



### CETOP 2/NG04

AD.2.E... CH. I PAGE 4

"A09" DC COILS CH. I PAGE 4

STANDARD CONNECTORS CH. I PAGE 19

## DIRECTIONAL CONTROL VALVES CETOP 2/NG4

The ARON directional control valves NG4 are designed for subplate mounting with an interface in accordance with UNI ISO 4401 - 02 - 01 - 0 - 94 standard (ex CETOP R 35 H 4.2-4-02), and are the smallest on the market in their category whilst still featuring excellent performance.

The use of solenoids with wet armatures ensures quiet operation, means that dynamic seals are no longer required and important levels of counter-pressure are accepted on the return line. The solenoid's tube is screwed at valve body directly, while a locking ring nut seal the coil in right position.

**The cast body** with a great care in the design and production of the ducts of the 5 chambers have made it possible to improve the spools allowing relatively high flow rate with low pressure drops ( $\Delta p$ ).

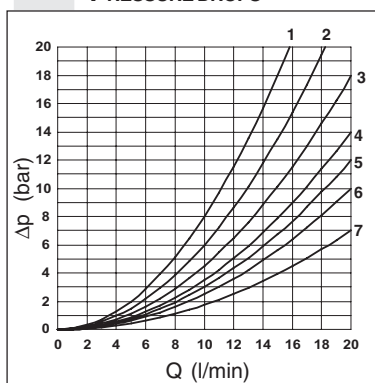
The spool rest positions are obtained by means of springs which centre it when there is no electrical impulse. The solenoids are constructed to DIN 40050 standards and are supplied by means of DIN 43650 ISO 4400 standard connectors which, suitably assembled, ensure a protection class of IP 65.

The solenoid coils are normally arranged for DIN 43650 ISO 4400 type connectors (standard version). On request, could be available the following coil connection variants: AMP Junior connections; flying leads connections, with or without integrated diode; Deutsch connections with bidirectional integrated diode.

The supply may be in either DC or AC form (with the use of a connector and rectifier) in most common voltage.

The valves are designed for use with DIN 51524 standard hydraulic mineral oils and it is recommended that filters should be fitted to ensure a maximum contamination level of class 10 in accordance with NAS 1638,  $\beta_{25} \geq 75$ .

### PRESSURE DROPS



Spool type	Connections				
	P → A	P → B	A → T	B → T	P → T
01	4	4	6	6	
02	6	6	7	7	5
03	4	4	7	7	
04	1	1	2	2	3
05	6	6	4	4	
66	5	5	5	7	
06	5	5	7	5	
15	4	4	4	4	
16	5	5	6	6	
20*	5	5	6	6	

Curve No.

\* = with energized spool

The diagram at the side shows the pressure drop curves for spools during normal usage. The fluid used is a mineral based oil with a viscosity of  $46 \text{ mm}^2/\text{s}$  at  $40^\circ\text{C}$ ; the tests have been carried out at a fluid temperature of  $40^\circ\text{C}$ . For higher flow rates than those in the diagram the losses will be those expressed by the following formula:

$$\Delta p_1 = \Delta p \times (Q_1/Q)^2$$

where  $\Delta p$  will be the value for the losses for a specific flow rate  $Q$  which can be obtained from the diagram,  $\Delta p_1$  will be the value of the losses for the flow rate  $Q_1$  that is used.

### ORDERING CODE

<b>AD</b>	Directional valve
<b>2</b>	CETOP 2/NG4
<b>E</b>	Electrical operator
<b>**</b>	Spool (tables next page)
<b>*</b>	Mounting (table 1 next page)
<b>*</b>	Voltage (table 2 next page)
<b>**</b>	Variants (table 3 next page)
<b>3</b>	Serial No.

TAB. 1 MOUNTING

STANDARD	
<b>C</b>	
<b>D</b>	
<b>E</b>	
<b>F</b>	
SPECIALS (WITH PRICE INCREASING)	
<b>G</b>	
<b>H</b>	
<b>I</b>	
<b>L</b>	
<b>M</b>	

TAB.3- VARIANTS

VARIANT	CODE
No variant	00
Viton	V1
Pilot light	X1
Rectifier	R1
Emergency button	E1
Rotary emergency button	P1 (*)
Solenoid valve without connectors	S1
Cable gland "PG 11"	C1
Viton + Pilot light	VX
Viton + Rectifier	VR
Pilot light + Rectifier	XR
AMP Junior connection	AJ
Solenoid with flying leads (250 mm)	FL
Solenoid with flying leads (130 mm) and integrated diode	LD
Deutsch connection with bidir. diode	CX
Coil 8W (only 24V)	8W
Other variants relate to a special design	

(\*) P1 Emergency tightening torque max. 6÷9 Nm / 0.6 ÷ 0.9 Kgm with CH n. 22

TAB.2 - A09 (27 W) COIL

DC VOLTAGE	
<b>L</b>	12V
<b>M</b>	24V
<b>N</b>	48V*
<b>P</b>	110V*
<b>Z</b>	102V*
<b>X</b>	205V*
<b>W</b>	Without DC coils

115Vac/50Hz  
120Vac/60Hz  
with rectifier

230Vac/50Hz  
240Vac/60Hz  
with rectifier

Voltage codes are not stamped on the plate, they are readable on the coils.

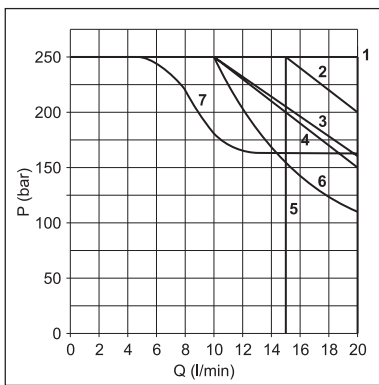
\* Special voltage

- Mounting type D is only for solenoid valves with detent
- In case of mounting D with detent, the supply to solenoid must be longer than 100 ms.

- The AMP Junior coil and with the flying leads (with or without diode) coils are available in 12V or 24V DC voltage only.

- The Deutsch coil with bidirectional diode is available in 12V DC voltage only.

LIMITS OF USE



Spool Type	Curves No
01	1
02	3
03	1
04	4
05	1
66	1
06	1
15	1(7*)
16	2(6*)
20	5

(6\*) = 16 spool used as 2 or 3 way, follow the curve n°4  
(7\*) = with 8W coil

The tests have been carried out with solenoids at operating temperature and a voltage 10% less than rated voltage with a fluid temperature of 40°C. The fluid used was a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40°C. The values in the diagram refers to tests carried out with the oil flow in two directions simultaneously (e.g. from P to A and at the same time B to T). In case of valve 4/2 or 4/3 used with flow in one direction only, the limits of use could have variations which may even be negative.

**Medium switching times** Energizing: 20 ms  
De-energizing: 40 ms

Tests have been carried out by spool normally closed with flow of 10 l/min at 125 bar and a 100% supply, warm standard coil and without any electronic components. These values are indicative and depend on the following parameters: the hydraulic circuit, the fluid used and the variation of pressure, flow and temperature.

STANDARD SPOOLS

TWO SOLENOIDS, SPRING CENTRED "C" MOUNTING			
Spool Type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
05		+	
66		+	
06		+	

ONE SOLENOID, SIDE A "E" MOUNTING			
Spool Type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
05		+	
66		+	
06		+	
15		-	
16		+	

ONE SOLENOID, SIDE B "F" MOUNTING			
Spool Type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
05		+	
66		+	
06		+	
15		-	
16		+	

TWO SOLENOIDS "D" MOUNTING			
Spool Type		Covering	Transient position
20*		+	

\* SPOOLS WITH PRICE INCREASING

1

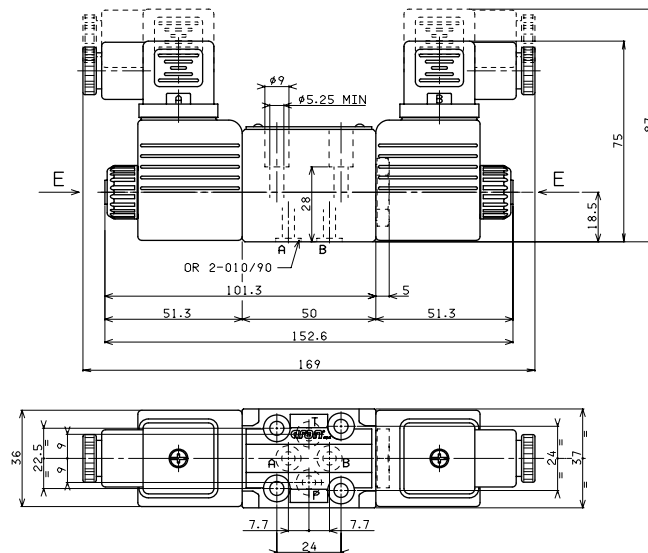
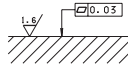


Max. pressure ports P/A/B	250 bar
Max pressure port T (dynamic)	250 bar
Max flow	20 l/min
Max excitation frequency	3 Hz
Duty cycle	100% ED
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max contamination level	class 10 in accordance with NAS 1638 with filter β <sub>25</sub> ≥ 75
Weight with one DC solenoid	0,88 Kg
Weight with two DC solenoids	1,1 Kg

E = Manual override

Screws with material specifications min. 8.8 recommended - UNI 5931  
Tightening torque of screws M5x35 = 5 Nm / 0.5 Kgm.

Support plane specifications



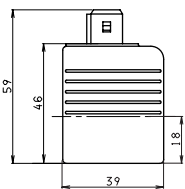
DC COILS A09



Type of protection (in relation to connector used)	IP 65
Number of cycle	18.000/h
Supply tolerance	±10%
Ambient temperature	-30°C ÷ 60°C
Duty cycle	100% ED
Insulation class	H
Weight	0,215 Kg

- The AMP Junior coil and with the flying leads (with or without diode) coils are available in 12V or 24V DC voltage only.
- The Deutsch coil with bidirectional diode is available in 12V DC voltage only.

AMP JUNIOR (AJ)

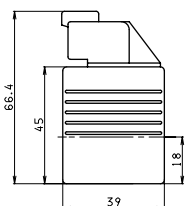


VOLTAGE (V)	MAX WINDING TEMPERATURE (AMBIENT TEMPERATURE 25°C)	RATED POWER (W)	RESISTANCE AT 20°C (OHM) ±7%
12V	123°C	27	5.3
24V	123°C	27	21.3
48V*	123°C	27	85.3
102V*	123°C	27	392
110V*	123°C	27	448
205V*	123°C	27	1577

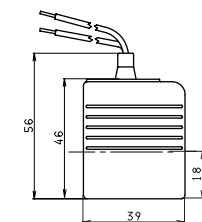
\* Special voltages

ETA09/AD2-CDL04-C3V - 04/2001/e

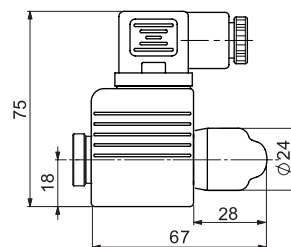
DEUTSCH COIL WITH BIDIR. DIODE (CX) DT04 - 2P



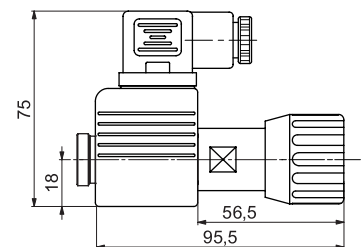
FLYING LEADS (FL) LEADS WITH DIODO (LD)



E1 MANUAL EMERGENCY



P1(\*) ROTARY EMERGENCY



(\*) P1 Emergency tightening torque max. 6±9 Nm / 0.6 ÷ 0.9 Kgm with CH n. 22

# ADC.3... DIRECTIONAL CONTROL VALVES CETOP 3

## SOLENOID OPERATED WITH REDUCED OVERALL SIZE

1



### ADC.3.E...

"A09" DC COILS

CH. I PAGE 7

STANDARD CONNECTORS

CH. I PAGE 19

The ARON NG6 directional control valves are designed for subplate mounting with an interface in accordance with UNI ISO 4401 - 03 - 02 - 0 - 94 standard (ex CETOP R 35 H 4.2-4-03).

The use of solenoids with wet armatures allows an extremely safe construction completely dispensing with the need for dynamic seal. The solenoid tube is screwed directly onto the valve casting whilst the coil is kept in position by a ring nut.

The operation of the directional valve is electrical. The centring is achieved by means of calibrated length springs which, once the impulse is over, immediately reposition the spool in the neutral position. To improve the valve performance, different springs are used for each spool.

The solenoids, constructed with a protection class of IP65 in accordance with BS 5490 standards, are available in direct current form and different voltage. The electrical controls are equipped with an emergency manual control inserted in the tube.

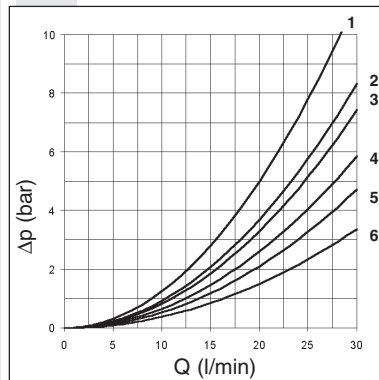
The ADC.3 valve uses shorter solenoids than the standard AD.3.E to reduce the overall dimensions.

The solenoid coils are normally arranged for DIN 43650 ISO 4400 type connectors (standard version). On request, could be available the following coil connection variants: AMP Junior connections; flying leads connections, with or without integrated diode; Deutsch connections with bidirectional integrated diode.

The recommended fluids are hydraulic mineral based oils in accordance with DIN 51524 and it is recommended that filters should be fitted to ensure a maximum contamination level of class 10 in accordance with NAS 1638,  $\beta_{25} \geq 75$ .

Max. pressure ports P/A/B/T	250 bar
Max flow	30 l/min
Max excitation frequency	3 Hz
Duty cycle	100% ED
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max contamination level	class 10 in accordance with NAS 1638 with filter $\beta_{25} \geq 75$
Weight with one DC solenoid	1,25 Kg
Weight with two DC solenoids	1,5 Kg

### PRESSURE DROPS



Spool type	Connections				
	P → A	P → B	A → T	B → T	P → T
01	4	4	4	4	
02	6	6	6	6	6
03	4	4	6	6	
04	3	3	2	2	5
15E-16E	6	3	1	5	
15F-16F	3	6	5	1	

Curve No.

The diagram at the side shows the pressure drop curves for spools during normal usage. The fluid used is a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40 °C; the tests have been carried out at a fluid temperature of 40 °C. For higher flow rates than those in the diagram, the losses will be those expressed by the following formula:

$$\Delta p_1 = \Delta p \times (Q_1/Q)^2$$

where  $\Delta p$  will be the value for the losses for a specific flow rate Q which can be obtained from the diagram,  $\Delta p_1$  will be the value of the losses for the flow rate Q<sub>1</sub> that is used.

1

ORDERING CODE

ADC	Directional valve
3	CETOP 3/NG6
E	Electrical operator
**	Spool (tables at the side)
*	Mounting (table 1)
*	Voltage (table 2)
**	Variants (table 3)
1	Serial No.

TAB.1 - MOUNTING

STANDARD	
C	
E	
F	
SPECIALS (WITH PRICE INCREASING)	
G	
H	

STANDARD SPOOL

\* SPOOLS WITH PRICE INCREASING

TWO SOLENOIDS, SPRING CENTRED "C" MOUNTING			
Spool type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	

ONE SOLENOID, SIDE A "E" MOUNTING

Spool type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
15		-	
16		+	

ONE SOLENOID, SIDE B "F" MOUNTING

Spool type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
15		-	
16		+	

TAB.2 - A09 (27 W) COIL

DC VOLTAGE	
L	12V
M	24V
N	48V*
P	110V*
Z	102V*
X	205V*
W	Without DC coils

Voltage codes are not stamped on the plate, they are readable on the coils.  
\* Special voltage

TAB.3 - VARIANTS

No variant	00
Viton	V1
Pilot light	X1
Rectifier	R1
Solenoid valve without connectors	S1
Cable gland"PG 11"	C1
Viton + Pilot light	VX
Viton + Rectifier	VR
Pilot light + Rectifier	XR
Emergency button	E1
Rotary emergency button	P1 (*)
Rotary emergency button (180°)	P5 (*)
Variant with lever for emergency button	LE
AMP Junior connection	AJ
Coil with flying leads (250 mm)	FL
Coil with flying leads (130 mm) with diode	LD
Deutsch connection with bidirectional diode	CX

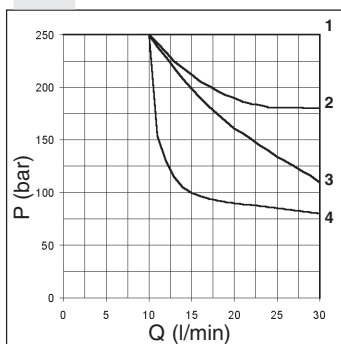
Other variants relate to a special design

• The AMP Junior coil and with the flying leads (with or without diode) coils are available in 12V or 24V DC voltage only.

• The Deutsch coil with bidirectional diode is available in 12V DC voltage only.

(\*) P1 and P5 Emergency tightening torque max. 6÷9 Nm / 0.6 ÷ 0.9 Kg<sub>m</sub> with CH n. 22

LIMIT OF USE



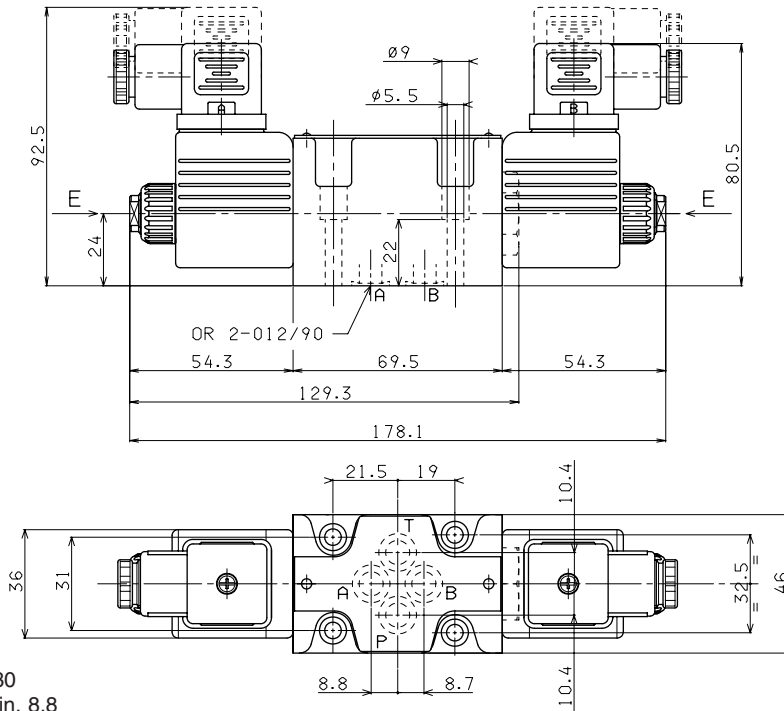
Spool type	n° curve
01	2
02	1
03	3
04	3
15-16	1(4*)

(4\*) = 15 and 16 spools used as 2 or 3 way, follow the curve n°4

The tests have been carried out with solenoids operating temperature and a voltage 10% less than rated voltage with a fluid temperature of 50 °C. The fluid used was a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40 degrees C. The values in the diagram refer to tests carried out with the oil flow in two directions simultaneously (e.g. from P to A and at the same time B to T).

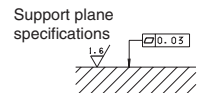
In the cases where valves 4/2 and 4/3 are used with the flow in one direction only, the limits of use could have variations which may even be negative (See curve No 4 and Spool No 15-16). The tests were carried out with a counter-pressure of 2 bar at T port.

OVERALL DIMENSIONS



E = Manual override

Fixing screws UNI 5931 M5x30  
with material specifications min. 8.8  
Tightening torque 5 ÷ 6 Nm / 0.5 ÷ 0.6 Kgm



A09 DC COILS



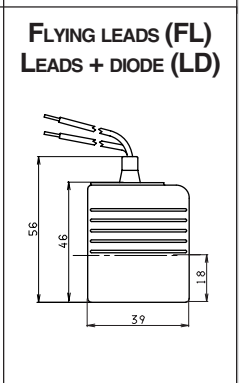
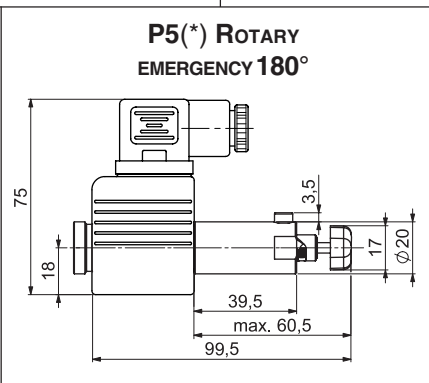
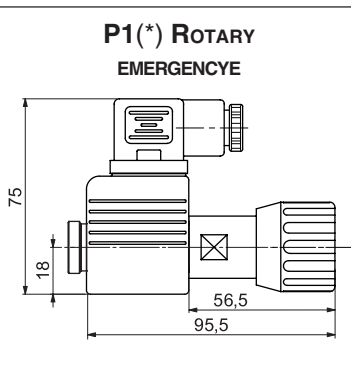
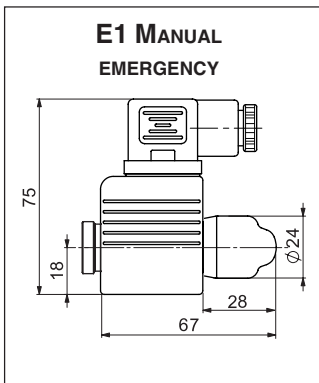
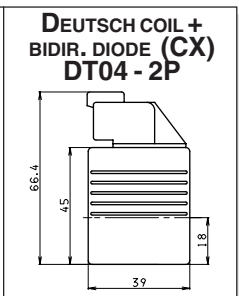
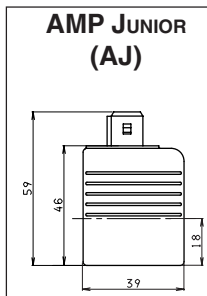
Type of protection (in relation to connector used)	IP 65
Number of cycle	18.000/h
Supply tolerance	±10%
Ambient temperature	-30°C ÷ 60°C
Duty cycle	100% ED
Insulation class	H
Weight	0,215 Kg

- The AMP Junior coil and with the flying leads (with or without diode) coils are available in 12V or 24V DC voltage only.
- The Deutsch coil with bidirectional diode is available in 12V DC voltage only.

VOLTAGE (V)	MAX WINDING TEMPERATURE (AMBIENT TEMPERATURE 25°C)	RATED POWER (W)	RESISTANCE AT 20°C (OHM) ±7%
12V	123°C	27	5.3
24V	123°C	27	21.3
48V*	123°C	27	85.3
102V*	123°C	27	392
110V*	123°C	27	448
205V*	123°C	27	1577

\* SPECIAL VOLTAGES

ETA09 - 04/2001/e



(\*) P1 and P5 Emergency tightening torque max. 6÷9 Nm / 0.6 ÷ 0.9 Kgm with CH n. 22





## DIRECTIONAL CONTROL VALVES CETOP 3/NG6

### INTRODUCTION

The ARON directional control valves NG6 are designed for subplate mounting with an interface in accordance with UNI ISO 4401 - 03 - 02 - 0 - 94 standard (ex CETOP R 35 H 4.2-4-03), and can be used in all fields on account of their high flow rate and pressure capacities combined with compact overall dimensions.

