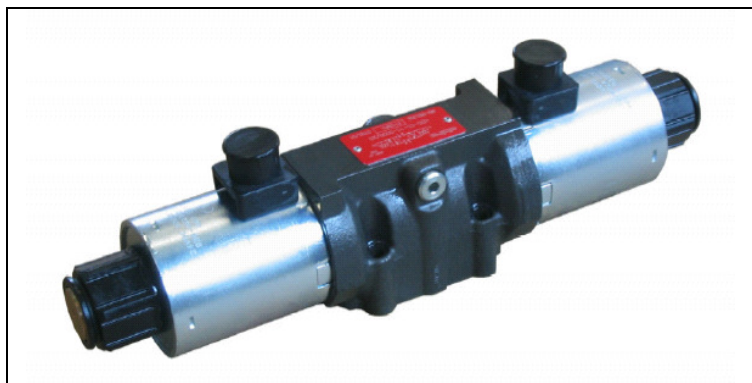
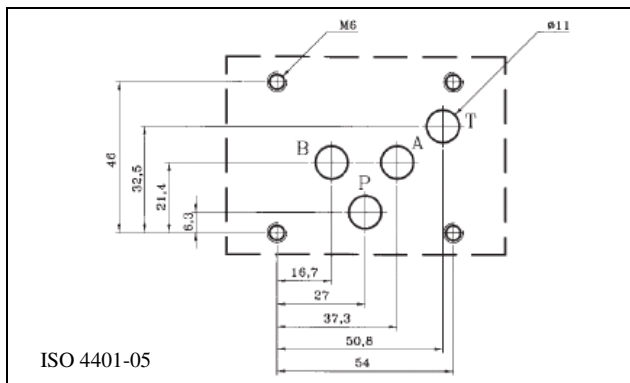
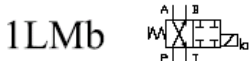
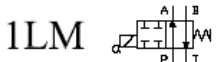
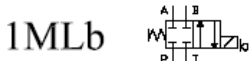
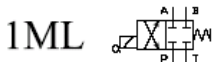
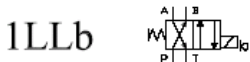
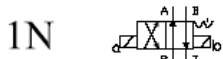
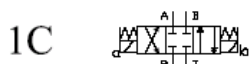


