

- Valve for limiting a system pressure
- Actuation via proportional solenoids
- For subplate mounting or sandwich plate design
- Valve and control electronics from a single source
- Types HD-DBEE and HD-ZDBEE with integrated control electronics:
  - Low example spread of the command value pressure characteristic curve
  - Independently adjustable up and down ramps

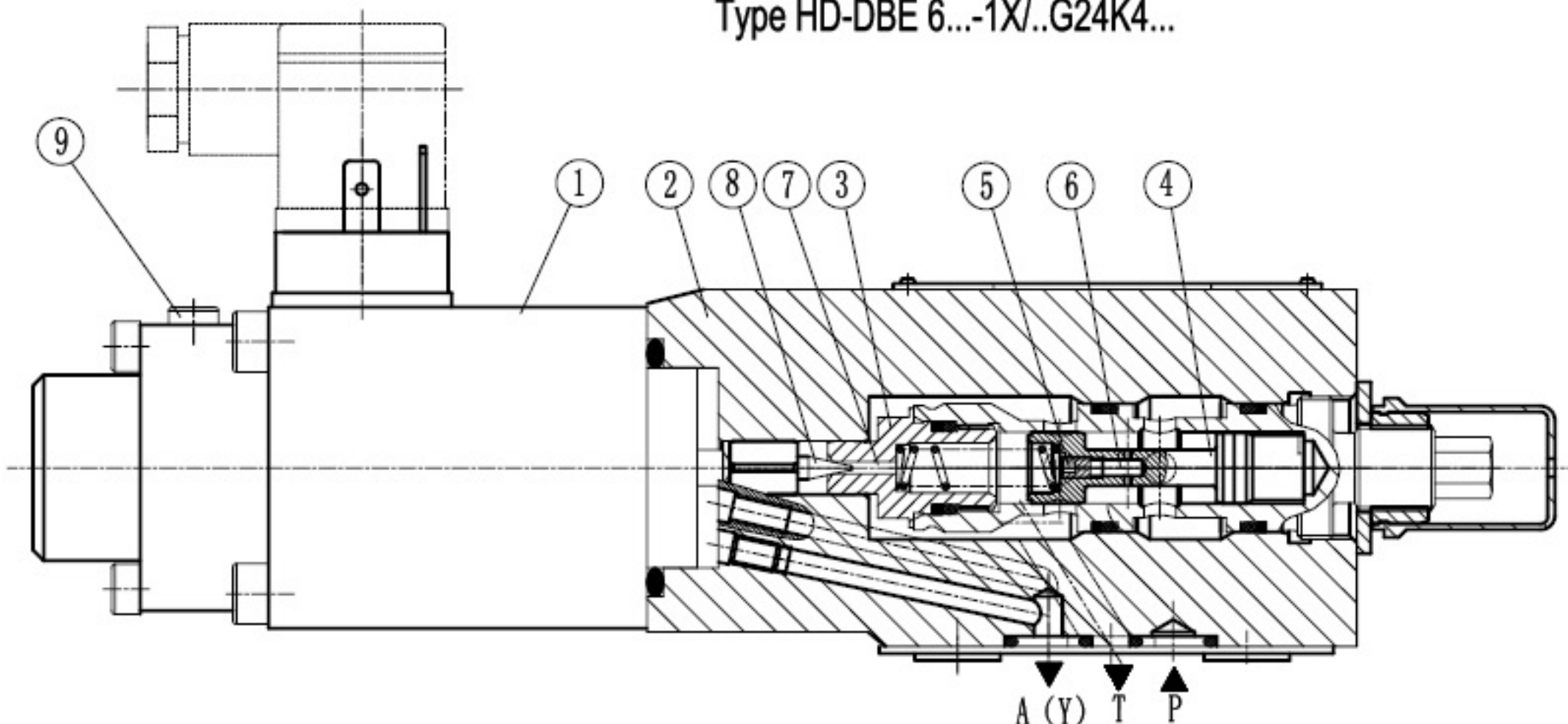


## Function, section

Proportional pressure relief valves, types HD-DBE and HD-ZDBE are actuated by means of a proportional solenoid. These valves are used to limit a system pressure. With these valves it is possible to steplessly adjust the system pressure, which is to be limited, in relation to the electrical command value.

These valves basically consist of a proportional solenoid (1), the housing (2), the valve cartridge (3), the spool (4) and the pilot poppet (8). The proportional solenoid converts the electrical current proportionally into a mechanical force. An increase in current causes a corresponding rise in the solenoid force. The solenoid armature chamber is filled with hydraulic fluid and is pressure-balanced. The setting of the system pressure is carried out via the proportional solenoids (1) in relation to the command value. Pressure arising from the system in port P acts on the right hand side of the spool (4). At the same time the system pressure acts via the control line (6) which is fitted with an orifice (5) on the spring loaded side of the spool (4). Via a further orifice (7) the system pressure acts on the pilot poppet (8) against the force of the proportional solenoid (1). Once the system pressure has reached the pre-set value the pilot poppet (8) lifts from its seat. Depending on the model, pilot oil can now flow away externally via port A (Y) or internally into the tank, this has the effect of limiting the pressure on the spring loaded side of the spool (4). If the system pressure continues to rise slightly then the higher pressure on the right hand side of the spool pushes the spool to the left into control position P to T. At a minimum control current - corresponding to a command value of zero - the minimum settable pressure will be set.

