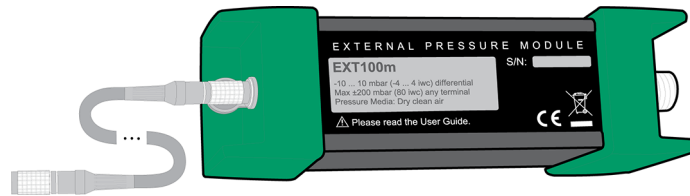


# EXT External Pressure Modules



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.

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

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# Prologue

Thank you for buying the Beamex External Pressure Module(s).

## Typographical Conventions

The following typographical conventions apply to this User Manual:

**Bold** text is, among others, used in the following situations:

- References to User Manual topics and parts



**Note:** This is a note. Notes typically inform you of something useful concerning the current topic.



**Caution:** This is a caution. Whenever you see a caution, read it carefully and take it seriously. By not observing cautions, you may damage the pump.



**Warning:** This is a warning. Whenever you see a warning, read it carefully and take it seriously. By not observing warnings, you may -at worst- damage the pump and/or get personal injury.

# About the External Pressure Modules

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 and EXT-s-IS modules are specially made for intrinsically safe calibrators and the only ones 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
- an EXT-IS or an EXT-s-IS, a Safety Information leaflet

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

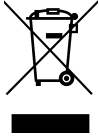
## Disposal of Waste Electrical and Electronic Equipment

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 below 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 are no user serviceable parts in the External Pressure Modules.

# Instructions for Use

## ***For other than the barometric module:***

Connect the external pressure 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**.

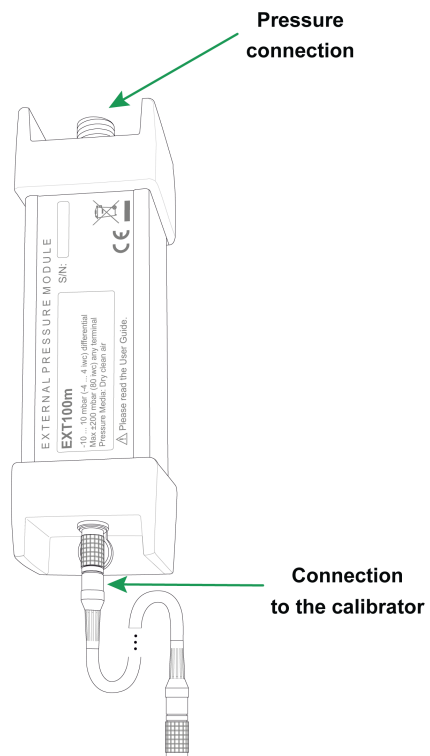
If both the pressure connection and the communication function as expected, proceed with the measurement/calibration.



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

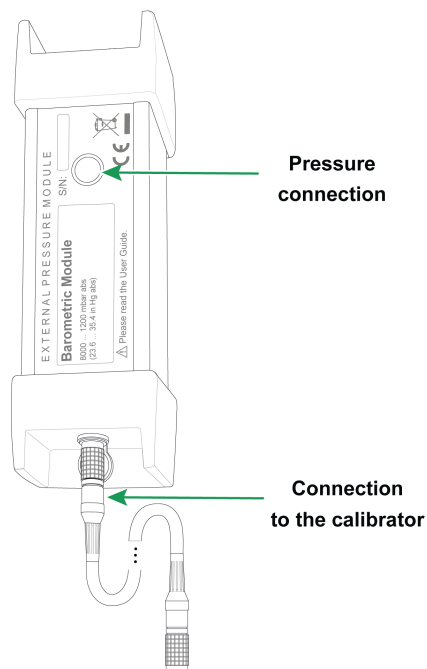
# About the Pressure Connections

The location of the pressure connection depends on the module at hand. For the **Gauge Module**, see the picture below.



**Figure 1: Location of the Pressure Connection - Gauge Module**

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 picture below.



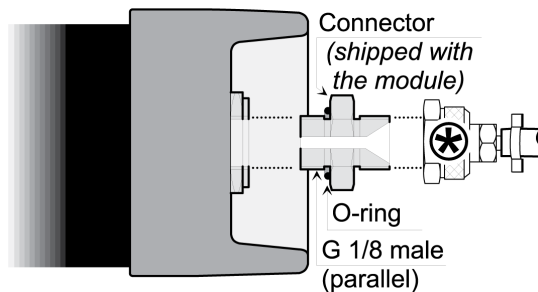
**Figure 2: Location of the Pressure Connection - Barometric Module**

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. 3.69 lbf·ft [pound-force feet] or 44.25 lbf·in [pound-force inches]).

