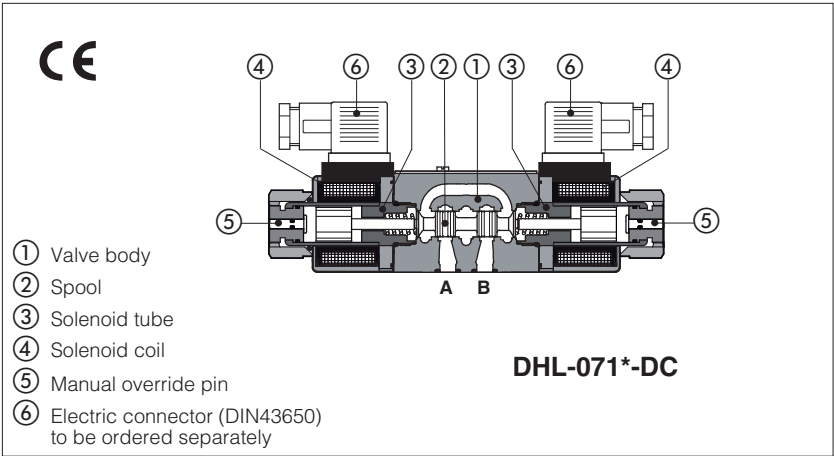


Solenoid directional valves type DHL - compact execution

direct operated, ISO 4401



Spool type, 4/3, 4/2, 3/2 way version.
Wet type solenoids made by:

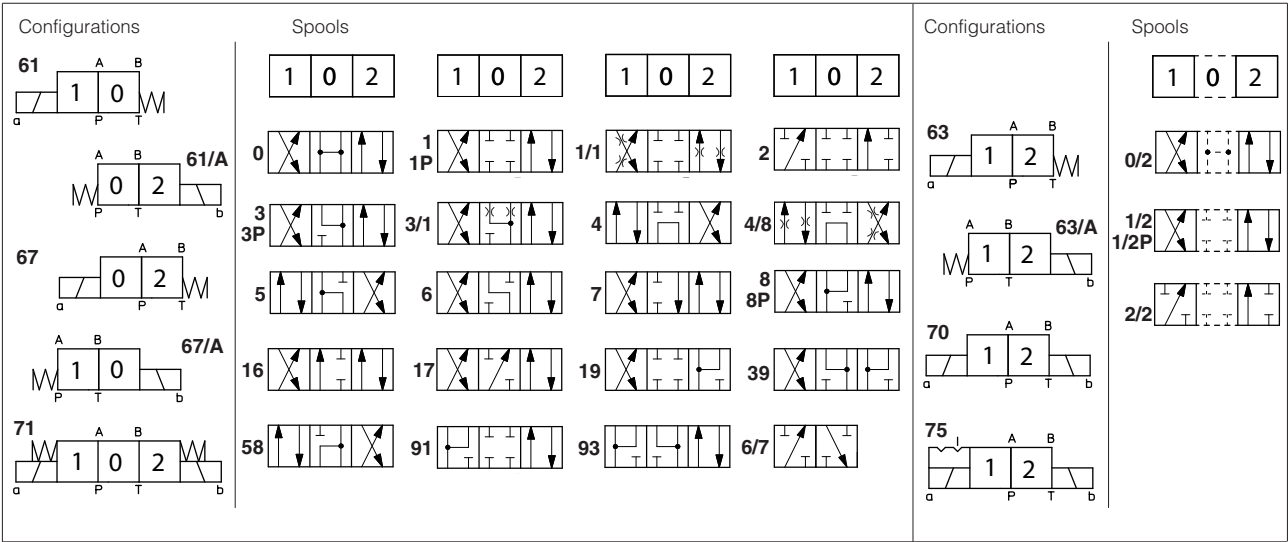
- screwed tube ③, different for AC and DC power supply
- interchangeable coils ④, specific for AC or DC power supply, easily replaceable without tools - see section ⑥ for available voltages

The valve body ① is 3 chamber type made by shell-moulding casting with wide internal passages ensuring low pressure drops.

