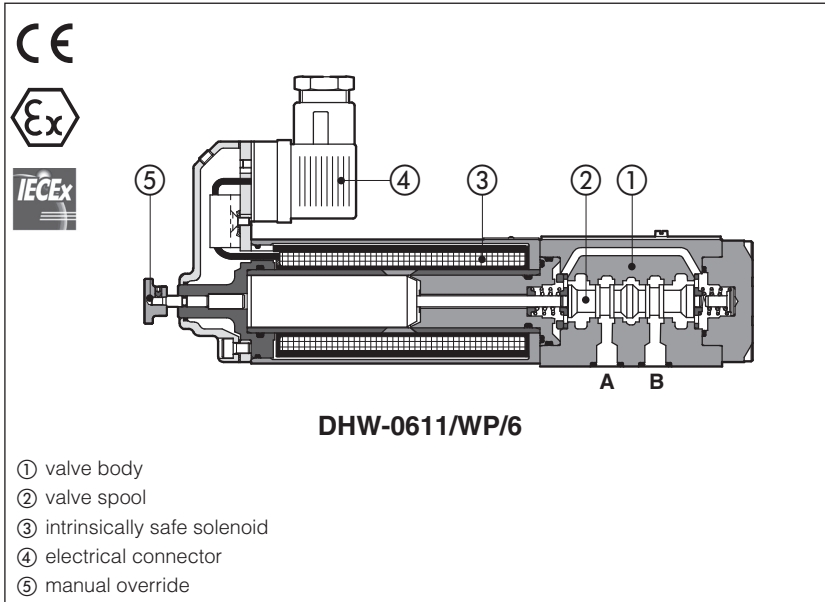


# Intrinsically safe solenoid directional valves

on-off spool type, direct - **ATEX** or **IECEX**



**DHW**

On-off, spool type, directional valves equipped with intrinsically safe solenoids certified for safe operation in hazardous environment with potentially explosive atmosphere.

Certifications:

- **ATEX or IECEX:**  
**II 1G Ex ia IIC, IIB, IIA**  
surface plants zone 0, 1 and 2

- **ATEX or IECEX:**  
**IM2 Ex ia IMb, Ex ib IMb**  
surface, tunnels or mining plants

DHW are **SIL** compliance with IEC 61508

See section [7] for certification data

The valves must be electrically powered through specific "safety barriers" limiting the max current to the solenoid, see section [13]