**Type HD-DBE 6...-1X/..G24K4...**

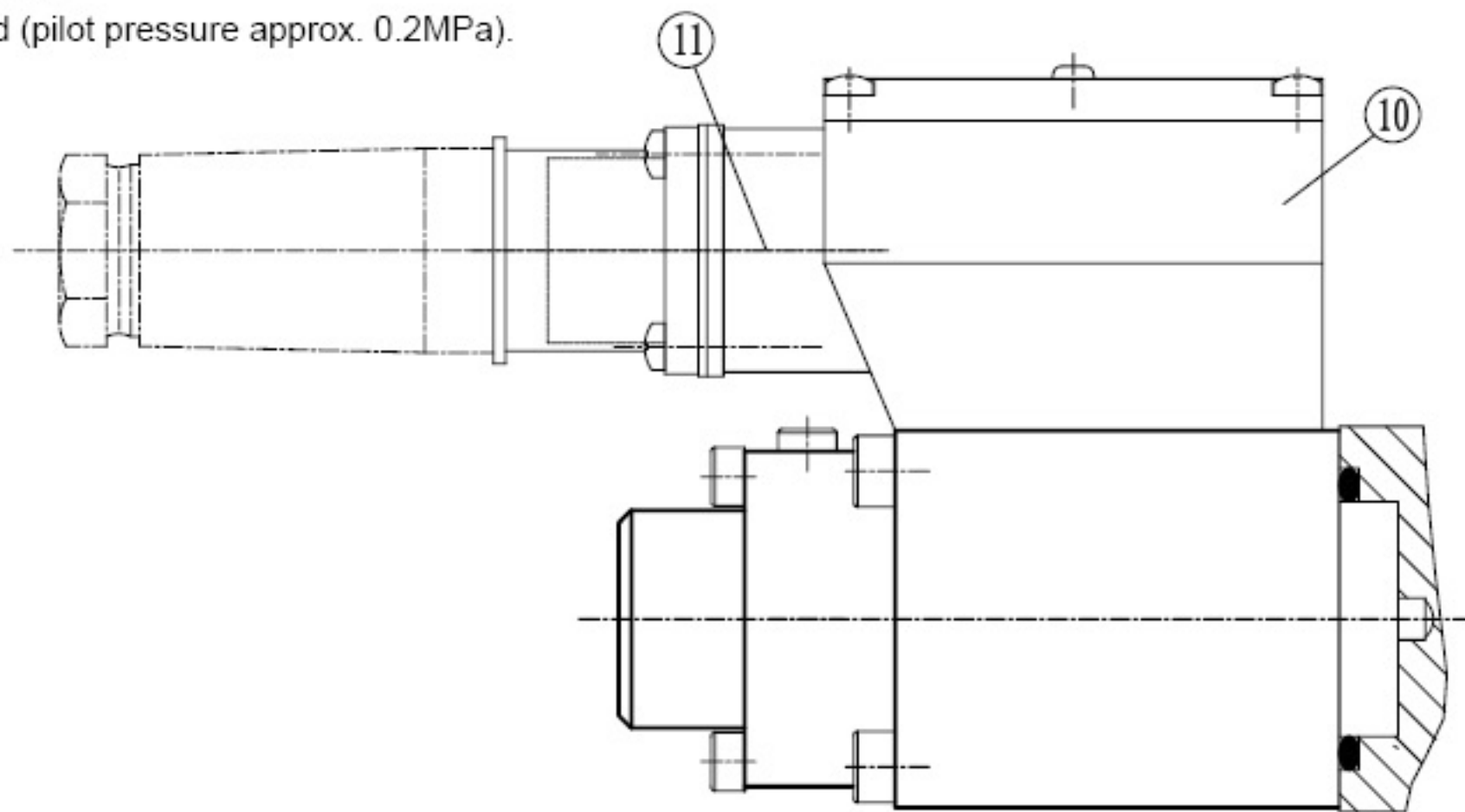


## Function, section

### Note!

To ensure optimum function, the valve must be bled at the commissioning stage:

- Remove bleed screw (9),
- Pour hydraulic fluid into the open threaded hole 9,
- When no more bubbles appear, re-fit screw.
- The tank should be prevented from draining. Where installation conditions are applicable a back pressure insert should be used (pilot pressure approx. 0.2MPa).



In terms of function and design these valves basically correspond to the types DBE and ZDBE.

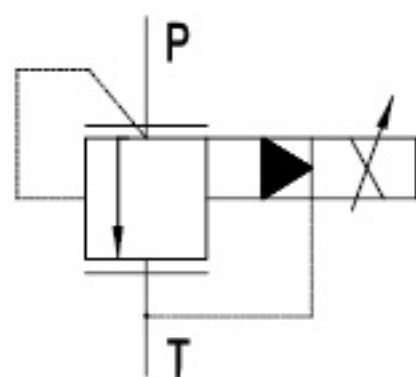
An additional housing (10) is fitted on the proportional solenoid which contains the control electronics. Supply and command value voltages are applied to the plug-in connector (11).

The command value pressure characteristic curve is factory pre-set (zero point at the valve cartridge (12) and the increase at the

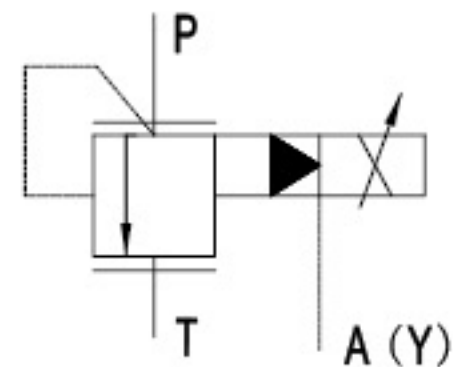
Imax potentiometer (R30) in the control electronics). At two potentiometers it is possible to independently adjust the ramp times for the increase and decrease in pressure. For further details regarding the integrated electronics, see page afterwards.

## Symbols (for sandwich plate symbol: 1 = component side, 2 = subplate side)

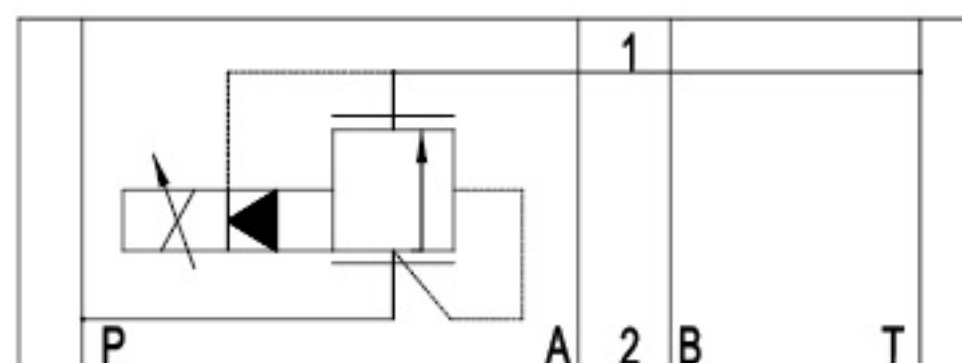
Type DBE(E) 6...



Type DBE(E) 6...Y..



Type ZDBE(E) 6 VP...



# Ordering details

HD DBE 6 — 1X / G24 \*

Technology of Beijing  
Huade Hydraulic =HD

Further details in clear text

Subplate mounting=No code  
Sandwich plate =Z

No code = NBR seals  
V = FKM seals

Proportional pressure relief valve

For external control electronics = No code  
With integrated control electronics = E

Electrical connection for DBE; ZDBE

K4= Without plug-in connector

Electrical connection For DBEE; ZDBEE

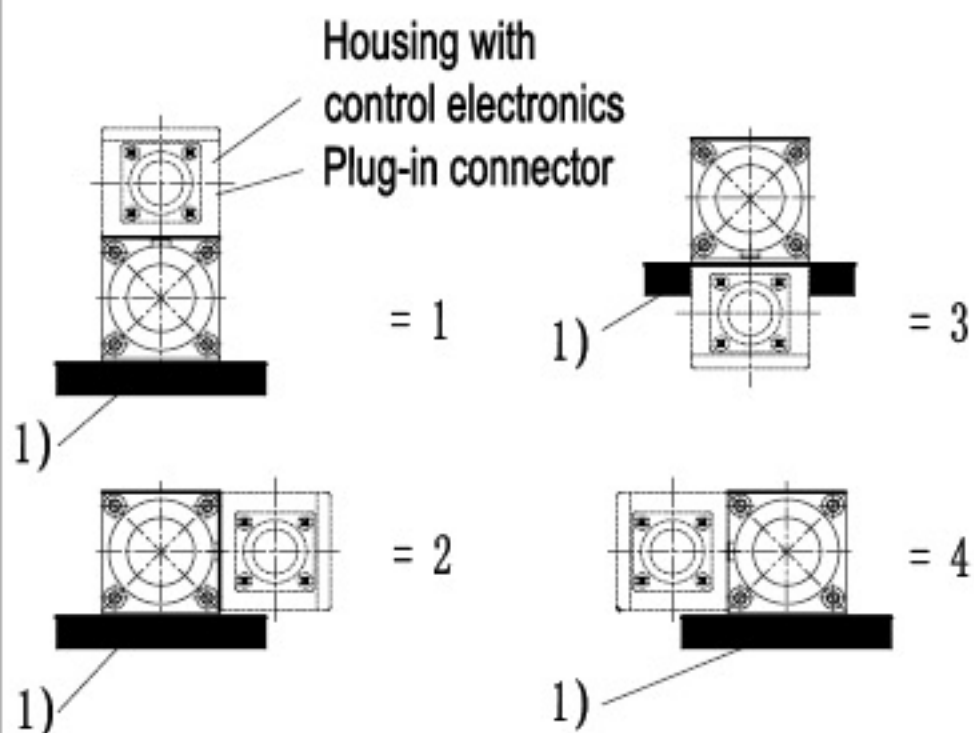
K31= Without plug-in connector

Nominal size 6 = 6

Subplate mounting valve = No code  
Sandwich plate P → T = VP

G24 = Supply voltage for  
the control electronics, 24 V DC

Position of the plug-in connector for the type ZDBE  
Position of housing with control electronics, type ZDBEE



1) Valve mounting side (O-ring grooves in the housing)

No code = Internal pilot oil drain  
(Recommendation: subplate mounting up to  
 $Q_{vmax} = 15$  L/min)  
Y= External pilot oil drain  
(only possible with subplate mounting)