The use of solenoids with wet armatures allows a very practical, safe construction completely dispensing with dynamic seals; the solenoid tube is screwed directly onto the valve chest whilst the coil is kept in position by means of a lock nut.

The special, precise construction of the ports and the improvement of the spools enables relatively high flow rates to be accommodated with a minimal pressure drop ( $\Delta p$ ). The operation of the directional valves may be electrical, pneumatic, oleodynamic, mechanical or lever.

The centre position is obtained by means of calibrated length springs which reposition the spool in the centre or end of travel position once the action of the impulse is over.

The solenoids are constructed with a protection class of IP66 to DIN 40050 standards and are available in either AC or DC form in different voltage and frequencies.

The new type DC coil "D15", of cause their high performance, allows to increasing the limits of use respect to last series.

All types of electrical control are available, on request, with different types of manual emergency controls.

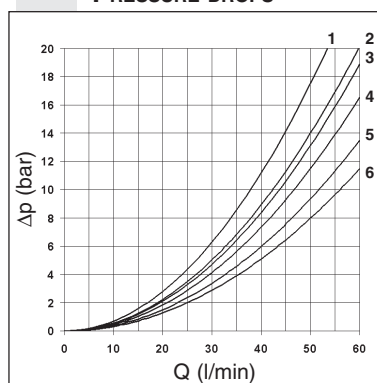
The solenoid coils are normally arranged for DIN 43650 ISO 4400 type connectors; is available on request these variant coils: with AMP Junior connections, with AMP junior and integrated diode, with Deutsch DT04-2P connections or solenoid with flying leads. Connectors with built in rectifiers or pilot lights are also available.

The valves are designed for use with DIN 51524 standard hydraulic mineral oils and it is recommended that filters should be fitted to ensure a maximum contamination level of class 10 in accordance with NAS 1638,  $\beta_{25} \geq 75$ .

### CETOP 3/NG06

STANDARD SPOOLS	CH. I PAGE 10
AD.3.E...	CH. I PAGE 11
AD.3.E...J*	CH. I PAGE 12
AD.3.V...	CH. I PAGE 13
AD.3.L...	CH. I PAGE 14
OTHER OPERATOR	CH. I PAGE 15
AD.3.P...	CH. I PAGE 16
AD.3.O...	CH. I PAGE 16
AD.3.M...	CH. I PAGE 17
AD.3.D...	CH. I PAGE 17
"D15" DC COILS	CH. I PAGE 18
"K12" AC SOLENOIDS	CH. I PAGE 18
STANDARD CONNECTORS	CH. I PAGE 19
"LE" VARIANTS	CH. I PAGE 20
L.V.D.T.	CH. I PAGE 21

### PRESSURE DROPS



The diagram at the side shows the pressure drop curves for spools during normal usage. The fluid used is a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40°C; the tests have been carried out at a fluid temperature of 40°C. For higher flow rates than those in the diagram, the losses will be those expressed by the following formula:

$$\Delta p_1 = \Delta p \times (Q_1/Q)^2$$

where  $\Delta p$  will be the value for the losses for a specific flow rate  $Q$  which can be obtained from the diagram,  $\Delta p_1$  will be the value of the losses for the flow rate  $Q_1$  that is used.

Spool type	Connections				
	P→A	P→B	A→T	B→T	P→T
01	5	5	5	5	
02	6	6	6	6	5
03	5	5	6	6	
04	1	1	1	1	4
44	1	1	1	1	2
05	5	5	5	5	
06	5	5	6	5	
66	5	5	5	6	
07		4	6		
08	6	6			
09		5		5	
10	5	5	5	5	
	Curve No.				

Spool type	Connections				
	P→A	P→B	A→T	B→T	P→T
11	4			6	
22		4	6		
12		5		6	
13		5	6		
14	2	1	1	1	2
28	1	2	1	1	2
15 - 19	4	4	6	6	
16	5	5	4	4	
17 - 21	1	3			
18	5	5			
20	4	4	4	4	
	Curve No.				

ORDERING CODE

<b>AD</b>	Directional valve
<b>3</b>	CETOP 3/NG6
<b>E</b>	Type of operator For other operator see next pages
<b>**</b>	Spool see page 10
<b>*</b>	Mounting type (table 1)
<b>*</b>	Voltage (table 2)
<b>**</b>	Variants (table 3)
<b>*</b>	Serial No.

**3** = DC voltage ("D15" coil)  
**2** = AC voltage ("K12" solenoid)

TAB.2 "E" OPERATOR TYPE

AC VOLTAGE	
<b>A</b>	24V/50Hz
<b>B</b>	48V/50Hz*
<b>J</b>	115V/50Hz - 120V/60Hz
<b>Y</b>	230V/50Hz - 240V/60Hz
<b>E</b>	240V/50Hz*
<b>F</b>	24V/60Hz*
<b>K</b>	AC without coils
DC VOLTAGE	
<b>L</b>	12V
<b>M</b>	24V
<b>V</b>	28V*
<b>N</b>	48V*
<b>Z</b>	102V*
<b>P</b>	110V*
<b>X</b>	205V*
<b>W</b>	DC without coils

115Vac/50Hz  
120Vac/60Hz  
with rectifier

230Vac/50Hz  
240Vac/60Hz  
with rectifier

Voltage codes are not stamped on the plate, their are readable on the coils.  
(\* ) Special voltage

- AMP Junior coils (with or without diode) and coils with flying leads and coils type Deutsch, are available in 12V or 24V DC voltage only.
- The pastic type coil (BR variant) is available in 12V, 24V, 28V or 110V DC voltage only.

TAB.1-MOUNTING

STANDARD	
<b>C</b>	
<b>D</b>	
<b>E</b>	
<b>F</b>	
SPECIALS (WITH PRICE INCREASING)	
<b>G</b>	
<b>H</b>	
<b>I</b>	
<b>L</b>	
<b>M</b>	

- **Mounting type D** is only for valves with detent
- In case of **mounting D** with detent a maximum supply time of 2 sec is needed (only for AC coils).

TAB.3 - VARIANTS

VARIANT	CODE	◆	PAGE
No variant	00		
Viton	V1		
Emergency control lever for directional control valves type ADC3 and AD3E	LE		10
Emergency button	E1		18
Rotary emergency button	P1		18
Rotary emergency button (180°)	P5		18
Pilot light	X1		19
Rectifier	R1		19
Preset for microswitch (E/F/G/H mounting only) (see below note 4)	M1	◆	11- 14
Solenoid valve without connectors	S1		
Marine version (AD.3.P..)	H1	◆	
Cable gland "PG 11"	C1		19
Emergency button+ Viton	EV		
Emergency button+ Pilot light	EX		
Viton + Pilot light	VX		
Emergency button+ Viton + Pilot light	A1		
Emergency button+ Rectifier	ER		
Viton + Rectifier	VR		
Viton + Rectifier + Emergency button	A2		
Pilot light + Rectifier	XR		19
Pilot light + Rectifier + Emergency button	A3		
Pilot light + Rectifier + Emergency button+ Viton	A4		
Preset for microswitch + Viton	MV	◆	
5 micron clearance	Q1	◆	
Spool movement speed control (only VDC) with ø 0.3 mm orifice	J3	◆	12
Spool movement speed control (only VDC) with ø 0.4 mm orifice	J4	◆	12
Spool movement speed control (only VDC) with ø 0.5 mm orifice	J5	◆	12
Spool movement speed control (only VDC) with ø 0.6 mm orifice	J6	◆	12
AMP Junior coil - for12V or 24V DC voltage only	AJ		18
AMP Junior coil and integrated diode - for12V or 24V DC voltage only	AD		18
Coil with flying leads (175 mm) - for12V or 24V DC voltage only	SL		18
D15 plastic type coil - for12V, 24V, 28V or 110V DC voltage only	BR		
Deutsch DT04-2P coil - for12V or 24V DC voltage only	CZ		18
IP67 type of connector	CN		19

Other variants relate to a special design

◆ = Maximum counter-pressure on T port: 8 bar  
◆ = Variant codes stamped on the plate



**TWO SOLENOIDS, SPRING CENTRED "C" MOUNTING**

Spool type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
44*		-	
05		+	
66		+	
06		+	
07*		+	
08*		+	
09*		+	
10*		+	
22*		+	
11*		+	
12*		+	
13*		+	
14*		-	
28*		-	

**ONE SOLENOID, SIDE A "E" MOUNTING**

Spool type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
44*		-	
05		+	
66		+	
06		+	
08*		+	
10*		+	
12*		+	
15		-	
16		+	
17		+	
14*		-	
28*		-	

**DIRECTIONAL CONTROL VALVES  
STANDARD SPOOLS CETOP 3/NG6**



**NOTE**

(\*) Spool with price increasing

• With spools 15 / 16 / 17 only mounting E / F are possible

• 16 / 19 / 20 / 21 spool not planned for AD3E variant J\*

• For lever operated the spools used are different.

Available spools for this kind of valve are: 01 / 02 / 03 / 04 / 05 / 06 / 66 / 07 / 22 / 13 / 15 / 16 / 17

**ONE SOLENOID, SIDE B "F" MOUNTING**

Spool type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
44*		-	
05		+	
66		+	
06		+	
08*		+	
09*		+	
10*		+	
22*		+	
12*		+	
13*		+	
07*		+	
15		-	
16		+	
17		+	
14*		-	
28*		-	

**TWO SOLENOIDS "D" MOUNTING**

Spool type		Covering	Transient position
19*		-	
20*		+	
21*		+	



A max. counter-pressure of 8 bar at T is permitted for the variant with a microswitch (M1).

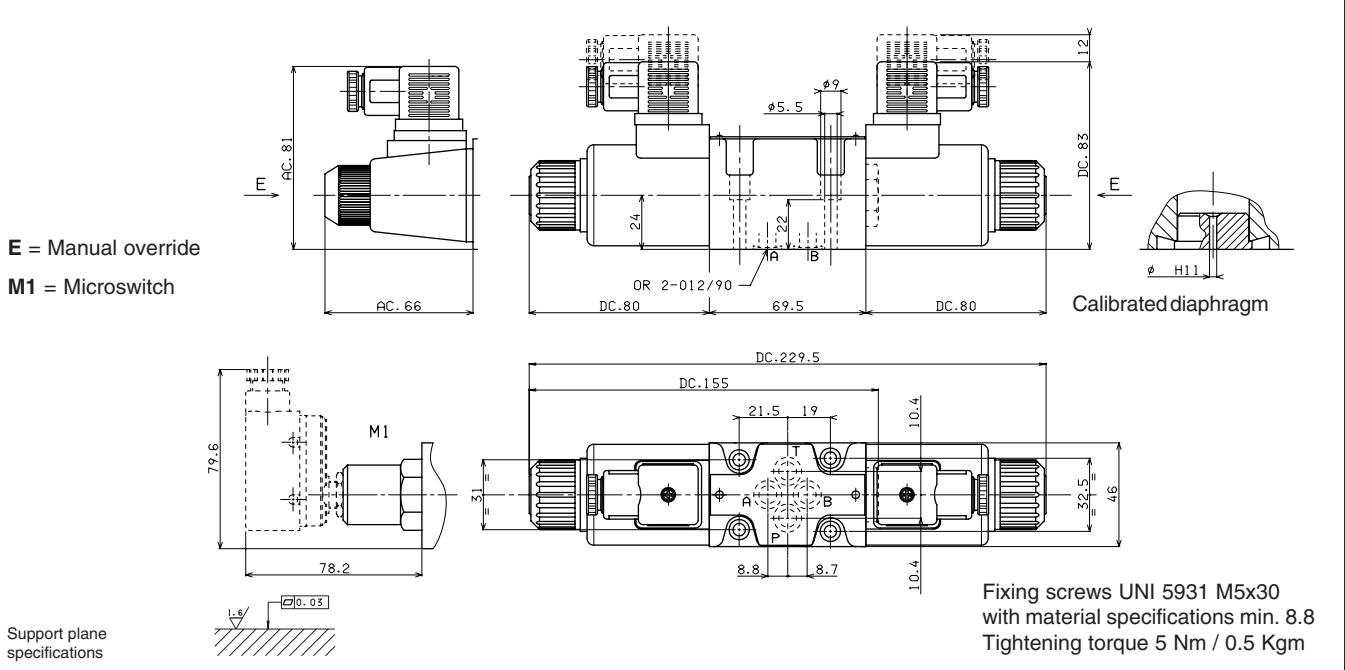
(\*) Pressure dynamic allowed for 2 millions of cycles.

Max. pressure port P/A/B	350 bar
Max. pressure port T (for DC) see note (*)	250 bar
Max. pressure port T (for AC)	160 bar
Max. flow	60 l/min
Max. excitation frequency	3 Hz
Duty cycle	100% ED
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter β <sub>25</sub> ≥ 75
Weight with one DC solenoid	1,65 Kg
Weight with two DC solenoids	2 Kg
Weight with one AC solenoid	1,25 Kg
Weight with two AC solenoids	1,55 Kg

CALIBRATED DIAPHRAGMS (**)	
ø (mm)	Code
blind	M52.05.0023/4
0.5	M52.05.0023/1
0.6	M52.05.0023/6
0.7	M52.05.0023/8
0.8	M52.05.0023
1.0	M52.05.0023/2
1.2	M52.05.0023/3
1.5	M52.05.0023/7
2.0	M52.05.0023/10
2.2	M52.05.0023/9
2.5	M52.05.0023/5

(\*\*) For high differential pressure please contact our technical department.

OVERALL DIMENSIONS

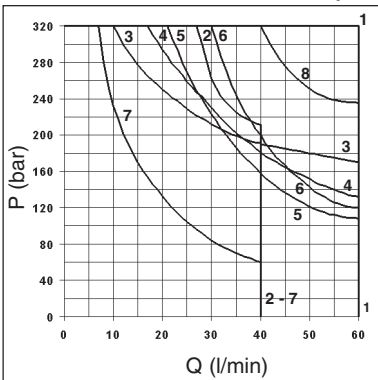


LIMITS OF USE

The tests have been carried out with solenoids at operating temperature and a voltage 10% less than rated voltage with a fluid temperature of 40°C. The fluid used was a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40°C. The values in the diagram refers to tests carried out with the oil flow in two directions simultaneously T = 2 bar (e.g. from P to A and the same time B to T). In the case where valves 4/2 and 4/3 were used with the flow in one direction only, the limits of use could have variations which may even be negative. Rest times: the values are indicative and depend on following parameters: hydraulic circuit, fluid used and variations in hydraulic scales (pressure P, flow Q, temperature T).

Direct current:	Energizing	30 ÷ 50 ms.	Alternating current:	Energizing	8 ÷ 30 ms.
	De-energizing	10 ÷ 30 ms.		De-energizing	15 ÷ 55 ms.

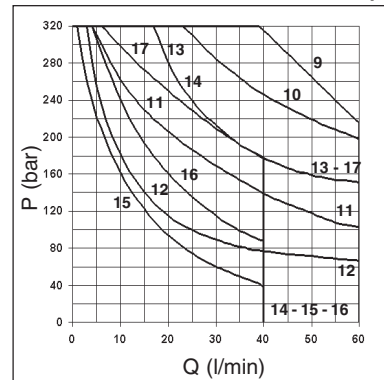
DIRECT CURRENT SOLENOIDS (DC)



Spool type	Solenoids	
	DC	AC
01	1	9
02	1	10
03	8	11
04	6	12
44	1	10
05	3	13
06 - 66	5	11
11 - 22	4	17
14 - 28	2	14
15	7	15
16	1	16

Curves

ALTERNATING CURRENT SOLENOIDS (AC)



# 1

## Valves type AD3.E... variant J\* with spool movement speed control

These ON-OFF type valves are used a lower spool movement speed than usual for conventional solenoid valves is required to prevent impacts which could adversely affect the smooth running of the system. The system consist of reducing the transfer section for the fluid from one solenoid to the other by means of calibrated orifices.

- This version can only be used with a direct current (DC) and also involves a **reduction in the limits of use so that we suggest to always test the valve in your application**

- To order AD.3.J\* version valves, specify the orifices code.

- The operation is linked to a minimum counter-pressure on T line (1 bar min.)

- The switching time referred to the spool travel detected by a LVDT transducer can vary for the NG6 valve from a minimum of 100 to a maximum of 300 ms depending on 5 fundamental variables:

- 1) Diameter of the calibrated orifices (see table)
- 2) Hydraulic power for clearance referring to flow and pressure values through valve
- 3) Spool type
- 4) Oil viscosity and temperature
- 5) Counter-pressure at T line

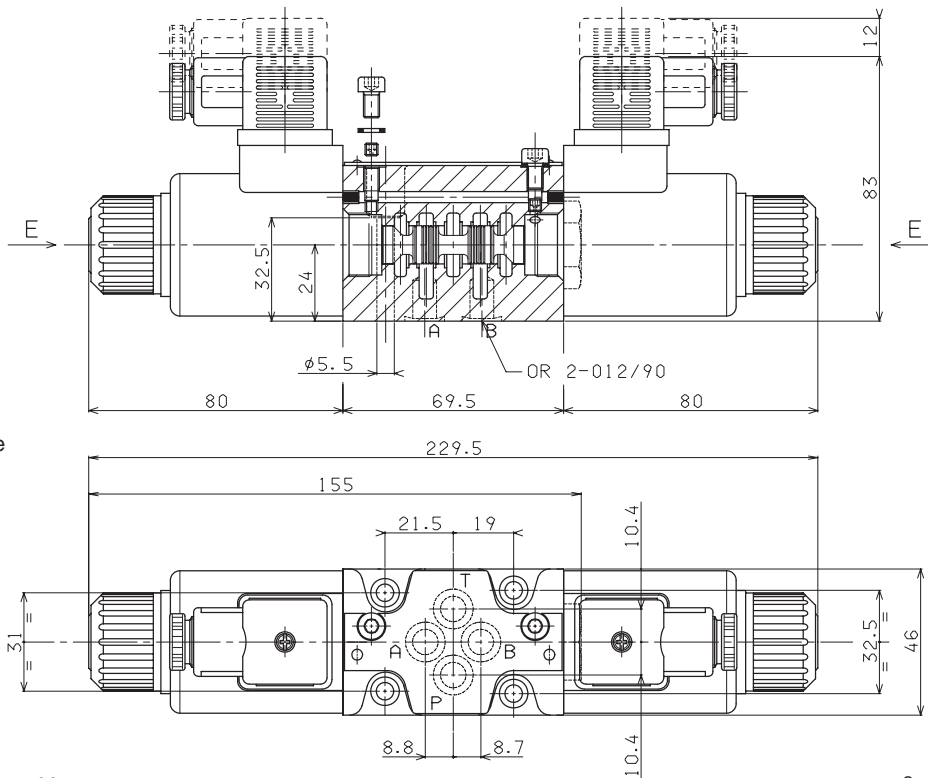
- Possible mountings: C / E / F / G / H
- 16 / 19 / 20 / 21 spools not planned for AD3E variant J\*

Max. pressure ports P/A/B	320 bar
Max. pressure port T (*)	250 bar
Max. flow	30 l/min
Max. excitation frequency	2 Hz
Duty cycle	100% ED
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Weight with one DC solenoid	1,65 Kg
Weight with two solenoids DC solenoids	2 Kg

(\*) Pressure dynamic allowed for 2 millions of cycles.

CALIBRATED ORIFICES AVAILABLE		
ø (mm)	M4x4	Code
0.3	M89.10.0028	J3
0.4	M89.10.0029	J4
0.5	M89.10.0006	J5
0.6	M89.10.0030	J6

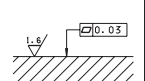
## OVERALL DIMENSIONS



E = Manual override

Fixing screws UNI 5931M5x40  
with material specifications min. 8.8  
Tightening torque 5 Nm / 0.5 Kgm

Support plane specifications





# AD.3.V... CETOP 3/NG6 WITH PROXIMITY SENSOR L.V.D.T.



1

### AD.3.V...

"D15" DC COILS	CH. I PAGE 18
STANDARD CONNECTORS	CH. I PAGE 19
L.V.D.T.	CH. I PAGE 21

The single solenoid directional valves type AD.3.V are used in applications where the monitoring of the position of the spool inside the valve is requested to manage the machine safety cycles in according with the accident prevention legislation. These directional valves are equipped with an horizontal positioned inductive sensor on the opposite side of the solenoid, which is capable of providing the first movement of the valve when the passage of a minimum flow is allowed. Integrated in safety systems, these valves intercept actuator movements that could be dangerous for the operators and for the machine.

Max. operating pressure ports P/A/B	350 bar
Max. operating pressure port T dynamic (see note*)	250 bar
Max. flow	60 l/min
Max. excitation frequency	3 Hz
Duty cycle	100% ED
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Type of protection (in relation to connector used)	IP 66
Weight	1,7 Kg

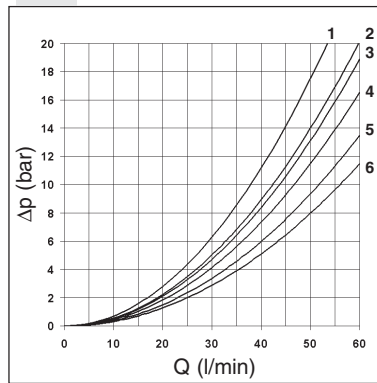
(\*) Pressure dynamic allowed for 2 millions of cycles.

- Possible mountings: E / F / H
- The valve is supplied with DC solenoid only

### ORDERING CODE

<b>AD</b>	Directional control valve
<b>3</b>	CETOP 3/NG6
<b>V</b>	Directional valve with single solenoid and L.V.D.T. proximity sensor
<b>***</b>	Spool and mounting (table 1)
<b>*</b>	Voltage (table 2)
<b>**</b>	Variants (table 3)
<b>2</b>	Serial No.

### PRESSURE DROPS



Spool type	Connections				
	P → A	P → B	A → T	B → T	P → T
01	5	5	5	5	5
02	6	6	6	6	
06	5	5	6	5	5
16	5	5	4	4	
17	1	3			6
66	5	5	5	6	
32	1	1	2	2	

Curves No.

The diagram at side shows the Δp curves for spool in normal usage. The fluid used is a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40°C; the tests have been carried out at a fluid temperature of 40°C.

