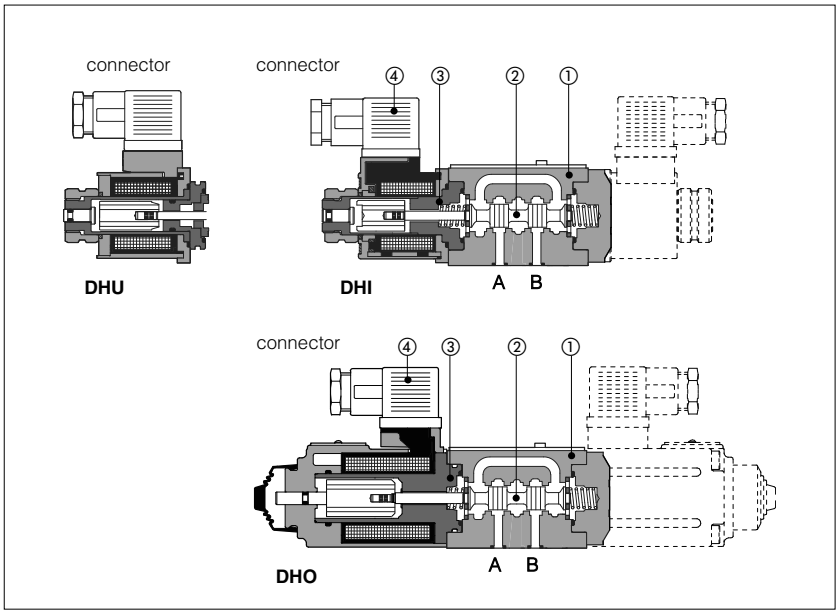
Solenoid directional valves type DHI, DHU, DHO

direct operated, ISO 4401 size 06



DHI,DHU and DHO are spool type, three or four way, two or three position direct operated solenoid valves designed to operate in oil hydraulic systems.

They are operated by wet and pressure sealed solenoid ③ with manual override and with coils certified according the North American standard **C UR US**:

- **DHI** for AC and DC supply;
- **DHU** for DC supply with improved performance;
- **DHO** for DC supply with high performance.

Moving parts are protected, lubricated and cushioned in oil.

Shell-moulding casting ① machined by transfer lines and then cleaned by thermal deburring.

Optimized flow paths largely cored with extrawide channels to tank for low pressure drops.

Interchangeable spools ② available in a wide variety of configurations.

DHU and DHO valves can be supplied with optional devices for control of switching times.

Standard electric/electronic connectors ④ able to satisfy the requirements of modern machines for electric interfaces characteristics.

Coils are fully encapsulated (class H).

In DHI and DHU, coils are easily replaceable without aid of tools.

Rugged execution suitable for outdoor use.

Surface mounting ISO 4401 size 06.
Max flow up to 60 l/min for DHI/DHU and up to 80 l/min for DHO.
Max pressure: 350 bar.

1 MODEL CODE

DHI – 0 63 1/2 /A - X 24 DC ** /*

Directional control valves size 06
DHI-0 = AC and DC supply
DHU-0 = for DC supply
DHO-0 = for DC supply, high performances

Valve configuration, see table 2
61 = single solenoid, center plus external position, spring centered
63 = single solenoid, 2 external positions, spring offset
67 = single solenoid, center plus external position, spring offset
70 = double solenoid, 2 external positions, without springs
71 = double solenoid, 3 positions, spring centered
75 = double solenoid, 2 external positions, with detent
77 = double solenoid, center plus external position, without springs
Other configurations are available on request.

Spool type, see table 3.

Options, see note 1 at section 5.