Mounting surface: **ISO 4401 size 06**
Max flow: **60 l/min**
Max pressure: **350 bar**

1	MODEL CODE							
	DHL - 0	61	1	/A -	X	24 DC	**	/*
	Solenoid directional valves size 06					Voltage code, see section ⑥	Series number	Seals material, see section ⑭: - = NBR PE = FKM
	Valve configuration, see section ②					00-AC = AC solenoids without coils 00-DC = DC solenoids without coils X = without connector		See section ⑫ for available connectors, to be ordered separately Coils with special connectors, see section ⑬ XK = Deutsch connector
	Spool type, see section ②					Options, see section ⑦		

2 CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1)



Note: Spool type 6/7 is available only for configuration 61, not available for version /A
Spool type 3/1 has restricted oil passages in central position, from user ports to tank.
Spools type 1/1 and 4/8 are properly shaped to reduce water-hammer shocks during the swithing.
Spools type 1P, 3P, 8P and 1/2P reduced the valve internal leakages

3 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	150 years, see technical table P007
Ambient temperature range	Standard = -30°C ÷ +70°C /PE option = -20°C ÷ +70°C
Storage temperature range	Standard = -30°C ÷ +80°C /PE option = -20°C ÷ +80°C
Surface protection	Body: zinc coating with black passivation Coil: zinc nickel coating (DC version) plastic incapsulation (AC version)
Corrosion resistance	Salt spray test (EN ISO 9227) > 200 h
Conformity	CE to Low Voltage Directive 2014/35/EU RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

4 HYDRAULIC CHARACTERISTICS

Operating pressure	Ports P,A,B: 350 bar; Port T 210 bar for DC version; 160 bar for AC version
Max flow	60 l/min , see Q/Δp diagram at section 8 and operating limits at section 9

5 ELECTRICAL CHARACTERISTICS

Insulation class	H (180°C) for DC coils; F (155°C) for AC coils Due to the occuring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 and EN ISO 4413 must be taken into account
Protection degree to DIN EN 60529	IP 65 (with connectors 666, 667 correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See section 6
Supply voltage tolerance	± 10%

6 COIL VOLTAGE

External supply nominal voltage ± 10%	Voltage code	Type of connector	Power consumption (2)	Code of spare coil DHL
12 DC	12 DC	666 or 667	29W	COL-12DC
14 DC	14 DC			COL-14DC
24 DC	24 DC			COL-24DC
28 DC	28 DC			COL-28DC
110 DC	110 DC			COL-110DC
220 DC	220 DC			COL-220DC
110/50 AC (1)	110/50/60 AC	669	58VA (3)	COL-110/50/60AC
115/60 AC	115/60 AC			COL-110/60AC
230/50 AC (1)	230/50/60 AC			COL-230/50/60AC
230/60 AC	230/60 AC			COL-230/60AC
110/50 AC - 120/60 AC	110 DC	669	29W	COL-110DC
230/50 AC - 230/60 AC	220 DC			COL-220DC

- (1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10÷15% and the power consumption is 55 VA.
- (2) Average values based on tests preformed at nominal hydraulic condition and ambient/coil temperature of 20°C.
- (3) When solenoid is energized, the inrush current is approx 3 times the holding current. Inrush current values correspond to a power consumption of about 150 VA.

7 OPTIONS

A = Solenoid mounted at side of port B (only for single solenoid valves). In standard versions, solenoid is mounted at side of port A.