DIRECTIONAL CONTROL VALVES SOLENOID OPERATED – CETOP 05 TYPE HD5-ES-*



2 FUNCTIONAL SYMBOLS

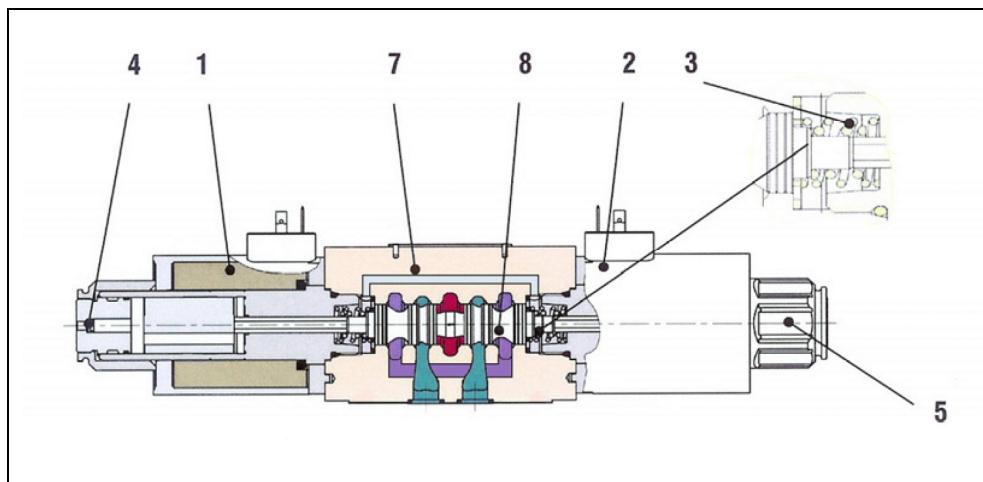


1 HOW TO READ THE MODEL CODE FOR VALVES HD5-*

HD5	-	ES	-	(1)	(C)	-	*	-	(024C)	/	20
①		②		③	④		⑤		⑥		⑦
①	HD5	:		4-way directional control valve Cetop 05 – Pressure 32 MPa (320 bar)							
②	ES	:		electrically controlled, standard							
③	(1)	:		spool type (see 4)							
④	(C)	:		solenoid(s) and spring(s) arrangement (see also 2)							
				C	:		2 sol. , spool is spring centered		(3 position)		
				N	:		2 sol. , spool is detented		(2 position)		
				LL	:		1 sol. (a), spool is spring offset		(2 pos. , end to end)		
				ML	:		1 sol. (a), spool is spring centered		(2 pos. , middle to end)		
				LM	:		1 sol. (a), spool is spring offset		(2 pos. , end to middle)		
⑤	*	:		Code reserved for special variants							
				b	:		only for version LL, ML, LM, solenoid b installed (instead of a)				
				T*	:		soft shifting device (see 14 and 15)				
				K	:		water proof caps on override pin (see 16)				
				Z*	:		anti-corrosion variants (see 18)				
				DR	:		solenoid(s) chamber draining (see 17)				
⑥	(024C)	:		electric voltage and solenoid coils (see 10, 11 and 12)							
⑦	20	:		design number (progressive) of the valve							

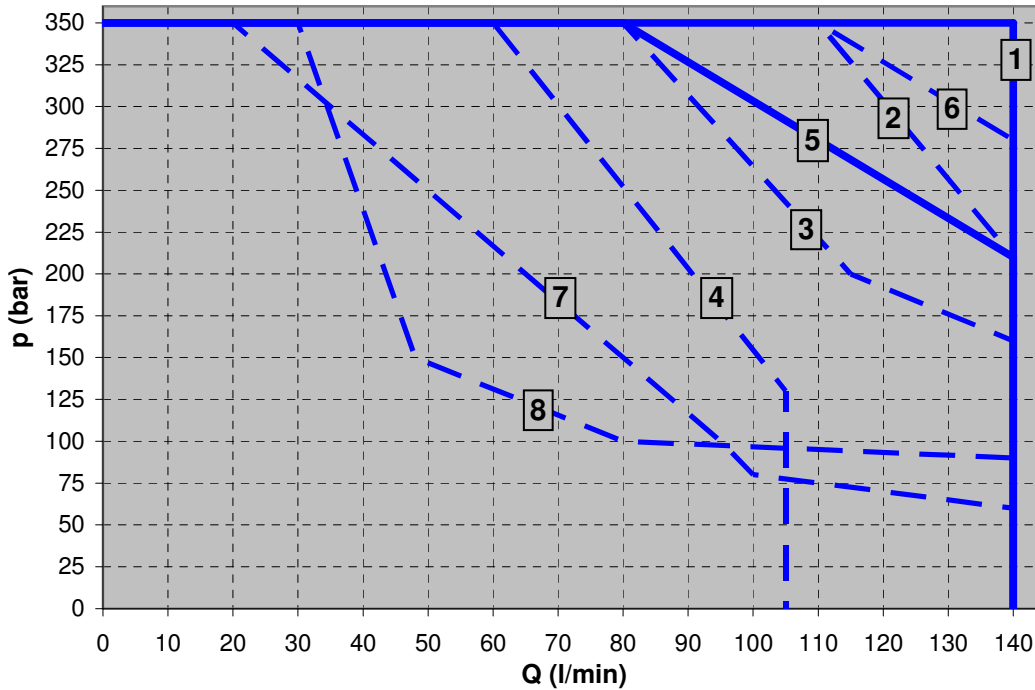
3 DESCRIPTION

The spool 8 shifts into the valve body 7 subject to the action of springs 3 and solenoids 1 and 2. Spool 8, depending from its shape and its position in the valve body 7, opens and/or closes passages between P, A, B and T ports, thus controlling the direction of the hydraulic flow. In case of electric cut-offs the spool can be manually shifted by acting on the override pins 4, located at the end of the solenoids and accessible through the retaining nuts 5.



