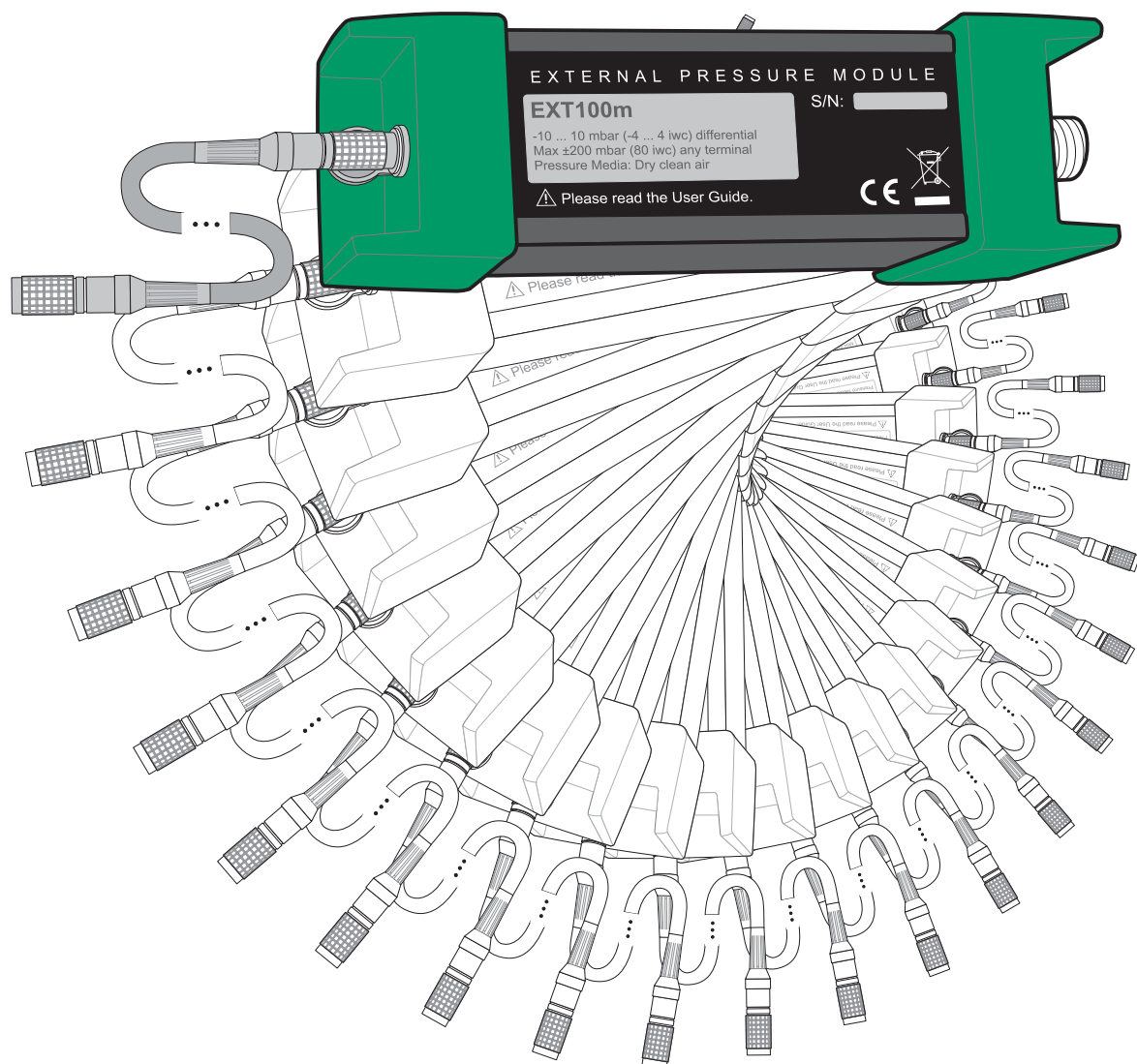


User Guide for External Pressure Measurement Modules



User Guide for External Pressure Measurement Modules

Dear user,

We have made every effort to ensure the accuracy of the contents of this manual. Should any errors be detected, we would greatly appreciate to receive suggestions to improve the quality of the contents of this manual.