MV, MO = auxiliary hand lever positioned vertically (MV) or horizontally (MO). For available configuration and dimensions see section 18

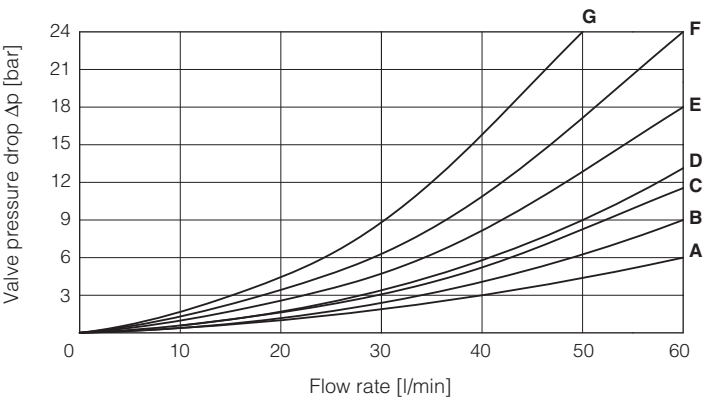
WP = prolonged manual override protected by rubber cap.

WPD/HL = manual override override with detent, to be ordered separately, see section 18

 The manual override operation can be possible only if the pressure at T port is lower than 50 bar

8 Q/ΔP DIAGRAMS based on mineral oil ISO VG 46 at 50°C

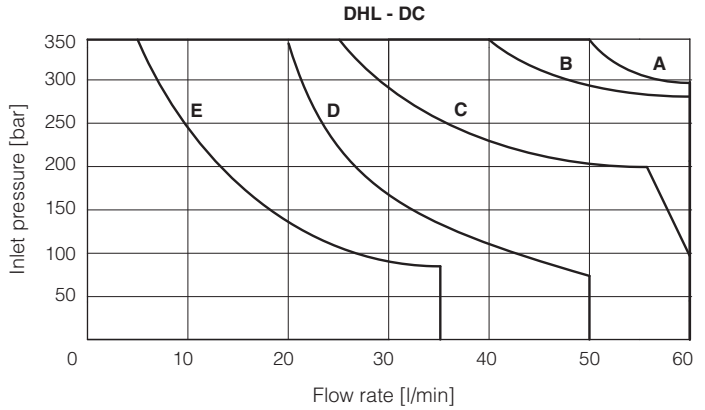
Flow direction Spool type	P→A	P→B	A→T	B→T	P→T
0	A	A	C	C	D
1, 1P, 1/1	C	C	C		
3, 3P, 3/1	D	D	A	A	
4, 4/8, 5	F	F	G	C	E
0/2, 1/2, 1/2P	D	D	D	D	
6, 7, 16, 17	D	D	D	D	
8, 8P	A	A	E	E	
2, 6/7	D	D			
2/2	F	F			
19, 91	E	E	D	D	
39, 93	F	F	G	G	



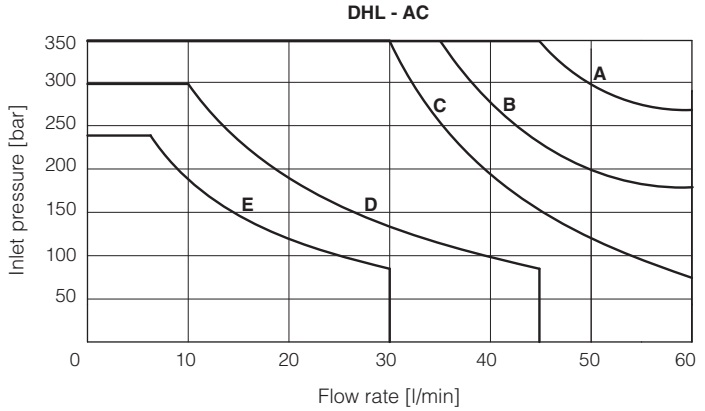
9 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

The diagrams have been obtained with warm solenoids and power supply at lowest value ($V_{nom} - 10\%$). The curves refer to application with symmetrical flow through the valve (i.e. $P \rightarrow A$ and $B \rightarrow T$). In case of asymmetric flow and if the valves have the devices for controlling the switching times the operating limits must be reduced.

