



# **PCON-Y17** Pressure Controller

50.000 <sup>\*</sup><sub>psi G</sub>



PRESTS

USB

# **Technical Manual**

EM0288-04

FUSE

PCON-Y17-DT Pressure Controller



# **EC Declaration of Conformity**

We declare under our sole responsability that the CE marked products, are in conformity with the essential requirements of the following EC Directives when installed in accordance with the installation instructions contained in the product documentation:

Series	PCON-Y17	
Description	Pressure Controlle	er
LVD Low Voltage Directive	2014/35/EC of the Euro the harmonization of the la designed for use within cer	pean Parliament and of the Council of 12 December 2006 on ws of Member States relating to Electrical Equipment tain voltage limits.
EN 61010-1	Safety requirements for ele use – Part 1: General Req	ectrical equipment for measurement, control and laboratory uirements.
EN 61010-2:010	Safety requirements for ele use - Part 2-010: Particula Materials.	ectrical equipment for measurement, control and laboratory requirements for laboratory equipment for the heating of
EMC directive	2004/108/EC of the Eu on the approximation of the compatibility and repealing	opean Parliament and of the Council of 15 December 2004 a laws of the Member States relating to electromagnetic Directive 89/336/EEC
EN 61326-1	Electrical equipment for me – Part 1: General Requirer	easurement, control and laboratory use - EMC requirements nents.
São Paulo, 8 Septemb	er 2015	
Vi.	<u>`</u>	Ref.
Vinicius José Gomes N	lunes	Antonio Rafael Sito Antunes
CEO		Engineering Manager

#### WARNING!



The instruments described in this technical manual are equipments for use in specialized technical area. The user is responsible for the configuration and selection of values of the parameters of the instruments. The manufacturer warns against the risk of incidents with injuries to both persons and property, resulting from the incorrect use of the instrument. Use the instrument only according to this technical manual. Any operation not described here is not allowed.



#### WARNING!

Do not apply pressure above 130% of full scale of the control range (for the range of 3000 psi, do not apply pressure above 110% of full scale control range).

#### WARNING!

Be careful with the pressure connections. High pressures with a large volume can cause damage to both persons and property.



Apply to the positive supply port pressure between 110% and 130% of the full scale of the control module (for the 3000 psi range, the positive pressure supply should be between 104% and 110%).

The pressure supply must be pneumatic, dry and clean air, nitrogen or inert gases.

#### WARNING!

When a vacuum pump is attached to the negative supply port of the pressure control module, it is strongly recommended to use a protection valve to atmosphere in the vacuum pump. When controlling from a high pressure to a low pressure the gas is exhausted through the negative supply port and can cause damage to the vacuum pump. Before going to a low pressure, it is recommended to make a VENT operation.



#### WARNING!

Other pressure equipments and accessories (such as hose, reservoirs, protection devices) connected to the calibrator must be appropriate to the working pressure.

#### WARNING!

During startup, do not connect any instrument to the output port of the Pressure Control Module. Before making connections to the Pressure Control Module, enter the CALIBRATOR menu and wait for the automatic VENT operation.



WARNING!

The calibrator discharges gas to the atmosphere through the supply (-) and vent ports. Leave these ports free.

The calibrator may produce high sound levels when discharging gas. Use a muffling device at the vent port.

#### WARNING!

Before connecting the instrument under test to the output port, make a VENT operation to discharge any gas inside the controller and go to MEASURE mode. Before turning the calibrator off, it is recommended to vent the gas inside the controller.



#### WARNING!

Before connecting the instrument under test to the output port it is recommended to configure the output range parameters. These parameters limit the controller output range, in order to protect the instrument under test.



# WARNING!

Avoid electric shock risk when touching the equipment. Use only suitable power cable with earth connection and never power up the equipment to the mains socket without an earth connection.



#### WARNING!

High voltage is present inside these equipments. It can cause great damages and injuries. Do not make any repair service inside the equipment without removing the plug from the supply.

# NOTICE!

High level of electromagnetic noise can cause instability to the equipment. The equipment is provided with electromagnetic interference filters that protect not only the mains but also the equipment itself against noise. These filters have no function if the unit is not earthed properly.

#### **IMPORTANT!**

All pressure equipment and accessories (such as hoses, connections, adapters, etc.) connected to the calibrator must be clean, free of residues such as oil, dirt, dust etc. These residues can cause irreversible damage to the internal system of the pressure control module. It is mandatory to use filters in both the pressure feed (SUPPLY (+)/ SUPPLY(-)) and out (OUT).

**CAUTION:** Damage caused by failure to observe the above recommendations results in total or partial loss of the equipment warranty.

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#### 1 - Introduction

#### 1.1. General Description

The **PCON-Y17 Pressure Controller** enables the control of pneumatic pressure up to 3000 psi (210 bar), including gauge and absolute pressure (optional barometric reference). Provides all features required for easier calibration and adjustment services on process instruments such as pressure transmitters, pressure switches, and manometers. It has a high level of accuracy, including aspects relating to changes in room temperature, and it maintains the specifications over long periods of time.

Besides providing high accuracy pressure values, it also allows the measurement of signals generated by the instrument under test which is being calibrated. This is possible due to an **embedded calibrator** specific for these types of signal, including current 4-20 mA. Thus, PCON-Y17 incorporates the functions of pressure controller, digital pressure standard and calibrator for mA, V, mV, ohms and RTD.

It is also a **Hart<sup>®</sup> Communicator** (optional) with a configurable internal resistance, transmitter power supply and latest DD as optional, in order to easily configure and calibrate Hart<sup>®</sup> pressure transmitters.

A highly visible **5.7**" **touchscreen display** allows easy configuration and userfriendly operation.

PCON-Y17 features **full advanced documenting capabilities**. It enables the creation and execution of automatic calibration procedures (Tasks). After completing a task, a Calibration Report is issued and it can be printed directly on a USB connected printer or a PDF document can be generated.

Communication with the computer through **SCPI commands** for on-line data acquisition and control of the calibrator.

# **1.2. Technical Specifications**

#### **1.2.1. Pressure Control Module**

Choose one range for the Pressure Control Module between 15 and 3,000 psi.

Ranges *	Resolution	Control Stability	Accuracy
(3) 0 – 15 psi	0.0001	± 0.002 % FS	± 0.012 % FS
(4) 0 – 30 psi	0.0001	± 0.002 % FS	± 0.012 % FS
(5) 0 – 100 psi	0.001	± 0.002 % FS	± 0.012 % FS
(6) 0 – 250 psi	0.001	± 0.002 % FS	± 0.012 % FS
(7) 0 – 500 psi	0.01	± 0.004 % FS	± 0.012 % FS
(8) 0 – 1,000 psi	0.01	± 0.004 % FS	± 0.012 % FS
(9) 0 – 3,000 psi	0.01	± 0.004 % FS	± 0.012 % FS

(\*) Gage pressure, vacuum (only for range 3), or compound (from range 3 to 8). Absolute pressure is obtained with the optional barometric reference. (\*\*) FS = Full Span.

Accuracy values are valid within one year and temperature range from 20 to 26 °C. Outside these limits add 0.005 % FS / °C, taking 23 °C as the reference temperature. These values are obtained through algorithms of temperature compensation on pressure measurements.

#### 1.2.2. Auxiliary Input

	Input Ranges	Resolution	Accuracy	Remarks
	-150 mV to 150 mV	0.001 mV	± 0.01 % FS*	
millivolt	-500 mV to -150 mV	0.01 mV	$\pm$ 0.02 % FS	$R_{input} > 10 MS2$
	150 mV to 2450 mV	0.01 mV	$\pm$ 0.02 % FS	auto-ranging
volt	-10 V to 11 V	0.0001 V	$\pm$ 0.02 % FS	$P_{\rm e} > 1 MO$
VOIL	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			
mA	-5 mA to 24.5 mA	0.0001 mA	± 0.01 % FS	R <sub>input</sub> < 120 Ω
rosistanco	0 to 400 Ω	0.01 Ω	$\pm$ 0.01 % FS	Excitation current
Tesistance	400 to 2500 Ω	0.01 Ω	± 0.03 % FS	0.85 mA, auto-ranging
Pt-100	-200 to 850 °C	0.01 °C	± 0.1 °C	
Ft-100	-328 to 1562 °F	0.01 °F	± 0.2 °F	1EC 00751
Dt 1000	-200 to 400 °C	0.1 °C	± 0.1 °C	
Pt-1000	-328 to 752 °F	0.1 °F	± 0.2 °F	IEC 00751
C++ 40	-200 to 260 °C	0.1 °C	± 2.0 °C	Minor 10.0
Cu-10	-328 to 500 °F	0.1 °F	± 4.0 °F	
	-60 to 250 °C	0.1 °C	± 0.2 °C	
NI-100	-76 to 482 °F	0.1 °F	± 0.4 °F	DIN-43760

(\*) FS = Full Scale.

Accuracy values are valid within one year and temperature range from 20 to 26 °C. Outside these limits add 0.001 % FS / °C, taking 23 °C as the reference temperature.

#### **1.2.3. General Specifications**

Power supply from 100 to 240 Vac, 50/60Hz.

Thirty minutes warm-up time.

Transmitter power supply (TPS): 24 Vdc, with protection from short circuit (30 mA).

Contact input for calibration of pressure switches.

Operating temperature range: 0 to 50 °C.

Relative Humidity: 0 to 90 % RH.

