Knob operated pin index cylinder valve in O-ring seal design for medical gases

Series PBN-12

Taper inlet

Parallel inlet

- Designed for ease of operation
- Reliable performance over extended temperature range
- Requires little or no maintenance

TPED Certification (CE mark) by BAM as notified body: ID-0589

BAM Bundesanstalt für Materialforschung und -prüfung

tekno valves
driven by excellence

ISO 9001 and TPED certified valve manufacturer

Features and benefits for best-in-class performance

Series PBN-12

Customer logo provided on request*

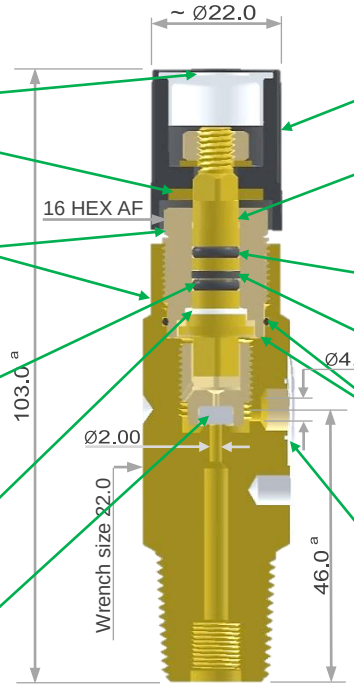
Brass plate secures knob from loosening during transport and prevents damage against over torque

Valve body and gland nut are nickel chrome plated. Gas wetted area are not plated to eliminate any flaking during service

Primary EPDM O-ring provides external tightness past upper spindle over entire operating and storage temperature and pressure range

PEEK thrust washer reduces friction and facilitates easy and low torque movement at full service pressure

Available in PA 66/PEEK soft seating



Ergonomic plastic knob provides firm grip and positive clearance with yoke

Gland nut step bore prevents ejection of upper spindle in case of shearing of spindle from the collar or breakage due to excessive torque

Secondary O-ring prevents moisture / contamination ingress

High durometer EPDM back-up ring prevents extrusion of primary O-ring

Metal to metal seal prevents leakage past gland nut threads. Gland nut O-ring arrests leakage in case the metallic sealing is compromised by external damage

Available in a variety of inlet and outlet configuration as per ISO / CGA / AS / IS standards

Dimensions are in mm

Dimensions shown are for 17E inlet

a Depends upon inlet connection

* Subject to MIN quantity

Design Specifications

MIN life	:2000 cycles
Operating and storage temperature range	:-46 °C to +65 °C
MIN closing torque	:0.6 Nm
Gland nut installation torque	:50 Nm
Knob retaining nut installation torque	:5 Nm
MAX test pressure (TP)	:240 bar
Lubricant	:Gleitmo 595
Flow coefficient (*Cv*)	:0.13
MAX weight of package mass without valve protection	:Refer drawing for details

Testing and certification

- ✓ Valve meets EN ISO 10297:2014 and CGA V-9 : 2012, tested by BAM Berlin
- ✓ Certified by BAM Berlin to European Transportable Pressure Equipment Directive (TPED) and available with Π mark
- ✓ Production testing for Pi-marked valves as per EN ISO 14246:2014

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Features and benefits for best-in-class performance

Series PBN-12

Brass plate secures knob from loosening during transport and prevents damage against over torque

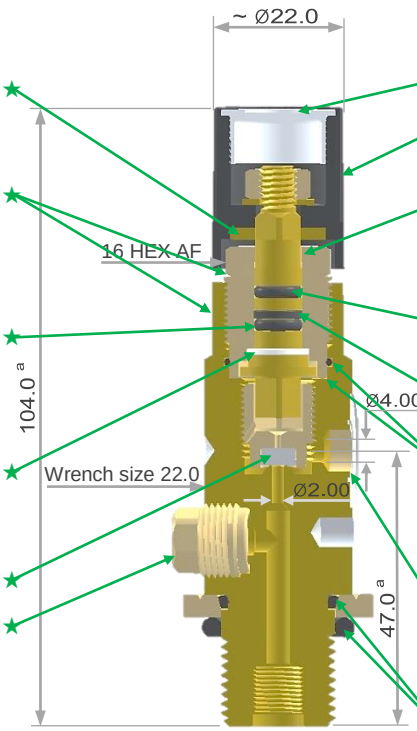
Valve body and gland nut are nickel chrome plated. Gas wetted area are not plated to eliminate any flaking during service

Primary EPDM O-ring provides external tightness past upper spindle over entire operating and storage temperature and pressure range