Size: **06**

Max flow: up to **25 l/min**

Max pressure: **350 bar**

**1 MODEL CODE**

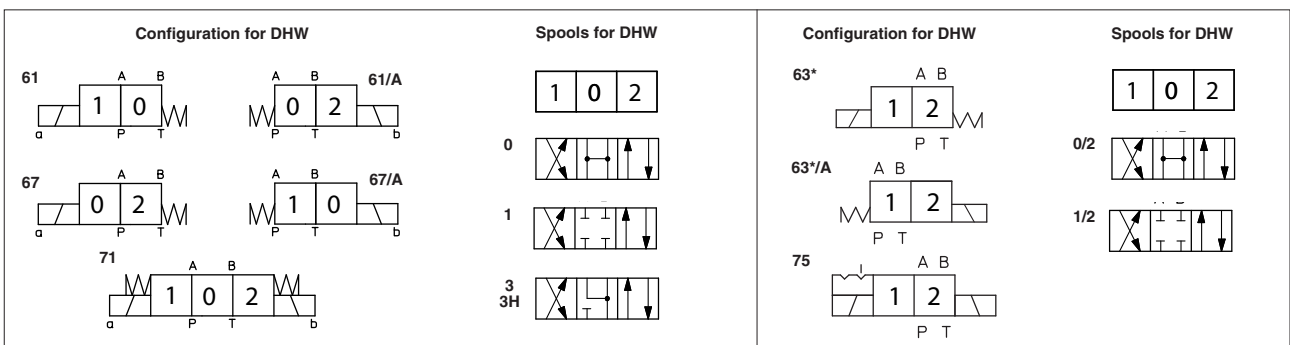
|   |   |   |   |   |    |    |   |   |   |   |   |   |   |
|---|---|---|---|---|----|----|---|---|---|---|---|---|---|
| <b>DHW</b>  | / | * | - | 0 | 71 | 3H | / | * | / | 6 | * | / | * |
| Intrinsically safe valve, spool type, direct  |   |   |   |   |    |    |   |   |   |   |   |   |   |
| <b>Certification type:</b><br>- = Omit for Atex Group II<br><b>M</b> = Atex Group I (mining)<br><b>IE</b> = IECEX Group II<br><b>IEM</b> = IECEX Group I (mining) |   |   |   |   |    |    |   |   |   |   |   |   |   |
| <b>Valve size (ISO 4401):</b><br><b>0</b> = size 06   |   |   |   |   |    |    |   |   |   |   |   |   |   |
| <b>Configuration</b> , see section [2] :  |   |   |   |   |    |    |   |   |   |   |   |   |   |
| <b>Spool type</b> , see section [2] :   |   |   |   |   |    |    |   |   |   |   |   |   |   |
| <b>Seals material</b> , see section [6] :<br>- = NBR<br><b>PE</b> = FKM<br><b>BT</b> = HNBR (1)   |   |   |   |   |    |    |   |   |   |   |   |   |   |
| Series number   |   |   |   |   |    |    |   |   |   |   |   |   |   |
| <b>Connector type</b><br><b>6</b> = DIN 43650 (standard)  |   |   |   |   |    |    |   |   |   |   |   |   |   |
| <b>Options (2):</b><br><b>A</b> = solenoid at side of port B<br><b>WP</b> = prolonged manual override   |   |   |   |   |    |    |   |   |   |   |   |   |   |

(1) Not for certification **M** and **IEM**, Group I (mining)

(2) Possible combined options: all combinations are available

⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

**2 CONFIGURATION and SPOOLS** (representation according to ISO 1219-1)



**Note:** Spool type 3H is available only for configuration 71. It is similar to spool type 3 but with higher flow capability A-B → T in central position, see section [10]

### 3 GENERAL CHARACTERISTICS

|  |   |
|--|---|
| Assembly position / location           | Horizontal position only  |
| Subplate surface finishing to ISO 4401 | Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100)   |
| MTTFd values according to EN ISO 13849 | 150 years, for further details see technical table P007   |
| Ambient temperature                    | <b>Standard</b> = -20°C ÷ +60°C <b>/PE</b> option = -20°C ÷ +70°C <b>/BT</b> option = -40°C ÷ +70°C   |
| Storage temperature range              | <b>Standard</b> = -20°C ÷ +80°C <b>/PE</b> option = -20°C ÷ +80°C <b>/BT</b> option = -40°C ÷ +70°C   |
| Surface protection                     | Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h  |
| Compliance                             | Intrinsically safe protection "Ex ia", see section 7<br>RoHs Directive 2011/65/EU as last update by 2015/65/EU<br>REACH Regulation (EC) n°1907/2006 |

### 4 HYDRAULIC CHARACTERISTICS

|                    |   |
|--------------------|---|
| Operating pressure | Ports P,A,B: <b>350</b> bar;<br>Port T <b>160</b> bar |
| Rated flow         | See Q/Δp diagrams at section 10                       |
| Maximum flow       | <b>25 l/min</b> , see operating limits at section 11  |

### 5 ELECTRICAL CHARACTERISTICS - see also section 7

|                            |                          |
|----------------------------|--------------------------|
| Nominal resistance at 20°C | 150 Ω                    |
| Coil insulation            | Class H                  |
| Working voltage            | 12 ÷ 26 V                |
| Minimum supply current     | 65mA, from I.S. barriers |
| Protection degree          | IP66                     |
| Duty factor                | 100%                     |
| Electrical connector       | DIN 43650 2 pin+GND      |