Engineering units – psi, bar, mbar, MPa, kPa, Pa, atm, at, mmH<sub>2</sub>O, cmH<sub>2</sub>O, ftH<sub>2</sub>O, inH<sub>2</sub>O, inH<sub>2</sub>O@60°F, torr, mmHg, cmHg, inHg, inHg@60°F, gf/cm<sup>2</sup>, kgf/cm<sup>2</sup>, kgf/m<sup>2</sup> (see section **4** – Pressure Units Conversion). Temperature: °C, °F, K.

Built in Web Server,

Ethernet communication. USB port for software/firmware upgrade.

HART<sup>®</sup> Communication Protocol (optional).

Includes technical manual and test leads.

Calibration Certificate (optional).

Pneumatic Connection: 1/8" Female BSPP.

Overpressure: For the range of 3000 psi, up to 110% full scale of the pressure control module. For the other ranges, up to 130% of the full scale of the pressure control module.

Power Supply: 100 to 240 Vac 50/60Hz (Time Delay Type Fuse 1 A / 250 V / 5x20 mm). Dimensions: 135 mm x 350 mm x 270 mm (HxWxD) - DT Version – Desktop. 132 mm x 483 mm x 255 mm (HxWxD) - RM Version – Rack Mounting.

Weight: 5.0 kg approx. (DT Version - Desktop) 9.5 kg approx. (RM Version – Rack Mounting)

One-year warranty.

Notes:

- \* Changes can be introduced in the instrument, altering specifications in this manual.
- \* HART<sup>®</sup> is a *FieldComm Group* trademark.

#### **1.3. Special Software Features**

- PRESET POINTS: edit your most frequently used setpoints and access them quickly.

- **STEP:** steps or setpoints with configurable time.

- **STABILITY/LEAK TEST:** measures the variation of the signal (be it Pressure or an Auxiliary Input signal) within a configurable period.

- PRESSURE SWITCH TEST: automatic testing of pressure switches.

- AUTOMATED TASKS: create calibration work orders and automatic execution of calibration services, storage of data and generation of calibration report to a directly connected USB printer or PDF file.

- DATA LOGGER: monitoring of input or output signals, storage and visualization of data in chart or table.

- VIDEOS: storage and viewing videos on the calibrator screen.

- MEMORY MANAGER: stores configuration types predefined by the user.

# 1.4. Order Code

Mounting Version DT - Desktop (for w RM - Rack Mountin Hart® Communica NH - Without Hart® CH - Hart® Calibra FH - Full-Hart® Col	PCON-Y17 rorkbench use) ng Version (fixed in a 19" tion Communication tor (basic commands: ze nfigurator, with DD librar	rack or workbench) ro, span, trim mA) y from <i>FieldComm Gro</i>	μp		Pressure Control Iodule (C1	-	Barometric Reference (Optional)
3 0 - 15 nsi	6 0 - 250 nsi	9 0 – 3 000 psi					
4 0 – 30 psi	7 0 - 500 psi	5 6 5,000 ps					
5 0 - 100 psi	8 0 - 1,000 psi						
See	specifications for each range i	n section 1.2.1 of this manu	al.				
Pressure Type (C1) G - Gauge V - Vacuum (Only for C - Compound (From For A	range 3) range 3 to 8) BSOLUTE pressure must be inc	luded the <i>optional BR</i> (Baro	metric Referenc	:e)			
Optional							
BR - Barometric Refer	ence (to measure and emula	te absolute pressure)					

#### 1.5. Parts Identification





#### RM Version – Rack Mounting



Fig. 03 - Front Panel PCON-Y17-RM

#### Note:

For the 3000 psi Pressure Control range there is no VENT PORT.

On the PCON-Y17-RM, the VENT and SUPPLY ports of the pressure control module are located on the back of the module, as well as the power supply (100 to 240 Vac) and Ethernet port.

#### 2 - Calibrator Operation

Turn on the PCON-Y17 by pressing the power switch (located on the rear panel for the DT version, and on the front panel for the RM version).

When powered on, the calibrator goes through a self-test routine. In case of failure, it displays a message to indicate the error; if that occurs, please contact the Presys Technical Assistance department.

After the self-test is completed, the display shows the main menu, as showed below.



Fig. 04 - Main Menu



#### WARNING!

During startup, do not connect any instrument to the output port of the Pressure Control Module. Before making connections to the Pressure Control Module, enter the CALIBRATOR menu and wait for the automatic VENT operation.

The main menu is divided in the following functions:

# **PREJYJ** | Instruments

**CALIBRATOR** – selects the input/output functions (Pressure Control Module, Auxiliary Input Signals and Pressure Measurement Module), see section **2.1**.

**HART**<sup>®</sup> – optional module that allows communication with devices that have Hart<sup>®</sup> Communication Protocol, see section **2.2**.

**TASKS** – performs calibrations automatically, see section **2.3**.

**DATA LOGGER** – record measurements, enabling visualization on chart or table, see section **2.4**.

**VIDEOS** – features videos made by *Presys* to assist in the use of the calibrator, and can also store videos made by the user, see section **2.5**.

**SETTINGS** – general instrument settings, see section **2.6**.

#### 2.1. Calibrator Menu

To select the **Pressure Control Module** and the **Auxiliary Input** functions press the **CALIBRATOR** button from the main menu.

When first entering the **CALIBRATOR** menu, the PCON-Y17 executes a **VENT** operation and an AUTO RESET of the pressure read in the Pressure Control Module. When it is done, it goes to **MEASURE** mode and opens the output isolation valve (see the module layout in section **2.1.2**). The following screen is displayed.





The Pressure Control Module has three operation modes: **MEASURE**, **VENT** and **CONTROL** (see sections **2.1.2**, **2.1.3** and **2.1.4**). To select an operation mode, press one of the buttons indicated below. The current state is indicated by the **Symbol**.



Fig. 06 - Pressure Control Module - Operation Modes

#### 2.1.1. Pressure Control Module – Connections

PCON-Y17-DT controls the pressure in the output port with high precision and stability. To control the pressure, a pressure between 110% and 130% of the full range of the control range is applied to the SUPPLY (+) power port, except for the 3,000 psi range which has a reduced range of 104% to 110% of the full scale. The pressure supply must be pneumatic, dry and clean air, nitrogen or inert gases.

If it is not possible to supply the PCON-Y17 with a pressure between 110% and 130% of the full range of the control range (and between 104% and 110% FS for the range of 3,000 psi), a lower supply pressure may be used, but the instrument control range will also be reduced. The PCON-Y17 measures the supply pressure and automatically sets its control parameters for better performance. If the pressure is not sufficient, a warning is displayed on the screen.

The presence of water, oil or particles in the pressure control module can cause irreparable damage to the system. Equipment and connections must be clean and dry when connected to both pressure supply and output. The use of impurities filters is necessary to protect the system. The use of 10 micron ( $\mu$ m) filters is recommended.



- For the DT version, all pneumatic connections are located on the rear panel of the PCON-Y17-DT. - For the RM version, the pneumatic connections VENT, SUPPLY (+) and SUPPLY (-) are located on the rear panel, pneumatic connections OUT and REF are located on the front panel of the PCON-Y17-RM.

Fig. 07 - Pressure Control Module

If you do not need to control negative pressure, connect to the supply (-) port a muffling device to reduce the sound levels.

To use the **PCON-Y17** with negative supply (vacuum), remove the damper (air diffuser) from the **SUPPLY (-)** port and connect the **PCON-Y17** vacuum kit and the vacuum pump (see **Fig. 08**). The negative supply does not need to be regulated. It is recommended that the vacuum pump has less than 70 mbar absolute (-13.5 psig) output.

When installing a vacuum feed, the pump must be protected against positive pressure discharge by the controller, which may damage and/or reduce the performance of the vacuum pump. This occurs in set point changes since the PCON-Y17 releases positive pressure from the system to the atmosphere through the **SUPPLY (-)** port.



The reservoir volume of the vacuum kit slows down and attenuates any sudden increase in positive pressure, thereby protecting the output of the vacuum pump.

Precautions must be taken to prevent the transfer of oil from the vacuum pump to the PCON-Y17. Before turning off the vacuum pump supply, it is recommended to disconnect the hose that connects the vacuum pump to the reservoir, allowing atmospheric pressure to enter directly into the pump and not through the instrument. Without this procedure, the oil present in the vacuum pump can progressively rise to the PCON-Y17 through the hose.

#### WARNING!



The instruments described in this technical manual are equipments for use in specialized technical area. The user is responsible for the configuration and selection of values of the parameters of the instruments. The manufacturer warns against the risk of incidents with injuries to both persons and property, resulting from the incorrect use of the instrument. Use the instrument only according to this technical manual. Any operation not described here is not allowed.

# WARNING!

Do not apply pressure above 130% of full scale of the control range (for the range of 3000 psi, do not apply pressure above 110% of full scale control range).

#### WARNING!

Be careful with the pressure connections. High pressures with a large volume can cause damage to both persons and property.



Apply to the positive supply port pressure between 110% and 130% of the full scale of the control module (for the 3000 psi range, the positive pressure supply should be between 104% and 110%).

The pressure supply must be pneumatic, dry and clean air, nitrogen or inert gases

# WARNING!



When a vacuum pump is attached to the negative supply port of the pressure control module, it is strongly recommended to use a protection valve to atmosphere in the vacuum pump. When controlling from a high pressure to a low pressure the gas is exhausted through the negative supply port and can cause damage to the vacuum pump. Before going to a low pressure, it is recommended to make a VENT operation.



#### WARNING!

Other pressure equipments and accessories (such as hose, reservoirs, protection devices) connected to the calibrator must be appropriate to the working pressure.

