SLAM-SHUT VALVES

Type BM6X
BM6X Slam-Shut Valves

Slam-shut valves

The BM6X series axial flow slam-shut valve is an automatic shut-off appliance suitable for installation as a safety device in regulating stations and on gas transfer and distribution lines.

The reduced face to face dimension, which is typical of wafer valves, facilitates installation even in existing regulating station that are not equipped with shut-off devices.

The slam-shut valve rapidly interrupts the gas flow in cases in which the pressure at the control point or points reaches the set level.

The BM6X slam-shut valves are of the “wafer” type with an off-center butterfly disk that is mounted eccentrically.

The gas flow favors closure of the valve.

The valve can only be re-opened manually.

The BM6X series slam-shut valve uses gas from the gas line for operation and therefore it does not require outside sources to operate.

The main features are as follows:

- Axial flow
- "Wafer" type valve
- Off-center butterfly disk
- Pressure control at one or more points in the system
- Activation due to pressure increase or decrease
- Emergency slam-shut push-button
- Button by-pass with automatic return
- Manual reset by the sole rotation of the reset shaft
- Easy maintenance
**Operation**

The BM6X series slam-shut valve consists of a "wafer" type valve body, an pilot and a by-pass valve.

The valve body has an off-center butterfly disk that is mounted eccentrically on the reset shaft.

A lip seal ensures tightness.

The spring thrust, with the additional weight of the eccentric off-center butterfly disk, ensures punctual and safe closure under any working conditions.

In addition, the compression of the seal, which is determined by the pressure, ensures perfect tightness.

The slam-shut valve can only be opened if the upstream and downstream pressures are equal.

The IT/2V by-pass valve with automatic return makes it possible to balance these pressures.

The valve can only be opened manually by rotating the pilot reset shaft.

When the controlled pressure lies within the set levels for the pilot, the latter remains set and prevents rotation of the shaft while keeping the butterfly disk open.

When said pressure changes beyond the set levels, the butterfly disk moves to the closure position.
BM6X Slam-Shut Valves

Features

Applications

The slam-shut valves in the BM6X series are used in natural gas reduction, distribution and transfer stations. This product has been designed to be used with fuel gases of 1st and 2nd family according to EN 437, and with other non aggressive and non fuel gases. For any other gases, other than natural gas, please contact your local sales agent.

Construction Features

The flange coupling surfaces are normally supplied with a step and finished with a semicircular profile phonographic groove.

Upon request, the flange coupling surfaces can be supplied with a smooth finish.

Upon request, the valve can be supplied complete with flanges to be welded to the line, stud bolts, nuts and gaskets.

Technical Features

<table>
<thead>
<tr>
<th>Pressure (bar)</th>
<th>ANSI 150</th>
<th>ANSI 300</th>
<th>ANSI 600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowable pressure</td>
<td>PS</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Inlet pressure range</td>
<td>b_{pu}</td>
<td>0 + 20</td>
<td>0 + 50</td>
</tr>
<tr>
<td>Overpressure set range</td>
<td>W_{do}</td>
<td>0.03 + 20</td>
<td>0.03 + 50</td>
</tr>
<tr>
<td>Underpressure set range</td>
<td>W_{du}</td>
<td>0.01 + 20</td>
<td>0.01 + 50</td>
</tr>
<tr>
<td>Accuracy class</td>
<td>AG</td>
<td>up to ± 1%</td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>t_{a}</td>
<td>≤ 1 s</td>
<td></td>
</tr>
</tbody>
</table>

Flanged connections

DN 80 - 100 - 150 - 200 - 250 - 300

Temperature

Standard version
Working -10 °C +60 °C

Low temperature version
Working -20 °C +60 °C

Materials

Body: Steel
Butterfly disk: Cast iron or steel
Shaft: Steel
Spring: Stainless steel
Lip seal: FKM
O-ring: NBR nitrile rubber or FKM

By-Pass Valve Type IT/2V Features

Allowable pressure: PS: 100 bar
Material: Brass
1/4" NPT female threaded pipe fitting
Versions

Sour Gases  The version referring to NACE standard is produced for use with sour gases (not available with the OS/80X-R-PN series pilot).