X = without connector
See note 2 at section 5 for available connectors, to be ordered separately
Coils with special connectors, see section 10 (only for DHI and DHU)
XJ = AMP Junior Timer connector
XK= Deutsch connector
XS= Lead Wire connection

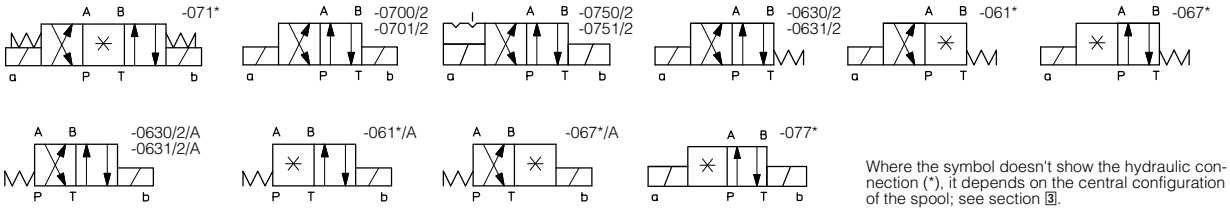
Voltage code, see section 6
00 = valve without coils (only for DHI and DHU).

Series number

Synthetic fluids
WG =water glycol
PE= phosphate ester

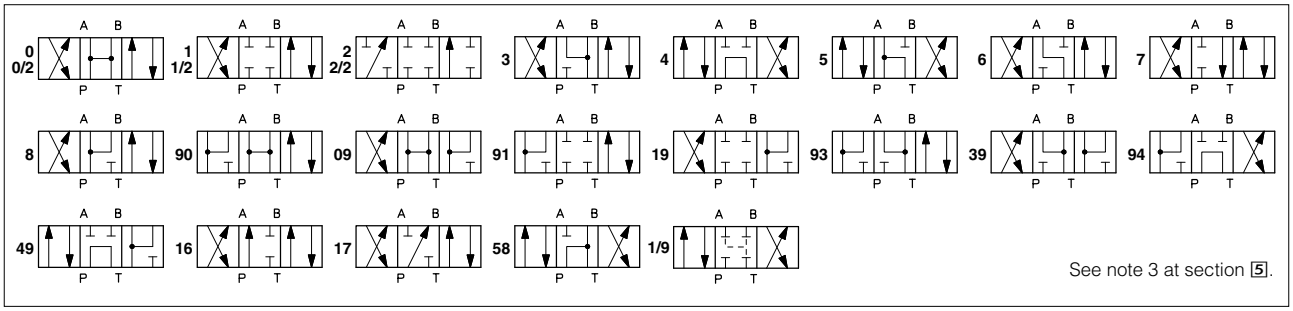
Note: configuration 63, 70 and 75 are available only with spools type 0/2, 1/2 and 2/2.

2 CONFIGURATION



Where the symbol doesn't show the hydraulic connection (*), it depends on the central configuration of the spool; see section 3.

3 SPOOLS - for intermediate passages, see tab. E001.



See note 3 at section 5.

4 MAIN CHARACTERISTICS OF DHI, DHU AND DHO DIRECTIONAL VALVES

Assembly position / location		Any position for all valves except for type - 070* (without springs) that must be installed with horizontal axis if operated by impulses
Subplate surface finishing		Roughness index $\sqrt{}^{0.4}$ flatness ratio 0,01/100 (ISO 1101)
Ambient temperature		from -20°C to +70°C
Fluid		Hydraulic oil as per DIN 51524 .... 535; for other fluids see section 1
Recommended viscosity		15 ÷ 100 mm²/s at 40°C (ISO VG 15 ÷ 100)
Fluid contamination class		ISO 19/16, achieved with in line filters at 25 μm value to $\beta_{25} \geq 75$ (recommended)
Fluid temperature		-20°C +60°C (standard and /WG seals) -20°C +80°C (/PE seals)
Flow direction		As shown in the symbols of tables 2 and 3
Operating pressure For versions with proximity switches (/FI/NC and /FI/NO versions) maximum counter pressure allowed on T port is 5 bar	**DHI**	Ports P,A,B: **350** bar; Port T: **120** bar
	DHU, DHO	Ports P,A,B: **350** bar; Port T **210** bar
Rated flow		See diagrams Q/Δp at section 7
Maximum flow		**60 l/min** for DHI and DHU; **80 l/min** for DHO, see operating limits at section 8

