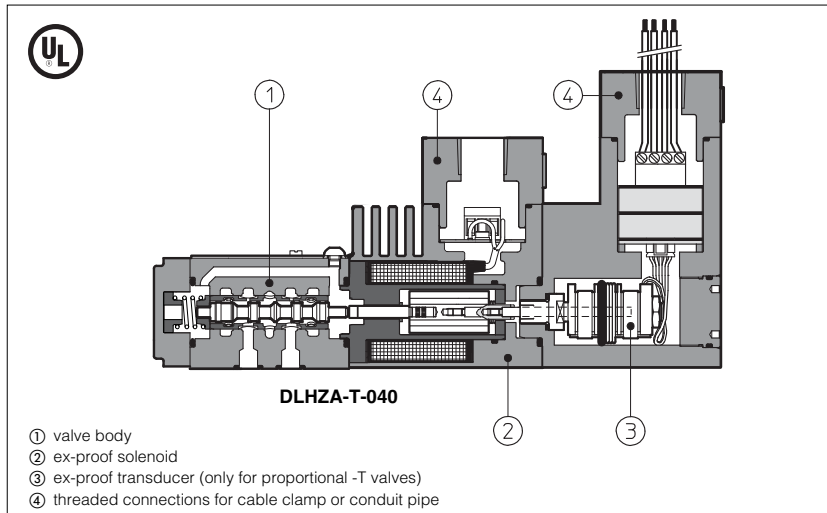


Explosion-proof solenoid valves

on/off and proportional controls - UL certification



Explosion-proof on/off and proportional solenoids certified according to UL 1002 Standard, Class I, Groups C&D.

The solenoid case is designed to contain the possible explosion which could be caused by the presence of the gas mixture inside the housing, thus avoiding dangerous propagation in the external environment.

DHA and DLOH valves are conform to **SIL 3** safety level (TÜV approved).

They are also designed to limit the external temperature according to the certified class to avoid the self ignition of the explosive mixture present in the environment.

These solenoids are applied to hydraulic valves for application in explosion-hazardous environments.

1 EXPLOSION PROOF SOLENOIDS: MAIN DATA

SOLENOID TYPE	PROPORTIONAL		ON-OFF
	without transducer	with transducer	
Solenoid code	OZAU-A	OZAU-T	OA
Voltage	12 DC, 24 DC	12 DC	12DC, 24DC, 110DC, 125DC, 220DC
code		-	12AC, 24AC, 110AC, 220AC (1)
Power consumption	35W		12W
Coil insulation	Class H		
Protection degree	IP 66 According to IEC 144 when correctly coupled with the relevant cable gland		
Duty factor	100%		
Mechanical construction	Flame proof housing classified, according to UL 1002, class I, groups C+D		
Cable entrance and electrical wiring	Cable gland connection 1/2" NPT (ANSI B2.1). The relevant cable gland has to be provided by the customer. The valves are supplied with 1,07 m (42 inches) cable length factory wired		

(1) For alternating current supply a rectifier bridge is provided built-in the solenoid

2 EXPLOSION PROOF SOLENOIDS: TEMPERATURE DATA

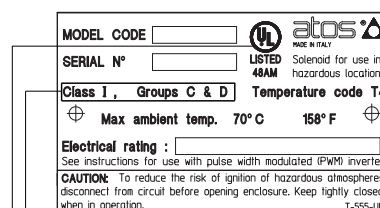
SOLENOID TYPE	PROPORTIONAL	ON/OFF
Method of protection	Ex d	
Temperature class with +70°C ambient temp.	T4	T6
Surface temperature	≤135 °C	≤ 85 °C
Ambient temperature	-40 ÷ +70 °C	

3 CERTIFICATIONS

In the following is resumed the valves marking according to UL 1002 certification

- Class I** = Equipment for famable gas and vapours
- Division 1** = Possibility of explosive atmosphere during normal functioning
- Groups C&D** = Gas group