PEEK thrust washer reduces friction and facilitates easy and low torque movement at full service pressure

Available in PA 66/PEEK soft seating

Pressure relief device (PRD) uses corrosion resistant Nickel disc. Internal plug capsule design using copper gasket provides secure sealing with valve body and protects the PRD from loosening or damage in service



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Ergonomic plastic knob provides firm grip and positive clearance with yoke

Gland nut step bore prevents ejection of upper spindle in case of shearing of spindle from the collar or breakage due to excessive torque

Secondary O-ring prevents moisture / contamination ingress

High durometer EPDM back-up ring prevents extrusion of primary O-ring

Metal to metal seal prevents leakage past gland nut threads. Gland nut O-ring arrests leakage in case the metallic sealing is compromised by external damage

Available in a variety of inlet and outlet configuration as per ISO / CGA / AS / IS standards

Two O-rings at the inlet thread facilitate leak proof connection with the cylinder neck

Dimensions are in mm

Dimensions shown are for U12 inlet

a Depends upon inlet connection

* Subject to MIN quantity

Design Specifications

MIN life	:2000 cycles
Operating and storage temperature range	:-46 °C to +65 °C
MIN closing torque	:0.6 Nm
Gland nut installation torque	:50 Nm
Knob retaining nut installation torque	:5 Nm
MAX test pressure (TP)	:240 bar
Lubricant	:Gleitmo 595
Flow coefficient (*Cv*)	:0.13
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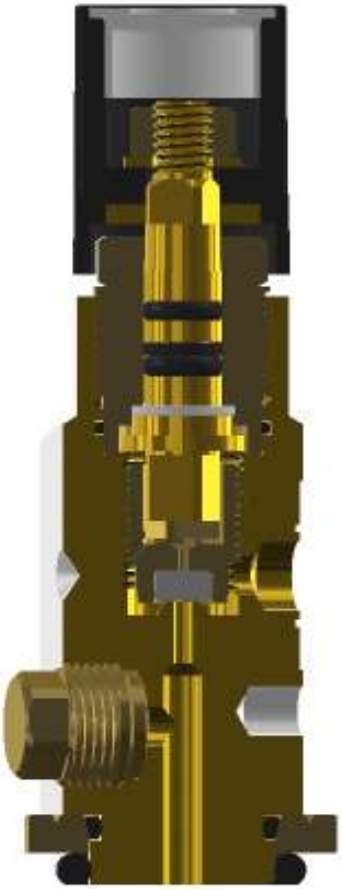
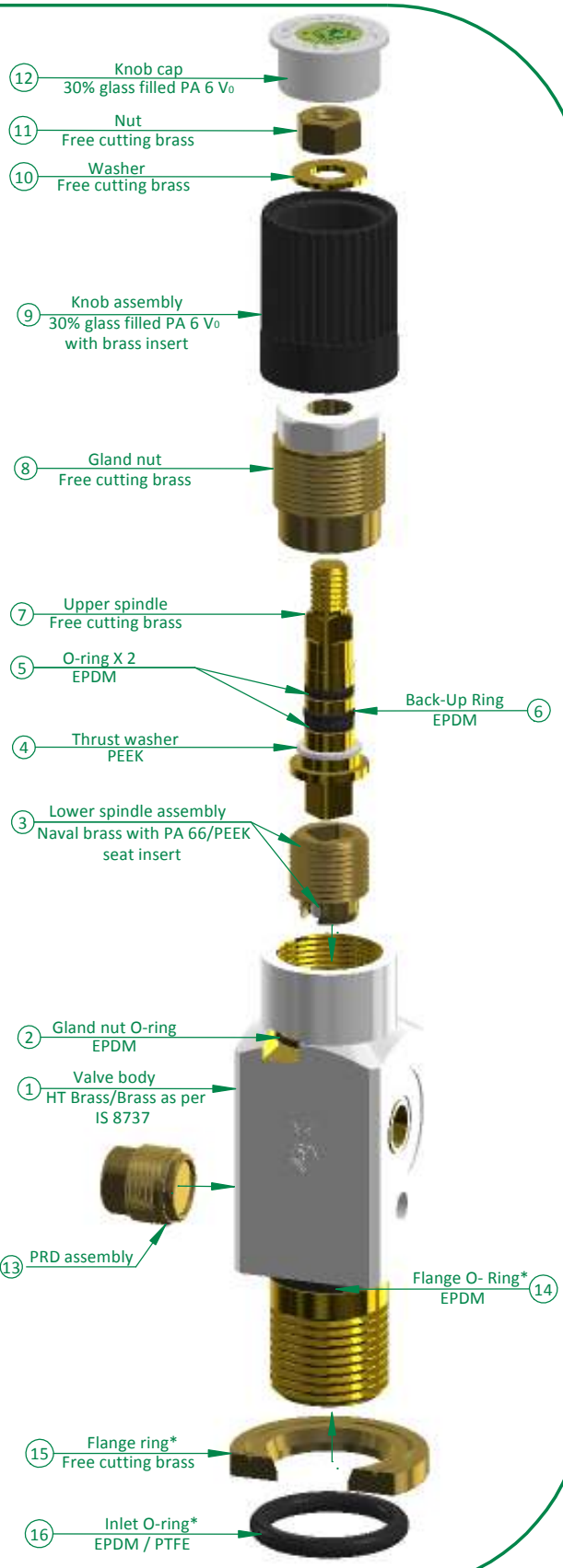
Material of construction and assembly arrangement