The above notwithstanding, we can assume no responsibility for any errors in this manual or their eventual consequences.

We reserve rights to make modifications to this manual without any further notice.

For more detailed technical data about External Pressure Measurement Modules, please contact the manufacturer.

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General

This User Guide applies to all External Pressure Modules made by Beamex. All External Pressure Modules may be used in all Beamex calibrators with a connector for External Pressure Modules and a firmware version supporting the External Pressure Module type.

Note that the EXT-IS modules are specially made for intrinsically safe calibrators and the only ones to that can be safely used in hazardous areas together with an intrinsically safe calibrator.

The External Pressure Module is shipped with:

- a traceable calibration certificate,
- a warranty card,
- this User Guide,
- an optional connection cable and
- with an EXT-IS, a Safety Information leaflet.

In some cases a pressure hose set is also included in the shipment.

Disposal of Waste Electrical and Electronic Equipment

Beamex is an environmentally conscious company developing products with a view to ensure that they are easy to recycle and do not introduce hazardous materials into the environment.

In the European Union (EU) and other countries with separate collection systems, waste from electrical and electronic equipment (WEEE) is subject to regulations.

EU WEEE Directive 2002/96/EC (the WEEE Directive) requires that producers of electronic equipment are responsible for the collection, reuse, recycling and treatment of WEEE which the Producer places on the EU market after August 13, 2005. The objective of this regulation is to preserve, protect and improve the quality of the environment, protect human health, and conserve natural resources.



The symbol on the left is also printed on the product's sticker. It indicates that this product should be handed over to applicable collection point for the recycling of electrical and electronic equipment.

For more detailed information about recycling of this product, please contact your local representative or your waste disposal service.

Service

There is no user serviceable parts in the External Pressure Modules.

Instructions for Use

For other than the barometric module:

Connect the external pressure measurement module to the pressure to be measured using a hose and a connector suited for the use. Take in consideration the pressure media and the maximum pressure when choosing the pressure hose.

For the barometric module:

Make sure that the pressure connection is not covered. Connect the communication cable to the external pressure module and the corresponding connector in the calibrator. To check if the connection between the EXT Module and the calibrator is working, choose Pressure measurement as the **Quantity** and the connected external pressure module as the **Function/Port**.

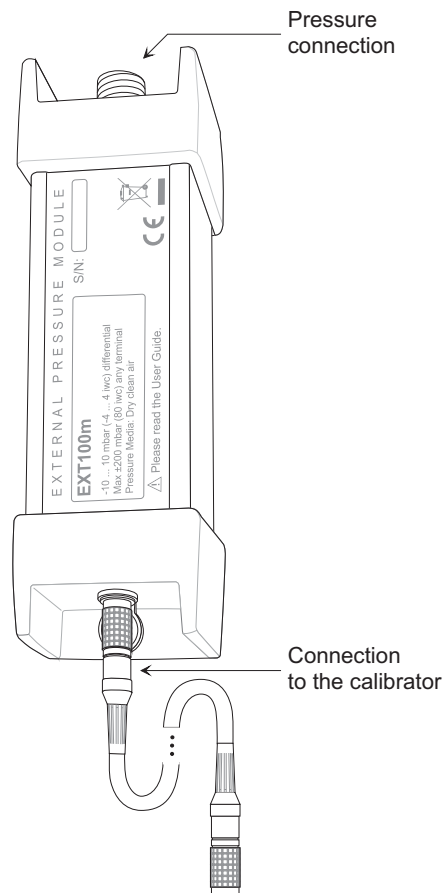
If both the pressure connection and the communication function as expected, proceed with the measurement/calibration.

Remember to read the safety instructions, found at the end of this booklet, before using the Pressure Module.

