Intrinsically safe solenoid valves
on/off controls - ATEX certification

On/off valves equipped with intrinsically safe solenoids certified according to ATEX 94/9/CE, protection mode:
- Ex IIC T6 or IIB T6, applicable in surface plants with gas or vapours environment, category 1, zone 0, 1 and 2.
- Ex IIC T5 or IIB T5, applicable in surface, tunnels or mining plants.

"Intrinsically safe" protection is based on the principle of limiting the energy of electric circuits in environments with presence of hazardous atmospheres. For this reason the valves must be supplied through specific "safety barriers" which limit the maximum current to the solenoid. Atos provides galvanically insulated barriers for single and double solenoid valves, see section 18 to 21. The "intrinsically safe" circuit is virtually unable to produce electrical surges or thermal effects able to cause explosion in hazardous environments also in presence of specific break-down situations.

1 INTRINSICALLY SAFE SOLENOIDS: MAIN DATA

<table>
<thead>
<tr>
<th>Solenoid code</th>
<th>Group II</th>
<th>Group I (mining)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OW-18/H</td>
<td>OW-18/H</td>
</tr>
<tr>
<td>Nominal resistance at 20°C</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Coil insulation</td>
<td>Class H</td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP65</td>
<td>IP67</td>
</tr>
<tr>
<td>Duty factor</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Electrical connector</td>
<td>DIN 43650 2 pin+GND</td>
<td>MIL-C-26482 3 pin</td>
</tr>
</tbody>
</table>

2 INTRINSICALLY SAFE SOLENOIDS: ELECTRICAL AND TEMPERATURE DATA

<table>
<thead>
<tr>
<th>Gas group</th>
<th>I and IIC</th>
<th>I and IIB</th>
<th>I and IIA</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature class</td>
<td>T6</td>
<td>T6</td>
<td>T5</td>
<td>-</td>
</tr>
<tr>
<td>V max</td>
<td>27 V</td>
<td>19,5 V</td>
<td>19,11 V</td>
<td>28 V</td>
</tr>
<tr>
<td>I max</td>
<td>130 mA</td>
<td>360 mA</td>
<td>360 mA</td>
<td>250 mA</td>
</tr>
<tr>
<td>P max</td>
<td>0,9 W</td>
<td>1,64 W</td>
<td>1,72 W</td>
<td>1,8 W</td>
</tr>
<tr>
<td>Minimum supply current</td>
<td>≈ 65mA, for I.S. barriers see section 18-21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface temperature (ambient temp. +60°C)</td>
<td>≤ 85°C</td>
<td>≤ 100°C</td>
<td>150 °C</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-40 ÷ +60°C (1)</td>
<td>-20 ÷ +60°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) The Group II solenoids are Atex certified for minimum temperature -40°C. Select "BT" in the valve code for the application with minimum temperature -40°C

3 CERTIFICATIONS

In the following is resumed the valves marking according to the ATEX Group I and Group II certification

3.1 GROUP II, ATEX
Ex = Equipment for explosive atmospheres
II = Group II for surface plants
I = Very high protection (equipment category)
G = For gas and vapours
ia = Intrinsically safe execution
IC = Gas group - application in surface plants
T6 / T5 = Temperature class of the solenoid surface referred to +60°C ambient temperature
Zone 0 (1 and 2) = Explosive atmosphere continuously present

3.2 GROUP I (mining), ATEX
Ex = Equipment for explosive atmospheres
I = Group I for mines and surface plants
M2 = High protection (equipment category)
d = Flame proof housing
I = Gas group (Methane)

3.3 EXAMPLE OF NAMEPLATE MARKING

Notified body and certificate number
Marking according to ATEX Directive
Assembly position the installation of DHW valves with the axis in vertical position is not recommended. If this type of installation is absolutely necessary, please consult our technical office.

