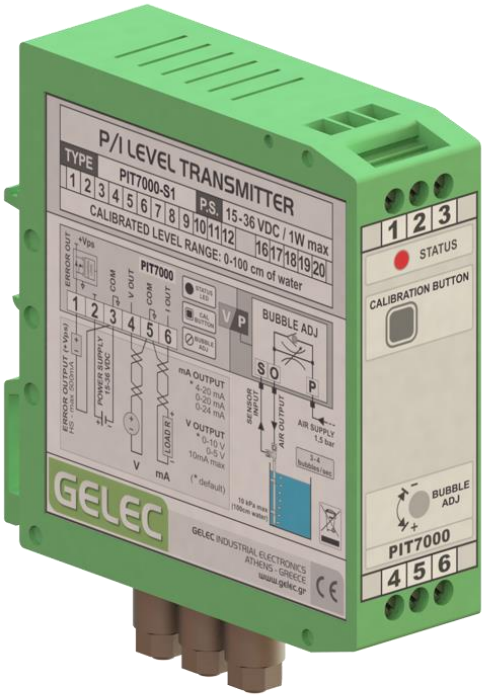
P/I LEVEL TRANSMITTER
PIT70000



GELEC

INDUSTRIAL ELECTRONICS

CONTENTS

I. PRECAUTIONS!

There are no serviceable parts inside the **PIT7000** unit. Not to be opened by any unauthorized person. Any repair, modification, or configuration of the device must be carried out by the manufacturer, or a qualified service engineer familiar with the application.

Improper handling may result in serious personal injury and considerable material damage. All connection and maintenance work must be carried out by qualified personnel.

RISK OF ELECTRIC SHOCK!

Use the correct voltage. The PIT7000 is designed for use with specific voltage only. Connection to a different voltage may cause fire, electric shock or other damage.

Do not touch the device and connection cabling with wet hands.

Disconnect the PIT7000 before cleaning it, to avoid the risk of electric shock.

Attempting to use a malfunctioning PIT7000 can be dangerous.

Do not block the enclosure ventilation slots of the PIT7000.

Keep liquids away from the PIT7000.
Spillage in the enclosure may result to fire, electric shock, or equipment damage. If a small object or liquid falls/spills into the PIT7000 enclosure, unplug the unit immediately. Have the unit checked by a qualified service engineer before using it again.

Set the PIT7000 in an appropriate location.
Do not install in a dusty or humid environment. Do not place it near heater, or air conditioner. Keep it away from air, steam, extremely high/low temperature, or humidity.

Always follow the instructions given by the manufacturer and use the PIT7000 in accordance to its specifications.

2. MANUFACTURER WARRANTY, GENERAL TERMS AND CONDITIONS

Thank you for purchasing our product.

Our products have been manufactured with the latest technology, the highest quality components and have gone through rigorous quality control tests at the factory, before shipment. Make sure that the part number/type indicated on the identification label and package corresponds to the part number/type of your order. After receiving the unit, inspect it in order to ensure that no damage was caused during transportation.

GELEC and GELEC's authorized distributors warrant to the original purchaser that the product shall be free from defect in material and/or workmanship. The warranty period begins on the purchase date (proof of purchase by invoice or delivery note) and is valid for one (1) year.

In the event of malfunction during the warranty period, attributable directly to faulty material and/or faulty construction and functional defects, GELEC and authorized distributors will, at their option, either repair or replace the faulty product with the same or similar model.

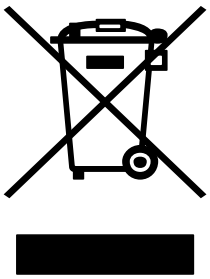
GELEC and authorized distributors shall have no obligation under this warranty, however, in the following cases:

- Any defect caused by freight damage, accident, disaster, faulty maintenance or improper handling.
- Any defect caused by modification, alteration, abuse, misuse, or incorrect installation.
- Any defect of the product caused by improper repair by third party other than GELEC and GELEC's authorized distributors.
- Any incompatibility of the product with subsequent technical innovations or regulations.
- Any defect of the product caused by external equipment.
- Any defect of the product on which the original manufacturer's labeling has been altered or removed.

In case of complaint please contact our company, or send the unit un-dismantled to your local dealer. Any necessary replacement parts and necessary repair work are covered free of charge.

All products are designed and produced by the manufacturer GELEC Co. LP to be in compliance with the EU norms applying to them. GELEC is not responsible for direct or indirect damages or malfunction caused by improper use or installation of the PIT7000.

3. DISPOSAL OF OLD ELECTRICAL & ELECTRONIC EQUIPMENT



This symbol, found on your product, indicates that this should not be treated as household waste when you wish to dispose it.

It should be handed over to an applicable collection point for the recycling of electrical and electronic equipment.

By ensuring this product is disposed of correctly, you will prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate disposal of this product.

The recycling of materials will help to preserve natural resources.

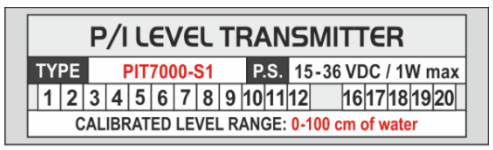
4. P/I LEVEL TRANSMITTER PIT7000

This operator's manual explains the functions and operation of the PIT7000. It also gives some troubleshooting tips as well as general precautions to be taken when operating the unit. In order to ensure the best performance and effective use of the PIT7000, we recommend that you read the information in this manual carefully and follow the instructions contained.

This manual is a complete guide for the PIT7000 with information on unit user maintenance, unit installation and operational instructions. Do not touch parts of the PIT7000 that are not referred in this manual. Keep this manual for immediate reference. It should help in solving any operational questions you may have.

No part of this manual may be quoted, reproduced, stored in a retrieval system, transmitted, transcribed or translated into any other language in any form or by any means, electronic, mechanical, or otherwise, without prior written permission of "Gelec Co. LP".

Although every effort has been made to ensure that this manual provides up to date information, please note that the contents of this manual and unit specifications are subject to change without notice.

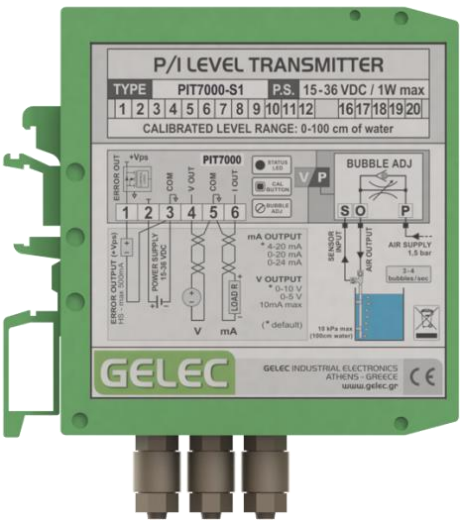


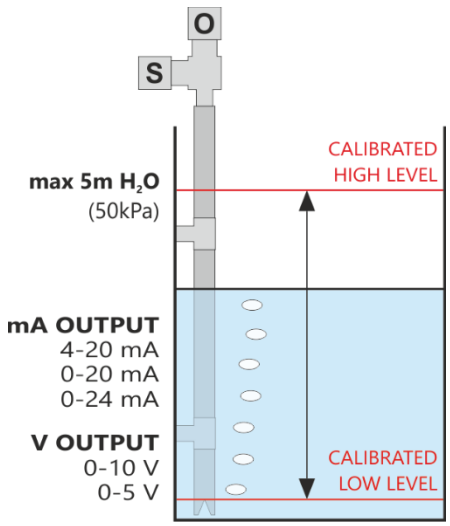
Don't forget to mention the exact type and version of your PIT7000 whenever you contact the manufacturer, asking for any further information. You can find this information on the identification label of the unit.

