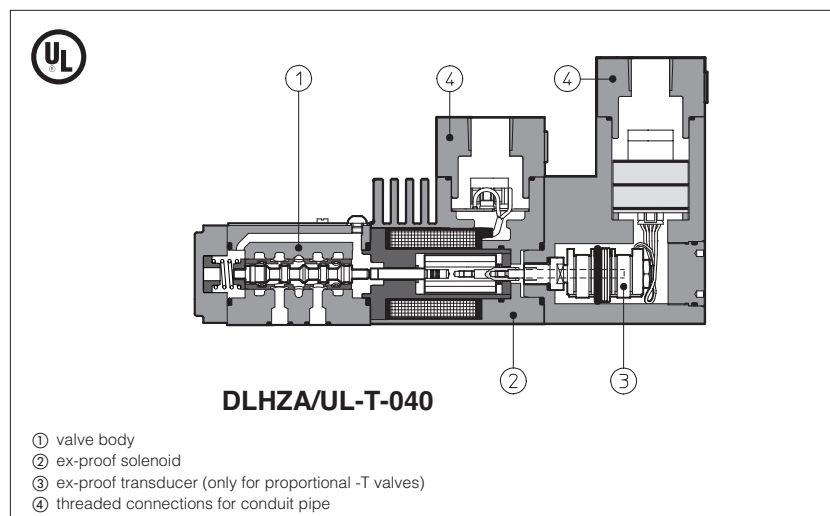


Explosion-proof solenoid valves

on/off and proportional controls - cULus certification



Explosion-proof on/off and proportional solenoids certified **cULus** according to UL 1203 and UL429, CSA 22.2 n°30-1986 and CSA 22.2 n°139-13.

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

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.

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.

DHA and DLAH valves are **SIL** compliance with IEC 61508 (TÜV certified) - see section 3.2

1 EXPLOSION PROOF SOLENOIDS: MAIN DATA

SOLENOID TYPE	PROPORTIONAL		ON-OFF
	without transducer	with transducer	
Solenoid code	OZAUL-A	OZAUL-T	OAUL
Voltage VDC ±10%	12 DC, 24 DC	12 DC	12DC, 24DC, 110DC, 125DC, 220DC
code VAC 50/60 Hz ±10%	-		12AC, 24AC, 110-120AC, 230-240AC (1)
Power consumption	35W		12W
Coil insulation	Class H		
Protection degree	IP 67 According to IEC 144 when correctly coupled with the relevant conduit pipe		
Duty factor	100%		
Mechanical construction	Flame proof housing classified, according to UL 1203 and UL429, CSA 22.2 n°30-1986 and CSA 22.2 n°139-13		
Cable entrance and electrical wiring	Connection 1/2" NPT (ANSI/ASME B46.1) for cable gland internal terminal board for cable connection		

(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	
	Ex d			
Method of protection	Ex d			
Temperature class	T4 (≤ 135°C)	T3 (≤ 200°C)	T6 (≤ 85°C)	T5 (≤ 100°C)
Ambient temperature	-40 ÷ +55	-40 ÷ +70	-40 ÷ +55	-40 ÷ +70
Surface temperature	≤ 135 °C		≤ 85 °C	

3 CERTIFICATIONS

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

- Class I** = Equipment for famable gas and vapours
- Division 1** = Possibility of explosive atmosphere during normal functioning
- Groups C&D** = Atmosphere containing flammable gas
- Groups IIA&IIB** = Gas group
- T6/T5** = Temperature class of solenoid surface referred to +55°C / +70°C ambient temperature

3.2 SIL compliance with IEC 61508: 2010

- DHA/UL and DLAH/UL meets the requirements of:
- **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)

