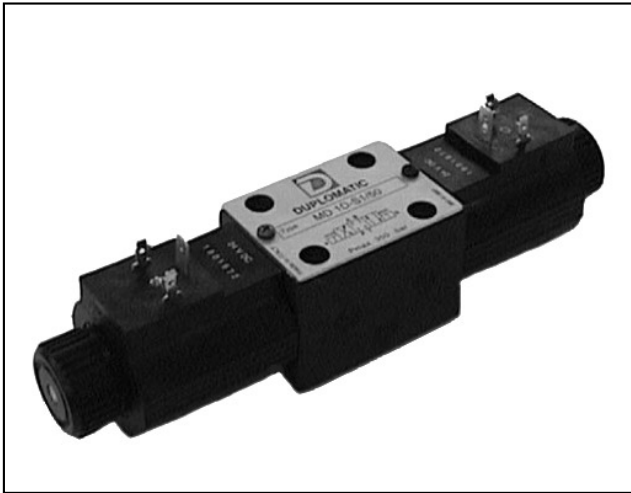




**DIPLOMATIC  
HYDRAULICS**

41 200/103 ED



# MD1D

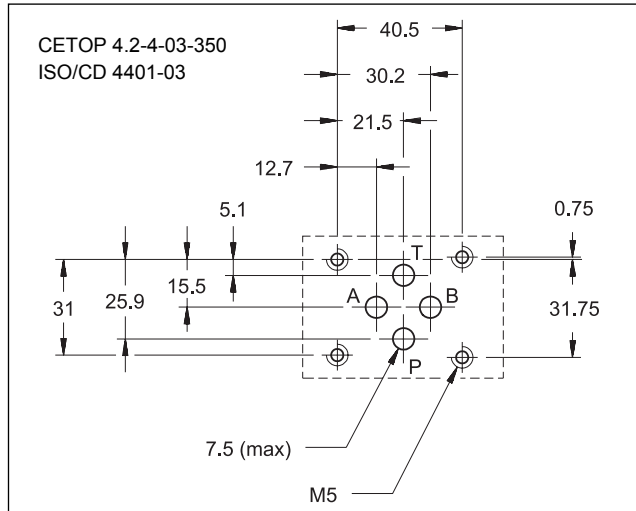
**SOLENOID OPERATED  
DIRECTIONAL CONTROL VALVES**  
DIRECT CURRENT - SERIES 50  
ALTERNATING CURRENT - SERIES 55

**CETOP 03**

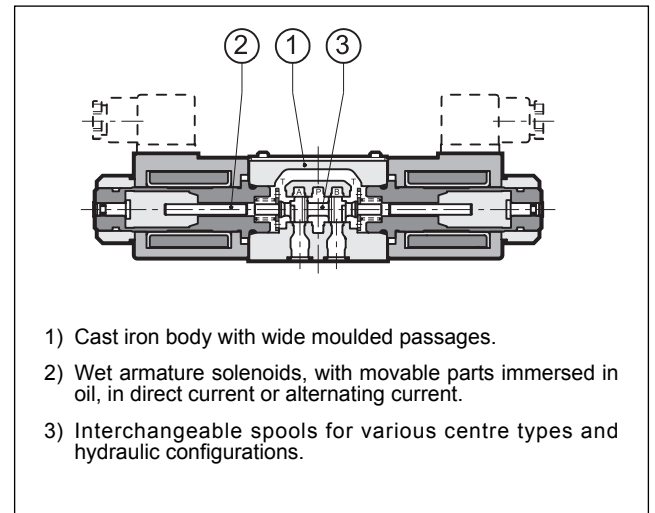
**p max 350 bar**

**Q max 75 l/min**

### MOUNTING INTERFACE



### OPERATING PRINCIPLE



A wide range of versions, with different spool positions at rest, are available:

– Type S: 4-way, 3-position directional valve, with two solenoids; positioning of spool at rest is obtained with centering springs.