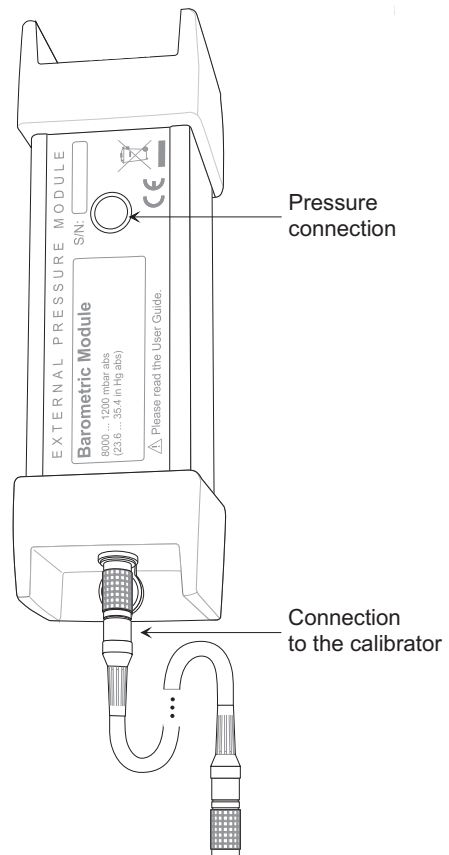
About the Pressure Connections

The location of the pressure connection depends on the module at hand. For gauge modules, see the leftmost picture below. The location of the connections of differential modules are similar to gauge modules except that there are two connections instead of one. For the barometric module, see the rightmost picture below.

Gauge modules:



Barometric module:

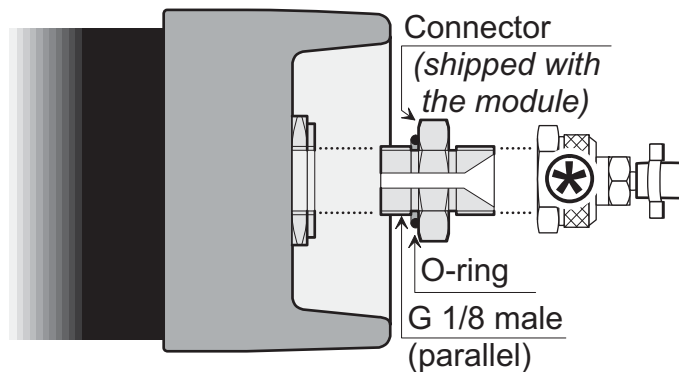


The pressure connection type also varies depending on the module type. The following pictures present connection types for differential and gauge type modules.

Note.

The External Pressure Module body can only withstand a torque smaller than 5 Nm (approx. 3.8 ft•lb [pound-force feet] or 44.25 in•lb [pound-force inches]).

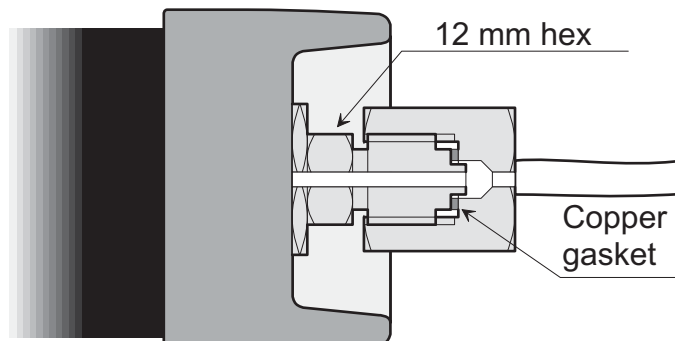
High and Standard Accuracy gauge External Pressure Modules with a pressure range up to and including 20 bar (300 psi):



⊗ To avoid damaging the module, use hand tightening only (max. 5 Nm (approx. 3.8 ft•lb [pound-force feet] or 44.25 in•lb [pound-force inches]) or apply the counterforce with a spanner on the connector body's hexagonal part.