5. GENERAL DESCRIPTION

The PIT7000 is an industrial, rangeable pressure transmitter, suitable for hydrostatic level measurement in open or vented tanks. It converts the level-proportional hydrostatic pressure to linear current and voltage signal standards (4-20, 0-20, 0-24mA / 0-5, 0-10V) for further processing.

The two output signals can be utilized simultaneously or independently, while their respective output range is selected through a dip-switch. PIT7000 zero and span settings can be easily rescaled in order to meet the operating requirements of your application, while factory default settings can be restored at any time.





The system requires the installation of a bubble tube submerged in the measured fluid, properly connected to the transmitter with pneumatic tubes. A volume of compressed air is constantly released into the fluid in a form of bubbles through the device's airflow regulator and the bubble tube. As the level changes, the backpressure measured by the transmitter's gauge pressure sensor is a direct level measurement.

The transmitter is isolated from the vessel's area and includes a gauge type pressure sensor, an airflow regulator with pneumatic adaptors, a calibration button and a status LED. It is designed to be installed inside an electrical control panel, snapped onto commercially available DIN mounting rails (NS32/NS35). The thermoplastic housing (Polyamide PA 6.6) is suitable and approved for electronic devices and industrial environment.

MAIN FEATURES

- High measuring accuracy in industrial environment
- Two analog outputs (mA/V)
- Five signal standards available (4-20, 0-20, 0-24mA / 0-5, 0-10V)
- Two pressure ranges available: 10kPa (100cm H_2O) , 50kPa (500cm H_2O)
- 0.35mm or 1.23mm resolution (H_2O)
- Pneumatic adaptors for 6/4 connection tubes
- Status LED, calibration button, configuration dip-switch
- Built-in adjustable air flow regulator
- Factory calibrated to full pressure range
- Simple and separate calibration of High and Low critical levels
- Factory default settings can be restored
- Error state recognition with relevant output signal
- Temperature compensated gauge pressure sensor
- Reliable and maintenance-free conductor connections
- Protective circuit against reverse polarity
- 15-36 VDC / 1W max
- DIN rail mounting (NS32/NS35)

ADVANTAGES OF BUBBLER SYSTEMS

- Cost effective and proven operating philosophy
- Transmitter and electrical connections are far from the tank in a protected area
- Proper for high temperature applications and harsh industrial environment
- Only the bubble tube material and the gas are exposed to the process
- Measurement unaffected by foam, pH, conductivity and turbulence
- Suitable for use with corrosive fluids
- System does not include any moving parts

6. FEATURES

PIT7000 VERSIONS

PIT7000 is provided in two versions with different pressure sensors, in order to meet a wide range of level measurement application needs.

	PIT7000-S1	PIT7000-S5
Operating pressure range	0-10 kPa (1.45 psi)	0-50 kPa (7.25 psi)
Factory calibrated level range (H_2O) (1)	0-100 cm	0-500 cm
Sensor resolution (H_2O)	0.35 mm	1.23 mm

1) Factory calibration has been made with **water** in ambient temperature. Values may differ when the device is recalibrated under each application's specific conditions and measured fluid.

TWO ANALOG OUTPUTS / FIVE OUTPUT RANGES AVAILABLE

PIT7000 provides two analog outputs (mA & V) which can be used either simultaneously, or independently. There are five common output signal standards available, covering the majority of process control applications.

The selection of the desired output range can be made from the internal configuration dip switch (SW1/SW2/SW3). The available output ranges are the following.

mA output ranges : 4 - 20 mA , 0 - 20 mA , 0 - 24 mA
V output ranges : 0 - 10 V , 0 - 5 V

Each output range change, forces the device to properly reconfigure its output linearization.

Notice that the output signal cannot get values outside the selected range, even if the application fluid exceeds the calibrated operating region.

SIMPLE CALIBRATION PROCEDURE / DEFAULT SETTINGS

PIT7000 standard versions (S1 and S5) are **factory calibrated in order to exploit the whole operating pressure range of their pressure sensor**. So, the minimum output signal of the selected output range is provided when the sensor is under atmospheric pressure (bubble tube not submerged into fluid), while the maximum output signal is provided when the sensor is under the maximum pressure of its pressure range.

The factory calibrated level ranges for water in ambient temperature are the following.

PIT7000-S1 : 0-100cm (0-10 kPa) , with resolution 0,35 mm (0,0005 psi)

PIT7000-S5 : 0-500cm (0-50 kPa) , with resolution 1,23 mm (0,0017 psi)

By following a simple calibration procedure, PIT7000 can be calibrated to provide its output ranges in different pressure limits than the factory pre-calibrated ones. There is also the option to restore the default factory calibration settings at any time, if needed. Refer to the relevant section for more information.

TWO ERROR STATES - ERROR OUTPUT

PIT7000 is designed to detect and manage two Error states that are likely to occur.

As long as the device is in Error state, the STATUS LED indicates the problem and a signal almost equal to power supply voltage (V_{PS}-1V) is provided through the ERROR OUTPUT for further utilization.

If the *ERROR OUTPUT* cannot be used due to application restrictions, there is the option to get an error signal from the mA output as well. If you select one of the 4-20mA/0-20mA ranges, the device can provide **an '*out of range*' 24mA signal, which can be recognized as an error signal** from the connected PLC. The output signal value (min or max) during an Error state can be selected from the internal configuration dip-switch (SW4), depending on the application needs. Refer to the relevant section for more information.

ERROR 1 - STATUS LED FLASHING RED (3Hz)

Check the device for the following possible problems.

1) mA OUTPUT OPEN CIRCUIT

A simple way to confirm that you have an open circuit, is to cut power supply, disconnect the external circuit from the mA output and short-circuit terminals #5 and #6 with a cable. Turn on the power for a few seconds, the problem should be solved and the PIT7000 should not be in Error state. Check the external circuit for disconnections.

Notice that if you are using only the V output, a 390Ω resistor must be connected at the mA output (terminals #5 and #6). Consult the relevant connection diagram and confirm that this resistor is properly connected.

2) HIGH LOAD RESISTANCE R_L

The load resistance value connected to mA output (including line resistance), may be higher than it should be. Refer to the relevant table and confirm that the externally connected circuit has the proper resistance value.

3) INTERNAL OVERHEATING

Internal overheating is unlikely to occur and may be caused due to wrong electrical connections, excessive temperature in the installation area, or PIT7000 hardware damage. Confirm that all connections and installation environment meet the device specifications.

ERROR 2 - STATUS LED FLASHING RED (1Hz)

INTERNAL HARDWARE FAILURE, OR DAMAGED SENSOR DUE TO EXCESSIVE PRESSURE.

Check all electrical and pneumatic connections and ensure that you have a proper layout. Disconnect/connect power supply. If this error remains, the device has a non-repairable damage. Hardware failure or excessive applied pressure are the possible causes.

Before replacing the damaged device with a new one, ensure that any possible problem that causes overpressure to the sensor (wrong connections/clogged pipes) is solved.