– Type TA/TC: 4-way, 2-position directional valve, with one solenoid; spool position at rest is obtained with a return spring.

– Type RK: 4-way, 2-position directional valve, with two solenoids; with mechanical detent of the extreme spool positions when solenoids are de-energized.

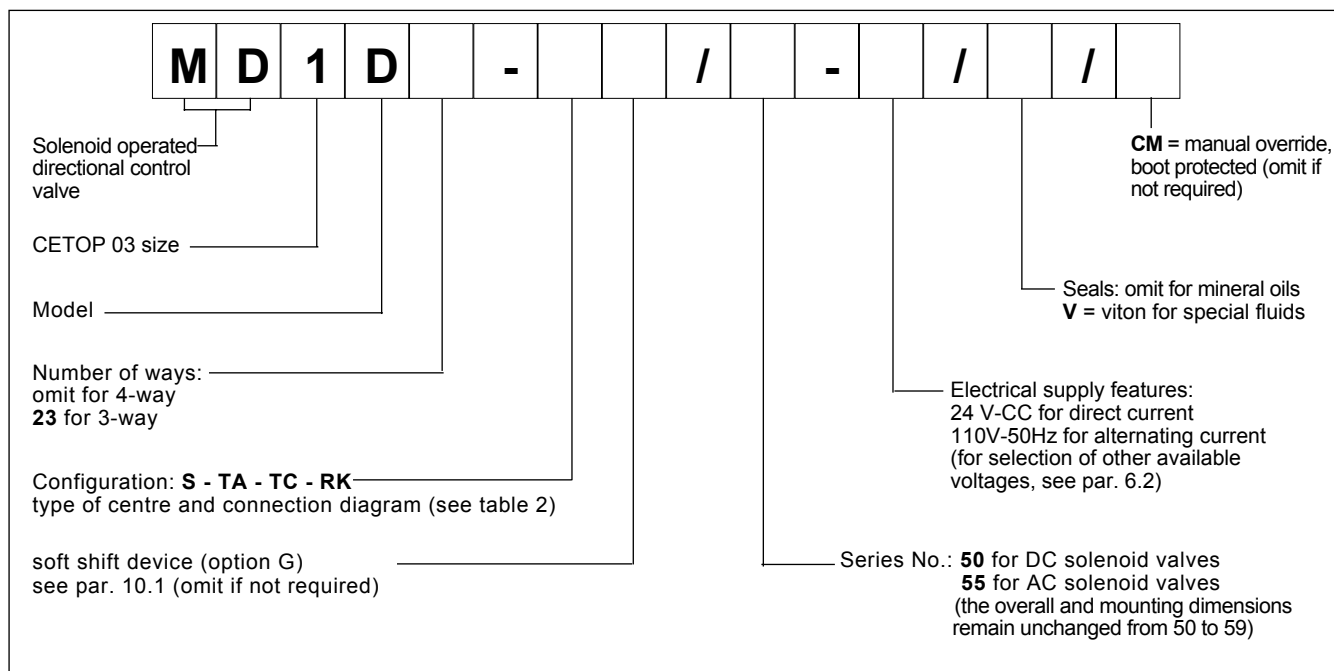
– Version 23: 3-way, 2-position directional valve, with one solenoid; positioning of spool at rest is obtained with a return spring.