#### WARNING!

The calibrator discharges gas to the atmosphere through the supply (-) and vent ports. Leave these ports free.

The calibrator may produce high sound levels when discharging gas. Use a muffling device at the vent port.

#### WARNING!

Before connecting the instrument under test to the output port, make a VENT operation to discharge any gas inside the controller and go to MEASURE mode. Before turning the calibrator off, it is recommended to vent the gas inside the controller.

#### **IMPORTANT!**

All pressure equipment and accessories (such as hoses, connections, adapters, etc.) connected to the calibrator must be clean, free of residues such as oil, dirt, dust etc. These residues can cause irreversible damage to the internal system of the pressure control module. It is mandatory to use filters in both the pressure feed (SUPPLY (+)/ SUPPLY(-)) and out (OUT).

#### 2.1.2. Measure Mode

In Measure mode, the calibrator shows the pressure measurement in the Control Module. In this state, the control mode is disabled.



Note: The pressure controller of 3000 psi range does not have the output isolation valves (module connection to the outlet is always open) or VENT (no VENT port to the atmosphere).



The state of the output isolation valve is user configurable. To change the state of the valve, press the **SETTINGS** button shown below and change the **Output Parameters** (OPEN / CLOSED) in the **ADVANCED** tab.

SETTINGS RESET PRESS	VENT OMEAS	SURE CONTROL			
•	PCON OPERAT	ION SETTINGS	UNIT	bar	3
$\sim$		OPEN	CLOSE	•	
	Head Height Corre	ection			5
		Correctio	n Settings	0	
	Pressure Sampling	Rate			_
		LESS ACCURATE	MORE ACCUR	ATE	
		FAST	SLOW		
)	Pressure Supply(+)				
		SUI	PPLY (+)	0	
	INF				
	RANGE	CON	TROL	ADVANCED	

Fig. 11 - Output Isolation Valve Status

**NOTE:** It is not possible to close the output isolation valve or to maintain it closed if the pressure inside the control module is larger than the pressure outside the control module by 100 psi or more. The 3000 psi pressure control range does not have an outlet isolation valve.

To zero the current pressure measurement, press the **RESET PRESS** button.



Fig. 12 - Reset of the current pressure measurement

#### 2.1.3. Control Mode

In this mode, the calibrator controls pressure at the output port through the admission and exhaustion control valves.



Note: The pressure controller of 3000 psi range does not have the output isolation valves (module connection to the outlet is always open) or VENT (no VENT port to the atmosphere).



#### a) Range Parameters

#### WARNING!

Before connecting the instrument under test to the output port it is recommended to configure the output range parameters. These parameters limit the controller output range, in order to protect the instrument under test.

To change the pressure controller output range press the **SETTINGS** button shown below and edit the **Min** and **Max** values in the **RANGE** tab.

SETTINGS	RESET PRESS	VENT	MEASURE	CONTROL		
Υ.		PCON OPER	ATION SETTING	GS	UNIT	bar 🐼
			Min	-0.99000		0
			Mex	2.06843		0
		N	ent Opening Limit	2.00000		0
		v	ent Rate (UNIT/s)	0.68948		D
				APPLY		
		Pressure India	ation Settings			
=		Decim	al places 0 1	2 3	4 5	0
		Filter in	tensity NO	WEAK MEDI	UM STRONG	G 🕜
		Pressure	Mode AB	s	GAUGE	0
		RAN	NGE	CONTROL		ADVANCED

Fig. 15 - Range parameters

Changing the output range is useful when the pressure range of the instrument under test is lower than the control module range, to protect against overpressure at the instrument.

# b) Changing the setpoint

Press the **SP** button or the indication of the pressure to change the setpoint to the desired value. When the pressure is stabilized, its reading value turns to green.



Fig. 16 - Control Mode - Changing Set point Value

The state of the output isolation valve is user configurable. To change the state of the valve, press the **SETTINGS** button shown below and change the **Output Parameters** (OPEN / CLOSED) in the **ADVANCED** tab.





**NOTE:** It is not possible to close the output isolation valve or to maintain it closed if the pressure inside the control module is larger than the pressure outside the control module by 100 psi or more. The 3000 psi pressure control range does not have an outlet isolation valve.

#### c) Stabilization Settings

When the controlled pressure is within the limits established by the Stabilization Settings, its reading value is shown in **green (stable)**. When it is outside, it is shown in **red (not stable)**.

You can configure the **Error Window** (± value in the current unit of pressure) that a stable pressure reading can deviate from the setpoint value, and the **Minimum Time** (in seconds) the pressure reading must be inside these limits to indicate stable.

Press the **SETTINGS** button and select the **CONTROL** tab shown below, edit the values in **Stabilization Settings** and press the **APPLY** button.

SETTINGS	RESET PRESS	VENT OMEASUR	CONTROL		
$\sim$		PCON OPERATION SET	TINGS	UNIT	bar 🛞
		Control Mode AutoZero	Linear Auto	Max	OFF     Windowed Static Control     Moder(WSCM)
		Slew Rate Setting			
		SP Slew Rate (UNIT/s	0.10000	)	0
			APPLY		
		Stabilization Settings			
		Minimum time (s	3		0
<b>F</b>		Error window (Press. Unit 0.002%(FS	0.0000	5	0
			APPLY		
		OPTIMIZATION OPTIONS	7		
		REMEMBER!!! To use the optimization set! feature.	tings, you must UNLOCK t	he	UNLOCK
		RANGE	CONTRO		ADVANCED

Fig. 18 - Stabilization Settings

# d) Control Settings

PCON-Y17 has three different Control Modes that define the controller output behavior when the setpoint is changed: **Linear**, **Auto** and **Max**.

- Linear: the output varies linearly according to the parameter SP Rate (*Pressure* Unit / second). The controlled pressure will be closer to the linear behavior for lower values of pressure rate, protecting the instrument under test from overshoot.
- Auto: for positive steps, the controlled pressure varies exponentially with preconfigured parameters (not user configurable), protecting the instrument under test from overshoot.

• Max: the fastest control mode, but may produce overshoot of the controlled pressure.



Fig. 21 - Max. Control Mode

Edit the Control Parameters by pressing the **SETTINGS** button shown below. Go to the **CONTROL** tab and select the desired **Control Mode** option. For the *Linear* option, also edit the **SP Rate** (in current pressure unit / second).

SETTINGS RESET PRESS PCON C		35	UNIT	bar 🚫
	Control Mode Line	ear Auto	Max 👩	OFF
$\sim \chi_{c}$	AutoZero AUT	OZERO M		Winclowed Static Control Moder/WSCMI
Slew Rate	Setting			
	SP Slew Rate (UNIT/s)	0.10000	0	
		APPLY		
Stabilizati	SP Rate ( rror wire only for Liv	current pre near Contro	ssure unit / ol Mode.	second)
		APPLY		
OPTIMIZA	TION OPTIONS			
	REMEMBER!!! To use the optimization settings, feature.	you must UNLOCK the	B	UNLOCK
	RANGE	CONTROL		ADVANCED

Fig. 22 - Control Parameters

#### e) Control Modes

The PCON-Y17 offers two different control modes: Dynamic and Window Static mode.

**Dynamic Mode:** the controller constantly adjusts to reach the setpoint. In this mode, small leaks and system changes are automatically compensated. The Control Valves are always active..

**Window Static Control Mode:** The controller reaches the setpoint, stop the control valves and will only resumes control when the pressure exceeds the limits set for the window, thus the pressure can be set and measured without the noise from the pressure control system.



Fig. 23 - Control Parameters

The limits for both Dynamic and Window Static Mode are set in **SETTINGS** > **CONTROL** tab > **STABILIZATION SETTINGS**, in the option **ERROR WINDOW**.

The screen indication **WSCM ON** shows that the Window Static Control mode is active. Otherwise, the indication **WSCM OFF** is shown.

During the stable time, there are two indications with the stabilized value: the time that the value is stable inside the determined error window and the  $2\sigma$  (calculated 2 standard deviation)

#### f) Preset Setpoints

Configure your most frequently used setpoints with the **PRESET** function. You can edit up to eight points (P1 to P8). Pressing the **OK** button the setpoint is automatically changed to the value of the corresponding point.

Another fast way to change the setpoint to the preset values is using a numeric keyboard connected to the PCON-Y17 Type A USB (see **section 1.5** – Parts Identification). In Control Mode, when pressing from 0 to 7 in the keyboard the corresponding preset setpoints P1 to P8 will be controlled.

SETTINGS	RES	ET PRESS	5	/ENT	MEAS	URE	CONTROL
↔ 2934 s	9	T	1	ľ	l	100	Linear
Preset Fund	ction			[		psi	
ок	)	10.00	P1	P5	50.0	00	ок
ок		20.00	Pz	P6	60.0	0	ок
ок		30.00	P3	P7	70.0	00	ок
ок		40.00	P4	P8	80.0	00	ок
							)X(
SP= 0.00	( <b>)</b>	ST	EP	- FR	iste -		NUDGE
			-0	NPUT			

Fig. 24 - Preset Set points

#### g) Step Function

The **STEP** programming makes the calibrator output vary in pre-defined steps. It is useful in calibrations where some scale points are verified; for example 0% - 25% - 50% - 75% - 100%.

To generate setpoints, you must set the minimum and maximum range points (MIN and MAX) and the desired number of points.

If you want each step is achieved automatically after a preset time, you must set the **TIME** (in seconds). In this case, the steps are controlled automatically and continuously.

To start the STEP function, change the status of the **EXEC** switch to **ON**. Once the function is activated, the output starts executing the **STEP** program. The steps are automatically and continuously controlled according to the set time.