Application graph based on the amount of $\text{H}_2\text{S}$ present in the gas

The red line divides the graph into two zones. The “A” zone indicates the range in which the NACE version must be used. The “B” zone indicates the range in which that version is not required.
BM6X Slam-Shut Valves

Calculation procedures

The following formulas refer to normal operating conditions in a sub-critical state with: \( P_2 > \frac{P_1}{2} \)

**Symbols**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>( Q )</td>
<td>Natural gas flow rate in Stm(^3)/h</td>
</tr>
<tr>
<td>( P_1 )</td>
<td>Absolute inlet pressure in bar</td>
</tr>
<tr>
<td>( P_2 )</td>
<td>Absolute outlet pressure in bar</td>
</tr>
</tbody>
</table>

\( C_g \) = Flow rate coefficient  
\( C_1 \) = Body shape factor  
\( d \) = Relative density of the gas

**Flow Coefficients**

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>DN 80</th>
<th>DN 100</th>
<th>DN 150</th>
<th>DN 200</th>
<th>DN 250</th>
<th>DN 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_g )</td>
<td>4500</td>
<td>9000</td>
<td>20250</td>
<td>36000</td>
<td>55800</td>
<td>81000</td>
</tr>
<tr>
<td>( C_1 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24</td>
</tr>
</tbody>
</table>

**Flow Rate \( Q \)**

\[
Q = 0.525 \cdot C_g \cdot P_1 \cdot \sin \left( \frac{3417}{C_1} \cdot \sqrt{\frac{P_1-P_2}{P_1}} \right)^{\text{Deg}}
\]

\[
Q = 0.525 \cdot C_g \cdot P_1
\]

For other gases with different densities, the flow rate calculated with the above formulas must be multiplied by the correction factor:

\[
F = \sqrt{\frac{0.6}{d}}
\]

**Power Loss \( \Delta p \)**

\[
\Delta p = \frac{P_1 \cdot \sqrt{P_1^2 - 4 \cdot \left( \frac{Q}{C_g \cdot 1.05} \right)^2}}{2}
\]

**DN Size**

Calculate the required \( C_g \) with the following:

\[
C_g = \frac{Q}{0.525 \cdot P_1 \cdot \sin \left( \frac{3417}{C_1} \cdot \sqrt{\frac{P_1-P_2}{P_1}} \right)^{\text{Deg}}}
\]

N.B. The formula appearing above is valid only when the flow rate refers to natural gas.  
For other gases, divide the flow rate by the correction factor \( F \).

Choose the slam-shut valve with the \( C_g \) higher than the calculated value. After having determined the slam-shut valve diameter, it is suggested to check that the velocity on the seal seat is not higher than 80 m/sec. by using the following formula:

\[
V = 345.92 \cdot \frac{Q}{D N^2} \cdot \frac{1 - 0.002 \cdot P_u}{1 + P_u} \quad V = \text{Velocity (m/s)}
\]

\[
345.92 = \text{Numerical constant}
\]

\[
Q = \text{Flow rate under standard conditions (Stm}^3/\text{h)}
\]

\[
D N = \text{Valve nominal diameter (mm)}
\]

\[ P_u = \text{Inlet pressure in relative value (bar)} \]

In case of velocities higher than indicated limits, increase the valve diameter.
BM6X Slam-Shut Valves

Pilot

The following pilots are used with the BM6X slam-shut valves:

- **OS/80X-R Series**: Spring loaded pneumatic device
- **OS/80X-R-PN Series**: Pneumatic device controlled by PRX-PN series pilots

**OS/80X-R**

The OS/80X-R series pilot is supplied in different models according to set ranges required.

Technical Features

<table>
<thead>
<tr>
<th>Model</th>
<th>Valve Flow from Left to Right</th>
<th>Valve Flow from Right to Left</th>
<th>Overpressure Set Range $W_{do}$ (bar)</th>
<th>Underpressure Set Range $W_{du}$ (bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>OS/80X-BP-S-R</td>
<td>OS/80X-BP-R</td>
<td>5</td>
<td>0.03</td>
<td>2</td>
</tr>
<tr>
<td>OS/80X-BPA-D-S-R</td>
<td>OS/80X-BPA-D-R</td>
<td>20</td>
<td>0.50</td>
<td>5</td>
</tr>
<tr>
<td>OS/80X-MPA-D-S-R</td>
<td>OS/80X-MPA-D-R</td>
<td>100</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>OS/80X-APA-D-S-R</td>
<td>OS/80X-APA-D-R</td>
<td></td>
<td>5</td>
<td>41</td>
</tr>
<tr>
<td>OS/88X-S-R</td>
<td>OS/88X-R</td>
<td></td>
<td>18</td>
<td>80</td>
</tr>
</tbody>
</table>