8 HYDRAULIC LIMITS OF USE

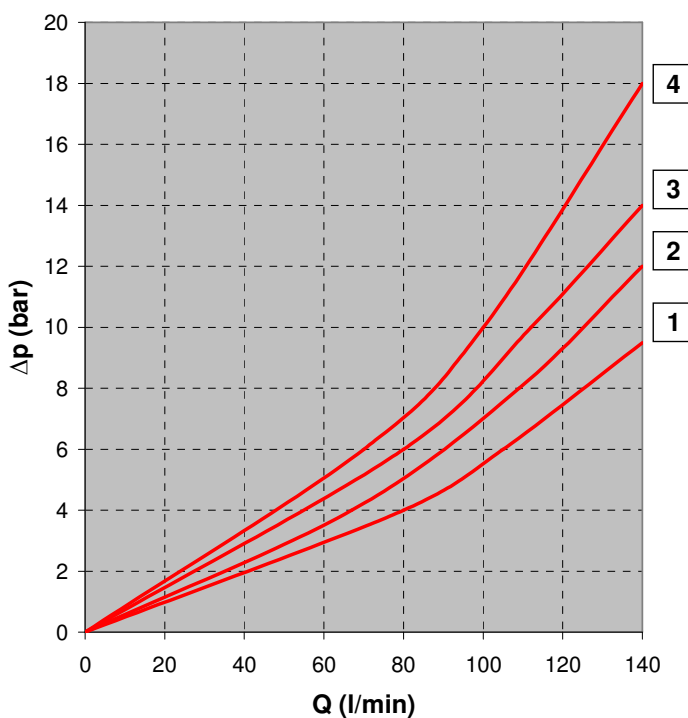
p/Q characteristics limits for safe use of HD5-ES-* solenoid operated valves. Limit curves apply to solenoid valves energized with rated voltage -5% and flushed with hydraulic fluid with properties according to ISO 4406 class 19/17/14. Those limits are valid for use of the valve as 4-way control.



Spool type	Limits
0C	1
1C	
8C	
0ML	
1ML	
8ML	5
3C	
3ML	3
4C	3
55C	7
7C	4
1N	6
2N	8
OLL	2
1LL	2
1LLb	2
2LL	8
4ML	3

9 TYPICAL DIAGRAMS

Typical Δp curves for valves HD5-ES-*, with mineral oil at $v = 32 \text{ mm}^2/\text{s}$ and $t = 40^\circ\text{C}$, for flow $P \rightarrow A/B$, $A/B \rightarrow T$ and $P \rightarrow T$

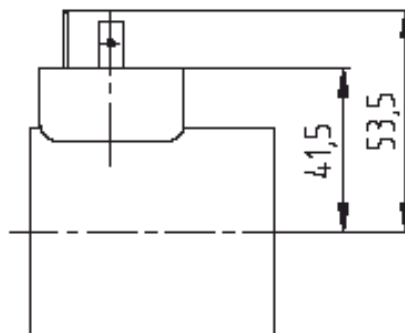


Spool type	P - A	P - B	A - T	B - T	P - T
0C	1	1	2	2	1
1C	1	1	2	2	-
3C	1	1	2	2	-
4C	3	3	4	4	1
55C	1	1	1	2	2
7C	1	1	2	2	-
8C	1	1	2	2	-
1N	1	1	2	3	-
2N	1	1	-	-	-
0LL	1	1	1	3	-
1LL	1	1	2	2	-
1LLb	1	1	2	2	-
2LL	1	1	-	-	-
0ML	-	1	2	-	1
1ML	-	1	2	-	-
3ML	-	1	2	-	-
4ML	3	-	-	4	1
8ML	-	1	2	-	-

10 SOLENOID COILS, WITH STANDARD ELECTRIC CONNECTION TO ISO 4400 / DIN 43650, FOR DC SUPPLY

Standard valves type HD5-ES-* are operated by solenoid that are energized directly from a D.C. voltage supply. Solenoid valves can be supplied without electric coils as **HD5-ES-*-0000** and coils can be supplied separately as **B05-***C**.

Directly from D.C. supply			
Voltage	Valve Code	Coil Code	Nominal Current (A)
V 12 DC	HD5-ES-*-012C	B05-012C	3,17
V 24 DC	HD5-ES-*-024C	B05-024C	1,73



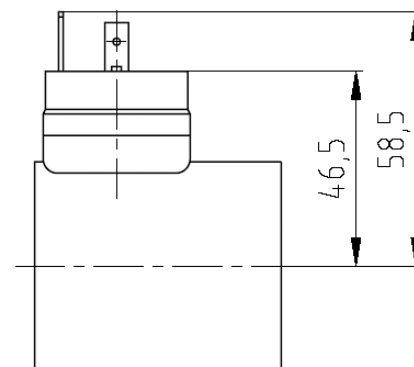
Permissible supply voltage variation : +5% -10%

Special voltages available : V 48 DC, V 106 DC, V 205 DC

11 SOLENOID COILS, WITH STANDARD ELECTRIC CONNECTION TO ISO 4400 / DIN 43650, FOR AC SUPPLY

Valves type HD5-ES-* can be operated from A.C. supply by the use of coils that incorporate a full wave bridge rectifier. Coils with rectifier can be supplied separately as **B05-***A**.