7. PIT7000 OVERVIEW & CONFIGURATION

The PIT7000 is a complete pressure transmitter with 6 built-in connection terminals, an air flow regulator with pneumatic adaptors, a calibration button, a configuration dip-switch and a status LED. Its thermoplastic housing (Polyamide PA 6.6) is approved for electronic devices in industrial environment. It is designed to be installed inside a vented electrical control panel, snapped onto commercially available DIN mounting rails (NS32/NS35).

STATUS LED

The STATUS LED at the front side indicates various operational stages of the PIT7000. Consult the following table for quick reference and the relevant sections for detailed information.

LED COLOR	PIT7000 STATUS
GREEN	Device powered - Normal operation
FLASHING GREEN	High-Level calibration mode
FLASHING ORANGE	Low-Level calibration mode
GREEN/RED	Confirmation of calibration processes
FLASHING RED (3 Hz)	ERROR 1
FLASHING RED (1 Hz)	ERROR 2
OFF	Device not powered

CALIBRATION BUTTON

The calibration button is used in PIT7000 calibration process and when the calibration settings need to be reset to default. Refer to the relevant sections in this manual for more information.

AIR FLOW REGULATOR

The one-way air flow regulator controls the volume of air which escapes the bubble tube. Having the recommended pneumatic layout, you will find this airflow rate preset at approximately **3-4 bubbles per second**. This is the recommended rate for a controlled and constant stream of bubbles, which is important for consistent measurement.

The airflow adjustment can affect the device's proper functionality and re-adjustments are not recommended by a user which is not familiar with the device operation. However, if it is necessary adjust the regulator with a flat screwdriver (clockwise for decreasing, counterclockwise for increasing) and set the bubbles to the recommended rate. The front label may block the regulator access, for unintended adjustments protection.

CONFIGURATION DIP SWITCH

The internal 4-position dip-switch specifies the output range of the PIT7000 analog outputs (mA/V) and their output value during *ERROR* state. **Dip-switch adjustments must not be done when the device is powered.** Disconnect power supply, open the enclosure and proceed to switch adjustments according to the information below. If there is not a dip-switch inside your PIT7000 version, consider all switches being at OFF position.

- **SW1/SW2 switches** (**mA** output range selection)

With SW1/SW2 switches you can select the **mA** output range at terminals **#5**(COM) / **#6**(+).

4 - 20 mA → SW1 : OFF , SW2 : OFF (default)
0 - 20 mA → SW1 : OFF , SW2 : ON
0 - 24 mA → SW1 : ON , SW2 : OFF

--- Do not set both SW1/SW2 to ON ---
This setting is used only in manufacturing stages and can lead to device malfunction.

- **SW3 switch** (**V** output range selection)

With SW3 switch you can select the **Volt** output range at terminals **#5**(COM) / **#4**(+).

0 - 10 V → SW3 : OFF (default)
0 - 5 V → SW3 : ON

- **SW4 switch** (Output value during **ERROR** state)

With SW4 switch you can select the output value during *ERROR* state, according to the selected output range. Refer to the ERROR section in this manual, for more information about the possible errors.

	4-20mA	**0-20mA**	**0-24mA**	**0-10V**	**0-5V**
SW4 : OFF (default)	4 mA	0 mA	0 mA	0 V	0 V
SW4 : ON	24 mA*	24 mA*	24 mA	10 V	5 V

* You can exploit the '*out of range*' 24mA output for *ERROR* recognition from your PLC, when the dedicated *ERROR OUTPUT* cannot be used due to application restrictions.

This is an actual advantage only for 4-20mA / 0-20mA ranges. For the rest of the ranges the output value options are within the measuring range and cannot be utilized. Though, you can choose between minimum and maximum output, according to your application needs.

8. PNEUMATIC SECTION

GAUGE PRESSURE SENSOR

PIT7000 includes a gauge type, silicon piezoresistive pressure sensor, providing an accurate and linear output directly proportional to the applied pressure. On-Chip Temperature Compensated & Calibrated, this sensor is laser trimmed for precise Span, Offset calibration and temperature compensation.

Having a gauge pressure sensor, the PIT7000 uses **the atmospheric pressure** as a reference. This means that it must be installed in a vented electronic panel in order to have the same pressure conditions with the measured tank, which is open/vented by default.

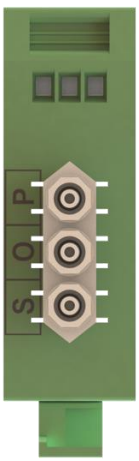
PNEUMATIC ADAPTORS

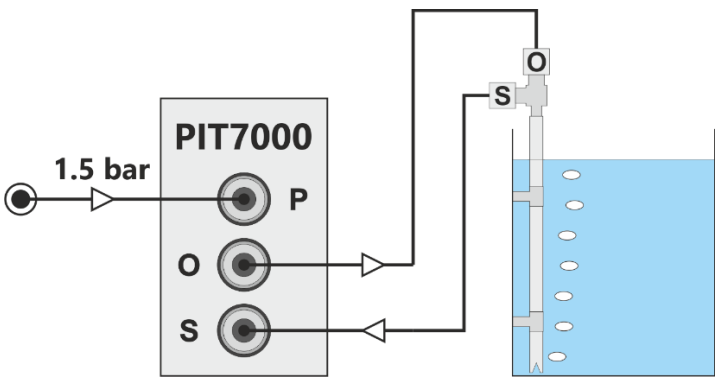
PIT7000 has three straight male pneumatic adaptors for 6/4 connection tubes.

The **(P) adaptor** is the input of the internal air flow regulator and is used for the compressed air supply. Provide an invariable pressure, higher than the hydrostatic pressure of the tank. A recommended pressure value would be approximately 1.5 bar (22 psi).

The **(O) adaptor** is the output of the internal air flow regulator towards the bubble tube. Refer to the 'Airflow Regulator' section in this manual, for bubble adjustment information.

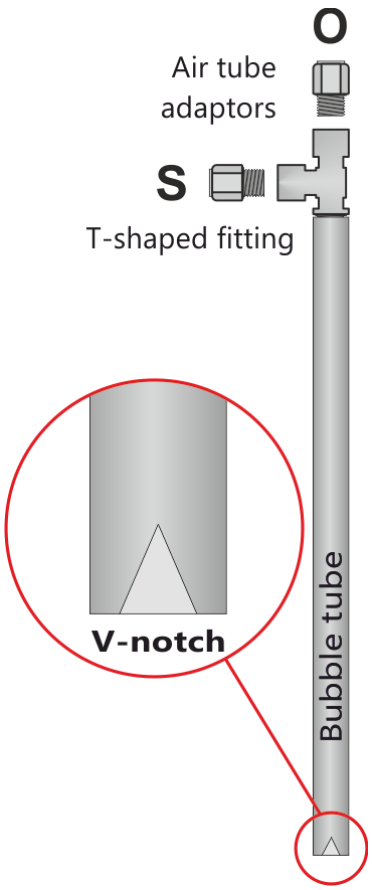
The **(S) adaptor** is the input of the internal pressure sensor which measures the hydrostatic pressure. Check the pressure limits of your PIT7000 version before any connection. Excessive applied pressure can cause permanent damage, or degradation to the sensor.





