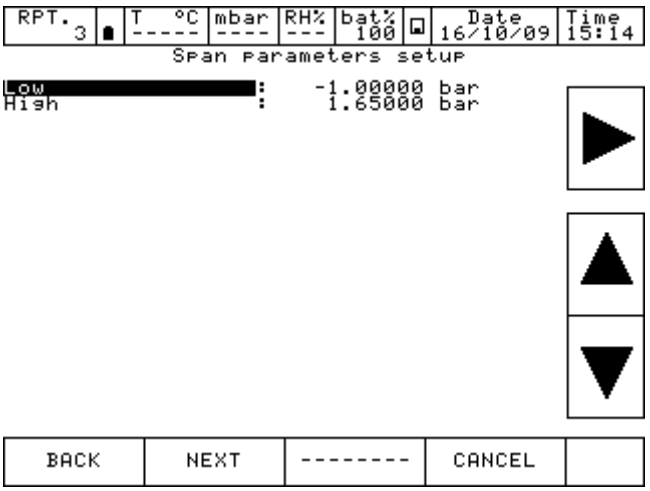

Figure 32 – Sensor range setup

Now it is possible to finalize the procedure by pressing the YES button or come back to the previous step pressing NO.

Figure 33 - Channel setup confirmation

Pressing the key YES, the channel is set up with the selected parameters and the screen with four channels is displayed again.

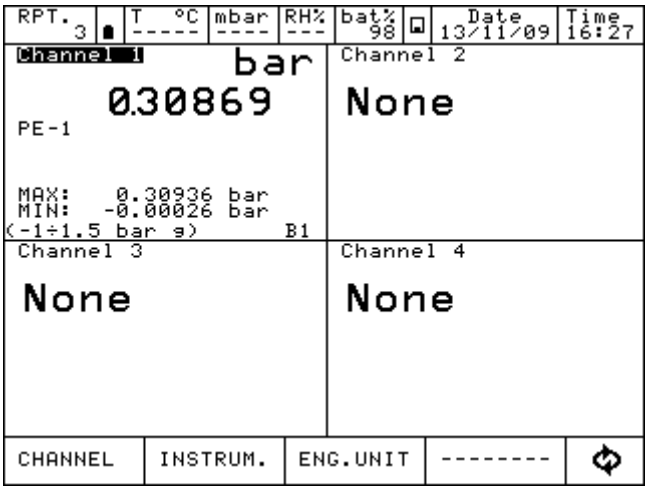

Figure 34 – Main display with pressure measurement

6.4.2.2 Thermocouple signal measurement

The following procedure shows the setup of Pascal 100 or Pascal 100/IS for temperature signal measurement, for example, through a thermocouple connected to the input module. The channel for measurement is selected by pressing one of the four large displays, once the menu CHANNEL is selected, press ASSIGN as shown in the below figure.

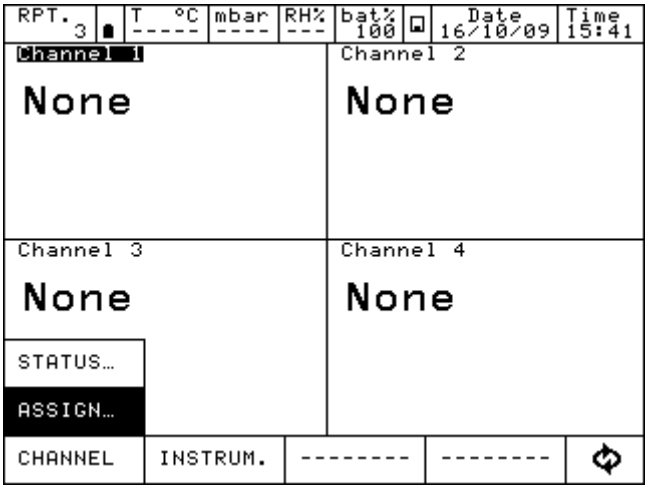

Figure 35 – Channel assign selection

Automatically the program shows the following screen and it remains in this position until the operator selects the type of parameter he desires to associate to the Channel 1.

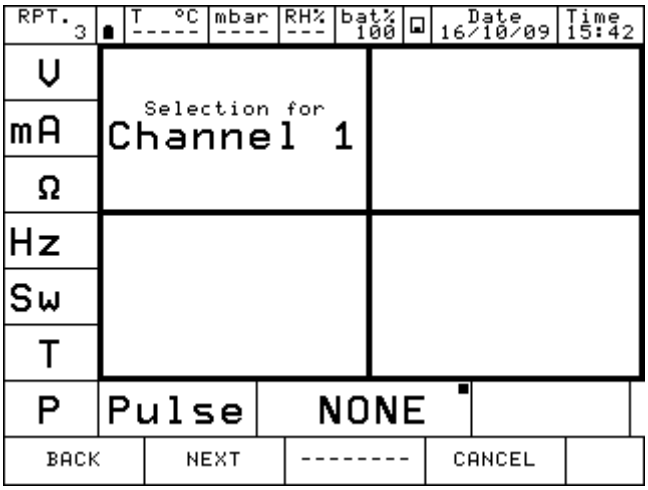

Figure 36 – Temperature parameter selection

Press T for Temperature.
The instrument requires the channel role:

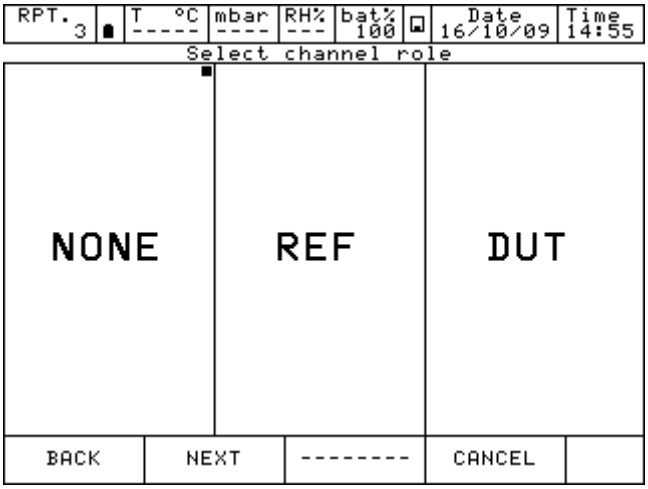

Figure 37 – Channel role selection

NONE to use the channel for simple measurement
REF to use the channel as reference in a comparison calibration
DUT to use the channel as measurement of a Device Under Test in a comparison calibration

Press one of the above button (NONE, REF, DUT) to define the channel role**.**

Pressing REF or DUT the procedure continues as shown below**:**
I/O to assign a particular I/O module to the software channel.
KEYBOARD to setup by keyboard a particular value read from an external instrument.

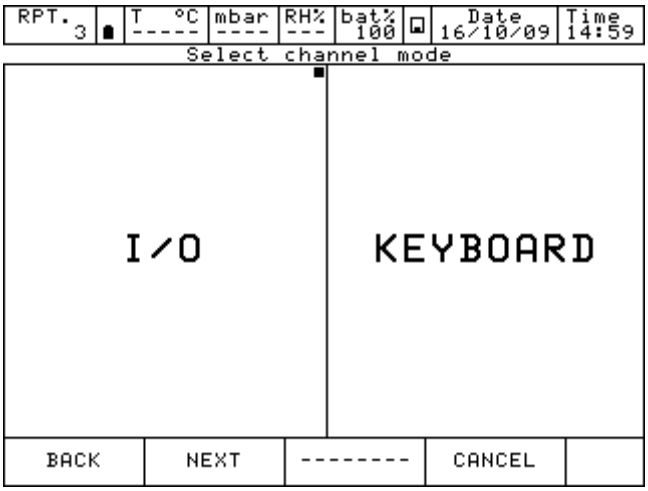

Figure 38 – Channel mode selection

By selecting I/O the instrument requires now to specify whether to measure a signal or to perform a simulation: for example Measure.

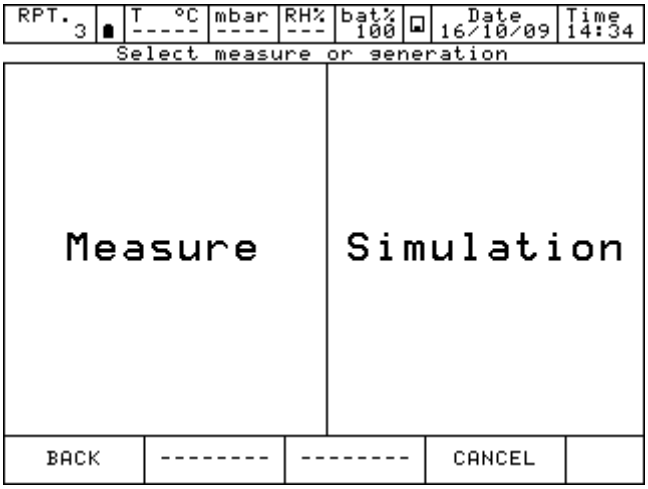

Figure 39 - Measure or Simulation selection

At this point the operator needs to select on which physical channel the thermocouple has to be connected, example IN A.

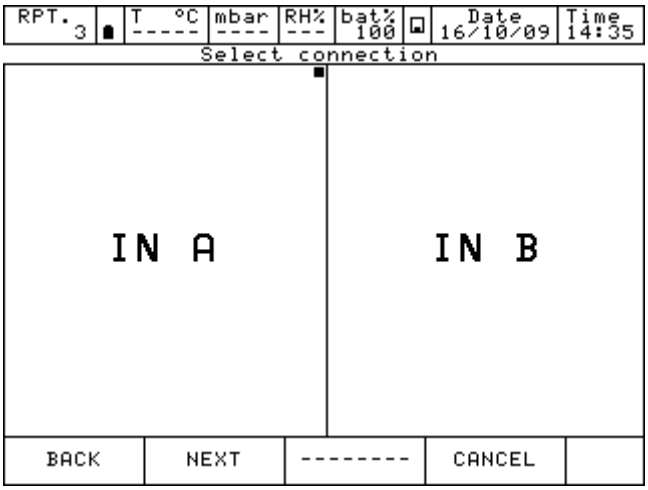

Figure 40 - Input module selection

It is necessary now to select a thermocouple (Tc) or a thermoresistance (Rtd), for example Tc.

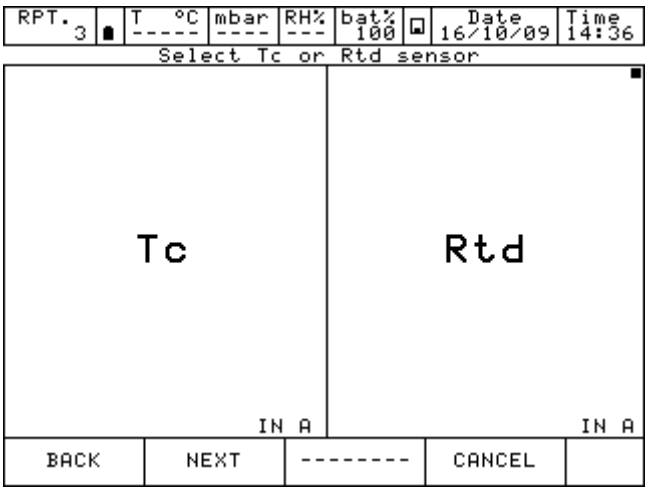

Figure 41 - Tc / Rtd selection

Selecting Tc the page for thermocouple set up is shown as follow:

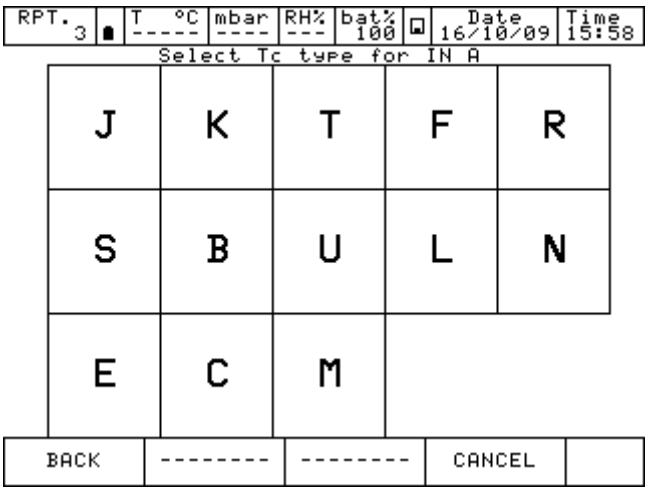

Figure 42 – Tc type selection

Next page helps the operator to select: the engineering unit (°C - °F - K) and the type of reference cold junction (internal or external). Selecting “internal cold junction”, a Pt100 is directly connected to the TC input pins, measures the environmental temperature; whereas by selecting “external cold junction”, the temperature value must be inserted by using the keyboard.

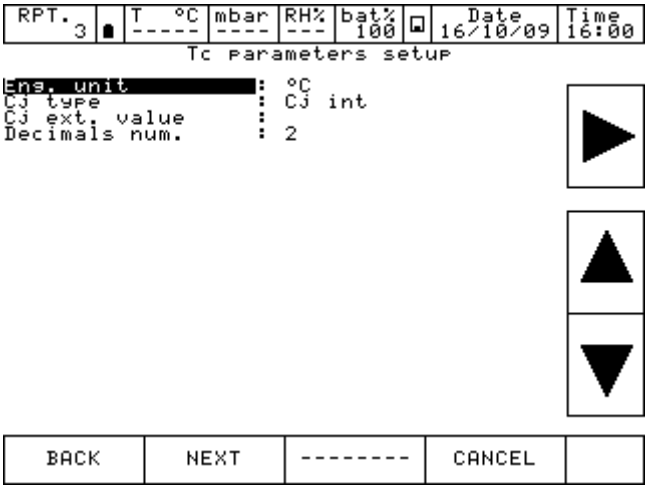

Figure 43 – Tc parameters selection

The next screen shows the Span parameter (measuring range). In the default settings, the sensor has its maximum range equal to the measuring range (Span). If the Span has to be redefined, or to be reduced, same can be changed by using a numeric keyboard. The redefinition of the Span is used during a calibration for comparison where a relationship between a REF and a DUT channel has to be done.

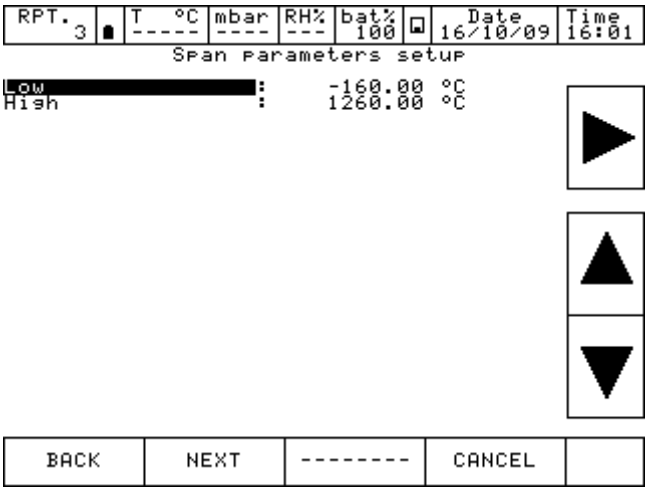

Figure 44 – Tc range selection

Now it is possible to finalize the procedure by pressing the YES button or come back to the previous step pressing NO.

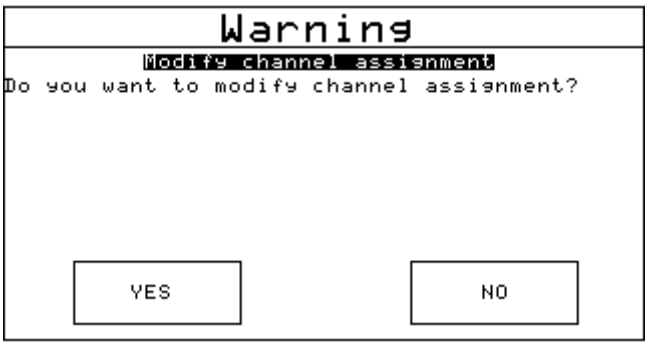

Figure 45 - Channel setup confirmation

Pressing the key YES, the channel is set up with selected parameters and the screen with four channels is displayed again.

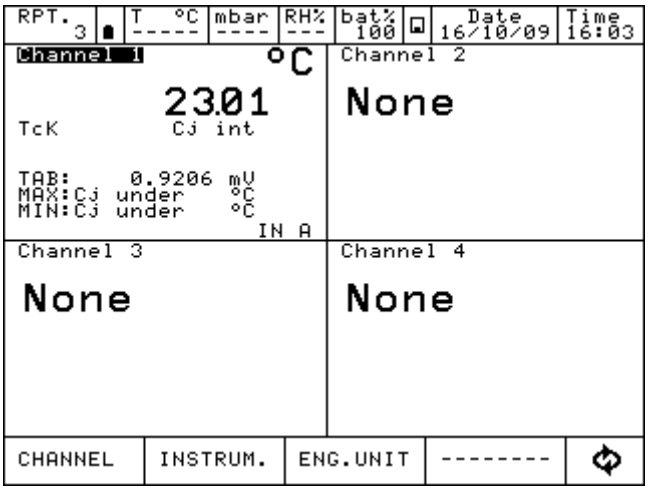

Figure 46 - Main display with temperature measurement

GB

6.4.2.3 Electrical parameter measurement

The following procedure shows the settings of Pascal 100 or Pascal 100/IS for the electrical parameters measurement through the input module. To select the channel press on one of the four large displays, then press CHANNEL: once menu is displayed press ASSIGN. Procedure is shown below:

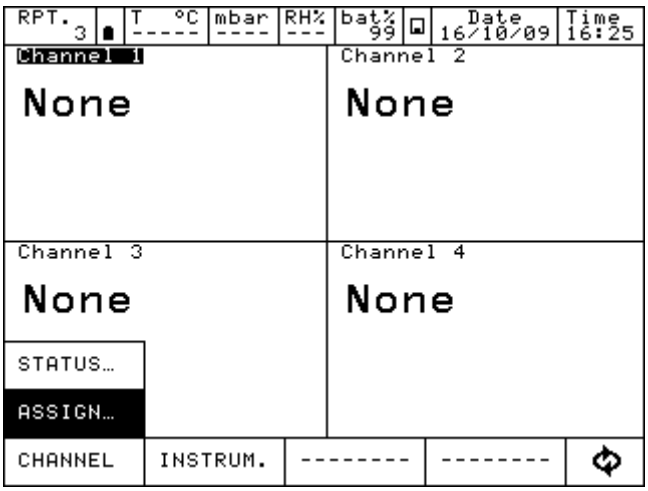

Figure 47 - Channel assign selection

Automatically the program shows the following configuration and it remains in this position till the operator selects the parameter to be associated to the Channel 1.
For example, press mA for current measurement.