Series PBN-12





* For parallel inlet connection only

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Disassembly, inspection and assembly instructions

Series PBN-12

Disassembly of valve

1. Place the valve assembly after removing from the cylinder in a vice or similar holding fixture. The holding fixture must securely grip the valve body (1) on the wrench flats so that there is no damage to the valve body plating, internal bores, inlet and PRD.
2. Remove knob cap (12) by pulling it away from the knob (9) using a screw driver. Use 3/8" socket wrench or HEX box wrench to unscrew the nut (11) by turning it counter clockwise.
3. Remove the knob from the upper spindle (7) square. The nut and washer (10) will come out with the knob.
4. Using a 16 mm socket wrench or hex box wrench, unscrew the gland nut (8) in counter clockwise direction. The upper spindle assembly with O-rings (5), back-up ring (6) and thrust washer (4) will remove with the gland nut. Remove the upper spindle assembly from the gland nut by pushing the upper spindle from the top. Be careful not to scratch the gland nut sealing surface.
5. Use the upper spindle to remove the lower spindle assembly (3) from the valve chamber, by rotating it counter clockwise.
6. Remove the PRD (13) (if necessary) using 12mm socket wrench or T-30 Torx star tool (as applicable) by rotating in counter clockwise direction.

Inspection of valve and components

1. Valve body (1)
   a. Inspect the valve body chamber for dirt, debris or damage. Where possible, blow out the valve body chamber using clean, dry, compressed Air or Nitrogen to remove any foreign particles.
   b. Inspect the valve body for seat damage and thread wear.
   c. Inspect if gland nut O-ring (2) is in place inside the valve body groove.
   d. Do not attempt to repair the valve body if damaged.
2. Components
   a. Inspect all parts visually for wear, damage. Replace parts as necessary. In case of damage to upper spindle (7) and / or elastomers, replace with new upper spindle assembly.
   b. Inspect lower spindle (3) threads and soft seating for any sign of wear / damage. Inspect the thrust washer (4). Replace if necessary.
   c. Inspect PRD (13) if installed for any damage.
   d. Replace flange O-ring (14) and inlet O-ring (16) once valve is removed from the cylinder.

Assembly of valve

1. Check all parts visually for burrs, dent, damage and crack.
2. Lubricate parts as per GA drawing.
   NOTE Customer will receive parts / spare kits in lubricated condition.
3. Place thrust washer (4) to rest above the upper spindle (7) step.
4. Use special tools to fit O-rings (5) and back-up ring (6) in upper spindle groove. Care should be taken to place the back-up ring above the O-ring in the lower groove and secondary O-ring in the upper groove.
5. Insert upper spindle subassembly inside gland nut (8) with a twisted motion to avoid damage to elastomers and insert till it rests on gland nut counter bore.
6. Fit gland nut O-ring (2) inside the groove provided in the valve body (1) just below the gland nut threads.
7. Place the lower spindle assembly (3) into the valve body. Position the upper spindle to engage with the lower spindle square and screw in gland nut into the valve body by rotating the upper spindle square. This will also drive the lower spindle assembly to rest with the valve body seat.
8. Clamp valve body in bench vice between nylon clamps. Tighten gland nut at 50 Nm in clockwise direction using 16 mm socket wrench or hex box wrench.
9. Use 12 mm socket wrench or HEX box wrench or T-30 Torx star tool (as applicable) for tightening PRD assembly (13), if applicable. For CG-1 device, tighten at 15-20 Nm in clockwise direction and for CG-4/5 device, tighten at 8-10 Nm.
10. Place the knob (9) on the upper spindle square.
11. Fit the knob by tightening nut (11) over washer (10) using a 3/8" socket wrench or HEX box wrench at 5 Nm in clockwise direction and push fit knob cap (12) in the knob.
12. For parallel inlet connection, fit flange O-ring (14) in the groove provided above the inlet thread, fit the flange ring (15) below the flange O-ring and place the inlet O-ring (16) so that it rests against the flange ring.