Directly from A.C. supply			
Voltage	Valve Code	Coil Code	Nominal Current (A)
V 115 AC / 50 (60) Hz	HD5-ES-*-115A	B05-115A	0,40
V 230 AC / 50 (60) Hz	HD5-ES-*-230A	B05-230A	0,20

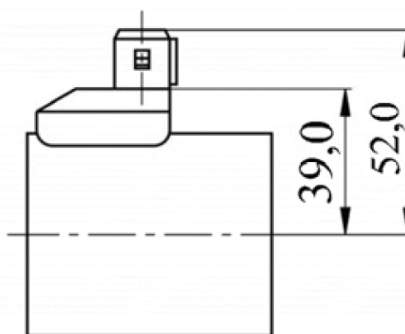


Permissible supply voltage variation : +5% -10%

12 OPTIONAL ELECTRIC CONNECTION

Coils type B05-* for valves HD5-ES-* can be supplied with 2-poles AMP Junior-Timer electric connection. Coils with AMP connection can be supplied separately as **B05-***CAMP**

AMP electric connection			
Voltage	Valve Code	Coil Code	Nominal Current (A)
V 12 DC	HD5-ES-*-012CAMP	B05-012CAMP	3,17
V 24 DC	HD5-ES-*-024CAMP	B05-024CAMP	1,73

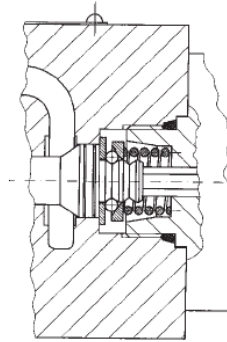


Other optional electric connection are available :
 - Flying Leads
 - Flying Leads (250 mm) with Deutsch connection (DT04-2P)

13 VERSION "N" : MECHANICAL DETENT ON SPOOL

Solenoid valves with detent typically are 2 position, 2 solenoid, no-spring valves where the spool is kept at the extreme ends of its stroke by a mechanical device.

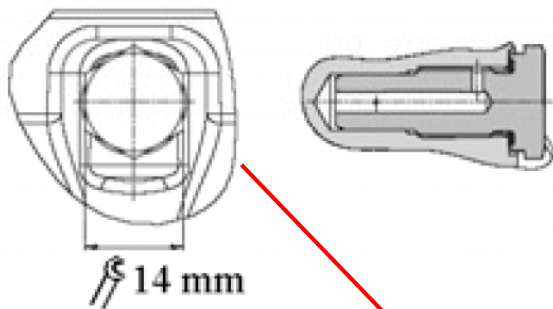
This permits that solenoids are energized by short time current pulses and the spool remains at its position regardless of forces due to hydrodynamics or gravitational/inertial effects (vibrations).



14 VERSION "T" : SOFT SHIFTING

Solenoid valves with soft shifting devices are 2 or 3 position valves which incorporated a fixed throttling orifice (\varnothing 0,6 mm) on the channel that connects the extreme hydraulic chambers of the valve.

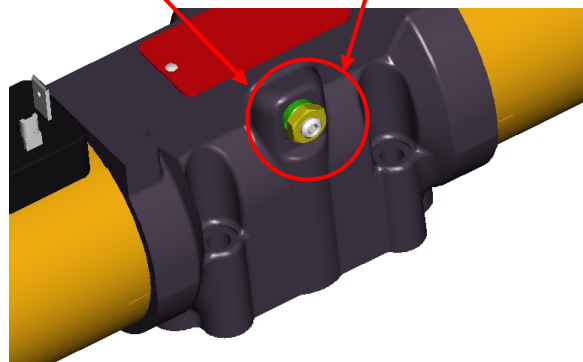
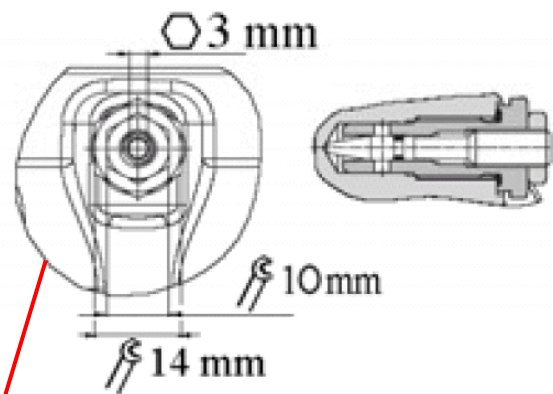
The throttling effect controls the spool shifting time, thus limiting unwanted hydraulic shocks.