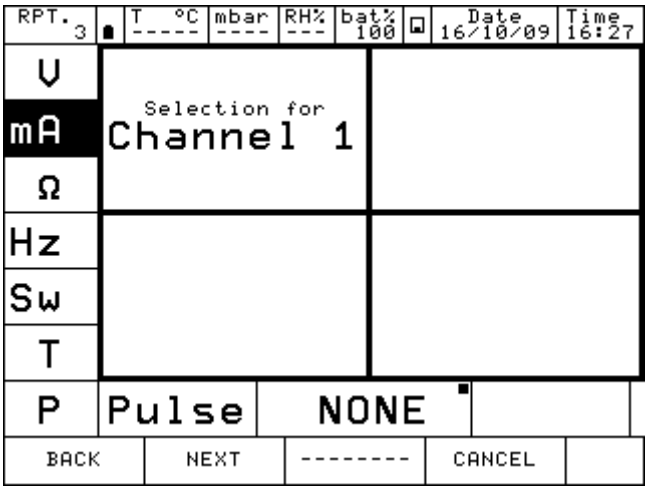

Figure 48 – mA parameter selection

The instrument requires the selection of the role:

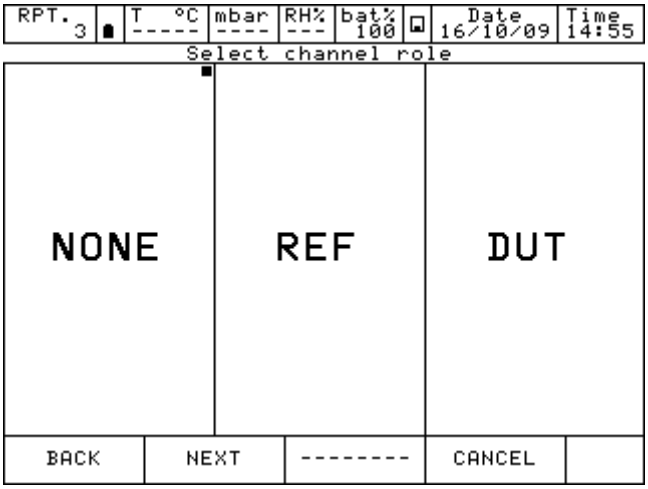

Figure 49 - Channel role selection

NONE to use the channel for simple measurement
REF to use the channel as reference in a comparison calibration
DUT to use the channel as measurement of a **D**evice **U**nder **T**est in a comparison calibration

Press one of the above button (NONE, REF, DUT) to define the channel role**.**

Pressing REF or DUT the procedure continues as shown below**:**
I/O to assign a particular I/O module to the software channel.
KEYBOARD to setup by keyboard a particular value read from an external device.

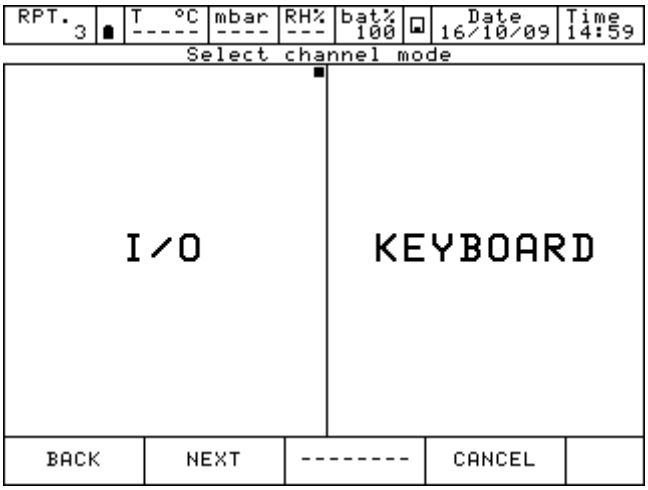

Figure 50 - Channel mode selection

Then press I/O to assign a particular I/O module to the software channel, or press keyboard to setup a particular value read from an external device**.**

By selecting the input/output (I/O) the procedure requires to select MEASURE (to measure a signal) or GENERATION (to generate a signal)

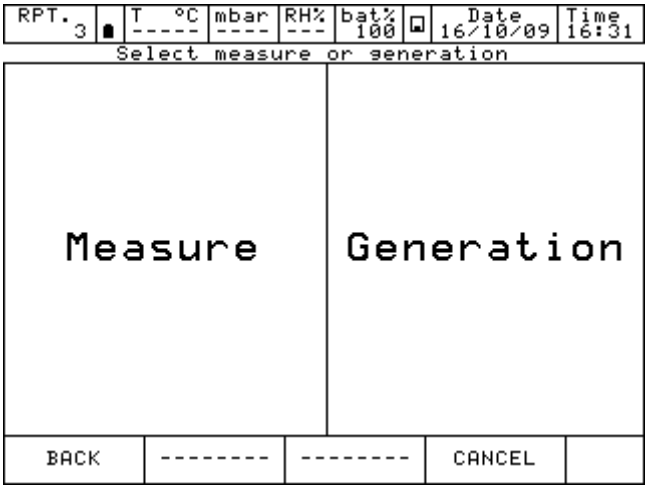

Figure 51 – Measure or generation selection

By pressing MEASURE, automatically the Pascal 100 or Pascal 100/IS requires to select input module (IN A- IN B) to be used. Double input will be displayed when the calibrator has a double input configuration and both modules are not assigned yet. Otherwise only one input will be displayed

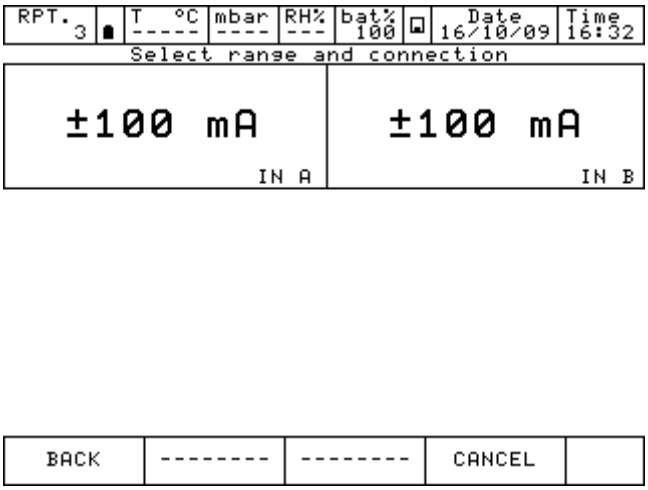

Figure 52 – mA selection from IN A or IN B

The next step shows the span parameter (measuring range). In the default settings, the maximum range is equal to the measuring range (span). If the span has to be redefined or reduced, it can be changed by using a numeric keyboard. To access to the keyboard use the arrows displayed on the right side of the screen. Change of the span is used during a calibration for comparison where a relationship between a REF and a DUT channel has to be assigned.

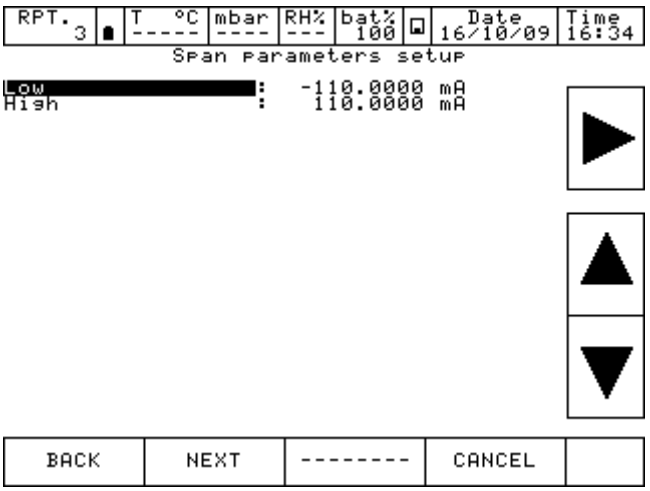

Figure 53 – mA range setup

Now it is possible to finalize the procedure pressing YES or come back to the previous step pressing NO.

Figure 54 - Channel setup confirmation

Pressing YES, the channel is assigned to the selected parameter and the screen with four channels is displayed again.

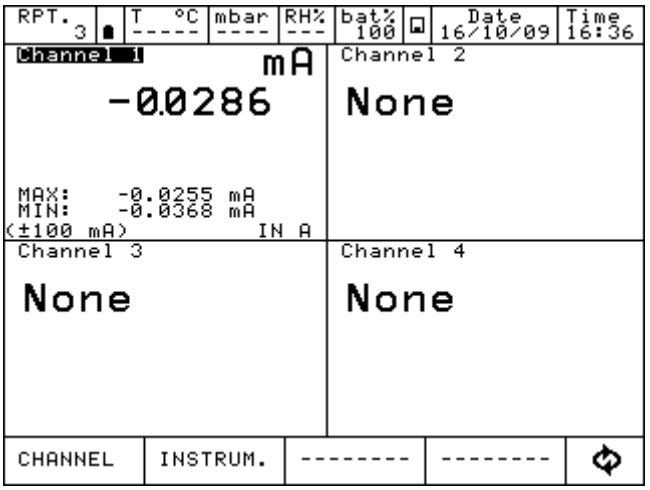

Figure 55 – Main display with mA measurement

6.4.2.4 Temperature Simulation

The procedure for the temperature simulation assignment is similar to the measurement one as described previously, except for the step “Select measure or simulation” where the operator needs to press SIMULATION instead of MEASURE. In the following step the user needs to select one of the output OUT A or OUT B available.

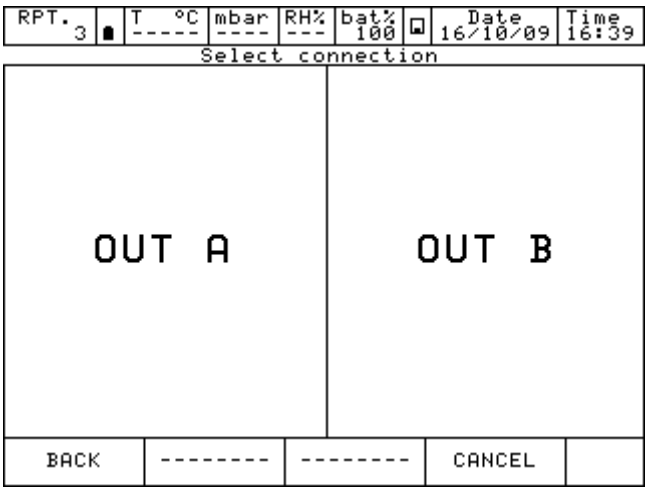

Figure 56 – Generation module selection

6.4.2.5 Electrical parameter generation

The procedure for the assignment of the generation of an electric parameter (for example mA) is similar to the electrical signal measurement one as described previously, except for the step "Select measure or generation” where the operator needs to select GENERATION instead of MEASURE.
Then the user needs to select OUT A or OUT B (if available).

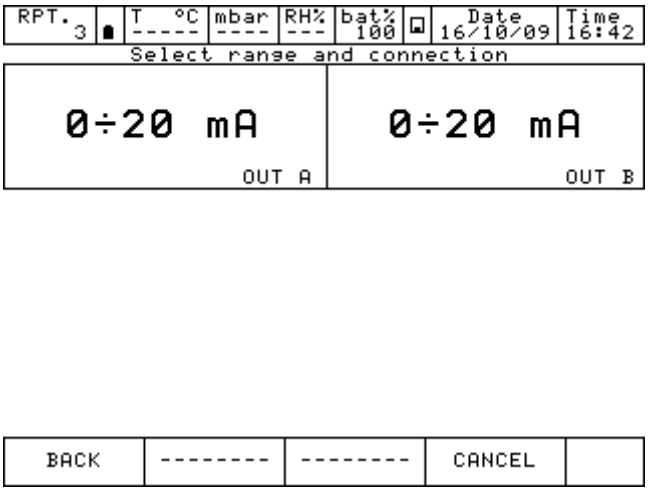

Figure 57 – mA generation module selection

The next selection ask if a passive or active loop is required (with 24 V supply for the loop).

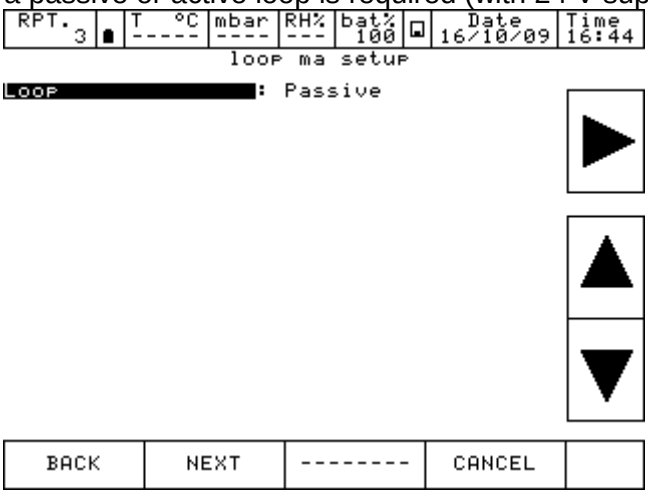

Figure 58 – mA loop generation setup

6.4.2.6 Channel 4 – mathematic functions

Channel four has an additional setting named CALC. This function enables to display on channel n. 4 a value, result of the combination of the values displayed in channel 1 and 2. To access, press on the display of channel 4, then Channel on the bottom bar and then assign.

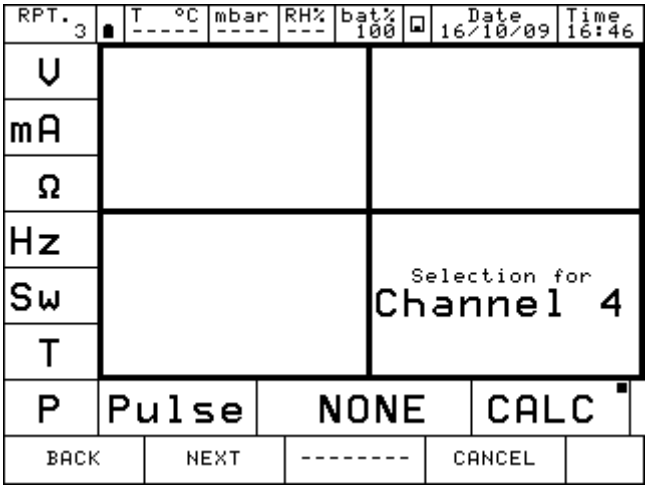

Figure 59 – Channel 4 assignment

Pressing CALC the followings are displayed:

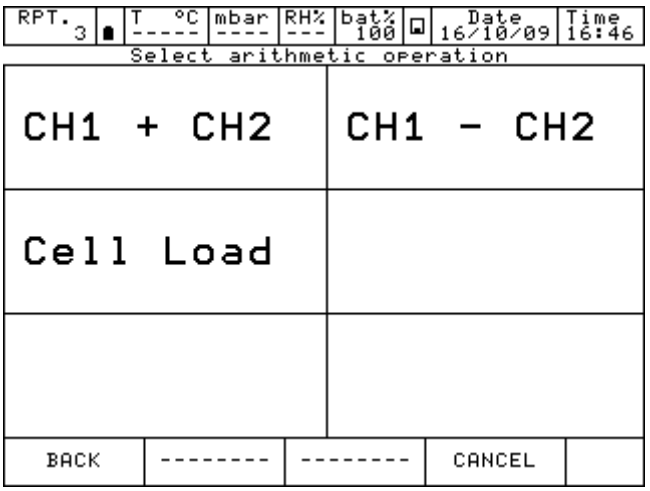

Figure 60 – Calculation types

CH1 + CH2 channel 4 displays the total value of the values displayed on channel 1 and 2
CH1 - CH2 channel 4 displays the difference value of the values displayed on channel 1 and 2
Cell Load channel 4 displays the ratio mV/V of the load cells

CH1+CH2 and CH1-CH2 functions can be used only if channel 1 and 2 are set with the same values: same engineering unit, same number of digits, no channel assigned with error indication. In this case, below what will be displayed:

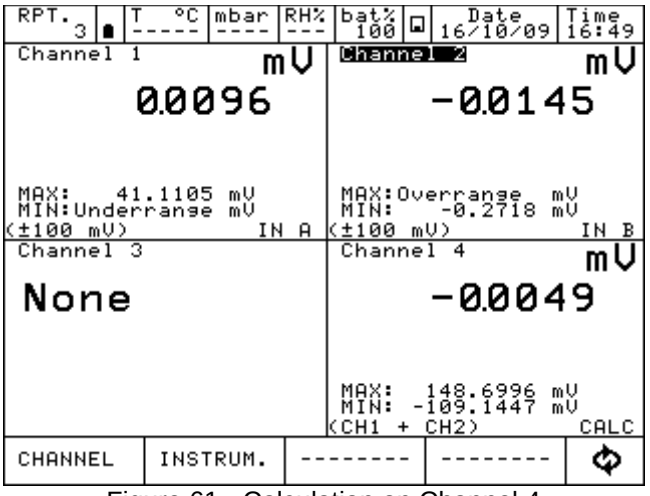

Figure 61 - Calculation on Channel 4

Otherwise the channel 4 will be displayed as:

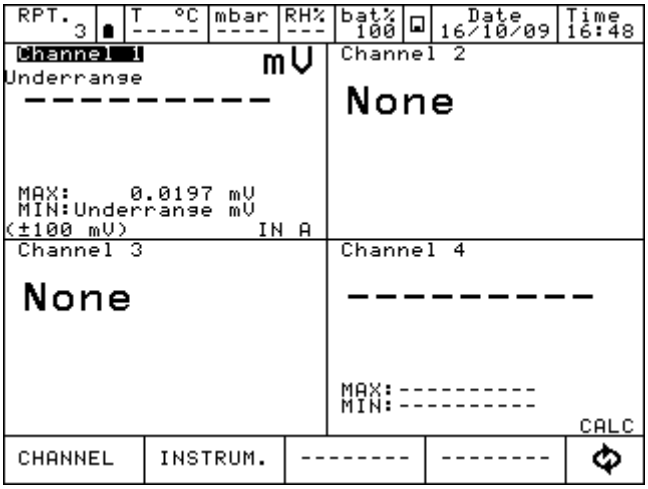

Figure 62 – Calculation not possible on Channel 4

For the Cell Load, the channel 4 can calculate the result coming from a load cell connected as per the below scheme:

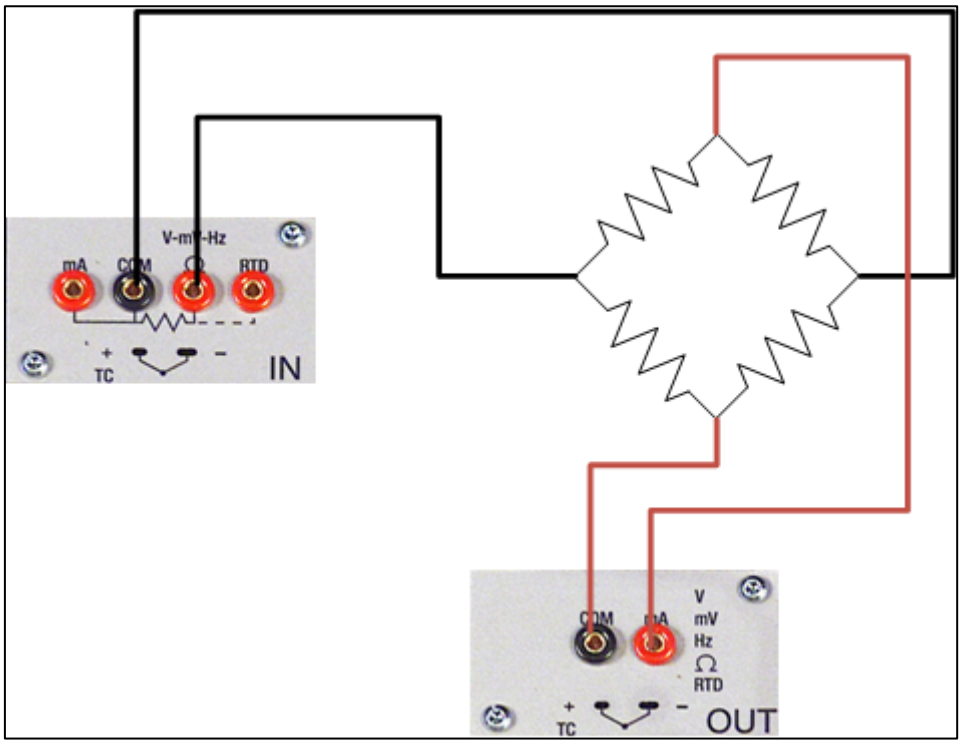

Figure 63 – Cell Load connection

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Calculation is possible only when channel 1 is assigned for mV measurement (bridge signal) and channel 2 is assigned for V generation, range 0÷20 V (bridge supply). Moreover channel 1 should not be set in error mode.
In this case, below what will be displayed:

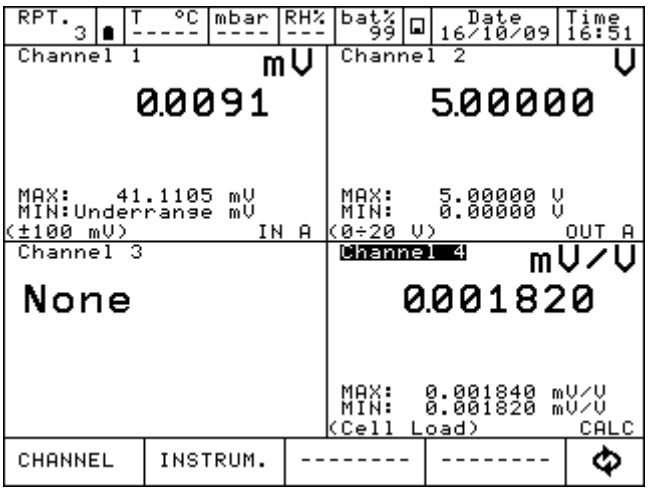


Figure 64 – Cell Load calculation

Pascal 100 or Pascal 100/IS allows to manage the sensitivity of the load cell from 0 mV/V up to 9.99999 mV/V.
Moreover, on channel 4, the SCALING function can be assigned through the menu CHANNEL in order to display an engineering unit more appropriate (for example Kg or a pressure unit).