50 = Pressure stage 5MPa  
100= Pressure stage 10MPa  
200= Pressure stage 20MPa  
315= Pressure stage 31.5 MPa

1X= Series 10 to 19  
(10 to19: unchanged installation and connection  
dimensions)

<b>Technical data (for applications outside these parameters, please consult us!)</b>			
General			
Installation			optional
Storage temperature range		°C	-20 to +80
Ambient temperature range	DBE and ZDBE	°C	-20 to +70
	DBEE and ZDBEE	°C	-20 to +50
Weight	DBE and ZDBE	Kg	2.4
	DBEE and ZDBEE	Kg	2.5
Hydraulic (measured at $v = 46 \text{ mm}^2/\text{s}$ and $t = 40^\circ\text{C} \pm 5^\circ\text{C}$ )			
Max. operating pressure	Ports P ; P1 - P2; A1 - A2; B1 - B2	MPa	31.5
	Port T	MPa	5
Max. settable pressure	Pressure stage 5	MPa	5
	Pressure stage 10	MPa	10
	Pressure stage 20	MPa	20
	Pressure stage 31.5	MPa	31.5
Min. settable pressure at signal value 0		MPa	see characteristic curves
Return pressure port A; with external pilot oil drain (Y)			separate and at zero pressure to tank
Pilot oil flow		L/min	0.6 to 1.2
Max. flow		L/min	30
Pressure fluid			mineral oil (HL, HLP) to DIN 51 524
			further pressure fluids on request!
Pressure fluid temperature range		°C	-20 to +80
Viscosity range		$\text{mm}^2/\text{s}$	15 to 380
Degree of contamination to ISO			Max. permissible degree of contamination of the fluid pressure to ISO 4406 (C) 20/18/15
Hysteresis		%	$\pm 1.5$ of maximum settable pressure
Repeatability		%	$\pm 2$ of maximum settable pressure
Linearity		%	$\pm 3.5$ of maximum settable pressure
Example spread of the com. value pressure char. curve, referring to the hysteresis char. curve, pressure increasing	DBE and ZDBE	%	$\pm 2.5$ of maximum settable pressure
	DBEE and ZDBEE	%	$\pm 1.5$ of maximum settable pressure
Step response $T_u + T_g$	10% $\rightarrow$ 90%	ms	approx. 80
	90% $\rightarrow$ 10%	ms	approx. 50
			depending on installation

**Technical data (for applications outside these parameters, please consult us!)**

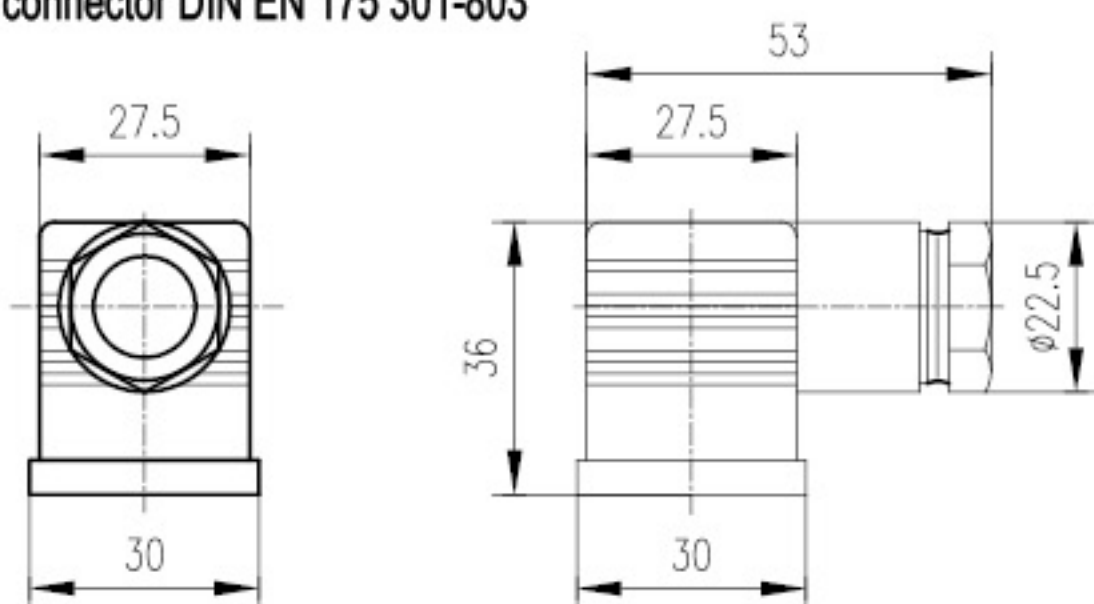
Electrical			
Voltage type			24V DC
Min. control current		mA	100
Max. control current		mA	1600
Solenoid coil resistance	Cold value at 20° C	Ω	5.4
	Max. warm value	Ω	7.8
Duty		%	100
Electrical connections	DBE and ZDBE		With component plug to DIN EN 175 301-803
			Plug-in connector to DIN EN 175 301-803 <sup>1)</sup>
	DBEE and ZDBEE		With component plug to E DIN 43 563-AM6-3
			Plug-in connector to E DIN 43 563-BF6-3 <sup>1)</sup>
Valve protection to DIN 40 050			IP 65
Control electronics			
For DBEE and ZDBEE			Integrated into the valve
For DBE and ZDBE			
Amplifier in Eurocard format	analogue		HD-VT-VSPA1-1-1X/ <sup>1)</sup>

1) separate order

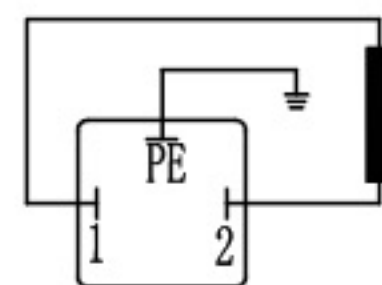
**Electrical connections**

For type DBE, ZDBE (for external control electronics)

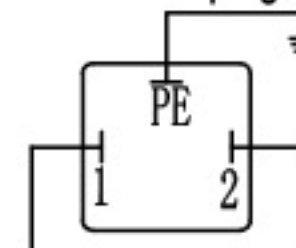
Plug-in connector DIN EN 175 301-803



Connections at component plug



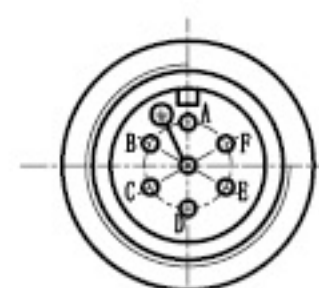
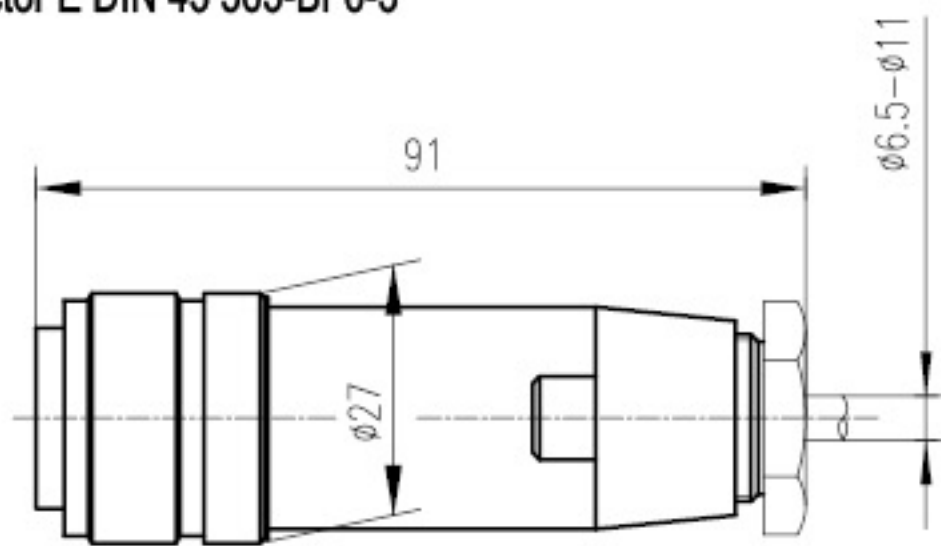
Connections at plug-in connector



To amplifier

For types DBEE, ZDBEE (with integrated control electronics)

Plug-in connector E DIN 43 563-BF6-3



## Integrated control electronics for types DBEE, ZDBEE

### Function:

The control of the integrated electronics is at the two differential amplifier ports D and E.