15 VERSION "TR" : ADJUSTABLE SOFT SHIFTING

In Version "TR" valves, the fixed orifice is replaced by an adjustable, variable throttle valve that permit a fine and precise adjustment of the spool shifting time.

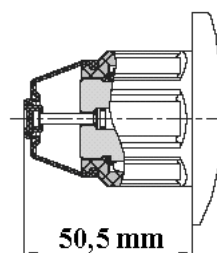
To increase the throttling (and therefore the shifting time) turn clock-wise the adjusting screw (Ch. 3 mm), after having unlocked its retaining nut (Ch. 10 mm).



16 VERSION "K" : OVERRIDE PIN

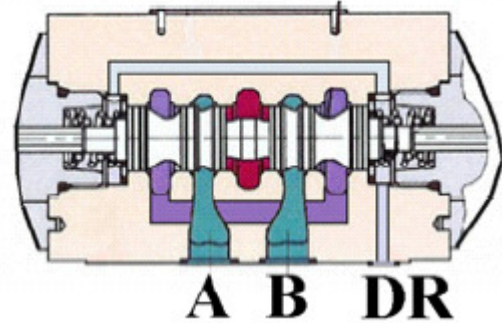
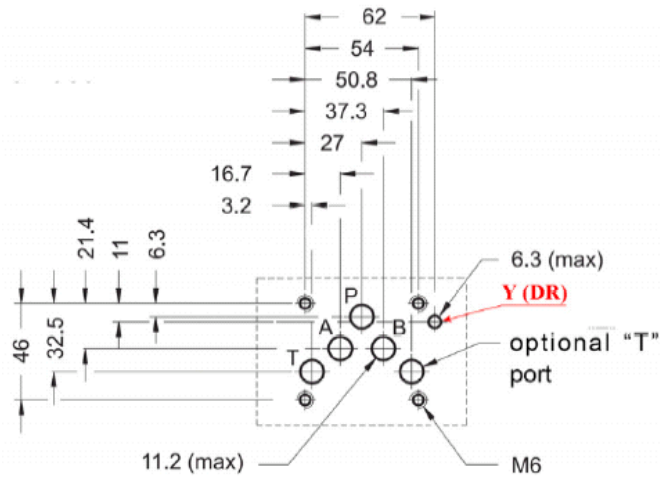
Solenoid valves according to "K" version have override actuators that push on the valve's override pins and permit a quick and easy "hand operation" of the valves, without the need of any tool.

The override actuator is incorporated in a flexible rubber cap that is easily applicable on the solenoid retaining nuts and that protects from moisture and water splashes.



17 VERSION "DR" : SEPARATE DRAINING OF THE SOLENOID CHAMBER

Solenoid valves according to "DR" version present a draining line of the chambers of the solenoids. This version should be adopted in presence of high counter-pressure on T line that exceed the permissible recommended maximum pressure for T ports of the valve (210 bar). Position of additional draining port DR is conform with ISO 4401-05 interface and correspond to the Y port.

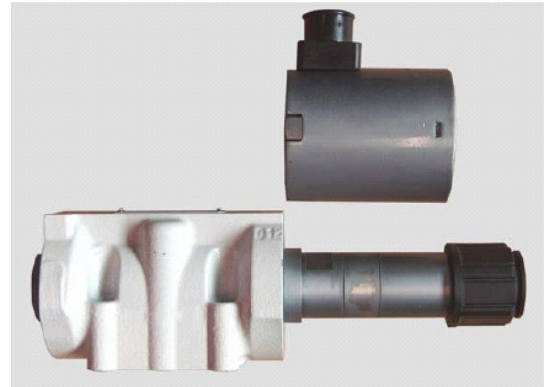


Dimensions in mm

18 ANTICORROSION OPTIONS

On HD5-ES-* standard valves the body is phosphate coated, the solenoid tubes are not treated and coils mantel and irons are zinc trivalent plated. To increase the resistance to corrosive agents different variants are available :

- ZT :**
 - Body, solenoid tubes and coils irons are zinc trivalent plated
- ZL :**
 - Body is coated with special TEMADUR 40 zinc painting
 - Solenoids have 8-12 µm zinc plating
- ZK :**
 - Body is coated with special TEMADUR 40 zinc painting
 - Solenoids tube and coils irons are "zinc-nickel" plated



Example of ZK painted valve : HD5-ES-1LLb-ZK-024C/20