3.1 EXAMPLE OF NAMEPLATE MARKING



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

<p>DHA = spool type - direct DPHA = spool type - piloted</p> <p>UL = C UL US certification</p> <p>Valve size (ISO 4401) for DHA 0 = 06 for DPHA 1 = 10 2 = 16 4 = 25 6 = 32</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/ASME B46.1 (tapered)</p>	/ UL -	0	63	1/2	/ NPT /	*	24DC	**	/*
--	--------	----------	-----------	------------	---------	---	-------------	----	----

Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM
Low temperature execution:
BT = low temperature -40°C

Series number

Voltage code - see section 11

Options:

- A** = solenoid at side of port B (for single solenoid valves)
- O** = horizontal cable entrance
- MV** = vertical hand lever (1)
- WP** = prolonged manual override protected by metallic cap

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)
- /L9** = (only for DPHA-2 and DPHA-4) plug with calibrated restrictor on port P of pilot valve
- /S** = Main spool stroke adjustment (only for DPHA-2, -4)

(1) Option **/MV** available only for DHA, configuration 61, 63, 71 and spool type 0, 0/2, 1, 1P, 1/2, 1/2P, 3, 3P, 4, 7

5 CONFIGURATIONS and SPOOLS for DHA valves

<p>Configurations</p> <p>Spools</p>	<p>Configurations</p> <p>Spools</p> <p>only for spool 0/2 and 1/2</p>
---	---

6 CONFIGURATIONS and SPOOLS for DPHA valves

<p>Configurations</p> <p>Spools</p>	<p>Configurations</p> <p>Spools</p>
---	---

NOTES:

- For **DP*-1** are available only spools: **0, 0/2, 1, 1/2, 3, 4, 5, 58, 6, 7**
- For **DP*-6** are available only spools: **0, 1, 2, 3, 4, 5, 58, 6, 7, 8, 19, 91**

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

DLAH /UL - 2 A / NPT / * 24DC ** /*

Directional control valve poppet type, size 06
DLAH = max flow 12 l/min
DLAHM = max flow 30 l/min

UL = C UL US certification

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

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

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

Seals material (1):
 omit for NBR (mineral oil & water glycol)
PE = FPM

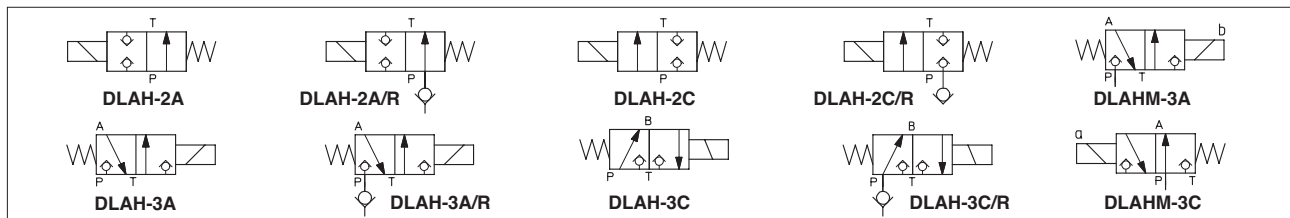
Series number

Voltage code - see section 11

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

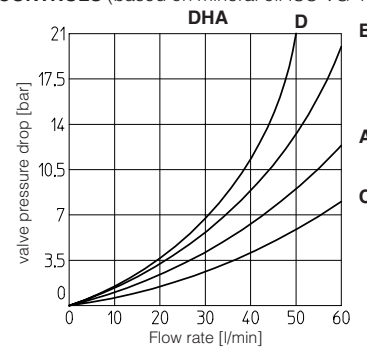
Solenoid threaded connection:
NPT = 1/2" NPT ANSI/ASME B46.1 (tapered)