The ramp generator generates a delayed increase or decrease of the solenoid current from a command value jump (0 to 10 V or 10 to 0 V). At the potentiometer R14 the increase time of the solenoid current may be set and the decrease time at potentiometer R13.

The maximum ramp time of 5 s is only possible over the complete command value range. With smaller command value changes the ramp is shortened accordingly.

The command value-solenoid current characteristic curve is adjusted to the valve via the characteristic curve generator in such a way that nonlinearities are compensated for in the hydraulics and thus a linear command value-pressure characteristic curve is formed.

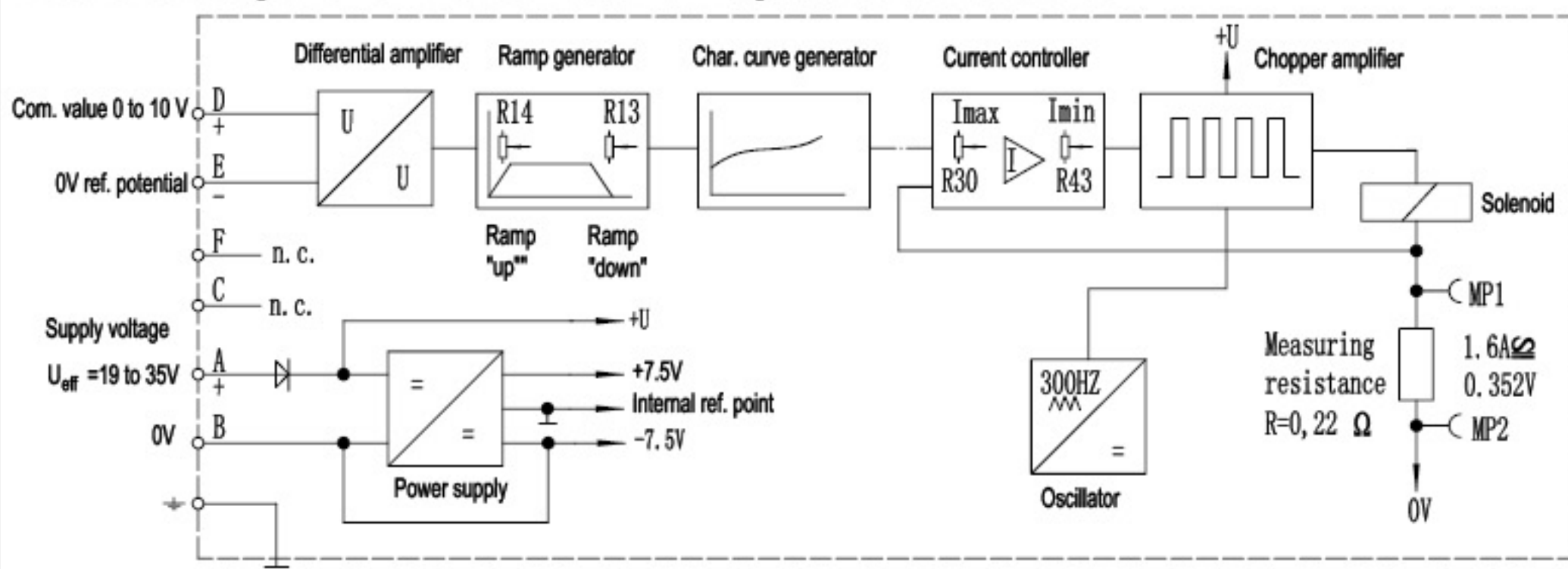
The current controller controls the solenoid current independent from the solenoid coil resistance.

At the potentiometer R30 the increase of the command value-current characteristic curve and thus also the increase of the command value-pressure characteristic curve of the proportional pressure valve may be altered. The potentiometer R43 is used for the setting of the bias current. This setting should not be altered. If necessary the zero point of the command value-pressure characteristic curve may be set at the valve seat.

The power stage of the electronics for the control of the proportional solenoid is formed by a chopper amplifier. It is pulse width modulated with a pulse frequency of 300 Hz.

The solenoid current may be measured at both test points MP1 and MP2. A voltage decrease of 0.352 V at the measuring resistance equals a solenoid current of 1.6 A.

### Block circuit diagram / Terminal connection of integrated control electronics



### Supply voltage

Power supply with rectification

One-phase rectification or three-phase bridge:  $U = 19$  to  $35$  V

Residual ripple factor at power supply:  $< 5\%$

Output current:  $I_{\text{eff}} = \text{max. } 1.4$  A

Supply cable: - Recommendation 5 core  $0.75$  or  $1$  mm with protective conductor and screen

- External diameter  $6.5$  to  $11$  mm

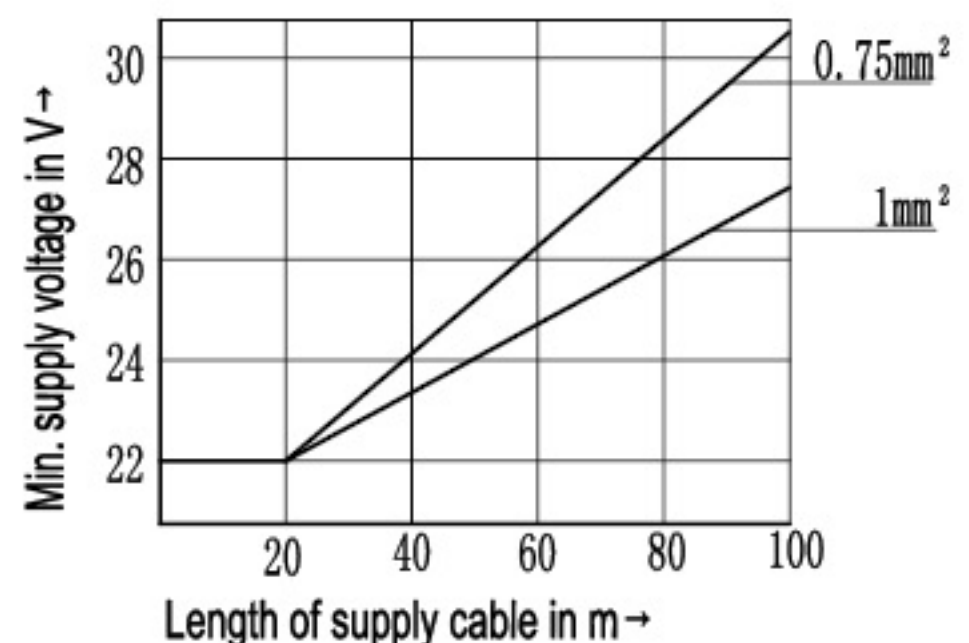
- Screen on  $0$  V supply voltage

- Max. permissible length  $100$  m

The minimum supply voltage at the power supply depends on the length of the supply cable (see diagram).