4.1 Coils characteristics

Insulation class	H (180°C) Due to the occuring surface temperatures of the solenoid coils, the European standards EN563 and EN982 must be taken into account
Connector protection degree DIN 43650	IP 65
Relative duty factor	100%
Supply voltage and frequency	See electric feature 6
Supply voltage tolerance	± 10%
Certification	**C UR US**

5 NOTES

1 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.
WP = prolonged manual override protected by rubber cap (standard for DHO models) - see section 12.
L1, L2, L3 = device for switching time control, installed in the valve solenoid (only for DHU and DHO models). For spools 4 and 4/8 only device L3 is available.
F * = with proximity switch for monitoring spool position: see tab. E110.
MV, MO = auxiliary hand lever positioned vertically (MV) or horizontally (MO). For available configuration and dimensions see table E138.

2 Type of electric/electronic connector DIN 43650, to be ordered separately

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

3 Spools

- spools type **0/2, 1/2, 2/2** are only used for two position valves: single solenoid valves, type DH*-063*/2 and double solenoid valves type DH*-070*/2 and DH*-075*/2.
- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spools type **1, 4** and **5** are also available as **1/1, 4/8** and **5/1.** They are properly shaped to reduce water-hammer shocks during the swiching.
- spools type **1, 3, 8** and 1/2 are available as **1P, 3P, 8P** and **1/2P** to limit valve internal leakages.
- spool type **1/9** has closed center in rest position but it avoids the pressurization of A and B ports due to the internal leakages.
- Other types of spools can be supplied on request.

6 ELECTRIC FEATURES

Valve	External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	Code of spare coil DHI	Code of spare coil DHU	Colour of coil label
DHI DHU	6 DC	**6 DC**	SP-666 or SP-667	33 W	SP-COU-6DC/ 80	SP-COU-6DC/ 80	brown
	9 DC	**9 DC**			SP-COU-9DC /80	SP-COU-9DC /80	light blue
	12 DC	**12 DC**			SP-COU-12DC /80	SP-COUR-12DC /10	green
	14 DC	**14 DC**			SP-COU-14DC /80	SP-COUR-14DC /10	brown
	18 DC	**18 DC**			SP-COU-18DC /80	SP-COU-18DC /80	blue
	24 DC	**24 DC**			SP-COU-24DC /80	SP-COUR-24DC /10	red
	28 DC	**28 DC**			SP-COU-28DC /80	SP-COUR-28DC /10	silver
	48 DC	**48 DC**			SP-COU-48DC /80	SP-COU-48DC /80	silver
	110 DC	**110 DC**			SP-COU-110DC /80	SP-COUR-110DC /10	black
	125 DC	**125 DC**			SP-COU-125DC /80	SP-COU-125DC /80	silver
	220 DC	**220 DC**			SP-COU-220DC /80	SP-COUR-220DC /10	black
	24/50 AC 24/60 AC	**24/50/60 AC**		60 VA (4)	SP-COI-24/50/60AC /80 (1)	-	pink
	48/50 AC 48/60 AC	**48/50/60 AC**			SP-COI-48/50/60AC /80 (1)	-	white
	110/50 AC 120/60 AC	**110/50/60 AC 120/60 AC**			SP-COI-110/50/60AC /80 (1) SP-COI-120/60AC /80	-	yellow white
	230/50 AC 230/60 AC	**230/50/60 AC 230/60 AC**			SP-COI-230/50/60AC /80 (1) SP-COI-230/60AC /80	-	light blue silver
	110/50 AC 120/60 AC	**110RC**	SP-669	40 VA 35 VA	SP-COU-110RC /80	SP-COUR-110RC /10	gold
	230/50 AC 230/60 AC	**230RC**		40 VA 35 VA	SP-COU-230RC /80	SP-COUR-230RC /10	blue