8 CONFIGURATION OF DLAH AND DLAHM



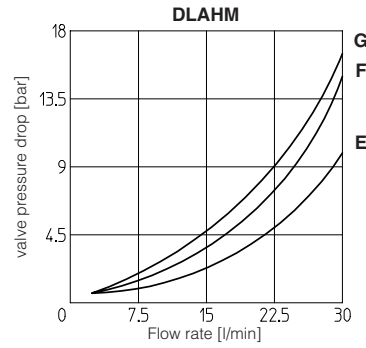
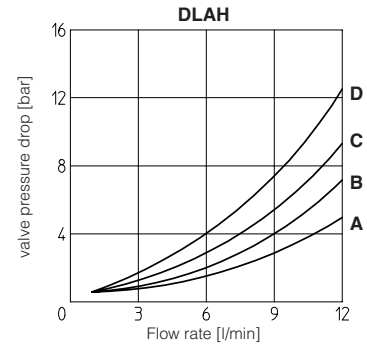
9 Q/Δp DIAGRAMS OF ON/OFF DIRECTIONAL CONTROLS (based on mineral oil ISO VG 46 at 50°C)

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 DLAH and DLAHM less than 5 drops/min (0,36 cm³/min) at max pressure.

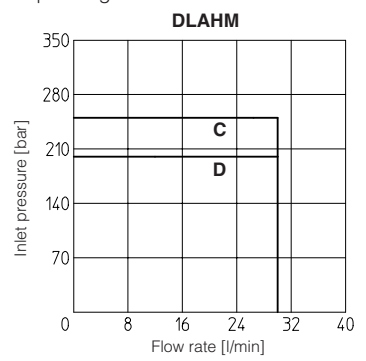
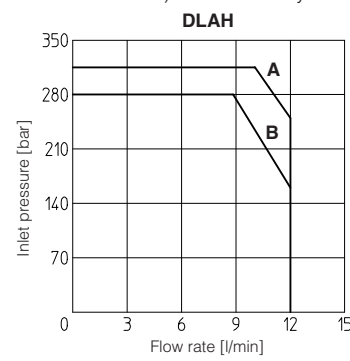
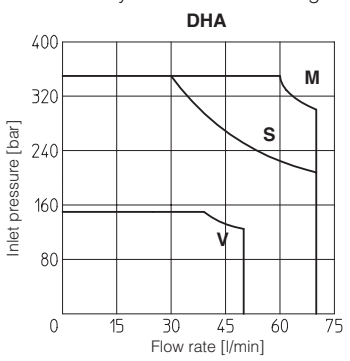
Flow direction	Valve type	
	P → A (1) (P → B)	A → T (B → T)
DLAH-2A	B	-
DLAH-2C	C	-
DLAH-3A	D	C
DLAH-3C	C	A
DLAHM-3A	G	F
DLAHM-3C	F	E



(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 = DLAH-3A;
B = DLAH-2A, DLAH-3C

C = DLOK-3A;
D = DLAHM-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"
20 (ISO 6264) **32** = G 1 1/4"
32 (ISO 6264)

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

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

Seals material (1):
 omit for NBR (mineral oil & water glycol)
PE = FPM

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

AO/UL = C UL US certification

Solenoid threaded connection:

NPT = 1/2" NPT ANSI/ASME B46.1 (tapered)

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/ASME B46.1 (tapered)

Certification type
AO/UL = C UL US certification

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

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

Seals material (1):
 omit for NBR (mineral oil & water glycol)
PE = FPM

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

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 = C UL US certification

T = with integral position transducer

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

Configuration, see section 19
4 = spring offset with fail safe
6 = spring offset

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

Seals material (1):
omit for NBR (mineral oil & water glycol)
PE = FPM

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/ASME B46.1 (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)

Hydraulic symbols		*40-L*3 *40-D*3 *40-DT*3 *40-T*3 *40-V*3	*40-L*1 *40-D*1 *40-DT*1 *40-T*1 *40-V*1	*60-L*1 *60-V*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)														
Δp max P-T	70			60														
Spool	L0	L1	V1	L3	V3	L5	T5	L7	T7	V7	D7	DT7	L3	L7	T7	V7	D7	DT7
Max flow at Δp = 30 bar [l/min]	2,5	4,5	5	9	13	18		26		26÷13			40	65			65÷33	
max permissible flow	4	7	8	14	20	28		40		40÷20			55	80			80÷40	
Leakage [cm³/min] at P = 100 bar (1)	<100	<200	<100	<300	<150	<500	<200	<900	<200	<200	<700	<200	<1000	<1500	<400	<400	<1200	<400
Response time [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.

