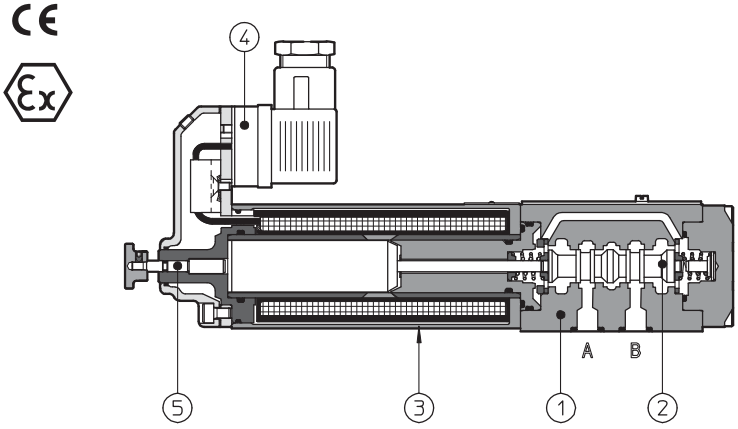
Intrinsically safe solenoid valves

on/off controls - ATEX certification



DHW-0611/WP/6

① valve body
② valve spool
③ intrinsically safe solenoid
④ electrical connector
⑤ manual override

On/off valves equipped with intrinsecally safe solenoids certified according to ATEX 94/9/CE, protection mode:
- Ex II 1 G, Ex ia IIC T6, IIB T6 or IIA T5 (surface plants with gas or vapours environment, category 1, zone 0, 1 and 2).
- Ex I M2 Ex ia I (solenoids group I for 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 limitate the max 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 thermic effects able to cause explosion in hazardous environments also in presence of specific break-down situations.

1 INTRINSICALLY SAFE SOLENOIDS: MAIN DATA

Solenoid code	Group II	**OW-18/6**	**OW-18/H**
	Group I (mining)	**OWM-18/6**	**OWM-18/H**
Nominal resistance at 20°C		150	
Coil insulation		Class H	
Protection degree		IP65	IP67
Duty factor		100%	
Electrical connector		DIN 43650 2 pin+GND	MIL-C-26482 3 pin

2 INTRINSICALLY SAFE SOLENOIDS: ELECTRICAL AND TEMPERATURE DATA

Method of protection		**Ex ia / Ex ib** according to EN60079-0: 2006, EN60079-11:2007					
Gas group		**I** and **IIC**			**I** and **IIB**	**I** and **IIA**	**I**
Temperature class		**T6**			**T6**	**T5**	**-**
Electrical characteristic	V max	27 V	19,5 V	19,11 V	28 V	28 V	12,2 V
	I max	130 mA	360 mA	360 mA	250 mA	396 mA	2200 mA
	P max	0,9 W	1,64 W	1,72 W	1,8 W	2,8 W	6,82 W
Minimum supply current		≥ 65mA, for I.S. barriers see section 18 to 21					
Surface temperature (ambient temp. +60°C)		≤ 85°C				≤ 100°C	150 °C
Ambient temperature		-40 ÷ +60°C (1)					-20 ÷ +60°C

(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

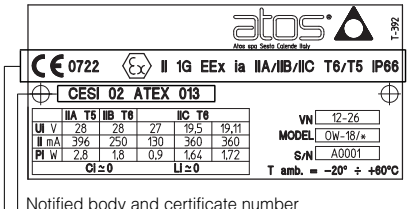
3.1 GROUP II, Atex

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
IIC = 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 continuosly 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

4 MAIN CHARACTERISTICS OF INTRINSICALLY SAFE VALVES

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 $\sqrt{}^{04}$ 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 .... 535; for other fluids see section 5
Recommended viscosity	15 ÷ 100 mm²/s at 40°C (ISO VG 15 ÷ 100) max viscosity 400 mm²/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