With lengths  $> 50$  m a capacitor of  $2200 \mu\text{F}$  must be installed near

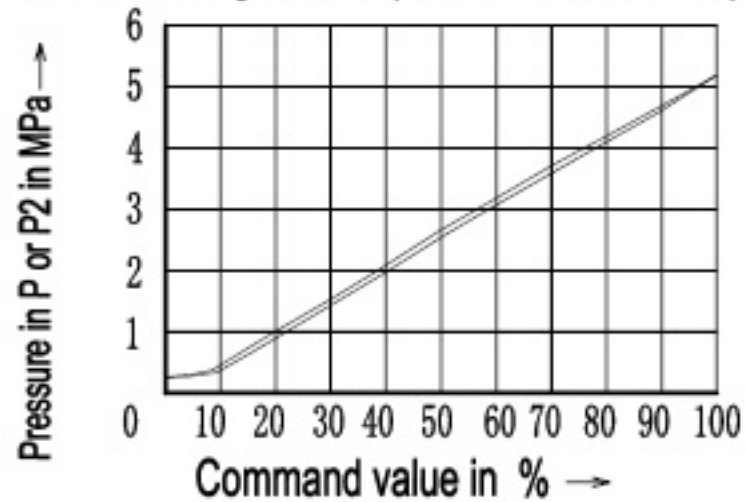
the valve in the supply line.



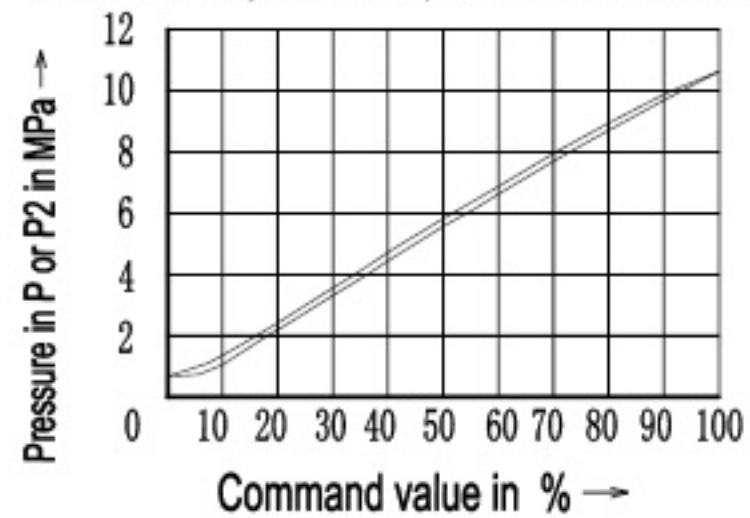
## Characteristic curves (measured at $v=46\text{mm}^2/\text{s}$ and $t=40^\circ\text{C}\pm 5^\circ\text{C}$ )

Pressure in ports P or P2 in relation to the command value ( $q_v = 5\text{ L/min}$ )

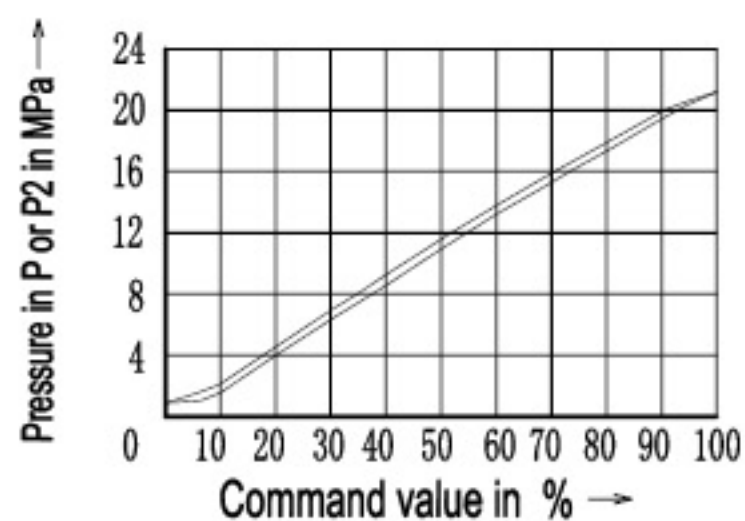
Pressure stage 5MPa (external and internal)



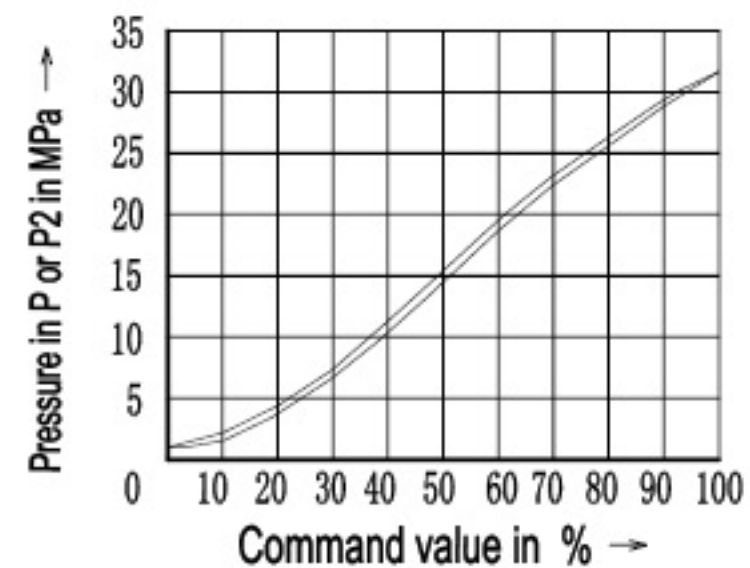
Pressure stage 10MPa (external and internal)



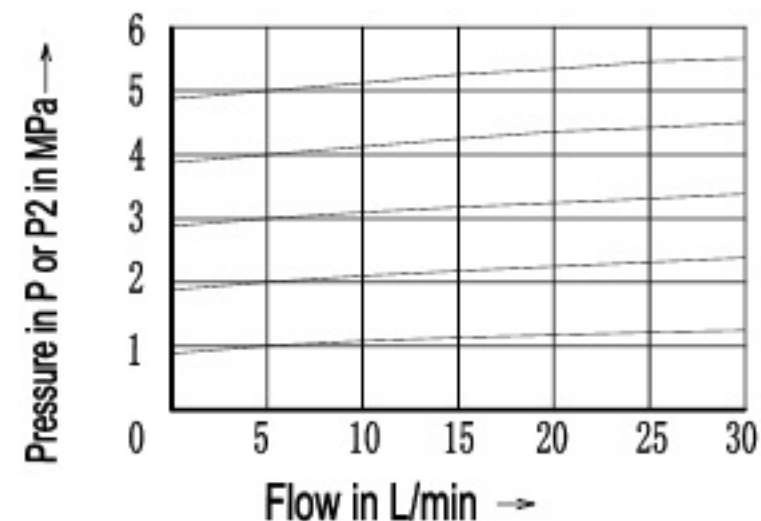
Pressure stage 20MPa (external and internal)



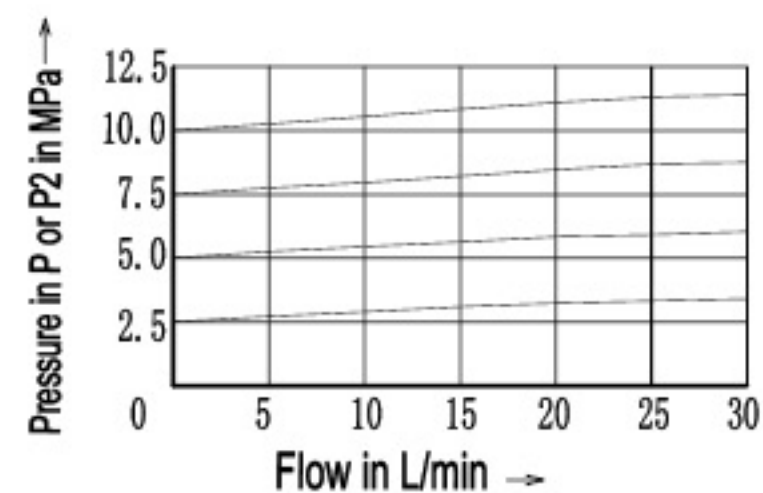
Pressure stage 31.5MPa (external and internal)