Subplate surface finishing Roughness index $R_a$ flatness ratio 0.01/100 (ISO 1101)

Ambient temperature from -20°C to +60°C (standard, /WG and /PE seals) -40°C to +60°C for /BT option

Fluid Hydraulic oil as per DIN 51524-2, 555; for other fluids see section 5

Recommended viscosity $15 \div 100$ mm$^2$/s at 40°C (ISO VG 15 \div 100) max viscosity 400 mm$^2$/s

Fluid contamination class ISO 18/15, achieved with in line filters at 10 μm value to $\beta_{10} \geq 75$ (recommended)

Fluid temperature -20°C +60°C (standard, /WG and /PE seals) -40°C to +60°C for /BT option

4 MAIN CHARACTERISTICS OF INTRINSICALLY SAFE VALVES

- DH = spool type - direct
- DPH = spool type - piloted

W = intrinsically safe solenoid, Atex certified

M = Group M (mining)

Valve size (ISO 4401):
- for DHW: $0 = size 06$
- for DPHW: $1 = size 10$ $2 = size 16$ $3 = size 25$

5 MODEL CODE OF SPOOL TYPE ON-OFF DIRECTIONAL SOLENOID VALVES

<table>
<thead>
<tr>
<th>DH</th>
<th>W</th>
<th>/</th>
<th>-</th>
<th>0</th>
<th>71</th>
<th>3H</th>
<th>/</th>
<th>A</th>
<th>/</th>
<th>6</th>
<th>**</th>
<th>/</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH</td>
<td>W</td>
<td>/</td>
<td>-</td>
<td>0</td>
<td>71</td>
<td>3H</td>
<td>/</td>
<td>A</td>
<td>/</td>
<td>6</td>
<td>**</td>
<td>/</td>
</tr>
</tbody>
</table>

W = synthetically oil resistant, Atex certified

Connector type - see section 5

Series number

Options:
- /A = solenoid at side of port B
- /WP = prolonged manual override

6 HYDRAULIC CONFIGURATIONS OF DHW VALVES

Configuration for DHW

Spools for DHW

<table>
<thead>
<tr>
<th>0/2</th>
<th>1/2</th>
<th>3/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B</td>
<td>A B</td>
<td>A B</td>
</tr>
<tr>
<td>P T</td>
<td>P T</td>
<td>P T</td>
</tr>
</tbody>
</table>

Where the symbol doesn’t show the hydraulic connection (*), it depends by the central configuration of the spool.

7 CONFIGURATION OF DPHW VALVES

Spools for DPHW valves

For all size

<table>
<thead>
<tr>
<th>0 1/2</th>
<th>3 4</th>
<th>5 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B</td>
<td>A B</td>
<td>A B</td>
</tr>
<tr>
<td>P T</td>
<td>P T</td>
<td>P T</td>
</tr>
</tbody>
</table>

Only for DPHW-2, DPHW-3

<table>
<thead>
<tr>
<th>2/2</th>
<th>3/4</th>
<th>5/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B</td>
<td>A B</td>
<td>A B</td>
</tr>
<tr>
<td>P T</td>
<td>P T</td>
<td>P T</td>
</tr>
</tbody>
</table>

Where the symbol doesn’t show the hydraulic connection (*), it depends on the central configuration of the spool.
8 MODEL CODE OF POPPET TYPE LEAK FREE ON-OFF DIRECTIONAL SOLENOID VALVES

DLOH **  / A / R / WO / 6

<table>
<thead>
<tr>
<th>Directional control valve, poppet type size 56</th>
</tr>
</thead>
<tbody>
<tr>
<td>omit for Group II</td>
</tr>
<tr>
<td>M = Group I (mining)</td>
</tr>
</tbody>
</table>

2 = 2 way
3 = 3 way

A = open in rest position
C = closed in rest position

Options:
R = with check valve on port P
WP = prolongued manual override

(1) Option /BT = low temperature -40°C also available on request (not for group I Atex -mining)

9 HYDRAULIC CONFIGURATIONS OF DLOH VALVES

DLOH*-WO

10 Q/Δp DIAGRAMS based on mineral oil ISO VG 46 at 50°C

DHW

11 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

The diagrams refer to warm solenoids and power supply provided by the Atos barrier type Y-BXNE-412. For DHW valves the curves refer to application with symmetrical flow through the valve (i.e. P→A and B→T). In case of asymmetric flow the operating limits must be reduced.