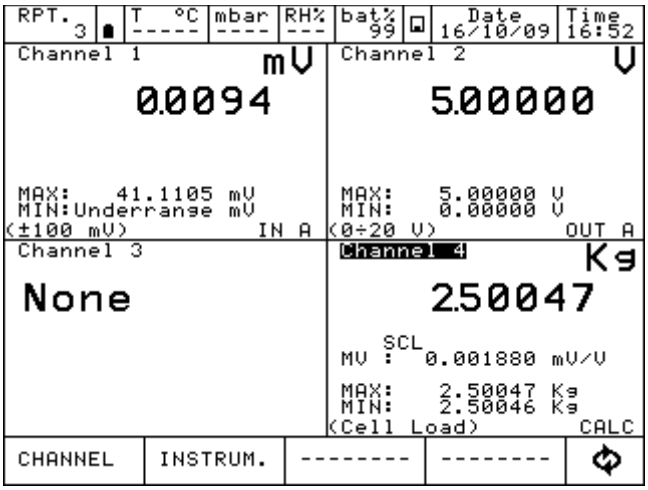
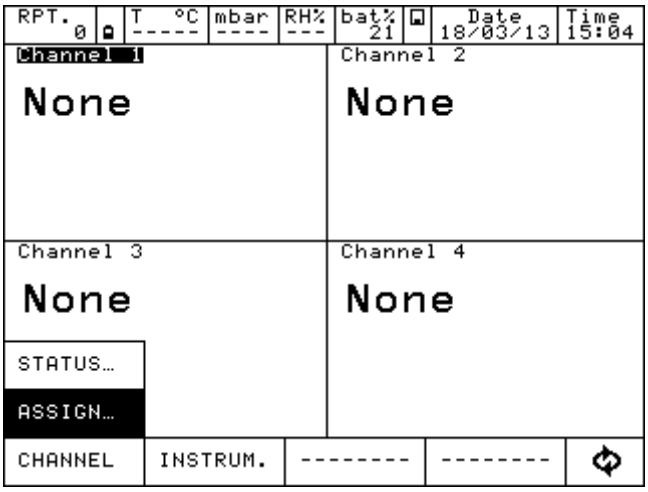


Figure 65 – Cell Load calculation with Scaling function active

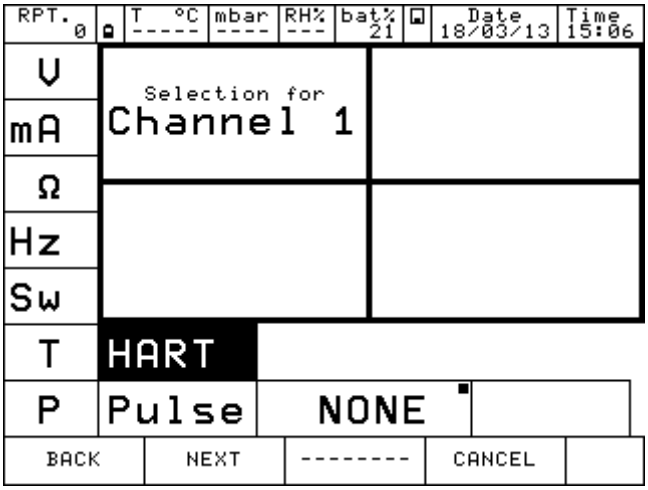
6.4.2.7 HART channel assignment

To select the channel press on one of the four large displays, then press CHANNEL. Once menu is displayed press ASSIGN. Procedure is shown below:

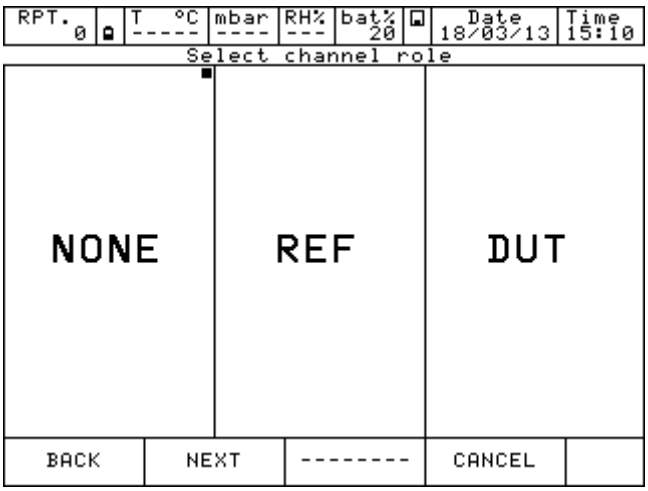


Automatically the program shows the following configuration and it remains in this position till the operator selects the parameter to be associated to the Channel 1.

For example, press HART for HART measurement.



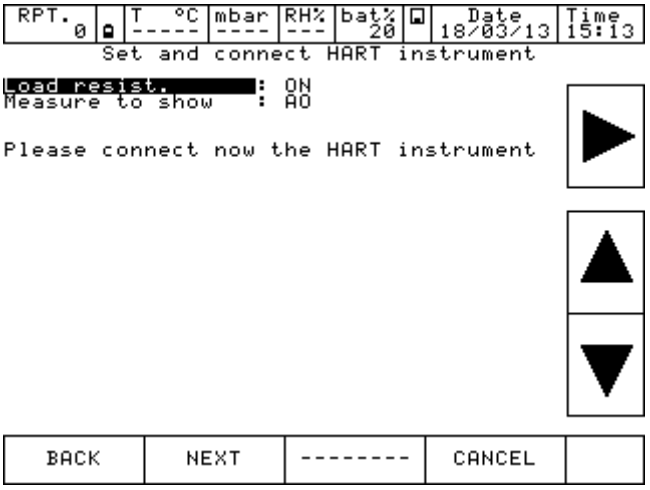
The instrument requires the selection of the role:



NONE to use the channel for simple measurement
REF to use the channel as reference in a comparison calibration
DUT to use the channel as measurement of a Device Under Test in a comparison calibration

GB

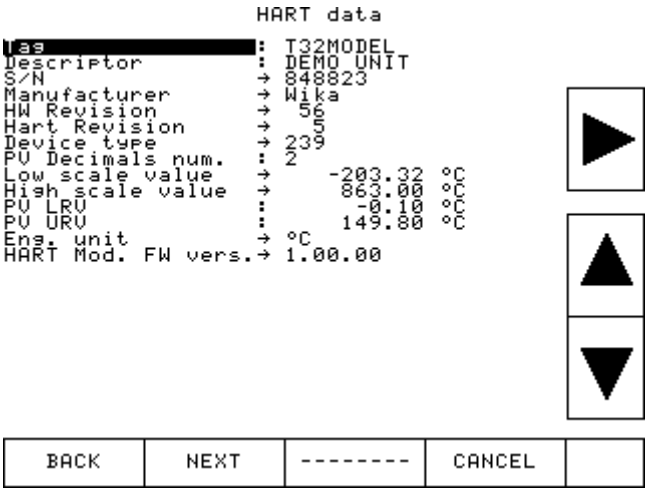
Press one of the above button (NONE, REF, DUT) to define the channel role.
Pressing REF or NONE the procedure continues as shown below:



Here the user can choose if enable the internal module 250Ω resistor (ON or OFF), and choose what digital measure wants to show as the big value displayed on the channel window: PV or AO. The other type of measure however is displayed on the channel in a smaller font.

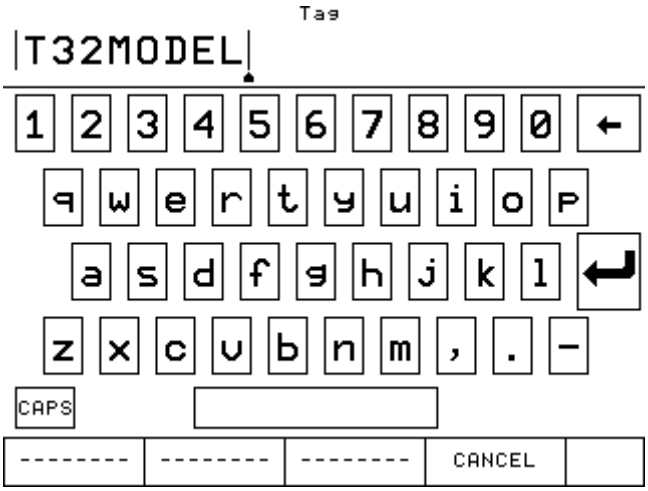
Before pressing NEXT be sure to already make the proper connections to the HART instrument as show in previous chapter

Press NEXT and, after few seconds, if no error is shown the following appear (depending on HART transmitter type connected):



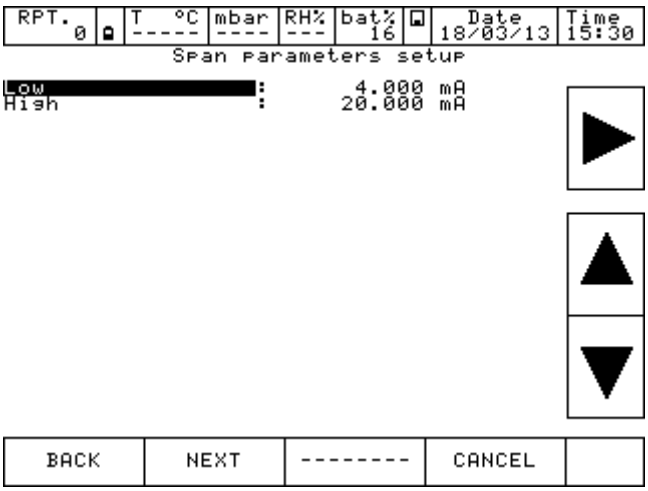
Here the user has the possibility to change some parameter (they showed with ':' moving the black line with arrows.
They can be: TAG, DESCRIPTOR, PV decimals units, PV LRV and PV URV.

After positioned to the parameter needed to modify press right arrow key, for example on the TAG parameter:

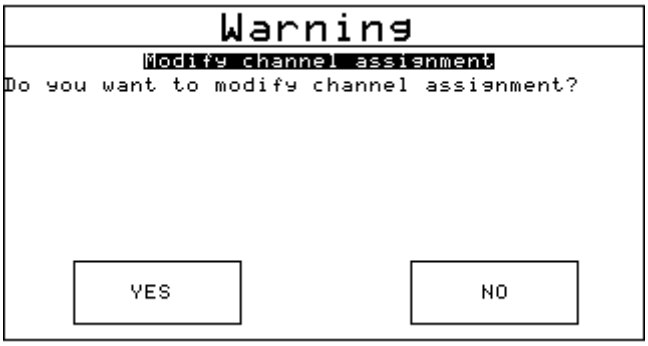


If desired delete all the characters with backspace and insert the desired. After press ENTER to store the parameter inside the HART transmitter; the Pascal will return to the previous display.
IMPORTANT NOTE: HART requires that all the characters must be in upper case in order to be properly stored.
Press NEXT to continue.

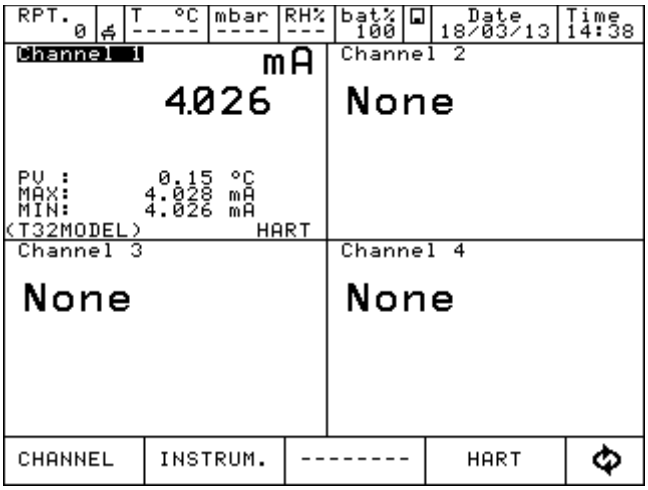
The next step shows the span parameter (measuring range). In the default settings, the maximum range is equal to the measuring range (span). If the span has to be redefined or reduced, it can be changed by using a numeric keyboard. To access to the keyboard use the arrows displayed on the right side of the screen. Change of the span is used during a calibration for comparison where a relationship between a REF and a DUT channel has to be assigned.



Now it is possible to finalize the procedure pressing YES or come back to the previous step pressing NO.



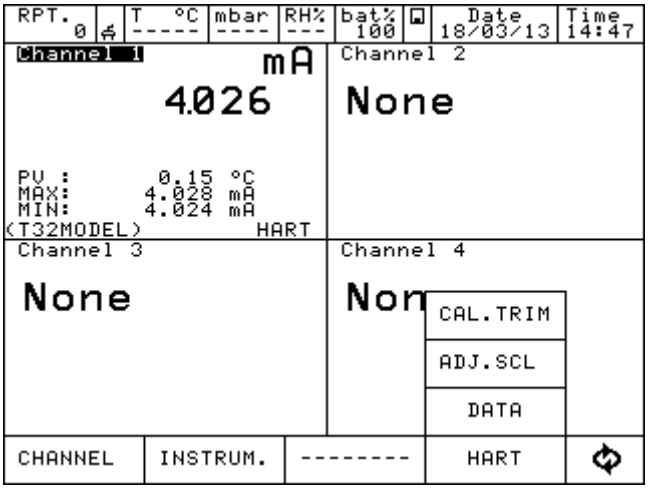
Pressing YES, the channel is assigned to the selected parameter and the screen with four channels is displayed again.



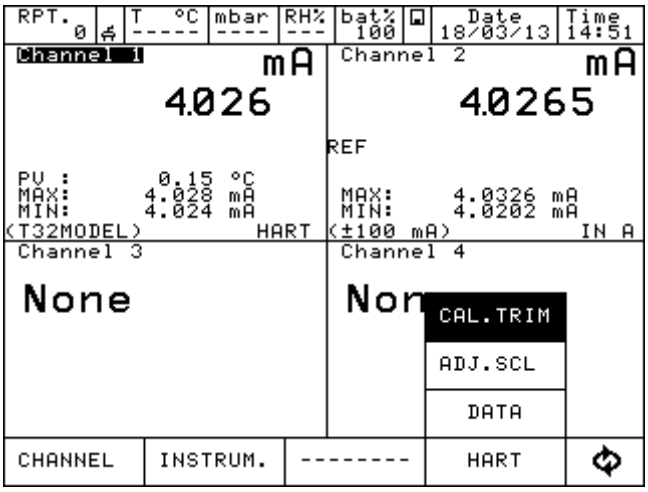
6.4.2.8 HART trimmer calibration

When the HART transmitter needs to be recalibrated or adjusted the HART menu can achieve these two types of possibilities:

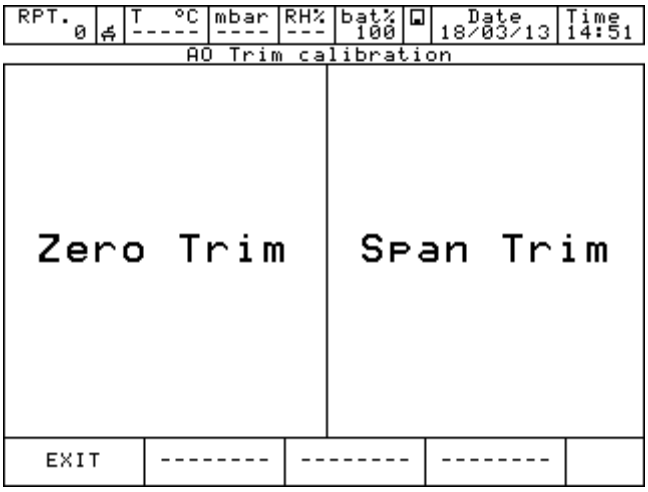
- ADJ.SCL
- CAL.TRIM



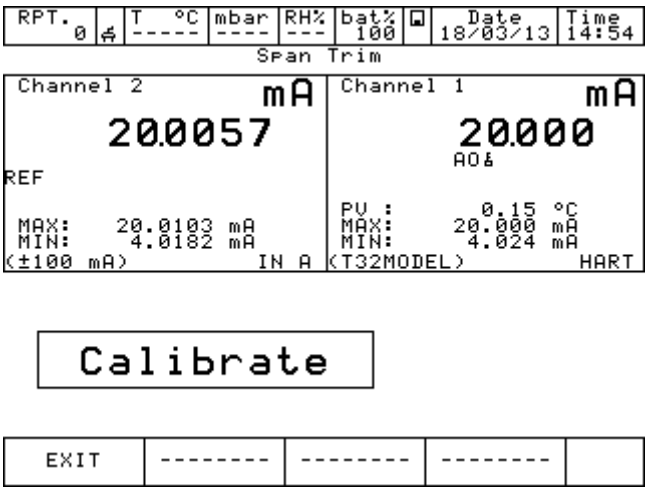
CAL.TRIM permits to correct the analog mA generation, of the HART transmitter, referred to the digital AO value displayed if the output DAC goes out of tolerance.
Zero and Span needs to be corrected.
If the user wants to recalibrate the Trim. an INPUT mA measurement channel has to configured as REF channel. In addition, the loop wiring needs to flow to the IN mA terminals.
If no REF mA Input channel is configured first an error will be shown.