SETTIN	IGSE RESI	ET PRESS	VENT	MEASUR	E OCONTROL	SETTINGS	RESET PRESS	VENT	MEASU	RE O	CONTROL
↔ 50 s	oj	1	1		100 Linea	ar ↔	0	I.	I E	100	Linea
Step	p Function			1	8						
	MAX	100.00	psi	0.0	0 psi						
	MIN	0.000	psi	25.0	00 psi 00 psi	G ,		21	50		osi (
	TIME	20	(S)	75.0	00 psi			4.	<b>J</b> . <b>U</b>		
	POINTS	5		100.	oo psi						
0		Wait stabil	ize		-	STEP Funct Activated	for the next s	ing SP			
SP=	0.00	SIR	P	RESET	NUDGE	STEP:1	75 ¥ 0.	00	SP=25.00	A.5	0.00
			INPUT					INPU	r		

Fig. 25 - STEP Function (automatic step program)

If a zero value is set for the time, the steps are not changed automatically (manual step program). In this case, to move to the next step you must press the next set point value button. By pressing the previous set point button, it returns a step.



Fig. 26 - STEP Function (manual step program)

#### h) Nudge Function

The **NUDGE** function enables the user to change the setpoint up or down by small steps.

Press the **NUDGE** button to edit the step size. Press the "+" and "-" symbols to increment and decrement the setpoint.

If you are using a numeric keyboard connected to the PCON-Y17 Type A USB (see **Fig.01** for Desktop Version or **Fig.03** for Rack Mounting – Front Panel), you can increment and decrement the setpoint by pressing the "+" and "-" buttons in the keyboard.



Fig. 27 - NUDGE Function

# 2.1.4. Vent Mode



#### WARNING!

Be careful with the pressure connections. High pressures with a large volume can cause damage to both persons and property.



#### WARNING!

The calibrator discharges gas to the atmosphere through the supply (-) and vent ports. Leave these ports free.

The calibrator may produce high sound levels when discharging gas. Use a muffling device at the vent port.



#### WARNING!

Before connecting the instrument under test to the output port, make a VENT operation to discharge any gas inside the controller and go to MEASURE mode. Before turning the calibrator off, it is recommended to vent the gas inside the controller.

In this mode, the calibrator turns the pressure control off and vents the pressure inside the control module through the **VENT** valve.



Fig. 28 - Vent mode - screen

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Note: The pressure controller of 3000 psi range does not have the output isolation valves (module connection to the outlet is always open) or VENT (no VENT port to the atmosphere).

Fig. 29 - Vent mode – state of the valves

The state of the output isolation valve is user configurable. To change the state of the valve, press the **SETTINGS** button shown below and change the **Output Parameters** (OPEN / CLOSED) in the **ADVANCED** tab.



Fig. 30 - Output Isolation Valve Status

**NOTE:** It is not possible to close the output isolation valve or to maintain it closed if the pressure inside the control module is larger than the pressure outside the control module by 100 psi or more.

To zero the current pressure measurement, press the **RESET PRESS** button.



Fig. 31 - Reset of the current pressure measurement

The VENT Control Settings is accessed by pressing the **SETTINGS** button and selecting the **RANGE** tab. It presents two parameters for the VENT mode: **Vent Opening Limit** (in the current pressure unit) and **Vent Rate** (in the current pressure unit/ second).

		CONTROL			
$\mathbf{X}$	PCON OPERATION SETTI Range Parameters	NGS	UNIT	bar	0
	Min	-0.99000	0		
	Mex	2.06843	0		
	Vent Opening Limit	2.00000	0		
•	Vent Rate (UNIT/s)	0.68948	0		
		APPLY			
	Pressure Indication Settings	1 2 3			
	Filter intensity NO	WEAK MEDIL	JM STRONG	0	
	Pressure Mode A	ABS	GAUGE	0	_
	-				

Fig. 32 - VENT Configuration

When the VENT mode is started, first the calibrator reads the pressure in the control module. If the pressure measurement is below the **Vent Opening Limit** value, the control is shut off and the VENT valve opens. Otherwise, if the pressure is above this limit, the controller reduces the pressure down to the **Vent Opening Limit** value by varying it according to the **Vent Rate** parameter. When the pressure reaches this limit, the control is shut off and the VENT valve is opened.

The VENT valve remains opened until another Operation Mode (Control or Measure) is started. To select another operation mode, press the VENT button again.

#### 2.1.5. Absolute Mode

PCON-Y17 has an optional barometric reference (optional BR, see section **1.4 Order Code**). When this option is chosen, PCON-Y17 can emulate absolute pressure by using a built-in barometer at the REF (reference) port.



#### WARNING!

Do not apply pressure above 15 psia to the REF (reference) port.

To change the indication to absolute mode, press the **SETTINGS** button shown below and select the ABS option.

SETTINGS RESET PRESS	VENT   MEASURE  100	CONTROL		
$\mathbf{X}$	PCON OPERATION SETTIN Range Parameters	IGS UNIT	bar	0
	Min	-0.99000	0	
	Max	2.06843	0	
	Vent Opening Limit	2.00000	0	
4	Vent Rate (UNIT/s)	0.68948	0	
		APPLY		
	Pressure Indication Settings			
	Decimal places 0	1 2 3 4	s ()	
	Filter intensity NO	WEAK MEDIUM STR	ONG	
ļ,	Pressure Mode A	BS GAUGE	0	

Fig. 33 - Absolute Option



Fig. 34 - Absolute Indication

# 2.1.6. Changing the Pressure Unit

To change the Pressure Unit press on the current engineering unit (psi, atm, bar etc.), select the desired option and press **OK**.



Fig. 35 - Pressure Unit

# 2.1.7. Filter Intensity

If necessary, you can configure the **filter intensity** applied to the pressure reading. When filtering the measured pressure is not required, just set this parameter to **NO**. The filter intensity is applied only to the reading; it does not affect the pressure control.

SETTINGS	RESET PRESS				, L.			
$\sim$		PCON OPE	RATION SETT	TINGS	U	NIT	bar	6
			Min	-0.9	9000	0		
			Ma	2.00	5843	0		
			Vent Opening Limi	2.00	0000	0		
		4	Vent Rate (UNIT/s	0.68	3948	0		
				AP	PLY			
		Decim	ntensity NO	1 2 WEAK	3 4 MEDIUM	5 STRONG	0	
		Pressure	Mode	ABS	GAU	JGE	0	
		RA	NGE	CON	TROL		ADVANCED	
		Fig. 3	86 - Filte	r Intens	sity			

#### 2.1.8. Auxiliar Input

At the bottom of the screen, an input can be configured. When an input is selected, the screen will split automatically, showing two simultaneous variables. To select an input, just touch the **INPUT** bar.



Fig. 37 - Auxiliary Input

Select through the menu the type of signal to be measured and use the corresponding terminals (see **Fig. 40 – Input Connections** or press the **HELP** button).

SETTINGS DESET	PDESS 1	VENT	MEASURE	CONTROL
-1			2	oonnito
-				
	9	90'	22	bar
	• / .		20	
	SIGNAL INPUT SI			8
v	SIGNAL INPUT SI mV	ELECTION	Онм	8
V PRESSURE	SIGNAL INPUT SI mV SWITCH	DISABLED     ELECTION     MA     RTD		
V PRESSURE	SIGNAL INPUT SI mV SWITCH	ELECTION MA RTD		

Fig. 38 - Auxiliary Input Type Selection

For **OHM** and **RTD** measurement, you should also select between 2, 3 or 4 wires options. The **SWITCH** input is a measurement of continuity of an external contact connected to the input (between RTD1 and RTD4) of PCON-Y17. When there is continuity, the entry shows **CLOSED**, otherwise it shows **OPEN**.

The **PRESSURE** option activates the pressure measurement by the PCON-17 pressure control sensor (C1).

#### NOTE:

For the PCON-Y17 with the BR (barometric reference) option, the internal barometer may be read at the C2 option.

Whenever the input signal is above or below the input ranges established in the specifications, the display indicates **OVER** or **UNDER**, respectively.

The engineering unit can be changed by clicking on it (psi, atm, etc.) and selecting the desired option.



Fig. 39 - Selecting the Engineering Unit

The **NONE** option turns the auxiliary input function off.



#### **Auxiliary Input or Measurement Connections**

Note: For the DT version, the pressure control module is located on the rear panel. For the RM version, these connections are on the front panel.



#### 2.1.9. Transmitter Power Supply (TPS)

The PCON-Y17 has the TPS (transmitter power supply), 24 Vdc, galvanically isolated and provided with short-circuit protection (current limited to 30 mA).



Fig. 41 - TPS Power Supply

# 2.1.10. Auxiliary Input Scale Function

When selecting **SPECIAL FUNCTION** in the auxiliary input channel, the display will show:

SIGNA	L: V NO S	PECIAL FUNCTION
SPECIAL FU	JNCTIONS SETTINGS	8
SCALE		
		7



The selected special function will act on the previously selected input.

After selecting and configuring the special function, enable it by changing the key status to one. To disable it change the key to off. To change the state of the key, just click on it.

When there is no active special function, the message **NO SPECIAL FUNCTION** is displayed at the top of the screen.