BUBBLE TUBE

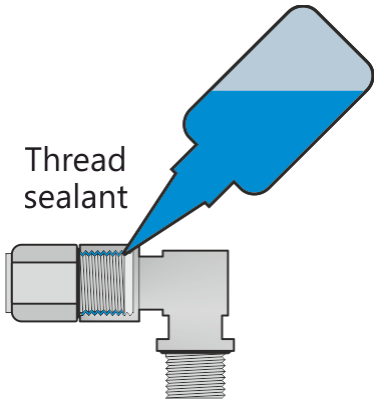
A thin tube should be firmly installed in the tank with its nozzle submerged in the measured fluid. A small volume of air is provided to this tube through the device's airflow regulator and connection pipes, escaping into the fluid in a form of bubbles. **The device measures the hydrostatic pressure at the point where the bubbles are released.**



At the bottom side, the tube's nozzle must have **a smoothed V-notch**, in order to assist the release of a controlled and constant stream of small bubbles (3-4 per second). This is preferable for consistent measurement, rather than intermittent large bubbles.

On the top side, **a T-shaped fitting** is needed to connect the 6/4mm tubes which lead to (S) and (O) adaptors of the PIT7000.

Use standard and compatible pneumatic parts, which meet the operating requirements of the application regarding pressure, temperature, safety etc.



The top of the tube must be at least **25cm above the fluid's highest possible level**, for avoiding fluid suction towards connection tubes and PIT7000 after air supply cut-off.

In order to have unaffected measurement, it is very important to **prevent air leakage in all pneumatic connections**. Use an appropriate thread sealant in all threaded elements.

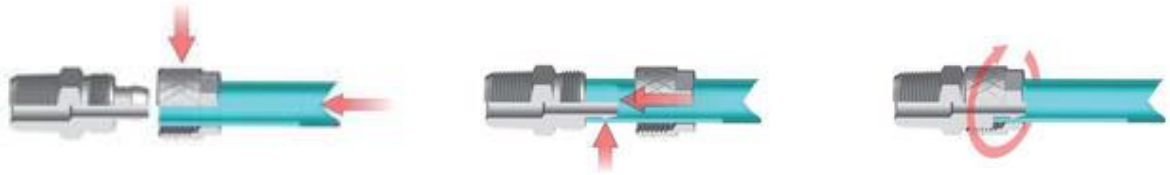
In a common level measurement application, the tube is installed almost at the bottom of the tank. **Ensure that the provided air can escape freely into the fluid** and the nozzle is not blocked by the tank body or possible sediment/dirt during operation. Partial blockage of the nozzle will cause faulty readings and full blockage will lead the compressed air supply directly to the pressure sensor and damage it.

Do not install the tube deeper than your PIT7000 version allows. The excessive applied pressure can cause permanent damage or degradation to the device's pressure sensor.

CONNECTION TUBES

The adaptors are suitable for **6/4mm** tubes and the supported types are **PA6, PA11, PA12, Polyurethane, Polyethylene, PTFE and FEP**. Ensure that the tubes meet the operating requirements of your application (pressure, temperature, safety etc.).

To assembly, insert the tube on the nut, thread the tube on the fitting cone and tighten the nut by hand, or with a spanner.



Ensure that pipes are **smoothly curved and not bended** at all points. Piping layout should remain sufficiently protected from possible bending, blockage, tear, corrosion, or any damage that would affect the device's functionality.

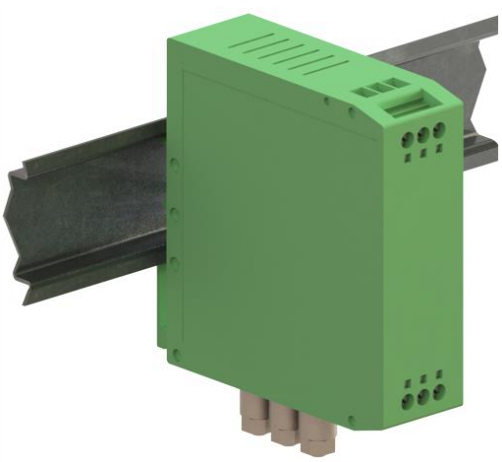
Maintain the pneumatic circuit in good condition. Polluted air, dust, oil etc. inside the circuit may gradually affect the measurement, clog up the pipes, or even damage the device's pressure sensor.

Any air leakage along the (S) / (O) piping will affect the measurement.

9. INSTALLATION

In this section, you can find useful information that have to be taken under consideration during PIT7000 installation. Always follow the recommended instructions and use the PIT7000 in accordance to its specifications.

INSTALLATION AREA



Having a gauge pressure sensor, the PIT7000 uses the atmospheric pressure as a reference. This means that it must be installed in an electronic panel **under atmospheric pressure**, in order to be under the same pressure with the measured tank, which is open/vented by default. Keep the unit protected from steam, flame, extremely high or low temperature and humidity. Do not block the ventilation slots above and below the unit. Fluid insertion into housing may cause damage, electric shock or fire.

In the back side of PIT7000, there is a clip for the mechanical mounting (lock) on an Ω-type mounting rail (**DIN NS32/NS35**), with the release hook at the bottom. The device should have at least 60mm free space below it for the air pipes and 15mm on top of it, for the wires. Ensure that the connected pneumatic tubes are **smoothly curved and not bended**.

PNEUMATIC CIRCUIT

Pneumatic layout must be sufficiently protected from possible bending, blockage, tear, corrosion, or any damage that would affect the device's functionality. Polluted air, dust, oil etc. inside the circuit may gradually affect the measurement, clog up the pipes, or even damage the device's pressure sensor. Check the pneumatic circuit periodically and clean/replace the pipes if necessary. Use standard and compatible pneumatic parts, which meet the requirements of the application regarding pressure, temperature, safety etc.

In order to **prevent fluid suction towards piping** and PIT7000 after air supply cut-off, the top side of the bubble tube must be at least 25cm above the fluid's highest level. Additionally, you can install the device at a point higher than your tank. If somehow fluid suction occurs, disconnect the (S) tube from PIT7000, clean it and confirm that the device works properly before using it again.

BUBBLE TUBE - APPLICATION TANK

The measured level corresponds to **the upright distance between the bubble tube's V-notch vertex and the fluid level**. This means that if the device has the default factory calibration, the V-notch must be installed at the point you need the transmitter's minimum output. For example, in a common application this point is usually the bottom of the tank.

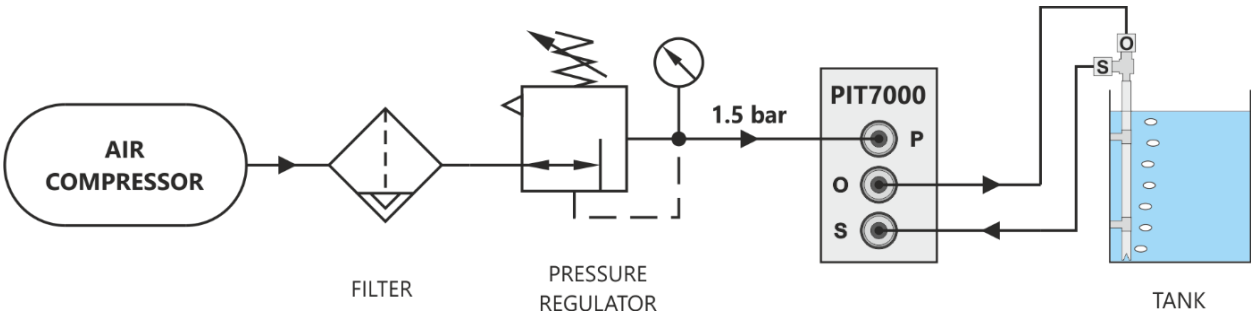
After the tube installation, confirm that bubbles are released from the V-notch and not from another point of the nozzle. The provided air volume must escape freely into fluid, **with the nozzle not being blocked** by the tank body, or possible sediment/dirt. Partial blockage may cause faulty readings and full blockage will lead the air supply directly to the sensor and damage it. In case of tanks with sediments, install the tube at a higher point (so the bubble stream is not affected) and consider this elevation as an offset.