Curve	DC version, spool type:
A	0, 0/2, 1/2, 1/2P, 8, 8P
B	1, 1P, 1/1
C	3, 3P, 3/1, 6, 7
D	4, 4/8, 16, 17, 5, 19, 39, 58, 91, 93
E	2, 2/2, 6/7



Curve	AC version, spool type:
A	0, 0/2, 1/2, 1/2P, 8, 8P
B	1, 1P, 1/1
C	3, 3P, 3/1, 6, 7
D	4, 16, 17, 4/8, 5, 19, 39, 58, 91, 93
E	2, 2/2, 6/7



10 SWITCHING TIMES (average values in msec)

Test conditions: - 20 l/min; 150 bar
- nominal voltage
- 2 bar of counter pressure on port T
- mineral oil: ISO VG 46 at 50°C

The elasticity of the hydraulic circuit and the variations of the hydraulic characteristics and temperature affect the response time.

Valve	Switch-on AC	Switch-off AC	Switch-on DC	Switch-off DC
DHL	10 - 25	20 - 40	30 - 50	15 - 25

11 SWITCHING FREQUENCY

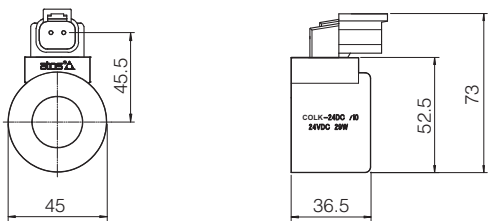
Valve	AC (cycles/h)	DC (cycles/h)
DHL + 666 / 667	7200	15000

12 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately, see tech table K500)

666 = standard connector IP-65, suitable for direct connection to electric supply source
667 = as 666, but with built-in signal led. Available for power supply voltage 24 AC or DC, 110 AC or DC, 220 AC or DC
669 = with built-in rectifier bridge for supplying DC coils by alternate current (AC 110V and 230V - I_{max} 1A)
E-SD = electronic connector which eliminates electric disturbances when solenoid valves are de-energized

13 COILS WITH SPECIAL CONNECTORS only for voltage supply **12, 14, 24, 28** V_{DC}

Deutsch connector DT-04-2P



Options -XK

Coil type COLK, Deutsch connector DT-04-2P male
Protection degree **IP67**

Note: For the electric characteristics refer to standard coils features - see section **6**

14 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR	HFC	

15 PLUG-IN RESTRICTOR (to be ordered separately)

The use of plug-in restrictors in valve's ports P or A or B may be necessary in case of particular conditions as long flexible hoses or the presence of accumulators which could cause at the valve switching instantaneous high flow peaks over the max valve's operating limits.

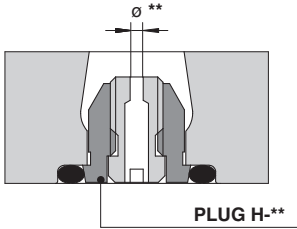
Ordering code:

PLUG H

-

08, 10, 12, 15 calibrated orifice diameter in tenths of mm
Example PLUG-H-**12** = orifice diameter **1,2 mm**
Other orifice dimensions are available on request

For particular heavy conditions with pulsing pressure, the use of modular plate with calibrated orifices code **SET-050268/*** is suggested - see tech. table **TE020**