20 MODEL CODE OF PRESSURE COMPENSATED PROPORTIONAL FLOW CONTROL VALVES

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

QVHZA = size 06
QVKZA = size 10

UL = C UL US 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

Seals material (1):
omit for NBR (mineral oil & water glycol)
PE = FPM

Series number

Omit for standard coil 12 Vdc:
24 = with 24 VDC 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/ASME B46.1 (tapered)

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

Hydraulic symbols		QVHZA-A QVKZA-A	QVHZA-T QVKZA-T											
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	QVKZA-A	QVKZA-T									
Valve size	06		06	10	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	6 - 8	10 - 12
Max flow on port A [l/min]	40		35	50	55	50		60		70	100	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 = C UL US 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

Seals material (2):
 omit for NBR (mineral oil & water glycol)
PE = FPM

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/ASME B46.1 (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	8	1	2	3	4	5		
Valve size	06			10	20	32	16	25	32	40	50	63	80	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	4500	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 = C UL US certification

A = without integral transducer

Valve size:
 see section 25 for size code

Max regulated pressure:
 see section 25

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

Seals material (1):
 omit for NBR (mineral oil & water glycol)
PE = FPM

Series number

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

Options:
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/ASME B46.1 (tapered)

25 HYDRAULIC CHARACTERISTICS

Valve model	RZGA				HZGA		KZGA		AGRCZA			LIRZA			
Size code	010		033		031		031		10	20	1	2	3	4	
Valve size	06				10		10		10	20	16	25	32	40	
Max regulated pressure [bar]	32; 100; 210				80;		180;		250						
Min regulated pressure [bar]	0,8		1		1		1		1	1	7	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	300	160	300	550	800			

ON-OFF and proportional valves -A

Standard version **Option /O**

- ① cover with threaded connection for vertical cable gland fitting
- ② cover with threaded connection for horizontal cable gland fitting
- ③ terminal board for cables wiring
- ④ standard manual override

1 = Coil + PCB 3 poles terminal board
2 = GND suitable for wires cross sections
3 = Coil - up to 2,5 mm² (max AWG14)

(2) = alternative GND screw terminal
connected to solenoid housing

Proportional valves -T

- ① solenoid cover with threaded connection for cable gland fitting
- ② transducer cover with threaded connection for cable gland fitting
- ③ solenoid terminal board for cables wiring
- ④ transducer terminal board for cables wiring

Solenoid wiring

1 = Coil + PCB 3 poles terminal board
2 = GND suitable for wires cross sections
3 = Coil - up to 2,5 mm² (max AWG14)

(2) = alternative GND screw terminal
connected to solenoid housing

Position transducer wiring

1 = Output signal PCB 4 poles terminal board
2 = Supply -15 V suitable for wires cross sections
3 = Supply +15 V up to 2,5 mm² (max AWG14)
4 = GND

Cable Specification:
Power supply and transducer cables have to comply with following characteristics

- Suitable for use in Class I Division 1, Gas Groups C
- Armored Marine Shipboard Cable which meets UL 1309
- Tinned Stranded Copper Conductors
- Bronze braided armor
- Overall impervious sheath over the armor

Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)

For Class I wiring the 3C 1,5 mm² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.

Note: a Loctite sealant type 545, should be used on the cable gland entry threads

26.1 Cable temperature

The cable must be suitable for the working temperature as specified in the "safety instructions" delivered with the first supply of the products.