With an invariable pressure of 1.5 bar, possible bubble discontinuance doesn't mean airflow adjustment malfunction. It may be caused by blockage, or air leakage along piping. Inspect (S) and (O) adaptors and piping for possible damages.

Even if the bubble tube is not submerged into fluid, **long distance tubing or other factors in installation may rise a small amount of pressure to the sensor**, causing a small output offset. Re-calibrating Low Level will solve the issue, refer to the relevant section.

PIT7000 has a gauge pressure sensor which uses the atmospheric pressure as a reference. Therefore, **the application tank must be open or vented** and the measured fluid constantly under atmospheric pressure.

The shape of the tank must allow a **linear relationship between the fluid volume and the measured level**. Otherwise a proper software must be developed, which will automatically calculate the filled volume of the tank, depending on the output of the transmitter.



Pneumatic Layout example

APPLICATION FLUID

The application fluid has to be homogenous, having the same density at all points of its volume and with relatively low viscosity, in order to allow a controlled and constant stream of bubbles through it. For example, honey is not an appropriate fluid for this measuring method. In addition, the fluid cannot be sensitive to a gas bubbling through it.

PIT7000 standard versions are factory calibrated with water in ambient temperature, exploiting the whole operating pressure range of their pressure sensor (1m of water in PIT7000-S1 / 5m of water in PIT7000-S5), unless otherwise stated on the product label. So, the level which generates the maximum output signal corresponds to the maximum pressure that your version can handle.

Hydrostatic pressure is affected from factors that cannot be easily specified (fluid/solution density, temperature, gravitational acceleration etc.). In order to **define the maximum level of your application's specific fluid**, after having all electric and pneumatic connections finalized, you can follow the procedure below.

- Gradually fill the tank with the application fluid, while measuring the output signal.
- When you reach maximum output (e.g. 20mA in 4-20mA range), stop the filling.
- ✓ This level is the maximum level that this specific fluid should reach during any process stage. Higher level than that, will expose the PIT7000 sensor beyond its operating pressure range.

10. ELECTRICAL SECTION

ELECTRICAL CONNECTIONS

The PIT7000 housing is equipped with 6 connection terminals, two triple screw terminal blocks per side (top & bottom).

The terminal blocks are manufactured to provide resistance to stress corrosion cracking, electrolytic corrosion, rusting and screw loosening in case of vibrations. This way, conductor connections are maintained reliable and maintenance-free in harsh industrial environment.

The conductor's stripping length should be **8 mm**, with its cross-section within the following ranges (depending on type). The recommended tightening torque is 0.5 - 0,6 Nm.

Rigid solid : **0,2 - 4,0 mm²**
Flexible stranded : **0,2 - 2,5 mm²**
AWG : **24 - 12**

Clamp all types of copper cables without pre-treatment. Do not solder the conductors, as it affects the proper connection quality. Two conductors with the same cross section make contact safely in the clamping parts. If necessary, copper ferrules can be used as a protection against splicing when stranded conductors are wired. In general terms, ensure that you are having reliable mechanical connection and electrical contact.

CONNECTION TERMINALS

Read carefully the following information and refer to the connection diagrams and technical data, regarding proper wiring of the PIT7000 with the associated equipment.

Confirm that you have proper connections before unit operation. Wrong connections may lead to permanent device or external equipment damage. Don't proceed to any connection modification, while the unit is powered.

TERMINALS #2 - #3 *(POWER SUPPLY - V_{PS})*

Connect the power supply **(15-36 VDC)** to terminals **#2 (+)** and **#3(-)**.

Maximum power consumption is approximately 1W. There is not an electrical safety fuse in the internal power circuit. Although there is polarity protection, ensure that you are applying proper voltage and polarity.

TERMINALS #1 - #3 *(ERROR OUTPUT)*

Terminals **#1 (V_{PS} -1V)** and #**3 (COM)** provide the Error output signal during operation. An internal *High Side Driver* provides a voltage output signal during *ERROR* state, almost equal to power supply voltage (V_{PS} -1V).

The output current limit is **500mA**, while the Current Limit Initial Peak is **3A max**.

If you don't need this output, leave the relevant terminals unconnected. Refer to the relevant section in this manual for more information.

TERMINALS #4 - #5 *(V OUTPUT SIGNAL)*

Terminals **#4 (V_{OUT})** and #**5 (COM)** provide the Voltage output signal during operation. The output range **(0…5V / 0…10V)** can be selected from the internal configuration dip switch. Refer to the relevant section in this manual for more information.

The output continuous current limit is **10mA**, with an overcurrent protection of **30mA max**.

If you are going to use the *V OUTPUT* without using the *mA OUTPUT*, **you must connect a 390Ω** resistor to the *mA OUTPUT* (terminals 5-6). Check the relevant connection diagram.

For having the signal unaffected from any interference, it is recommended to use a shielded cable with twisted pair, properly grounded at the side of the signal receiving device.

TERMINALS #5 - #6 *(mA OUTPUT SIGNAL)*

Terminals **#6 (I_{OUT})** and #**5 (COM)** provide the mA output signal during operation. The output range **(4...20mA / 0...20mA / 0...24mA)** can be selected from the internal configuration dip-switch.

Notice that, even if the selected maximum output value is 20mA, this output may be configured to provide **24mA for ERROR recognition** (SW4 at the internal dip-switch). Refer to the relevant section in this manual for more information.