NOTE Refer "Material of construction and assembly arrangement" page to identify the part No. given in the bracket

Operating principle

Series PBN-12

Identifying features

PBN-12 is knob operated pin index soft seated valve using two piece brass spindle construction. The design is suitable for medical gas cylinder using Yoke connection for filling and discharge. The design uses O-rings to create a seal around the upper spindle. PEEK thrust washer makes contact with the collar of the upper spindle under pressure and acts as anti-friction ring as the upper spindle rotates to open and close the valve. Leakage through the gland nut threads is protected by metallic sealing with secondary protection provided by an O-ring below the gland nut threads.

The valve is designed to operate at exceptionally low torque to allow users in hospitals as well as in filling plants to open and close the valve with minimum effort. For this reason the movement from full open to close position is achieved in one full turn.

The valve does not use any magnetic parts making it compatible for use with MRI application. In addition the design does not use any fluorinated polymer with toxic by-products of combustion.

Recommended opening procedure

It is recommended that the valves always be opened gradually in anticlockwise direction. Opening the valve fully causes the lower spindle to ride upwards on its threads until it contacts the upper spindle. Valves in fully open position can be mistaken as closed by inexperienced or untrained operators. When an operator checks a valve to ensure its position, he should always check by attempting to close the valve, never by trying to open the valve.

Recommended closing procedure

Close the cylinder valve by rotating the knob in the clockwise direction.

Valve installation

Valving procedure and torque guidelines should be as per EN ISO 13341.

⚠ CAUTION

1. NEVER use wrenches or other persuaders to operate the valve.
2. Valving tools (e.g. sockets or jaws) used to screw the valve into the cylinder must make contact with the flats in the valve body and not touching any part of the PRD, if provided. The tools should fit the valve properly without causing damage.
3. Over-torquing the valve into the cylinder must be avoided as they cause high stresses in the cylinder neck, leading to overload failures. Over-torquing also leads to irreparable damage to the valve stem.
4. As upper spindle is non-rising, do not over torque the valve in open direction.
5. Do not use PTFE tapes on gland nut threads to stop gland leakage.
6. Do not replace soft seat in the bottom spindle.
7. Repair and maintenance should be carried out by trained personnel.
8. Proper Yokes should be used for filling and discharge ensuring contact only at the intended sealing surface.

Series PBN-12

Valve item code matrix

Valve series	
PBN	PBN-12

Inlet [A]	
18T	18T to BS 341-1
17E	17E to ISO 11363-1
08N	1/2-14 NGT to CGA V-1
1BS	1" to BS 341-1:1962
25E	25E to ISO 11363-1
12N	3/4-14 NGT to CGA V-1
U12	3/4-16 UNF to JIS B 8246

Dip Tube [A]	
X	Not required
R	Customer requirement

Specification	
L	EN ISO 10297:2014 ("Pi" marked)
V	V-9-12
5	IS 3745:2006

Body	
HT	HT brass CP
FP	Brass to IS 8737 CP

Inspection	
T	Our own (In house inspection service)
B	BIS
L	Lloyds

Gas service [B and C]	
O2	Oxygen
He	Helium
CO	Carbon dioxide
Ai	Air
NT	Nitrogen
NO	Nitrous oxide
ON	50% N2O + 50% O2

Pressure rating	
180	180 bar
190	190 bar
200	200 bar
240	240 bar

PBN	HT	17E	X	407	CO	X	XX	L	T	6	TP	240

(For example only)

Outlet [A]	
407	ISO 407
CGA	CGA V-1
S37	IS 3745
A24	AS 2473-3

PRD type	
1	CG-1
4	CG-4
8	CG-5
X	Not required

PRD rating	
28	186-207 bar
32	208-232 bar
36	230-250 bar
38	248-276 bar
39	270-300 bar
XX	Not required

Seating [C]	
6	PA 66 seat insert
K	PEEK seat insert

WP/TP [D]	
WP	Valve working pressure
TP	Valve test pressure

Material options for inlet O-ring
EPDM
PTFE

A - Other inlet, outlet & dip tube connections are available as per customer requirement

B - Valve may also be used for mixtures of the listed gases

C - PEEK seat is not available with valves for oxygen and nitrous oxide service and their mixtures

D - The term working pressure (WP) is only applicable for compressed gases and does not apply to liquefied gases. For compressed gas, test pressure = 1.2 x working pressure.
For liquefied gases, test pressure shall be at least equal to the minimum test pressure corresponding to the applicable filling ratio quoted in the relevant transport regulation (ADR) for that gas.