3.1 EXAMPLE OF NAMEPLATE MARKING



Marking according to UL 1002 certification

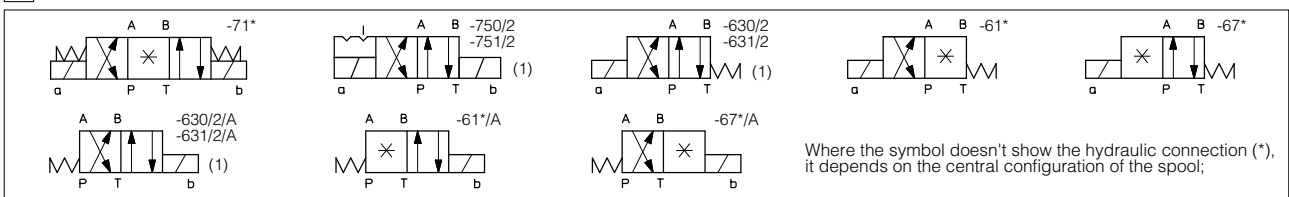
UL identification mark

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

<p>DHA = spool type - direct DPHA = spool type - piloted</p> <p>UL = UL 1002 certification</p> <p>Valve size (ISO 4401) for DHA 0 = 06 for DPHA 1 = 10 2 = 16 3 = 25</p> <p>Valve configuration, DHA see section 5 and DPHA see section 6</p> <p>Spool type, DHA see section 5 and DPHA see section 6</p> <p>Solenoid threaded connection: NPT = 1/2" NPT ANSI B2.1 (tapered)</p>	<p>/ UL - 0 63 1/2 / NPT /</p>	<p>* 24DC **</p>	<p>Synthetic fluids: WG = water-glycol PE = phosphate ester Low temperature execution: BT = low temperature -40°C</p> <p>Series number</p> <p>Voltage code - see section 1</p> <p>Options: A = solenoid at side of port B (for single solenoid valves) O = horizontal cable entrance MV = horizontal hand lever (1) WP = prolonged manual override protected by metallic cap</p> <p>Only for DPHA: /D = Internal drain. /E = External pilot pressure. /H = Adjustable chokes (meter-out to the pilot chambers of the main valve). /H9 = Adjustable chokes (meter-in to the pilot chambers of the main valve). /S = Main spool stroke adjustment (only for DPHA-2, -3).</p>
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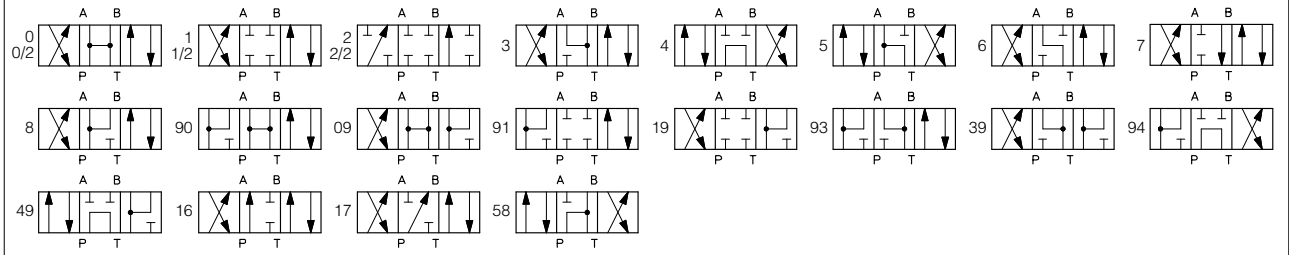
(1) Option **/MV** available only for DHA, configuration 61, 63, 71 and spool type 0, 0/2, 1, 1/2, 3, 4. For installation dimensions see table E138