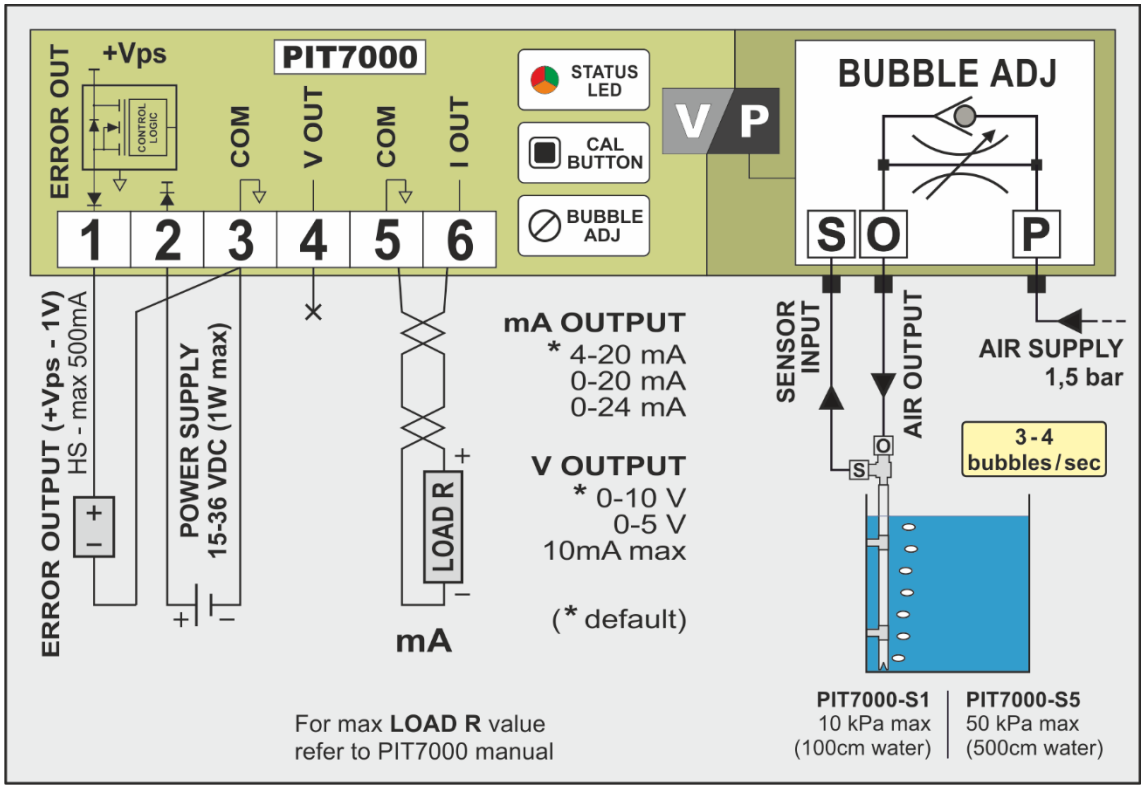
For having the signal unaffected from any interference, it is recommended to use a shielded cable with twisted pair, properly grounded at the side of the signal receiving device.

MAXIMUM LOAD RESISTANCE (R_L)

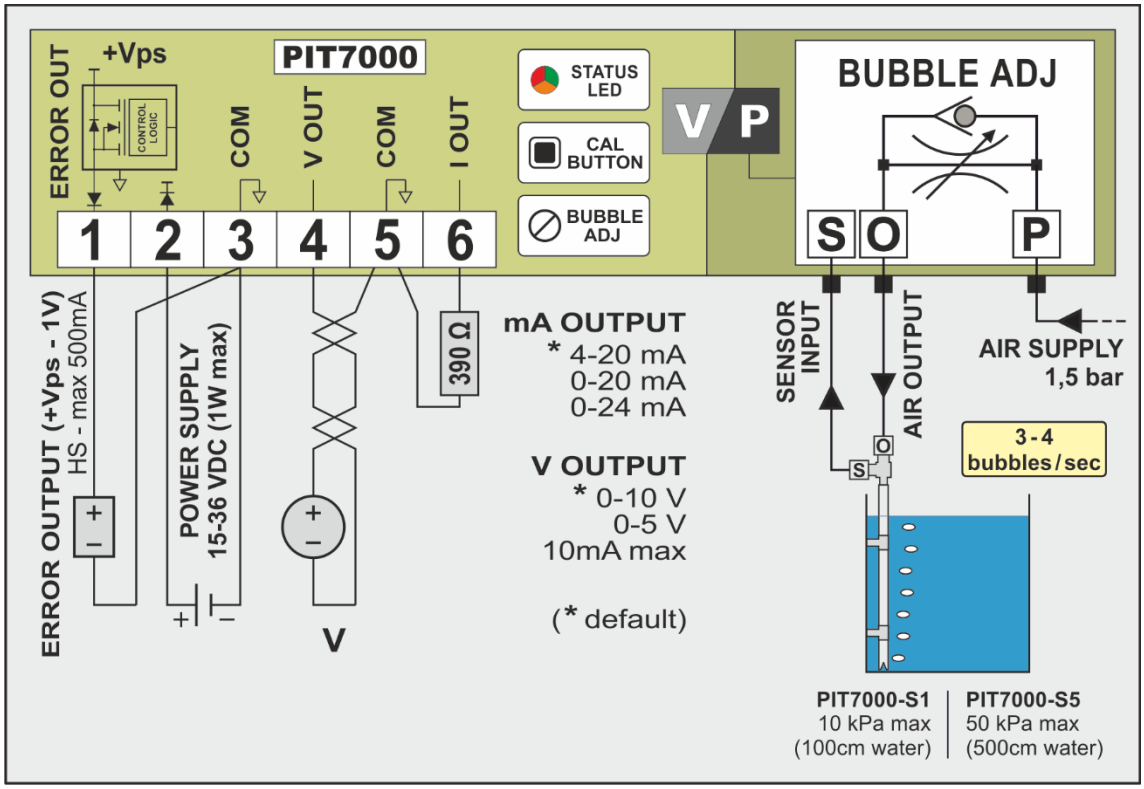
The output current is proportional to level height. In order to get proper and linear mA fluctuation, a maximum load resistance R_L (including line resistance) must not be exceeded depending on the supply voltage (V_{PS}) of the device. Consult the following table for the maximum load resistance you should have for each supply voltage.

V_{PS} (V)	**max R_L (Ω)** for 20mA max output	**max R_L (Ω)** for 24mA max output
15	550	420
16	600	460
17	650	500
18	700	540
19	750	580
20	800	620
21	850	660
22	900	700
23	950	740
24	1000	780
25	1050	820
26	1100	860
27	1150	900
28	1200	940
29	1250	980
30	1300	1000
31	1350	1040
32	1400	1080
33	1450	1120
34	1500	1160
35	1550	1200
36	1600	1240

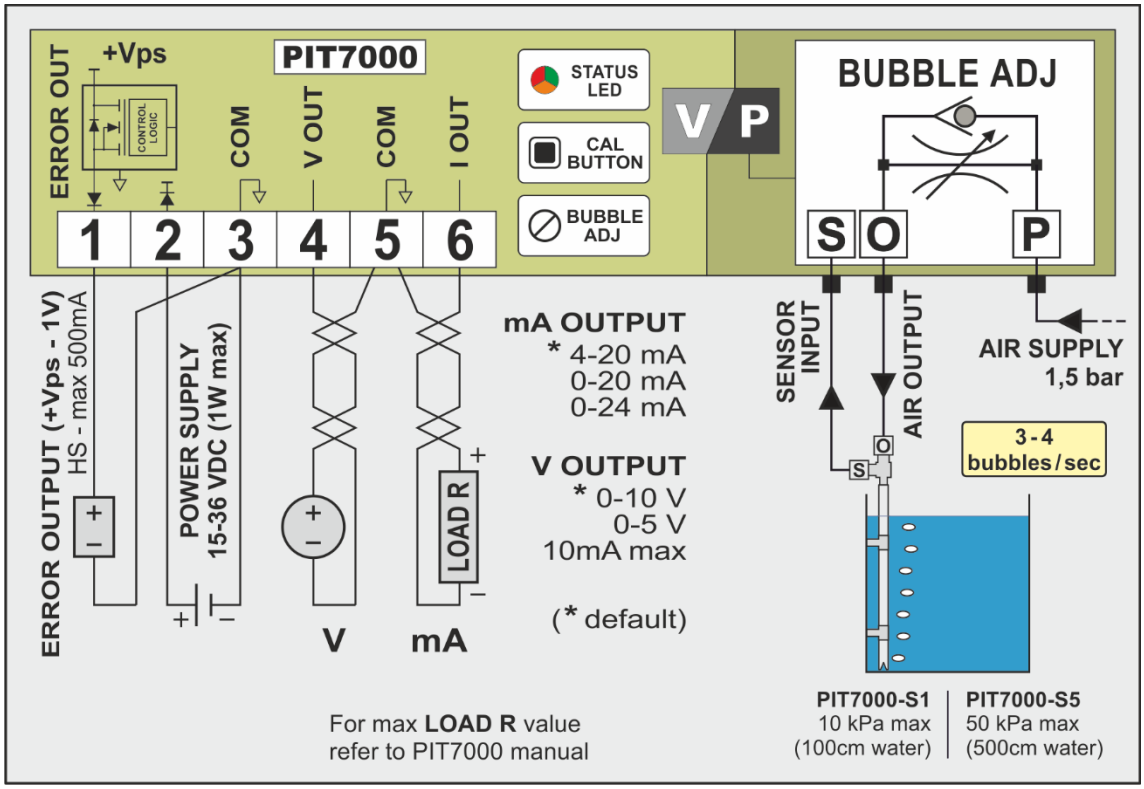
PIT7000 Connection Diagram (only mA output used)