#### **SCALE** Function

SIGNAL	: mA			SCALE	
SCALE					2
INPUT HIGH	20.0000	mA	SCALE HIGH	100.00	
INPUT LOW	4.0000	mA	SCALE LOW	0.00	
	FLOW.	1		UNIT psi	
-0.00	DECIMALS O	1 2	3 4	ок	R
INPUT	SPECI	AL FUNC	TIONS	THE PARTY	



It establishes a linear relationship between the PCON-Y17 input signal and what is shown on the display, according to the graphic below:



The scaled indication on the display (#) may represent any engineering unit, such as: m/s, m<sup>3</sup>/s, %, etc. The number of decimals, up to four, shown on the display may be configured.

The value for **Input High** must be necessarily higher than **Input Low**. On the other hand, **Scale High** and **Scale Low** may have any relationship between themselves: higher than, lower than or equal to, and they may have a signal before them. Thus direct or reverse relationships may be established.

For the current input, a linear relationship may be established as it has been previously shown or it may be squared **(FLOW)** as illustrated below:





#### 2.1.11. Calibration Examples

#### a) Pressure Transmitter Calibration

Use the PCON-Y17 **TPS** source (24 Vdc) to power up a two-wire transmitter and connect the current as illustrated below. Select **mA** (current) in the **Input (Auxiliary)** menu and configure the Pressure Control parameters.



Fig. 46 - Pressure Transmitter Calibration

Readings of the mA input can be scaled to pressure through the **SCALE** option (see section **2.1.10**.). Thus, the error between the input and the output of the pressure transmitter is easily calculated.

#### b) Pressure Switch Verification

Pressure switches are devices that receive a pressure signal and have relay alarm. The relay is activated whenever the pressure passes above or below a certain setpoint alarm.

Connect the pressure switch relay output to the switch input of PCON-Y17, **RTD1** and **RTD4** terminals, and make the pneumatic connections as illustrated in the figure below.



Fig. 47 - Pressure Switch Verification

Select **SWITCH** in the **Input (Auxiliary)** menu and configure the Pressure Control parameters (the **Control** Operation Mode must be selected).

To perform the automatic pressure test, press the PRESSURE SWITCH as shown in the following figure.

IGS RESET PRESS	VENT	MEASURE	CONTROL	Pressure switch test				(
-1		1 2		PRESSURE SWITCH INFORMATION	TEST PARAMETERS			
				TAG	MIN	1.00000	MAX	2.00000
	<b>0</b>	00	have C	SERIAL NUMBER	TRIP	1.50000	TRIPERROR	0.10000
U.7	70	75	bar G		DEADZONE	0.20000	DEADZONE	0.10000
				MODEL	RATE	0.02000		bar
0	PE	Ν						
	0.9 sian	0.998 SIGNAL: SWITCH OPE	0.99893 SIGNAL: SWITCH OPEN	0.99893 bar G SIGNAL SWITCH OPEN	0.99893 bar G BERIAL NUMBER MODEL SIGNAL: SWITCH	D.99893 bar G BESLIRE SWITCH HOGHLATON TAG BERIAL NUMBER MODEL SIGNAL: SWITCH OPEN	D.999893 bar G SIGNAL: SWITCH OPEN	D.999893 bar G SIGNAL: SWITCH OPEN

Fig. 48 - Pressure Switch Test

Select the **PRESS SWITCH TEST** button, fill in the **MIN** and **MAX** fields (the minimum and maximum pressures at which the test will be done). In **TRIP** field, fill the pressure that the switch changes its state and **DEADZONE** the value of the band that the switch continues its last state. **TRIP ERROR** and **DEADZONE ERROR** are the acceptance criteria for the Pass/Fail test indication. The **RATE** field correspond to the PCON-Y17 increasing rate in Pressure unit / second. Choose lower values for more accurate results.

Press **START** to start the pressure switch test. PCON-Y17 will control the pressure at the output port from the **MIN** to the **MAX** pressure value. The instant the relay changes from closed to opened it is shown on the display the alarm setpoint pressure switch. Then PCON-Y17 starts to decrease the output pressure to find a transition switch from opened to closed, in order to calculate the deadzone.



Fig. 49 - Pressure Switch Test Result

# 2.1.12. Leakage / Stability Test

The leakage / stability test measures the variation of a signal for a certain time. It is useful, for example, to check for pressure leak in the system.

To do the test, put the PCON-Y17 in **Measure** mode (the pressure control valves are off) and select the **Input (Auxiliary)** desired (the leakage / stability test may be done with any of the Auxiliary Input signals, for testing the pressure in the control module select **PRESSURE**  $\rightarrow$  **C1**).



Fig. 50 - Leak test, select MEASURE mode and the Auxiliary Input

Press the Quick Navigator icon  $\longrightarrow$  MENU  $\rightarrow$  BAR GRAPH.



Fig. 51 - Menu (Quick Navigator)

20 1200.00 200.00 0.000 0.000 IAX 100.00 psi 100.01 psi MIN AVG AVG ALARMS LEAK / STABILITY TEST CLEAR EVENTS START 20 5 \*205 н ect te in and click start but s LO м SOUN н

Fig. 52 - Leak/Stability Test - screen

Define the test duration (in seconds) and press the **START** button.



Fig. 53 - Leak/Stability Test - results

During the test, you can increase the test time by pressing the **+20s** button. The **S**, **M** and **H** buttons change the time unit to second, minute and hour, respectively. It is shown on the display the variation of the signal from the first to the last reading ( $\Delta$ **V**) and the increasing or decreasing rate is calculated (**Average**, in input unit / time unit).

#### 2.2. HART<sup>®</sup>

PCON-Y17 can be used to read and set parameters in devices that have HART<sup>®</sup> Communication Protocol. The HART<sup>®</sup> Protocol allows digital communication between master (in this case, PCON-Y17) and the slave (field instrument) superimposed on the 4-20 mA analog signal. To access this function from the main menu, select the **HART<sup>®</sup>** option.

<sup>'</sup> The HART<sup>®</sup> Communication of PCON-Y17 is an optional module. The calibrator has three versions: **NH** (without HART<sup>®</sup> Communication), **CH** (HART<sup>®</sup> Calibrator) and **FH** (Full-HART<sup>®</sup> configurator with DD library).

The **CH** option has basic and universal commands for HART<sup>®</sup> communication (zero, span, trim mA etc.) that allow you to adjust the range of the instrument, monitoring the primary variable, current adjustment etc. The **FH** option, in addition to basic and universal commands, is provided with the DD library (Device Description) from *FieldComm Group* and allows the setting of specific parameters of each instrument.

The following description is valid for **CH** and **FH** options.

# 2.2.1. HART<sup>®</sup> Connections

When selecting HART<sup>®</sup> from the main menu the **mA INPUT + HART** and **ONLY HART (INCLUDING NETWORK)** options are shown. An internal resistor (250  $\Omega$ ) Can also be enabled or disabled. The option must be chosen according to the type of connection to be made.

#### mA INPUT + HART<sup>®</sup>



Fig. 54 - Transmitter Powered up by the Calibrator Itself (TPS) mA INPUT + HART<sup>®</sup> (Internal Resistor Enabled)



Fig. 55 - Transmitter Powered up by an External Power Supply mA INPUT + HART<sup>®</sup> (Internal Resistor Enabled)

For the connections shown in **Figures 54 and 55**, use the **mA INPUT + HART**<sup>®</sup> option and **INTERNAL RESISTOR** enabled. In this mode, the 250  $\Omega$  resistor is activated internally in series with the calibrator mA input. The calibrator can measure current from the transmitter and also read and set parameters via HART<sup>®</sup>. If the internal resistor is not enabled, an external resistor of at least 150  $\Omega$  must be inserted in series with the mA input. To power up the transmitter, the PCON-Y17 **TPS** source (**Fig. 54**) or an external source (**Fig. 55**) can be used.

#### ONLY HART (INCLUDING NETWORK)



Fig. 56 - ONLY HART®

**IMPORTANT:** Before connecting the calibrator to the transmitter (s) as shown above, make sure that the mA input is not selected in the PCON-Y17 (Enter the Calibrator menu and select any other auxiliary input in CA-1 than mA or select the option NONE)

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For the connection shown in **Figure 56**, use the option **ONLY HART**<sup>®</sup>. In this mode, the internal resistor and the mA input are disabled. The HART<sup>®</sup> resistor (at least 250  $\Omega$ ) must be externally inserted in series with the power source and the transmitter. In this case, the calibrator does not perform the measurement of the transmitter current, but can read and configure its parameters via HART<sup>®</sup>.

### 2.2.2. Starting Communication

Entering the HART® menu, a screen shown. Enabling a HART® CONFIGURATOR option (**FH** version only) or calibrator to allow access to Full-Hart software (DD library) with all device parameters. By disabling this function, the **CH** software is started with the basic and universal commands for Hart® communication (zero, span, trim mA etc.).



Fig. 57 – ONLY HART®

Then set the internal resistor (250  $\Omega$ ) and set the HART® connection type (mA + HART® or ONLY HART®).

For the **CH** option must be inserted the instrument **ADDRESS** with which to communicate and press the **CONNECT** button. If the address of the instrument is not known, the **SEARCH** button can be pressed, which will search for instruments in the address range from 0 to 15.

Up to 15 instruments in a HART® network (addresses 1 to 15) are allowed. For a single field instrument with address 0, on the **mA IN + HART**® connection, the primary variable can be read both analog (4 to 20 mA) and digital (HART®). In network connection, the only way to read the primary variable is digitally (**ONLY HART**®).

# 2.2.3. Adjusting the Measurement Range of a HART<sup>®</sup> Transmitter

While the instrument is being connected, in the **DEVICE INFO** tab are shown information about instrument identification, such as TAG, manufacturer, description, message, date, measuring range and damping filter. Some of these parameters can be changed in STANDARD CONFIG.