### PERFORMANCE RATINGS (working with mineral oil of viscosity of 36 cSt at 50°C)

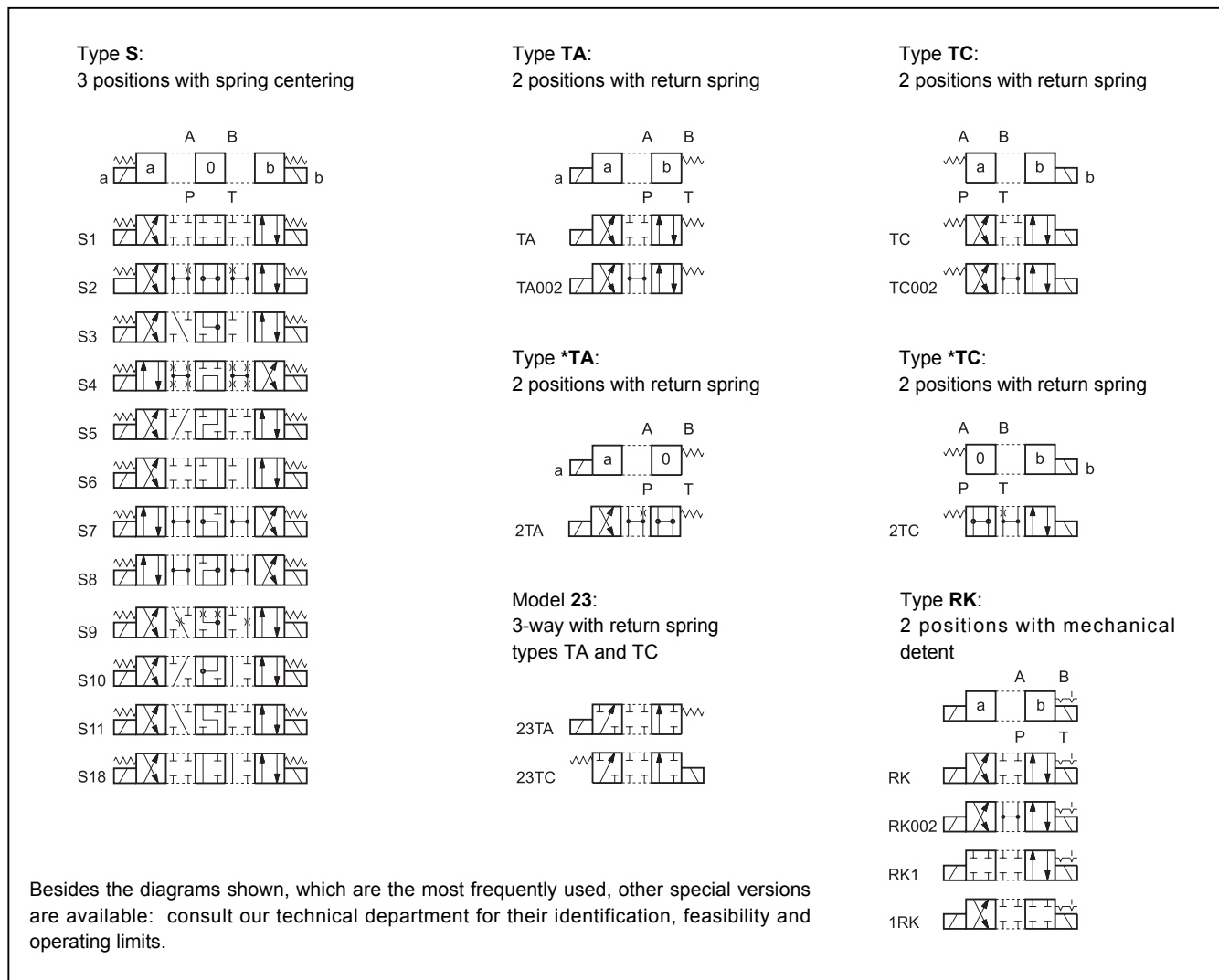
Max. working pressure:	– ports P A B	bar	350
	– port T	bar	140
Maximum flow rate:	– from port P to A or B	l/min	75
	– from port A or B to T	l/min	85
Ambient temperature range		°C	–20 ÷ +50
Fluid temperature range		°C	–20 ÷ +80
Fluid viscosity range		cSt	10 ÷ 400
Recommended viscosity		cSt	25
Degree of fluid contamination	According to NAS 1638 class 10		
Mass: MD1D-S, RK		kg	2
MD1D-TA/TC		kg	1,5