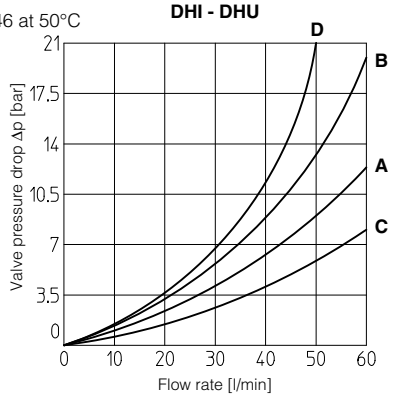
Valve	External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)	External supply nominal voltage ± 10%	**Voltage code**	Type of connector	Power consumption (2)
DHO	12 DC	**12 DC**	SP-666 or SP-667	32 W	110/50 AC	**110 DC**	SP-669	40 W
	24 DC	**24 DC**			120/60 AC			35 W
	110 DC	**110 DC**		40W	230/50 AC	**220 DC**		40 W
	220 DC	**220 DC**			230/60 AC			35 W

(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) In a cycle, where solenoid is energized/deenergized in 1 second (1 Hz), the average power consumption is 7 W; for longer cycles, the power consumption is lower.
When solenoid is energized the inrush current is 6 A at 12 VDC and 3 A at 24 VDC corresponding to power consumption peak of 72 W.
These current peaks persist for a period shorter than 100 msec and they must be considered when electric circuit is designed.
(4) 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.

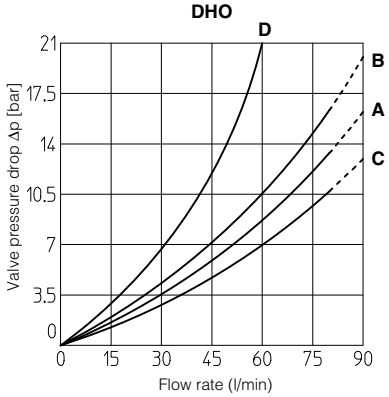
7 Q/ΔP DIAGRAMS based on mineral oil ISO VG 46 at 50°C

Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
0	C	C	C	C	
0/2, 1, 1/2	A	A	A	A	
2, 3	A	A	C	C	
2/2, 4, 5, 9*	D	D	D	D	A
6	A	A	C	A	
7	A	A	A	C	
8	C	C	B	B	

DHI - DHU



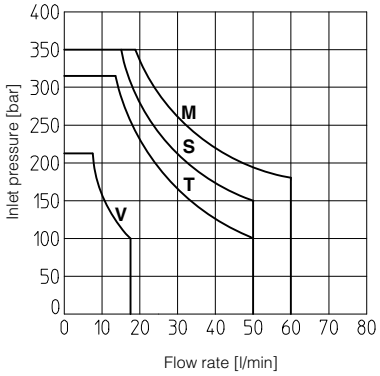
DHO



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

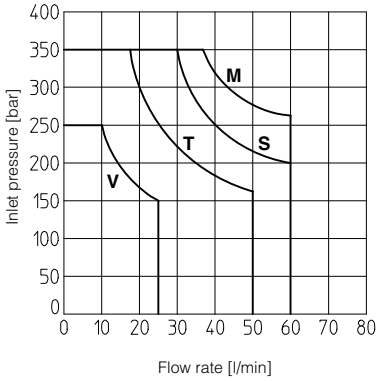
The diagrams have been obtained with warm solenoids and power supply at lowest value (V_{nom} - 10%). The curves refer to application with symmetrical flow through the valve (i.e. P→A and B→T). In case of asymmetric flow and if the valves have the devices for controlling the switching times the operating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

DHI



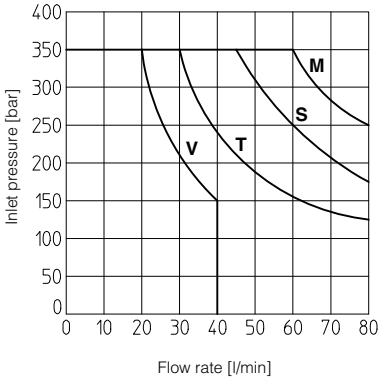
M = Spools 0, 1, 1/2, 8
S = Spools 0/2, 3, 6, 7
V = Spools 2, 2/2, *9, 9*
T = Spools 4, 5

DHU



M = Spools 0, 1, 1/2, 8
S = Spools 0/2, 3, 6, 7
V = Spools, 2, 2/2, *9, 9*
T = Spools 4, 5

DHO



M = Spools 0, 1, 1/2, 8.
S = Spools 0/2, 3, 6, 7.
V = Spools 2, 2/2, *9, 9*
T = Spools 4, 5.