### 6 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

|                                      |   |                           |                      |
|--------------------------------------|---|---------------------------|----------------------|
| Seals, recommended fluid temperature | NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C<br>FKM seals (/PE option) = -20°C ÷ +80°C<br>HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C |                           |                      |
| Recommended viscosity                | 15 ÷ 100 mm <sup>2</sup> /s - max allowed range 2.8 ÷ 500 mm <sup>2</sup> /s  |                           |                      |
| Max fluid contamination level        | ISO 4406 class 20/18/15 NAS 1638 class 9, see also filter section at www.atos.com or KTF catalog  |                           |                      |
| <b>Hydraulic fluid</b>               | <b>Suitable seals type</b>  | <b>Classification</b>     | <b>Ref. Standard</b> |
| Mineral oils                         | NBR, FKM, HNBR  | HL, HLP, HLPD, HVL, HVLDP | DIN 51524            |
| Flame resistant without water        | FKM   | HFDU, HFDR                | ISO 12922            |
| Flame resistant with water           | NBR, HNBR   | HFC                       |                      |

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

#### (1) Performance limitations in case of flame resistant fluids with water:

-max operating pressure = 210 bar      -max fluid temperature = 50°C

### 7 CERTIFICATION DATA

|   |  |           |   |     |                                     |       |                          |     |     |      |             |      |
|---|--|-----------|---|-----|-------------------------------------|-------|--------------------------|-----|-----|------|-------------|------|
| Valve type                                | DHW                                      |           | DHW/IE                                      |     | DHW/M                               |       | DHW/IEM                  |     |     |      |             |      |
| Certification                             | ATEX (Group II)                          |           | IECEX (Group II)                            |     | ATEX (mining) (Group I)             |       | IECEX (mining) (Group I) |     |     |      |             |      |
| Solenoid code                             | OW-18/6                                  |           | OWI-18/6                                    |     | OWM-18/6                            |       | OWIM-18/6                |     |     |      |             |      |
| Type examination certificate (1)          | CESI 02<br>ATEX 013                      |           | IECEX<br>CES 12.0017                        |     | CESI 02<br>ATEX 013                 |       | IECEX<br>CES 12.0017     |     |     |      |             |      |
| Method of protection                      | Ex II 1G    Ex ia                        |           | Ex ia                                       |     | Ex I M2    Ex ia I Mb    Ex ib I Mb |       |                          |     |     |      |             |      |
|   | IIA T5 Ga                                | IIB T6 Ga | IIC T6 Ga                                   |     |                                     |       |                          |     |     |      |             |      |
| Electrical characteristics (max values)   | Ui [V]                                   | 28        | 28  | 27  | 19,5                                | 19,11 | 28                       | 28  | 27  | 19,5 | 19,11       | 12,4 |
|   | Ii [mA]                                  | 396       | 250   | 130 | 360                                 | 360   | 396                      | 250 | 130 | 360  | 360         | 2200 |
|   | Pi [W]                                   | 2,8       | 1,8   | 0,9 | 1,64                                | 1,72  | 2,8                      | 1,8 | 0,9 | 1,64 | 1,72        | 6,82 |
|   | Ci , Li                                  | ≅ 0       |   | ≅ 0 |                                     | ≅ 0   |                          | ≅ 0 |     | ≅ 0  |             | ≅ 0  |
| Temperature class                         | T5                                       |           | T6  |     |                                     |       |                          |     |     |      |             |      |
| Surface temperature (ambient temp. +60°C) | ≤ 100°C                                  |           | ≤ 85°C                                      |     |                                     |       |                          |     |     |      | ≤ 150°C     |      |
| Ambient temperature                       | -20 ÷ +60°C                              |           | -40 ÷ +60°C (2)                             |     |                                     |       |                          |     |     |      | -20 ÷ +60°C |      |
| Applicable standards                      | EN 60079-0<br>EN 60079-11<br>EN 60079-26 |           | IEC 60079-0<br>IEC 60079-11<br>IEC 60079-26 |     |                                     |       |                          |     |     |      |             |      |