## 1 - IDENTIFICATION CODE



## 2 - CONFIGURATIONS





### 3 - HYDRAULIC FLUIDS

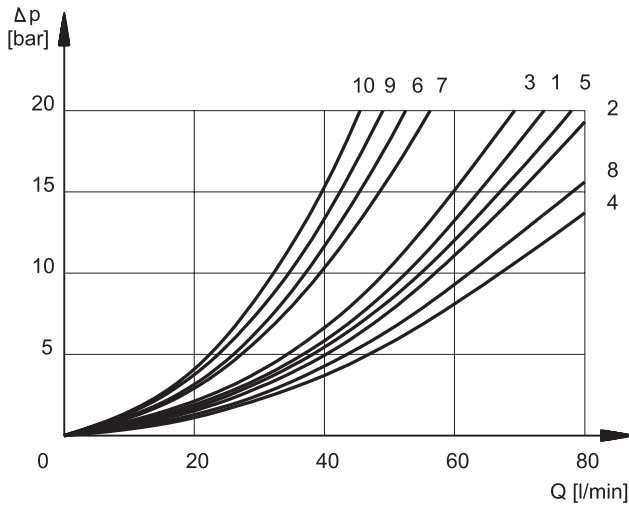
Use mineral oil-based hydraulic fluids, with the addition of suitable anti-frothing and anti-oxidising agents.

For the use of other fluid types (water glycol, phosphate esters and others), please consult our technical department.

Using fluids at temperatures higher than 70°C causes a faster degrading of the fluid's characteristics and of the seals.

The fluid must be preserved in its physical and chemical characteristics.

### 4 - PRESSURE DROPS $\Delta p$ -Q (obtained with viscosity of 36 cSt at 50 °C)



SPOOL TYPE	SPOOL POSITION	CONNECTIONS				
		P→A	P→B	A→T	B→T	P→T
CURVES ON GRAPH						
S1	Energized	2	1	1	2	
S2	De-energized Energized	8	8	4	4	3*
S3	De-energized Energized	1	1	7 <sup>■</sup> 4	7 <sup>○</sup> 4	
S4	De-energized Energized	6	6	7	7	7
S5	De-energized Energized	1	7 8	2	2	
S6	De-energized Energized	1	1	2	7 4	
S7	De-energized Energized	8	10	9	9	7 <sup>○</sup>
S8	De-energized Energized	10	8	9	9	7 <sup>■</sup>
S9	Energized	1	1	2	2	
S10	De-energized Energized	7 <sup>■</sup> 8	7 <sup>○</sup> 8	2	2	
S11	De-energized Energized	1	1	7 4	2	
S18	De-energized Energized	7 8	1	2	2	
TA	De-energized Energized	1	1	5	5	
23TA	De-energized Energized	5	5			
RK	Energized	1	1	5	5	

\* A-B blocked    ■ B blocked    ○ A blocked

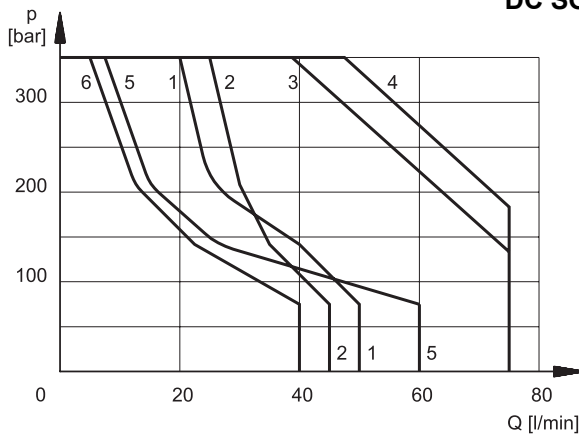


## 5 - OPERATING LIMITS

The curves define the flow rate operating fields according to the solenoid valve pressure with DC and AC solenoids.