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

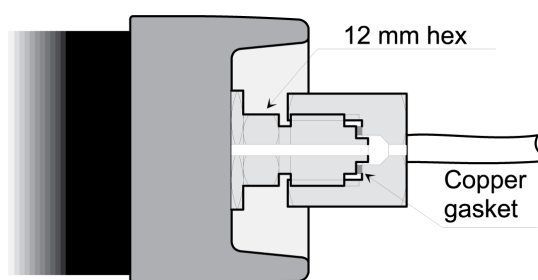


**Figure 3: High and Standard Accuracy Gauge External Pressure Module Connector**

⊗ To avoid damaging the module, use hand tightening only and max. 5 Nm (approx. 3.69 lbf·ft [pound-force feet] or 44.25 lbf·in [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.

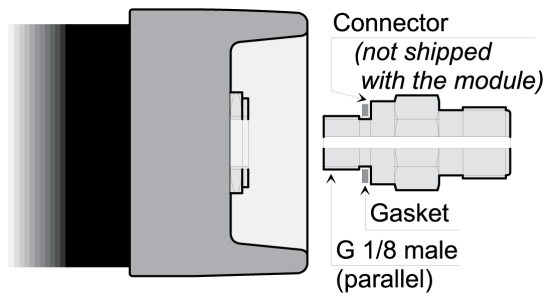
**High Accuracy Gauge External Pressure Modules with a pressure range above 20 bar (300 psi):**



**Figure 4: High Accuracy Gauge External Pressure Module Connector**

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

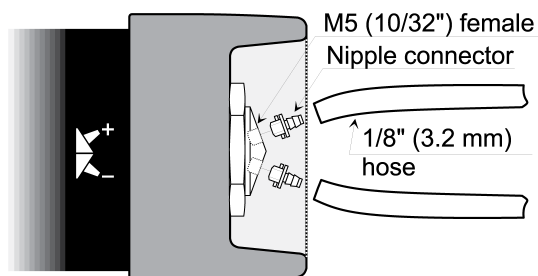
**Standard Accuracy Gauge External Pressure Modules with a pressure range above 20 bar (300 psi):**



**Figure 5: Standard Accuracy Gauge External Pressure Module Connector**

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

**Differential Modules:**



**Figure 6: Differential Module Connector**

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 <sup>1</sup>	Resolution
EXT B(-IS) <i>Barometric module</i>	kPa abs	70 to 120	0.01
	mbar abs	700 to 1,200	0.1
	psi abs	10.1 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

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

<b>High Accuracy Modules</b>			
<b>Type</b>	<b>Unit</b>	<b>Range<sup>2</sup></b>	<b>Resolution</b>
EXT20C(-IS)	kPa	-100 to 2,000	0.01
	bar	-1 to 20	0.0001
	psi	-14.5 to 300	0.001
EXT60(-IS)	kPa	0 to 6,000	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 1,500	0.01
EXT160(-IS)	MPa	0 to 16	0.0001
	bar	0 to 160	0.001
	psi	0 to 2,400	0.01
EXT250(-IS)	MPa	0 to 25	0.001
	bar	0 to 250	0.01
	psi	0 to 3,700	0.1
EXT600(-IS)	MPa	0 to 60	0.001
	bar	0 to 600	0.01
	psi	0 to 9,000	0.1
EXT1000(-IS)	MPa	0 to 100	0.001
	bar	0 to 1,000	0.01
	psi	0 to 15,000	0.1

<sup>2</sup> 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 <sup>3</sup>	Resolution
EXT200mC-s(-IS)	kPa	±20	0.001
	mbar	±200	0.01
	iwc	±80	0.01
EXT2C-s(-IS)	kPa	-100 to 200	0.01
	bar	-1 to 2	0.0001
	psi	-14.5 to 30	0.001
EXT20C-s(-IS)	kPa	-100 to 2,000	0.1
	bar	-1 to 20	0.001
	psi	-14.5 to 300	0.01
EXT160-s(-IS)	MPa	0 to 16	0.001
	bar	0 to 160	0.01
	psi	0 to 2,400	0.1

## Accuracies and Uncertainties

High Accuracy Modules		
Type	Accuracy <sup>4</sup> (±)	1 Year Uncertainty <sup>5</sup> (±)
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

<sup>3</sup> Every external pressure module's range may be displayed also in absolute pressure if the Barometric Option is installed.