In the **DEVICE INFO** tab, the **MIN** and **MAX** fields indicate the measuring range of the HART<sup>®</sup> transmitter. For PV (primary variable) equal to the MIN value, the transmitter should generate 4 mA. For PV (primary variable) equal to the MAX value, the transmitter should generate 20 mA. The maximum allowable range of the transmitter is shown just above (**RANGE ...**). To edit the range of the transmitter, just change the MIN and MAX values and press the **SAVE RANGE** button.

On this screen you can also edit the unit of the primary variable and the input filter (damping).

ENERAL INFO	NE	W ADDRESS:	CHANGE
MANUFACTURER			
REVISION	5		ī.
TAG	PT01		
DATE	10/15/2014		
MESSAGE	PRESSURE TRANS	MITTER	
DESCRIPTOR			
NGE INFO	Transmitter	measuring range	
NGE INFO Lange: 0850	Transmitter	measuring range	ZERO
NGE INFO (ange: 0850 MIN 0	psi	UNIT: psi	ZERO

Fig. 58 - Adjusting the measuring range of the HART<sup>®</sup> transmitter

# 2.2.4. Adjusting the Measurement Range of a HART<sup>®</sup> Transmitter with Reference (CH Option)

Another way to adjust the range of the transmitter is to generate the minimum and maximum values of the desired range in the transmitter input and to adjust these values as minimum and maximum (set by reference).

To adjust the range of a pressure transmitter, connect the transmitter pressure input to the output port of the Pressure Control Module. Go to the **Calibrator** option, configure the control parameters and select the **Control** mode. Select **mA** at the **(Auxiliary) Input** and press the **Hart** button. The pressure control will work as the standard value for the adjustment range of the instrument.



Fig. 59 - Quick HART<sup>®</sup> adjustment with reference

Generate pressure to the transmitter input corresponding to the lower range value and press the — button. Transmitter will generate 4 mA to this value. Generate pressure to the transmitter input corresponding to the upper range value and press the — button. The transmitter will generate 20 mA for this value.

Another way to do this adjust is to enter in the **HART** option through the **MAIN MENU**, set the connection type, address and then press **CONNECT**. Select the **MONITOR** tab. In this screen it is shown the value of the primary variable (PV) read by HART<sup>®</sup> (digital), the current that the transmitter wants to generate (**AO** - **DIGITAL OUTPUT**), and the current measured by PCON-Y17 (**ANALOGIC READ**). Set the pressure controlled pressing **OUTPUT** and adjust the transmitter range by pressing the  $\downarrow$  **Inf Range** and  $\uparrow$  **Sup. Range** buttons.

ART DEVICE	Changes the number of de	cimais	
PRIMARY VARIABLE	400.7 psi		
DIGITAL OUTPUT	20.000 mA		
ANALOG READ	20.000 mA		
FERENCE ADJUST	na na seconda de la compaña		
SUP. RANGE OUTF	PUT: 400.00 psi	ressure Control Module Output	
HINF. RANGE	Automent of measuring	idinge with reference	
DEVICE INFO	OF ALL SETTING	MONTFORING	

Fig. 60 - Adjusting the Measuring Range of the HART® Transmitter with Reference

#### 2.2.5. Checking / Adjusting HART<sup>®</sup> Transmitter mA Output

In **DEFAULT SETTINGS** tab the output current of the HART<sup>®</sup> transmitter (output trim) can be adjusted according to current measured by the calibrator. You can make this adjustment only when the PCON-Y17 is connected to a single transmitter with address 0, in the **mA INPUT + HART**<sup>®</sup> option of connection, since the calibrator needs to measure the current to make the adjustment.

Before performing the adjustment, a transmitter output current check can be performed by pressing the **CHECK** button. The transmitter will generate a fixed current (4, 8, 12, 16, 20 mA) and the calibrator will show the measured values for each point.

To adjust automatically, simply press the **AUTO** button. The calibrator will send the commands to the transmitter to generate 4 and 20 mA (fixed), make the measurement of these points, and adjust the output (trim). The adjustment is completed when the **D/A Adjustment Completed** message appears.

The **LEAD TIME** field sets the time (in seconds) of each point stabilization time.

HART COMMUNICATOR	HART COMMUNICATOR
MESSAGE PRESSURE TRANSMITTER SAVE MSG TAG: PT01 SET TAG DESCRIPTOR	MESSAGE PRESSURE TRANSMITTER SAVE MSG TAG: PT01 DESCRIPTOR SET TAG
LEAD TIME 5 MODE 4.000 mA FDX READ: 4.000 mA FDX READ: 4.000 mA FDX READ: 8.001 mA FDX READ: 8.001 mA FDX READ: 8.001 mA FDX READ: 12.000 mA MODE 16.000 mA FDX READ: 12.001 mA MODE 20.000 mA FDX READ: 15.001 mA	LEAD TIME 5 MODE 4mA FIX VALUE 4.0008 SAVED MODE 20mA FIX VALUE 19.9988 SAVED D/A ADJUSTMENT COMPLETED. VALUE 19.9988 SAVED D/A ADJUSTMENT COMPLETED.
DEVICE INFO DEFAULT SETTINGS HONOLOGING	DEVICE INFO DEFAULT SETTINGS MONITORING

Fig. 61 - Checking / Adjusting the mA HART<sup>®</sup> Transmitter Output

# 2.2.6. Full-Hart Configurator (FH Option)

If the **HART® CONFIGURATOR** option is enabled, the **FH** software starts. For this option, the instrument is automatically found and the calibrator will display the basic, universal and specific parameters (DD library).

To start the HART configurator you must wait for the PCON-Y17 read all the instrument parameters. The PCON-Y17 will display the message: *Reading device information. Please wait ...* After connected, at the bottom of the screen will show the TAG, model of the connected instrument and the DD (Device Description) file used.

You can open the instrument configuration tree, located on the left side of the screen. This tree changes according to the instrument, since each HART® transmitter has its specific commands.



Fig. 62 – Device Parameters

Double-click the parameter you want to change and edit the value.

Parameters identified by the icon <sup>(1)</sup> have methods. To change them, double click on the parameter and follow the indicated steps.

For other parameters, after editing, the value of the field turns yellow, indicating that there has been a change but it has not yet been saved in the transmitter. To confirm, press the button  $\Im$ . To cancel press  $\Im$ .

**—** ·

To view the value of mA input or change the output setpoint, press the button



Fig. 63 - Calibrator / Controller Input and Output Values

To view the status of the device, enter the **VIEW** menu and then **DEVICE CONDITION**:



Fig. 64 – Device Status

To save the entire configuration of a HART® instrument connected to the calibrator, the **Document Device** function of the **DEVICE** menu can be used. This function is useful when you want to save the configuration of an instrument to later download to another instrument of the same model, or to back up the settings.

Press **DEVICE> DOCUMENT DEVICE**, fill in the File Name field with a name for the configuration and press **Save Device Config**. Optionally, you can note a description of the configuration in the **Notes** field.

Lon How		
A Online	Item	Value Units
	Device setup	ir li
	PV PV	-0.00 deaC
	A Electr	27.85 degC
ocument Device		
File Name		
T01 _ 14472801xt		
NOTES		
-		-
		1
1. C		
	Save Device Config	
	ليستقصينا	
	1	
and Int - Dourie	a: 00 5115 - 111 6d/o1/01/01	HART

Fig. 65 - Saving the Configuration of a Device

When you want to load the saved configuration into an instrument, go to the **DEVICE> DOWNLOAD / VIEW** menu. To select the configuration file, double click on it.

Press the **WRITE** button to download the configuration file for the connected instrument. Before the instrument is fully configured, some confirmation messages will be displayed. To cancel, press X. To continue, press **OK**. At the end of the configuration, the **Configuration Write Complete** message appears.

#### 2.3. Automatic Tasks

In PCON-Y17, automatic calibration can be created and performed tasks. This option can be used to generate calibration work orders for transmitters and indicators. PCON-Y17 also creates and performs tasks for calibration of analog gauges, using the inverted calibration method, so the user can change the control set points in small steps until the expected value is being indicated on the gauge.

#### 2.3.1. Creating Tasks

To create tasks from the main menu, select **CALIBRATOR**. Select the desired type of **Input (Auxiliary)** and the **Pressure Control Module** configuration (select the **Control** mode). For example, to calibrate a pressure transmitter, select the Control mode and mA auxiliary input (which will be connected to the current output of the transmitter). For a pressure indicator, e.g., selected **NONE** for the auxiliary input.

To calibrate an analog gauge using the inverted calibration method, select **NONE** for the input.

Press the **International State of CREATE NEW TASK.** 

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Fill in at least the serial number of the instrument to be calibrated, instrument TAG, stabilization time for each point (wait time in minutes), maximum error allowed for the instrument to be calibrated (in % of the span, reading or full scale), calibration range.

CREATED BY	Jonh A.			C
MANUFACTURER	Presys			C
MODEL	Pressure Transmit	tter		C
MESSAGE				
PLANT				
SERIAL N.	165.01.15	8	WAITING TIME(S)	20
TAG	PT01		MAX ERROR (%)	0.1
ERROR	SPAN	•		

Fig. 66 - Task Information

Go to the **As Found/ As Left** tab. Add each point to be generated by the PCON-Y17 and the expected value for the instrument under calibration, for both **As found** (calibration done before adjustment) and **As left** (calibration done after adjustment). Points can also be generated with the help of the **AUTO** button. By pressing this button, simply enter the maximum and minimum values of the calibration range and the amount of points so that it will be generated a list of points considering the same steps and a linear scale. Also, fill in the number of repetitions (**REP**) of readings, and the calibration strategy (initial to the final point  $\uparrow$ , final to the initial point  $\downarrow$ , etc.). If the As-Found repetitions are set to 0 (zero), the task will contain only As-Left calibration.

