

## INTRODUCTION

Instrument valves and manifolds are often used on general applications for liquid and gas service and are suitable for shutting-off impulse lines to separate the instrument from the process medium. This enables replacing, calibration, cleaning or testing of the instrument. For these purposes Badotherm offers a wide range of instrument valves and 2-, 3-, and 5-valve manifolds. Badotherm instrument valves and manifolds are designed to provide the safest possible connection and mounting of instruments. The manifolds can be used for direct mounting to transmitters according to IEC 61518 or for remote mounting to transmitters. All Badotherm instrument valves and manifolds are manufactured within the European Union with certified materials and full traceability. The instrument valves and manifolds are manufactured according to the design standard EN 12266-1 / MSS-SP 99 / MSS-SP 61.

## HOW TO USE INSTRUMENT VALVES AND MANIFOLDS

Using the instrument valve: Instrument valves are often used on general applications for liquid and gas service and are suitable for shutting-off the impulse lines and for mounting to pressure instruments.

Using the 2-valve manifold: In normal operations, the 'isolate' valve is open while the 'vent' valve is closed.

- **To calibrate the instrument,** connect reference equipment to the vent port. It is possible to check the calibration of the instrument without removing it from the installed position.
- **To remove the instrument,** first close the 'isolate' valve, then open the 'vent' valve to relieve pressure upstream (from 'isolate' valve to instrument).

Using the 3-valve manifold: In normal operations, the 'isolate' valves are open while the 'equalize' valve is closed. This provides a differential pressure reading to the pressure gauge or transmitter.

- **To start-up the instrument,** first open the upstream 'isolate' and 'equalize' valve, then open the downstream (from 'isolate' valve to process) 'isolate' valve and close the 'equalize' valve.

- **To zero the instrument,** first close the downstream 'isolate' valve then open the 'equalize' valve and adjust the zero setting on the instrument.
- **To remove the instrument,** first close both 'isolate' valves, then open the 'equalize' valve to relieve pressure between the manifold and the instrument.

Using the 5-valve manifold: In normal operations, the 'isolate' valves are open while the 'equalize' and 'vent' valves are closed. This provides a differential pressure reading to the pressure gauge or transmitter.

- **To start-up the instrument,** first open the upstream 'isolate' and 'equalize' valve, then open the downstream 'isolate' valve and close the 'equalize' valve.
- **To zero the instrument,** first close both 'vent' valves and the downstream 'isolate' valve. Then open the 'equalize' valve and adjust the zero setting on the instrument.
- **To calibrate the instrument,** an option provided by 5-valve manifolds, which is not available on 3-valve types, is connecting the 'vent' port to pressure sources to check the calibration of the instrument.
- **To remove the instrument,** first close both 'isolate' valves, then open the 'equalize' valves to relieve pressure between the manifold and the instrument.

## STANDARD PRODUCT FEATURES

Some highlights of standard instrument valves and manifolds are:

- Certified stainless steel components
- T-bar handle
- Stainless steel stop pin
- Laser engraved identification
- Heat code traceability on body with original material certificates according to EN10204 - 3.1
- Virgin PTFE spindle gasket
- Pressure rating 413 bar (6.000 PSI) at 38°C
- (Hydro) static pressure tested at 1.5 times maximum working pressure

### VALVE SPINDLE ASSEMBLY

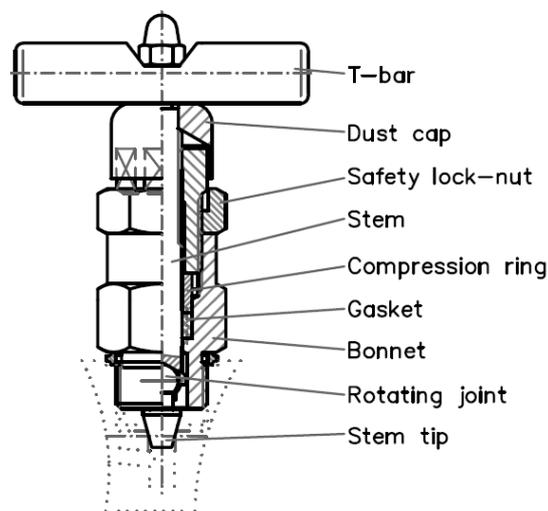
The most important part of the instrument valve or manifold is the spindle assembly with the following highlights:

- **T-bar handle** for operating the valve.
- **Colour anodised dust caps** to prevent ingress of contamination and to protect actuating threads. Dust caps are made of aluminium.
  - Blue = isolation valve
  - Red = vent valve
  - Green = equalizing valve
- **Safety lock-nut** is mounted to prevent unwanted loosening of the valve stem spindle gasket.
- **Hard stem** is precision machined material to provide consistent shut-off.
- **Compression ring** is used to divide compression and rotational friction on the spindle gasket equally.
- **Spindle gasket** is made of Virgin PTFE to ensure leak free closing of the valve assembly.
- **Bonnet** is holding the spindle gasket and the compression ring together and is made of the same material as the valve body.
- **Rotating joint** to create a stem tip that is not wearing the valve seat due to rotational friction.
- **Tip** is made of various materials in order to prevent wear of the spindle and chemical resistance to the process.