5 CONFIGURATION OF DHA VALVES

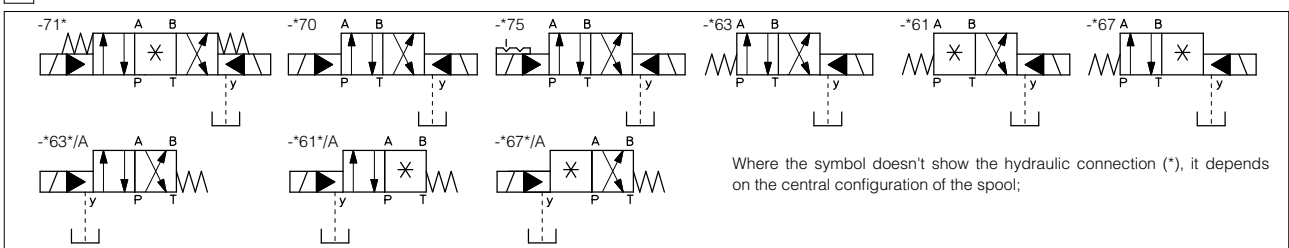


(1) Configurations 63 and 75 are available only for spool type 0/2, 1/2 and 2/2

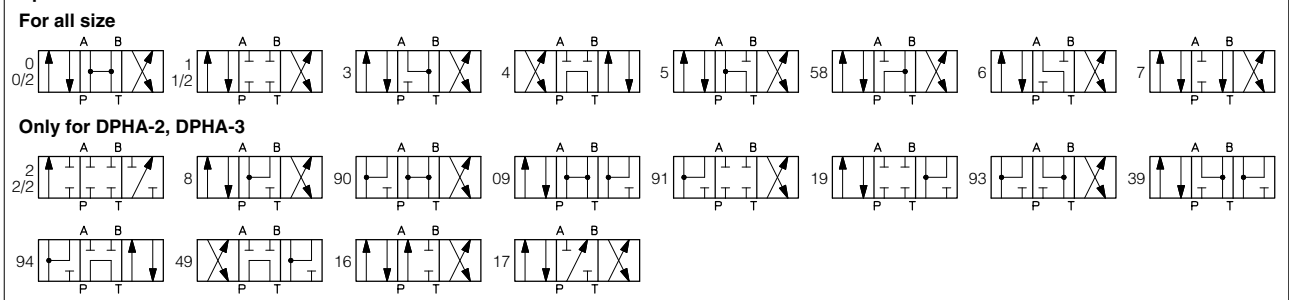
Spools for DHA valves



6 CONFIGURATION OF DPHA VALVES



Spools for DPHA valves



7 MODEL CODE OF POPPET TYPE, LEAK FREE, DIRECTIONAL SOLENOID VALVES

DLO H - 2 A / NPT - AO/UL / * 24DC ** /*

Directional control valve poppet type, size 06

H = max flow 12 l/min
K = max flow 30 l/min

2 = two way (only for DLOH)
3 = three way

Valve configuration, see section 8
A = open in rest position
C = closed in rest position

Solenoid threaded connection:
NPT = 1/2" NPT ANSI B2.1 (tapered)

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

Series number

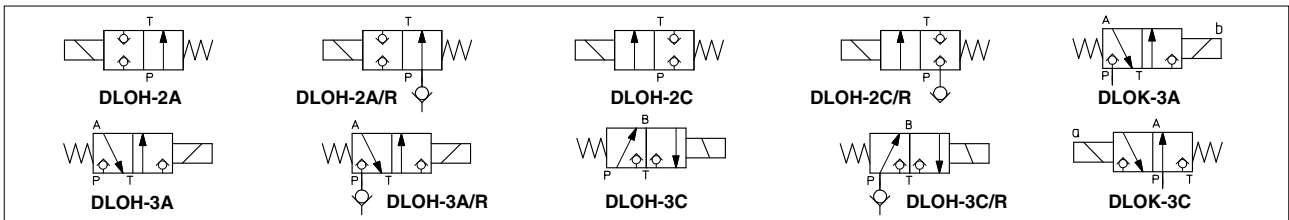
Voltage code - see section 11

Options:
O = horizontal cable entrance
R = with check valve on port P
WP = prolonged manual override protected by metallic cap

Certification type
AO/UL = UL 1002 certification

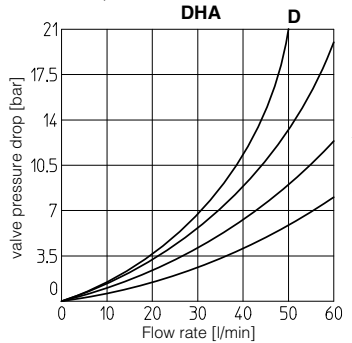
(1) Option **/BT** = low temperature -40°C also available on request