4.1 Corrosion protection characteristics

Valve screws: all screws made in stainless steel class A2

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

DH W /* – 0 71 3H / A / 6 ** /*

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

W = intrinsecally safe solenoid, Atex certified

omit for Group II
M = Group I (mining)

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

Valve configuration, DHW see section 6 and DPHW see section 7

Spool type, DHW see section 6 and DPHW see section 7
3H = spool type 3H for marine applications (1) Only for DHW-071

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

Connector type - see section 17
/6 = DIN 43650 (standard)
/H = MIL-C-26482

Series number

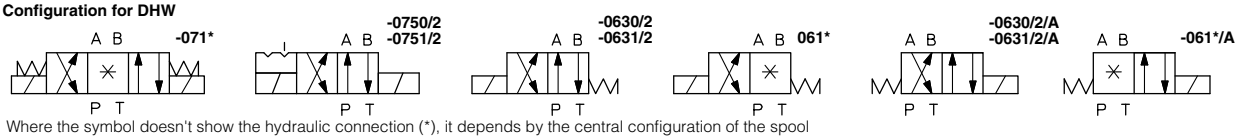
Synthetic fluids (2):
WG = water-glycol
PE = phosphate ester

(1) Spool type 3H provides larger passages A-B to T in central position than spool type 3, see section 11.3

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

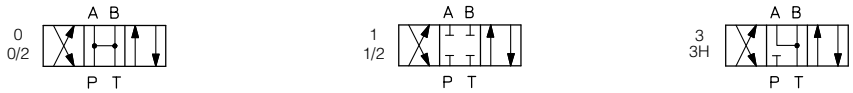
6 HYDRAULIC CONFIGURATIONS OF DHW VALVES

Configuration for DHW

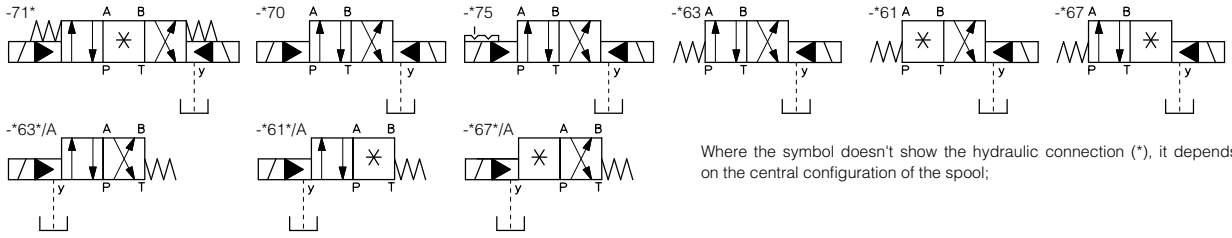


Where the symbol doesn't show the hydraulic connection (*), it depends by the central configuration of the spool

Spools for DHW



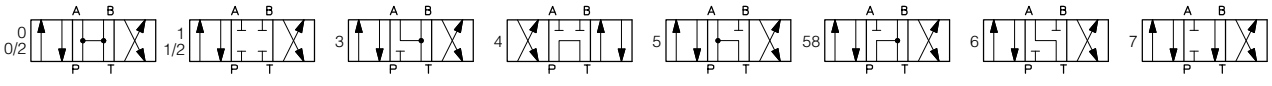
7 CONFIGURATION OF DPHW VALVES



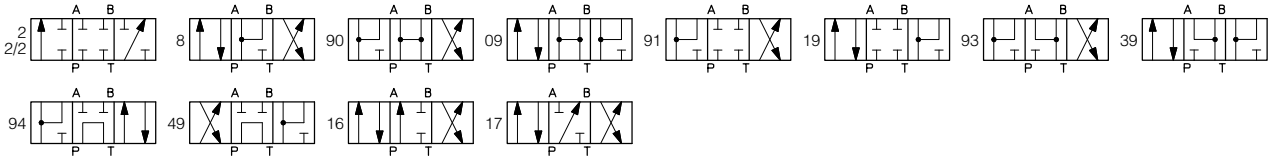
Where the symbol doesn't show the hydraulic connection (*), it depends on the central configuration of the spool;