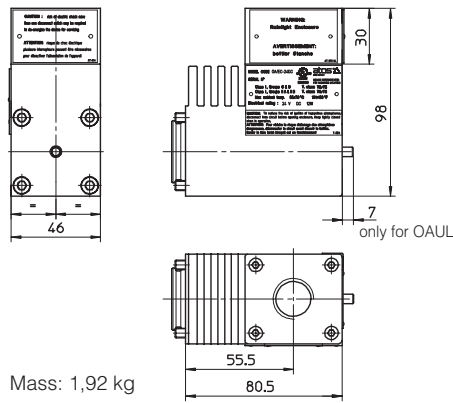
ON-OFF

Max ambient temperature [°C]	Temperature class	Surface temperature [°C]	Cable temperature
55 °C	T6	<85 °C	100 °C
70 °C	T5	<100 °C	100 °C

PROPORTIONAL

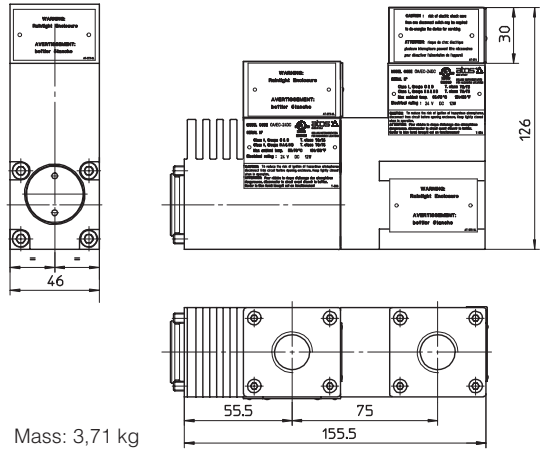
Max ambient temperature [°C]	Temperature class	Surface temperature [°C]	Cable temperature
55 °C	T4	<135 °C	100 °C
70 °C	T3	<200 °C	100 °C

**OZAU
OZAU-A**



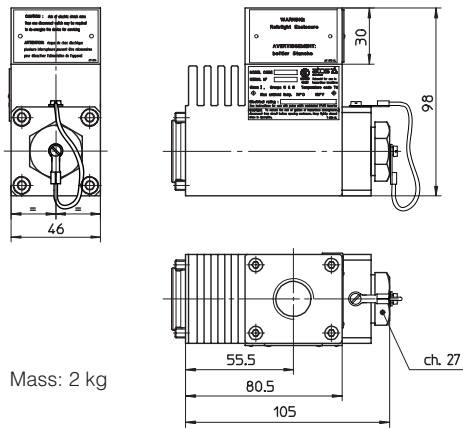
Mass: 1,92 kg

OZAU-T



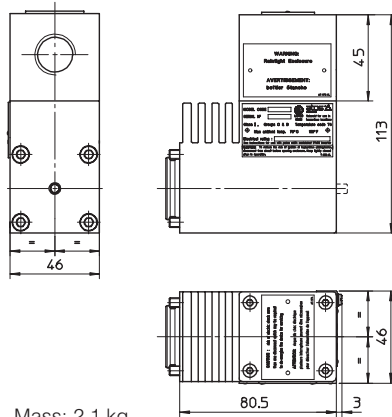
Mass: 3,71 kg

Option /WP



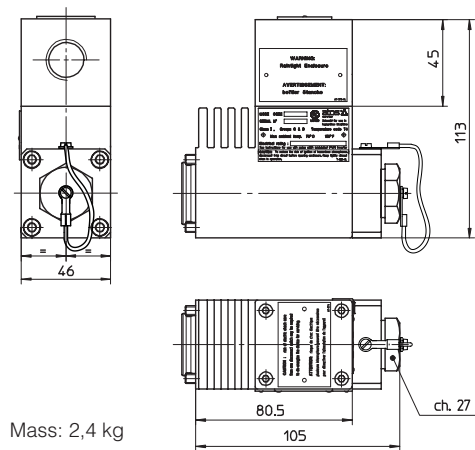
Mass: 2 kg

Option /O



Mass: 2,1 kg

Option /OWP



Mass: 2,4 kg

Option /MV