8 CONFIGURATION OF DLOH/AO/* AND DLOK/AO/*



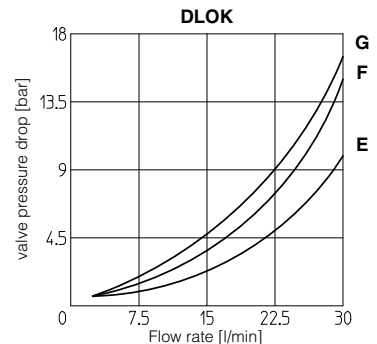
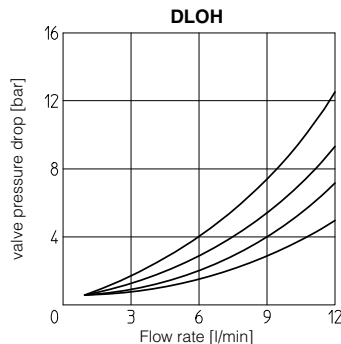
9 Q/Δp DIAGRAMS OF ON/OFF DIRECTIONAL CONTROLS (based on mineral oil ISO VG 46 at 50°C)

Flow direction	Spool type				
	P→A	P→B	A→T	B→T	P→T
0	C	C	C	C	
0/2, 1, 1/2	A	A	A	A	
3	A	A	C	C	
4, 5	D	D	D	D	A
6	A	A	C	A	
7	A	A	A	C	
8	C	C	B	B	



INTERNAL LEAKAGE of DLOH and DLOK less than 5 drops/min (0,36 cm³/min) at max pressure.

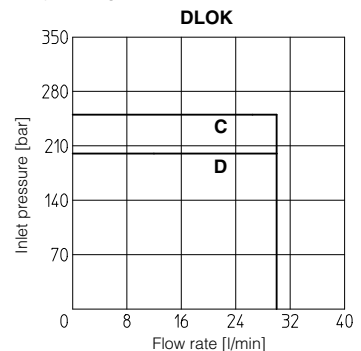
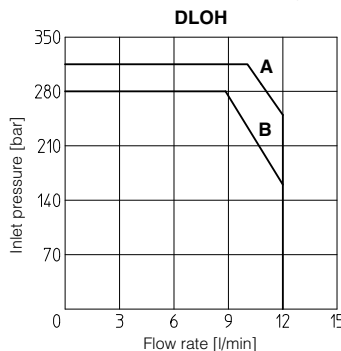
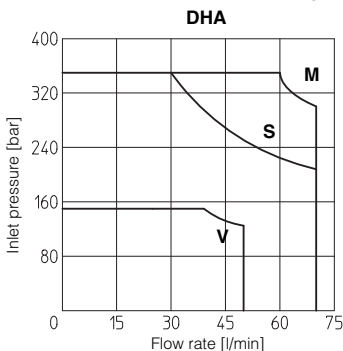
Flow direction	Valve type	
	P → A (1) (P → B)	A → T (B → T)
DLOH-2A	B	-
DLOH-2C	C	-
DLOH-3A	D	C
DLOH-3C	C	A
DLOK-3A	G	F
DLOK-3C	F	E



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

10 OPERATING LIMITS OF ON/OFF DIRECTIONAL CONTROLS (based on mineral oil ISO VG 46 at 50°C)

The diagram have been obtained with warm solenoids and power supply at lowest value ($V_{nom}-10\%$). For DHA 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.



M = Spools 0, 1, 8; **V** = Spools 4, 5.
S = Spools 0/2, 1/2, 3, 6, 7;

A = DLOH-3A;
B = DLOH-2A, DLOH-3C.

C = DLOK-3A;
D = DLOK-3C.

10.1 Max pressure in port T = 210 bar

11 MODEL CODE OF PRESSURE RELIEF VALVES

AGAM - 20 / 2 0 /210/100/100 / NPT - AO/UL / * 24 DC ** /*

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

Valve size for AGAM: **10** (ISO 6264) **20** = G 3/4" **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

Max regulated pressure of first (second / third) setting see section 12

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

Series number

Voltage Code, see section 11

Options:

- E** = external pilot
- O** = horizontal cable entrance
- V** = regulating handwheel
- WP** = prolonged manual override protected by metallic cap
- Y** = external drain

Certification type:
AO/UL = UL 1002 certification

Solenoid threaded connection:
NPT = 1/2" NPT ANSI B2.1 (tapered)