Spools for DPHW valves

For all size



Only for DPHW-2, DPHW-3



8 MODEL CODE OF POPPET TYPE LEAK FREE ON-OFF DIRECTIONAL SOLENOID VALVES

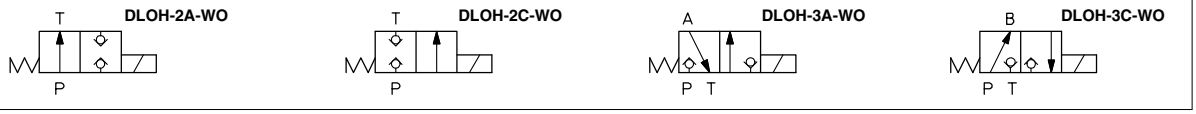
DLOH / * – 2 A / R – WO / 6 ** /*

- DLOH: directional control valve, poppet type size 06
- *: omit for Group II; **M** = Group I (mining)
- 2: **2** = 2 way; **3** = 3 way
- A: **A** = open in rest position; **C** = closed in rest position
- R: Options: **/R** = with check valve on port P; **/WP** = prolunged manual override
- WO: **/WO** = intrinsically safe solenoid, Atex certified
- 6: Connector type - see section 17; **/6** = DIN 43650 (standard); **/H** = MIL-C-26482
- **: Series number
- *: Synthetic fluids (1): **WG** = water-glycol; **PE** = phosphate ester

(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

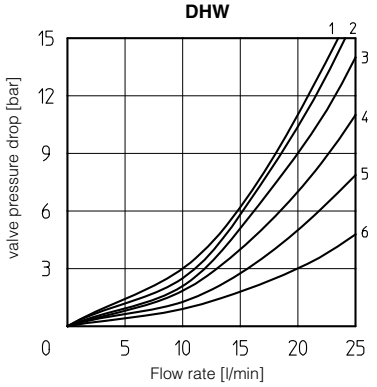
DHW

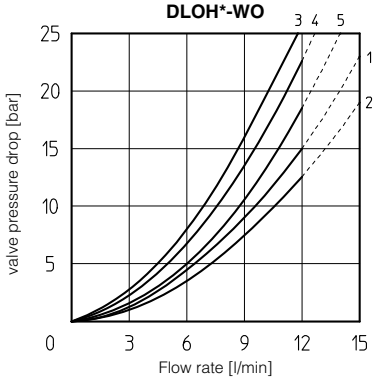
Flow direction \ spool type	0	0/2	1/2	1	3	3H
P→A / P→B	4	5	5	3	3	3
A→T / B→T	6	2	1	2	4	5

DLOH*-WO

Flow direction \ configuration	2A	2C	3A	3C
P→A / P→B (1)	1	2	4	3
A→T / B→T	-	-	5	4

(1) For two-way valves pressure drop refers to P→T



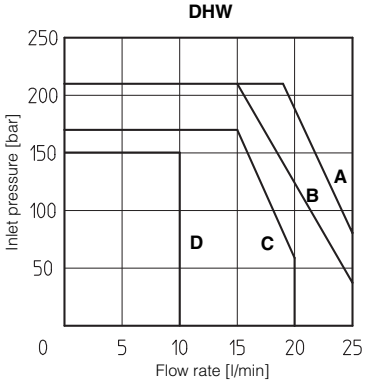


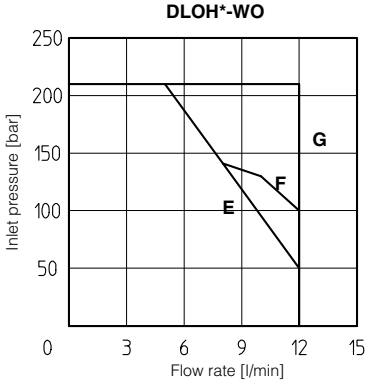
11 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

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

DLOH type	2A	2C	3A	3C
Diagram	G	G	F	E





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
18 cm^3/min with P=100 bar - fluid viscosity = 43 cSt at 40 °C
30 cm^3/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 cm^3/min) at max pressure.