11.1 Operating pressure:
Ports P, A, B = 350 bar Port T = 160 bar

11.2 Operating limits (only for DHW-0713H)
Max flow = 10 l/1' - Max pressure = 150 bar

11.3 Flow capability in central position A-B → T (only for DHW-0713H)
Max flow = 25 l/1' with Δp 10,5 bar

12 INTERNAL LEAKAGES

12.1 DHW internal leakages
16 cm³/min with P=100 bar - fluid viscosity = 43 cSt at 40 °C
30 cm³/min with P=140 bar - fluid viscosity = 22 cSt at 45 °C

12.2 DLOH*-WO internal leakages based on mineral oil ISO VG 46 at 50°C
less than 5 drops/min (0.36 cm³/min) at max pressure.
**13** MODEL CODE OF PRESSURE CONTROLS

AGAM

```
AGAM = pressure relief valve, subplate mounting, see tab. C066
ARAM = pressure relief valve, threaded connections, see tab. C066
```

Omit for Group II

M = Group I (mining)

Valve size

- for AGAM:
  - 10 = size 10 (ISO 6264);
  - 20 = size 20 (ISO 6264);
  - 32 = size 32 (ISO 6264);

- for ARAM:
  - 10 = size 10 (ISO 6264);
  - 20 = G 3/4”;
  - 32 = G 1 1/4”;

Number of the different setting pressure values:

1 = one setting pressure
2 = two setting pressure
3 = three setting pressure

Valve configuration

- B = venting with de-energized solenoid
- E = venting with energized solenoid
- W = without venting

Options:

- /B = cartridge piloted via port “B” of solenoid pilot valve
- /E = external attachments X (G 1/4”) and underneath port X supplied plugged (only for sizes 40 to 80)
- /WO = Intrinsically safe solenoid, Atex certified

Note: for the code of the ISO cartridge to use with the above covers see tab. H003, section 3 and tab. H030, section 3.

**14** HYDRAULIC CHARACTERISTICS

AGAM-

```
AGAM-*/10/**-WO
AGAM-*/11/**-WO
AGAM-*/20/**-WO
AGAM-*/21/**-WO
AGAM-*/22/**-WO
AGAM-*/32/**-WO
```

Valve model

<table>
<thead>
<tr>
<th>AGAM-10-WO</th>
<th>AGAM-20-WO</th>
<th>AGAM-32-WO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max pressure [bar]</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>Setting</td>
<td>50; 100; 210; 350</td>
<td></td>
</tr>
<tr>
<td>Pressure range [bar]</td>
<td>4-50; 6-100; 7-210; 8-350</td>
<td></td>
</tr>
<tr>
<td>Max flow [l/min]</td>
<td>200; 400; 600</td>
<td></td>
</tr>
</tbody>
</table>

**15** MODEL CODE OF COVERS FOR CARTRIDGE VALVES

LIDBH

```
LIDBH = with solenoid valve and shuttle valve for pilot selection
LIDBEW = with solenoid valve for pilot selection
```

Omit for Group II

M = Group I (mining)

Valve configuration, see section [I]

Valve size (ISO 7368)

- for LIDBH:
  - 16 = 16
  - 20 = 20
  - 32 = 32

- for LIDBEW:
  - 16 = 16
  - 20 = 20
  - 32 = 32

Options:

- /B = cartridge piloted via port “B” of solenoid pilot valve
- /E = external attachments X (G 1/4”) and underneath port X supplied plugged (only for sizes 40 to 80)
- /WO = Intrinsically safe solenoid, Atex certified