(1) Option **/BT** = low temperature -40°C also available on request

12 HYDRAULIC CHARACTERISTICS

Valve model	Size 10	Size 20	Size 32
Setting		50; 100; 210; 350	
Max pressure port P [bar]		350	
Pressure range [bar]		4÷50; 6÷100; 7÷210; 8÷350	
Max flow AGAM [l/min]	200	400	600
Max flow ARAM [l/min]	-	350	500

13 MODEL CODE OF COVERS FOR CARTRIDGE VALVES

LIDEW - 1 / NPT - AO/UL - * 24DC ** /*

Cover type:
LIDBH* = with solenoid valve and shuttle valve for pilot selection
LIDEW* = with solenoid valve for pilot selection
 * = valve configuration (see H030 section 2)

Size (ISO 7368)
1 = 16; **4** = 40; **8** = 80 (only for LIDEW);
2 = 25; **5** = 50;
3 = 32; **6** = 63;

Solenoid threaded connection:
NPT = 1/2" NPT ANSI B2.1 (tapered)

Certification type
AO/UL = UL 1002 certification

Optional different provision or setting of the calibrated plugs in the pilot channels see table H030 sect. 6

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

Series number

Voltage code - see section 11

Options:

- B** = cartridge piloted via port "B" of solenoid pilot valve
- E** = external attachments X (1/4" GAS) and underneath port X supplied plugged (only for sizes 40..80)
- O** = horizontal cable entrance
- WP** = prolonged manual override protected by metallic cap

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

14 HYDRAULIC SYMBOLS

18 MODEL CODE OF SERVOPROPORTIONAL VALVES

DLHZA / UL - T - 0 4 0 - L 7 3 / NPT / * ** /*

DLHZA = size 06
DLKZA = size 10

UL = UL 1002 certification

T = with integral position transducer

Valve size (ISO 4401)
0 = size 06 (DLHZA)
1 = size 10 (DLKZA)

Configuration, see section 19
4 = external plus central position, spring centered
6 = 3 position, spring centered

Spool overlapping in central position, see section 19
0 = P, A, B, T zero overlapping

Spool type
L = linear; **T** = not linear;

(1) Option **/BT** = low temperature -40°C also available on request

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

Series number

Options:
B = solenoid at side of port A
C = position transducer with current feedback 4÷20 mA
Y = external drain

Solenoid threaded connection:
NPT = 1/2" NPT ANSI B2.1 (tapered)

Fail safe configuration:
1 = A, B, P, T with positive overlapping **3** = P, positive overlapping; A, B, T negative

Spool size: see section 19

19 HYDRAULIC CHARACTERISTICS (based on mineral oil ISO VG 46 at 50 °C)

*40-L*3
*40-T*3

*40-L*1
*40-T*1

*60-L*1

Valve model	DLHZA-T*						DLKZA-T*		
Pressure limits [bar]	ports P, A, B = 350; T = 160 (250 with external drain /Y)						ports P, A, B = 315; T = 160 (250 with external drain /Y)		
Spool	L1	L3	L5	T5	L7	T7	L3	L7	T7
Δp max P-T [bar]	70	70	70	70	70	70	60	60	60
Max flow at Δp = 30 bar [l/min]	4,5	9	18	27	40	60	55	80	80
Max flow at Δp max bar [l/min]	7	14	28	40	55	80	55	80	80
Leakage [cm³/min] at P = 100 bar (1)	< 200	< 300	< 500	< 200	< 900	< 200	< 1000	< 1500	< 400
Response time (2) [ms]	≤ 10						≤ 15		
Hysteresis [%]	≤ 0,1%						≤ 0,1%		
Thermal drift	zero point displacement < 1% at ΔT = 40°C								

(1) Referred to spool in center position and 50°C oil temperature.
(2) Response times at step signal (0%→100%) are measured from 10% to 90% of step value and are strictly referred to valve regulation.