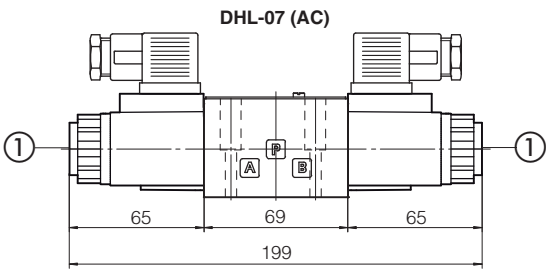
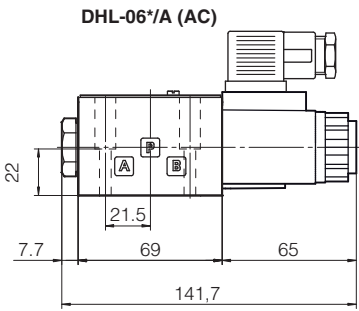
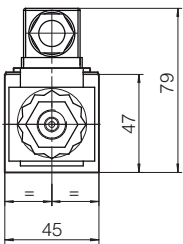
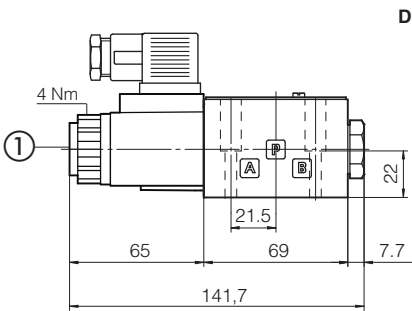
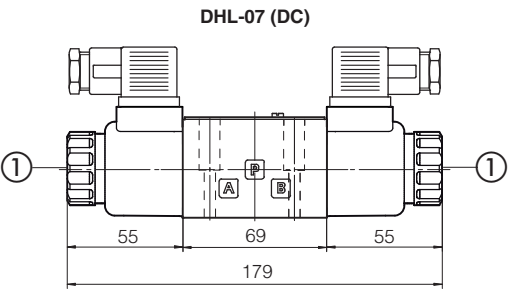
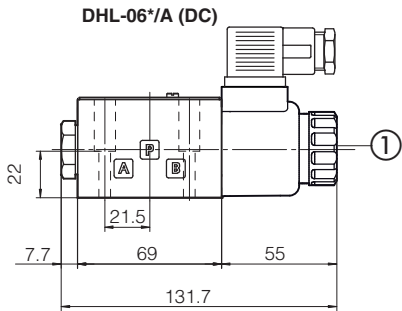
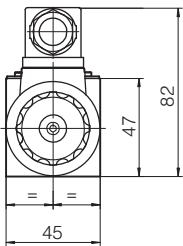
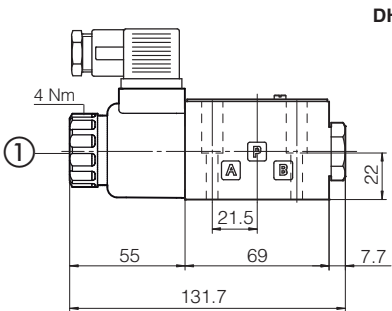
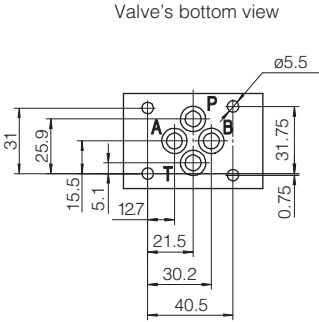
16 FASTENING BOLTS AND SEALS

Fastening bolts	Seals
4 socket head screws M5x30 class 12.9 Tightening torque = 8 Nm	4 OR 108; Diameter of ports A, B, P, T: Ø 7,5 mm (max)