Materials

**OS/80X-R**

Servomotor body
- OS/80X-BP-R, OS/80X-BPA-D-R: Aluminum
- OS/80X-MPA-D-R, OS/80X-APA-D-R: Steel

Diaphragm
- Fabric-finished NBR

O-ring
- NBR rubber

**OS/84X-R, OS/88X-R**

Servomotor body
- Brass

Lip seal
- Teflon (PTFE)

O-ring
- NBR rubber

**OS/80X-R-PN**

The OS/80X-R-PN series pilot is supplied in two models:

**OS/80X-R-PN**: Pressure range 0.5 to 40 bar.

Appliance made of an OS/80X-APA-D-R set at about 0.4 bar and a variable number of PRX/182-PN pilots for overpressure and PRX/181-PN for underpressure, as many as necessary to control different points of the installation.

**OS/84X-R-PN (Safety Accessory)**: Pressure range 30 to 80 bar.

Appliance made of an OS/84X-R set at about 20 bar and a variable number of PRX-AP/182-PN pilots for overpressure and PRX-AP/181-PN for underpressure, as many as necessary to control different points of the installation.

Technical Features

<table>
<thead>
<tr>
<th>Model</th>
<th>Body Resistance (bar)</th>
<th>Overpressure Set Range $W_{do}$ (bar)</th>
<th>Underpressure Set Range $W_{du}$ (bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>OS/80X-R-PN</td>
<td>100</td>
<td>0.5</td>
<td>40</td>
</tr>
<tr>
<td>OS/84X-R-PN</td>
<td>100</td>
<td>30</td>
<td>80</td>
</tr>
</tbody>
</table>

Materials

**PRX/181/182-PN, PRX-AP/181/182-PN**

Body
- Steel

Diaphragm
- Fabric-finished NBR

O-ring
- NBR rubber
BM6X Slam-Shut Valves

Installation and assembly

Orientations  The BM6X/ slam-shut valves are normally installed in lines with a horizontal axis. Vertical axis installation is possible but only with a flow direction from top to bottom.

Flow from right to left
OS/80X-R Clockwise resetting

Flow from left to right
OS/80X-S-R Counterclockwise resetting

Off-Center Butterfly Disk Adjusting

In the event of replacement of the OS/80X-R or valve disassembly for maintenance work, it is very important to check the level of the ‘C’ height indicated in the following table prior to reinstalling the valve on the line. If necessary, use the respective dowel to adjust the position of the off-center butterfly disk to avoid the occurrence of irregular loads due to the impact of the fluid.

<table>
<thead>
<tr>
<th>Type</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM6X/80</td>
<td>Min. 1 mm - Max. 3 mm</td>
</tr>
<tr>
<td>BM6X/100</td>
<td>Min. 1 mm - Max. 5 mm</td>
</tr>
<tr>
<td>BM6X/150</td>
<td>Min. 3 mm - Max. 8 mm</td>
</tr>
<tr>
<td>BM6X/200</td>
<td>Min. 5 mm - Max. 10 mm</td>
</tr>
<tr>
<td>BM6X/250</td>
<td>Min. 6 mm - Max. 11 mm</td>
</tr>
<tr>
<td>BM6X/300</td>
<td>Min. 8 mm - Max. 13 mm</td>
</tr>
</tbody>
</table>

In the event of grit or grime in the lines, it is advisable to install a filter upstream with a filtering capacity of at least 20 microns.

Simulation of the Fluid Mechanics of the Internal Flows
Accessories

Proximity Switch

In order to send the shut-off opening/closing signal, a proximity switch suitable for installation in hazardous area is used.

The use of this switch foresees the application of an intrinsic safety separation barrier which should be installed in safe area.

The distance between the proximity switch and the barrier should be calculated according to the type of gas and installation electrical specifications.