20 MODEL CODE OF PRESSURE COMPENSATED PROPORTIONAL FLOW CONTROL VALVES

QVHZA / UL - T - 06 / 12 / NPT / * ** /*

QVHZA = size 06
QVKZA = size 10

UL = UL 1002 certification

A = without position transducer
T = with integral position transducer

Valve size (ISO 4401)
QVHZA: **06** QVKZA: **10**

Max regulated flow:
QVHZA QVKZA
3 = 3,5 l/min; **36** = 36 l/min; **65** = 65 l/min
12 = 12 l/min; **45** = 45 l/min; **90** = 90 l/min
18 = 18 l/min;

(1) Option **/BT** = low temperature -40°C also available on request

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

Series number

Omit for standard coil 12 V_{DC}:
24 = with 24 V_{DC} coils (only A version)

Options:
C = current feedback signal 4÷20 mA (only for -T versions)
D = quick venting
O = horizontal cable entrance (only for -A versions)
WP = prolonged manual override protected by metallic cap (only for valves without transducer)

Solenoid threaded connection:
NPT = 1/2" NPT ANSI B2.1 (tapered)

21 HYDRAULIC CHARACTERISTICS (based on mineral oil ISO VG 46 at 50 °C)

Hydraulic symbols	QVHZA-A QVKZA-A						QVHZA-T QVKZA-T							
	QVHZA-A QVKZA-A						QVHZA-T QVKZA-T							
Note: In three-way versions port P is open. In two-way versions port P must be plugged. Port T must always be plugged.														
Valve model	QVHZA-A						QVHZA-T							
Valve size	06						10							
Max pressure ports P, A, B [l/min]	210													
Max regulated flow [l/min]	3,5	12	18	36	45	3,5	12	18	35	45	65	90	65	90
Min regulated flow (1) [cm³/min]	15	20	30	50	60	15	20	30	50	60	85	100	85	100
Regulating Δp [bar]	4 - 6		10 - 12		15	4 - 6		10 - 12		15	6 - 8		10 - 12	
Max flow on port A [l/min]	40		35		50	50		50		60		70		100

Above performance data refer to valves coupled with Atos electronic drivers.
(1) Values are referred to 3-way configuration. In the 2-way configuration, the values of min regulated flow are higher.

22 MODEL CODE OF PROPORTIONAL PRESSURE RELIEF AND COMPENSATOR VALVES

RZMA / UL - A - 010 / 250 / NPT / * /* ** /*

Pressure relief:
RZMA = subplate size 06
HZMA = modular size 06
AGMZA = subplate size 10, 20, 32
LIMZA = cartridge (1)
 Pressure compensator:
LICZA = cartridge (1)

UL = UL 1002 certification

A = without integral pressure transducer

Valve size:
 see section 23 for size code

Max regulated pressure:
 see section 23

(1) For the code of the ISO cartridge to use with LIMZA and LICZA, see tab. F300 section 2.
 (2) Option **/BT** = low temperature -40°C also available on request

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

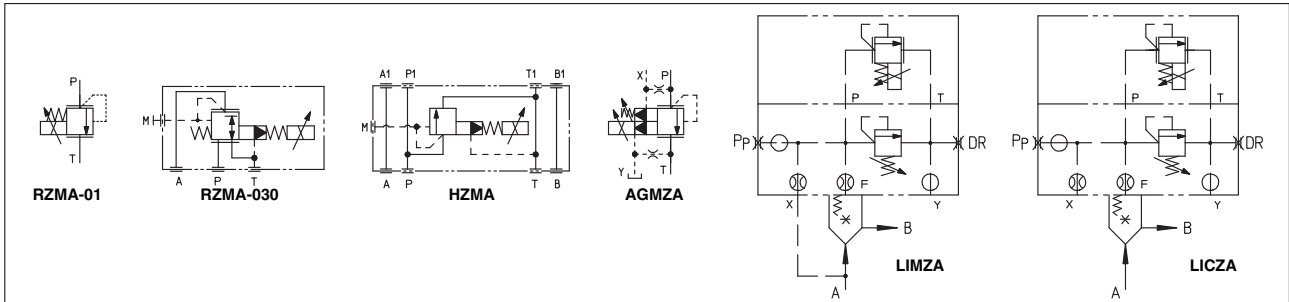
Series number

Omit for standard coil 12 V_{DC}:
24 = with 24 V_{DC} coils (only A version)