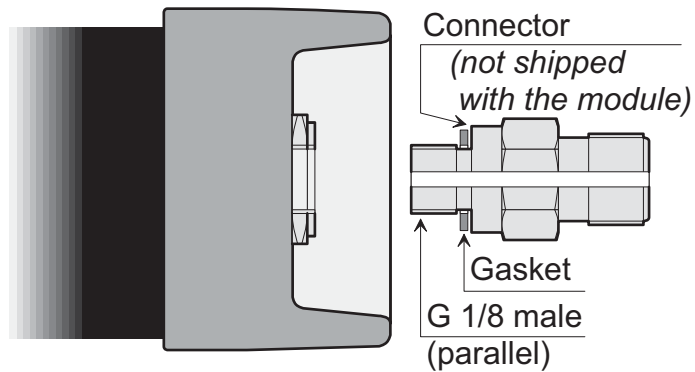
The connector shipped with - and fixed to - the module is suited for Beamex pressure hose connections. It can be removed and replaced with another connector suited for your needs.

High Accuracy gauge External Pressure Modules with a pressure range above 20 bar (300 psi):



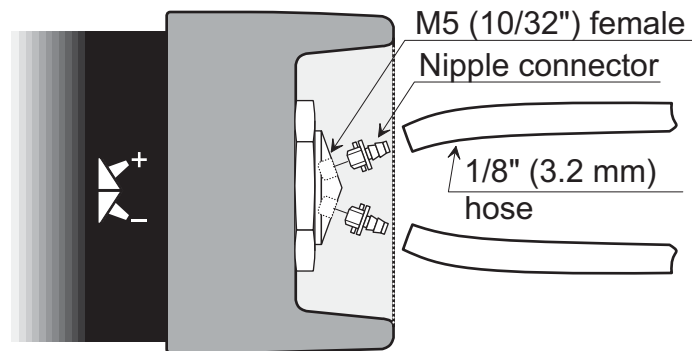
To avoid damaging the module, always tighten or release the pressure connector by applying the counterforce with a spanner on the 12 mm hex.

**Standard Accuracy gauge External Pressure Modules
with a pressure range above 20 bar (300 psi):**



Use a connector with a thread and gasket as specified in the picture above.

Differential modules:



The module body has an M5 thread (10/32") where a nipple connector is located. The connector on the standard delivery is suited for a 1/8" hose (inner diameter approx. 3.2 mm). If you are using another type of hose, replace the nipple connector with a suitable one.

Technical Specifications

Measuring Ranges

| High Accuracy Modules | | | |
|--|-----------|----------------------|------------|
| Type | Unit | Range ⁽¹⁾ | Resolution |
| EXT B(-IS) <i>Barometric module</i> | kPa abs | 80 to 120 | 0.01 |
| | mbar abs | 800 to 1200 | 0.1 |
| | psi abs | 11.6 to 17.4 | 0.001 |
| EXT10mD(-IS) | kPa diff | -1 to 1 | 0.0001 |
| | mbar diff | -10 to 10 | 0.001 |
| | iwc diff | -4 to 4 | 0.001 |
| EXT100m(-IS) | kPa | 0 to 10 | 0.0001 |
| | mbar | 0 to 100 | 0.001 |
| | iwc | 0 to 40 | 0.001 |
| EXT400mC(-IS) | kPa | -40 to 40 | 0.001 |
| | mbar | -400 to 400 | 0.01 |
| | iwc | -160 to 160 | 0.001 |
| EXT1C(-IS) | kPa | -100 to 100 | 0.001 |
| | bar | -1 to 1 | 0.00001 |
| | psi | -14.5 to 15 | 0.0001 |
| EXT2C(-IS) | kPa | -100 to 200 | 0.001 |
| | bar | -1 to 2 | 0.00001 |
| | psi | -14.5 to 30 | 0.0001 |
| EXT6C(-IS) | kPa | -100 to 600 | 0.01 |
| | bar | -1 to 6 | 0.0001 |
| | psi | -14.5 to 90 | 0.001 |
| EXT20C(-IS) | kPa | -100 to 2000 | 0.01 |
| | bar | -1 to 20 | 0.0001 |
| | psi | -14.5 to 300 | 0.001 |
| EXT60(-IS) | kPa | 0 to 6000 | 0.1 |
| | bar | 0 to 60 | 0.001 |
| | psi | 0 to 900 | 0.01 |
| EXT100(-IS) | MPa | 0 to 10 | 0.0001 |
| | bar | 0 to 100 | 0.001 |
| | psi | 0 to 1500 | 0.01 |
| EXT160(-IS) | MPa | 0 to 16 | 0.0001 |
| | bar | 0 to 160 | 0.001 |
| | psi | 0 to 2400 | 0.01 |
| EXT250(-IS) | MPa | 0 to 25 | 0.001 |
| | bar | 0 to 250 | 0.01 |
| | psi | 0 to 3700 | 0.1 |
| EXT600(-IS) | MPa | 0 to 60 | 0.001 |
| | bar | 0 to 600 | 0.01 |
| | psi | 0 to 9000 | 0.1 |
| EXT1000(-IS) | MPa | 0 to 100 | 0.001 |
| | bar | 0 to 1000 | 0.01 |
| | psi | 0 to 15000 | 0.1 |