<sup>4</sup> Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

<sup>5</sup> 1 Year Uncertainty includes hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).

<b>High Accuracy Modules</b>		
<b>Type</b>	<b>Accuracy<sup>6</sup> (±)</b>	<b>1 Year Uncertainty<sup>7</sup> (±)</b>
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

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<sup>6</sup> Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

<sup>7</sup> 1 Year Uncertainty includes hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).

Standard Accuracy Modules		
Type	Accuracy <sup>8</sup> (±)	1 Year Uncertainty <sup>9</sup> (±)
EXT200mC-s(-IS)	-	0.05% RDG + 0.05% FS
EXT2C-s(-IS)	-	0.05% FS
EXT20C-s(-IS)	-	0.05% FS
EXT160-s(-IS)	-	0.05% FS

## 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

<sup>8</sup> Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

<sup>9</sup> 1 Year Uncertainty includes hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).

## Maximum Pressure

High Accuracy Models		
Type	SI Unit	Imperial
Barometric	1,200 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	1,800 psi
EXT100(-IS)	200 bar	3,000 psi
EXT160(-IS)	320 bar	4,800 psi
EXT250(-IS)	500 bar	7,400 psi
EXT600(-IS)	900 bar	13,000 psi
EXT1000(-IS)	1,000 bar	15,000 psi

Standard Accuracy Models		
Type	SI Unit	Imperial
EXT200mC-s(-IS)	400 mbar	160 iwc
EXT2C-s(-IS)	4 bar	60 psi
EXT20C-s(-IS)	40 bar	600 psi
EXT160-s(-IS)	320 bar	4,800 psi

## Pressure Media

High Accuracy Modules	
Type(s)	Pressure Media
Barometric	Dry, clean, inert, non-toxic, non-corrosive gases.
EXT10mD(-IS) to EXT6C(-IS)	Dry, clean, inert, non-toxic, non-corrosive gases.
EXT20C(-IS) to EXT1000(-IS)	Clean, inert, non-toxic, non-corrosive gases or liquids.

Standard Accuracy Modules	
Types	Pressure Media
EXT200mC-s(-IS) and EXT2C-s(-IS)	Dry, clean, inert, non-toxic, non-corrosive gases.
EXT20C-s(-IS) and EXT160-s(-IS)	Clean, inert, non-toxic, non-corrosive gases or liquids.

## Pressure Connection

High Accuracy Modules	
Type(s)	Pressure Connection
Barometric	M5 (10/32") female.
EXT10mD(-IS)	2 x M5 female threads with adapters for 1/8" (3.2 mm) ID hose.
EXT100m(-IS) to EXT20C(-IS)	Bx G1/8" male.
EXT60(-IS) to EXT1000(-IS)	G1/4" B male.

Standard Accuracy Modules	
Types	Pressure Connection
EXT200mC-s(-IS) to EXT20C-s(-IS)	G 1/8" female with G 1/8 (ISO 228-1) 60° internal cone adapter.
EXT160-s(-IS)	G 1/8 female (parallel).

## Wetted Parts

High Accuracy Modules	
Type(s)	Wetted Parts
EXT10mD(-IS)	Multiple materials including silicon, plastics, metals etc.
EXT60(-IS) to EXT1000(-IS)	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.

## Maximum Amount of Pressure Cycles for EXT1000/EXT1000-IS

The sensor unit of EXT1000/EXT1000-IS withstands 10,000 full range pressure cycles.

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

# Operating Environment and Specifications

<b>All Modules</b>	
<b>Dimensions</b>	Length: 145 mm / 5.7" Width: 45 mm / 1.8" Depth: 55 mm / 2.2"
<b>Weight</b>	0.5 kg / 1.1 lb
<b>Storage temperature</b>	-20 ... +60°C / -4 ... 140°F
<b>Operating temperature</b>	-10 ... +50° C / 14 ... 122°F
<b>Humidity Range</b>	0 ... 80 % R.H. non-condensing

# Warnings

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

## Warnings Concerning the Use of External Pressure Modules



**Warning:** 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.



**Warning:** 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.



**Warning:** 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.



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



**Warning:** EXT-IS and EXT-s-IS modules are the only EXT modules that can be safely used in hazardous areas, together with an intrinsically safe calibrator.

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



**Warning:** 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.



**Warning:** 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.



**Warning:** 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.



**Warning:** 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.



**Warning:** 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.