Options:
E = external pilot (only for AGMZA)
O = horizontal cable entrance
P = with integral mechanical pressure limiter (only for LI*ZA)
Y = external drain (only for AGMZA)

Solenoid threaded connection:
NPT = 1/2" NPT ANSI B2.1 (tapered)

23 HYDRAULIC CHARACTERISTICS



Valve model	RZMA			HZMA			AGMZA			LIMZA						LICZA				
Size code	010	030	030	10	20	32	1	2	3	4	5	6	1	2	3	4	5			
Valve size	06			10	20	32	16	25	32	40	50	63	16	25	32	40	50			
Max regulated pressure [bar]				80;			180;			250										
Max pressure at port P, A, B, X [bar]										315										
Max pressure at port T, Y [bar]										210										
Max flow [l/min]	4	40	40	200	400	600	200	400	750	1000	2000	3000	200	400	750	1000	2000			

24 MODEL CODE OF PROPORTIONAL PRESSURE REDUCING VALVES

RZGA / UL - A - 010 / 250 / NPT / * /* ** /*

Pressure reducing:
RZGA = subplate size 06
HZGA = modular size 06
KZGA = modular size 10
AGRCZA = subplate size 10, 20
LIRZA = cartridge

UL = UL 1002 certification

A = without integral transducer

Valve size:
 see section 23 for size code

Max regulated pressure:
 see section 23

Note: for the code of the ISO cartridge to use with LIRZA, see tab. F300 section 2.
 (1) Option **/BT** = low temperature -40°C also available on request

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

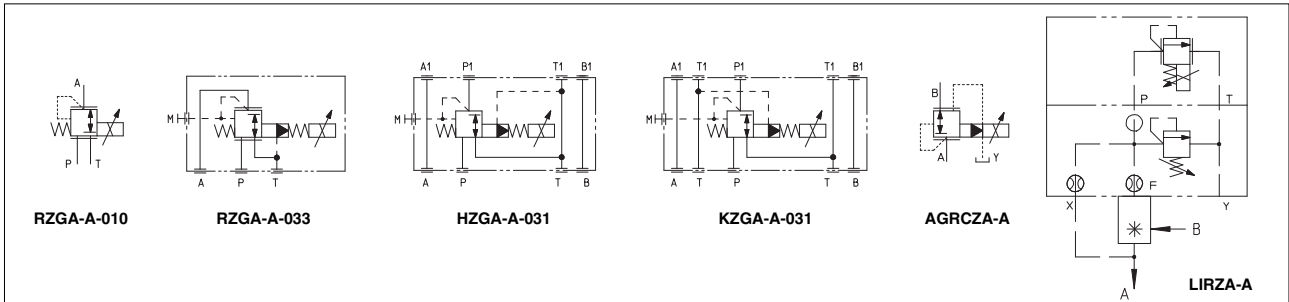
Series number

Omit for standard coil 12 V_{DC}:
24 = with 24 V_{DC} coils (only A version)

Options:
E = external pilot (only for AGRCZA)
O = horizontal cable entrance (1)
P = with integral mechanical pressure limiter (only for AGRCZA and LIRZA)
R = with check valve (only for AGRCZA)

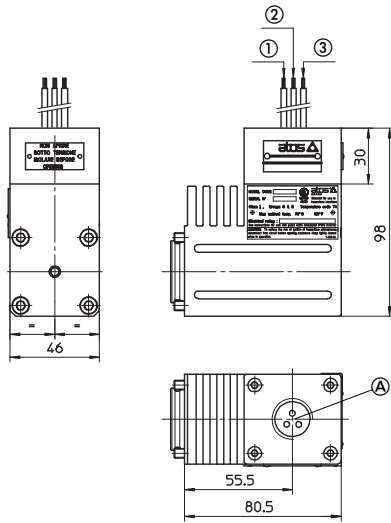
Solenoid threaded connection:
NPT = 1/2" NPT ANSI B2.1 (tapered)