¹⁾ Every external pressure module's range may be displayed also in absolute pressure if the internal Barometric Module is installed.

| Standard Accuracy Modules | | | |
|---------------------------|------|----------------------|------------|
| Type | Unit | Range ⁽¹⁾ | Resolution |
| EXT200mC-s | kPa | ±20 | 0.001 |
| | mbar | ±200 | 0.01 |
| | iwc | ±80 | 0.01 |
| EXT2C-s | kPa | -100 to 200 | 0.01 |
| | bar | -1 to 2 | 0.0001 |
| | psi | -14.5 to 30 | 0.001 |
| EXT20C-s | kPa | -100 to 2000 | 0.1 |
| | bar | -1 to 20 | 0.001 |
| | psi | -14.5 to 300 | 0.01 |
| EXT160-s | MPa | 0 to 16 | 0.001 |
| | bar | 0 to 160 | 0.01 |
| | psi | 0 to 2400 | 0.1 |

¹⁾ Every external pressure module's range may be displayed also in absolute pressure if the Barometric Option is installed.

Accuracies and Uncertainties

| High Accuracy Modules | | |
|---------------------------|--------------------------------------|---------------------------------------|
| Type | Accuracy ⁽¹⁾ (±) | 1 Year Uncertainty ⁽²⁾ (±) |
| Barometric | 0.3 mbar | 0.05 kPa / 0.5 mbar / 0.0073 psi |
| EXT10mD(-IS) | 0.05 % Span (<i>Span = 20mbar</i>) | 0.05 % Span + 0.1 % RDG |
| EXT100m(-IS) | 0.015 % FS + 0.0125 % RDG | 0.025 % FS + 0.025% RDG |
| EXT400mC(-IS) | 0.01 % FS + 0.0125 % RDG | 0.02 % FS + 0.025% RDG |
| EXT1C(-IS) | 0.007 % FS + 0.0125 % RDG | 0.015 % FS + 0.025% RDG |
| EXT2C(-IS) | 0.005 % FS + 0.01 % RDG | 0.01 % FS + 0.025% RDG |
| EXT6C(-IS) | 0.005 % FS + 0.01 % RDG | 0.01 % FS + 0.025% RDG |
| EXT20C(-IS) | 0.005 % FS + 0.01 % RDG | 0.01 % FS + 0.025% RDG |
| EXT60(-IS) | 0.005 % FS + 0.0125 % RDG | 0.01 % FS + 0.025% RDG |
| EXT100(-IS) | 0.005 % FS + 0.0125 % RDG | 0.01 % FS + 0.025% RDG |
| EXT160(-IS) | 0.005 % FS + 0.0125 % RDG | 0.01 % FS + 0.025% RDG |
| EXT250(-IS) | 0.007 % FS + 0.0125 % RDG | 0.015 % FS + 0.025% RDG |
| EXT600(-IS) | 0.007 % FS + 0.01 % RDG | 0.015 % FS + 0.025% RDG |
| EXT1000(-IS) | 0.007 % FS + 0.01 % RDG | 0.015 % FS + 0.025% RDG |
| Standard Accuracy Modules | | |
| Type | Accuracy ⁽¹⁾ (±) | 1 Year Uncertainty ⁽²⁾ (±) |
| EXT200mC-s | - | 0.05% RDG + 0.05% FS |
| EXT2C-s | - | 0.05% FS |
| EXT20C-s | - | 0.05% FS |
| EXT160-s | - | 0.05% FS |