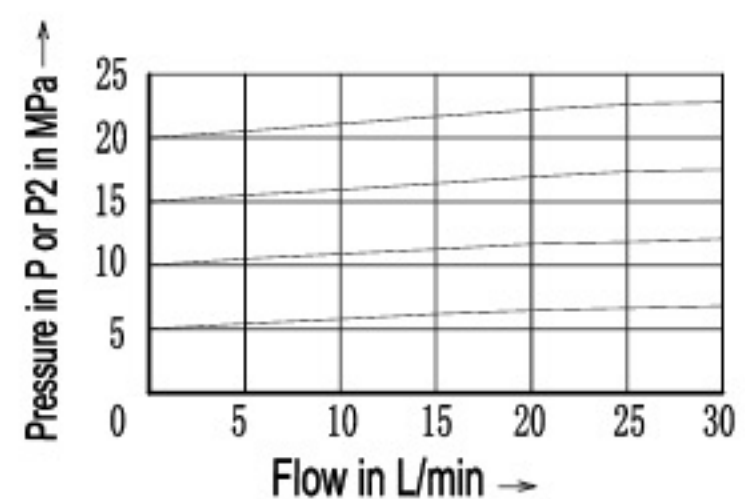
Pressure stage 5MPa (external and internal)



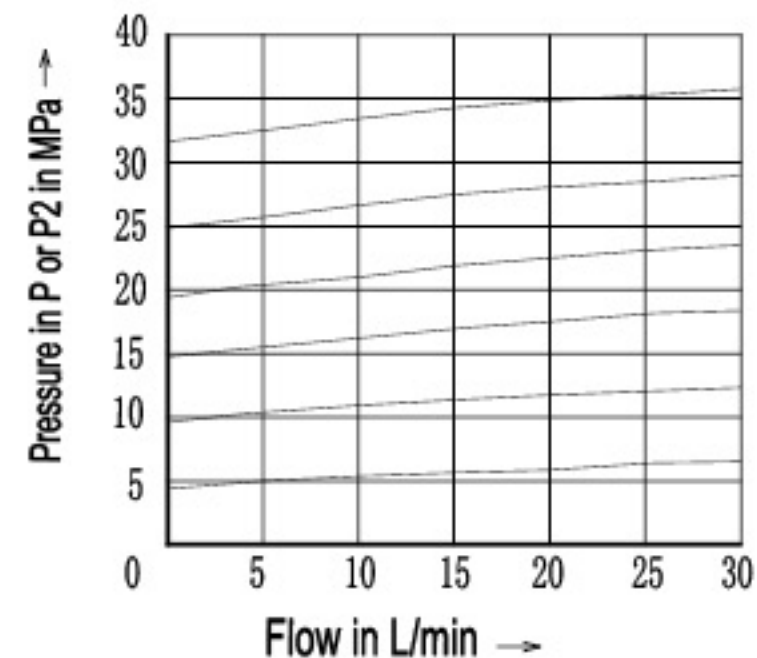
Pressure stage 10MPa (external and internal)



Pressure stage 20MPa (external and internal)



Pressure stage 31.5MPa (external and internal)

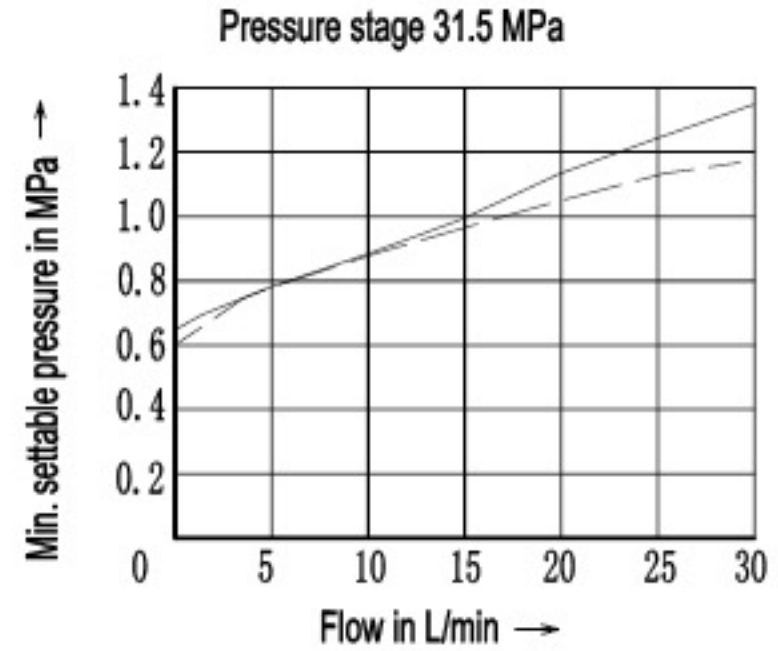
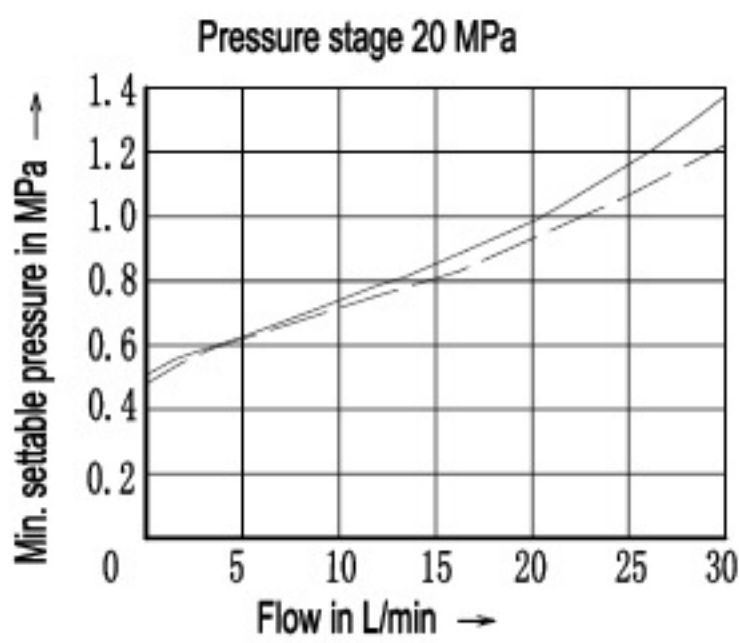
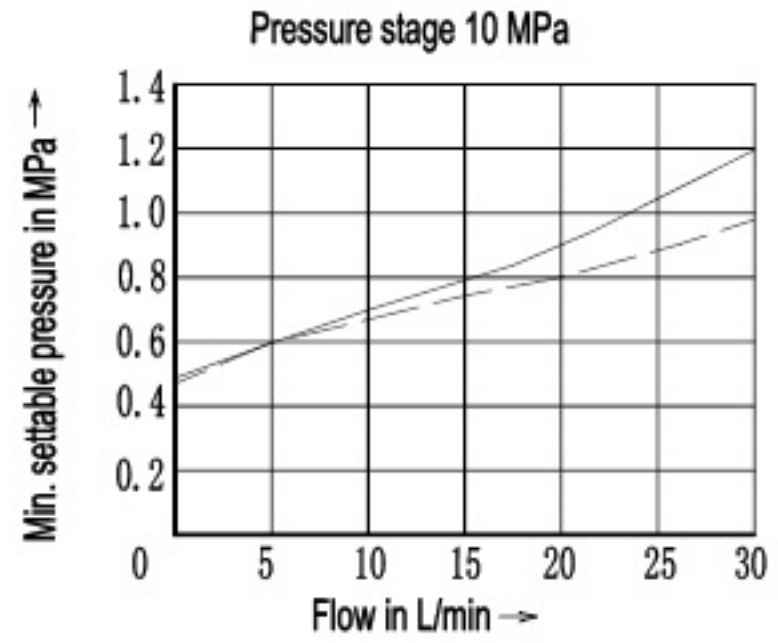
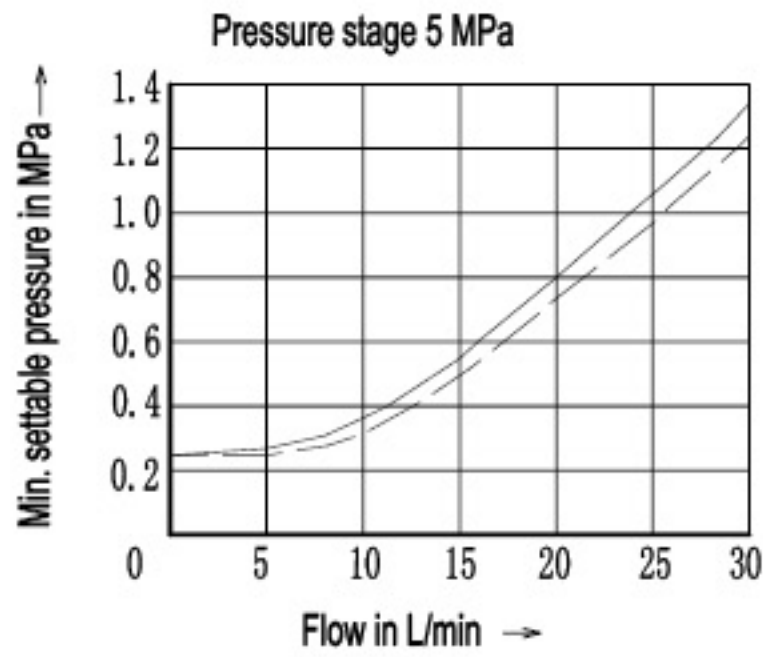