The instrument shows:



Press “Zero Trim” or “Span Trim”, and the display shows (in this case Span Trim is selected):



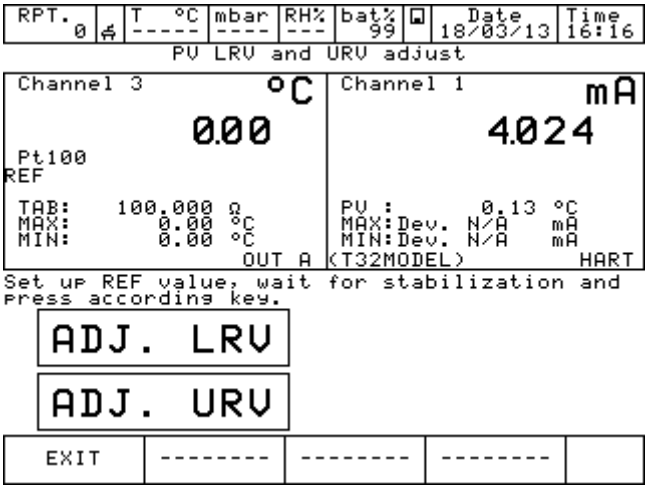
The HART instrument is put in fixed mode generation (4 or 20 mA) and the REF channel is measuring the true analog mA generation. To re-align to the correct 20 mA (or 4 mA) generation press “Calibrate” button.
If needed follow the same procedure for “Zero Trim”.

GB

6.4.2.9 HART scale adjust

ADJ.SCL permits to align the range of PV to the Lower and Upper mA generation values.
The Lower value of PV is the value at which the transmitter will generate the 4 mA nominal value, and the Upper value is the value at which the transmitter will generate the 20 mA nominal value.
Here is described the “automated” procedure that permits to align in “real-time” these values. The user can also change them manually in the “HART data” page as seen before.
If the user wants to adjust the scale a channel of the same input type of the transmitter has to be configured as REF channel. If no REF channel is configured first an error will be shown.

Press ADJ.SCL menu and the following is shown (assuming that we are using a Pt100 transmitter, e REF simulation Pt100 channel is configured as Channel 3):



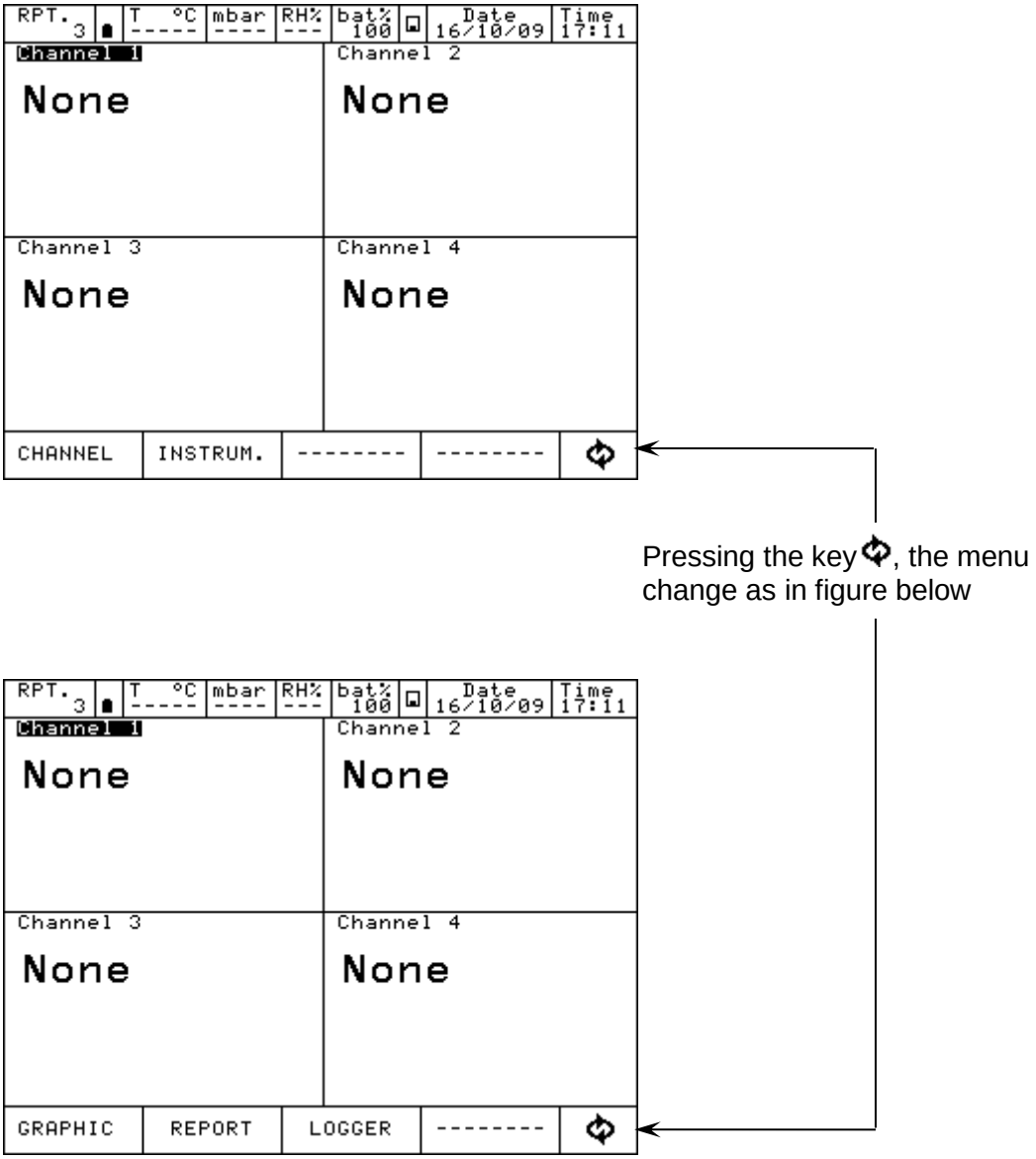
Set the REF Channel to the desired value that permits to output by the transmitter the 4mA value (example 0°C). When the value is stable press ADJ. LRV button.

Now set the REF Channel to the desired value that permits to output the transmitter the 20mA value (example 150°C). When the value is stable press ADJ. URV button.

Now the transmitter will generate 4 and 20 mA between 0 °C – 150 °C.

6.5 Menu

The MENU is available in the bottom of the display and changes according to the step of the procedure that is running on the instrument.
The MENU sections can be selected pressing on their screen portion respectively.
Pressing it, a menu will be displayed on the left side of the display, showing all the possible options available in that moment for that specific configuration.
For example, to change the channel configuration, first select the channel pressing one of the 4 displays, then select Channel from the MENU and then ASSIGN.
To modify the number of DECIMALS to be displayed, select the box INC.DEC o DEC.DEC to increment or decrement the decimals.



6.5.1 Channel Menu

Inside the bottom line menu, the box CHANNEL allows to change and assign the selected channel: this section is dynamic and changes according to the procedure followed

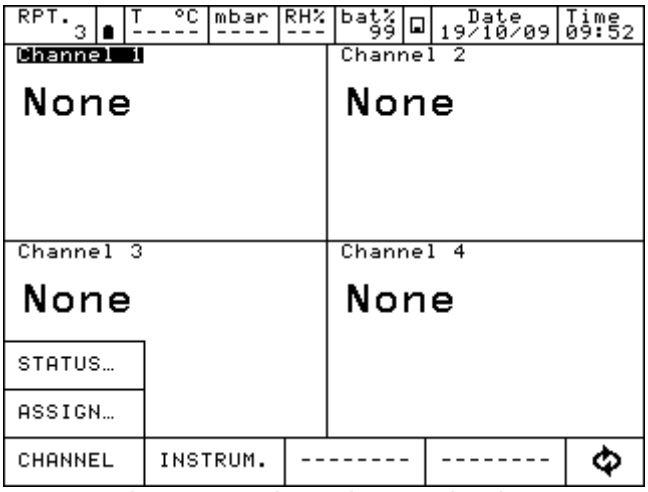


Figure 66 – Channel menu showing

For example, channel has been assigned for V measurement: pressing the CHANNEL box, the following menu will be displayed:

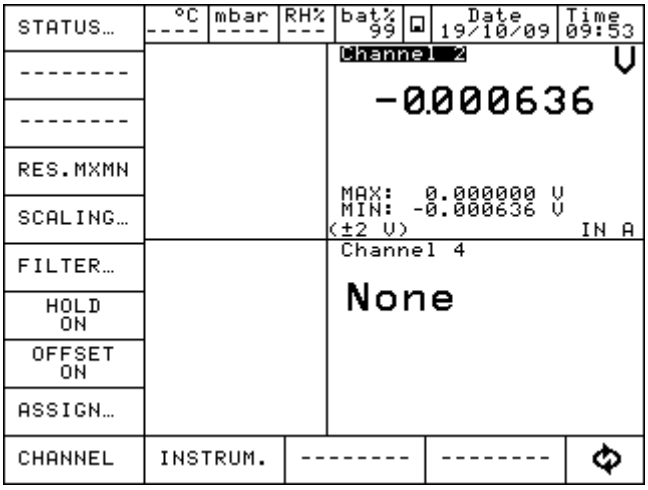


Figure 67 – Channel menu showing for electrical input

The menu consists of:

STATUS	to visualize the channel configuration and the measure range
RES.MXMN	to reset max and min value of the range
SCALING	to scale a signal and display it with a different engeneering unit
FILTER	to filter the signal
HOLD. ON	to hold the last display
OFFSET. ON	to set the zero for the measurement
ASSIGN.	to assign the channel

In case an electrical parameter is simulated, the box CHG.OUT will be displayed in the menu: this key enables the access to a keyboard to set up the values to be generated.

The CHANNEL menu for the electrical, temperature and pressure signals is shown here below :

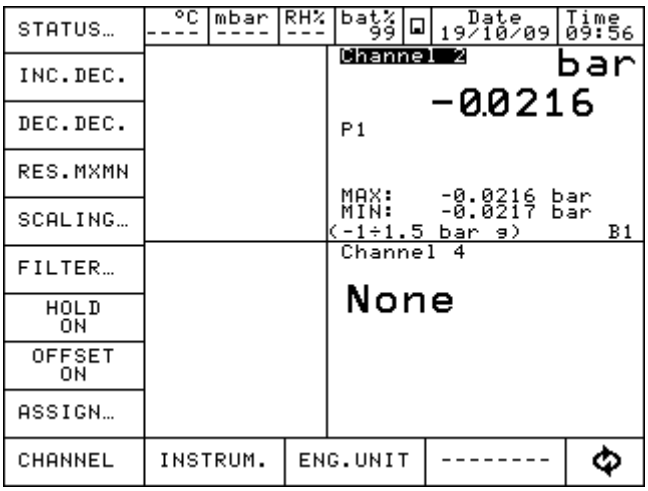


Figure 68 – Channel menu showing for pressure

INC.DEC o DEC.DEC boxes are displayed: they enable to modify the number of DECIMALS to be displayed.

More Information about the Channel Menu is available in chapter 6.6

6.5.2 Instrument Menu

This menu enables to see and change the settings of the instrument.
Pressing on INSTRUM the following menu is displayed.

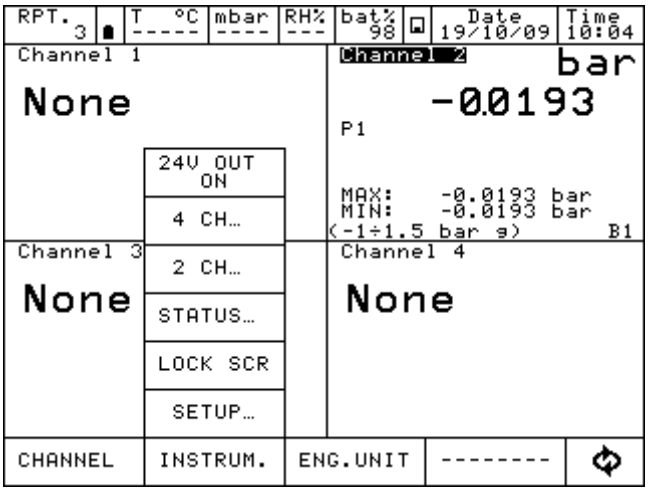


Figure 69 – Instrument menu showing

1) **SETUP** to set up the instrument configuration, as per below picture:

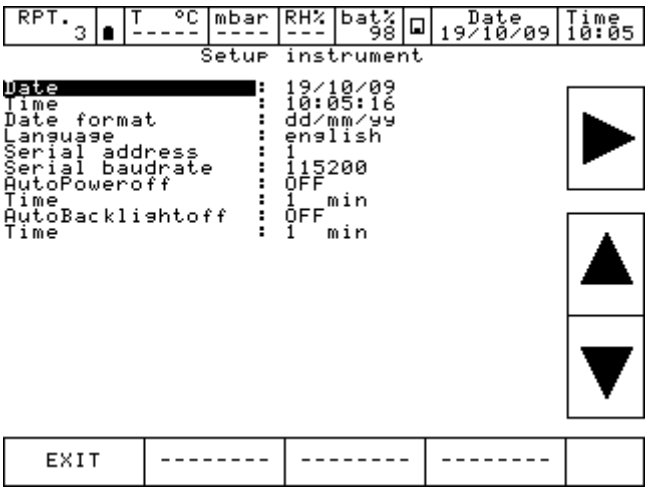


Figure 70 – Instrument setup screen showing

Different languages are available: 2 different ones are available on each instrument configuration. Standard languages are English and Italian.
Serial Baud rate must be set up at 115200 to enable data transfer to the PC.

2) **LOCK SCR** To lock and unlock the screen. To unlock press LAMP (text 5 of the keyboard)

3) **STATUS** to see the status of the calibrator:
Model – Serial Number – Version – Languages – Build date – I/O Modules installed – Date – Time – Battery voltage

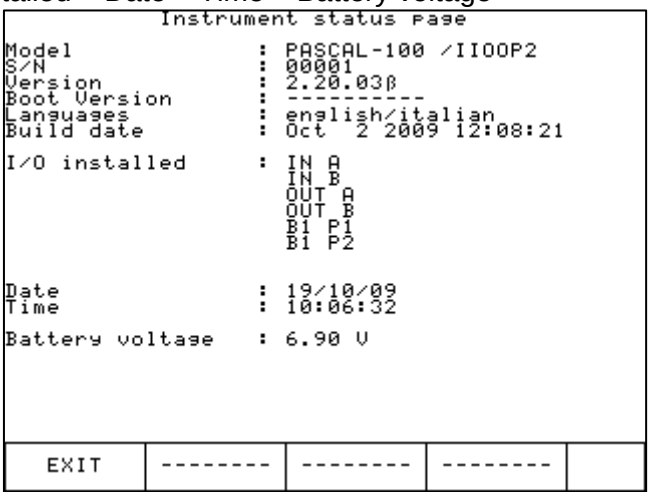


Figure 71 – Instrument status page showing

4) **2 CH** To show 2 channels on the dispaly, as per picture below.

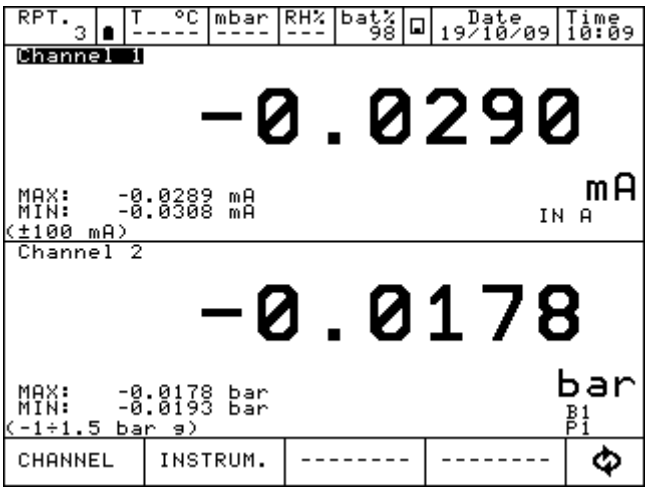


Figure 72 – Two channels display

5) **4 CH** To visualize all the 4 Channels on the display.
6) **24V OUT** To power on /off the 24 Vcc to supply the power to the device under test

6.5.3 Report Menu

This menu enables to access to the calibration reports and calibration procedures section.

For more information please refer to Chapter 6.7

6.5.4 Engineering unit Menu

Engineering unit displayed can be changed faster selecting and pressing the box ENG.UNIT on the active menu: this is possible only for channels assigned for pressure or temperature measurements.

6.5.5 Logger Menu

Selecting the box LOGGER the following menu is accessed: SETUP, VIEW. LOG, DEL.LOGS

For more information please refer to Chapter 6.8.

6.5.6 Calibration Menu

The calibration menu allows the calibration of the parameters available on the calibrator.

Separate Operating instruction available.

6.5.7 Graph Menu

To display the behavior of a variable associated to a channel in a certain range of time, press GRAPHIC inside the active menu. The box SETUP is displayed in the new menu, enabling the selection of the following parameters:

Sampling time (hh, mm, ss)
Scale (automatic, manual)
Lower limit (in manual)
Upper limit (in manual)
X Axis (fixed or tracked to cursor)

Select the values with the arrows and then press START. The graphic will be visualized on the display, as per the figure

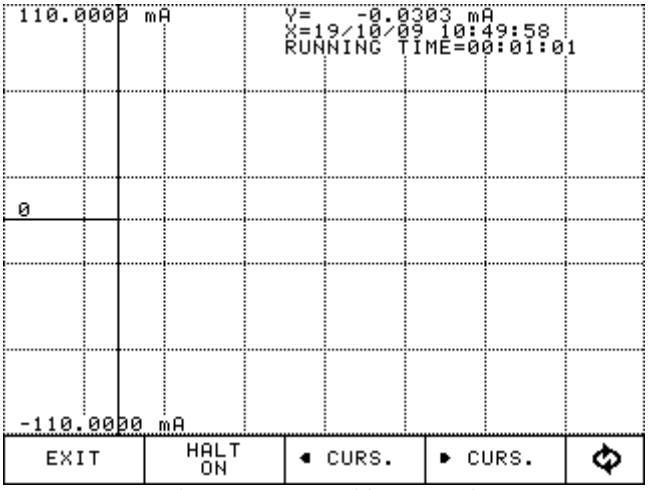


Figure 73 – Realtime graph

Through the box CURS. the cursor can be moved, visualizing for every step the value of the graphic. Pressing INFO OFF all the displayed information will be hidden, while with GRID OFF the grid will be hidden. Both the information and the grid can be displayed again pushing the related buttons.

Through the box  (circle with arrows) in the bottom right side of the menu, it's possible to acces to all other menu not shown on this screen.