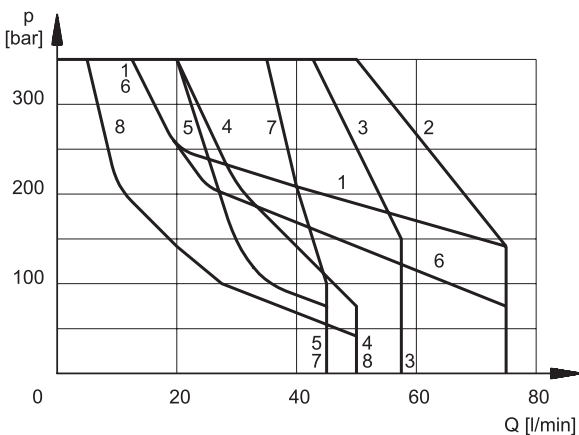
The values have been obtained with viscosity 36 cSt, temperature 50 °C, filtration 25 µm and with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.

### DC SOLENOID VALVES



curve	type	curve	type
1	S4, S7, S8	4	S5, S10, S18
2	S2	5	S3, S6, S9, S11
3	S1, RK, TA	6	23

### AC SOLENOID VALVES



curve	type	curve	type
1	S6, S11	5	S4
2	S1, S5, S10, S18, RK, TA	6	S3
3	S9	7	S2
4	S7, S8	8	23

The values indicated in the two graphs can be considerably reduced if a 4-way valve is used with port A or B plugged.

### 5.1 Switching times

The values indicated refer to an S1 solenoid valve for Q=50 l/min, p=150 bar working with mineral oil at a temperature of 50°C, a viscosity of 36 cSt and with PA and BT connections. The energizing times are obtained at the time the spool switches over. The de-energizing times are measured at the time pressure variation occurs on the line.

TIMES (±10%)	ENERGIZING	DE-ENERGIZING
AC solenoid	30 ms	40 ms
DC solenoid	50 ms	40 ms



## 6 - ELECTRICAL FEATURES

### 6.1 Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded onto the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The tubes for alternating current supply are different than those for direct current and are recognizable by the letter "A" stamped on the rear, on the manual override side.

The coil is fastened to the tube by a threaded nut, and can be rotated 360°, compatible with the available space.

The interchangeability of coils of different voltages is allowed within the same type of supply current; alternating or direct (AC or DC / CCR).

### 6.2 Available voltages

Besides the standard voltages shown in the table, other special configurations are available upon request.

The CCR coils must be used when rectified current is used to supply a valve equipped with a DC tube.

Rectified current supply takes place by fitting a rectifier, externally or incorporated in the "D" type connectors, between the alternating current source (24 V or 110 V, /50 or /60 Hz) and the coil.

<b>SUPPLY VOLTAGE FLUCTUATION</b>	± 10% Vnom
<b>MAX. SWITCH ON FREQUENCY</b>	10.000 ins/hr
<b>DUTY CYCLE</b>	100%
<b>ELECTROMAGNETIC COMPATIBILITY (EMC) EMISSIONS (see note 1)</b>	EN 50081-1
<b>IMMUNITIES</b>	EN 50082-2
<b>LOW VOLTAGE</b>	in compliance with 73/23/EEC 96/68/EEC
Class of protection according to IEC 144 Atmospheric agents Coil insulation Impregnation	IP 65 class H class F

**Note 1:** In order to further reduce the emissions, use of type H connectors (for DC or AC supply) is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see par. 9).

### 6.3 Current and power consumption

Energizing of a solenoid valve takes place with different electrical transients depending on whether the supply is in AC or DC.

In alternating current energizing, an initial phase (maximum movement) is seen, during which the solenoid consumes elevated value currents (inrush current); the current values diminish during the plunger stroke until it reaches the minimum values (holding current) when the plunger reaches the stroke end.