### TAB.2 - VOLTAGE D15 COIL (30W)

<b>L</b>	12V	
<b>M</b>	24V	
<b>V</b>	28V*	115Vac/50Hz 120Vac/60Hz with rectifier
<b>N</b>	48V*	
<b>Z</b>	102V*	230Vac/50Hz 240Vac/60Hz with rectifier
<b>P</b>	110V*	
<b>R</b>	205V*	
<b>W</b>	Without DC coils and connectors	

Voltage codes are not stamped on the plate, they are readable on the coils.  
\* Special voltage

### TAB1 - STANDARD SPOOLS FOR AD3V

#### POSSIBLE MOUNTING: E / F / H

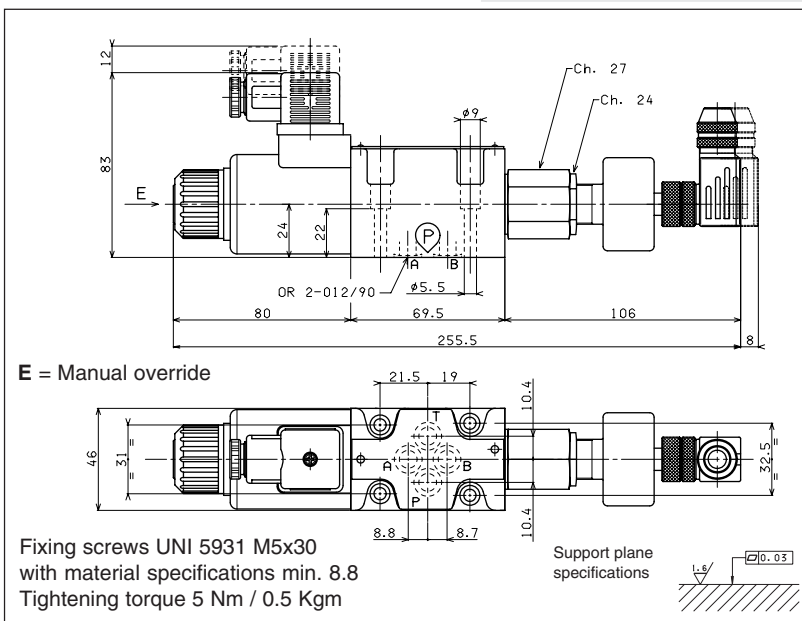
Spool type	Covering	Transient position
01E	+	
01F	+	
02E	-	
06H*	+	
16E	+	
17F	+	
66F	+	
32E	+	

(\*) Spool with price increasing

### TAB.3 - VARIANTS

No variant (connectors as in the drawing)	00
Viton	V1
Emergency button	E1
Pilot light	X1
Rectifier	R1
Flow diversion without connector (coil)	S1
Without proximity connector LVDT	S3
Without coils and proximity connector	S4
Cable gland "PG 11"	C1
Viton + Pilot light	VX
AMP Junior coil	AJ
AMP Junior coil and integrated diode	AD
Coil with flying leads (175mm)	SL
Deutsch DT04-2P Coil type	CZ
Other variants relate to a special design	

**CE** registered mark for industrial environment with reference to the electromagnetic compatibility. European norms:  
- EN50082-2 general safety norm - industrial environment  
- EN 50081-1 emission general norm - residential environment





AD.3.L...

STANDARD SPOOLS

CH. I PAGE 10

Max. pressure ports P/A/B	320 bar
Max. pressure port T	160 bar
Max. flow	60 l/min
Lever angle	2 x 17°
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter $\beta_{25} \geq 75$
Weight	1,2 Kg
Weight M1 variant	1,8 Kg

## ORDERING CODE

<b>AD</b>	Directional valve
<b>3</b>	CETOP 3/NG6
<b>L</b>	Lever operation
<b>**</b>	Spool type (see table 1) Spool symbol see page I•10
<b>*</b>	Mounting type (see table 2)
<b>*</b>	<b>Z</b> = Valve with lever <b>X</b> = Valve without lever
<b>*</b>	Variants (see table 3)
<b>4</b>	Serial No.

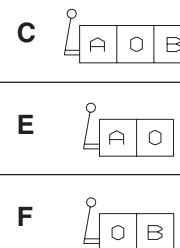
TAB.1

## SPOOLS TYPE

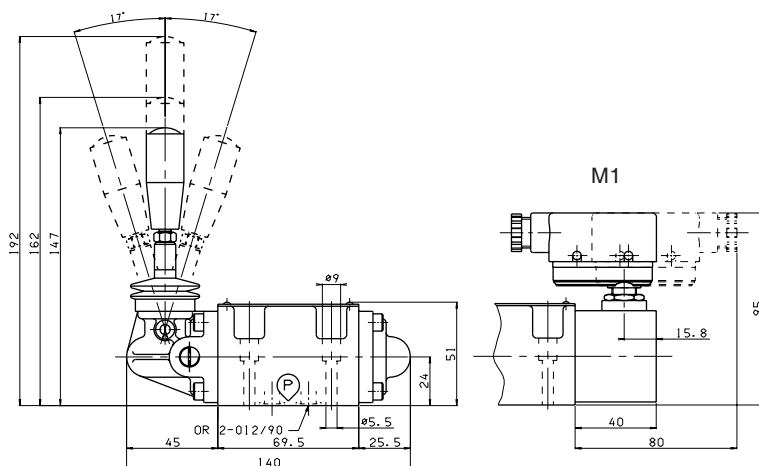
- For these valves spools are different from ones used on the other directional valves
- Available spools:  
01 / 02 / 03 / 04 / 05 / 06 / 66  
07 / 22 / 13 / 15 / 16 / 17

TAB.2

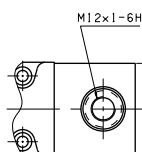
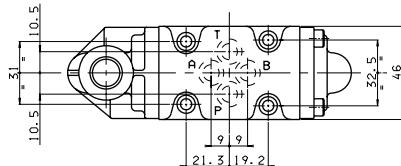
## MOUNTING TYPE



## OVERALL DIMENSIONS



M1 = microswitch



Fixing screws UNI 5931 M5x30  
with material specifications min. 8.8  
Tightening torque 5 Nm / 0.5 Kgm

Support plane specifications

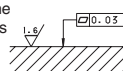


TABLE 3 - VARIANTS TABLE

VARIANTS	CODE (♦)
No variant	00
Viton	V1
Preset for microswitch Available on request NATIONAL AM1107 type microswitch	M1 (♦)
Preset for microswitch + Viton	MV (♦)
With detent (mechanical connection) (Springs are different from those for standard versions)	D1 (♦)
Preset for microswitch + Detent	MD (♦)
Lever length 162 mm	L1
Lever length 192 mm	L2
♦ Variant codes stamped on the plate	

# DIRECTIONAL CONTROL VALVES OTHER OPERATOR CETOP 3/NG6



1



## INTRODUCTION

The ARON directional control valves NG6 are designed for subplate mounting with an interface in accordance with UNI ISO 4401 - 03 - 02 - 0 - 94 standard (ex CETOP R 35 H 4.2-4-03), and can be used in all fields on account of their high flow rate and pressure capacities combined with compact overall dimensions.

The use of solenoids with wet armatures allows a very practical, safe construction completely dispensing with dynamic seals; the solenoid tube is screwed directly onto the valve chest whilst the coil is kept in position by means of a lock nut.

The special, precise construction of the ports and the improvement of the spools enables relatively high flow rates to be accommodated with a minimal pressure drop ( $\Delta p$ ).

The centre position is obtained by means of calibrated length springs which reposition the spool in the centre or end of travel position once the action of the impulse is over.

The valves are designed for use with DIN 51524 standard hydraulic mineral oils and it is recommended that filters should be fitted to ensure a maximum contamination level of class 10 in accordance with NAS 1638,  $\beta_{25} \geq 75$ .

## OTHER OPERATOR

STANDARD SPOOLS	CH. I PAGE 10
AD.3.P...	CH. I PAGE 16
AD.3.O...	CH. I PAGE 16
AD.3.M...	CH. I PAGE 17
AD.3.D...	CH. I PAGE 17

## ORDERING CODE

<b>AD</b>	Directional valve
<b>3</b>	CETOP 3/NG06
<b>*</b>	Type of operator <b>P</b> = Pneumatic <b>O</b> = Oleodynamic <b>M</b> = Mechanically <b>D</b> = Direct mechanically (For other operator see past pages)
<b>**</b>	Spool (see page I•10)
<b>*</b>	Mounting type (tab.1)
<b>Z</b>	No voltage
<b>**</b>	Variants: <b>00</b> = no variant <b>V1</b> = Viton <b>H1</b> = Marine version (for AD3P only) <b>DI(*)</b> = Internal draining (for AD3O only)
<b>2</b>	Serial No.

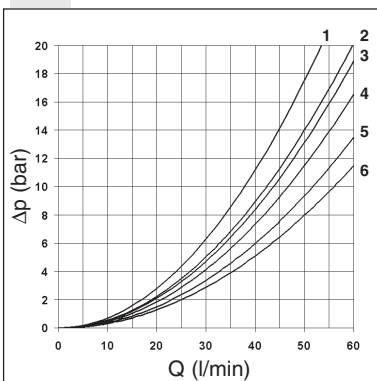
## TAB.1 MOUNTING

STANDARD	
<b>C</b>	
<b>D</b>	
<b>E</b>	
<b>F</b>	
SPECIALS (WITH PRICE INCREASING)	
<b>G</b>	
<b>H</b>	
<b>I</b>	
<b>L</b>	
<b>M</b>	

• In case of **mounting D** with detent a maximum supply time of 2 sec is needed (only for AC coils).

(\*) The DI variant is recommended in the environments characterised by the presence of dust or any type of contamination.

## PRESSURE DROPS



Spool type	Connections				
	P → A	P → B	A → T	B → T	P → T
01	5	5	5	5	
02	6	6	6	6	5
03	5	5	6	6	
04	1	1	2	2	4
05	5	5	5	5	
06	5	5	6	5	
07	5	5	5	6	
08	6	6			
09	5	5		5	
10	5	5	5	5	

Curve No.

Spool type	Connections				
	P → A	P → B	A → T	B → T	P → T
11	4			6	
22		4	6		
12		5	6	6	
13		5	6	6	
14	2	1	1	1	2
28	1	2	1	1	2
15 - 19	4	4	6	6	
16	5	5	4	4	
17 - 21	1	3			
18	5	5			
20	4	4	4	4	

Curve No.

The diagram at the side shows the pressure drop curves for spools during normal usage. The fluid used is a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40°C; the tests have been carried out at a fluid temperature of 40°C. For higher flow rates than those in the diagram, the losses will be those expressed by the following formula:

$$\Delta p_1 = \Delta p \times (Q_1/Q)^2$$

where  $\Delta p$  will be the value for the losses for a specific flow rate Q which can be obtained from the diagram,  $\Delta p_1$  will be the value of the losses for the flow rate Q1 that is used.



# AD.3.P... PNEUMATIC OPERATION TYPE VALVES CETOP 3/NG6



1



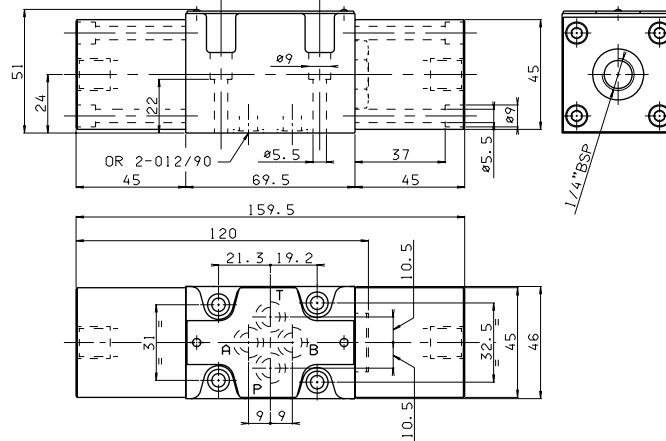
Max. pressure ports P/A/B	320 bar
Max. pressure port T	160 bar
Max. flow	60 l/min
Minimum operating pressure	$2 + [0.027 \times (pt^*)]$ bar - see note
Maximum operating pressure	20 bar
Fluid viscosity	$10 \div 500 \text{ mm}^2/\text{s}$
Fluid temperature	$-25^\circ\text{C} \div 75^\circ\text{C}$
Ambient temperature	$-25^\circ\text{C} \div 60^\circ\text{C}$
Max. contamination level	class 10 in accordance with NAS 1638 with filter $\beta_{25} \geq 75$
Weight single pilot	1,2 Kg
Weight twin pilot	1,8 Kg

• Possible mountings:  
C/D/E/F/G/H/I/L/M

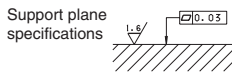
Ordering code see page before

(pt\*) = pressure at port T

## OVERALL DIMENSIONS

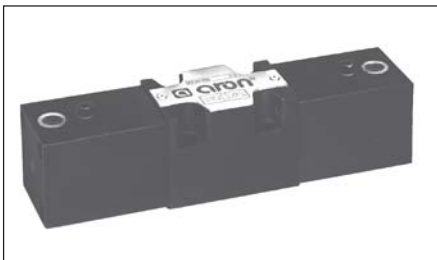


Fixing screws UNI 5931 M5x30 with material specifications min. 8.8  
Tightening torque 5 Nm / 0.5 Kgm



IAD3P - 02/2000/e

# AD.3.O... OLEODYNAMIC OPERATION TYPE VALVES CETOP 3/NG6



Max. pressure ports P/A/B	320 bar
Max. pressure port T	160 bar
Max. flow	60 l/min
Minimum operating pressure	$15 + [0.1 \times (pt^*)]$ bar - see note
Maximum operating pressure	250 bar
Fluid viscosity	$10 \div 500 \text{ mm}^2/\text{s}$
Fluid temperature	$0^\circ\text{C} \div 75^\circ\text{C}$
Ambient temperature	$-25^\circ\text{C} \div 60^\circ\text{C}$
Max. contamination level	class 10 in accordance with NAS 1638 with filter $\beta_{25} \geq 75$
Weight single pilot	1,5 Kg
Weight twin pilot	2,3 Kg

• Possible mountings:  
C/D/E/F/G/H/I/L/M

Ordering code see page before

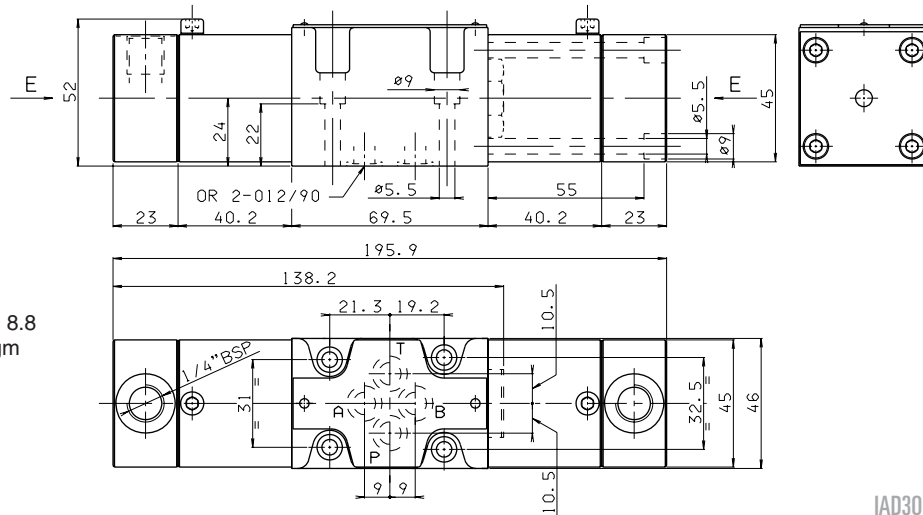
(pt\*) = pressure at port T

The DI variant is recommended in the environments characterised by the presence of dust or any type of contamination.

### Further technical specifications (for DI variant only)

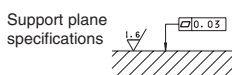
Minimum operating pressure	$[10 + (pt^*)]$ bar - see note
Maximum operating pressure	250 bar
Max. piloting leakage	1 l/min

## OVERALL DIMENSIONS



E = Manual override

Fixing screws UNI 5931 M5x30 with material specifications min. 8.8  
Tightening torque 5 Nm / 0.5 Kgm



IAD3O - 03/2000/e

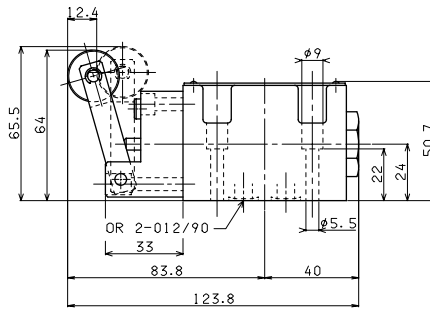


Max. pressure ports P/A/B	320 bar
Max. pressure port T	160 bar
Max. flow	60 l/min
Minimum operating force - see note (*)	2,5 Kg
Maximum operating force - see note (**)	13 Kg
Cam angle	27°
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter $\beta_{25} \geq 75$
Weight	1 Kg

- Possible mountings: E / F / G / H
- Ordering code see page before
- Note: (\*) In the absence of counter-pressure at port T
- (\*\*) with a pressure of 160 bar at port T

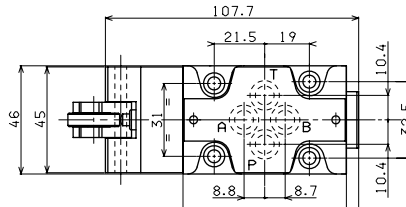
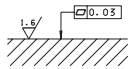
### OVERALL DIMENSIONS

Stroke 12,4 mm  
Working stroke 3 mm



Fixing screws UNI 5931 M5x30  
with material specifications min. 8.8  
Tightening torque 5 Nm / 0.5 Kgm

Support plane specifications



EAD3M - 02/2000/e

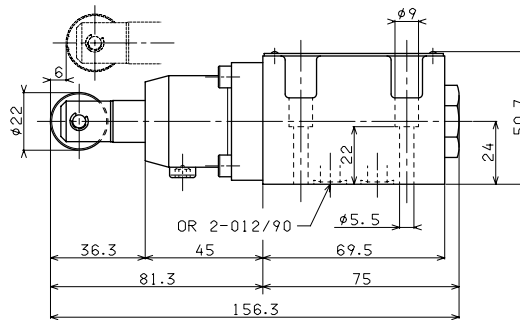


Max. pressure ports P/A/B	320 bar
Max. pressure port T	20 bar
Max. flow	60 l/min
Operating force - see note (*)	6 Kg
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	0°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter $\beta_{25} \geq 75$
Weight	1,5 Kg

- Possible mountings: E / F / G / H
- Ordering code see page before
- Note: (\*) In the absence of counter-pressure at port T

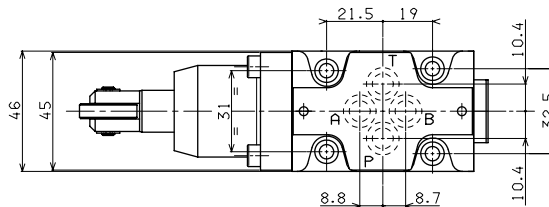
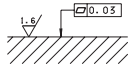
### OVERALL DIMENSIONS

Stroke 6 mm  
Extra stroke 2 mm  
Working stroke 3 mm



Fixing screws UNI 5931 M5x30  
with material specifications min. 8.8  
Tightening torque 5 Nm / 0.5 Kgm

Support plane specifications



EAD3D - 02/2000/e



### "D15" DC COILS FOR CETOP 3



Type of protection (in relation to the connector used)	IP 66
Number of cycles	18.000/h
Supply tolerance	±10%
Ambient temperature	-54°C ÷ 60°C
Duty cycle	100% ED
Insulation class	H
Weight	0,354 Kg

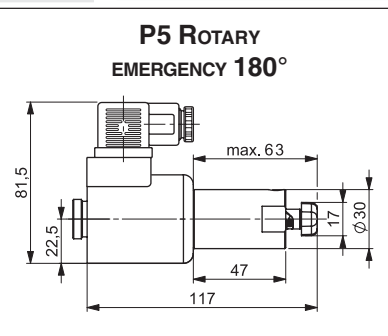
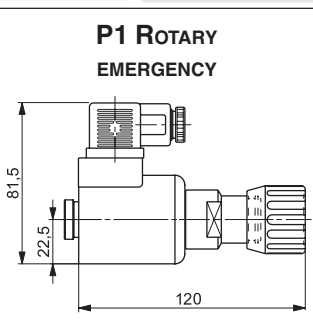
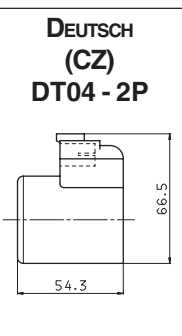
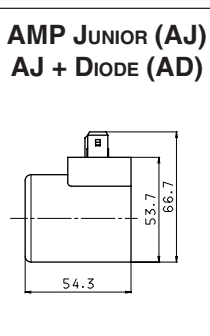
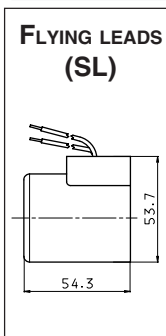
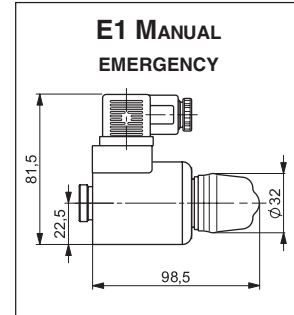
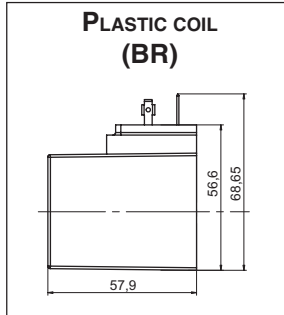
•AMP Junior coils (with or without diode) and coils with flying leads and coils type Deutsch, are available in 12V or 24V DC voltage only.

•The pastic type coil (BR variant) is available in 12V, 24V, 28V or 110V DC voltage only.

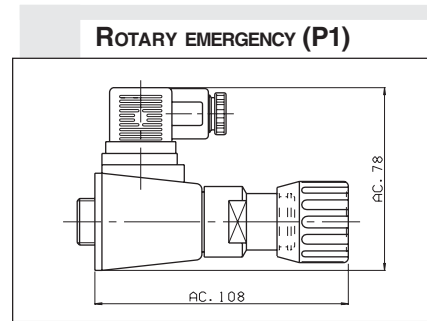
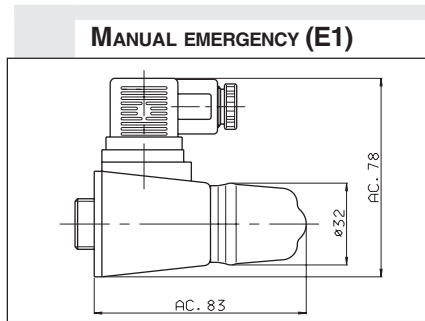
VOLTAGE (V)	MAX. WINDING TEMPERATURE (AMBIENT TEMPERATURE 25°C)	RATED POWER (W)	RESISTANCE AT 20°C (OHM) ±10%
12V	110°C	30	4.8
24V	110°C	30	18.8
28V*	110°C	30	25.6
48V*	110°C	30	75.2
102V*	110°C	30	340
110V*	110°C	30	387
205V*	110°C	30	1375

(\*) SPECIAL VOLTAGES

ETD15 - 04/2001/e



### "K12" AC SOLENOIDS FOR CETOP 3



Type of protection (in relation to the connector used)	IP 66
Number of cycles	18.000/h
Supply tolerance	+10% / -10%
Ambient temperature	-54°C ÷ 60°C
Duty cycle	100% ED
Max. static pressure	210 bar
Insulation class	H
Weight	0,4 Kg

VOLTAGE (V)	MAX. WINDING TEMPERATURE (AMBIENT TEMPERATURE 25°C)	RATED POWER (VA)	IN RUSH CURRENT (VA)	RESISTANCE AT 20°C (OHM) ±10%
24V/50Hz	100°C	57	230	1.96
24V/60Hz*	125°C	63	252	1.43
48V/50Hz*	140°C	66	205	6.85
115V/50Hz - 120V/60Hz	125°C - 105°C	52 - 47	230 - 222	49
230V/50Hz - 240V/60Hz	125°C - 105°C	55 - 48	241 - 221	186
240V/50Hz*	137°C	79	204	145

\* SPECIAL VOLTAGES

ETK12 - 02/2000/e

## CONNECTORS DIRECTIONAL CONTROL VALVES IN ACCORDANCE WITH DIN 43650/ISO4400



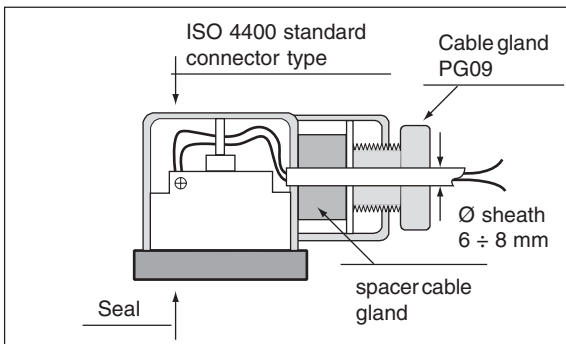
1



CONNECTOR	VOLTAGE <small>*SPECIAL VOLTAGE</small>	ORDERING CODE	CODE (VARIANTS)
<b>STANDARD (IP65)</b>			
Grey (side A)		V86.05.0004	No variant
Black (side B)		V86.05.0002	
<b>TYPE WITH CABLE GLAND PG 11</b>			
Grey (side A)		V86.05.0008	<b>C1</b>
Black (side B)		V86.05.0006	
<b>LENS COVER WITH PILOT LIGHT</b>			
(sides A and B)	12 VAC/VDC	V86.10.0018	<b>X1</b>
	24 VAC/VDC	V86.10.0012	
	115 VAC/VDC	V86.10.0020	
	230 VAC/VDC	V86.10.0022	
<b>WITH RECTIFIER</b>			
Grey (side A)		V86.20.0004	<b>R1</b>
Black (side B)		V86.20.0002	
Inlet voltage: 12÷220VAC Rectified voltage: 9÷200VDC			
<b>LENS COVER WITH PILOT LIGHT AND RECTIFIER</b>			
(sides A and B)	12 VAC	V86.25.0018	<b>XR</b>
	24 VAC	V86.25.0019	
	48 VAC*	V86.25.0020	
	115 VAC*	V86.25.0021	
	230 VAC*	V86.25.0022	
<b>TYPE OF PROTECTION IP67</b>			
Grey (side A)		V86.28.0002	<b>CN</b>
Black (side B)		V86.28.0001	

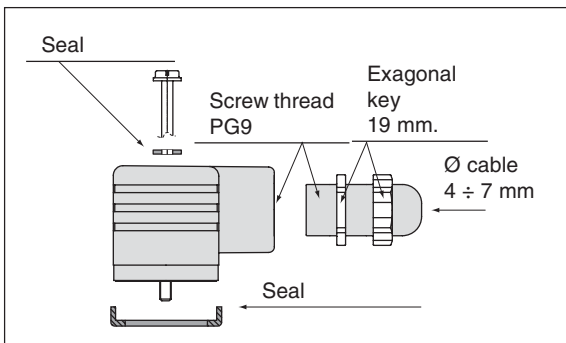
- Screw tightening torque: 60Ncm.
- **Note: the screw has to enter less than 4 mm into the threaded section of the coil.**
- It is suggest the use of the CN connector type (IP67) with the variant BR coil, which made in plastic material.

