# **B** BADOTHERM<sup>®</sup>

## PTH – direct mounted to Yokogawa EJ# 110A/E

#### **Design description**

The PTH Diaphragm Seal construction is designed to make the differential or gauge pressure transmitter suitable for a direct manifold fit, meeting the requirements of the IEC 61518. The PTH is standard suitable for pressure measurement up to a maximum process temperature of 200°C. This can however be increased to higher temperatures when combined with different fill fluids. The wetted parts are all made from AISI 316(L), this can be varied depending on the process conditions.

The PTH is a solution that is developed as an alternative to the Rosemount 3051H high process temperature pressure transmitter and is fully interchangeable. The 3051H had a high process temperature capability of 191°C for measuring differential or gauge pressure without the use of remote Diaphragm Seals or capillaries. Badotherm have developed a Diaphragm Seal solution perfectly suited to this type of requirement. This solution makes it possible to continue measuring pressure at high process temperature (capability of 200°C or higher) for measuring differential or gauge pressure by means of a direct manifold-mounted solution.

#### **Process flange - Diaphragm combinations**

The diaphragm is TIG-welded to the flange and is designed to have the best performance for the specific size. This means that the flexibility and shape is carefully tested and measured. The standard thickness of diaphragm foil is 0.075mm. A selection of most common material combination are shown below. Other combination can be made upon request.

Body Material	Diaphragm material		
	General name	UNS	Wst.
AISI 316(L)	AISI 316L	S31603	1.4404
	Alloy C-276	N10276	2.4810
	Tantalum	R60702	-



#### Size, rating and facings

IEC 61518			
Size	Rating	Facing	Roughness
PTH	250 bar		Do 0.9 um
PTH-L	100 bar	IEC 01310	πα υ.ο μπ

#### **Retaining bolts & nuts**

The retaining bolts that holds the process flanges are 5/8" UNC in ASTM A193 B7 and for the standard PTH, for the light version it is size M12 A2-70. Different grades can be selected optionally.

Grade bolt	Grade nut	Material
ISO 3506-1 A2-70	ISO 3506-2 A2	AISI 304
ISO 3506-1 A4-70	ISO 3506-2 A4	AISI 316
ASTM A193 B7	ASTM A194 2H	Carbon steel
ASTM A193 B8M	ASTM A194 8M	AISI 316



#### **Gold coatings**

Two types of gold coating thickness can be applied on the USL-F seals, both suitable for corrosion protection and hydrogen permeation. The selection possibilities are:

- 25 µm thickness
- 40 μm thickness

-> See datasheet "Gold coatings"

#### Torque

The closing of the process flanges is done with 4 bolts.

Туре	Size	Nm	lb.ft
PTH	5/8" UNC	126 Nm	93 lb.ft
PTH-L	M12	80 Nm	59 lb.ft

#### Gaskets

Due to the high static pressure in combination with high temperatures the standard gasket is camprofile stainless steel with graphite layer. In between the PTH and the pressure transmitter it is using an IEC connection as well including a PTFE gasket.

Material	Operating temperature
FKM	-25 / +205°C
Camprofile	-200 /+ 500°C

#### **Pressure**

The maximum working pressure of the PTH is limited by the construction and pressure transmitter. The maximum allowed operating pressure (MAOP) of the construction is depending on the type of bolts used. The maximum pressure of the assembly is depending on the type of PTH

Size	МАОР		Design	
	@20°C	@200°C	@400°C	@20°C
4 x M12 (A2-70)	100 bar	75 bar	25 bar	175 bar
4 x 5/8" (B7)	250 bar	200 bar	50 bar	350 bar
Based on the assumption bolts and body materials has same expansion coefficients. Some materials are limited by material specification and are not able to meet 400°C				

#### **Pressure testing**

The PTH is factory pressure tested at a default value of 55% of the MAOP. Optionally other values can be selected such as MAOP, or a specific value.

#### **Reference accuracy**

0,025% for the Diaphragm Seal + transmitter specifications.

#### Mounting position effects

Zero shifts up to 15 mbar (at 180°C), which can be calibrated out. There is no span effect.

#### **Temperature effect**

The standard temperature effect is very low, however this can reduced with an additional temperature test.

Material	Temperature effect
Standard	0.24 mbar / 10°C
Temperature tested	0.15 mbar / 10°C
Based on 75 um AISI316(L) diaphragm filled with BSO22.	

#### **Material Certification**

Material traceability and related certification are applicable for all process wetted parts. Material certification possibilities depend on the type of seal, the assembly construction and the materials used. Material certification is in accordance with EN10204 3.1.

Additional material certification and testing can be provided on request, such as Positive Material Identification (PMI), Intergranular corrosion (IGC) testing, material certification in accordance with EN10204 3.2, NACE conformity for ISO-15156 (MR-0175) and/or ISO-17945 (MR-0103), NORSOK M-630 and many more.

-> Please note that the responsibility for material selection always rests with the user.

#### Flange Marking & Traceability

All flanges are marked by the forging shop with heat number, material designation, size, and rating. Badotherm adds a Badotherm reference number and the manufacturers name to the flange for traceability purposes.

#### **Flanges and origin**

The seal parts are made from materials according to the applicable standards. The cover flanges are made out of forged bar stock, depending on the selected material.

#### **Leak Testing**

All seals are helium tested according the EN 13185 test procedure A.3 up to 10<sup>-9</sup> mbar l/s before used on a diaphragm seal application. -> See datasheet "Diaphragm Seal testing"

#### **Cleanliness of the wetted parts**

All parts are standard cleaned from excessive oil and grease. When additional requirements are needed, the parts can be cleaned according customer requirements and cleaning specifications.



#### **Example performance calculation**

Whether a diaphragm seal can be used for a specific measurement, depends on the size of the diaphragm. That size is restricted by the size of the diaphragm seal.

For pressure transmitters, Badotherm offers an online performance calculation tool to calculate its performance and to ensure that the diaphragm size is suitable for your measurement.

The table below presents the minimum span of the respective diaphragm sizes with standard process conditions. As rule of thumb, a TPE of max 5% is often considered acceptable, but it depends per situation.

#### Minimum span table

dD	AP/GP	DP
57mm	415 mbar	70 mbar
Pressure transmitter; ambient temperature -10+30°C; process temperature 100°C with BSO 22 fill fluid.		

See the general overview of all diaphragm sizes with several standard situations and in combination with Badotherm pressure gauges.

#### **Replacement parts & Cleaning**

The PTH seal can be used in harsh environments like crude oil or other viscous fluids. Especially with sticky process fluids the reading of the transmitter can deviate in time. Cleaning of the inside of the construction can be done. When the PTH is dismounted according the instructions the process flanges can be removed by loosening the stud bolts. Cleaning of the process heads can be done with appropriate dissolvent allowed by the local authorities. The diaphragms can be cleaned as well however the diaphragms are sensitive to force of a partial surface. Cleaning should be done with care, soft cloths and water or the same dissolvent. After cleaning the PTH can be assembled again. A new gasket is advised to be used at both sides. Tightening should be done according the correct torque and sequence of tightening.

Item number	Description	Ca
9225010325	Camprofile gasket PTH	AISI316 core, graphite layer

Below an exploded view of the PTH assembly.







### Dimensions: PTH assembled to Yokogawa EJX110A







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