6.5.8 Ramp Menu

This menu is displayed when the parameter are associated to an ouput card.
This function allows to set a ramp that automatically shift the generated value in configurable steps. If both generation outputs are available, each one associated to a channel, two ramps can be set up and can be run simultaneously. Ramp can be programmed as per below:

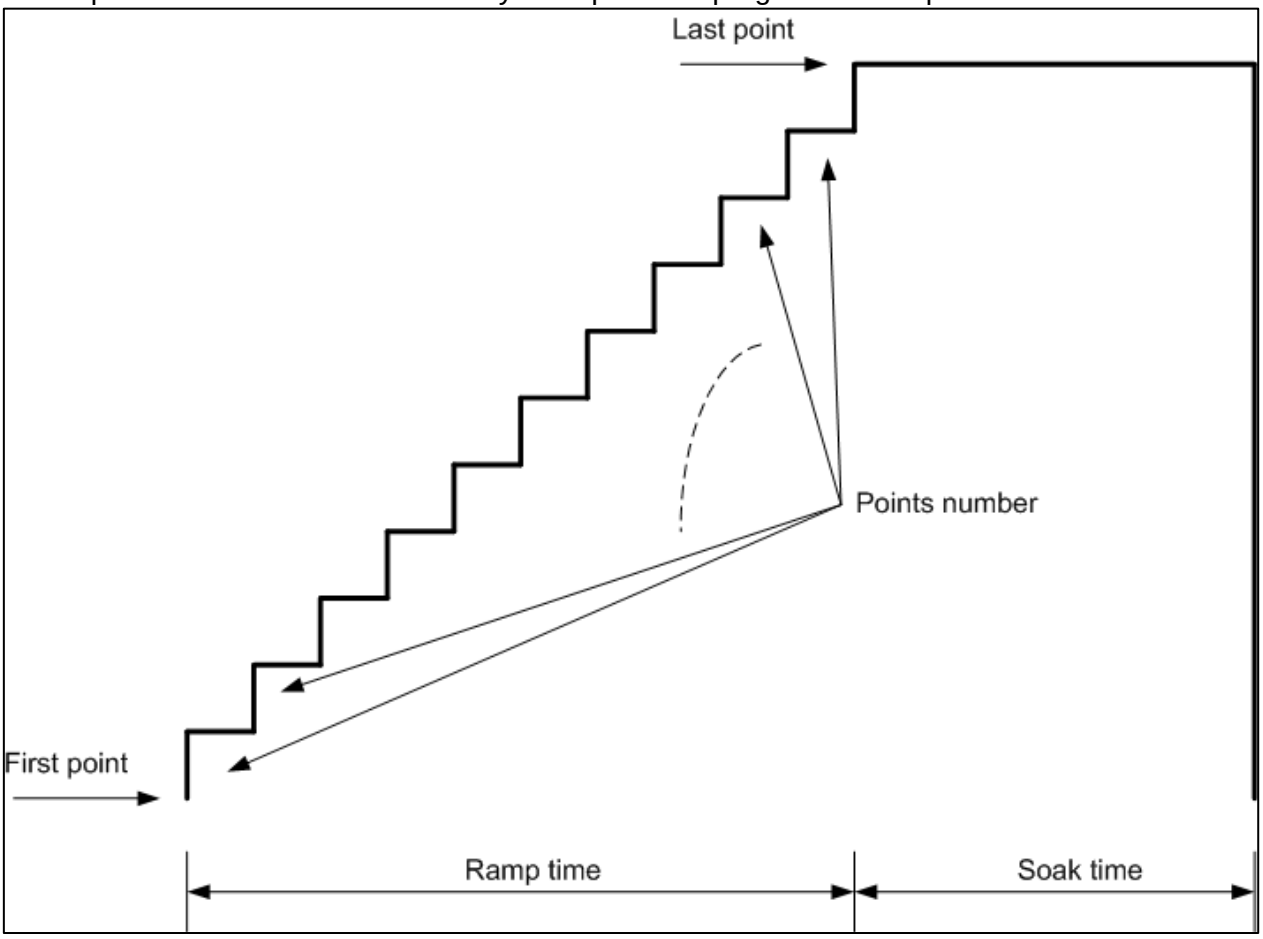


Figure 74 – Ramp profile

Press RAMP:

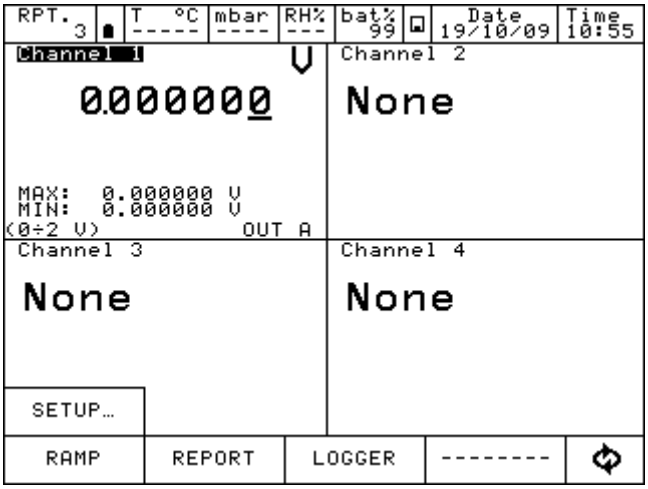


Figure 75 – RAMP Menu

Press SETUP to set the ramp:

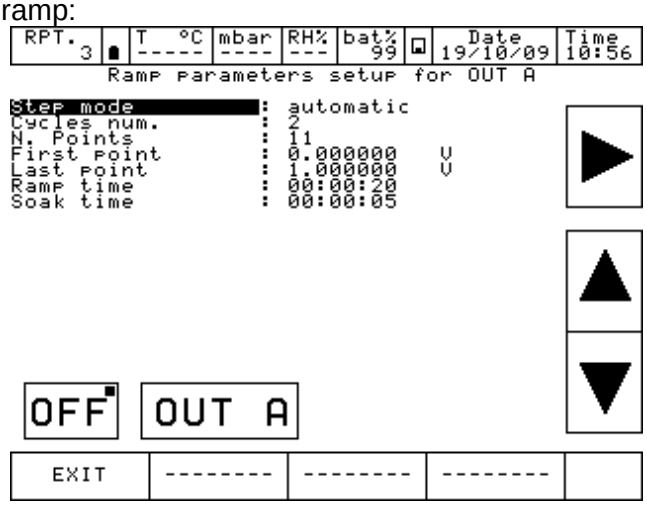


Figure 76 – Ramp parameters setup

Here above a ramp has been set: starting from 0 V, in 11 steps it reaches 1 V after 20 sec.: then it remains standstill for 5 sec. The ramp will be executed 2 times (Cycles num.).
Press OUT A to start the ramp function: the instrument will show the main screen and the writing RMP will be displayed to show that the function ramp is active.

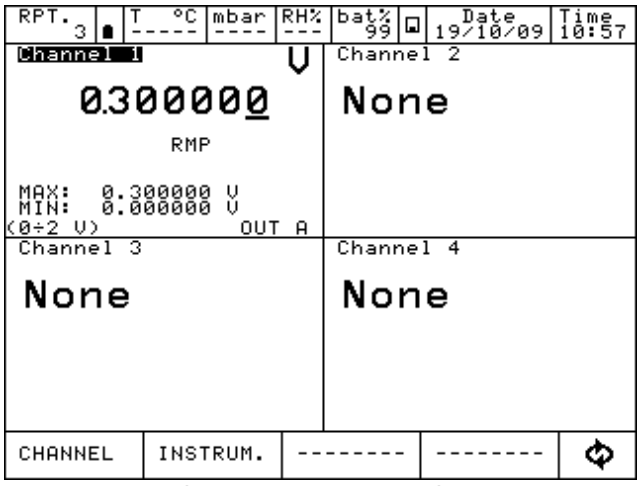


Figure 77 - Ramp running

If another channel is assigned to OUT B, here below you can see how the Ramp will be shown:

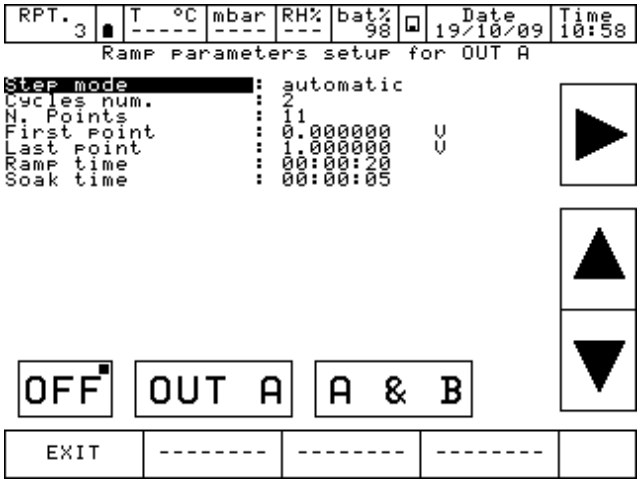


Figure 78 – Ramp setup with both OUTs

OUT A & B are both available. The Ramp can start for both the channels simultaneously

6.5.9 Disk Menu

Data related to the Reports, Loggings and Calibration procedures are stored as files into the internal memory of the equipment.
Press Menu DISK, and the following options will be displayed:

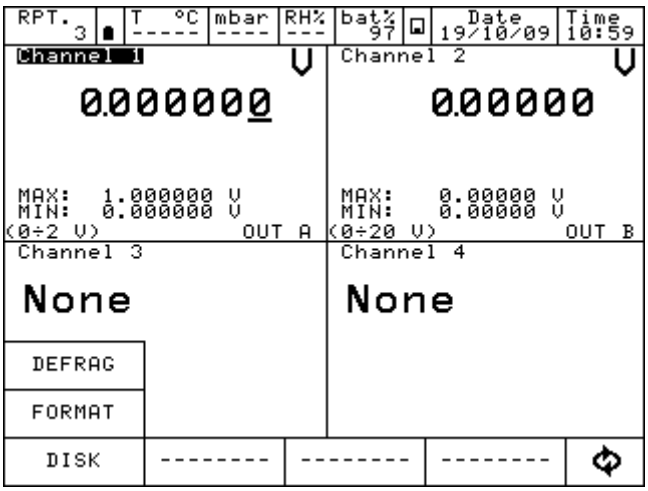


Figure 79 – DISK Menu

FORMAT allow to cancel completely the virtual DISK. This operation will cancel all the store data. Before proceeding the instrument will ask a final confirmation to the operator.

DEFRAG this operation may be required when many data are created and deleted continuously. Inside the internal memory of the Disk, in fact, empty spaces could be generated: this may lead to a warning message related to the shortage of the memory and the impossibility to store new data. To recover this space, please proceed with the Defrag: the existing data will not be lost but a certain time is required to complete the procedure.

6.6 Measurement Channel

When a measure is displayed, the ENG.UNT will appear.

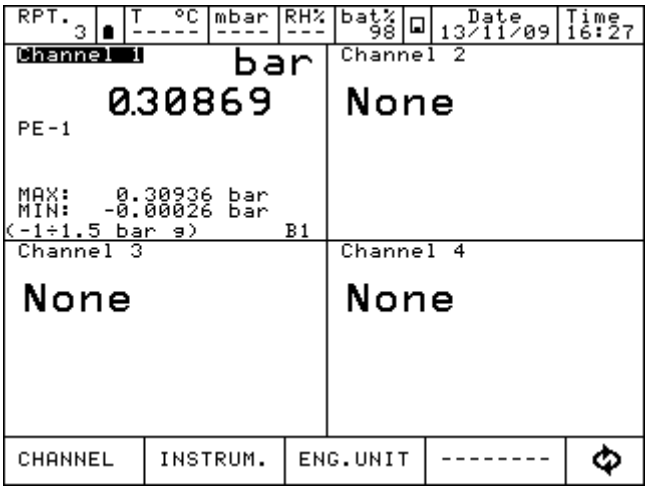


Figure 80 – Main screen

6.6.1 Status

Press CHANNEL and then press STATUS to visualize all the parameters related to the status of the channel (1, 2, 3, and 4): the configuration of each channel is displayed. Press the arrows in the bottom menu to change the channel. See the below picture:

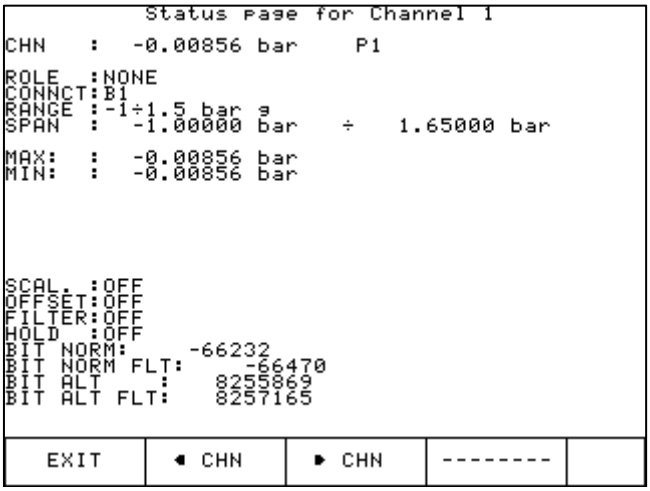


Figure 81 – Channel status page

Press EXIT to return to the initial screen.

6.6.2 Res. MxMn

Press Res. MxMn to restart the Max and Min value displayed on the channel.

6.6.3 Scaling

The SCALING enables to display the value into a different engineering unit. Press SCALING and access to the below window:

Low Scl: min. value of the signal and reading scale (e. g. 0 kg at 0 bar)
High Scl: max. value of the signal and reading scale (e. g. 10 kg at 1 bar)
Eng. unit Scl: new engineering unit desired
Decimals num.: Number of decimals required
Transfer. funct.: linear, square root, quadratic

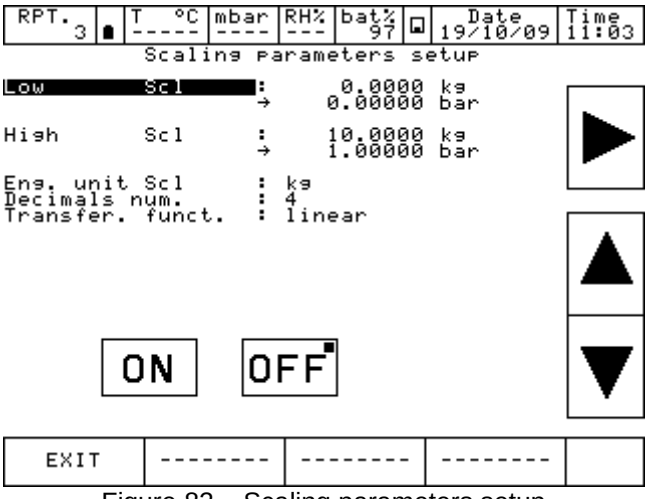


Figure 82 – Scaling parameters setup

Once all parameters are set, press ON to enable the function: on the main display SCL writing will appear. The new value will be displayed with the new engeneering unit in big letters. The existing measurement will be displayed below in small letters. Example available here below:

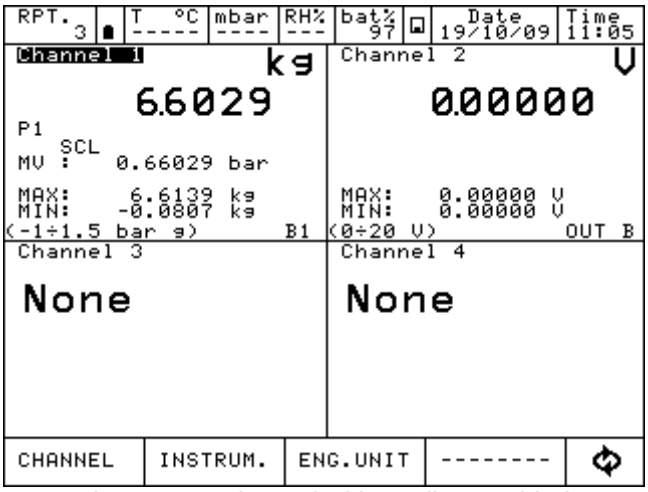


Figure 83 – Channel with Scaling enabled

6.6.4 Filter

The FILTER can filter a measurement.
Press FILTER to visualize: “Filter parameter setting”
Filter can be set through the following:
Filter weight: in percentage

Select the filter weight and then press ON.

FLT writing will be displayed when filter is active. Filtered value will be displayed in big letters, real value will be displayed below in small letters.

6.6.5 Hold On – Hold Off

HOLD ON-HOLD OFF is used to freeze what displayed in a specific channel.
Press HOLD ON to hold the values: HOLD OFF will appear. Press it to unlock the channel. HOLD ON will appear again

HLD on the display means that the values are hold. See below:

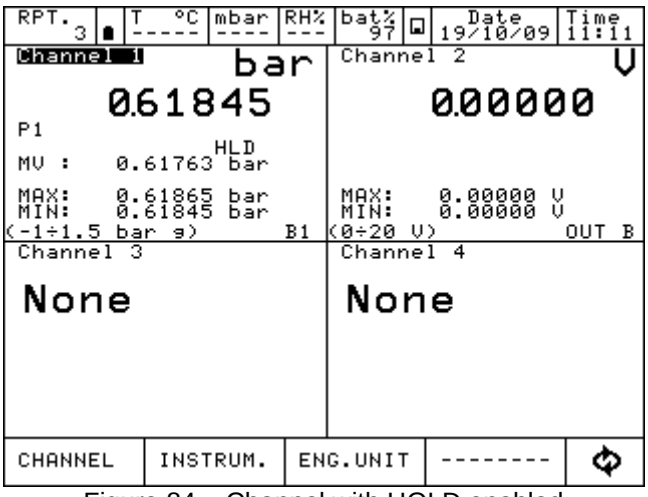


Figure 84 – Channel with HOLD enabled

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6.6.6 Offset On – Offset Off

OFFSET ON – OFFSET OFF is used to restar the measurement on a specific channel
Press OFFSET ON to restart: zero will be displayed and OFFSET OFF will appear. Press to come back to the previous value.
OFS indicates that the OFFSET is ON.

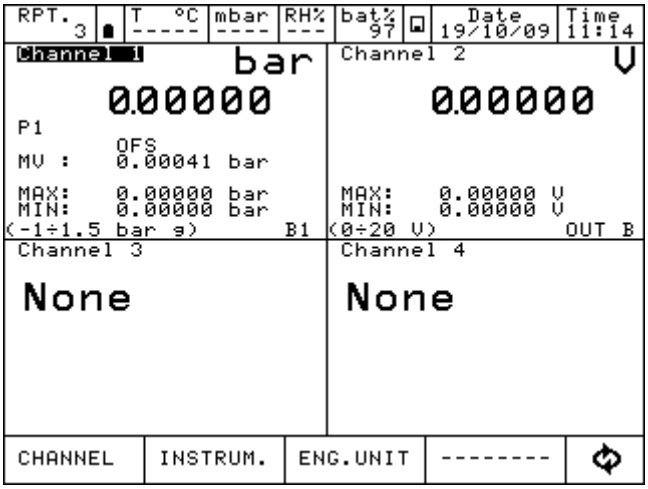


Figure 85 – Channel with OFFSET enabled

6.6.7 Inc. Dec – Dec. Dec

If channel is set up for pressure or temperature measurements in the CHANNEL menu the functions INC.DEC. e DEC.DEC. are displayed. These functions allow to increment/decrement the number of the displayed digits

6.6.8 Chg. Out

CHG.OUT allows to change a signal coming out from an Output card.
Press CHG. OUT to display a keyboard to select the value of the signals within the limits specified during the assignment (clarly indicated under “min” e “Max” on the left side).