### ELECTRICAL FEATURES OF CONNECTORS



#### CONNECTORS IP 65 (STANDARD)

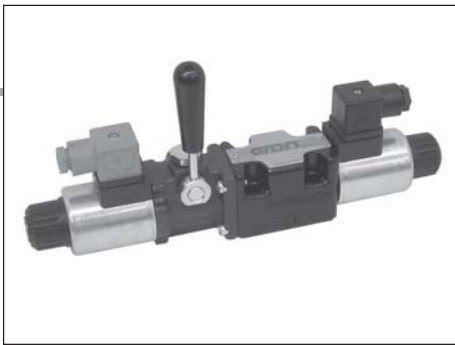
AC rated voltage	Max. 250 V
DC rated voltage	Max. 300 V
Pin contact rated flow	10A
Pin contact max. flow	16A
Max. section cable	1,5 mm <sup>2</sup>
Ø Cable gland PG09 - M16x1,5	6 ÷ 8 mm
Type of protection	IP65 EN60529
Insulation class	VDE 0110-1/89
Operating temperature	-40°C ÷ 90°C



#### CONNECTORS IP67 (CN VARIANT)

AC rated voltage	Max. 250 V
DC rated voltage	Max. 300 V
Pin contact rated flow	10A
Pin contact max. flow	16A
Max. section cable	1,5 mm <sup>2</sup>
Ø Cable gland PG09 - M16x1,5	4 ÷ 7 mm
Type of protection	IP67 EN60529
Insulation class	VDE 0110-1/89
Operating temperature	-20°C ÷ 80°C

The degrees of protection indicate is guaranteed only if the connectors were properly mounted with his original seals.



## "LE" VARIANT - EMERGENCY CONTROL LEVER FOR DIRECTIONAL CONTROL VALVES (ADC/AD.3.E)

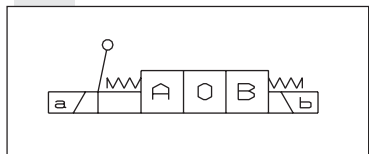
The emergency control lever for solenoid valves by Aron, represents a develop in terms of safety and flexibility among applied hydraulic components.

Thanks to his flexibility, the component was designed to be inserted between the valve body and the spool, providing total interchangeability between the different types of solenoid body valves manufactured by Aron. It is compatible with the standard CETOP 3 and stackable valves with threaded connections –G3/8" or 9/16-18UNF (SAE 6). The component is available for both directional control and proportional valves (for the last type of control please consult our Technical Department)

As an emergency lever applied to solenoid valves, the control can be used as a safety device in conformity with the industry standards , also playing an useful role in the event of power cuts. The control can be used in agricultural and mobile fields; the manual action can be used to carry out periodic maintenance work on mobile components of the vehicle , in perfectly safe working conditions.

Max operating pressure port T:	
dynamic	160 bar
static	210 bar
Max operating pressure port P for series connection configuration	
	160 bar

### HYDRAULIC SIMBOL

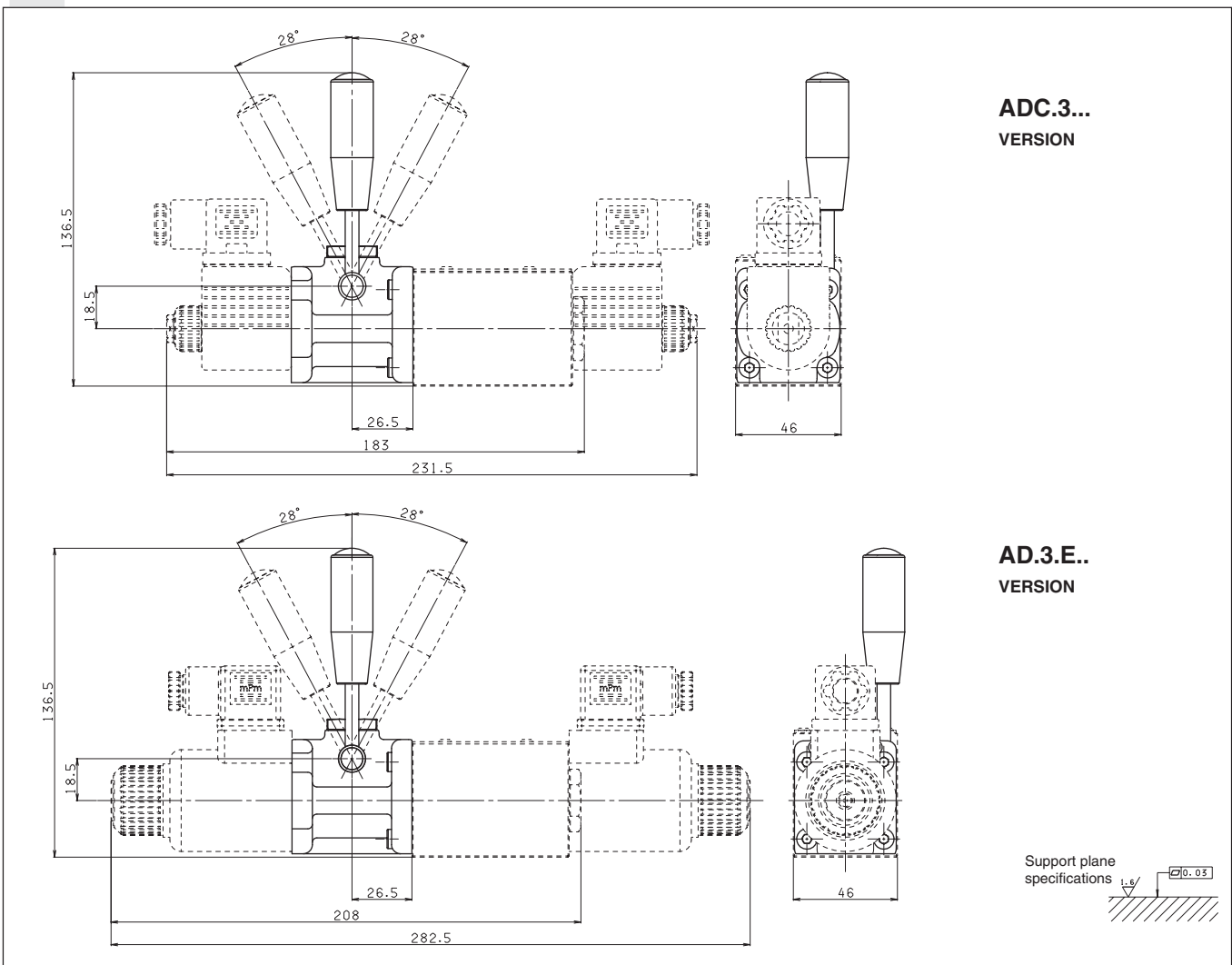


- MOUNTING TYPE: C / F / H
- SPOOLS TYPE: 01/02/03/04/16/17/66

### MOUNTING COMPATIBILITY

CODE VALVE	DESCRIPTION	COIL	VOLTAGE
ADC.3...	Directional control valve	A09	27 W
AD.3.E...	Directional control valve	D15	30 W

### OVERALL DIMENSION



# PROXIMITY SENSOR TYPE L.V.D.T.



1

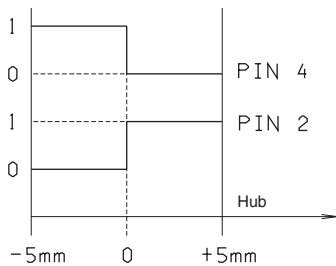


Supply voltage	24 V ± 20%
Polarity reversal protection	max 300 V
Switching point hysteresis	≤ 0,06 mm
Reproducibility	± 0,02 mm
Max. output current	≤ 250 mA
Protection against short circuit	yes
Operating temperature	-25°C ÷ 85°C
Connection type	connector
Protection according to DIN	IP65
Max. pressure	315 bar

**CE certificate according to 89/336/EEC EMC is provided. A screened cable is needed.**

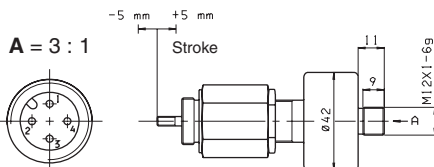
The LVDT position transducers allow to check exactly the very instant when the passage of a minimum flow is allowed.

## FUNCTIONAL DIAGRAM ON PIN 2 AND 4

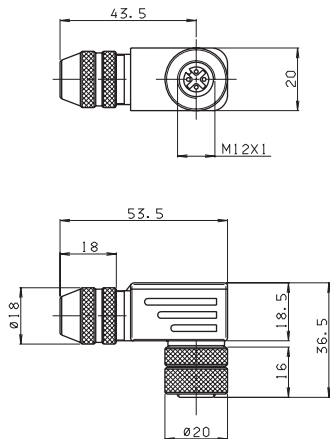


0 = Voltage Pin 2 and Pin 4 < 1,8 V  
1 = Voltage Pin 2 and Pin 4 24 V ± 20%

## OVERALL DIMENSION LVDT



## OVERALL DIMENSIONS CONNECTOR

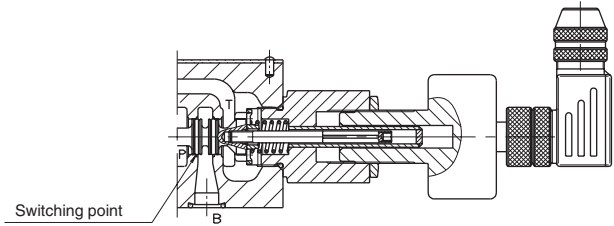
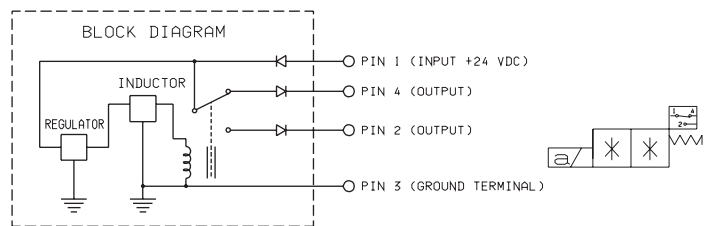


Type of protection IP67  
Ambient temperature -40°C ÷ 85°C

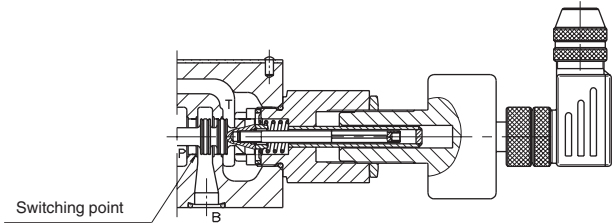
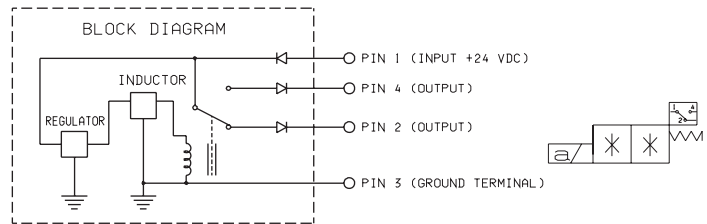
Ordering code: V86400003

## ELECTRICAL CONNECTIONS LVDT

**A** With this connection, on the Pin 4 an output signal is active when no oil is crossing the valve (from P → B).



**B** With this connection, on the Pin 4 there is no output signal when oil is crossing the valve (from P → B).



**NB:** connecting the output to Pin 4 or Pin 2 the type of contact, normally closed or open, can be chosen.



## AD.3.X\*... DIRECTIONAL CONTROLE CETOP 3 IN ACCORDANCE WITH 94/9/CE ATEX DIRECTIVE



### 94/9/CE ATEX EC DIRECTIVE (EXPLOSIVE ATMOSPHERE)

#### INTRODUCTION

Since 30/06/2003 products introduced into the market (or started-up) inside the EU, destined to be used in potentially explosive environments, must be in compliance with the 94/4/EC Directive through special marking. The directive regarding ATEX products 94/9/EC is therefore the regulation instrument that the European Union uses to obtain legislative harmonisation between the States and guarantee free circulation of goods inside the European Community itself.

The directive affirms that to eliminate obstacles from commerce it is necessary to guarantee a high level of protection and, with this aim, define the essential requirements on the subject of safety and health. The dispositions base themselves on the principle of the "new approach" (NA), for which the essential safety requirements of products must be established depending on the risk evaluation concurrent at the time of their use.

**The 94/4/EC Directive is applied to the manufacture specifications** of all those products (electrical and not) destined to be used in potentially explosive environments caused, by the dangers deriving from the presence of dust or gas, with the scope of reducing the risk of use that could be derived.

The term **product** refers to appliances, protection systems, devices, components and relative combinations, as defined in 94/9/EC Directive.

The term **appliances** intends machines, materials, fixed or mobile devices, control elements, instruments detection and prevention systems. Alone or combined these are destined for production, transport, deposit, measurement, adjustment and conversion of energy, and to the transformation of material and which, by way of the powerful triggering sources, risk causing an explosion. As a consequence, even intrinsically safe appliances re-enter within the field of application of the directive.

The combination of two or more appliance parts, as well as any other components, makes up a whole unit that can be considered a product and therefore re-enters within the field of application of the 94/9/EC Directive. If the whole unit requires adequate **installation** (therefore it is not immediately ready for use) the attached instructions should guarantee maintenance of compliance to the 94/9/EC Directive on installation, without further evaluations of conformity. The installer must follow the instructions correctly.

When a combination of appliances leads to a **plant** this may not re-enter within the field of application of the directive. Each part must be certified and in compliance with the directive (as well as being subject to the relative evaluation of conformity, EC marking, etc.).

The plant manufacturer must therefore presume the conformity of the various components (each supplied with conformity certificate released by the respective manufacturer) and limit their evaluation only to any additional risks that become important in the final combination. Nevertheless, if the plant manufacturer inserts parts without EC marking or components not supplied with the certificate it will be obligatory to carry out further conformity evaluation of the whole unit.

The 94/9/EC Directive envisions **obligations of the person** who introduces products into the market and/or starts them up, whether they are manufacturer's, his agent's, importer's or any other responsible person. The dispositions and obligations envisioned by the directive for **introduction into the market** have been applied, since 30 June 2003, to every individual product, independently from the date and place of manufacture. It is the manufacturers responsibility to guarantee conformity of all products, where these re-enter within the field of application of the directive.

The directive does not govern the use of the appliances; rather it establishes that the products can only be used if in compliance with safety requirements at the time of their introduction into the market or of their start-up. "**Start-up**" means the first use of the products subject of the 94/9/EC Directive on EU territory by a final user. Nevertheless, a product that is immediately ready for use and does not need assembly or installation, and whose distribution conditions (deposit, transport, etc.) are not important for performance, is considered started-up at the time of introduction into the market.

Among the main potential causes/sources of triggering an explosion, such as sparks, flames, electric arcs etc..., **maximum surface temperature** also plays an important role. The dispositions of the directive establish evaluation criteria for the maximum temperature admissible depending on the type of explosive atmosphere in which the appliance must operate.

For environments characterised by the presence of **gas-air**, some temperature values are supplied to which the appliances must refer. They are indicated by the letter T followed by a number. The criterion to apply is that for which the temperature of the appliance must never exceed 80% of the value indicated for its own category.

For environments characterised by the presence of **dust-air**, to prevent setting on fire of the airborne dust, the surface temperature of the appliances must be decidedly lower than the predictable temperature of catching fire of the air+dust mixture. Therefore, during planning the maximum working surface temperature must be declared directly (in degrees centigrade).

Increases in temperature deriving from an accumulation of heat and chemical reactions must also be taken into consideration. The thickness of the deposited layer of dust must also be considered and, if necessary, limit the temperature, to prevent an accumulation of heat.



AD.3.XD...  
-20°C ÷ +40°C



AD.3.XS...  
-30°C ÷ +60°C

#### AD.3.XD... / AD.3.XS...

ATEX DIRECTIVE	CH. I PAGE 22
ATEX CLASSIFICATION	CH. I PAGE 23
SERIES AD.3.X*...	CH. I PAGE 24
TECHNICAL SPECIFICATIONS	CH. I PAGE 24
ORDERING CODE	CH. I PAGE 24
VALVE MARKING	CH. I PAGE 25
INSTRUCTIONS FOR INSTALLATION	CH. I PAGE 25
AD.3.XD...	CH. I PAGE 26
AD.3.XS...	CH. I PAGE 26
LIMITS OF USE	CH. I PAGE 26
SAFETY INSTRUCTIONS	CH. I PAGE 27
INSTRUCTIONS FOR USE AND MAINTENANCE	CH. I PAGE 27
DECLARATION OF CONFORMITY	CH. I PAGE 27

**CLASSIFICATIONS OF AREA - MIX - GROUP AND RELATIVE CATEGORY – ACCORDING TO ATEX DIRECTIVES**

The 94/9/EC Directive is a “new approach” directive based on risk analysis. Its objective is to minimise the risks deriving from the use of some products indoors or in relation to a potentially explosive atmosphere. The probability of an explosive atmosphere manifesting must be considered not only as “one-off” or from a static point of view: all operative conditions that can derive from the transformation process must be taken into consideration.

- An **explosive atmosphere** for the 94/9/EC Directive is made up from a mixture of inflammable substances (as gas, vapours, mists and dust), with air, in determined atmospheric conditions in which, after triggering, the combustion propagates together with the unburned mixture.
- An atmosphere susceptible to transforming into an explosive atmosphere because of local and/or operative conditions is defined **potentially explosive atmosphere**.

Explosive atmospheres are not only formed in the presence of obviously dangerous substances such as fuel, solvents etc., but also in the presence of apparently harmless products such as wood dust, metal dusts, flour, grain, sugar etc. Therefore it can concern not only industries in the chemical or oil industry sectors, but also industries in the foodstuffs, textile, manufacturing etc.. It is important to consider that to re-enter within the 94/9/EC Directive a product must be applied in presence of one or more of the characteristic elements listed above: *presence of inflammable substances and air, in atmospheric conditions that favour the propagation of combustion*. The directive does not define the atmospheric conditions itself. The relative norms indicate a temperature range, but this does not exclude that the products may be planned and evaluated specifically to occasionally function outside of this range, introducing the opportune construction transformations.

To define a **conformity evaluation procedure** adequate for the directive, the Manufacturer must, on the basis of the declared use, establish the products functioning conditions (this means to say, envision the type of working area, the type of explosive mixture with which it will come into contact and the level of probability that an explosive atmosphere verifies itself); successively he must establish to which Group the product belongs and individualise the category inside the Group.

With the Atex 99/92/EC Directive (For the safety of workers) the working conditions in which products in compliance with Atex 99/4/EC Directive will function are indicated here. These are expressed in “**Areas**” and defined according to the level of probability that a potentially explosive atmosphere is verified, respectively for every type of atmosphere (gas-air mix or dust-air mix).

**Area 0 and 20** Places in which an explosive atmosphere is constantly present or present for long periods or frequently.

**Area 1 and 21** Places in which an explosive atmosphere is probable. It is verified in normal functioning and exercise conditions.

**Area 2 and 22** Places in which an explosive atmosphere has low probability of being verified or, if it occurs only lasts for a brief period of time.

**GAS-AIR-TYPE EXPLOSIVE MIXTURE (G)**

The products destined to work in environments characterised by this type of explosive atmosphere will be respectively indicated for Area **0, 1 or 2** depending on the Group and category of origin (see below) and are marked with the letter G.

**DUST-AIR-TYPE EXPLOSIVE MIXTURE (D)**

The products destined to work in environments characterised by this type of explosive atmosphere will be respectively indicated for Area **20, 21 or 22** depending on the Group and category of origin (see below) and are marked with the letter D.

**GROUP I**

*Includes the appliances destined to be used in underground jobs in the mines and their surface plants, exposed to the risk of the release of firedamp and/or combustible dust.* The subdivision into categories depends on the fact if the power supply must be interrupted or not if an explosive atmosphere manifests due to a mixture of air and gas, vapours mists (D) or a mixture of air and dust (G).

**Category M1 Very high protection level.** These products must be able to remain operative, for safety reasons, in the presence of an explosive atmosphere and present specific performances or protection configurations for breakdown in case of explosion.

**Category M2 High protection level.** The power supply to these products must be interrupted in the presence of an explosive atmosphere. Protection means must be incorporated to guarantee the level of protection during normal functioning and also in oppressive working conditions or resulting from great stress.

**GROUP II**

*Includes appliances destined to be used in different environments (from the mines) in which there is a probability that an explosive atmosphere manifests itself.* Their subdivision into categories depends on two factors: the place, where the product will be used and if the probability that a potentially explosive atmosphere, owing to the mixture of air and gas, vapours, mists (D) and the mixture of air and dust (G), comes about in a constant or occasional manner and if it does occur, does this possibility remain for long or brief period of time.

**Category 1 Very high protection level.** These products must be planned to function in compliance with operative parameters established by the Manufacturer in environments in which there is a high probability that explosive atmospheres are always detected or manifest often or for long periods of time. They must present specific performances or protection configurations for breakdown in case of explosion.