The compatibility of material with the process media is important. Parts that are considered as wetted parts, because they come into contact with the process medium, are:

- Stem / axle
- Tip
- Bonnet
- Gasket

All mentioned parts above can be executed in various exotic material (see product datasheets).



### SPINDLE GASKETS AND ANTI-SEIZE

Spindle gaskets are used to prevent leakage of gases and/or liquid. Badotherm spindle gaskets are standard made of Virgin PTFE and optional in Flexible Graphite.

The supplied anti-seize compound is a Copper / Graphite 2 gram pillow pack composed from pure Copper and Graphite flakes.

### VENT AND PURGE PORTS

The purpose of 3 or 5-valve manifolds is to consolidate several valves into one body, allowing engineers to do various tasks and functions without removing the pressure instrument from the installed position.

Various instrument valves and manifolds can be supplied with vent ports, purge ports or even both. In the market, the purge port is also referred to as 'test' port. The difference between a vent and a purge port is:

- **Vent ports** are ports where the process media can be drained or vented, but it is blocked by a valve. This valve needs to be open before it can be vented.
- **Purge ports** are open ports where the process media can be drained or purged. It is only blocked by a blind plug, but once removed the process media can run out without a valve that is blocking it.

**MARKING**

Each instrument valve or manifold has laser engraved markings that contains the following information:

- Product type
- Instrument & process connection
- Packing
- Max pressure / temperature rating at 38°C
- Schematic flow diagram
- Heat no. codification
- Body material
- Spindle codification in case of exotic material
- Origin

**CLEANING AND PACKAGING**

Every Badotherm instrument valve or manifold is cleaned and packed in accordance with Badotherm Standard Cleaning and Packaging procedure (Valves & Manifolds).

Optional there is a cleaning for oxygen service (for PTFE spindle gasket only) where the wetted parts are cleaned with a suitable detergent. The instrument will be laser marked with the 'free of oil' logo. Further, these

instruments are packed individually in airtight plastic bags and carton boxes.

**PRESSURE TESTING ACC. EN12266-1**

All Badotherm instrument valves and manifolds are manufactured within the European Union with certified materials and full traceability. The instrument valves and manifolds are manufactured according to the design standard EN 12266-1 / MSS-SP 99 / MSS-SP 61.

Every Badotherm instrument valve or manifold is factory tested with a shell test and a seat test performed at 1.5 times the maximum working pressure according to EN 12266-1 - P10, P11 and P12 respectively MSS-SP61.

**PRESSURE EQUIPMENT DIRECTIVE (PED)**

Due to internal bore size and internal volumes up to and including 1" / 25mm, products offered in this catalogue comply with S.E.P (Sound Engineering Practice) article 3, paragraph 3 of the Pressure Equipment Directive (P.E.D.) 97 / 23 / EC and therefore CE marking is not applicable.

**INTRODUCTION**

The conditions in the process industry are becoming more challenging and therefore a growing need for additional specifications is required. Some highlights of the optional features are:

- Flexible Graphite spindle gasket
- Pressure rating 10.000 PSI (689 bar) at 38°C
- Suitable for Sour Gas Service
- Full compliance of NACE MR01-75 specifications
- Anti-tamper and lockable handle features
- Cleaning for oxygen service
- Mounting bracket and assembly kits
- Blind plugs and plug & chain

**WIDE RANGE OF EXOTIC MATERIALS AVAILABLE**

Various exotic materials are available for body and stem/tip. The suitable material is dependent on the process media. Exotic materials can be sourced from NORSOK M-650 approved mills. The list below provides the various exotic materials:

- Monel 400
- Hastelloy C-276
- Duplex 2205
- Super Duplex 2507
- Titanium Gr. 2
- Inconel 625
- Stellite 6b (stem only)

**PRESSURE TEMPERATURE RATINGS BODY MATERIAL**

The following pressure temperature ratings are applicable for various body materials:

| temperature               | AISI 316(L) | Monel 400 | Hastelloy C276 | Duplex 2205 | Super Duplex 2507 | Inconel 625 |
|---------------------------|-------------|-----------|----------------|-------------|-------------------|-------------|
| -29 / -17 °C <sup>1</sup> | 413         | 335       | 431            | 431         | 431               | 431         |
| -17 / +38 °C              | 413         | 335       | 431            | 431         | 431               | 431         |
| 50 °C                     | 401         | 299       | 431            | 431         | 431               | 431         |
| 100 °C                    | 351         | 281       | 429            | 422         | 422               | 429         |
| 150 °C                    | 321         | 272       | 418            | 382         | 383               | 418         |
| 200 °C                    | 297         | 272       | 403            | 355         | 355               | 403         |
| 250 °C <sup>1</sup>       | 278         | 272       | 386            | 337         | 337               | 386         |
| 300 °C <sup>1</sup>       | 263         | 272       | 357            | 323         | 324               | 357         |
| 350 °C <sup>1</sup>       | 253         | 272       | 335            | -           | -                 | 335         |
| 400 °C <sup>1</sup>       | 245         | 267       | 305            | -           | -                 | 305         |
| 450 °C <sup>1</sup>       | 240         | 224       | 282            | -           | -                 | 282         |