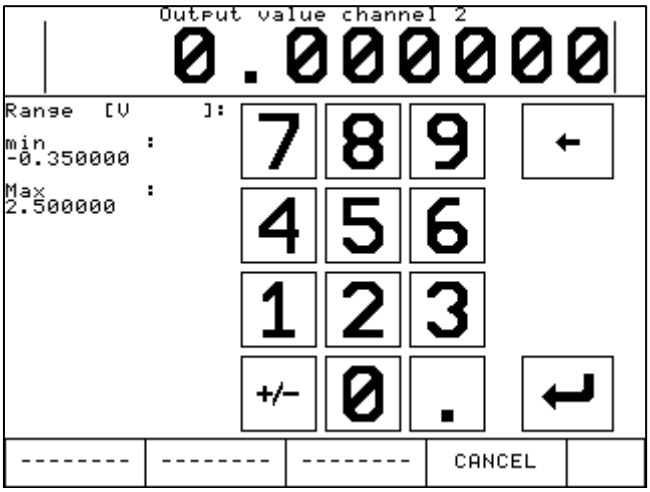


Figure 86 – Generation / simulation value modifing

The keyboard can be accessed pressing on the right side of the displayed value as shown below:

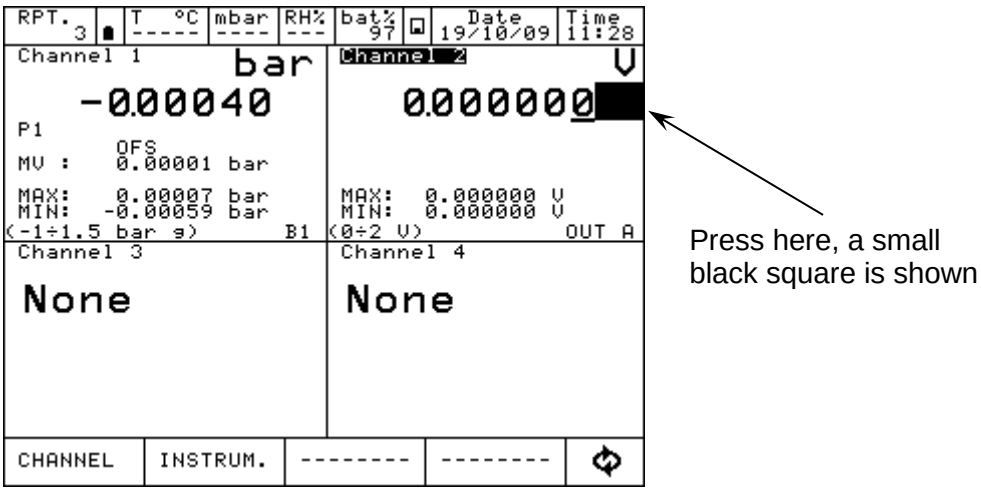


Figure 87 – Generation value – how to modify

Press  to visualize at the bottom menu the 4 arrows as per the below image:

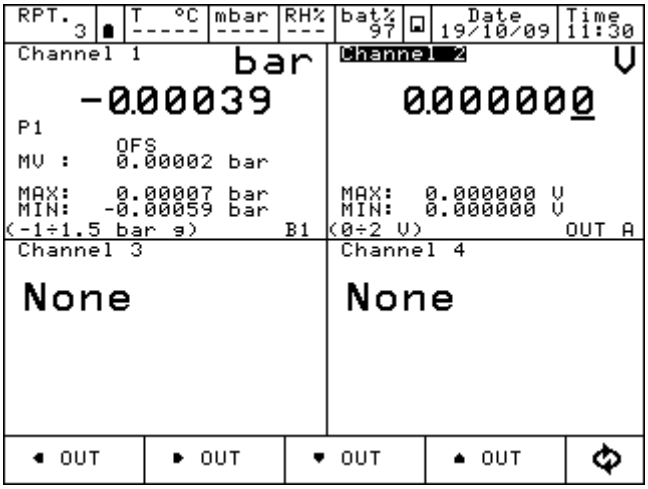


Figure 88 – Generation value – how to modify

Cursor can be moved right and left using the first 2 arrows starting from the left side. The selected cell value can be increased or decreased using the remaining 2 arrows on the right side.

6.7 Report

To create a report one channel has to be set as REF (*Reference*) and another one as DUT (*Device Under Test*): reference signal and direct measurement (or manual input by keyboard) are required.
For the REFERENCE: remember to set the range equivalent to the one of the DUT. When the channel is assigned as reference, the symbol REF will appear.
For the DUT: remember to define the max error and the declaration. A bargraph will be displayed on the DUT channel. When the channel is device under test, the symbol DUT will appear.

Press REPORT**,** the below menu is displayed:

VIEW RPT View Reports
SETUPRPT Set up Reports
DEL.RPTS deletes all the Reports
VIEW PRC View Procedures
SETUPPRC Set up Procedures
DEL.PRCS Delete all the Procedures

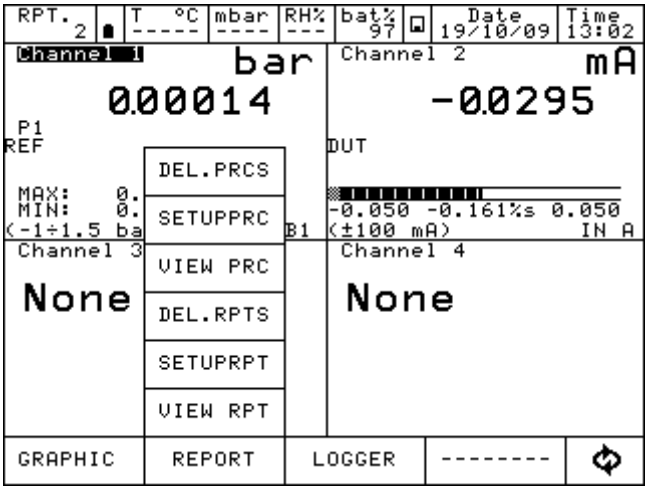


Figure 89 – Report menu

Press SETUPRPT to create a new Report.
Info required are:

Report name
DUT model (Device Under Test)
DUT Serial Number (Device Under Test)
Operator
Job Number
Found Left
Up Down
N. Points

A standard Report configuration for the calibration of a pressure trasmitter 0-1 bar range is available here below

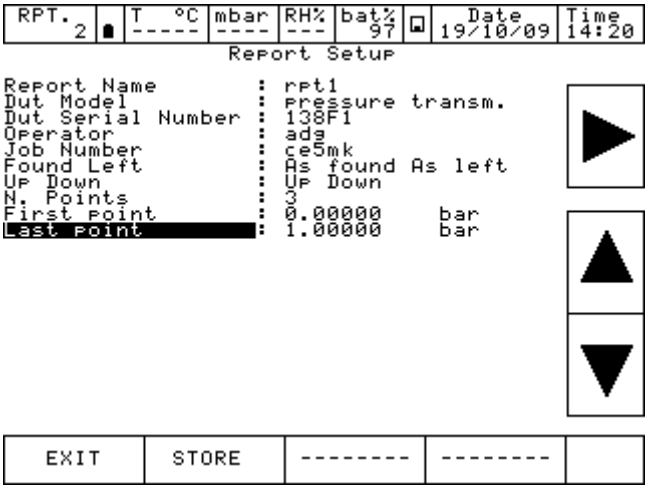


Figure 90 – Report setup

Once completed Press STORE per memorize the data.
The following screen will appear:

Figure 91 – Store Report request

Press YES to store the report set up and then press again yes to run the report.

Figure 92 – Report run request

The main screen will be displayed as per below:

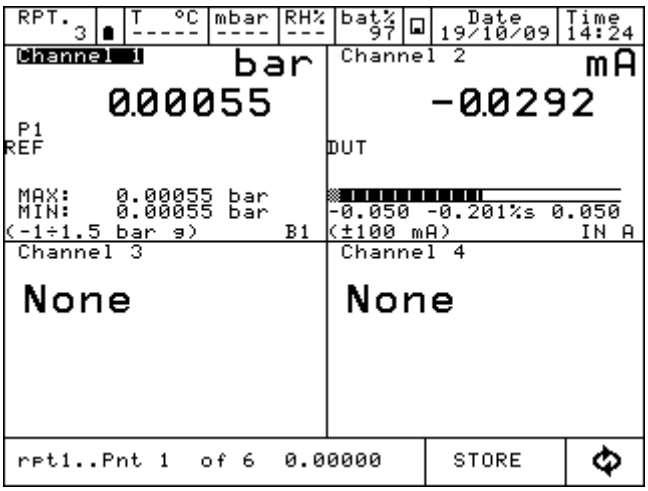


Figure 93 – Report running display

On the bottom menu, the report name (rpt1), the calibration point (1of 6) and the related reference value (0.00000) will be shown. Press STORE to store the first calibration point: the switch to the second point is done automatically (pnt 2 will be shown), and so on for all the predefined calibration points. Pay attention to the bargraph in the DUT display: check if point is inside or outside the limit specified during the DUT assignment.
Once the calibration cycle is defined, the generation of an electrical signal is done automatically. For the pressure, instead, the operator has to reach the required pressure values using the manual pump and the fine adjustment.
During the configuration process the operator can name the report: the same can be recalled when the same procedure is required.
In any moment the operator can stop the calibration pressing ABORT.

To make the zero on the reference channel REF, press OFFSET before storing the first calibration point: this function is displayed as OFS on the channel display, under the measurement value. Press again OFFSET to come back to the original configuration: OFS will disappear.

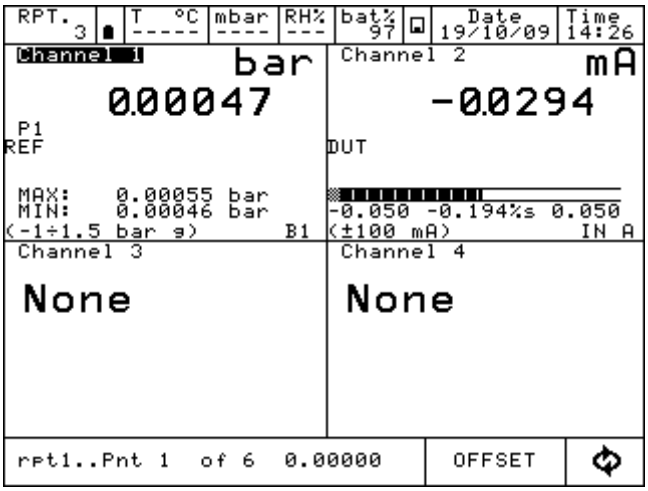


Figure 94 – Report running display – next menu

Once the last calibration point is done, press STORE (or ABORT): the Report will end automatically and the display will go back to its original configuration.

To visualize the report, access to REPORT menu and press VIEW RPT to view the stored reports:

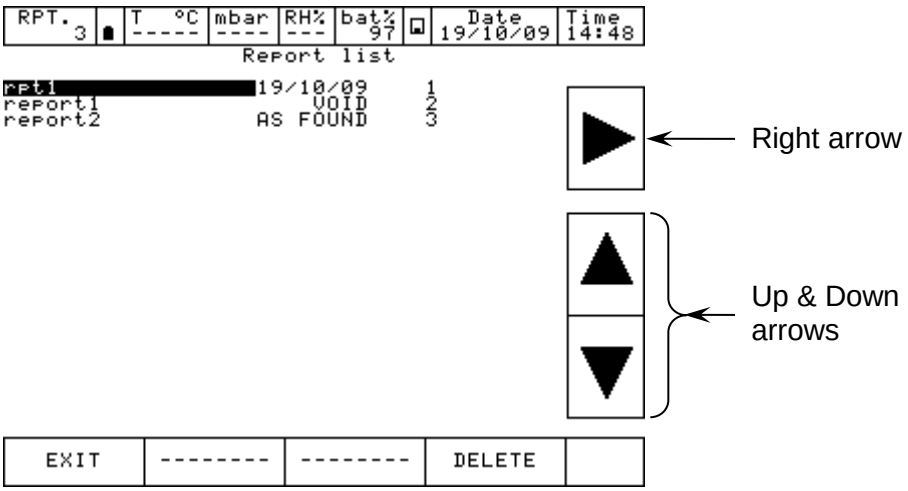


Figure 95 – Display Report list

The above picture shows the list of the existing report: name and status are displayed.
Under the status, the writing AS FOUND is displayed when the calibration data refers to a calibration process done on an instrument without any adjustment: when a date is available this means that calibration process is complete (AS FOUND AS LEFT). If the report has never been run, VOID will be displayed next to the name.
Press the arrows to move the cursor up and down to select the report, press on the right arrow to visualize the information available in the report.
The menu DELETE allows to cancel the reports: a confirmation is required by the operator before proceeding

Selecting the name of the REPORT, the SETUP of the report will be displayed:

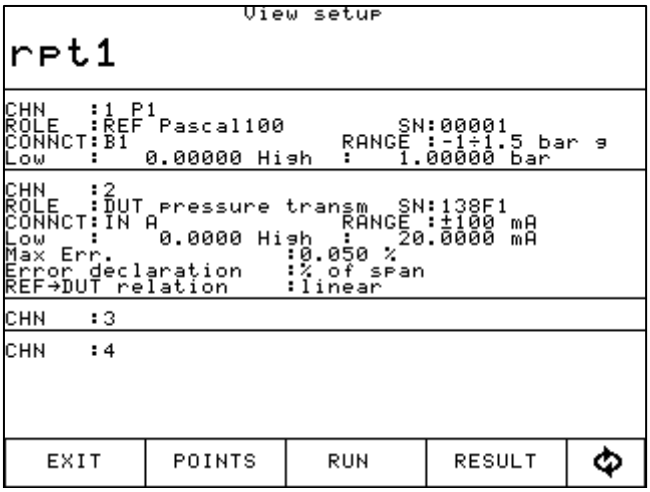


Figure 96 – Display Report setup

Pressing POINTS, the list of the calibration points will be shown:

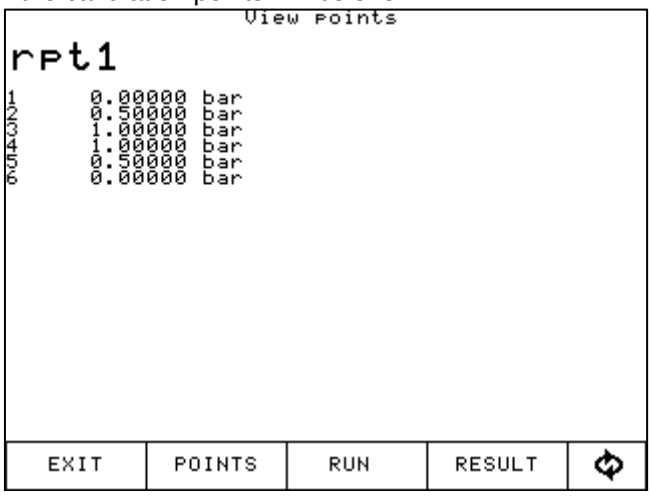
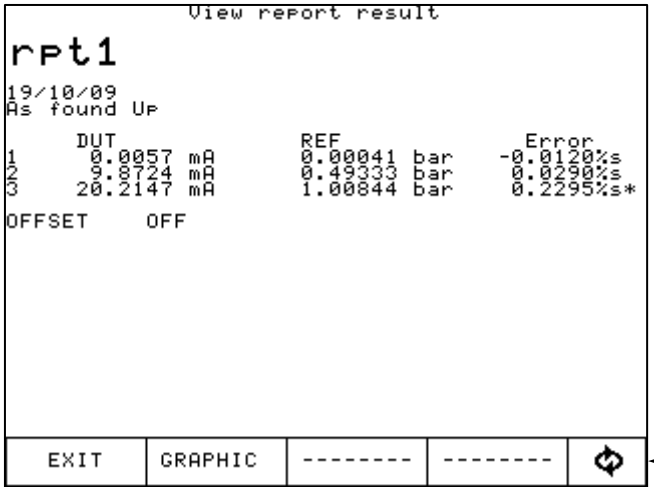


Figure 97 – Display test points Report

Pressing RESULT, the calibration results are shown:



Scrolling menu

Figure 98 – Display Report results

Press the “scrolling menu”, menu with “As found”, “As left”, “Up”, “Down”, will appear to enable to see the calibration results related to the different calibration stages.
“As found”, (calibration points before any adjustment on the DUT) “As left” (calibration points after the adjustment on the DUT has been carried out),“Up” (calibration points going up), “Down” (calibration points going down).
Pressing GRAPHIC, the graphic of the calibration will be displayed, see below:

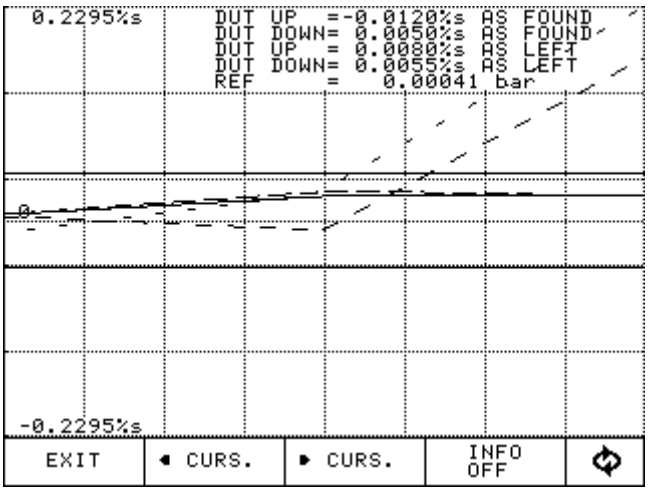


Figure 99 – Display Report in graphic mode

X axis represents the calibration points related to the reference (REF).
Y axis represents the error in percentage (compared to the Reading range, as assigned to the DUT) related to the Device Under Test channel (DUT).

From REPORT menu, select DEL.RPTS to cancel all the reports in the memory.

6.8 Data Logger

The LOGGER function allows to store the data displayed on the 4 Channels simultaneously.