PIT7000 Connection Diagram (only V output used)



PIT7000 Connection Diagram (V & mA outputs used)



II. CALIBRATION PROCESS - DEFAULT SETTINGS

PIT7000 operating model involves **two critical levels ('Low level' & 'High Level') which can be re-calibrated by the user** in order to meet the application requirements, as long as the hydrostatic pressure they cause is within the sensor's specified pressure range. The device configures the output linearization after each level calibration. The fluid level during operation, should be between 'Low' and 'High' levels in order to cause the relevant output changes.

LOW LEVEL

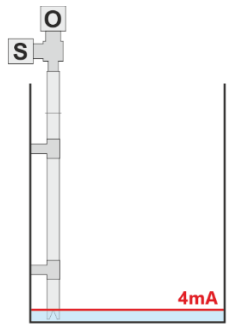
'Low Level' is defined as the level where the PIT7000 provides the **minimum output value of the selected output range** (for example 4mA, if the selected range is 4-20mA).

Unless otherwise stated on the product label, **PIT7000 is factory calibrated to provide the minimum output when atmospheric pressure is applied to its pressure sensor.** In other words, when the bubble tube's V-notch is not submerged into fluid and the provided air escapes freely from it.

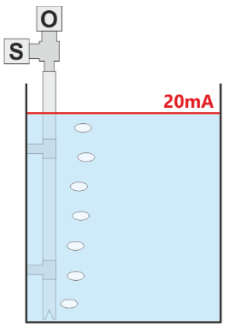
HIGH LEVEL

'High Level' is defined as the level where the PIT7000 provides the **maximum output value of the selected output range** (for example 20mA, if the selected range is 4-20mA).

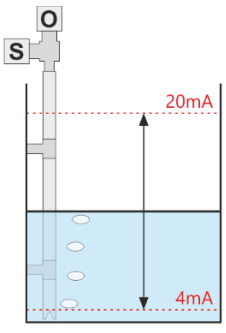
Unless otherwise stated on the product label, **PIT7000 is factory calibrated to provide the maximum output when full rated pressure is applied to its pressure sensor.** In other words, when the bubble tube's V-notch is submerged at a point with 10kPa (100cm water) hydrostatic pressure for PIT7000-S1, or at a point with 50kPa (500cm water) for PIT7000-S5.



CALIBRATED LOW LEVEL
(min output signal)



CALIBRATED HIGH LEVEL
(max output signal)



OPERATING LEVEL
(between LOW and HIGH)

Any modification of the calibration must be processed by an engineer familiar with the device operation, the associated equipment and the application in general.

IMPORTANT CALIBRATION NOTES

- In order to begin the calibration procedure, PIT7000 must be at its **final installation position with all connections (electrical/pneumatic) completed**. The installation area of PIT7000 must be under atmospheric pressure, during calibration and operation.

- **Ensure that you have a proper electrical and pneumatic layout.** Refer to the PIT7000 manual and confirm that every part and connection of the electrical/pneumatic layout meets the recommended requirements. Ensure that the air tubes are clean, smoothly curved, not bended/blocked and without possible leakage.

- After initial power supply, allow a **warm-up time of 15 minutes before calibration**. This will allow PIT7000 components to achieve thermal stabilization and reach the thermal state of normal operation. Without the warm-up time, the output signal during operation may be slightly higher than the calibrated output signal (up to 1%).

- **Adjust the supplied air pressure to 1,5 bar**. Different pressure can also be applied if it is necessary, as long as it's higher than the hydrostatic pressure in maximum level. It is recommended that the applied pressure during calibration, will be the same with the applied pressure during normal operation.

- For maximum measurement precision, **the fluid used in calibration procedure must be the same with the application's fluid**. If this is not possible, you should use a fluid with confirmed similar density. For example, you shouldn't calibrate PIT7000 using water, if it's going to be used in an oil tank. The fluid's temperature during calibration should also be similar to the fluid's temperature during operation.

- Fill the tank at a relatively low level and **confirm that a constant and controlled bubble stream (3-4 per second) is escaping the bubble tube's V-notch**. If you observe a significantly different airflow rate, adjust it properly with the *AIR FLOW REGULATOR*.

- **After any calibration procedure connect properly a multimeter,** to confirm the desired output behavior. The output during calibration stages provides the minimum signal of the selected output range (for example 4mA, if the selected range is 4-20mA).

- **The two levels can be separately calibrated**. You don't have to calibrate both levels, each time a change at one of them is needed. The device automatically reconfigures its output linearization.

LOW-LEVEL CALIBRATION PROCEDURE

PIT7000 should be in normal operation (STATUS LED constant GREEN) before proceeding.

- ► Set the fluid at the level you want the PIT7000 to provide the minimum output value and wait until it becomes calm.
- ► Press and hold CALIBRATION BUTTON until the STATUS LED starts flashing ORANGE. Flashing ORANGE means that the device is in Low-Level Calibration mode.
- ► Press and hold***** CALIBRATION BUTTON until the LED starts flashing GREEN/RED. Flashing GREEN/RED means that data are saved. Release the button.
- ✓ Low Level value is registered. PIT7000 automatically exits Low-Level Calibration mode and returns in Normal Operation (STATUS LED constant GREEN).

***** An **instant press** of the CALIBRATION BUTTON (not press and hold) when the device is in Low-Level Calibration mode, **bypasses this mode** and leads to High-Level Calibration mode (STATUS LED starts flashing GREEN). **The present data are not saved** and the device maintains the value it had before entering Low-Level Calibration mode.

HIGH-LEVEL CALIBRATION PROCEDURE

PIT7000 should be in normal operation (STATUS LED constant GREEN) before proceeding.

- ► Set the fluid at the level you want the PIT7000 to provide the maximum output value and wait until it becomes calm.
- ► Press and hold CALIBRATION BUTTON until the STATUS LED starts flashing ORANGE.
- ► Press instantly CALIBRATION BUTTON. The STATUS LED starts flashing GREEN. Flashing GREEN means that the device is in High-Level Calibration mode.
- ► Press and hold***** CALIBRATION BUTTON until the LED starts flashing GREEN/RED. Flashing GREEN/RED means that data are saved. Release the button.
- ✓ High Level value is registered. PIT7000 automatically exits High-Level Calibration mode and returns in Normal Operation (STATUS LED constant GREEN).