**Category 2 High protection level.** These products must be planned to function in compliance with operative parameters established by the Manufacturer in environments in which there is a high probability that explosive atmospheres can manifest. Protection against explosions relative to this category must function in a way to guarantee the required safety level even in the presence of functioning defects of the appliances or in dangerous operative conditions, which frequently must be taken into consideration.

**Category 3 Normal protection level.** These products must be planned to function in compliance with operative parameters established by the Manufacturer in environments in which there is a slight probability that explosive atmospheres can manifest, and however only rarely or for a brief period of time. This type of product belonging to the category in question must guarantee the safety level required in normal functioning conditions.

# AD.3.X\*... DIRECTIONAL CONTROLE CETOP 3 IN ACCORDANCE WITH 94/9/CE ATEX DIRECTIVE



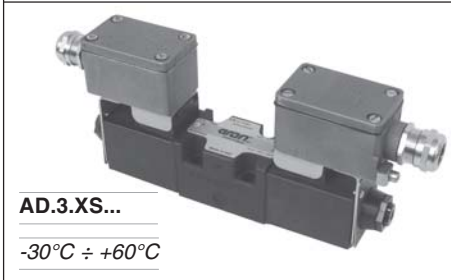
**VALVES SUITABLE FOR APPLICATIONS IN ZONES WHERE EXPLOSIVE ATMOSPHERE MAY OCCUR, AND ALSO ZONES CHARACTERIZED BY THE PRESENCE OF GAS MIXTURES**

The AD3.X\* valve series are **Group II** appliances (destined to be used in environments, apart from mines, where there is the probability of explosive atmospheres) **category 2** (high protection level), for use in **Zones 1 and 2** (places where it is probable that an explosive atmosphere forms in normal working conditions) and classified by the presence of gas-air type explosive mixtures, vapours and mists (letter **G**). We are therefore, talking about specially designed valves that are realised in compliance with the ATEX 94/9/EC Directive and according to European regulations EN 1127-1, EN 13463-1 and EN 13463-5.

Going back to Aron's "NG06 direction control" range, these valves are prepared for plate-mounting with attachment surface in compliance with UNI ISO 4401 - 03 - 02 - 0 - 94 (ex CETOP R 35 H 4.2-4-03). Activation is electrical and the centre position is obtained using springs with calibrated lengths, which once the impulse or command action has ceased, re-position the cursor in the centre or at the end run.

The coils used for these valves are subject to separate conformity certification, according to the ATEX Directive (EC-type). Suitable for use in zones 1 and 2, these coils are suitable for functioning in presence of gas (group IIC) and offer construction-type protection safety, respectively initialled "EEx d IIC T5 for the AD3XD" valve and "EEx me II T4 for the AD3XS" valve.

Before marking and issue onto the market, the valves of the AD3.XD / AD3.XS series undergo controls and inspections as envisioned by the internal Manufacturing System and as envisioned by the Certified Company Quality System in compliance with ISO 9001 regulations according to Vision 2000. All of the AD3.XD and AD3.XS valve series undergo 100% functional inspections. These controls guarantee that the products sold are in compliance with all reported in the Technical Specifications File deposited and declared by marking with AD3X/ATEX/04.



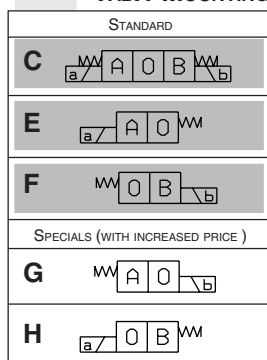
AD.3.XD... / AD.3.XS...	
ATEX DIRECTIVE	Ch. I PAGE 22
ATEX CLASSIFICATION	Ch. I PAGE 23
SERIES AD.3.X*...	Ch. I PAGE 24
TECHNICAL SPECIFICATIONS	Ch. I PAGE 24
ORDERING CODE	Ch. I PAGE 24
VALVE MARKING	Ch. I PAGE 25
INSTRUCTIONS FOR INSTALLATION	Ch. I PAGE 25
AD.3.XD...	Ch. I PAGE 26
AD.3.XS...	Ch. I PAGE 26
LIMITS OF USE	Ch. I PAGE 26
SAFETY INSTRUCTIONS	Ch. I PAGE 27
INSTRUCTIONS FOR USE AND MAINTENANCE	Ch. I PAGE 27
DECLARATION OF CONFORMITY	Ch. I PAGE 27

### ORDERING CODE

<b>AD</b>	Directional control valve
<b>3</b>	CETOP 3/NG06
<b>X*</b>	Solenoid valve in accordance with 94/9/CE ATEX Directive <b>D</b> = with performed explosion proof solenoids (EEx d) <b>S</b> = with performed increased safety solenoids (EEx me)
<b>**</b>	Spool <b>01/02/03/04/16</b> (see sideways) For different spools, please contact Aron Customer Service
<b>*</b>	Mounting <b>C / E / F / G / H</b> (tab.1) For different mounting, please contact Aron Customer Service
<b>*</b>	Voltages (tab.2)
<b>**</b>	Variants <b>00</b> = No variants <b>V1</b> = Viton (for AD3XD only)
<b>1</b>	Serial No.

TECHNICAL SPECIFICATIONS	AD.3.XD...	AD.3.XS...
<b>Valve marking</b>	<b>CE Ex II 2 G cT5</b>	<b>CE Ex II 2 G cT4</b>
Max. operating pressure ports P/A/B	320 bar	320 bar
Max. pressure port T (dynamic)	250 bar	70 bar
Max. flow	60 l/min	60 l/min
Max. excitation frequency	3 Hz	3 Hz
Duty cycle	100%ED	100%ED
Hydraulic fluid	mineral oil DIN 51524	mineral oil DIN 51524
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s	10 ÷ 500 mm <sup>2</sup> /s
<b>Fluid temperature</b>	<b>-20°C ÷ +40°C</b>	<b>-30°C ÷ +60°C</b>
<b>Ambient temperature</b>	<b>-20°C ÷ +40°C</b>	<b>-30°C ÷ +60°C</b>
Max. contamination level	class 10 with NAS 1638 with filter β <sub>25</sub> ≥ 75	class 10 with NAS 1638 with filter β <sub>25</sub> ≥ 75
Weight (with one solenoid)	2,37 Kg	2,10 Kg
Weight (with two solenoids)	3,82 Kg	3,40 Kg
Coil rated power	11-13 W	
Degree of protection	IP 67	IP 66
Supply tolerance	±10%	-10% ÷ 0%
Supply cable	standard length 3m with cable gland	Cable gland in accordance with ATEX for cable type Ø external = 7 ÷ 12 mm
Solenoid marking	<b>CE Ex II 2 G EEx d IIC T5 W11 - CESI 03 ATEX 212</b>	<b>CE Ex II 2 G EEx me II T4 BASEEFA02AATEX0199X</b>
Connector marking	EEx d II C KEMA 01 ATEX X2240X	EEx e II KEMA 99 ATEX 6971

**TAB.1 MOUNTING**



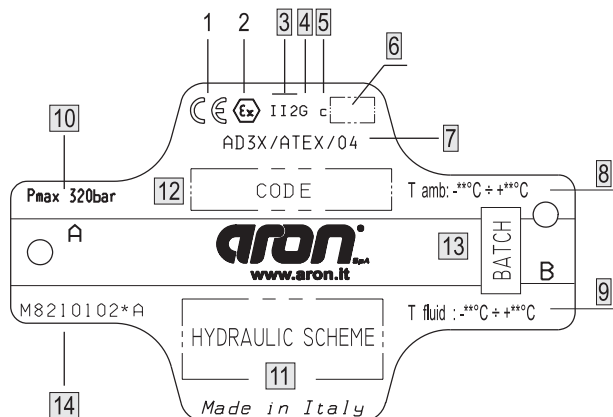
**TAB. 2 - VOLTAGES**



AC VOLTAGE	FOR AD3XD	FOR AD3XS
<b>A</b>	24/50Hz	24/50Hz
<b>B*</b>	/	48/50Hz
<b>C</b>	110V/50Hz	/
<b>J</b>	/	115V/50Hz
<b>D</b>	220V/50Hz	/
<b>I</b>	230V/50Hz	230V/50Hz
DC VOLTAGE	FOR AD3XD	FOR AD3XS
<b>L</b>	12V	12V
<b>M</b>	24V	24V
<b>P*</b>	110V	/
<b>N</b>	48V	/

(\*) Special voltage Voltage code is always stamped on the plate of the AD3X\* valve

**VALVE MARKING**

**REGISTERED MARK AND IDENTIFICATION PLATE FOR AD3X\*... SOLENOID VALVES IN ACCORDANCE WITH ATEX DIRECTIVE**



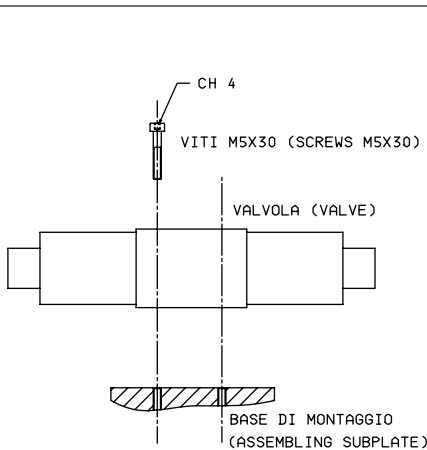
1		In accordance with Europe Directive
2		In accordance with Atex 94/9/CE Directive
3	II 2	Group II (surface places) Class 2 (high degree of protection)
4	G	Explosive atmosphere which is comprised of gas, vapours or mist
5	c	safety performed
6	T*	Class of temperature series AD3XD T5 (<100) series AD3XS T4 (< 135)
7	AD3X/ATEX/04	Reference of the Technical issue put down at the Notifying Body

8	T amb	Operating ambient temperature series AD3XD - 20°C ÷ + 40°C series AD3XS - 30°C ÷ + 60°C
9	T fluid	Operating fluid temperature series AD3XD - 20°C ÷ + 40°C series AD3XS - 30°C ÷ + 60°C
10	Pmax 320 bar	Max. operating pressure
11	HYDRAULIC SCHEME	Hydraulic scheme of the valve
12	CODE	Complete reference number of the valve's ordering code
13	BATCH	Reference number of the technical ordering code (batch)
14	M8210102*A	Plate code

Every solenoid valve is supply with its "Identification Plate" and with the "Declaration of Conformity" in accordance with the 94/4/CE Atex Directive.

The identification plate shows the most important technical performance and constructive specifications so **it has to be always integral and visible.**

DAMAGING SUBSTANCE AND ZONE	CLASS (94/9/CE DIRECTIVE)
Gas, vapours or mist <b>Zone 0</b>	1G
Gas, vapours or mist <b>Zone 1</b>	2G or 1G
Gas, vapours or mist <b>Zone 2</b>	3G, 2G or 1G



**EXAMPLE OF A CORRECT INSTALLATION**

**INSTRUCTIONS FOR A CORRECT INSTALLATION**

**1** Assemble the valve on the mounting base using 4 - M5x30 UNI5931 screw fasteners in class 8.8 minimum material with tightening torque of 5 Nm. Surface features: roughness Ra < 1.6 and planarity 0.03mm max.  
**2** Carry out wiring of the solenoids according to the user instructions of the relative coils (a copy is always supplied with each solenoid).

- The valves must be connected to earth using the special anti-loosening and anti-rotation connection element.
- When mounting the valve onto the base (manifold) ensure not to damage the OR sealing rings on the surface.
- For the aspects tied to the installation of the solenoids, see the relative safety instructions. The electrical components must not be opened when live.
- If it is necessary to loosen the ring nuts on the external ends of the coil to opportunely position the cable-holders, they must be tightened again to the respective tightening torques.

Tightening torque ring nut/coil (Ch. 24) for series AD3XD = 25 ± 2Nm  
 Tightening torque ring nut/coil (Ch. 22) for series AD3XS = 19 ± 1Nm

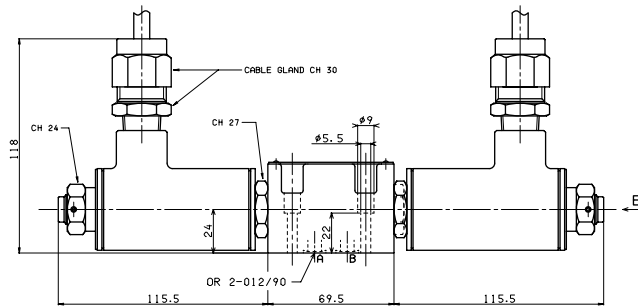
**AD.3.X\* VALVES SUITABLE FOR APPLICATIONS IN ZONES WHERE EXPLOSIVE ATMOSPHERE MAY OCCUR (GAS MIXTURES) - 94/9/CE ATEX DIRECTIVE**



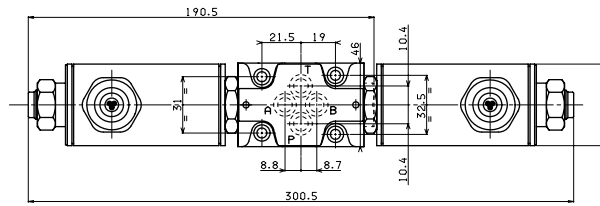
**OVERALL DIMENSIONS**

1

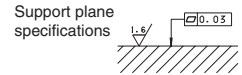
**AD.3.XD... SOLENOID VALVES EQUIPPED WITH EXPLOSION PROOF COILS SUITABLE FOR APPLICATIONS IN ZONES WHERE EXPLOSIVE ATMOSPHERE MAY OCCUR (GAS MIXTURES)**



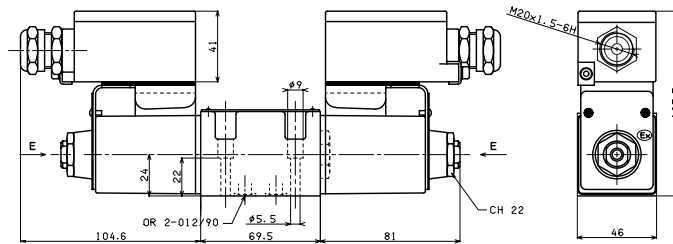
E = Manual override



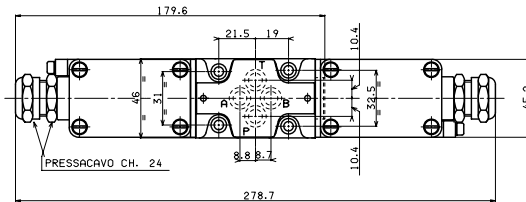
Fixing screws UNI 5931 M5x30  
with material specifications min. 8.8  
Tightening torque 5 Nm / 0.5 Kgm



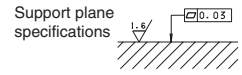
**AD.3.XS... SOLENOID VALVES EQUIPPED WITH INCREASED SAFETY COILS SUITABLE FOR APPLICATIONS IN ZONES WHERE EXPLOSIVE ATMOSPHERE MAY OCCUR (GAS MIXTURES)**



E = Manual override

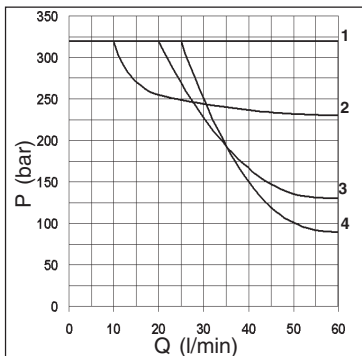


Fixing screws UNI 5931 M5x30  
with material specifications min. 8.8  
Tightening torque 5 Nm / 0.5 Kgm

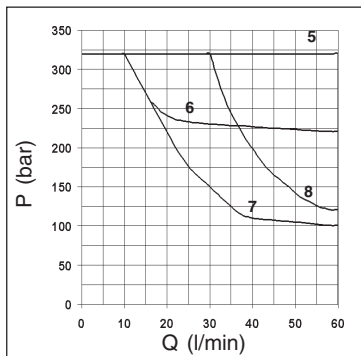


**LIMITS OF USE**

**AD.3.XD...**



**AD.3.XS...**



Spool type	Curve
	<b>AD3XD</b>
01	2
02	1
03	3
04	4
16	1
	<b>AD3XS</b>
01	6
02	5
03	7
04	8
16	5

The tests have been carried out with solenoids at operating temperature with a voltage 10% less than rated voltage with a fluid temperature of 40°C. The fluid used was a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40°C. The values in the diagram refers to tests carried out with the oil flow in two direction simultaneously (e.g.. from P to A and in the same time B to T).  
**In cases where valves 4/2 e 4/3 were used with the flow in one direction only, the limits of use could have variations which may even be negative.**



### SAFETY INSTRUCTIONS

- **Carefully read everything reported in the instruction sheet attached to the valves, before installation. All maintenance operations must be performed according to the manual.**
- The AD3.XD and AD3.XS series valves must be installed and maintained in compliance with plant and maintenance regulations for environments classified against the risk of explosion because of presence of gas (for example: EN 60079-14, EN 60079-17 or other national regulations/standards).
- The valves must be connected to earth using the special anti-loosening and anti-rotation connection element.
- For all safety aspects tied to the use of the coil see the relative use and maintenance instructions. The electrical appliances/components must not be opened when live.
- The user must periodically control, depending on the conditions of use and the substances used, the presence of deposits, cleaning, wear and correct functioning of the valves.

**Attention: all installation and maintenance interventions must be performed by qualified staff.**

### INSTRUCTIONS FOR A CORRECT USE AND MAINTENANCE

#### USE:

- Respect functional limits indicated in the *technical features* section and those, where restrictive, indicated in the solenoid safety instructions.
- The oil used must be within the types envisioned by the manufacturer and its contamination level must be maintained within the indicated limits.

#### MAINTENANCE:

- The user must periodically control, depending on the conditions of use and the substances used, the presence of deposits, cleaning, wear and correct functioning of the valves.
- If the OR sealing rings are damaged, only replace them with those specifically supplied by the manufacturer.

### EXAMPLE OF THE DECLARATION OF CONFORMITY



**Dichiarazione di conformità  
Declaration of conformity**

Noi **Aron S.p.a**  
We **Via G. Natta, 1  
42100 Reggio Emilia (RE)**

*dichiariamo sotto la nostra esclusiva responsabilità che il prodotto:  
declare under our sole responsibility that the product:*

**Valvole serie AD3.XD/ AD3.XS  
Valves series AD3.XD/ AD3.XS**

*al quale questa dichiarazione si riferisce è conforme alla seguente direttiva:  
to which this declaration relates complies with the following Directives:*

- **ATEX Directive 94/9/EC**

*La conformità è stata verificata sulla base dei requisiti delle norme o dei documenti normativi riportati nel seguito:  
The conformity are under observance of the following standards or standards documents:*

- EN 1127-1
- EN 13463-1
- EN 13463-5

*Marcatura / marking*

Valvole serie AD3.XD: **CE**  II 2 G c T5, T6

Valvole serie AD3.XS: **CE**  II 2 G c T4, T5 Tamb. - 30°C ÷ + 60°C

*Fascicolo tecnico: AD3X/ATEX/04  
Technical issue*

*Organismo Notificato di deposito del fascicolo tecnico:  
The documents required will archive at the following location:*

**INERIS - BP2 60550 VERNEUIL EN HALATTE - FRANCE**  
Notified body Atmosphere explosives.  
Reference No. 17487/04

Reggio Emilia (RE), dated 03.06.04

Signature





## DIRECTIONAL CONTROL VALVES CETOP 5/NG10

### INTRODUCTION

The ARON directional control valves NG10 designed for subplate mounting with an interface in accordance with UNI ISO 4401 - 05 - 04 - 0 - 94 standard (ex CETOP R 35 H 4.2-4-05), and can be used in all fields on account of their excellent capacity and pressure specifications.

The use of solenoids with wet armatures means that the construction is extremely functional and safe completely dispensing with need for dynamic seals. The solenoid dust cover is screwed directly onto the valve casing whilst the coil is kept in position by a ring nut.

Great care has been taken in the design and the production of the ducts and the improvement of the spools has allowed relatively high flow rates to be accommodated with minimal pressure drops ( $\Delta p$ ). The operation of the directional valves can be electrical, pneumatic, oleodynamic, mechanical or lever operated.

The centring position is achieved by means of calibrated length springs which, once the action of impulse is over, return the spool to the centre or end travel position.

The solenoids constructed with protection class in accordance with DIN 40050 standards are available in either direct current (IP65) or alternating current (IP66) with different voltage and frequencies.

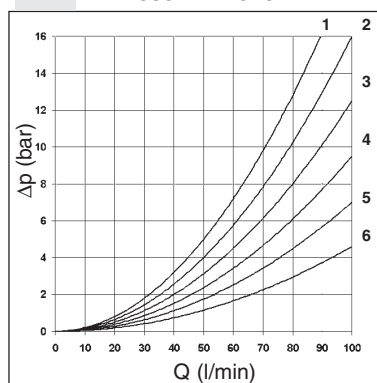
All types of electrical controls can be fitted, on request, with different types of manual emergency controls. The electrical supply takes place through connectors meeting DIN 43650 ISO 4400 standards; connectors are also available with built in rectifier or pilot lights.

The valves are designed for use with DIN 51524 standard hydraulic mineral oils and it is recommended that filters should be fitted to ensure a maximum contamination level of class 10 in accordance with NAS 1638,  $\beta_{25} \geq 75$ .

### CETOP 5/NG10

STANDARD SPOOLS	CH. I PAGE 30
AD.5.E...	CH. I PAGE 31
AD.5.E...J*	CH. I PAGE 32
AD.5.E...Q5	CH. I PAGE 32
AD.5.O...	CH. I PAGE 33
AD.5.D...	CH. I PAGE 33
AD.5.L...	CH. I PAGE 34
"A16" DC SOLENOIDS	CH. I PAGE 35
"K16" AC SOLENOIDS	CH. I PAGE 35
STANDARD CONNECTORS	CH. I PAGE 19

### PRESSURE DROPS



The diagram at the side show the pressure drop curves for spools during normal usage. The fluid used is a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40°C; the tests have been carried out at a fluid

temperature of 40°C.

For higher flow rates than those in the diagram, the losses will be those expressed by the following formula:

$$\Delta p_1 = \Delta p \times (Q_1/Q)^2$$

where  $\Delta p$  will be the value for the losses for a specific flow rate Q which can be obtained from the diagram,  $\Delta p_1$  will be the value of the losses for the flow rate Q<sub>1</sub> that is used.

Spool type	Connections				
	P → A	P → B	A → T	B → T	P → T
01	2	2	5	5	
02	3	3	6	6	3
03	2	2	6	6	
04	3	3	4	4	1
05	3	3	5	5	
06	2	2	5	5	
66	2	2	5	5	
07		1	5		
10	3	3	5	5	
11	4			5	
	Curve No.				

Spool type	Connections				
	P → A	P → B	A → T	B → T	P → T
22		4	5		
14	3	3	6	6	2
15	2	2	4	5	
16	2	2	4	5	
17	3	3			
19	3	3	4	5	
20	3	3	4	5	
21	3	3			
28	3	3	6	6	2
	Curve No.				

**ORDERING CODE**

<b>AD</b>	Directional valve
<b>5</b>	CETOP 5/NG10
<b>*</b>	Type of operator (tab.1)
<b>**</b>	Spools (see tables on page I•30)
<b>*</b>	Mounting type (tab.2)
<b>*</b>	Voltage (tab.3)
<b>**</b>	Variants (tab.4)
<b>2</b>	Serial No.