In direct current energizing, current consumption stays at fairly constant values, essentially determined by Ohm's law:  $V = R \times I$

#### Direct current coils \*VCC (values ± 5%)

Nominal voltage [V]	Resistance at 20°C [ohm]	Current consumption [A]	Power consumption [W]	Code
12	4,6	2,6	31,2	1901671
24	17,8	1,35	32,1	1901672
48	71,5	0,67	32,1	1901673
110	390	0,28	30,8	1901674
220	1510	0,15	32	1901675

#### Rectified current coils \*V-CCR (values ± 5%)

Nominal voltage [V]	Resistance at 20°C [ohm]	Code
24	14,3	1901677
48	57,2	1901680
110	335	1901678
220	1284	1901679

#### Alternating current coils \*V-\*Hz (values ± 5%)

Frequency [Hz]	Nominal tension [V]	Resistance at 20°C [ohm]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]	Code
50	24	0,88	8,7	2,35	209	56,5	1902660
	48	3,2	4,5	1,25	216	60	1902661
	230	80	0,85	0,21	196	49	1902679
50/60	110V-50Hz	17,5	1,9	0,48	209	52,8	1902677
	120V-60Hz	17,5	1,8	0,45	216	54	
	220V-50Hz	70	0,95	0,23	209	50,6	1902678
	240V-60Hz	70	0,87	0,21	209	50,4	
60	24	0,78	10	2,6	240	62,4	1902675
	48	2,3	5,6	1,5	269	72	1902665
	110	15	2	0,5	220	55	1902680
	220	60	1	0,26	220	57,2	1902681