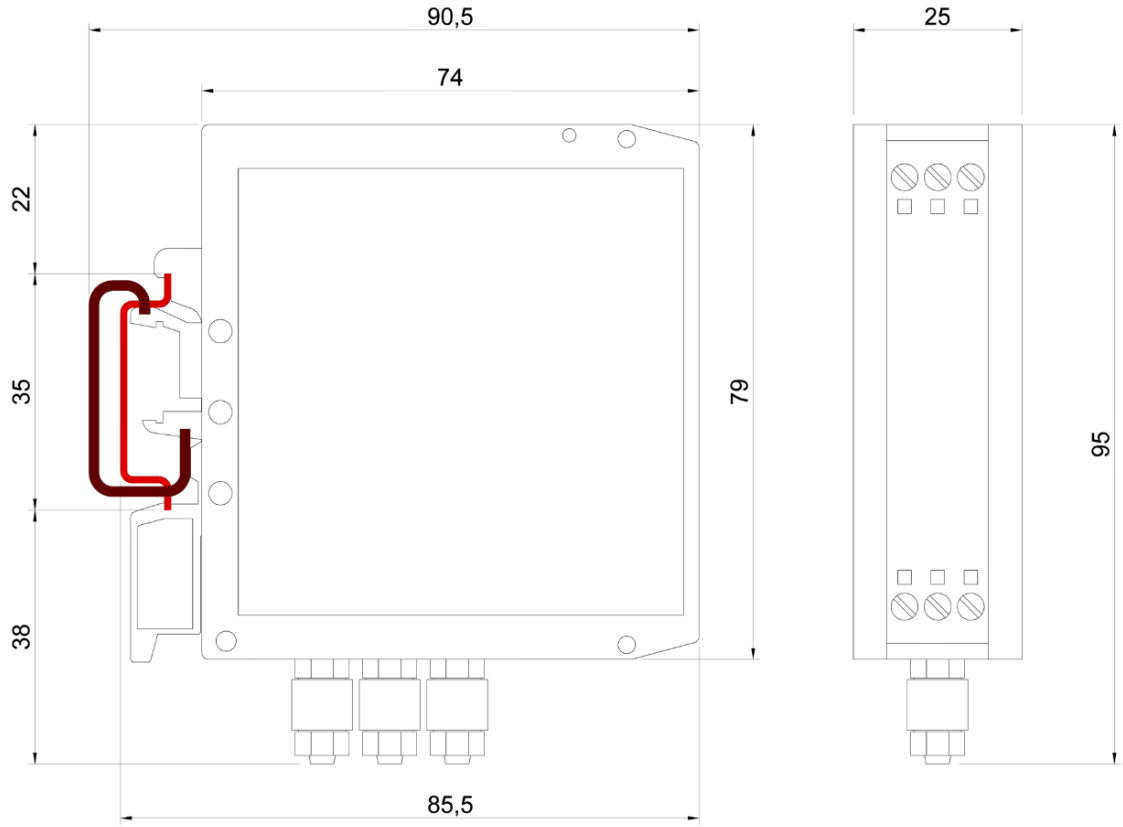
***** An **instant press** of the CALIBRATION BUTTON (not press and hold) when the device is in High-Level Calibration mode, **bypasses this mode** and PIT7000 returns in normal operation (STATUS LED constant GREEN). **The present data are not saved** and the device maintains the value it had before entering High-Level Calibration mode.

RESET TO DEFAULT SETTINGS

The default factory calibration settings can be restored with the following procedure.

- ▶ Turn off the power supply of PIT7000 (STATUS LED is OFF).
- ▶ Press and hold CALIBRATION BUTTON when power supply is off.
- ▶ While still pressing, turn on power and wait until the LED starts flashing GREEN/RED. Flashing GREEN/RED means that settings are reset. Release the button.
- ✓ Settings are reset to default. PIT7000 returns in Normal Operation (STATUS LED constant GREEN).

12. DIMENSIONS



13. TECHNICAL SPECIFICATIONS

PIT7000 GENERAL DATA	
Unit dimensions (HxWxD)	95 x 25 x 85 mm
Minimum installation area (HxWxD)	170 x 26 x 86 mm
Weight	145 gr
Housing material	Polyamide (PA 6.6) - Green
Mounting	DIN rail NS32/NS35 (acc. to EN60715)
Degree of protection	IP20
Recommended installation position	Electrical control panel (vented)
Flammability rating according to UL 94	V2
Operating temperature	-20 ... +70 °C (-4 ... +158 °F)
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)
Features	
Internal pressure sensor	Silicone piezoresistive (Gauge) Laser trimmed Precise span and offset calibration Temperature compensated
Sensor operating pressure range *(S) adaptor*	0-10 kPa / 0-1.45 psi / 0-100cm H_2O (S1 version) 0-50 kPa / 0-7.25 psi / 0-500cm H_2O (S5 version)
Sensor proof pressure *(S) adaptor*	50 kPa (S1 version) 100 kPa (S5 version)
Recommended air pressure supply *(P) adaptor*	1,5 bar / 22 psi
Average air drain	150 cm^3/min (approx.)
Resolution (H_2O at 25°C)	0.35 mm (0.0005 psi) (S1 version) 1.23 mm (0.0017 psi) (S5 version)
Sensor linearity	±1.0% FSS (S1 version) -0.6 +0.4% FSS (S5 version)
Pressure hysteresis	±0.1% FSS
Temperature hysteresis	±0.5% FSS
Pneumatic connection characteristics	
Pneumatic fittings	3 straight male adaptors for 6/4 mm tubes
Plastic connection tubes compatibility	6/4 mm (D/d) PA6, PA11, PA12, Polyethylene, Polyurethane, PTFE, FEP
ELECTRICAL DATA	
Supply voltage	15-36 VDC
Power consumption	1W max

ERROR OUTPUT (Terminals 1-3)	
Current limit	500 mA
Current limit initial peak	3 A max
V OUTPUT (Terminals 4-5)	
Available output ranges	0-5 V / 0-10 V
Maximum continuous current	10 mA (minimum 1kΩ R_L)
Overcurrent protection	30 mA
mA OUTPUT (Terminals 5-6)	
Available output ranges	4-20mA / 0-20mA / 0-24mA
Maximum Load resistance (R_L) *(depending on V_{PS} - check relevant section)*	1.600 Ω (for 20mA max output) 1.240 Ω (for 24mA max output)
Electrical connection characteristics	
Terminal block configuration	6 ends (3 screw connections per side)
Terminal block plating material	High quality copper
Pitch	5 mm
Clamping parts surface protection	Galvanic nickel or tin plating
Clamping parts resistance	Electrolytic corrosion Rusting Stress corrosion cracking
Conductor cross section range	IEC rigid solid: 0,2 - 4,0 mm^2 IEC flexible stranded: 0,2 - 2,5 mm^2 AWG: 24 - 12
Conductor stripping length	8 mm / NOT soldered
Tightening torque	0,5 – 0,6 Nm
STANDARDS	
In conformance with the following standards:	CE

Specifications are subject to change without prior notice.

INDUSTRIAL ELECTRONICS

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