ISO 4401: 2005
Mounting surface: 4401-03-02-0-05

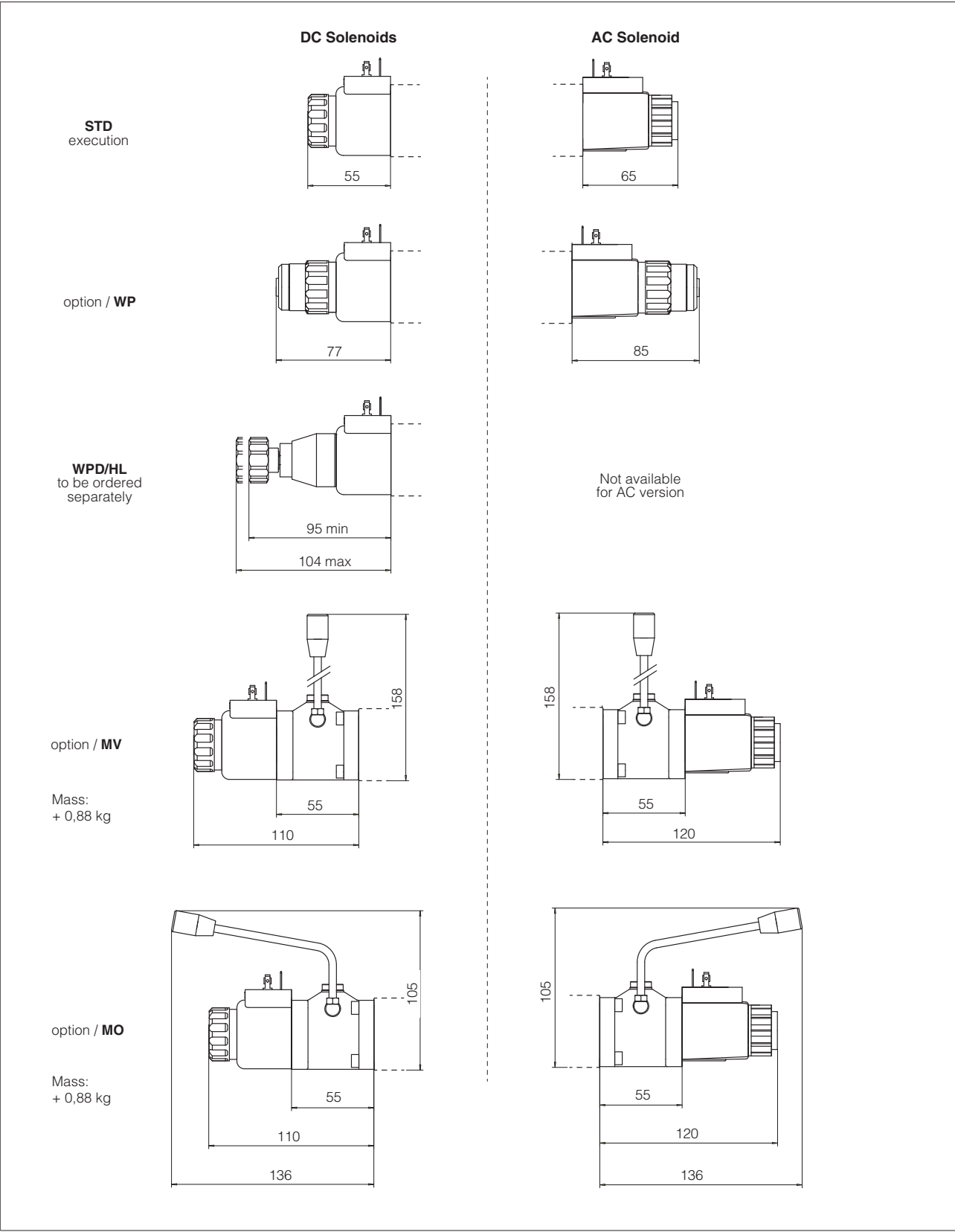
Mass (Kg)		
	DC	AC
DHL-06	1,3	1,2
DHL-07	1,6	1,4

P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT



① Standard manual override PIN

⚠ The manual override operation can be possible only if the pressure at T ports is lower than 50 bar



19 RELATED DOCUMENTATION

E001	Basics for solenoid directional valves	P002	Installation, commissioning and maintenance guidelines
K150	Handwheels for hydraulic controls	P005	Mounting surfaces for electrohydraulic valves
K280	Single and modular subplates	P007	Functional safety, MTTFd reliability data
K500	Electric and electronic connectors		