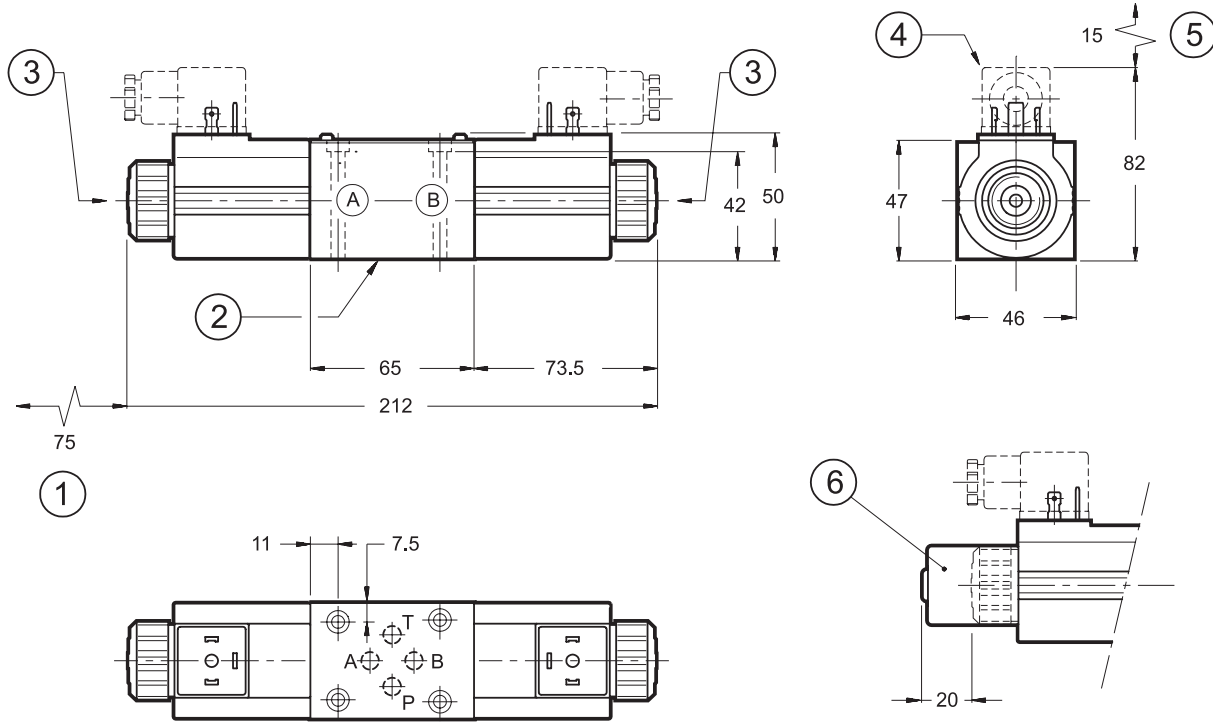


# MD1D

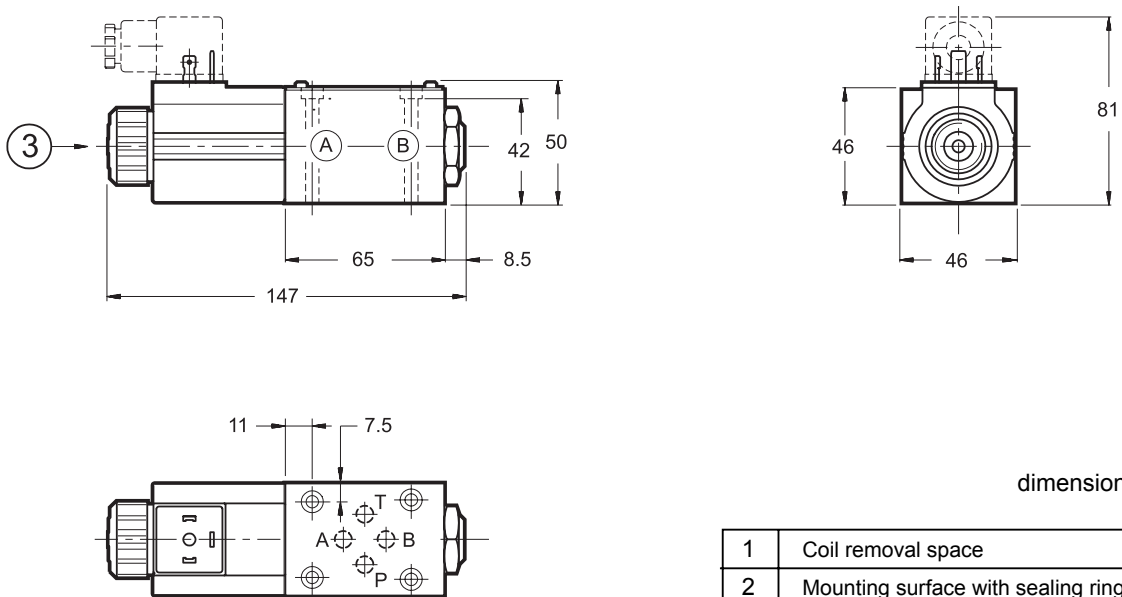
SERIES 50 - 55

## 7 - OVERALL AND MOUNTING DIMENSIONS OF DIRECT AND ALTERNATING CURRENT SOLENOID VALVES

MD1D - S  
MD1D - RK



MD1D - Ta



dimensions in mm

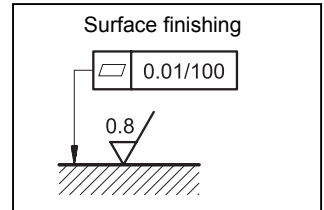
1	Coil removal space
2	Mounting surface with sealing rings
3	Manual override
4	Electric connector to be ordered separately (see cat. 49 000)
5	Connector removal space
6	CM manual override, boot protected

See par. 11 for fastening bolts and sealing rings



## 8 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type RK valves - without spring and with mechanical detent - must be mounted with the longitudinal axis horizontal. Valve fitting takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing. If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur. For use in tropical climates, it is necessary to include the CM option.



## 9 - ELECTRIC CONNECTORS

The solenoid valves are never supplied with connector.  
Connectors must be ordered separately.  
For the identification of the connector type to be ordered, please see catalogue 49 000.

## 10 - SPECIAL CONFIGURATIONS

### 10.1 MD1D solenoid valve with soft shift device (option G)

When the valve switching connection from one configuration to another is required to have a smooth change-over, the valves can be fitted with a soft shift device of the spool movement.

These valves are particularly useful to smoothen the start, the stop and the changeover of motion of an actuator, reducing pressure shocks. The resulting average times are 120 ÷ 180 ms (with viscosity of 36 cSt at 50°C).