¹⁾ Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

²⁾ 1 Year Uncertainty includes hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).

Temperature Coefficient

| EXT10mD | |
|---|--|
| SI Unit | Imperial |
| < ±0.002 % Span/°C outside 15 ... 35 °C | < ±0.0012 % Span/°F outside 59 ... 95 °F |
| All Other Modules | |
| SI Unit | Imperial |
| < ±0.001 % Rdg/°C outside 15 ... 35 °C | < ±0.0006 % Rdg/°F outside 59 ... 95 °F |

Maximum Pressure

| High Accuracy Modules | | |
|---------------------------|---------------|---------------|
| Type | SI Unit | Imperial |
| Barometric | 1200 mbar abs | 35.4 inHg abs |
| EXT10mD(-IS) | 200 mbar | 80 iwc |
| EXT100m(-IS) | 200 mbar | 80 iwc |
| EXT400mC(-IS) | 800 mbar | 320 iwc |
| EXT1C(-IS) | 2 bar | 22 psi |
| EXT2C(-IS) | 4 bar | 60 psi |
| EXT6C(-IS) | 12 bar | 180 psi |
| EXT20C(-IS) | 40 bar | 600 psi |
| EXT60(-IS) | 120 bar | 1800 psi |
| EXT100(-IS) | 200 bar | 3000 psi |
| EXT160(-IS) | 320 bar | 4800 psi |
| EXT250(-IS) | 500 bar | 7400 psi |
| EXT600(-IS) | 900 bar | 13000 psi |
| EXT1000(-IS) | 1000 bar | 15000 psi |
| Standard Accuracy Modules | | |
| Type | SI Unit | Imperial |
| EXT200mC-s | 400 mbar | 160 iwc |
| EXT2C-s | 4 bar | 60 psi |
| EXT20C-s | 40 bar | 600 psi |
| EXT160-s | 320 bar | 4800 psi |

Pressure Media

| High Accuracy Modules | |
|---------------------------|---|
| Type(s) | Pressure Media |
| Barometric | Dry, clean, inert, non-toxic, non-corrosive gases |
| EXT10mD to EXT6C | Dry, clean, inert, non-toxic, non-corrosive gases |
| EXT20C to EXT1000 | Clean, inert, non-toxic, non-corrosive gases or liquids |
| Standard Accuracy Modules | |
| Types | Pressure Media |
| EXT200mC-s and EXT2C-s | Dry, clean, inert, non-toxic, non-corrosive gases |
| EXT20C-s and EXT160-s | Clean, inert, non-toxic, non-corrosive gases or liquids |

Pressure Connection

| High Accuracy Modules | |
|---------------------------|---|
| Type(s) | Pressure Connection |
| Barometric | M5 (10/32") female. |
| EXT10mD | Two connector nipples for hoses with an inner diameter of approx. 3.2 mm (1/8") in standard shipment. Hose included |
| EXT100m to EXT20C | G 1/8" female with G 1/8 (ISO 228-1) 60° internal cone adapter. |
| EXT60 to EXT1000 | Acc. to EN 837-1 with ISO 228-1 G 1/4 B thread |
| Standard Accuracy Modules | |
| Types | Pressure Connection |
| EXT200mC-s to EXT20C-s | G 1/8" female with G 1/8 (ISO 228-1) 60° internal cone adapter. |
| EXT160-s | G 1/8 female (parallel). |