Synthetic fluids (1):

- WG = water-glycol
- PE = phosphate ester

Number of the different setting pressure values:

1 = one setting pressure
2 = two setting pressure
3 = three setting pressure

**16** HYDRAULIC SYMBOLS
The electric supply to these solenoids must be done through electronic devices situated out of potentially flammable environment (i.e. in safe zone), which limit the electric current to the intrinsically safe solenoid. These electronic devices are normally called “intrinsically safe barriers” approved and certified according to the Ex ia protection mode. To select the proper intrinsically safe barriers following data must be considered:

1) Vmax and Imax of the solenoid as specified in section [2] must not be exceeded also in fault conditions;
2) the resistance of the solenoid is 150 Ω and the current supplied by the barrier, in normal operation condition, must be over the min. limit (65 mA) to ensure the valve correct operation (over 70 mA for max performances).

The barriers type Y-BXNE 412 are galvanically isolated electronic devices, developed according to the European Norms EN60079-0/06, EN60079-11/07 and certified ATEX 94/9/CE, protection mode Ex ia IIC. These barriers ensure the optimized functioning of the Atos valves up to the max operating limits specified in section.

The barriers Y-BXNE-412 are double channel type, suitable to operate valves with double or single solenoid. Two single solenoid valves can be connected to the barrier (one to each channel) but they cannot be contemporary operated.

**MODEL CODE OF I.S. BARRIER**

**I.S. barrier for double solenoid valves**

Y-BXNE 412 00 *

Supply voltage
- E = 110÷230 V AC
- 2 = 24÷48 V DC

The above barrier can be used both for double or for single solenoid valves.

With one barrier, two single solenoid valves can be operated but not contemporary, see section [19].

### TECHNICAL CHARACTERISTICS OF I.S. BARRIER Y-BXNE 412

<table>
<thead>
<tr>
<th></th>
<th>Y-BXNE 412</th>
</tr>
</thead>
<tbody>
<tr>
<td>N° output channels</td>
<td>2</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>110±230 VAC ±10% (50/60 HZ)</td>
</tr>
<tr>
<td></td>
<td>21.6 ± 53 VDC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>&lt; 3W</td>
</tr>
<tr>
<td>Output voltage Uo</td>
<td>19.5 V</td>
</tr>
<tr>
<td>Output current Io</td>
<td>341 mA</td>
</tr>
<tr>
<td>Output power Po</td>
<td>1.64 W</td>
</tr>
<tr>
<td>Galvanic insulation supply/output</td>
<td>2500 VAC / 50 Hz</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-25 °C ± +70 °C</td>
</tr>
<tr>
<td>Working temperature</td>
<td>-10 °C ± +60 °C</td>
</tr>
<tr>
<td>Housing material</td>
<td>ABS case</td>
</tr>
<tr>
<td>Mounting</td>
<td>on rail EN 50022</td>
</tr>
<tr>
<td>Electrical connections</td>
<td>screw terminals</td>
</tr>
<tr>
<td>Method of protection</td>
<td>Ex ia IIC</td>
</tr>
<tr>
<td>ATEX classification</td>
<td>Ex II T G/D</td>
</tr>
</tbody>
</table>
21 INSTALLATION DIMENSIONS OF I.S. BARRIER [mm]

Y-BXNE 412

Safe zone Hazardous zone

Power supply

Input command Sol. A

Input command Sol. B

+ Vdc/+ Vdc

+24 Vdc

GND

Sol. A

Sol. B

22 EXTERNAL PROFILE OF INTRINSICALLY SAFE VALVES [mm]

DHW-06

DHW-07

DLOH-**/WO

DPHW-16

DPHW-17

DPHW-26

DPHW-27

ARAM-20/1*-WO

ARAM-32/1*-WO

LIDEW1-*-WO

LIDEW2-*-WO

LIDEW4-*-WO

AGAM-10/1*-WO

AGAM-20/1*-WO

AGAM-32/1*-WO