The characteristic curves were measured without back pressure at port A (external pilot oil drain) and T (internal pilot oil drain). With internal pilot oil drain the pilot oil drain increases the pressure in P or P2 by the amount acting in port T.

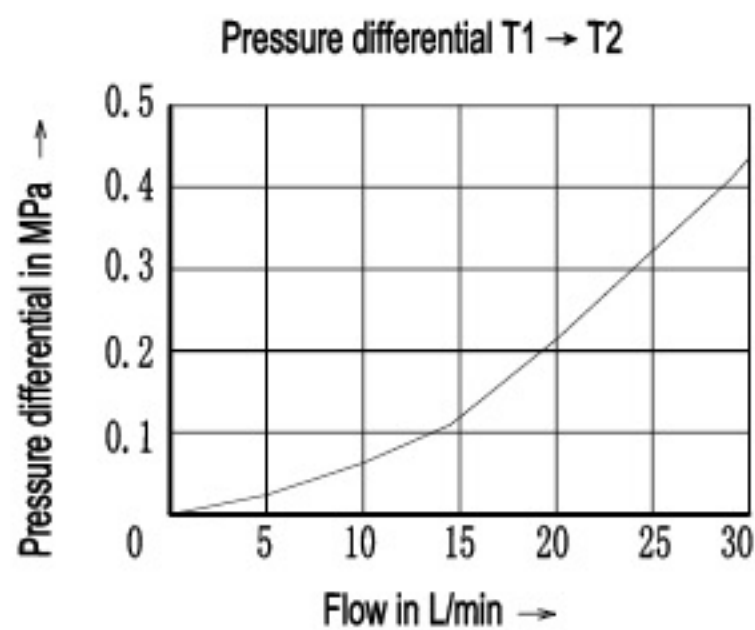
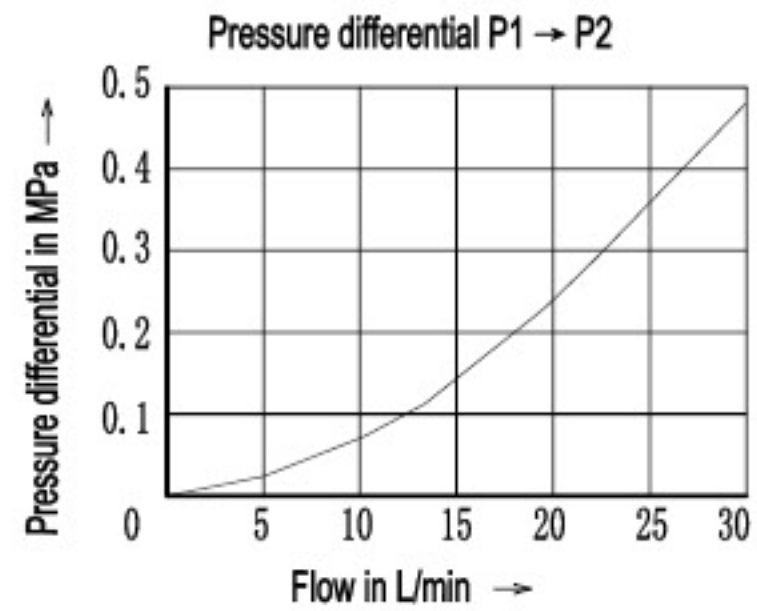
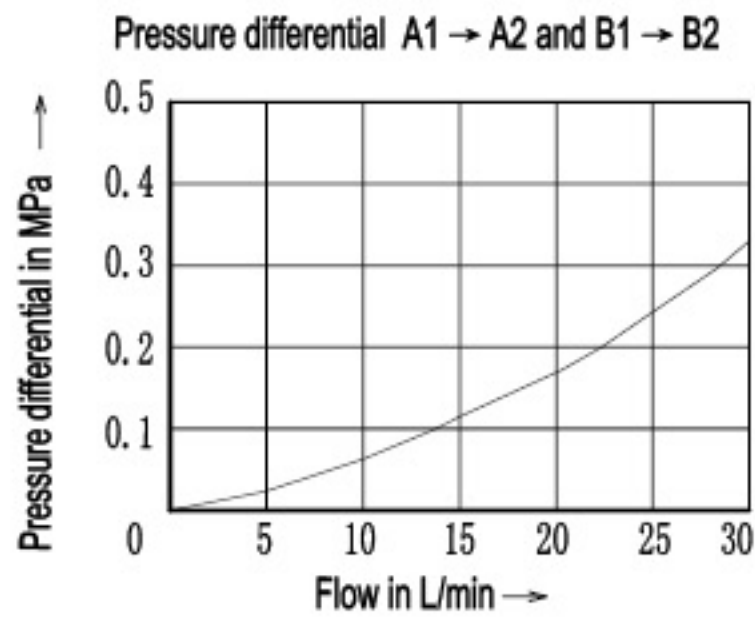
# Characteristic curves (measured at $v=46\text{mm}^2/\text{s}$ and $t=40^\circ\text{C}\pm 5^\circ\text{C}$ )