9 SWITCHING TIMES (average values in msec)

DHI

Valve	Switch-on AC	Switch-on DC	Switch-off
DHI + SP-666 SP-667	30	45	20
DHI + SP-669	45	—	80
DHI + E-SD	30	45	50

DHU

Valve	Switch-on AC	Switch-on DC	Switch-off
DHU + SP-666 SP-667	—	45	20
DHU + SP-669	45	—	80
DHU + E-SD	—	45	50
DHU-*/L1	—	60	60
DHU-*/L2	—	80	80
DHU-*/L3	—	110	150

DHO

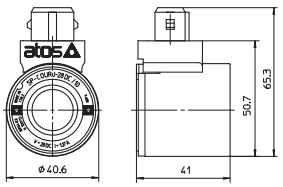
Valve	Switch-on AC	Switch-on DC	Switch-off
DHO + SP-666 SP-667	—	50	20
DHO + SP-669	50	—	80
DHO + E-SD	—	50	50
DHO-*/L1	—	60	60
DHO-*/L2	—	80	80
DHO-*/L3	—	150	150

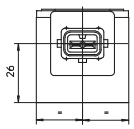
Test conditions:

- 36 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.

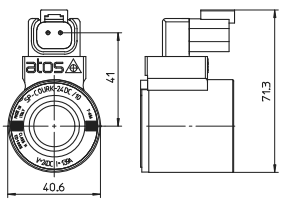
10 COILS TYPE COU* and COUR* WITH SPECIAL CONNECTORS (only for DHI and DHU)

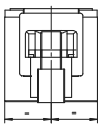




Options -XJ

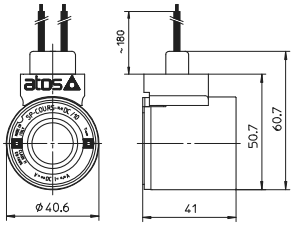
Coil type SP-COUJ, SP-COURJ
AMP Junior Timer connector
Protection degree IP67

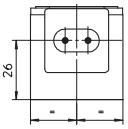




Options -XK

Coil type SP-COURK
(not available for COU)
Deutsch connector
DT-04-2P male
Protection degree IP67



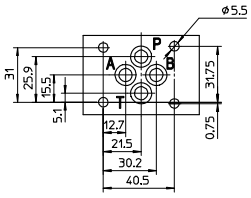


Options -XS

Coil type SP-COUS, SP-COURS
Lead Wire connection
Cable lenght = 180 mm

Note: The above coils are available only for voltage supply 12, 14, 24 and 28 VDC. For the characteristics refer to standard coils features - see sect. 6

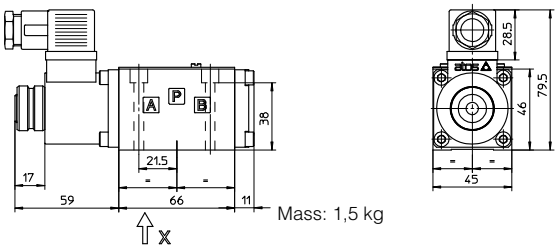
11 DIMENSIONS [mm]



ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts:
4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max).