Wetted Parts

| High Accuracy Modules | |
|---------------------------|--|
| Type(s) | Wetted Parts |
| EXT10mD | Multiple materials including silicon, plastics, metals etc. |
| EXT60 to EXT1000 | AISI316 stainless steel, Hastelloy, Nitrile rubber, Copper (gasket) |
| Others | AISI316 stainless steel, Hastelloy, Nitrile rubber |
| Standard Accuracy Modules | |
| Types | Wetted Parts |
| All Modules | AISI316 stainless steel, Hastelloy, Nitrile rubber |

Dimensions

| All Modules | | |
|-------------|---------|----------|
| Dimension | SI Unit | Imperial |
| length | 145 mm | 5.7" |
| width | 45 mm | 1.8" |
| depth | 55 mm | 2.2" |

Weight

| All Modules | |
|-------------|----------|
| SI Unit | Imperial |
| 0.5 kg | 1.1 lb |

Operating and Storage Temperature Ranges

| All Modules | | |
|-----------------------|---------------|---------------|
| Temperature Range | SI Unit | Imperial |
| Operating temperature | -10 ... +50°C | 14 ... 122 °F |
| Storage temperature | -20 ... +60°C | -4 ... 140 °F |

Humidity Range

| All Modules | |
|----------------|--------------------------------|
| Humidity Range | 0 ... 80 % R.H. non-condensing |

Maximum Amount of Pressure Cycles for EXT1000/EXT1000-IS

The sensor unit of EXT1000/EXT1000-IS withstands 10000 full range pressure cycles.

Exceeding the maximum amount of pressure cycles may result in leakage or even explosion.

All specifications are subject to change without prior notice

Warnings

Please note that certain warnings do not apply to all External Pressure Measurement modules. E.g., high pressure warnings are valid only for high pressure modules.

Warnings Concerning the Use of External Pressure Measurement Modules

Always depressurize the system before opening or connecting any pressure fittings or connectors. Use proper valves for venting the system. Never connect the pressure tubing to a pressurized connector even when the connector is equipped with a valve that closes when the tubing is removed. Ensure that all connections are made correctly and that the hose and the connectors are intact.

When using gas, the system must not contain any liquid, especially if you do not know how they may react under pressure. Use of clean air or nitrogen is recommended as gaseous pressure media. Liquid pressure media should be preferred when using modules with a pressure range of 60 bar (900 psi) or more.

Never plug a hose with your hands or put the hands in front of a gas spray coming from a leakage. If a gas bubble gets into the blood circulation, it can cause death.

Do not use the same tubing with different liquids or gases.

Warnings Concerning the Use of High Pressure (6 bar / 90 psi or more)

High pressure is always dangerous. Only personnel with good experience and knowledge of high pressure liquid, air and nitrogen operations are allowed to work with the module. Read carefully all these instructions and local safety instructions for high pressure operations before starting the use.

If you use nitrogen, minimize the leak to the atmosphere and take care of sufficient ventilation. Close the valve of the nitrogen cylinder, when the system is not in use. Increase in the percentage of nitrogen in the ambient air may cause unconsciousness and death without warning. Read carefully the safety instructions for nitrogen and make sure that the other people in the same space are aware of the danger.

Check what the local regulations say about construction and use of pressurized vessels. The regulations normally control construction and use of systems where the product of the pressure and volume exceeds a certain limit. The volume of this system depends on the instrument connected to it.

High pressure gas is dangerous because it can break the container and the flying splinters may cause injury. Also small leaks of gas may be dangerous because the high velocity of the leaking gas jet enables penetration through skin. If a gas bubble gets into the blood circulation, it can cause death. The leak jet is particularly penetrative, if some liquid is coming with the gas.

Use of liquid pressure medium is recommended with pressure measurement modules at higher pressure range. Use water or suitable hydraulic oil. Check that the used liquid is not aggressive against the materials used in the transducer or tubing. When using liquid, minimize the amount of air in the system. It minimizes the amount of spilled liquid in case of leakage.



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