For inverted calibrations, select the option **VINVERTED CAL** (this option is available only if the input type **NONE** has been selected).

EXPECTED		mA (IN)		
POINT		POINT		
REP.	0	AUTO		Ē
STRATEGY	¥ 🛨	11 11	3	6
S LEFT			(	*
CONTRACTORNOLI		100-00000		5
EXPECTED		mA (IN)	0 4.0000	_[
EXPECTED		mA (IN) POINT	0 4.0000 25 8.0000 50 12.0000	_[
EXPECTED	4		0 4.0000 25 8.0000 50 12 0000 75 16.0000	[
EXPECTED POINT REP.	1	mA (IN) POINT AUTO	0 4.0000 25 8.0000 50 12.0000 75 16.0000 100 20.0000	_[
EXPECTED POINT REP. STRATEGY	1	mA (IN) POINT AUTO	0 4.0000 25 8.0000 50 12.0000 75 16.0000 100 20.0000	
EXPECTED POINT REP. STRATEGY RANGE 4.0000	1 2 2 4	mA (IN) POINT AUTO # 20.0000 3	0 4.0000 25 8.0000 50 12.0000 75 16.0000 100 20.0000 mA (IN)	

Fig 67 - Task Points and Strategy

Go to the **Review and Save** bar. Choose an identification name/number for your task. If you want to save the model of this task for later use in creating other tasks, press **SAVE TEMPLATE** and give a title for it. When you want to open this model again, open the task creation screen and press **OPEN TEMPLATE** in **Task info** tab.

Click on the **CREATE** button to create the task. It is now saved in the calibrator.

CREATED IN: 01/10/201 INSTRUMENT DETAILS: TAG: PT01 SERIAL NUMBER: 165.01 MODEL: Pressure Transm MANUFACTURER: Presy	5 15 nitter s		
PRESSURE CONTROL 0 1 OUTPUT RANGE: 4 TO 20 MAX ERROR = 0.1% SPAN LEAD TIME: 20 SECONDS	o 100 psi ) mA ((SPAN = 16 mA)) ;		
serviceOrder265		8	
SAVE TEMPLATE			

Fig. 68 - Creating a Calibration Task

#### 2.3.2. Performing Tasks

To perform an existing task, select **TASKS** > **EXPLORE TASKS** from the main menu. A list identifying the created work orders that have not been performed yet (• **WAITING**) is shown. Select the desired task and press **OK**. Make the necessary connections between the calibrator and the instrument to be calibrated and press **START**.

serviceOrder265	ALS TASK DETAILS CREATED IN: 01/10/2015 INSTRUMENT DETAILS: TAG: PT01 SERIAL NUMBER: 165.01.15 MODEL: Pressure Transmitter MANUFACTURER: Presys PRESSURE CONTROL 0 to 100 psi OUTPUT RANGE: 4 TO 20 mA MAX ERROR = 0.1% SPAN( SPAN = 16 mA ) LEAD TIME: 20 SECONDS	
	ORMED DELETE OK	

Fig. 69 - Exploring tasks

PCON-Y17 automatically starts the calibration by generating the set points registered in the task and doing the reading of the instrument to be calibrated. If you select the **NONE** option for the input, for each generated point the calibrator requires the value read by the instrument.

For inverted calibrations, it is possible to vary the control set point in small steps, until the pointer of the analog gauge indicates the desired value. When the initial set point stabilizes, the following screen is shown. This set point variation is made through the buttons "+" and "-" and the steps shall be established by the option **STEP**.

When the analog gauge reaches the desired value, press **OK** to confirm the point.

CANCEL	CHAR	T/TABLE		AS-LEFT
INVERTED CAL.		TO BE OBTAINED 15.000 psi		CONTROLLED PRESSURE 14.908 psi
	-			+
SP=1	4.900	_		
SP=14.900 STEP 0.1				ок

Fig. 70 - Inverted Calibration

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The result will be displayed on the screen, and a progress bar is displayed to indicate the calibration remaining time. At the end of the calibration, a report is shown with the generated values, the obtained values, the expected values, and the error. If the error is higher than the registered value for the task, the line appears in **red**.

The first time that a task is performed, it will be saved as **As-found** (before adjustment). If it runs again, it will be saved as **As-left** (after adjustment). The results are saved in the calibrator and can be viewed at any time.

#### 2.3.3. Viewing Results

Once a task has been performed, it remains saved in the calibrator.

To view the results of a calibration by the PCON-Y17, select **TASKS** in the main menu.

Enable the • **PERFORMED** option. The list will show only the tasks that have been performed. Select the desired work order and press **OK**. On the screen, the report with the calibration points, the obtained values, expected values and the errors will be shown. If the error is higher than the value registered for the task, the line appears in red.

ABS, ERR.	SPAN ERR.
ABS. ERR.	SPAN ERR.
0.0007 mA	0.004%
0.0022 mA	0.014%
	0.000%
0.0014 mA	0.00970
-0.0014 mA	-0.007%
	ABS. ERR. 0.0007 mA 0.0022 mA

Fig. 71 - Viewing the Task Result in the Calibrator

The icon Saves the task data in a PDF file in the internal memory card of the Calibrator. To access the files saved on the PCON-Y17 internal memory, connect the USB cable to the computer (type A USB) and to the PCON-Y17 (Micro-B USB, see **Fig. 01** for DT Version or **Fig. 03** for Rack Mounting Version).

To save the data in a Pen Drive or External HD, press the Pen Drive icon  $^{\amalg}$  after saving the data.

To print the Calibration Report, press the printer icon E. The printer must have been previously configured in **SETTINGS** > **SYSTEM** > **PRINTER CONFIG** and Page 54

must be connected to the Type A USB Host port of PCON-Y17 (see **section 1.5** - Parts Identification).

TASK DETAILS CREATED IN: 01/ INSTRUMENT DE TAG: PT01 SERIAL NUMBER: MODEL: Pressure MANUFACTURER PRESSURE CONT OUTPUT RANGE: MAX ERROR = 0. LEAD TIME: 20 S	10/2015 TAILS: 165.01.15 Transmitter Presys RCL0 to 100 psi 4 TO 20 mA 196 SPAN( SPAN = 16 mA ) ECONDS			PF	SELAL	
As-left perfor	med by:				(many loss)	
As-left perfor	med by: EXPECTED	OBTAINED	ERROR	SPAN ERR.	PASS/FAIL	ĭ 📃
As-left perfor POINT 0.00 # 25.00 #	med by: EXPECTED 4.0000 mA 8.0000 mA	0BTAINED 4.0007 mA 8.0022 mA	ERROR 0.0007 mA	SPAN ERR. 0.004%	PASS/FAIL Pass Pass	
As-left perfor POINT 0.00 # 25.00 # 50.00 #	med by: EXPECTED 4.0000 mA 8.0000 mA 12.0000 mA	0BTAINED 4.0007 mA 8.0022 mA 12.0014 mA	ERROR 0.0007 mA 0.0022 mA 0.0014 mA	SPAN ERR. 0.004% 0.014% 0.009%	PASS/FAIL Pass Pass Pass	
As-left perfor POINT 0.00 # 25.00 # 50.00 # 75.00 #	med by: 4.0000 mA 8.0000 mA 12.0000 mA 16.0000 mA	OBTAINED 4.0007 mA 8.0022 mA 12.0014 mA 15.9969 mA	ERROR 0.0007 mA 0.0022 mA 0.0014 mA -0.0011 mA	SPAN ERR. 0.004% 0.014% 0.009% -0.007%	PASS/FAIL           Pass           Pass           Pass           Pass           Pass	
As-left perfor POINT 0.00 # 25.00 # 50.00 # 75.00 # 100.00 #	EXPECTED           4.0000 mA           8.0000 mA           12.0000 mA           16.0000 mA           20.0000 mA	OBTAINED 4.0007 mA 8.0022 mA 12.0014 mA 15.9989 mA 19.9985 mA	ERROR 0.0007 mA 0.0022 mA 0.0014 mA -0.0011 mA -0.0015 mA	SPAN ERR. 0.004% 0.014% 0.009% -0.007% -0.009%	PASS/FAIL           P355           P355           P355           P355           P355           P355           P355           P355           P355           P355	

Fig. 72 - Printed Task Report

To access the files saved on the SD card (internal files / memory) of the calibrator, connect the USB cable to the USB Type A port of the computer (USB type A) and the USB Device port of the PCON-Y17 (USB type B for version RM, and USB micro type for the DT version, see section **1.5** of this manual, "Identification of Parts").

The logo can be changed to one of your own company. To do this, connect a USB cable between the USB Device port of the PCON-Y17 and the USB Type A port on the computer. Change the LOGO.bmp file to your logo file (it should have a .bmp extension). We recommend an image of size close to 200 x 200 pixels.

To add your signature to the Report, create a signed user in the **Settings**  $\rightarrow$  **System** menu (see section 2.6.1 of this manual, "System") and enable password protected access.

#### 2.4. Data Logger

PCON-Y17 allows you to record a series of measurements over time to display data in a chart or table format.

Select **CALIBRATOR** from the main menu and select the desired configuration for Pressure Control and <u>Aux</u>iliary Input.

Press the icon and select **DATA LOGGER**.

The calibrator automatically starts the measurements and displays each measured point on the chart.