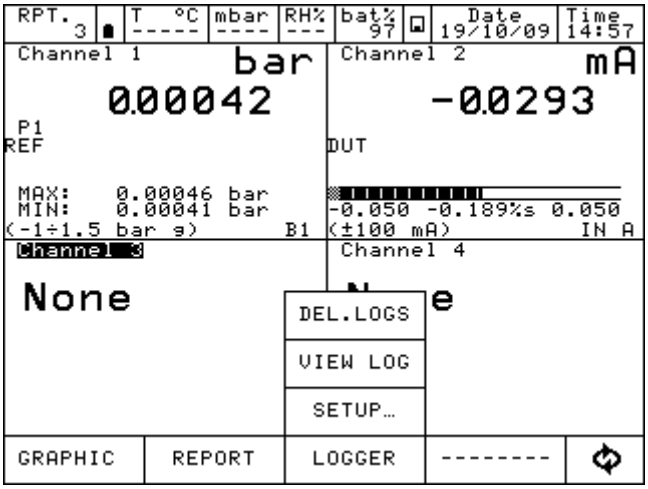


Figure 100 – Menu Logger

Pressing LOGGER, the following will be displayed:

SETUP set up of the Logger
VIEW LOG View Logs data
DEL.LOGS delete all the Logs

Selecting SETUP, “Data Logger Setup” will be displayed as per the below:
Log Name Name of the Log (compulsory)
Sampling time sampling time between 2 measurements (hours, min., sec.)
Sampling length total time of the logging

Pressing START, the logging process will start:

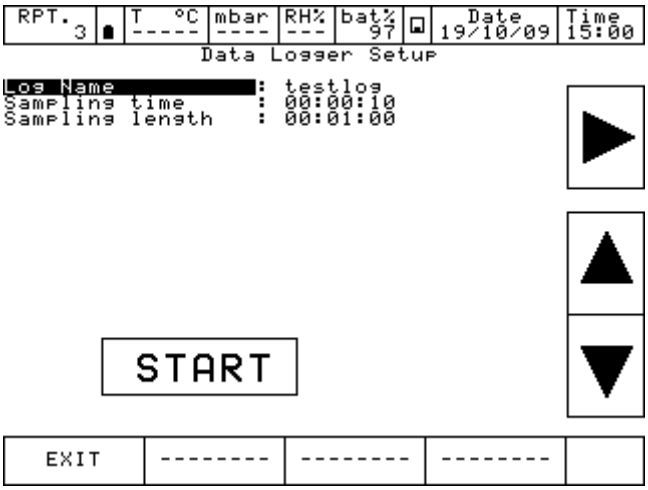


Figure 101 – Logger data setup

The flashing of the floppy disc icon, on the central part of the upper menu, shows that the LOGGER is active. The data will be stored on all 4 Channels (if assigned) simultaneously

GB

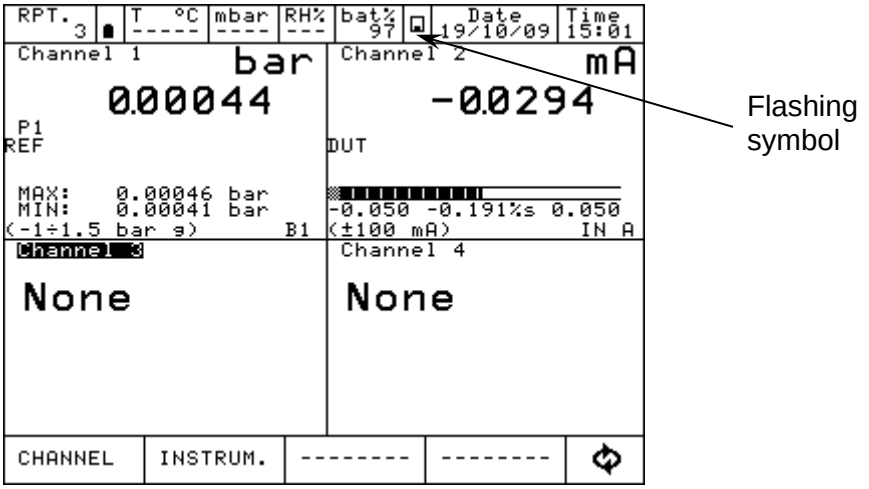


Figure 102 – Logger running

Pressing DEL.LOGS all the logs will be deleted: a confirmation will be asked to the user before proceeding.

Pressing VIEW LOG all the stored logs will be shown

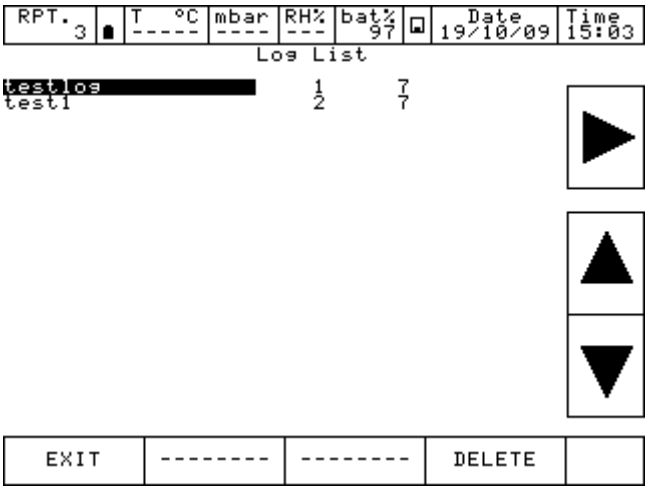


Figure 103 – Display Log list

Press the 2 arrows up and down to scroll the logs inside the list: press the other arrows to see the data and graphic of each log.
Menu DELETE allows to cancel the selected log: a confirmation will be asked to the user before proceeding

6.9 Communication

Through the Software Program PascalLink, all reports can be downloaded to a PC.
Through the Software Program PasLog, all logs can be downloaded to a PC.
Following configuration is required for the download of the data: press INSTRUM. On the main menu and then SETUP

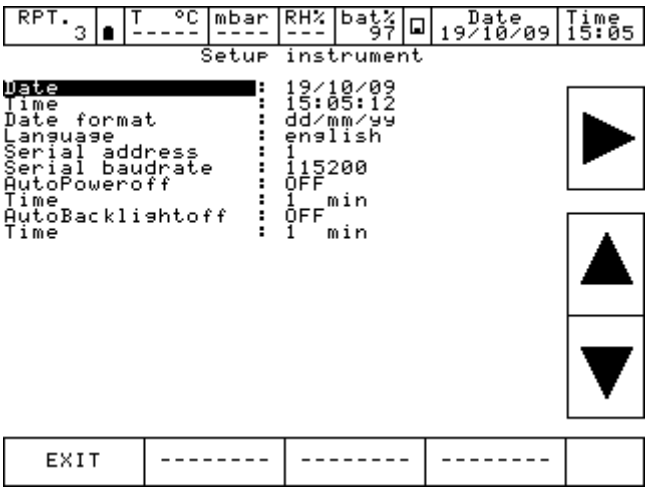


Figure 104 – Display instrument setup

6.10 Calibration Examples

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6.10.1 Example 1 – Calibration of two wires pressure transmitters

Pascal 100 or Pascal 100/IS generates 24 V d.c. power supply to the transmitter. The 4-20 mA output signal from the transmitter is sent to be measured to an electrical input signals card IN A or IN B.
The pressure reference value to the transmitter is generated by the hand pump and by the fine volumetric regulator, both present in the calibrator, and measured as REF by the calibrator itself.
The figure below shows how to connect the transmitter to the calibrator.

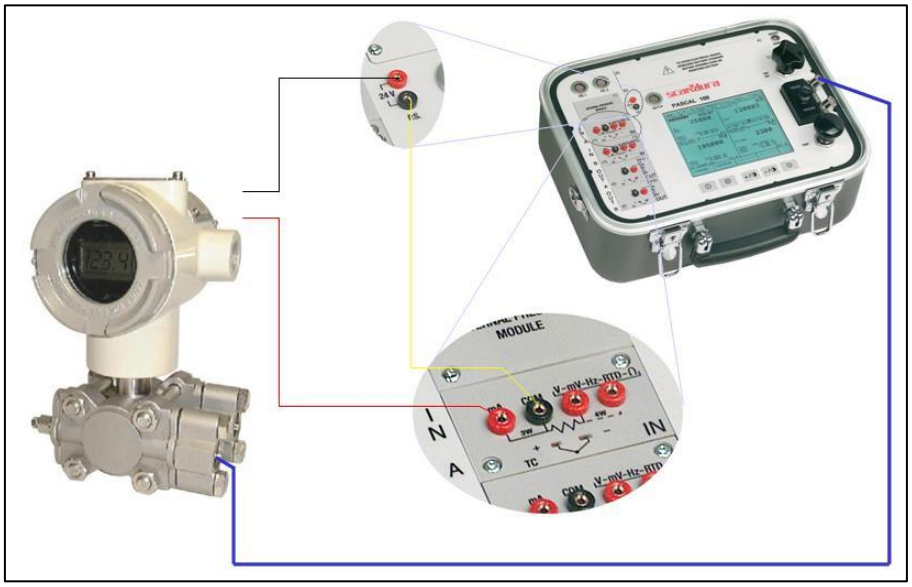

Figure 105 – Pressure transmitter calibration example

A typical configuration of Pascal100 for the calibration of a pressure transmitter is illustrated in the following figure:

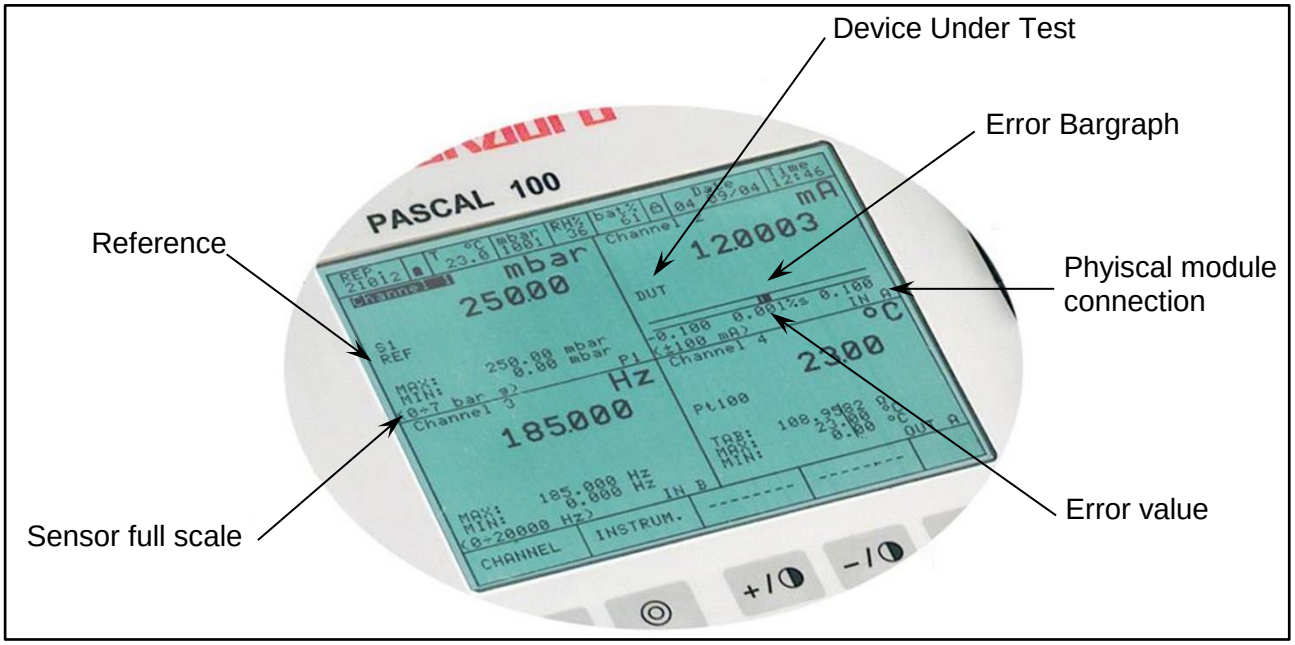

Figure 106 – Pressure transmitter calibration configuration

6.10.2 Example 2 – Calibration of PTZ gas volume converters

Pascal 100 or Pascal 100/IS can be used to calibrate a gas volume converter, where the absolute pressure, the temperature value and the Z factor are used to convert the gas volume measurement.
Gas volume, calculated at standard conditions.
The following figure shows the use of the calibrator.

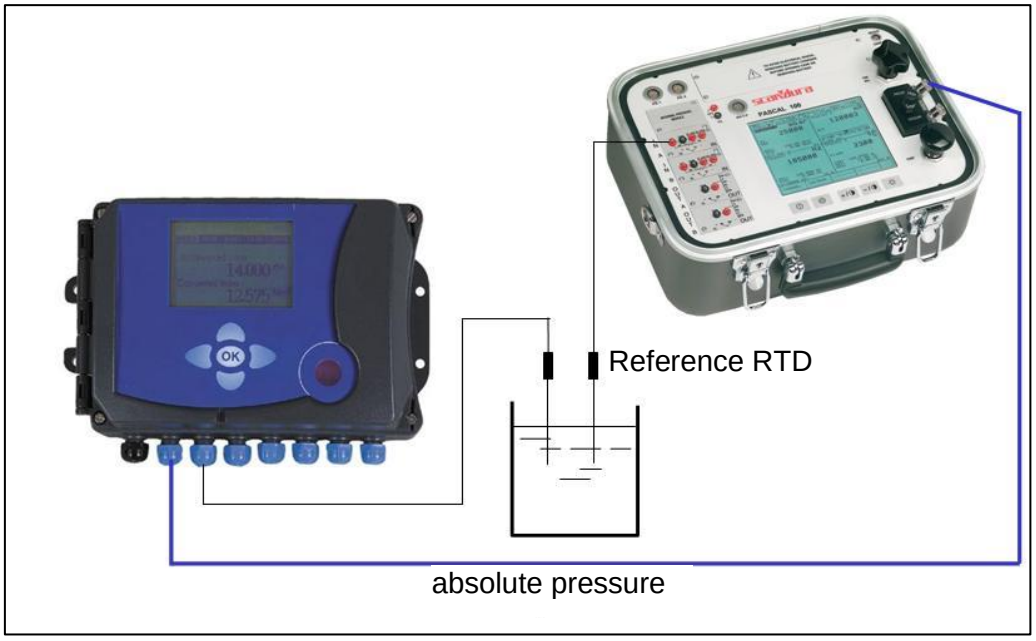

Figure 107 – PTZ Gas volume converter calibration example

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6.10.3 Example 3 – Calibration of four wires RTD's

A 4-wire RTD can be calibrated by using the method of comparison, connecting it to the input (IN A) as a DUT (Device Under Test) and comparing it with a reference RTD connected to the other input (IN B) as REF (Reference),

In this way the two measures can be compared, the calculated error is reported on the calibration report.

The figure below shows the connection of the calibrator

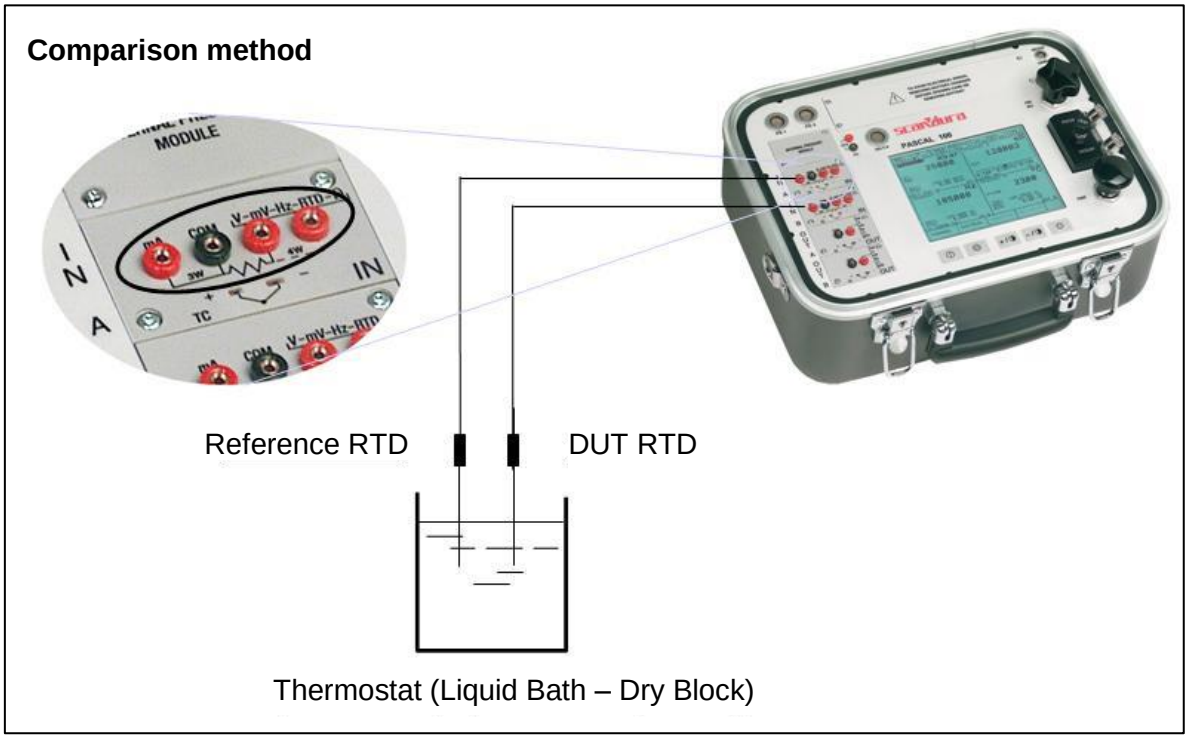

Figure 108 – 4 wires thermoresistance calibration example

6.10.4 Example 4 – Calibration of Thermocouples

The calibration of thermocouples is similar to that of RTDs, i.e. by comparison, except for the choice of the type of reference thermocouple to be used accordingly to the types of thermocouples to be calibrated.

You must also select the cold junction compensation if the internal, external or assigning a compensation value.

The figure below shows the connection of the calibrator:

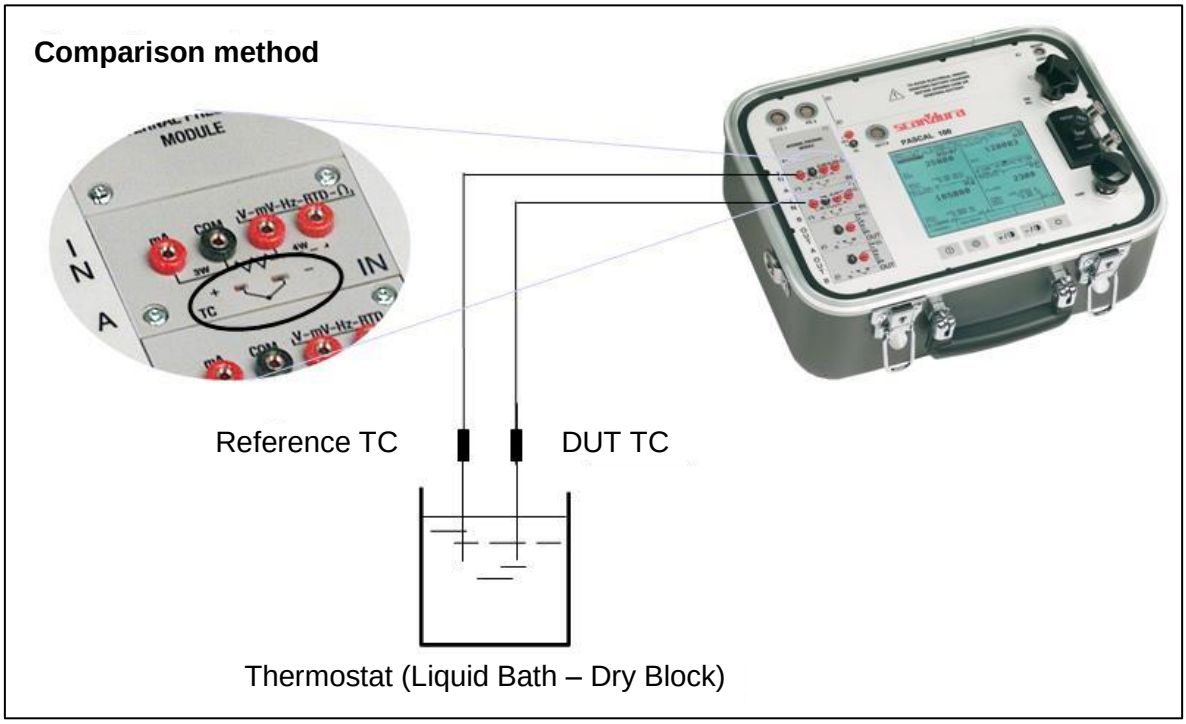

Figure 109 – Thermocouple calibration example

7 Maintenance, cleaning and servicing

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7.1 Maintenance

The Multichannel Calibrator model Pascal 100 or Pascal 100/IS is maintenance-free.
Repairs must only be carried out by the manufacturer.