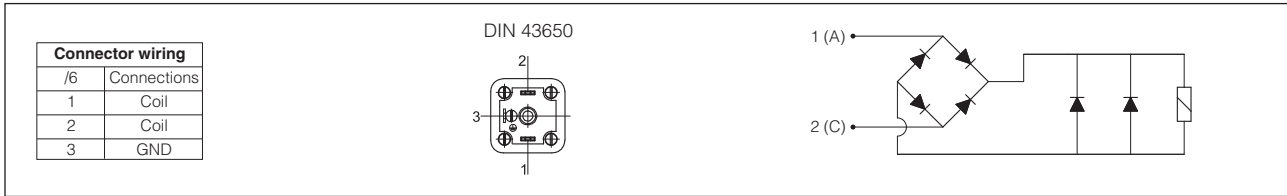
(1) The type examiner certificates can be downloaded from www.atos.com      (2) Only for /BT option

⚠ **WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

**8 SIL compliance with IEC 61508: 2010**

- **SC3** (systematic capability)
- max **SIL 2** (HFT = 0 if the hydraulic system does not provide the redundancy for the specific safety function where the component is applied)
- max **SIL 3** (HFT = 1 if the hydraulic system provides the redundancy for the specific safety function where the component is applied)

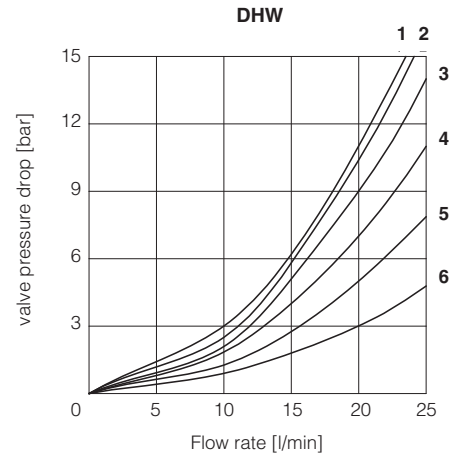
**9 EX PROOF SOLENOIDS WIRING**



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

**DHW**

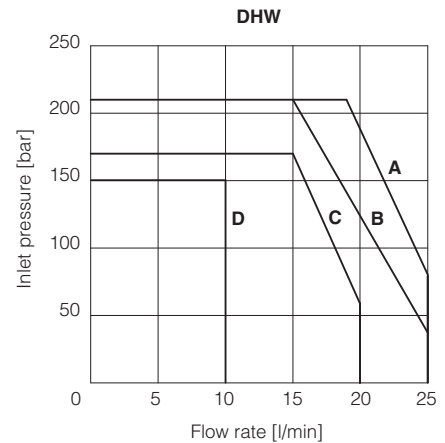
| Flow direction \ spool type | spool type |     |     |   |   |    |
|-----------------------------|------------|-----|-----|---|---|----|
|                             | 0          | 0/2 | 1/2 | 1 | 3 | 3H |
| P→A / P→B                   | 4          | 5   | 5   | 3 | 3 | 3  |
| A→T / B→T                   | 6          | 2   | 1   | 2 | 4 | 5  |
| A - B→T                     |            |     |     |   |   | 4  |



**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.

| DHW type | 0 | 0/2 | 1/2 | 1 | 3 | 3H |
|----------|---|-----|-----|---|---|----|
| Diagram  | B | B   | C   | C | A | D  |



**12 INTERNAL LEAKAGES**

**DHW internal leakages** based on mineral oil ISO VG 46 at 50°C  
**18 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

**13 INTRINSICALLY SAFE BARRIERS** - see tech. table **GX010**

Intrinsically safe valves must be powered through safety barriers certified according to Ex-ie protection mode, limiting the energy to the solenoid.

To select the proper intrinsically safe barriers following data must be considered:

- 1) Vmax and Imax of the solenoid as specified in section [7] 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, complying with European Norms EN60079-0/06, EN60079-11/07 and ATEX certified according to protection mode Ex ia IIC.