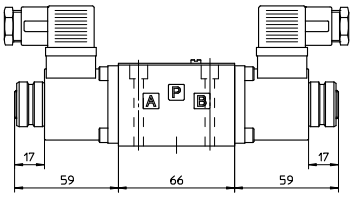
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
For the max pressures on ports, see section 4

DHI-06



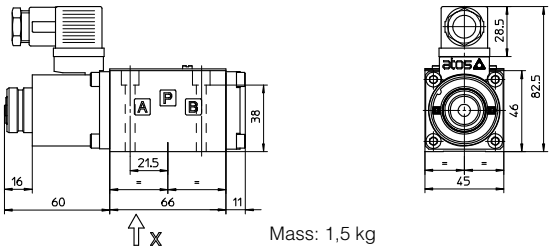
Mass: 1,5 kg

DHI-07



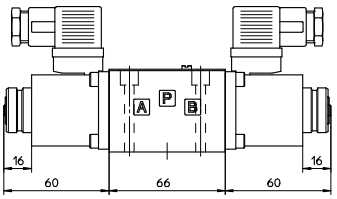
Mass: 1,8 kg

DHU-06



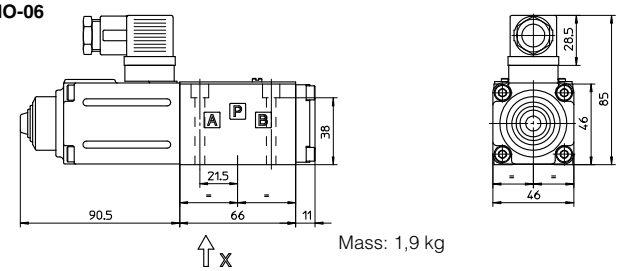
Mass: 1,5 kg

DHU-07



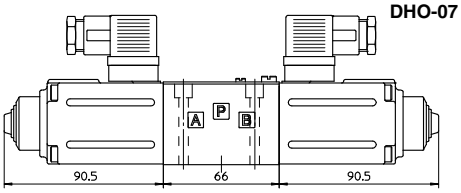
Mass: 1,8 kg

DHO-06



Mass: 1,9 kg

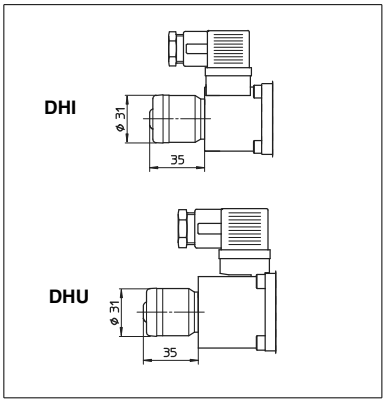
DHO-07



Mass: 2,6 kg

Overall dimensions refer to valves with connectors type SP-666

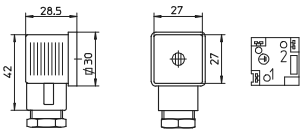
12 OPTION /WP (for DHI and DHU)



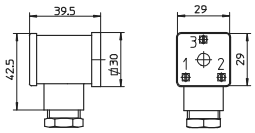
13 ELECTRIC CONNECTORS ACCORDING TO DIN 43650

The connectors must be ordered separately

SP-666, SP-667 (for AC or DC supply)



SP-669 (for AC supply)



CONNECTOR WIRING	
SP-666, SP-667	**SP-669**
1 = Positive ⊕ 2 = Negative ⊖ ⏚ = Coil ground	1,2 = Supply voltage VAC 3 = Coil ground

SUPPLY VOLTAGES		
SP-666	**SP-667**	
All voltages	24 AC or DC	110/50 AC
	110 AC or DC	110/60 AC
	220 AC or DC	230/50 AC
		230/60 AC

Note: for electronic connectors type **E-SD**, see tab. K500

14 MOUNTING SUBPLATES

Model	Ports location	GAS Ports A-B-P-T	Ø Counterbore [mm] A-B-P-T	Mass [kg]
BA-202	Ports A, B, P, T underneath;	3/8"	–	1,2
BA-204	Ports P, T underneath; ports A, B on lateral side	3/8"	25,5	1,8
BA-302	Ports A, B, P, T underneath	1/2"	30	1,8

The subplates are supplied with 4 fastening bolts M5x50. Also available are multi-station subplates and modular subplates. For further details see table K280.