13 MODEL CODE OF PRESSURE CONTROLS

AGAM /* – 20 / 2 0 / 210 - WO / WP / 6 ** /*

AGAM = pressure relief valve, subplate mounting, see tab. C066
ARAM = pressure relief valve, threaded connections, see tab. C045

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:
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
0 = venting with de-energized solenoid
1 = venting with energized solenoid
2 = without venting

Pressure range of first/second/third setting:
50 = 4 - 50 bar
100 = 6 - 100 bar
210 = 7 - 210 bar
350 = 8 - 350 bar

WO = Intrinsically safe solenoid, Atex certified

Option:
/WP = prolunged manual override

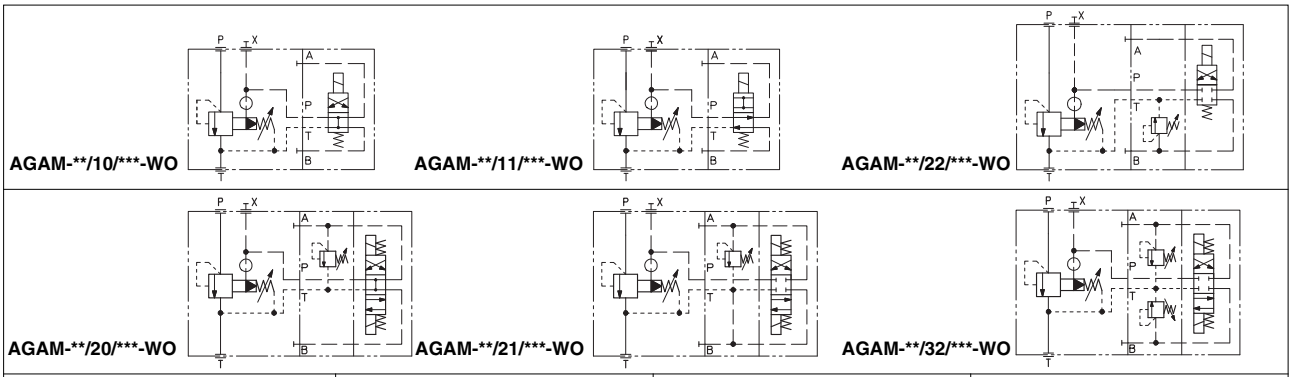
Connector type - see section 17
/6 = DIN 43650 (standard)
/H = MIL-C-26482

Series number

Synthetic fluids (1):
WG = water-glycol
PE = phosphate ester

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

14 HYDRAULIC CHARACTERISTICS



AGAM-/10/***-WO** **AGAM-**/11/***-WO** **AGAM-**/22/***-WO**

AGAM-/20/***-WO** **AGAM-**/21/***-WO** **AGAM-**/32/***-WO**

Valve model		AGAM-10-WO	AGAM-20-WO	AGAM-32-WO
Max pressure	[bar]	350		
Setting			**50; 100; 210; 350**	
Pressure range	[bar]		4÷50; 6÷100; 7÷210; 8÷350	
Max flow	[l/min]	200	400	600

15 MODEL CODE OF COVERS FOR CARTRIDGE VALVES

LIDEW /* 1 – 1 / * - WO / 6 ** /*

Cover type:
LIDBH = with solenoid valve and shuttle valve for pilot selection
LIDEW = with solenoid valve for pilot selection

Omit for Group II
M = Group I (mining)