25 HYDRAULIC CHARACTERISTICS

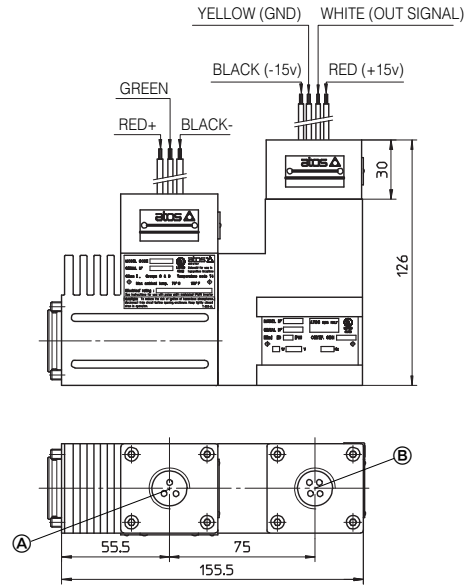


Valve model	RZGA			HZGA	KZGA	AGRCZA			LIRZA		
Size code	010	033	031	031	10	20	1	2	3		
Valve size	06			10	10	20	16	25	32		
Max regulated pressure [bar]	32; 100; 210				80;	180;	250				
Min regulated pressure [bar]	0,8	1	1	1	1	1	7	7	7		
Max pressure at port P [bar]							315				
Max pressure at port T [bar]							210				
Max flow [l/min]	12	40	40	100	160	300	160	320	600		

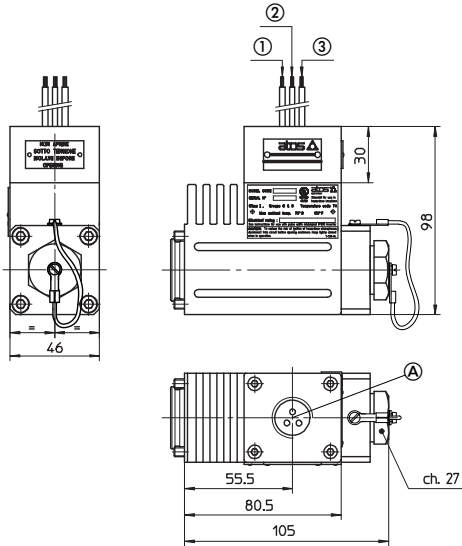
**OAUL
OZAUL-A**



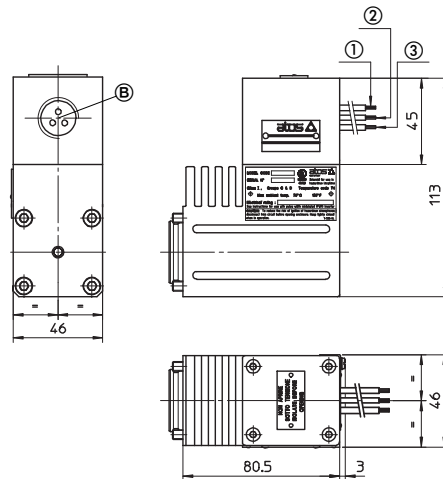
OZAUL-T



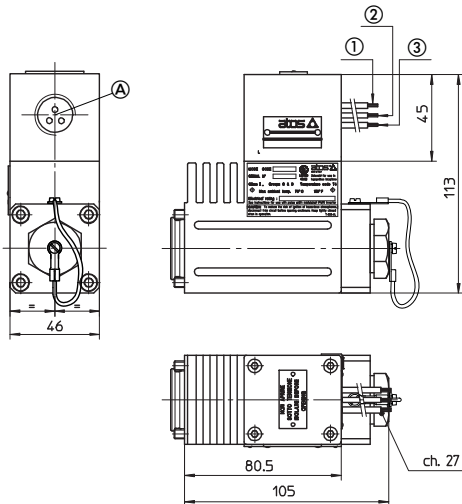
Option /WP



Option /O



Option /OWP



(A) Solenoid wiring (connection 1/2"NPT)

OAUL-*AC

- ① white = Coil (neutral)
- ② green = GND
- ③ black = Coil

OAUL-*DC

- ① red = +
- ② green = GND
- ③ black = -

OZAUL

- ① red = Coil
- ② green = GND
- ③ black = Coil

(B) Position transducer wiring (connection 1/2"NPT)

- White = Output signal
- Black = Supply -15 V
- Red = Supply +15 V
- Yellow = GND

The valves are supplied with 1,07 m (42 inches) cable length, factory wired.