Note: the valve response times are influenced not only by the working hydraulic conditions (flow rate and pressure), but also by the hydraulic fluid temperature and viscosity.

This solution is possible only with direct current solenoids.

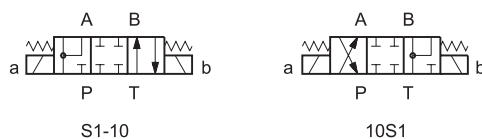
In order to improve the valve soft shift effect, use of spools with choked openings is recommended: type S12 (hydraulic diagram like S1) and type S42 (hydraulic diagram like S4)

Valve code example: MD1D- S12/G/50-24VCC. For their use, consult our technical department.

### 10.2 MD1D solenoid valve with special spools

Besides the standard spool configurations (see table 2), Duplomatic can develop, on request, connection diagrams with special spools for a wide range of applications: consult our technical department for their identification, feasibility and operating limits.

Examples:

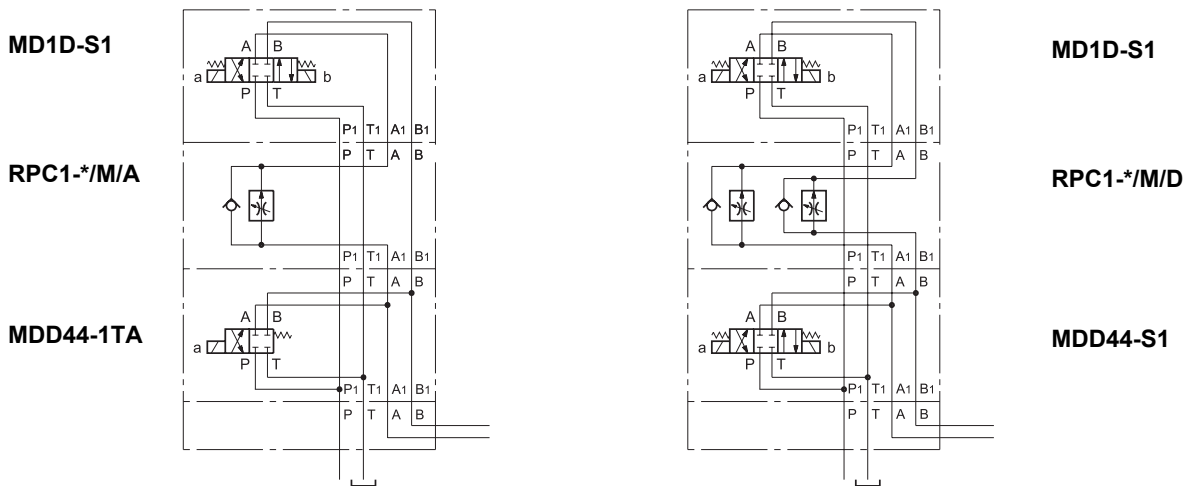




### 10.3 MDD44 Solenoid valve (see catalogue 41 250)

Switch-over solenoid valve in modular construction with passage holes through the entire body, a feature which makes its assembly with all modular valves equipped with CETOP 03 interface possible.

#### Application examples



This circuit is used to drive working units: fast approach, adjustable working speed and fast return.

This circuit is used to drive working units in both directions: fast approach - adjustable working speed.

### 11 - FASTENING BOLTS AND SEALING RINGS

Single valve fastening: 4 bolts M5x50
Tightening torque: 5 Nm
Threads of mounting holes: M5x10
Sealing rings: 4 OR type 2037

### 12 - SUBPLATES (See catalogue 51 000)

Type PMMD-AI3G with rear ports
Type PMMD-AL3G with side ports
P, T, A, B port dimensions : 3/8" BSP

	<p><b>DIPLOMATIC OLEODINAMICA SpA</b>          20025 LEGNANO (MI) - P.le Bozzi, 1 / Via Edison          Tel. 0331/472111-472236 - Fax 0331/548328</p>
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