The proximity switch should be positioned at about 0.5 mm from the stem (S).

The adjustment is made by means of adjusting nuts.

On request it is possible to supply the pilot in the version with two proximity switches in order to indicate extreme positions of valve opening/closing.

Electrovalve for Remote Controlled Closure

The OS/80X-R and the OS/80X-R-PN equipped with a shut-off device for minimum pressure, can be equipped with a 3-way valve with explosion-proof construction to permit remote-controlled closure.

IT/3V Three-Way Valve for Setting Control (P<sub>u</sub> max 50 bar)

It allows the OS/80X-R operation and setting control, without having to change the regulator setting.

The valve is installed on the OS/80X-R control line and it must be connected to a suitable pressure source that is capable of reaching the settings of the OS/80X-R.

The IT/3V three-way valve is of the spring-return type and it is equipped with a safety lock plate (B) on the control knob (Q).

When the plate (B) is pivoted, pressure on the knob (Q) makes it possible to put the sensitive member into communication with a pressure source, thus making it possible to perform operation and setting tests.

Upon completion of the procedures, releasing the knob will reset normal running conditions. The safety lock plate on the knob prevents accidental maneuvers.
BM6X Slam-Shut Valves

Examples of Connections

Installation in a low pressure regulating line.

OS/80X-R

Overpressure and underpressure control downstream of regulators

OS/80X-R-PN

Yellow: Downstream pressure
Green: Atmospheric pressure
BM6X Slam-Shut Valves

Overall Dimensions (mm)

<table>
<thead>
<tr>
<th>Type</th>
<th>DN 80</th>
<th>DN 100</th>
<th>DN 150</th>
<th>DN 200</th>
<th>DN 250</th>
<th>DN 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>155</td>
<td>170</td>
<td>220</td>
<td>220</td>
<td>220</td>
<td>220</td>
</tr>
<tr>
<td>B</td>
<td>250</td>
<td>290</td>
<td>415</td>
<td>445</td>
<td>480</td>
<td>510</td>
</tr>
<tr>
<td>C</td>
<td>54</td>
<td>70</td>
<td>102</td>
<td>135</td>
<td>168</td>
<td>203</td>
</tr>
<tr>
<td>ANSI 150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>190</td>
<td>230</td>
<td>279</td>
<td>343</td>
<td>406</td>
<td>482</td>
</tr>
<tr>
<td>E</td>
<td>95</td>
<td>115</td>
<td>140</td>
<td>172</td>
<td>203</td>
<td>241</td>
</tr>
<tr>
<td>I</td>
<td>197</td>
<td>227</td>
<td>284</td>
<td>342</td>
<td>375</td>
<td>436</td>
</tr>
<tr>
<td>ANSI 300</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>210</td>
<td>254</td>
<td>318</td>
<td>381</td>
<td>445</td>
<td>521</td>
</tr>
<tr>
<td>E</td>
<td>105</td>
<td>127</td>
<td>159</td>
<td>191</td>
<td>223</td>
<td>261</td>
</tr>
<tr>
<td>I</td>
<td>217</td>
<td>245</td>
<td>303</td>
<td>361</td>
<td>407</td>
<td>468</td>
</tr>
<tr>
<td>ANSI 600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>210</td>
<td>274</td>
<td>357</td>
<td>419</td>
<td>508</td>
<td>559</td>
</tr>
<tr>
<td>E</td>
<td>105</td>
<td>137</td>
<td>179</td>
<td>220</td>
<td>254</td>
<td>280</td>
</tr>
<tr>
<td>I</td>
<td>235</td>
<td>264</td>
<td>354</td>
<td>419</td>
<td>490</td>
<td>531</td>
</tr>
</tbody>
</table>

N.B. The B dimensions are indicative and refer to the models with larger dimensions. The threaded opening for the connection of the control line is 1/4" NPT female.

Weights (kg)

<table>
<thead>
<tr>
<th>Type</th>
<th>DN 80</th>
<th>DN 100</th>
<th>DN 150</th>
<th>DN 200</th>
<th>DN 250</th>
<th>DN 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI 150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>13</td>
<td>22</td>
<td>33</td>
<td>47</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td>ANSI 300</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>33</td>
<td>51</td>
<td>85</td>
<td>125</td>
<td></td>
<td></td>
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