**TAB.1  
TYPE OF OPERATOR**

<b>E</b>	Electrical
<b>D</b>	Direct mechanical
<b>O</b>	Oleo-pneumatic
<b>L</b>	Lever

**TAB.2  
MOUNTING**

STANDARD	
<b>C</b>	
<b>D</b>	
<b>E</b>	
<b>F</b>	
SPECIALS (WITH PRICE INCREASING)	
<b>G</b>	
<b>H</b>	
<b>I</b>	
<b>L</b>	
<b>M</b>	

**TAB.3 - "E" TYPE OPERATION**

AC VOLTAGE	
<b>A</b>	24V/50Hz
<b>B</b>	48V/50Hz*
<b>J</b>	115V/50Hz - 120V/60Hz
<b>Y</b>	230V/50Hz - 240V/60Hz
<b>E</b>	240V/50Hz*
<b>F</b>	24V/60Hz*
DC VOLTAGE	
<b>L</b>	12V
<b>M</b>	24V
<b>N</b>	48V*
<b>P</b>	110V*
<b>Z</b>	102V*
<b>X</b>	205V*
<b>K</b>	Without AC coils
<b>W</b>	Without DC coils
<b>Z</b>	other controls

115Vac/50Hz 120Vac/60Hz with rectifier
230Vac/50Hz 240Vac/60Hz with rectifier

Voltage codes are not stamped on the plate, their are readable on the coils.

\* Special voltage

- Mounting type **D** is only for valves with detent
- In case of mounting **D** with detent a maximum supply time of 2 sec is needed (only for AC coils).
- The springs for the version with detent (mounting **D**) are different from those for standard versions.

**TAB.4 - VARIANTS**

VARIANT	CODE	◆	PAGE
No variant	00		
Viton	V1		
Emergency button	E1		I•35
Pilot light	X1		I•19
Rectifier	R1		I•19
Preset for microswitch - (E/F/G/H only) see below note ◇	M1	◆	I•31- I•34
Rotary emergency button	P1		I•35
Solenoid valve without connectors	S1		
Marine version (AD.5.O..)	H1	◆	
Cable gland "PG 11"	C1		I•19
Emergency + Viton	EV		
Emergency + Pilot light	EX		
Viton + Pilot light	VX		
Emergency + Viton + Pilot light	A1		
Emergency + Rectifier	ER		
Viton + Rectifier	VR		
Viton + Rectifier + Emergency	A2		
Pilot light + Rectifier	XR		I•19
Pilot light + Rectifier + Emergency	A3		
Pilot light + Rectifier + Emergency + Viton	A4		
Preset for microswitch + Viton	MV	◆	
Spool movement speed control (VDC only) with ø 0.5 mm diameter orifice	J5	◆	I•32
Spool movement speed control (VDC only) with ø 0.6 mm diameter orifice	J6	◆	I•32
Spool movement speed control (VDC only) with ø 0.7 mm diameter orifice	J7	◆	I•32
Spool movement speed control (VDC only) with ø 0.8 mm diameter orifice	J8	◆	I•32
External draining solenoid (electrically operated only)	Q5	◆	I•32
Microswitch+ Detent (for lever operation)	MD	◆	
Detent for lever control	D1	◆	

◇ = Maximum counter-pressure on T port: 4 bar

◆ = Variant codes stamped on the plate

1

TWO SOLENOIDS, SPRING CENTRED "C" MOUNTING			
Spool type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
05		+	
66		+	
06		+	
07*		+	
08*		+	
10*		+	
22*		+	
11*		+	
12*		+	
13*		+	
14*		-	
28*		-	

ONE SOLENOID, SIDE A "E" MOUNTING			
Spool type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
05		+	
66		+	
06		+	
08*		+	
10*		+	
12*		+	
15		-	
16		+	
17		+	
14*		-	
28*		-	

STANDARD SPOOLS

(\*) Spool with price increasing

• With spools 15 / 16 / 17 only the mounting E / F are possible

• 19 / 20 / 21 spool not planned for variant J\*

• For lever operated the spools used are different.

Available spools for this kind of valve are: 01 / 02 / 03 / 04 / 05 / 06 / 66 / 07 / 22 / 13 / 15 / 16 / 17

ONE SOLENOID, SIDE B "F" MOUNTING			
Spool type		Covering	Transient position
01		+	
02		-	
03		+	
04*		-	
05		+	
66		+	
06		+	
08*		+	
10*		+	
22*		+	
12*		+	
13*		+	
07*		+	
15		-	
16		+	
17		+	
14*		-	
28*		-	

TWO SOLENOIDS "D" MOUNTING			
Spool type		Covering	Transient position
19*		-	
20*		+	
21*		+	

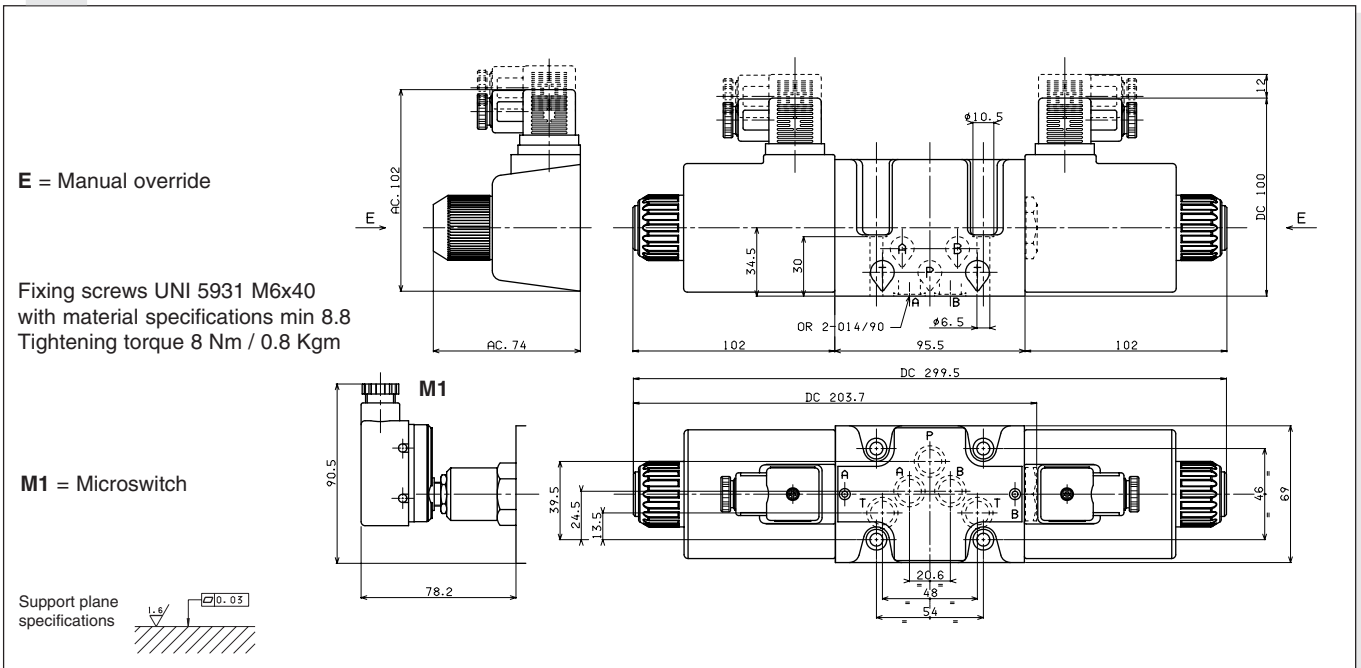


A max. counter-pressure of 4 bar at T is permitted for the variant with a microswitch (M1).

Max. pressure ports P/A/B	350 bar
Max. pressure port T (DC coil) see note (*)	250 bar
Max. pressure port T (AC coil)	160 bar
Max. flow	100 l/min
Max. excitation frequency	3 Hz
Duty cycle	100% ED
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter β <sub>25</sub> ≥ 75
Weight (with one DC solenoid)	4 Kg
Weight (with two DC solenoids)	5,1 Kg
Weight (with one AC solenoid)	3,5 Kg
Weight (with two AC solenoids)	4,3 Kg

(\*) Pressure dynamic allowed for 2 millions of cycles.

OVERALL DIMENSIONS



LIMITS OF USE

The tests have been carried out with solenoids at operating temperature and a voltage 10% less than rated voltage with a fluid temperature of 40°C. The fluid used was a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40°C.

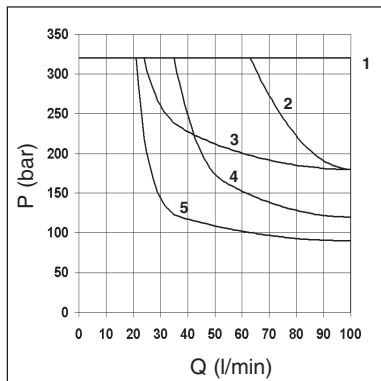
The values in the diagram refer to tests carried out with the oil flow in two directions simultaneously T = 2 bar (e.g. from P to A and the same time B to P).

In the cases where valves 4/2 and 4/3 were used with the flow in one direction only, the limits of use could have variations which may even be negative. Rest time: the values are indicative and depend on the following parameters: hydraulic circuit, fluid used and variations in hydraulic scales (pressure P, flow Q, temperature T).

Direct current : Energizing 60 ÷ 95 ms.  
De-energizing 25 ÷ 70 ms.

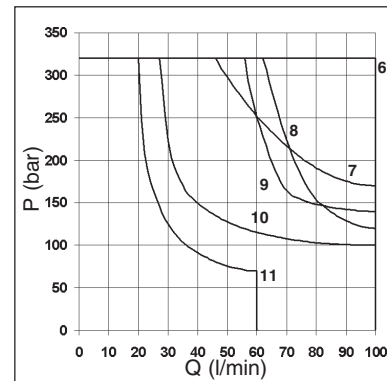
Alternating current: Energizing 12 ÷ 30 ms.  
De-energizing 10 ÷ 55 ms.

DIRECT CURRENT SOLENOIDS (DC)



Spool type	Solenoids	
	DC	AC
01	1	8
02	1	6
03	2	7
04	4	10
05	1	6
06 - 66	3	9
14-28	5	11
15	3	10
16	1	6
Curves		

ALTERNATING CURRENT SOLENOIDS (AC)



1

## Valves type AD5.E... with spool movement speed control variant J\*

These ON-OFF type valves are used when a lower spool movement speed than usual for conventional solenoid valves is required to prevent impacts which could adversely affect the smooth running of the system. The system consists of reducing the transfer section for the fluid from one solenoid to the other by means of calibrated orifice.

• This version can only be used with a direct current (DC) and also involves a **reduction in the limits of use so that we suggest to always test the valve in your application.**

- To order AD.5.J\* version valves, specify the orifices code.
- The operation is linked to a minimum counter-pressure on the T line (1 bar min.)
- The switching time referred to the spool travel detected by a LVDT transducer can vary for the NG10 valve a minimum of 200 to a maximum of 400 ms depending on 5 fundamental variables:

- 1) Diameter of the calibrated orifice (see table)
- 2) Hydraulic power for clearance referring to flow and pressure values through the valve
- 3) Spool type
- 4) Oil viscosity and temperature
- 5) Counter-pressure at T line

• **Possible mounting: C / E / F / G / H**

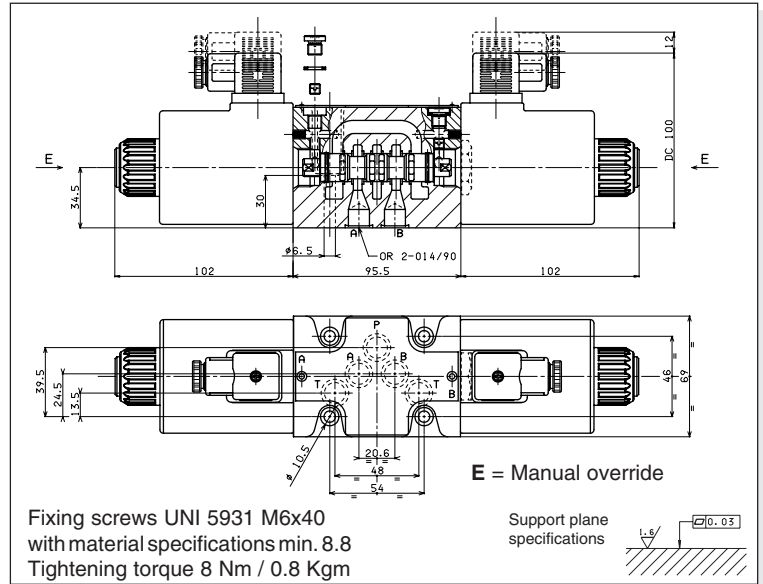
• **19 / 20 / 21 spools not planned for variant J\***

CALIBRATED ORIFICE AVAILABLE		
ø (mm)	M6x6	Code
0.5	M89.10.0031	<b>J5</b>
0.6	M89.10.0026	<b>J6</b>
0.7	M89.10.0032	<b>J7</b>
0.8	M89.10.0033	<b>J8</b>

EAD5E...J\$ - 00/2000/e

Max. pressure ports P/A/B	320 bar
Max. pressure port T - see note (*)	250 bar
Max. flow	100 l/min
Duty cycle	100% ED
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Weight with one DC solenoid	3,6 Kg
Weight with two DC solenoids	4,5 Kg

(\*) Pressure dynamic allowed for 2 millions of cycles.



# AD.5.E...Q5 VALVES WITH EXTERNAL DRAINING SOLENOID - VARIANT Q5

## Valves type AD5.E... variant Q5 with external draining solenoid

This involves valves with solenoid drainage chambers separated by line T in the CETOP 5 interface distinguished by the letter L. This solution makes it possible to operate with a maximum counter-pressure at T up to 320 bar using only 12.9 material fixing screws to ensure the maximum safety of the solenoid valve fixing and use of an additional drain. This version can be used for direct current (DC) and alternating current (AC), but involves a reduction in the limits of usage depending on the pressure at T.

• **Mounting possible: C / D / E / F / G / H / I / L / M**

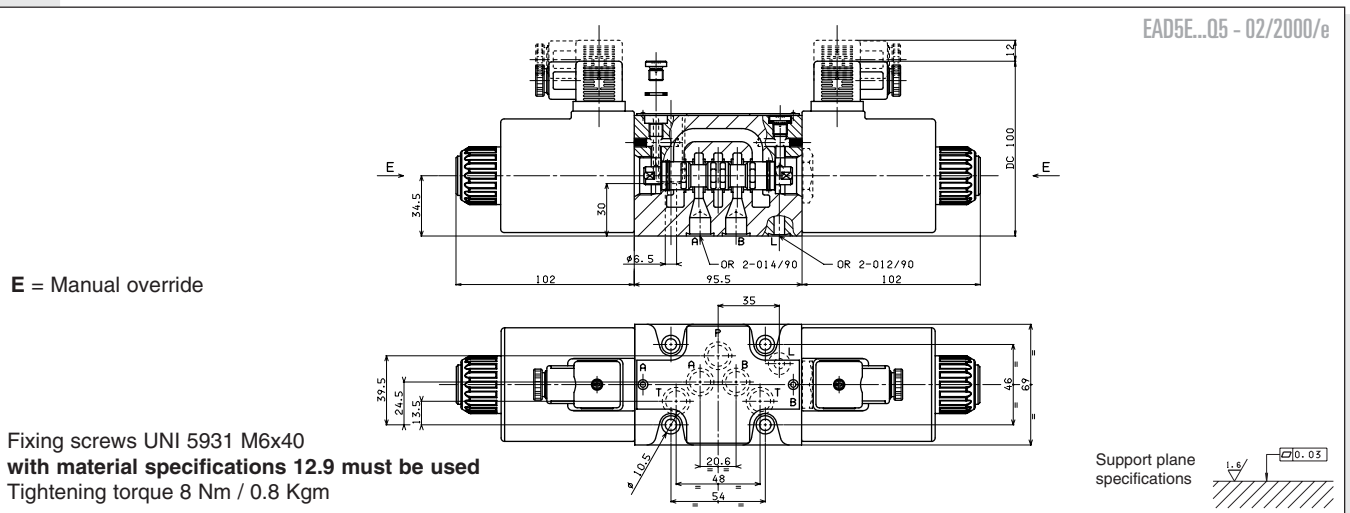
• **For subplate see BSH.5.31..**

Max. pressure ports P/A/B/T	320 bar
Max. pressure port L (DC coils) see note (*)	250 bar
Max. pressure port L (AC coils)	160 bar
Max. flow	100 l/min
Max. excitation frequency	2 Hz
Duty cycle	100% ED
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Weight with one DC solenoid	3,6 Kg
Weight with two DC solenoids	4,5 Kg
Weight with one AC solenoid	3,5 Kg
Weight with two AC solenoids	4,3 Kg

(\*) Pressure dynamic allowed for 2 millions of cycles.

### OVERALL DIMENSIONS

EAD5E...Q5 - 02/2000/e



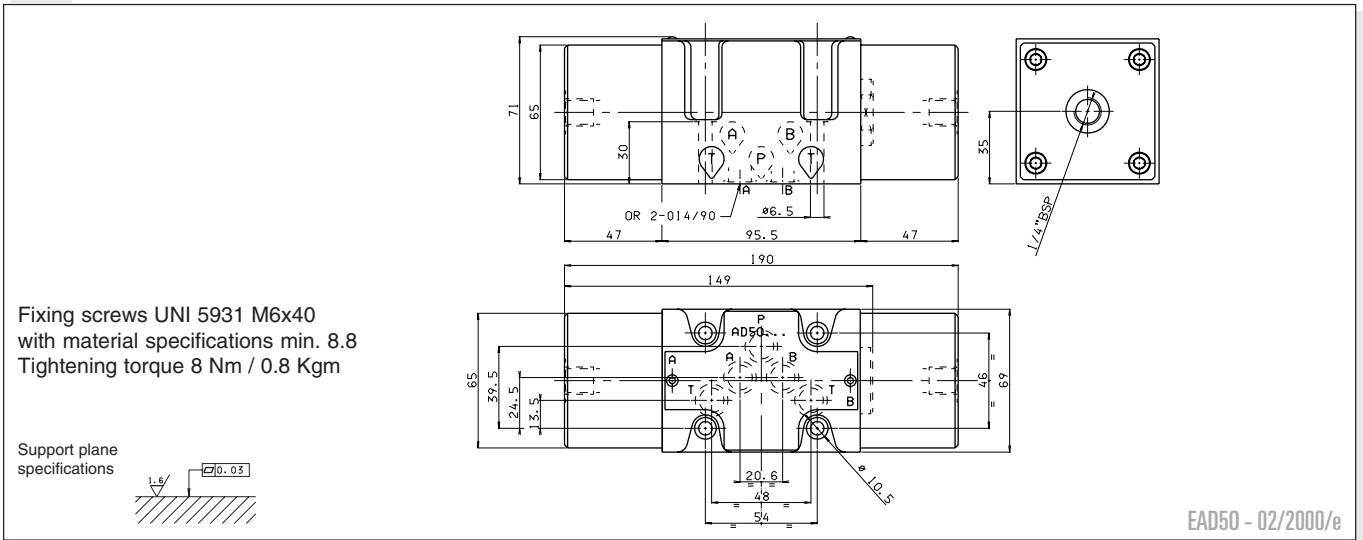


Max. pressure ports P/A/B	320 bar
Max. pressure port T	160 bar
Max. flow	100 l/min
Min. operating pressure	4 + [0.027 x (pt*)] bar - see note
Max. operating pressure	200 bar
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max. contamination level	class 10 in according with NAS 1638 with filter β <sub>25</sub> ≥ 75
Weight (single pilot)	4,1 Kg
Weight (twin pilot)	5,4 Kg

- Possible mounting: C / D / E / F / G / H / I / L / M
- Ordering code see page I•29

(pt\*) = Pressure at port T

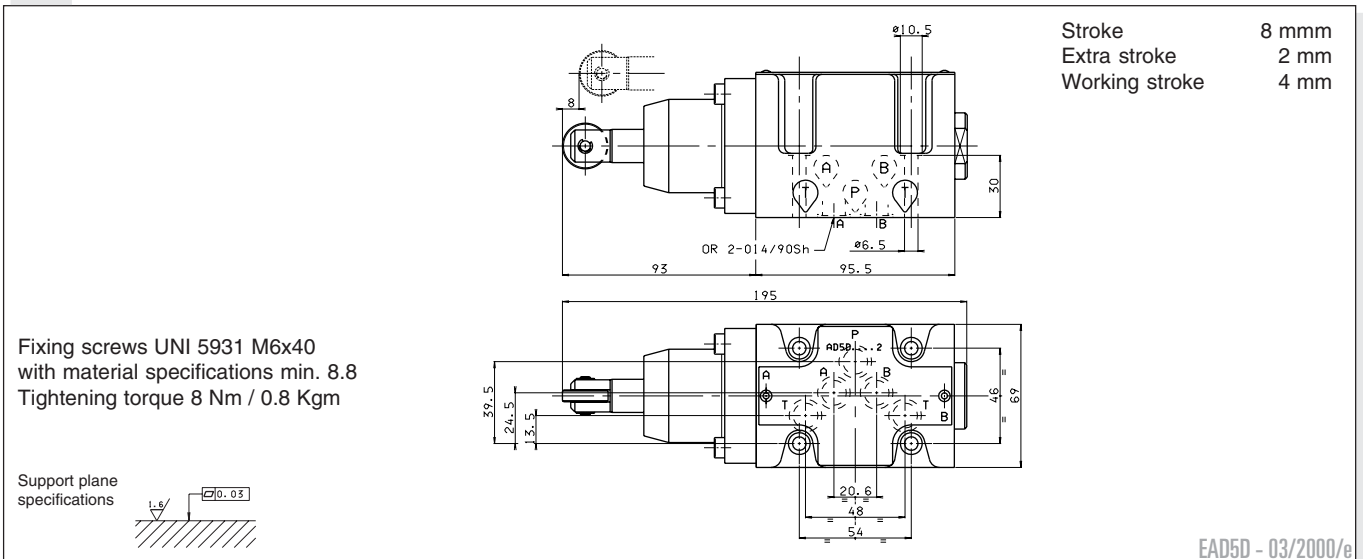
OVERALL DIMENSIONS



Max. pressure ports P/A/B	320 bar
Max. pressure port T	20 bar
Max. flow	100 l/min
Operating force - see note (*)	8 Kg - see note (**)
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter β <sub>25</sub> ≥ 75
Weight	3,8 Kg

- Possible mounting: E / F / G / H
- Ordering code see page I•29
- Notes: (\*) In the absence of counter-pressure at port T
- (\*\*) 10 Kg with a pressure of 20 bar at T

OVERALL DIMENSIONS





## AD.5.L... LEVER OPERATED TYPE VALVES CETOP 5/NG10



### AD.5.L...

ORDERING CODE CH. I PAGE 29

STANDARD SPOOLS CH. I PAGE 30

Max. pressure ports P/A/B	320 bar
Max. pressure port T	160 bar
Max. flow	100 l/min
Lever angle	2 x 15°
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter $\beta_{25} \geq 75$
Weight	4,7 Kg
Weight with M1 variant	5,35 Kg

• Possible mounting:  
**C / E / F**

• There is no **D** type mounting

• The variant **D1** specifies the detent (mechanical connection) for lever operation

• The springs for the version with detent (variant **D1**) are different from those for standard versions.