Valve configuration, see section 16

Valve size (ISO 7368)
for LIDBH*: **1** = 16, **2** = 16, **3** = 16, **4** = 16, **5** = 50
for LIDEW* **1** = 16, **2** = 16, **3** = 16, **4** = 16, **5** = 50, **6** = 63, **8** = 80

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

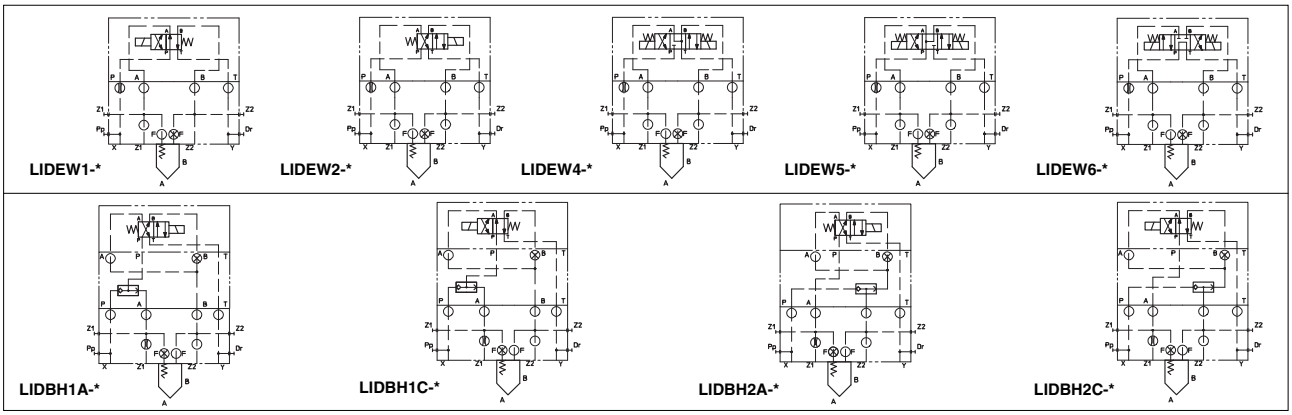
Connector type - see section 17
/6 = DIN 43650 (standard)
/H = MIL-C-26482

Series number

Synthetic fluids (1):
WG = water-glycol
PE = phosphate ester

Note: for the code of the ISO cartridge to use with the above covers see tab. H003, section 2 and tab. H030, section 3.
(1) Option **/BT** = low temperature -40°C also available on request (not for group I Atex -mining-)

16 HYDRAULIC SYMBOLS

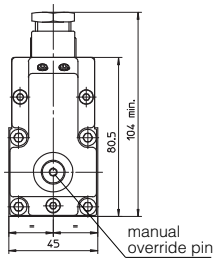


LIDEW1-* **LIDEW2-*** **LIDEW4-*** **LIDEW5-*** **LIDEW6-***

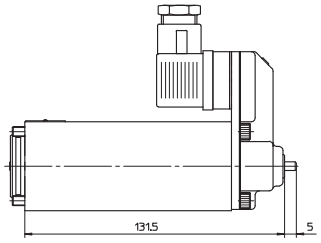
LIDBH1A-* **LIDBH1C-*** **LIDBH2A-*** **LIDBH2C-***

17 SOLENOID DIMENSIONS AND WIRING

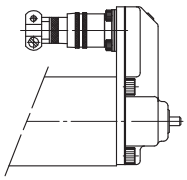
Dimension [mm]



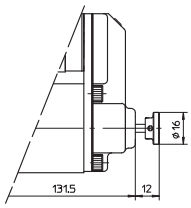
OW-18/6 (standard)



Option /H

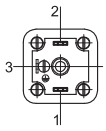


Option /WP

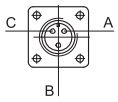


Connector wiring		
/6	/H	Connections
1	A	Coil
2	C	Coil
3	B	GND

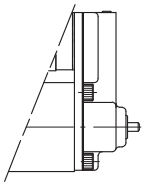
DIN 43650

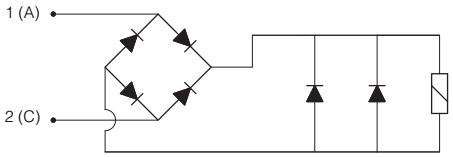


MIL-C-26482



cover shape for mining version





note: the connectors are supplied with the valves

18 INTRINSICALLY SAFE BARRIERS

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 11.
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.