These barriers ensure the optimized functioning of the Atos valves up to the max operating limits specified in section [4].

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**

|                        |          |
|------------------------|----------|
| <b>Y-BXNE 412 00</b>   | <b>*</b> |
| Supply voltage         |          |
| <b>E</b> = 110/230 VAC |          |
| <b>2</b> = 24÷48 VDC   |          |

**14** INSTALLATION DIMENSIONS [mm]

**ISO 4401: 2005** (see table P005)

**Mounting surface: 4401-03-02-0-05**

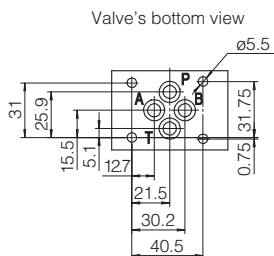
Fastening bolts: 4 socket head screws:

M5x50 class 12.9

Tightening torque = 8 Nm

Seals: 4 OR 108

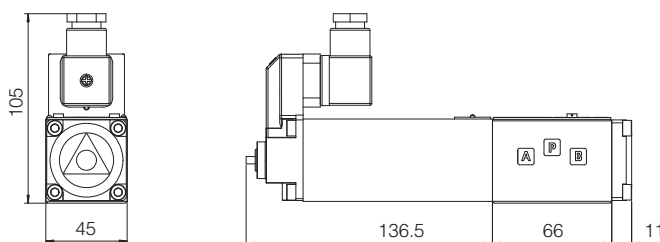
Ports P,A,B,T:  $\varnothing = 7.5$  mm (max)



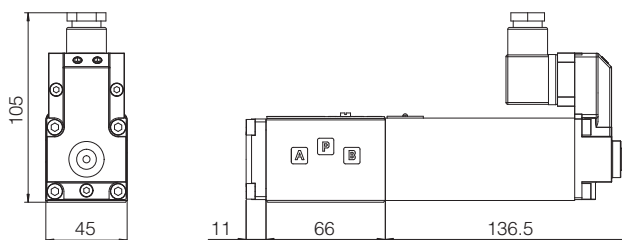
**P** = PRESSURE PORT  
**A, B** = USE PORT  
**T** = TANK PORT

| Mass [kg] |     |
|-----------|-----|
| DHW-06    | 2,4 |
| DHW-06*/A | 2,4 |
| DHW-07*   | 4   |

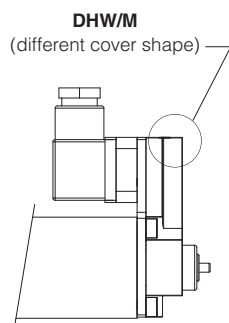
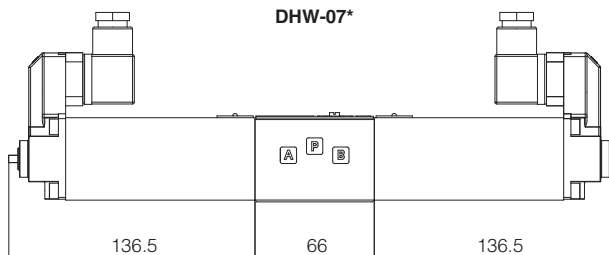
**DHW-06**



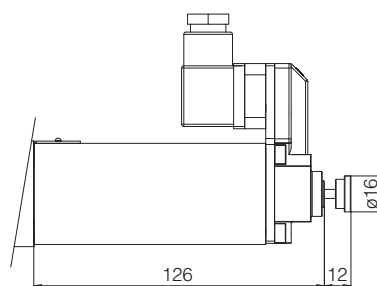
**DHW-06\*/A**



**DHW-07\***



**Option /WP**



**Note:** the connector is supplied with the valve

**15** RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X050** Summary of Atos intrinsically safe components certified to ATEX, IECEx
- EX950** Operating and maintenance information for intrinsically safe valves
- P005** Mounting surfaces for electrohydraulic valves