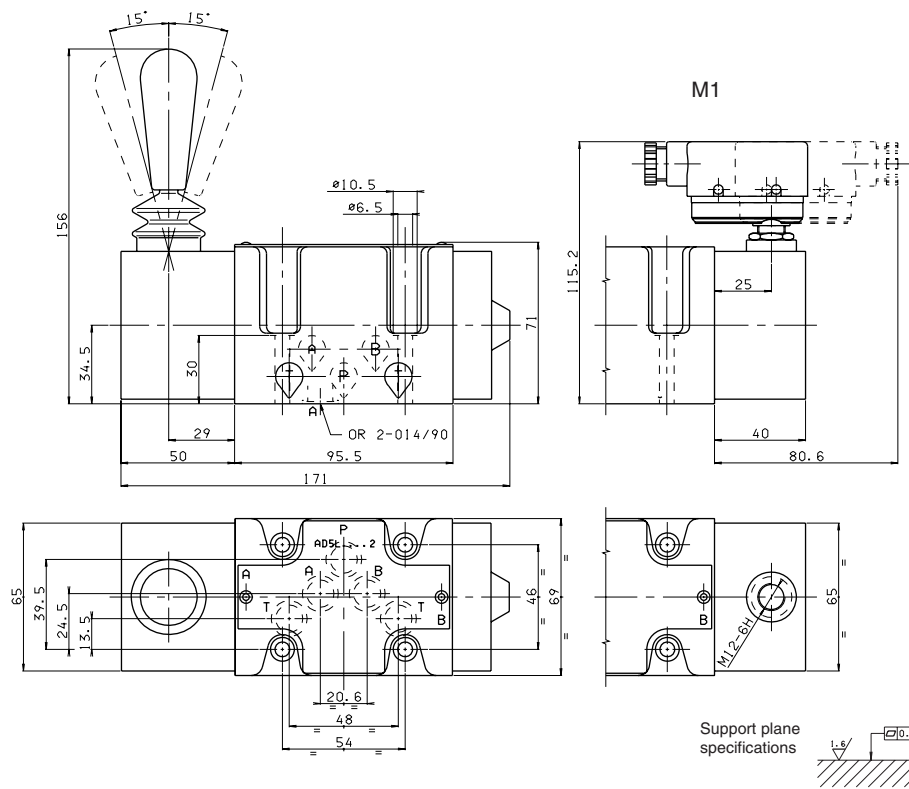
• Completely different spools are used for these (lever operated) valves than for all other types of operation (e.g. electrical, mechanical, pneumatic operation, .....)

• Available spools: 01 / 02 / 03 / 04 / 05 / 06 / 66 / 07 / 22 / 13 / 15 / 16 / 17 (for hydraulic symbols see page 1•30)

• Available on request NATIONAL AM1107 type microswitch

### OVERALL DIMENSIONS

M1 = Microswitch



Fixing screws UNI 5931 M6x40  
with material specifications min. 8.8  
Tightening torque 8 Nm / 0.8 Kgm

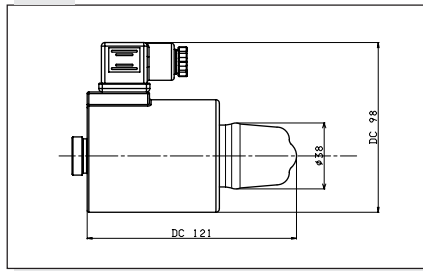


## "A16" DC COILS FOR CETOP 5

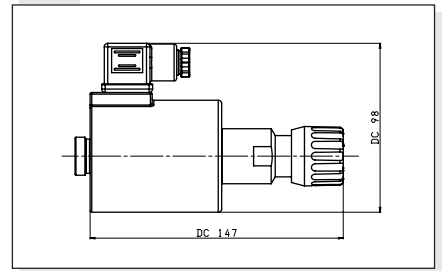


1

VARIANT WITH MAN. EMERGENCY E1



VARIANT WITH ROT. EMERGENCY P1



Type of protection (in relation to the connector used)	IP 65
Number of cycles	18.000/h
Supply tolerance	±10%
Ambient temperature	-30°C ÷ 60°C
Duty cycle	100% ED
Insulation class	H
Weight	0,9 Kg

VOLTAGE (V)	MAX. WINDING TEMPERATURE (AMBIENT TEMPERATURE 25°C)	RATED POWER (W)	RESISTANCE AT 20°C (OHM) ±7%
12V	106°C	45	3.2
24V	113°C	45	12,4
48V*	-	45	-
102V*	-	45	-
110V*	118°C	45	268
205V*	-	45	-

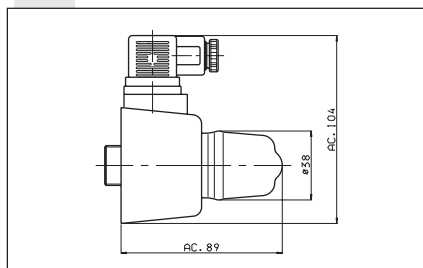
(\*) Special voltage ETA16 - 03/2002/e



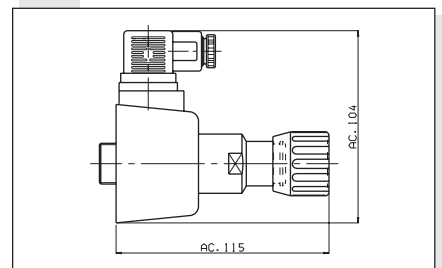
## "K16" AC SOLENOIDS FOR CETOP 5



E1 VARIANT WITH MAN. EMERGENCY



P1 VARIANT WITH ROT. EMERGENCY



Type of protection (in relation to the connector used)	IP 66
Number of cycles	18.000/h
Supply tolerance	+10% / -10%
Ambient temperature	-54°C ÷ 60°C
Duty cycle	100% ED
Max. pressure static	210 bar
Insulation class	H
Weight	0,8 Kg

VOLTAGE (V)	MAX. WINDING TEMPERATURE (AMBIENT TEMPERATURE 25°C)	RATED POWER (VA)	IN RUSH CURRENT (VA)	RESISTANCE AT 20°C (OHM) ±10%
24V/50Hz	134°C	124	454	0.56
24V/60Hz*	115°C	103.5	440	0.55
48V/50Hz*	134°C	113	453	2.10
115V/50Hz-120V/60Hz	121°C - 138°C	-	-	10.8
230V/50Hz-240V/60Hz	121°C - 138°C	-	-	43.0
240V/50Hz*	134°C	120	456	47.39

\* Special voltage ETK16 - 01/2000/e



# ADP. 5.E... DIRECTIONAL CONTROL CETOP 5/NG10

## HIGH PERFORMANCES SOLENOID OPERATED VALVES

**ADP.5.E...**  
 "D19" DC SOLENOIDS CH. I PAGE 38  
 STANDARD CONNECTORS CH. I PAGE 19

The ARON NG10 directional control valves are designed for subplate mounting with an interface in accordance with UNI ISO 4401 - 05 - 04 - 0 - 94 standard (ex CETOP R 35 H 4.2-4-05). The use of solenoids with wet armatures allows an extremely safe construction completely dispensing with the need for dynamic seal. The solenoid tube is screwed directly onto the valve casing whilst the coil is kept in position by a ring nut. Great care has been taken over the design and production of the ducts and the improvement of the spools allows relatively high flow rates to be accommodated for its size with minimal pressure drops ( $\Delta p$ ). The operation of the directional valve is electrical. The centring is achieved by means of calibrated length springs which, once the impulse is over, immediately reposition the spool in the neutral position. The solenoids, constructed with a protection class of IP66 in accordance with BS 5490 standards, are available in direct current form and different voltage. The electrical controls are equipped with an emergency manual control inserted in the tube.

The ADP.5.E.. valve has certain design features which allow it to "manage" a hydraulic power equal to  $Q = 120\text{l/min}$  with a  $P = 320\text{ bar}$ , maintaining a considerable safety margin. These features can be summarized as follows:

- Solenoid D19 with an optimum ratio between the power absorbed (42W) and the magnetic force
- Diameter of the spool 18 mm, with carefully designed geometry improved to compensate for the flow forces
- Compact graphite cast iron valve casing with high mechanical resistance
- Different springs, improved according to the features of the spool

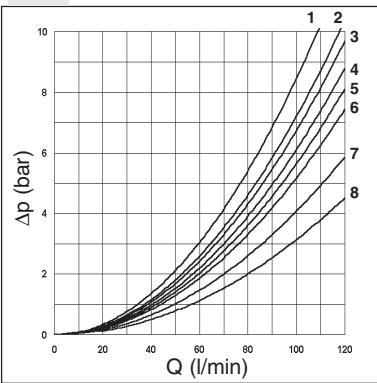
The electrical supply connectors meet DIN 43650 ISO 4400 standards; connectors are also available with built in rectifiers or pilot lights.

The recommended fluids are hydraulic mineral based oils in accordance with DIN 51524 and it is recommended that filters should be fitted to ensure a maximum contamination level of class 10 in accordance with NAS 1638,  $\beta_{25} \geq 75$ .

For other fluids please contact our Technical DPT.

• **The solenoids are in DC voltage only**

### PRESSURE DROPS



The diagram at the side shows the pressure drop curves for spools during normal usage. The fluid used is a mineral oil with a viscosity of  $46\text{ mm}^2/\text{s}$  at  $40^\circ\text{C}$ ; the tests have been carried out at a fluid temperature of  $40^\circ\text{C}$ . For higher flow rates than those in the diagram, the losses will be those expressed by the following formula:

$$\Delta p_1 = \Delta p \times (Q_1/Q)^2$$

where  $\Delta p$  will be the value for the losses for a specific flow rate  $Q$  which can be obtained from the diagram,  $\Delta p_1$  will be the value of the losses for the flow rate  $Q_1$  that is used.

Spool type	Connections				
	P → A	P → B	A → T	B → T	P → T
01	4	4	7	7	
02	6	6	8	8	7
03	3	3	8	8	
04	4	4	2	2	3
05	6	6	6	6	
66	4	4	8	7	
06	4	4	7	8	
14	6	4	8	6	2
15-19	2	2	5	5	
16-20	1	1	2	2	
28	4	6	6	8	2

Curve No.

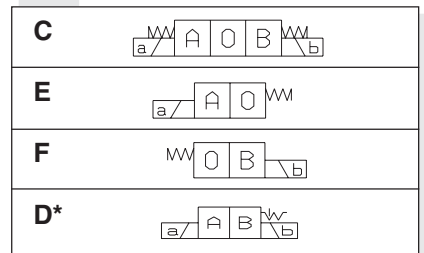
### ORDERING CODE

- ADP** High performances directional control valve
- 5** CETOP 5/NG10
- E** Electrical operator
- \*\*** Spools (Table next page)
- \*** Mounting (table 1)
- \*** Voltage (table 2)
- \*\*** Variants (table 3)
- 1** Serial No.

### TAB.3 - VARIANTS

VARIANTS	CODE
No variant	00
Viton	V1
Pilot light	X1
Rectifier	R1
Rotary emergency button	P1
Solenoid valve without connectors	S1
Cable gland "PG 11"	C1
Viton + Pilot light	VX
Viton + Rectifier	VR
Pilot light + Rectifier	XR
Adjustable spool movement speed control	Q4
With solenoid chamber external drainage (Y)	Q5

### TAB.1 - MOUNTING



(\*) Valve with detent

### TAB.2 - SOLENOID D19 (42 W)

DC VOLTAGE	
<b>L</b>	12V
<b>M</b>	24V
<b>N</b>	48V*
<b>P</b>	110V*
<b>Z</b>	102V*
<b>X</b>	205V*
<b>W</b>	Without DC coils

115Vac/50Hz  
120Vac/60Hz  
with rectifier

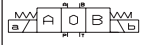






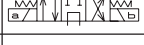
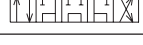

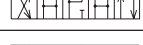
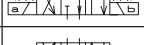
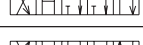
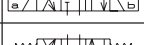
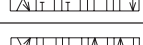
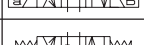
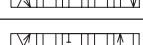
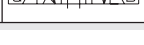
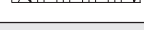
230Vac/50Hz  
240Vac/60Hz  
with rectifier






Voltage codes are not stamped on the plate, they are readable on the coils.

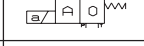




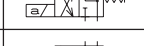
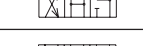
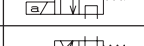
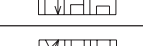
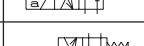
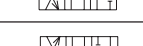

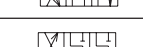
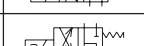

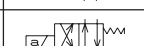







\* Special voltage

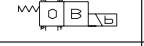
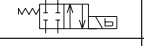
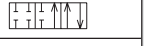


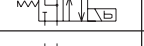
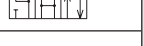
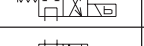
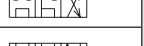
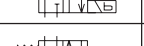
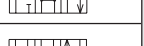
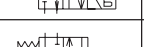

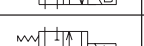



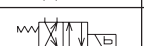





STANDARD SPOOLS

\* SPOOLS WITH PRICE INCREASING

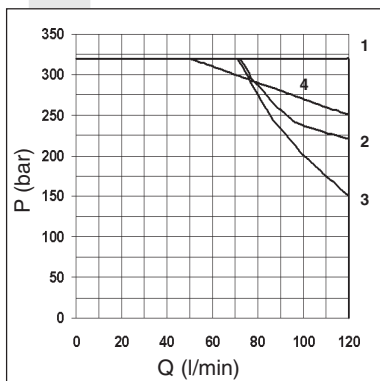
TWO SOLENOIDS, SPRING CENTRED "C MOUNTING"			
Spool type		Covering	Transient position
01		+	
02		-	
03		-	
04*		-	
05		-	
66		-	
06		-	
14*		-	
28*		-	

TWO SOLENOIDS "D MOUNTING"			
Spool type		Covering	Transient position
19*		-	
20*		+	

ONE SOLENOID, SIDE A "E MOUNTING"			
Spool type		Covering	Transient position
01		+	
02		-	
03		-	
04*		-	
05		-	
66		-	
06		-	
14*		-	
15		-	
16		+	
28*		-	

ONE SOLENOID, SIDE B "F MOUNTING"			
Spool type		Covering	Transient position
01		+	
02		-	
03		-	
04*		-	
05		-	
66		-	
06		-	
14*		-	
15		-	
16		+	
28*		-	

LIMITS OF USE



Spool type	n° curves
01	1
02	1
03	2
04	1
05	1
66	1
06	1
14	3
15	1
16	1
28	3
19	4
20	4

The tests have been carried out with solenoids at operating temperature and a voltage 10% less than rated voltage with a fluid temperature of 50°C.

The fluid used was a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40°C.

The values in the diagram refer to tests carried out with the oil flow in two directions simultaneously (e.g. from P to A and at the same time B to T).

**In the cases where valves 4/2 and 4/3 were used with the flow in one direction only, the limits of use could have variations which may even be negative.**

The tests were carried out with a counter-pressure of 2 bar at T.

1

**ADP.5.E... Q4 variant** - These ON-OFF type valves are used when a lower spool movement speed is required than it is generally available with a conventional solenoid valve in order to avoid those shocks which might otherwise compromise proper system operation. This is obtained by forcing the fluid to pass through the gap which exists between the screw thread and the M8x1 tapped thread, restricting in this way the transfer cross section between the 2 solenoid chambers. Using this variant may entail a reduction in the operational limits according to the spool used, up to the complete blocking of the change over itself. The valve operation depends on the presence of a minimum back pressure on the T line (min. 1 bar). The change over time referred to the spool stroke depends on 4 main variables:

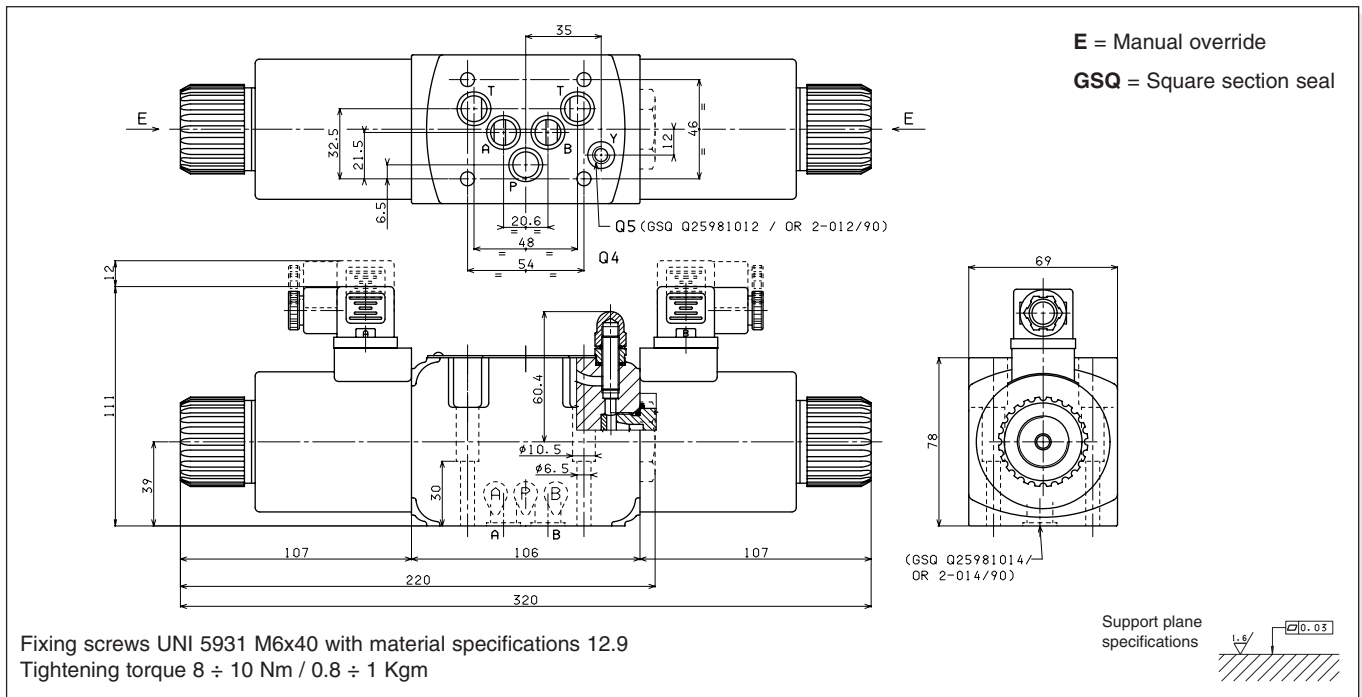
- Applicable hydraulic power, related to the flow rate and pressure drop across the valve;
- Spool type (system configuration);
- Oil viscosity and temperature;
- Back pressure on T.

Max. operating pressure: ports P/A/B	350 bar
Max. operating pressure: port T (*)	250 bar
Max. flow	120 l/min
Max. excitation frequency	3 Hz
Duty cycle	100% ED
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter $\beta_{25} \geq 75$
Weight with one DC solenoid	5 Kg
Weight with two DC solenoids	6,5 Kg

(\*) Pressure dynamic allowed for 2 millions of cycles

Pressure on port T valid in case Y is blocked (no external drainage). Normally the external drained is blocked with a plug S.T.E.I M6x6 UNI 5923

**ADP.5.E... Q5 variant** - These are valves with solenoid chambers drainage separated from the T line, obtained on CETOP RO5 interface and characterized by the letter Y. This solution allows operation with up to 320 bar max. back pressure on the T line while using only 12.9 material fixing screws to ensure maximum solenoid valve mounting safety and supplementary drainage.

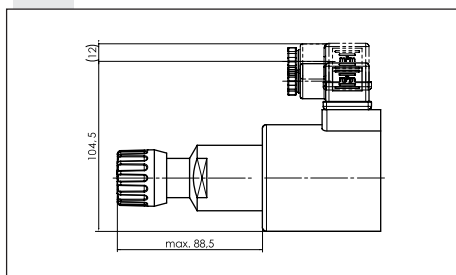


## "D19" DC SOLENOIDS



Type of protection (in relation to the connector used)	IP 66
Number of cycle	18.000/h
Supply tolerance	±10%
Ambient temperature	-54°C ÷ 60°C
Duty cycle	100% ED
Max static pressure	210 bar
Insulation class	H
Weight	1,63 Kg

### P1 ROTARY EMERGENCY



VOLTAGE (V)	MAX WINDING TEMPERATURE (AMBIENT TEMPERATURE 25°C)	RATED POWER (W)	RESISTANCE AT 20°C (OHM) ±10%
12V	105°C	42	3.43
24V	105°C	42	13.71
48V*	105°C	42	55
102V*	105°C	42	248
110V*	105°C	42	288
205V*	105°C	42	1000

\* Special voltage

ETD19 - 03/2000/e

# ADP.5.V... WITH PROXIMITY SENSOR L.V.D.T. CETOP 5/NG10



1



ADP.5.V...	
"D19" DC SOLENOIDS	CH. I PAGE 39
STANDARD CONNECTORS	CH. I PAGE 19
L.V.D.T.	CH. I PAGE 21

The ARON NG10 directional control valves are designed for subplate mounting with an interface in accordance with UNI ISO 4401 - 05 - 04 - 0 - 94 standard (ex CETOP R 35 H 4.2-4-05).

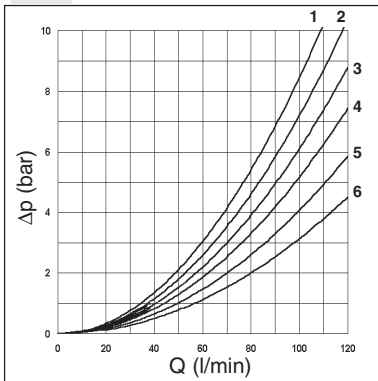
The single solenoid directional valves type ADP5V are used in applications where the monitoring of the position of the spool inside the valve is requested to manage the machine safety cycles in according with the accident prevention legislation. These directional valves are equipped with an horizontal positioned inductive sensor on the opposite side of the solenoid, which is capable of providing the first movement of the valve when the passage of a minimum flow is allowed. Integrated in safety systems, these valves intercept actuator movements that could be dangerous for the operators and for the machine.

Max. operating pressure: ports P/A/B	350 bar
Max. operating pressure: port T (*)	250 bar
Max. flow	120 l/min
Max. excitation frequency	3 Hz
Duty cycle	100% ED
Fluid viscosity	10 ÷ 500 mm <sup>2</sup> /s
Fluid temperature	-25°C ÷ 75°C
Ambient temperature	-25°C ÷ 60°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter β <sub>25</sub> ≥ 75
Type of protection (in relation to connector used)	IP 66
Weight	6,2 Kg

(\*) Pressure dynamic allowed for 2 millions of cycles

- Possible mountings: E / F
- The solenoid is in DC voltage only

### PRESSURE DROPS



The diagram at the side shows the pressure drop curves for spools during normal usage. The fluid used is a mineral oil with a viscosity of 46 mm<sup>2</sup>/s at 40°C; the tests have been carried out at a fluid temperature of 40°C. For higher flow rates than those in the diagram, the losses will be those expressed by the following formula:

$$\Delta p_1 = \Delta p \times (Q_1/Q)^2$$

where Δp will be the value for the losses for a specific flow rate Q which can be obtained from the diagram, Δp1 will be the value of the losses for the flow rate Q1 that is used.

Spool type	Connections				
	P → A	P → B	A → T	B → T	P → T
01	3	3	5	5	5
02	4	4	6	6	
66	3	3	6	5	6
06	3	3	5	6	
16	1	1	2	2	2

Curve No.

### ORDERING CODE

<b>ADP</b>	High performances directional control valve
<b>5</b>	CETOP 5/NG10
<b>V</b>	Directional valve with single solenoid and L.V.D.T. proximity sensor
<b>***</b>	Spool and mounting (table 1)
<b>*</b>	Voltage (table 2)
<b>**</b>	Variants (table 3)
<b>1</b>	Serial No.