All pressures in Bar

<sup>1</sup> Only applicable in combination with Flexible Graphite spindle gasket

**ANTI-TAMPER SPINDLE**

An anti-tamper spindle is a removable T-bar handle, which makes it possible to disconnect the T-bar from the manifold. This reduces the risk of human errors and / or deliberate tampering. The valve can be operated with the anti-tamper key. Every Badotherm instrument valve or manifold can be provided with an anti-tamper spindle.

**PRESSURE TEMPERATURE RATINGS SPINDLE GASKET**

The following pressure temperature ratings are applicable for spindle gaskets:

|                          | maximum pressure | temperature |
|--------------------------|------------------|-------------|
| <b>Virgin PTFE</b>       | 413 bar          | 100 °C      |
|                          | 275 bar          | 200 °C      |
| <b>Flexible Graphite</b> | 413 bar          | 100 °C      |
|                          | 230 bar          | 450 °C      |

## INTRODUCTION

Instrument valves and manifolds are positioned between the process and the instrument, which means that they have a minimum of two connection types. Logically, the process and instrument connection of the manifold can differ. For example, an instrument valve type BDTV910 can have a 1/2" NPT female instrument connection and a 1/2" BSP male process connection. Every process connection is customer specific, whereas instrument connections are often standardized. Badotherm offers several methods to mount instrument valves and / or manifolds:

- Thread options to mount instrument valves to pressure gauges
- Fitted and welding options to mount instrument valves to flush ports
- Accessories for mounting the instrument valve or manifold

## MOUNTING INSTRUMENT VALVES OR MANIFOLDS TO PRESSURE GAUGES

Thread connections are used to mount a pressure gauge with an instrument valve. It is recommended to select a pressure gauge with a NPT male connection and a manifold with a NPT female instrument connection.

When a BSP thread is selected, the instrument valves and manifolds are *standard* executed with an ISO 1179 gasket surface, while pressure gauges are manufactured with an EN 837 gasket surface. This can result in a channel that will be blocked by the gasket because of the eccentric hole in the manifold. The channel of the manifold and the pressure gauge are not in line and will have an improper or no flow at all. To avoid this, select a manifold instrument connection according to:

- EN 837 for pressure gauge mounting
- ISO 1179 for other mounting i.e. tubing

Various thread connections are described in the addenda.

## PRESSURE LEAK TEST OF THE ASSEMBLY

The pressure leak testing of the assembly is standard done with compressed air at 6 bar. Optional pressure leak testing is possible, e.g. process pressure or hydro-static pressure test of the assembly.

## MOUNTING INSTRUMENT VALVES TO FLUSH PORTS

Instrument valves are often mounted to flush accessories, such as flush rings, flush flanges, or diaphragm seal lower parts. The mounting of the instrument valve to the flush accessory can be done in several ways:

- Fitted
- Fitted and welded
- Butt welded
- Socket welded

All assemblies are standard pressure tested and can be supplied with several certificates such as material certificates, pressure test certificates or welding certificates in case of a butt weld construction. All mounting methods are according to ASME or EN standards.

## MOUNTING BRACKETS AND ASSEMBLY KITS

Badotherm supplies specific mounting brackets for easy installation of the instrument valve or manifold. The product highlights are:

- Bracket material AISI 316(L)
- Bolts and nuts in A4-70
- Straight, 90° angle or distance execution



Assembly kits are used to mount the manifolds to the pressure instrument. Badotherm assembly kits includes:

- Bolts
- Gaskets
- Anti-seize

Bolt material for fixing a valve to the instrument may vary depending on the process specifications (pressure / temperature). There are three different bolt materials available for mounting an instrument:

- A2-70 (ASTM F 738)
- B7 (ASTM A 193)
- B8M cl. 2 (ASTM A 193)



Assembly kit gaskets, not to be confused with spindle gasket, are standard made of Virgin PTFE but optional Flexible Graphite. The main difference lies in the temperature limits. Where Virgin PTFE can handle temperatures between  $-10^{\circ}\text{C}$  /  $+80^{\circ}\text{C}$ , can Flexible Graphite handle temperatures between  $-40^{\circ}\text{C}$  /  $+120^{\circ}\text{C}$ . The given temperature limits are based on the limits applicable for the transmitter. All gasket dimensions are in accordance with IEC 61518.

The supplied anti-seize compound is a Copper / Graphite 2 gram pillow pack composed from pure Copper and Graphite flakes.



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