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Frequently asked questions (FAQ)

Series PBN-12

1) How does PBN-12 design valves compare to single spindle packed design valves?

- Single spindle packed design valves have inherent limitation of particulate generation due to packing wear, unpredicted increase in closing torque, frequent need to tighten gland nut and seizing and galling of spindle thread.
  These limitations are eliminated in PBN-12 as it is designed to be used at low torques without external wrench/key and requiring little maintenance or no maintenance.

2) What is the advantage of using knob operated valves?

- Knob prevents the user from receiving a greater mechanical advantage than necessary to operate the valve and this helps in preventing damage to the internal mechanism.

3) How resistant is the valve operating mechanism to over torque?

- PBN-12 has been tested for resistance against over torque and safe failure up to a torque of 15.6 Nm in opening and closing direction. It is not possible for operator to impart such high torques in the field by hand. This makes the design resistant to damage due to over torque.

4) Is PA 66 soft seat and PEEK thrust washer compatible with Oxygen service?

- As per ISO 11114-2, it is not possible to make any assumption regarding compatibility of nonmetallic material with oxidizing gases. Use of nonmetallic part with high pressure oxygen service has to be carefully evaluated with respect to:
  a) Ignition property of the nonmetallic material and its volume
  b) Material's toxic byproducts, and hazards if combustion/decomposition occurs
  c) Valve design's susceptibility to ignition

  PA 66 is widely used valve seating material for Oxygen service. It is in compliance with EIGA IGC/Doc 73/00/E guideline to not employ fluorinated polymers like PTFE, PCTFE in gas wetted duty whose combustion products are toxic for medical or breathing service.

  PBN-12 has been successfully tested to Oxygen pressure surge test for WP-200 bar (TP-240 bar) to confirm compatibility with Oxygen and highly oxidizing gases

5) Does the design prevent ejection of top spindle in case of shearing of the collar of the upper spindle due to external impact?

- The upper spindle and gland nut are machined with a step for retention of spindle inside valve assembly in the unlikely event of shearing of the spindle collar. This always ensures safe failure.

6) How resistant is the operating mechanism loosening/ejection?

- In PBN-12, the gland nut thread has a finer pitch than the bottom spindle threads. This provides a mechanical lock preventing ejection of the operating mechanism while the valve is being opened even if the gland nut is loose.

  In addition, the design ensures that the upper and lower spindle will not disengage even if the thrust washer and valve seat is consumed by ignition.

7) Why is there a need to lubricate the valve?

- PBN-12 design is assembled with high quality lubricant compatible with the gases for which the valve is intended to be used thereby preventing seizing and galling in service.

Frequently asked questions (FAQ)

Series PBN-12

8) What is the expected life of O-ring/back-up ring? Should the entire upper spindle subassembly be replaced in case of any damage to upper spindle or O-ring/back-up ring?

- Tekno uses peroxide cured O-ring/back-up ring from reputed suppliers for long service life. The O-ring is protected in service from extrusion by thrust washer and back-up ring. If the upper spindle is required to be changed, we recommend replacing the upper spindle subassembly, i.e. factory fitted O-ring/back-up ring, duly lubricated.

9) What kinds of valve refurbishing tools are required for maintenance?

- PBN-12 design does not require any special refurbishing tools. The valve body internal threads or seat area are not damaged by frequent use and/or excessive torque on the operating mechanism.

10) Is it possible to replace soft seat in the lower spindle in case it is worn out?

- PA 66 / PEEK seat have high cycle life and load bearing capacity. If the seating is worn out, the lower spindle assembly needs to be changed as the soft seat is factory fitted in the lower spindle by special crimping operation which cannot be replicated at user end.

11) Do we need to tighten gland nut if external leakage is observed?

- The leakage through the upper spindle is protected by thrust washer under high pressure while leakage at low pressure is protected by spindle O-ring protected by a back-up ring. Leakage through the gland nut threads is protected by metallic sealing made by gland nut which abuts at the inner end with the valve body. The gland nut O-ring comes in play in the event the metallic sealing is compromised by external impact to the gland nut. Hence the design is well secured against gland leakage and there is no need to retighten the gland nut.

Disclaimer

While proper use and good maintenance would significantly enhance life of the valve, the recommendations and suggestions in the FAQ are not meant to substitute existing plant procedures.

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