For measurements to be saved, you must press the **REC** button (see **Figure 73**). With this option selected, all points (measurement and time) are saved in an internal file in PCON-Y17, which can be used to generate a table or chart.

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Fig. 73 - Data Logger

In the configuration menu (icon  $\checkmark$ ), you can edit the background color of the chart, color and line thickness, sampling rate (in seconds) and set the x (time) and y (measurements) axis of the chart.

212			DATA LOGGER I	NFO	ی او	
	CLO	GGER	SHEET	OPEN	SAVE	
I	44	44	END		CONFIG	1 and 1

Fig. 74 - Data-Logger Configuration Menu

Recording can also be programmed to start at a certain date and time in the **LOGGER** option. Just set the start time and end time of recording. During the defined range, the measured points are saved in an internal file in PCON-Y17.

To view a saved file press the **OPEN** button, select the desired file, and press **LOAD**. The file name contains the date and time of the measurements.

The **SHEET** button allows the visualization of data in table format, with the date and time of the measurement and the measured values.

If the user wants to export the current data to a ".csv" file that can be opened in a spreadsheet software, press the **SAVE** button and indicate the name and where it will be saved.

The button is saves the current screen image as a ".png" file. All saved screens can be viewed in the **IMAGE** menu.

If a Pen Drive is connected to the USB port, the data logger files (images and data) may be saved in it. If a Pen Drive is not connected, these files are saved in the internal SD card of the calibrator. To access the files saved on the PCON-Y17 internal memory, connect the USB cable to the computer (type A USB) and to the PCON-Y17 (Micro-B USB, see **Fig. 01** for DT Version or **Fig. 03** for Rack Mounting Version).

#### 2.5. Videos

PCON-Y17 has a video player. These videos can be viewed while a calibration is performed and are designed to assist in the use of the calibrator.

From the main menu, when selecting **VIDEOS** a list of video categories appears. Select the category and the desired video. Press the FULL SCREEN button Met to view the video in full screen and the WINDOW button to reduced screen.

To add new videos in the calibrator, connect the USB cable to the computer (type A USB) and to the PCON-Y17 (Micro-B USB, see **Fig. 01** for DT Version or **Fig. 03** for Rack Mounting Version). Open **VIDEOS** folder. Copy the new video to any sub-folder (category) of the VIDEOS folder. If you prefer to create a new category, simply create a new folder inside VIDEOS with the title of the desired category and copy the video to this folder.

#### 2.6. Settings

#### 2.6.1. System

In the **SYSTEM** tab you can set the volume of the calibrator, the touch screen calibration, identification of the calibrator, language, printer and security options.

#### • Touch screen Options

To adjust the touch screen, press the TOUCHSCREEN OPTIONS button. Press the places on the screen indicated by + (it is recommended to use the stylus for touch screen). After the calibration, press again on the screen at any point. Confirm the calibration to return to SYSTEM Menu.

#### • Language Setting

Press the desired language for the system and confirm with the OK button. The system must be restarted to save the configuration.

#### • Calibrator Identification

In this option it is possible to identify your calibrator, choosing a TAG name, Owner name and Location.

#### Sound Options

Press + or - to configure a value for the system audio volume.

#### Security Options

The instrument initially has no access password. This setting can be changed in **SECURITY OPTIONS.** 

To create a new user, press the key icon and then users icon . Fill in the blanks and press **CREATE.** It is possible to add a signature to be used when issuing a calibration report through the **TASK** feature.

Pay attention to the functions that each user level has access in the table below:

		Function				
User Lever	Calibrator	Tasks	Hart®	Data-Logger	Settings	
Operator	$\checkmark$	$\checkmark$	×	×	×	
Тес	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	×	
Admin	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	

To lock the system, press the padlock icon in the system menu. The next time PCON-Y17 is turned on, it will request login and password. To unlock the system, login as an <u>Admin</u> Level user and press the padlock icon in the system menu again.

#### • Adjust Cal.

Adjustment level protected by password (9875).

#### 2.6.2. Network

In **NETWORK** tab it is configured the IP address of the calibrator for Ethernet communication with the computer. The IP address can be dynamically configured (**DHCP**) or may have a fixed address (disable **DHCP** option and edit the desired address).

#### 2.7. Built-in Web Server

Before accessing the PCON-Y17 built-in web server, you must configure the network settings (see section **2.6.2.**). Connect the network cable into the Ethernet port of PCON-Y17 on the front panel (see **Fig. 01** for DT Version or **Fig. 03** for Rack Mounting Version).

To access the PCON-Y17 built-in webserver open the web browser on your computer and enter the following address.

#### <calibrator\_IP\_address>:5000/pconserver/pages/main.cgi

User: *admin* Password: *xvmaster* 

To verify the PCON-Y17 IP address press the button indicated below.



Fig. 75 - IP address



Fig. 76 - PCON-Y17 Web Server

In the PCON-Y17 Web Server, you can monitor the calibrator screen, change the setpoint and see the pressure and the auxiliary input readings.

#### 2.8. SCPI Commands Set

To control the calibrator using the SCPI commands connect a serial cable to the PCON-Y17 USB Type A port (see **fig.02**). Connect the cable to the serial port of the computer. At the menu **Settings**  $\rightarrow$  **Network**  $\rightarrow$  **Serial Comm**, enable the **SERIAL COMM** (**RUN** switch to  $\bigcirc$ ).

#### **Communication Parameters:**

Parity: none Data bits: 8 Baud rate: configurable at the menu Settings  $\rightarrow$  Network  $\rightarrow$  Serial Comm Stop Bits: configurable at the menu Settings  $\rightarrow$  Network  $\rightarrow$  Serial Comm

#### \*IDN?

Description: Instrument Identification. Parameters: ---Response: Manufacturer, ID, Serial Number, Software Version

#### \*CLS

**Description:** Clears the errors list. **Parameters:** ---**Response:** ---

#### SOURce:PRESsure <press>

**Description:** Changes the Pressure Control Setpoint. **Parameters:** New Setpoint **Response:** ---

#### MEASure:PRESsure?

**Description:** Pressure Reading. **Parameters:** ---**Response:** Pressure Reading|Unit|Stability

#### UNIT[:PRESsure]?

**Description:** Current Pressure Unit. **Parameters:** ---**Response:** Current Pressure Unit

#### UNIT[:PRESsure] <unit>

**Description:** Sets the Pressure Unit. **Parameters:** New Pressure Unit **Response:** ---

#### SYSTem:ERRor[:NEXT]?

Description: Checks the Errors List. Parameters: ---Response: Last Error

#### OUTput:CONTRol:TYPE <mode>

**Description:** Sets the Pressure Output Control Mode. **Parameters:** LINEAR | AUTO | MAX **Response:** ---

#### SOURce:PRESsure:SLEW?

**Description:** Reads the Current Pressure Output Slew Rate. **Parameters:** ---**Response:** Slew Rate (in pressure unit / second)

#### SOURce:PRESsure:SLEW <slewrate>

**Description:** Sets the Current Pressure Output Slew Rate. **Parameters:** New Slew Rate (in pressure unit / second) **Response:** ---

# MEASure[:SCALar]:CURRent[:DC]?

**Description:** mA Input (Auxiliary) Reading. **Parameters:** ---**Response:** mA Reading

# MEASure[:SCALar]:VOLTage[:DC]?

**Description:** Voltage Input (Auxiliary) Reading. **Parameters:** ---**Response:** V Reading

#### OUTPut:MODE <mode>

**Description:** Sets the Pressure Operation Mode. **Parameters:** VENT | CONTrol | MEASure **Response:** ---

#### PTYPE?

**Description:** Returns the current pressure mode **Parameters:** -- **Response:** A|G, where A means absolute pressure mode and G gauge pressure mode

#### PTYPE <mode>

Description: Sets the current pressure mode Parameters: A|G Response: OK or Fail

#### 3 - Maintenance

#### **3.1. Replacing the Current Input Fuse**

To replace the PCON-Y17 mA Input (Auxiliary) fuse, proceed as follows:

- Rotate the fuse holder counterclockwise (see **Fig. 01** for DT Version or **Fig. 03** for Rack Mounting Version – Fuse mA input). Try to use a plastic tool to avoid damaging the fuse holder;

- The fuse holder will be released;
- Pull the fuse holder and remove the fuse;
- Place the spare fuse (Time-Lag Type Fuse 32 mA / 250 V / 5 x 20mm).

#### 3.2. Replacing the Power Supply Fuse

In case of blow, the 1 Amp fuse (Time Delay Type Fuse 1 A / 250 V / 5x20mm), placed within the power supply socket on the rear can be replaced.

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The fuse may blow due to a voltage spike in the mains or a calibrator component fault. Replace the fuse once. If a second fuse blows again, it is because the fault is not that simple. In this case, contact the *Presys* technical support.

### 4 - Pressure Units Conversion

psi	bar	mbar	mPa	kPa
1	0.06894757	68.94757	0.006894757	6.894757

psi	Ра	atm	at	mmH₂O
1	6894.757	0.06804596	0.07030695	703.0890

psi	cmH₂O	ftH <sub>2</sub> O@4°C	inH₂O	inH₂O@60°F
1	70.30889	2.306726	27.68067	27.70759

psi	torr	mmHg	cmHg	inHg
1	51.71507	51.71507	5.171507	2.036026

psi	inHg@60°F	gf/cm <sup>2</sup>	kgf/cm <sup>2</sup>	kgf/m <sup>2</sup>
1	2.041772	70.30695	0.07030695	703.0695

# www.presys.com.br