### TAB.2 - DC VOLTAGE

DC VOLTAGE	
<b>L</b> 12V	115Vac/50Hz 120Vac/60Hz with rectifier
<b>M</b> 24V	
<b>N</b> 48V*	230Vac/50Hz 240Vac/60Hz with rectifier
<b>P</b> 110V*	
<b>Z</b> 102V*	Without DC coils and connectors
<b>X</b> 205V*	
<b>W</b>	

Voltage codes are not stamped on the plate, their are readable on the coils.

\* Special voltage

### TAB1 - STANDARD SPOOL

ONE SOLENOID			
Spool type	Covering	Transient position	
01E	+		
01F	+		
02E	-		
02F	-		
66E	-		
06F	-		
16E	+		
16F	+		
32E	+		

### TAB.3 - VARIANTS

VARIANTS	CODE
No variant (connectors as in the drawing)	00
Pilot light	X1
Rectifier	R1
Rotary emergency button	P1
Solenoid valve without connectors (coils)	S1
Without proximity connector LVDT	S3
Without coils and proximity connector	S4
Cable gland "PG 11"	C1
With solenoid chamber external drainage (Y)	Q5

**CE** registered mark for industrial environment with reference to the electromagnetic compatibility.

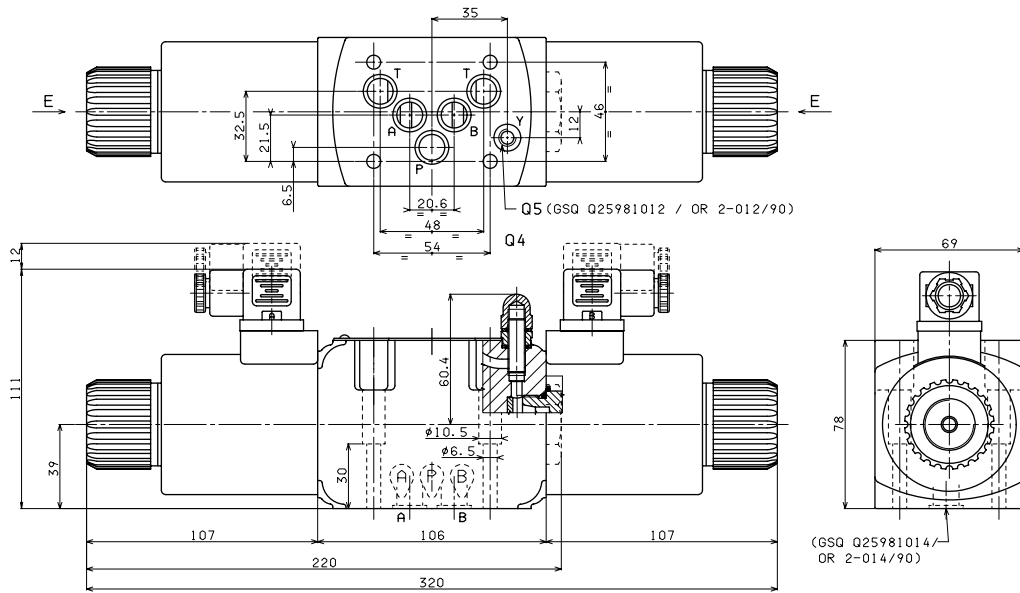
European norms:  
- EN50082-2 general safety norm - industrial environment  
- EN 50081-1 emission general norm - residential environment



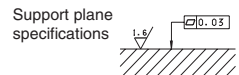
OVERALL DIMENSIONS

1

E = Manual override  
 GSQ = Square section seal



Fixing screws UNI 5931 M6x40  
 with material specifications 12.9  
 Tightening torque  
 8 ÷ 10 Nm / 0.8 ÷ 1 Kg

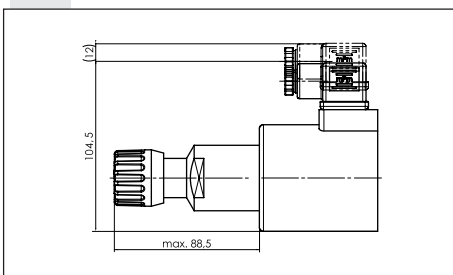


"D19" DC SOLENOIDS



Type of protection (in relation to the connector used)	IP 66
Number of cycle	18.000/h
Supply tolerance	±10%
Ambient temperature	-54°C ÷ 60°C
Duty cycle	100% ED
Max static pressure	210 bar
Insulation class	H
Weight	1,63 Kg

P1 ROTARY EMERGENCY



VOLTAGE (V)	MAX WINDING TEMPERATURE (AMBIENT TEMPERATURE 25°C)	RATED POWER (W)	RESISTANCE AT 20°C (OHM) ±10%
12V	105°C	42	3.43
24V	105°C	42	13.71
48V*	105°C	42	55
102V*	105°C	42	248
110V*	105°C	42	288
205V*	105°C	42	1000

\* Special voltage

ETD19 - 03/2000/e

# AD.3.I... AUTOMATIC RECIPROCATING VALVES CETOP 3



1



AD.3.I...

These automatic reciprocating valves, with interface UNI ISO 4401 - 03 - 02 - 0 - 94 standard (ex CETOP R 35 H 4.2-4-03), reverse the movement of an actuator every time the flow through the valve stops. With no max. pressure valves inside the body, the spool is moved by two springs and locked by unbalanced pressure inside valve; when no more flow is crossing the valve, the spool changes the position inverting the direction of the actuator.

With a preferential starting P → B and A → T position, these valves are mainly used to control the movement compactors or system where is not possible to use electrical device.

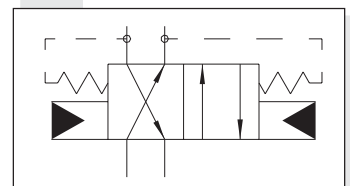
Max. operating pressure port P	320 bar
Max. flow	30 l/min
Minimum permitted flow	3 l/min
Fluid viscosity	20 ÷ 200 mm <sup>2</sup> /s
Fluid temperature	-20°C ÷ 60°C
Max. contamination level(*) class 10 in accordance with NAS 1638 with filter β <sub>25</sub> ≥ 75	
Positioner activating force (measured with 1 bar on the T line)	130 N
Weight of version without positioner	0,95 Kg
Weight of version with positioner	1 Kg

(\*) Max contamination level must be respect to obtain the right function of the valve

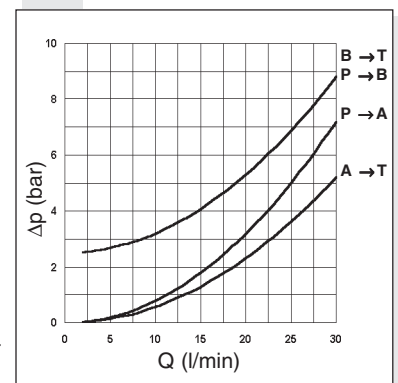
### ORDERING CODE

<b>AD</b>	Directional valve
<b>3</b>	CETOP 3/NG6
<b>I</b>	Automatic reciprocating valve at null flow
<b>P</b>	Version with positioner to adjust the pressure relief valve of the system
<b>**</b>	<b>00</b> = No variant <b>V1</b> = Viton
<b>1</b>	Serial No.

### HYDRAULIC SYMBOL

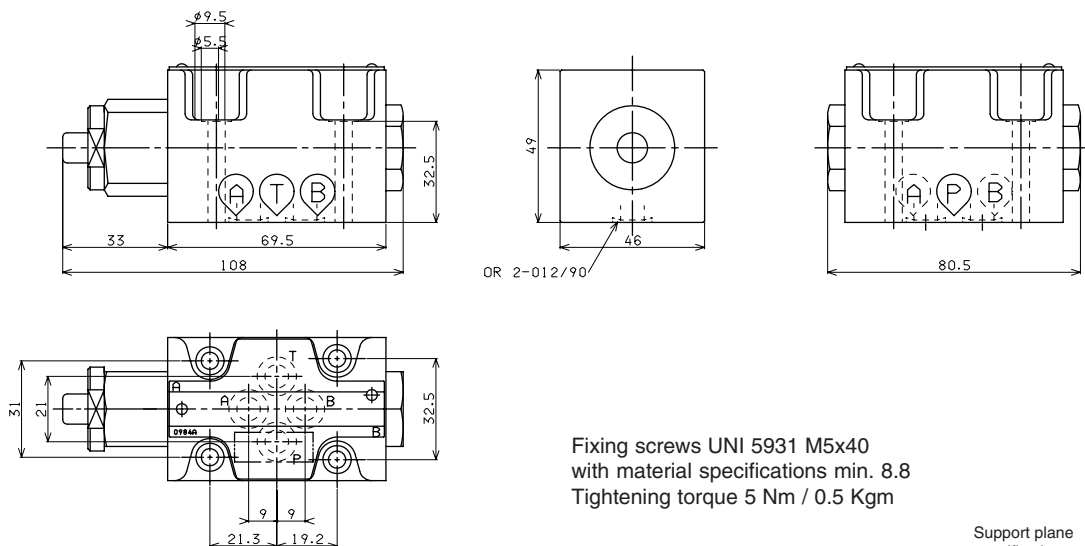


### PRESSURE DROPS



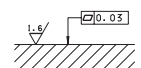
Tests carried out with mineral oil at a temperature of 40°C with viscosity of 46 mm<sup>2</sup>/s.

### OVERALL DIMENSIONS



Fixing screws UNI 5931 M5x40 with material specifications min. 8.8  
Tightening torque 5 Nm / 0.5 Kgm

Support plane specifications



# AD.5.I... AUTOMATIC RECIPROCATING VALVES CETOP 5



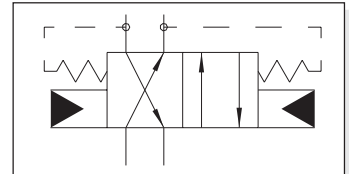
AD.5.I...

The operating principle of this type of inverter valve, with interface UNI ISO 4401 - 05 - 04 - 0 - 94 standard (ex CETOP R 35 H 4.2-4-05), is based on the pressure unbalanced created in its interior as a consequence of the fluid flow rate. On starting the system this valve assumes always a preferential position P → B e A → T.

When a pressure is applied to the cylinder which exceeds the system maximum flow rate valve calibration value (e.g. end stroke actuator), a hydraulic unbalanced is generated capable of changing over the valve and inverting the cylinder direction of the movement.

Max. operating pressure port P	320 bar
Max. flow	100 l/min
Minimum permitted flow	10 l/min
Fluid viscosity	32 ÷ 60 mm <sup>2</sup> /s
Fluid temperature	-20°C ÷ 60°C
Max. contamination level(*) class 10 in accordance with NAS 1638 with filter β <sub>25</sub> ≥ 75	
Positioner activating force (measured with 1 bar on the T line)	190 N
Weight of version without positioner	3,4 Kg
Weight of version with positioner	3,6 Kg

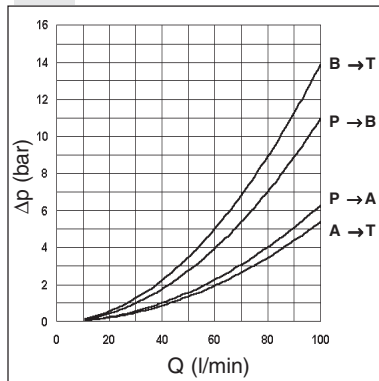
(\*) Max contamination level must be respect to obtain the right function of the valve



### ORDERING CODE

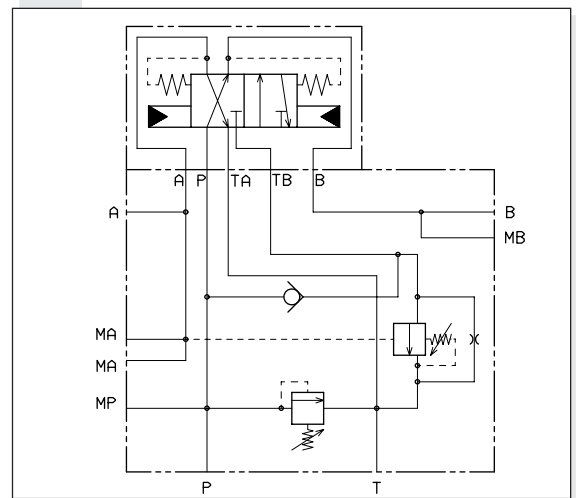
- AD** Directional control
- 5** CETOP 5/NG10
- I** Automatic reciprocating valve at null flow
- P** Version with positioner to adjust the pressure relief valve of the system
- \*\*** **00** = No variant  
**V1** = Viton  
**2T** = Variant for regenerative system
- 1** Serial No.

### PRESSURE DROPS

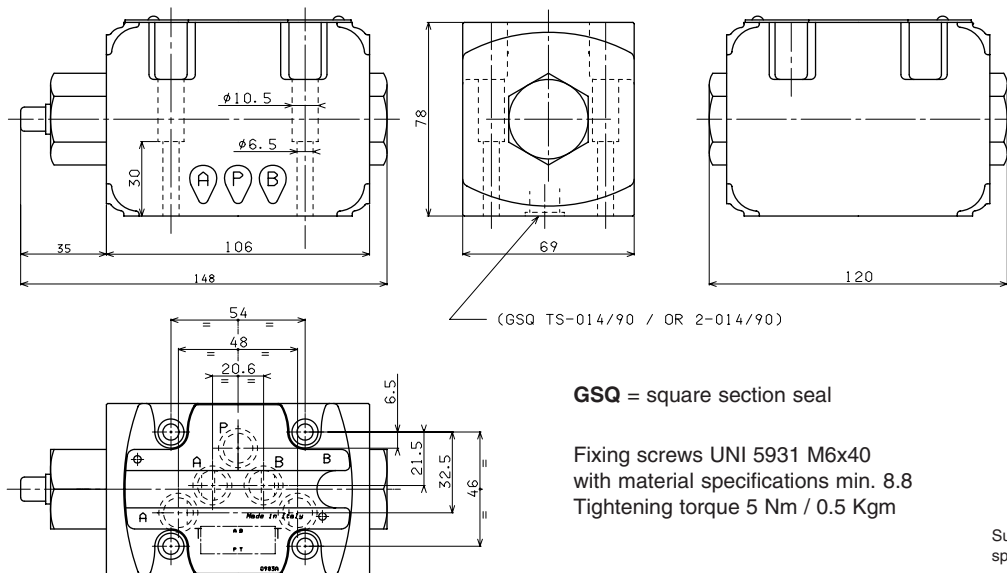


Tests carried out with mineral oil a temperature of 40°C with a viscosity of 46 mm<sup>2</sup>/s.

### AD.5.I.P.2T.1 FOR REGENERATIVE SYSTEM



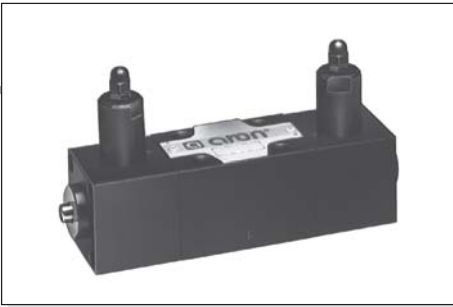
Version AD.5.I.P.2T.1 integrated in a regenerative circuit for compactors with roll on-off mobile system, solution useful for all applications where to connect microswitch of proximity is not possible. For any information about our regenerative manifold Aron please contact our technical department. For special subplate BS.5.RIA see Chapter X "Systems", next pages.



# AD.3.RI... AUTOMATIC RECIPROCATING VALVES CETOP 3



1



AD.3.RI...

This valve type is characterized by fully hydraulic operation, as it takes advantage of the system pressure rise to cause an automatic and continuous inversion of the utilization. The changeover takes place when the system pressure exceeds the inversion valves calibration pressure, and therefore also in not predetermined positions. At cylinder stroke end, the overall maximum pressure valve should be adjusted on a value 30% higher than the system operating pressure.

Max. operating pressure	320 bar
Max. pressure port T	160 bar
Min. recommended pressure	15 bar
Max. flow	25 l/min
Min. flow	2 l/min
Setting ranges:	Spring 1 15 ÷ 50 bar
	Spring 2 20 ÷ 140 bar
	Spring 3 50 ÷ 320 bar
Fluid viscosity	10 ÷ 60 mm <sup>2</sup> /s
Fluid temperature	-20°C ÷ 75°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter $\beta_{25} \geq 75$
Weight	2,3 Kg

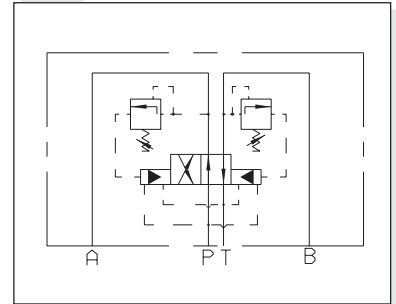
### ORDERING CODE

- AD** Directional valve
- 3** CETOP 3/NG6
- RI** Automatic reciprocating valve hydraulically operated automatic reciprocation
- 211** Scheme
- Z** No voltage
- \*** Setting ranges:  
**1** = 15 ÷ 50 bar  
**2** = 20 ÷ 140 bar  
**3** = 50 ÷ 320 bar
- \*\*** **00** = No variant  
**V1** = Viton
- 3** Serial No.

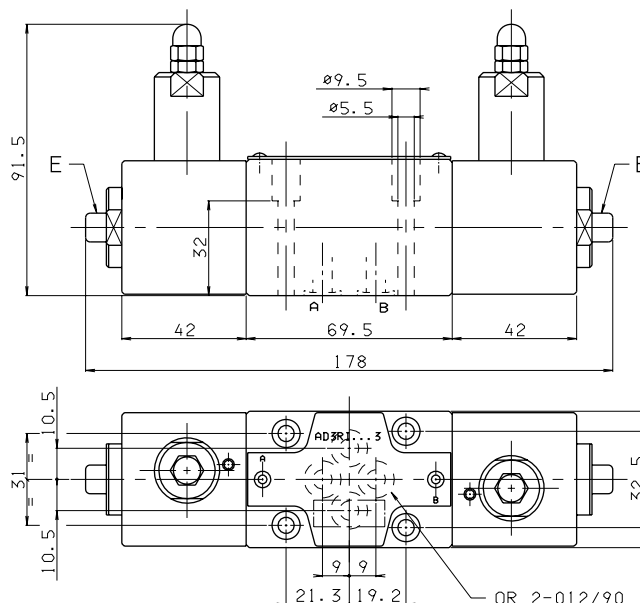
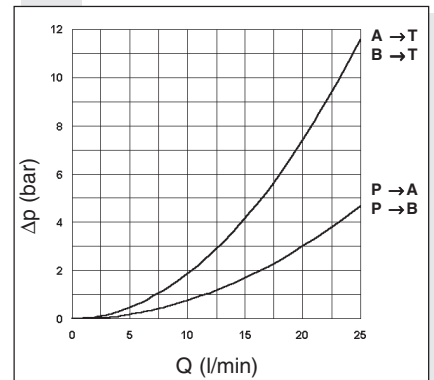
The inverter valves pressure calibration values should be 15% lower than that of the overall maximum pressure valve, and 15% higher than the maximum operating pressure.

Note: to operate the push button emergency, a minimum pressure of 3 bar on the actuator is needed.

### HYDRAULIC SYMBOL



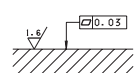
### PRESSURE DROPS



E = Manual override

Fixing screws UNI 5931 M5x40 with material specifications min. 8.8  
 Tightening torque 5 Nm / 0.5 Kgm

Support plane specifications



# AD.5.RI... AUTOMATIC RECIPROCATING VALVES CETOP 5



AD.5.RI...

This valve type is characterized by a fully hydraulic operation, as it takes advantage of the system pressure rise to cause an automatic and continuous inversion of the utilization. The changeover takes place when the system pressure exceeds the inversion valves calibration pressure, and therefore also in not predetermined position. At the cylinder stroke end, the overall maximum pressure valve should be adjusted on a value 30% higher than the system operating pressure.

Max. operating pressure	320 bar
Max. pressure port T	160 bar
Min. recommended pressure	15 bar
Max. flow	70 l/min
Min. flow	6 l/min
Setting ranges:	Spring 1 15 ÷ 50 bar
	Spring 2 20 ÷ 140 bar
	Spring 3 50 ÷ 320 bar
Fluid viscosity	10 ÷ 60 mm <sup>2</sup> /s
Fluid temperature	-20°C ÷ 75°C
Max. contamination level	class 10 in accordance with NAS 1638 with filter $\beta_{25} \geq 75$
Weight	5,4 Kg

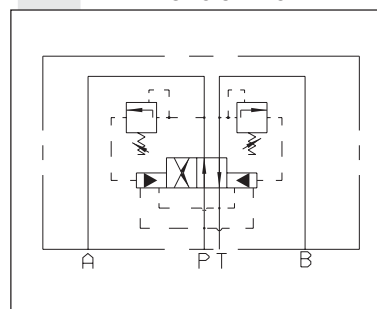
The inverter valves pressure calibration values should be 15% lower than that of the overall maximum pressure valve, and 15% higher than the maximum operating pressure.

Note: to operate the push button emergency, a minimum pressure of 3 bar on the actuator is needed.

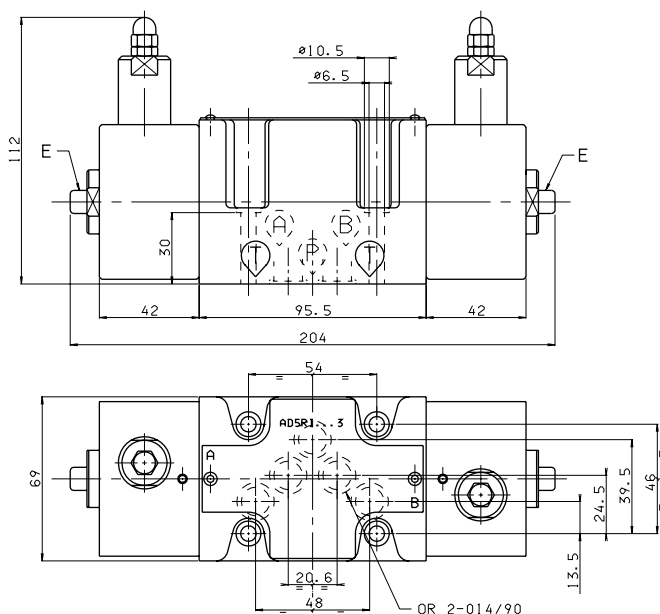
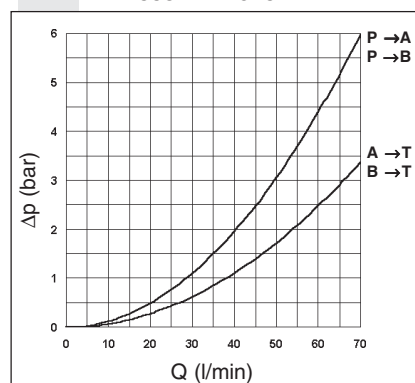
### ORDERING CODE

- AD** Directional valve
- 5** CETOP 5/NG10
- RI** Automatic reciprocating valve hydraulically operated automatic reciprocation
- 211** Scheme
- Z** No voltage
- \*** Setting ranges:  
**1** = 15 ÷ 50 bar  
**2** = 20 ÷ 140 bar  
**3** = 50 ÷ 320 bar
- \*\*** **00** = No variant  
**V1** = Viton
- 3** Serial No.

### HYDRAULIC SYMBOL



### PRESSURE DROPS



E = Manual override

Fixing screws UNI 5931 M6x40 with material specifications min. 8.8  
 Tightening torque 8 Nm / 0.8 Kgm

Support plane specifications