7.2 Cleaning

CAUTION!

- Before cleaning, correctly disconnect the Multichannel Calibrator model Pascal 100 or Pascal 100/IS from the pressure supply, and switch it off.
- Clean the Multichannel Calibrator model Pascal 100 or Pascal 100/IS with a moist cloth.
- Electrical connections must not come into contact with moisture.

For information on returning the instrument see chapter “8.2 Return”

7.3 Recalibration

DKD certificate - Certificates:
We recommend that the instrument is regularly recalibrated by the manufacturer, with time intervals of approx. 12 months. Every factory recalibration includes, additionally, an extensive free-of-charge check of all system parameters with respect to their compliance with the specification. The basic settings will be corrected if necessary.

8 Dismounting, return and disposal

WARNING!
Residual media in dismounted reference pressure sensors can result in a risk to persons, the environment and equipment.
Take sufficient precautionary measures.

8.1 Dismounting

Only disconnect test- and calibration installations once the system has been depressurised!

8.2 Return

WARNING!
Strictly observe when shipping the instrument:
All instruments delivered to WIKA must be free from any kind of hazardous substances (acids, bases, solutions, etc.).

When returning the instrument, use the original packaging or a suitable transport package.

To avoid damage:
1. Wrap the instrument in an antistatic plastic film.
2. Place the instrument, along with the shock-absorbent material, in the packaging. Place shock-absorbent material evenly on all sides of the shipping box.
3. If possible, place a bag, containing a desiccant, inside the packaging.
4. Label the shipment as transport of a highly sensitive measuring instrument.

Enclose the completed return form with the Multichannel Calibrator model Pascal 100 or Pascal 100/IS.

The return form is available on the internet:
www.wika.de / Service / Return

8.3 Disposal

Incorrect disposal can put the environment at risk.

Dispose of instrument components and packaging materials in an environmentally compatible way and in accordance with the country-specific waste disposal regulations.

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Organismo autorizzato n. 0051 con D.M. 23 marzo 2004, D.M. 2 luglio 2007 e D.M. del 10 marzo 2009

Emesso il / Issued on..... : 2010-05-11
Data di aggiornamento / Updated on.... : 2013-12-18
Sostituisce / Replaces..... : 2010-07-20

Certificato / Certificate

[1] ***Direttiva 94/9/CE*** / ***Directive 94/9/CE***
Certificato di Esame CE del Tipo / ***EC-type Examination Certificate***

[2] Apparecchiature o Sistemi di Protezione destinati ad essere utilizzati in atmosfere potenzialmente esplosive - Direttiva 94/9/CE / Equipment or Protective System intended for use in potentially explosive atmospheres - Directive 94/9/EC

[3] **Numero del Certificato di Esame CE del tipo / EC-type Examination Certificate number**

IMQ 08 ATEX 027 X

[4]	**Apparecchiatura / Equipment**	**Tipo / Type - Serie / Series**
	Calibratore portatile / Portable calibrator	**PASCAL 100/IS; PASCAL ET/IS**

[5]	**Costruttore / Manufacturer**	[6]	**Indirizzo / Address**
	Wika Italia S.r.l. & C. S.a.s.		**Via Marconi, 8 I-20020 Arese (MI)**

[7]	Questa apparecchiatura o sistema di protezione e le sue eventuali varianti accettate sono descritti nell'allegato al presente certificato e nei documenti descrittivi pure riportati in esso.	This equipment or protective system and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.
[8]	L'IMQ, organismo notificato n. 0051, in conformità all'articolo 9 della Direttiva 94/9/CE del Consiglio dell'Unione Europea del 23 Marzo 1994, certifica che questa apparecchiatura o sistema di protezione è conforme ai requisiti essenziali di sicurezza e salute per il progetto e la costruzione di apparecchiature e sistemi di protezione destinati ad essere utilizzati in atmosfere potenzialmente esplosive, definiti nell'Allegato II della Direttiva. Le verifiche ed i risultati di prova sono registrati nel rapporto a carattere riservato n.	IMQ, notified body n. 0051, in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive. The examination and test results are recorded in confidential report no.

43AI00022 - 43AI00022.1 - 43AI00022.2

[9]	La conformità ai Requisiti Essenziali di Sicurezza e Salute è assicurata dalla conformità alle:	Compliance with Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0:2012; EN 60079-11:2012

[10]	Il simbolo "X" posto dopo il numero del certificato indica che l'apparecchiatura o il sistema di protezione è soggetto a condizioni speciali per un utilizzo sicuro, specificate nell'allegato al presente certificato.	If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
[11]	Questo CERTIFICATO DI ESAME CE DEL TIPO è relativo soltanto al progetto, all'esame ed alle prove dell'apparecchiatura o sistema di protezione specificato in accordo con la Direttiva 94/9/CE. Ulteriori requisiti di questa Direttiva si applicano al processo di produzione e fornitura dell'apparecchiatura o sistema di protezione. Questi requisiti non sono oggetto del presente certificato.	This EC-TYPE EXAMINATION CERTIFICATE relates only to the design, examination and tests of the specified equipment or protective system in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.
[12]	L'apparecchiatura o il sistema di protezione deve includere i seguenti contrassegni	The marking of the equipment or protective system shall include the following

II 2G **Ex ib IIC T4 Gb**

IMQ S.p.A. - Via Quintiliano, 43 - 20138 Milano

1 / 5

Questo certificato, allegato incluso, può essere riprodotto solo integralmente e senza alcuna variazione. / This certificate may only be reproduced in its entirety and without any change, schedule included.

Mod. 1073/6

Emesso il / Issued on..... : 2010-05-11
Data di aggiornamento / Updated on .... : 2013-12-18
Sostituisce / Replaces ..... : 2010-07-20

[13] **Allegato** **Scheduled**

[14] **Numero del Certificato di Esame CE del tipo** **EC-type Examination Certificate number**

IMQ 08 ATEX 027 X

[15] **Descrizione dell'apparecchiatura** **Equipment description**

I calibratori modello **PASCAL 100/IS** e **PASCAL ET/IS** sono apparecchi alimentati a batteria inclusi in una custodia in lega di alluminio, con una tastiera a membrana e un display LCD.
I calibratori modello **PASCAL 100/IS** e **PASCAL ET/IS** comunicano con il mondo esterno tramite le schede di I/O, e sono connessi a circuiti a sicurezza intrinseca per le normali operazioni di misura e generazione di vari segnali (mV/V, mA, RTD, TC, ecc.).

The calibrators model **PASCAL 100/IS** and **PASCAL ET/IS** are battery powered apparatus included in an aluminium alloy case, with a membrane keyboard and LCD display.
The calibrators model **PASCAL 100/IS** and **PASCAL ET/IS** communicate with external world through I/O boards, and they are connected to intrinsically safe circuits for normal operations of measurement and generation of various signals (mV/V, mA, RTD, TC, etc.).

[15.1] **Identificazione dei Modelli / Serie** **Models / Series Identification**

PASCAL 100/IS; PASCAL ET/IS

PASCAL 100/IS; PASCAL ET/IS

[15.2] **Dati nominali** **Ratings**

Il calibratore modello PASCAL 100/IS è alimentato da pacco batterie (Ni-MH) di tipo 220021:
Tensione nominale: 4,8V
Capacità nominale: 9,5Ah

The calibrator model PASCAL 100/IS is supplied by battery pack (Ni-MH) type 220021:
Rated voltage: 4,8V
Rated capacity: 9,5Ah

Il calibratore modello PASCAL ET/IS è alimentato da pacco batterie (Ni-MH) di tipo 220022:
Tensione nominale: 4,8V
Capacità nominale: 4,5Ah

The calibrator model PASCAL ET/IS is supplied by battery pack (Ni-MH) type 220022:
Rated voltage: 4,8V
Rated capacity: 4,5Ah

[15.3] **Dati di Sicurezza** **Safety Ratings**

Parametri di ingresso:	**Parametri di uscita:**	**Input parameters:**	**Output parameters:**
Ui = 30V	Uo = 29,7V	Ui = 30V	Uo = 29,7V
Ii = 100mA	Io = 31mA	Ii = 100mA	Io = 31mA
Pi = 0,75W	Po = 0,92W	Pi = 0,75W	Po = 0,92W
Ci = trascurabile	Co = 69nF	Ci = negligible	Co = 69nF
Li = trascurabile	Lo = 30mH	Li = negligible	Lo = 30mH

[15.4] **Temperatura ambiente e Classe di temperatura** **Ambient temperature and Temperature classes**

I calibratori modello PASCAL 100/IS e PASCAL ET/IS assumono la classe di temperatura T4 con T_{amb}: -10°C ÷ +50°C.

The calibrators model PASCAL 100/IS and PASCAL ET/IS have temperature class T4 with T_{amb}: -10°C ÷ +50°C.

[15.5] **Grado di protezione (IP)** **Degree of protection (IP code)**

IP54

[15.6] **Avvertenze di targa** **Label warnings**

PASCAL 100/IS: **PASCAL 100/IS:**

15.6.1 Sul pannello interno:
Attenzione: potenziale rischio di cariche elettrostatiche - vedi istruzioni.

On internal skid:
Warning: potential electrostatic charge hazards - see instructions.

15.6.2 Quando il calibratore modello PASCAL 100/IS è utilizzato in modalità di generazione, i circuiti connessi all'uscita o ai terminali di alimentazione non devono essere connessi ad altre alimentazioni.

When the calibrator model PASCAL 100/IS is used in output mode, the circuits connected to out or P.S. terminals must not be connected to other supplies.

Questo certificato, allegato incluso, può essere riprodotto solo integralmente e senza alcuna variazione. /
This certificate may only be reproduced in its entirety and without any change, schedule included.

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Emesso il / Issued on..... : 2010-05-11
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[13] **Allegato** / **Scheduled**

[14] **Numero del Certificato di Esame CE del tipo** / **EC-type Examination Certificate number**

IMQ 08 ATEX 027 X

15.6.3	Ricaricare in zona sicura.	Recharge in safe area.
15.6.4	Sul pacco batteria: Pacco batteria tipo 220021. Sostituire in zona sicura con stesso tipo.	On the battery pack: Battery pack type 220021. Replace only in safe area with same type.
	PASCAL ET/IS:	**PASCAL ET/IS:**
15.6.5	Attenzione: potenziale rischio di cariche elettrostatiche - vedi istruzioni.	Warning: potential electrostatic charge hazards - see instructions.
15.6.6	Quando il calibratore modello PASCAL ET/IS è utilizzato in modalità di generazione, i circuiti connessi all'uscita o ai terminali di alimentazione non devono essere connessi ad altre alimentazioni.	When the calibrator model PASCAL ET/IS is used in output mode, the circuits connected to out or P.S. terminals must not be connected to other supplies.
15.6.7	Ricaricare in zona sicura.	Recharge in safe area.
15.6.8	Sul pacco batteria: Pacco batteria tipo 220022. Sostituire in zona sicura con stesso tipo.	On the battery pack: Battery pack type 220022. Replace only in safe area with same type.

[16] **Rapporto** / **Report**

43AI00022 - 43AI00022.1 - 43AI00022.2

[16.1] **Prove individuali** / **Routine (factory) tests**

16.1.1 Il costruttore deve effettuare le prove individuali previste al paragrafo 27 della norma EN 60079-0.

The manufacturer must carried out the routine test prescribed at clauses 27 of the EN 60079-0.

[16.2] **Documenti descrittivi** / **Descriptive documents**

N.	Titolo / Title	Revisione / Revision	Pagine / Pages	Data / Date
1	DL-43AI00022.1	1	170	2010-06-25
2	DL-43AI00022.2	2	64	2013-12-10
3	Piano di Controllo e Collaudo per pile ed accumulatori	1	4	2013-12-10

[16.3] **Conformità alla documentazione** / **Conformity with the documentation**

16.3.1 Il costruttore deve condurre tutte le verifiche e le prove necessarie ad assicurarsi che il prodotto sia conforme alla documentazione.

The manufacturer shall carry out the verifications or tests necessary to ensure that the product complies with the documentation.

16.3.2 Contrassegnando il prodotto in conformità all'art. 29 della norma EN 60079-0, il costruttore dichiara sotto la sua sola responsabilità che:

- il prodotto è stato costruito in conformità ai requisiti delle norme applicabili e pertinenti in materia di sicurezza;
- le verifiche e prove individuali previste all'art. 28.1 della Norma EN 60079-0 sono state condotte e completate con esito positivo.

Marking the equipment in accordance with Clause 29 of EN 60079-0, the manufacturer attests on his own responsibility that:

- the equipment has been constructed in accordance with the applicable requirements of the relevant standards in safety matters;
- the routine verifications and routine tests in 28.1 of EN 60079-0 have been successfully completed with positive results.

Questo certificato, allegato incluso, può essere riprodotto solo integralmente e senza alcuna variazione. /
This certificate may only be reproduced in its entirety and without any change, schedule included.

Mod. 1073/6

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Sostituisce / Replaces ..... : 2010-07-20

[13] **Allegato** **Scheduled**

[14] **Numero del Certificato di Esame CE del tipo** **EC-type Examination Certificate number**

IMQ 08 ATEX 027 X

[16.4] **Condizioni per l'installazione** **Installation conditions**

16.4.1

L'apparecchiatura in oggetto è prevista per essere installata in luoghi in cui vi siano le condizioni ambientali espressamente specificate all'art. 1, par. 2 della EN 60079-0.

L'installazione e l'uso in condizioni atmosferico-ambientali al di fuori dei suddetti intervalli richiedono considerazioni speciali e misure addizionali da parte dell'installatore o utilizzatore.

Tali eventuali condizioni avverse dovrebbero essere specificate al fabbricante dall'utilizzatore; non rientra nelle prescrizioni delle Norme applicabili di cui in [9] che l'Organismo di certificazione confermi l'idoneità alle condizioni avverse.

Above referred equipment is foreseen to be installed in locations where there are environmental conditions, as clearly specified at clause 1, par. 2 of EN 60079-0.

Installation and use in atmospheric and environmental conditions that are out of above mentioned intervals request special considerations and additional measures by the side of installer or user.

These should be specified to the manufacturer by the user; it is not a required by applicable standard listed in [9] that the certification body confirm suitability for the adverse conditions.

[17] **Condizioni speciali d'impiego (X)** **Special condition for safe use (X)**

17.1

PASCAL 100/IS:

Rischio potenziale di cariche elettrostatiche per il pannello interno: pulire solo con panni umidi o prodotti antistatici.

PASCAL 100/IS:

Potential electrostatic charge hazard for internal skid: clean only with wet clothes or antistatic products.

17.2

PASCAL ET/IS:

Rischio potenziale di cariche elettrostatiche: pulire solo con panni umidi o prodotti antistatici.

PASCAL ET/IS:

Potential electrostatic charge hazard: clean only with wet clothes or antistatic products.

17.3

Quando il calibratore modello PASCAL 100/IS o PASCAL ET/IS è utilizzato in modalità di generazione, i circuiti connessi all'uscita o ai terminali di alimentazione non devono essere connessi ad altre alimentazioni.

When the calibrator model PASCAL 100/IS o PASCAL ET/IS is used in output mode, the circuits connected to out or P.S. terminals must not be connected to other supplies.

[18] **Requisiti essenziali di sicurezza e salute** **Essential Health and Safety Requirements**

Art.	Conformità	Conformity
	Questo Certificato **non** indica la conformità alla sicurezza elettrica e ai requisiti prestazionali diversi da quelli espressamente inclusi nelle Norme elencate al punto [9].	This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed in [9].
	Questo Certificato **non** copre pericoli derivanti da condizioni ambientali diverse da quelle espressamente e puntualmente indicate nell'art. 1 della EN 60079-0.	This Certificate **does not** cover hazards coming from environmental conditions different from those clearly and precisely indicated in clause 1 of EN 60079-0.
1.2.7	In accordo all'Allegato VIII della Direttiva	1.2.7 According Annex VIII of the Directive
1.4	Non verificato.	1.4 Not verified.
1.5	Non applicato.	1.5 Not applied.
3	Non applicabile.	3 Not applied.

[19] **Condizioni di Validità della Certificazione** **Certification Validity Conditions**

19.1

L'uso di questo Certificato è soggetto allo Schema di Certificazione e al Regolamento applicabile ai possessori di Certificati IMQ.

The use of this Certificate is subject to the Certification Scheme and to the Regulation applicable to holders of IMQ Certificates.

19.2

La validità del certificato è soggetta alla condizione che il costruttore si conformi ai risultati dei riesami della documentazione e delle pertinenti disposizioni eventualmente incluse, registrate nella copia relativa della documentazione in 16.2.

The validity of this certificate is subject to the condition that the manufacturer complies with the results of the document review and of the pertinent requirement if any included, recorded in the relevant copy of documentation as per 16.2.

Questo certificato, allegato incluso, può essere riprodotto solo integralmente e senza alcuna variazione. /
This certificate may only be reproduced in its entirety and without any change, schedule included.

GB

Emesso il / Issued on.....: 2010-05-11
Data di aggiornamento / Updated on....: 2013-12-18
Sostituisce / Replaces.....: 2010-07-20

[13] **Allegato** **Scheduled**

[14] **Numero del Certificato di Esame CE del tipo** **EC-type Examination Certificate number**

IMQ 08 ATEX 027 X

Una copia di tale documentazione è conservata nell'archivio IMQ.

One copy of the mentioned documentation is kept in IMQ file.

[20] **Variazioni** **Variations**

20.1

2010-07:

- Aggiunto modello PASCAL ET/IS, differente dal PASCAL 100/IS per nuova custodia e diverso pacco batterie.

2010-07:

- Added PASCAL ET/IS model, different from PASCAL 100/IS for a new enclosure and a different battery pack.

20.2

2013-12:

- Aggiornamento ragione sociale e indirizzo costruttore;
- Aggiornamento a nuove norme;
- Aggiunta schede HART1 e HART2, intrinsecamente protette con le stesse metodologie delle schede già presenti;
- Integrazione grado di protezione da IP20 a IP54.

2013-12:

- Updated name and address manufacturer;
- Updated to new standard editions;
- Added HART1 and HART2 boards, that are intrinsically protected with the same method than current boards;
- Improved degree of protection from IP20 to IP54.

Questo certificato, allegato incluso, può essere riprodotto solo integralmente e senza alcuna variazione. /
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Mod. 1073/6

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