19 MODEL CODE OF I.S. BARRIER

19.1 I.S. barrier for double solenoid valves

Y-BXNE 412 00 *

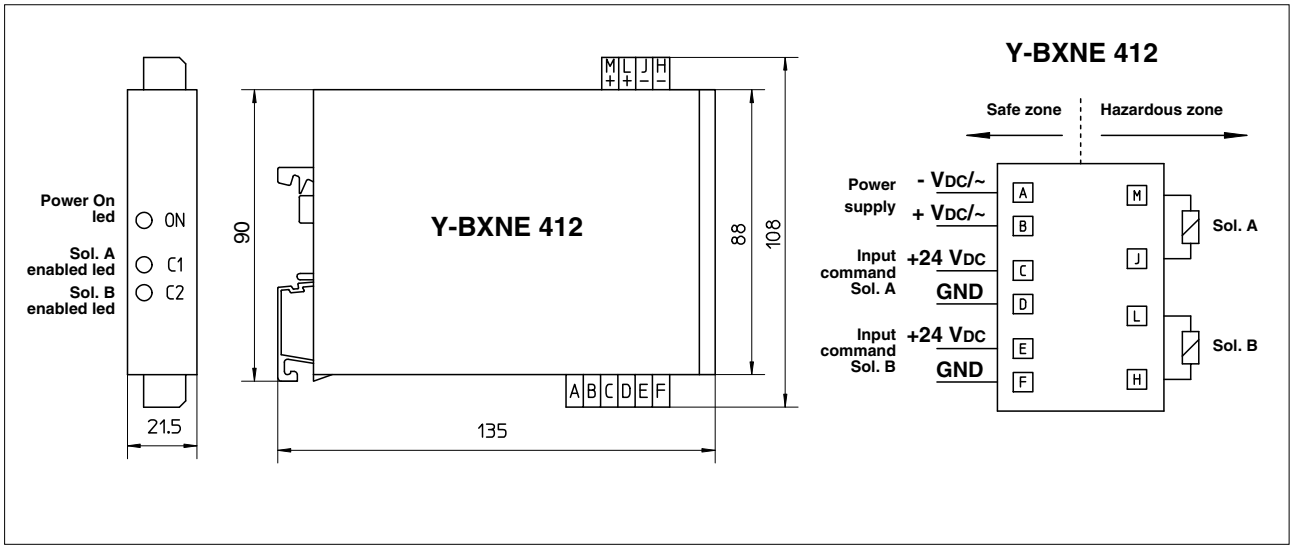
Supply voltage
E = 110/230 VAC
2 = 24÷48 VDC

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 18.

20 TECHNICAL CHARACTERISTICS OF I.S. BARRIER

	Y-BXNE 412
N° output channels	2
Power supply voltage	110÷230 VAC ±10% (50/60 HZ) 21,6 ÷ 53 VDC
Power consumption	< 3W
Output voltage Uo	19,5 V
Output current Io	341 mA
Output power Po	1,64 W
Galvanic insulation supply/output	2500 VAC / 50 Hz
Storage temperature	-25 °C ÷ +70 °C
Working temperature	-10 °C ÷ +60 °C
Housing material	ABS case
Mounting	on rail EN 50022
Electrical connections	screw terminals
Method of protection	Ex ia IIC
ATEX classification	Ex II 1 G/D

21 INSTALLATION DIMENSIONS OF I.S. BARRIER [mm]



22 EXTERNAL PROFILE OF INTRINSICALLY SAFE VALVES [mm]