Min. settable pressure at port P or P2 with a 0 command value

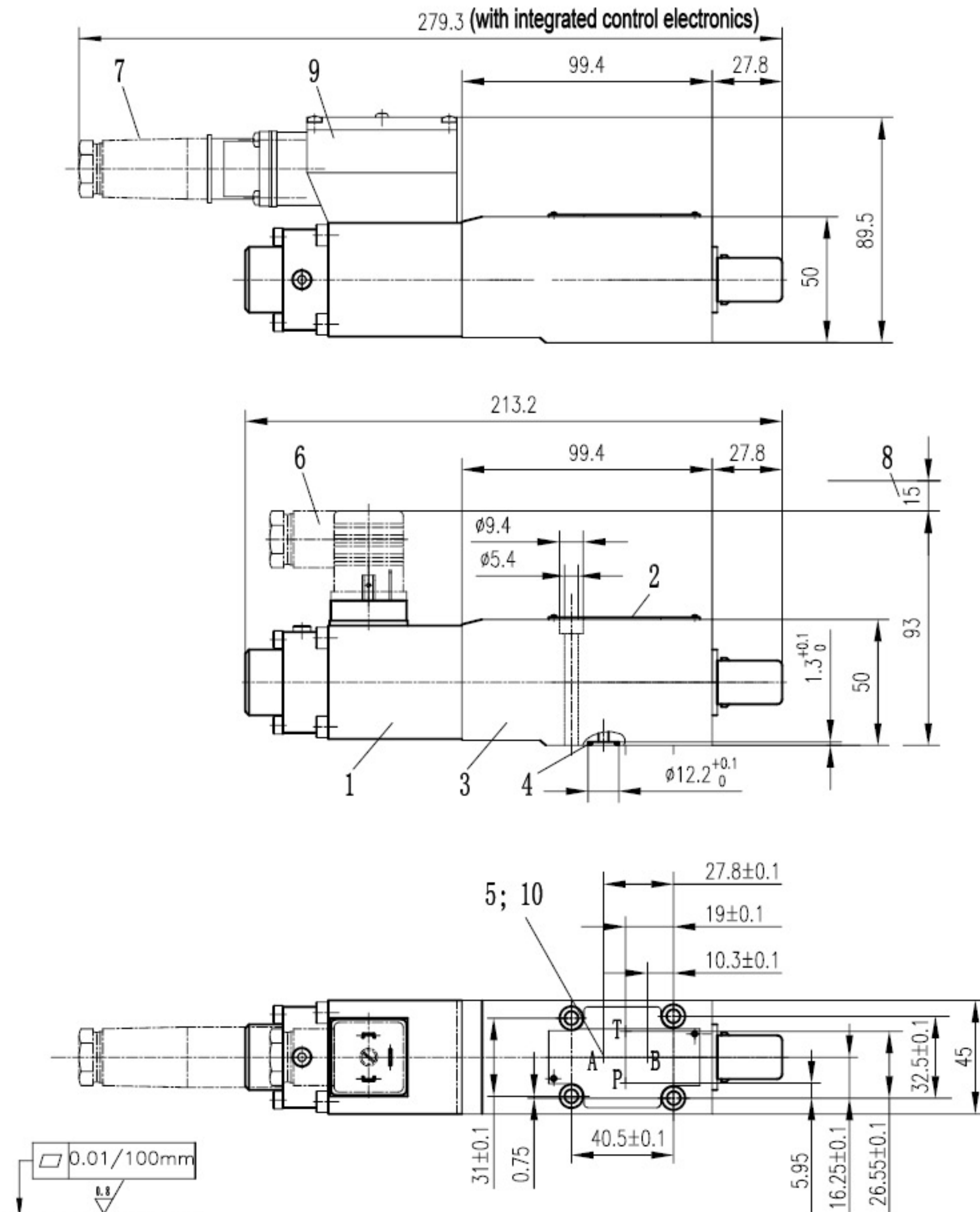
先导油排放 — 内排 --- 外排



The characteristic curves were measured without back pressure at port A (external pilot oil drain) and T (internal pilot oil drain). With internal pilot oil drain the pilot oil drain increases the pressure in ports P or P2 by the amount acting on port T.





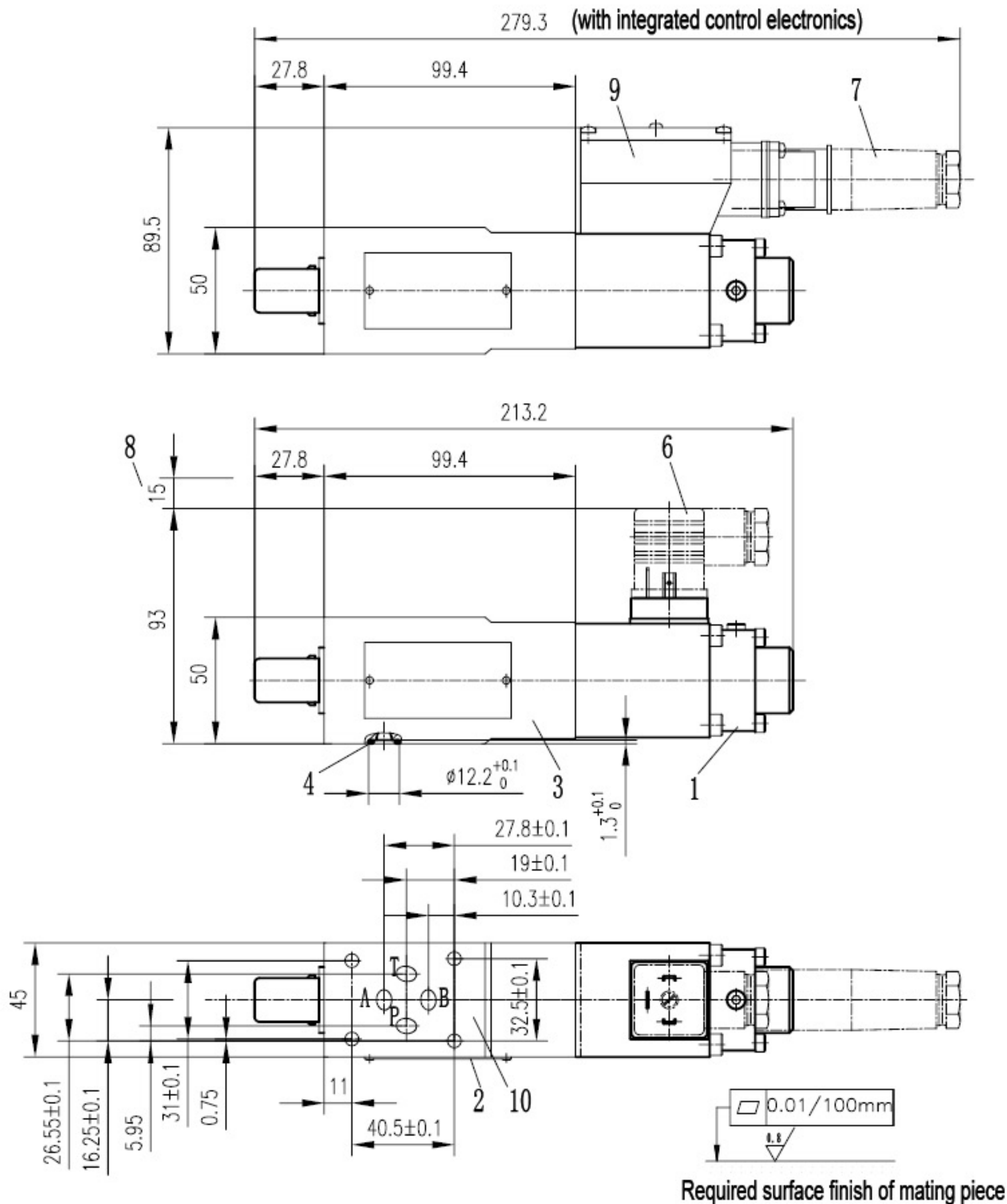


**Required surface finish of mating piece**

- |   |  |    |  |
|---|--|----|--|
| 1 | Proportional solenoid                                    | 8  | Space required to remove plug-in connector                   |
| 2 | Nameplate  | 9  | Integrated control electronics                               |
| 3 | Valve housing  | 10 | Porting pattern to DIN 24 340                                |
| 4 | O-rings 9.25 x 1.78( for ports A, B, P and T)            |    |  |
| 5 | Pilot oil drain for version Y is external via port A (Y) |    | Subplates and valve fixing screws must be ordered separately |
| 6 | Plug-in connector<br>(separate order)                    |    | Subplates: G 341/01 (G 1/4")                                 |
| 7 | Plug-in connector<br>(separate order)                    |    | G 342/01 (G 3/8")  |
|   |  |    | G 502/01 (G 1/2")  |
|   |  |    | Valve fixing screws: 4-M5(GB/T70.1); $M_A = 7 \text{ Nm}$    |

Unit dimensions: types HD-DBE and HD-DBEE

(Dimensions in mm)



- |   |  |    |  |
|---|--|----|--|
| 1 | Proportional solenoid                        | 10 | Porting pattern to DIN 24 340                                |
| 2 | Nameplate                                    |    | Subplates and valve fixing screws must be ordered separately |
| 3 | Valve housing                                |    | Subplates: G 341/01 (G 1/4")                                 |
| 4 | O-rings 9.25 x 1.78(for ports A, B, P and T) |    | G 342/01 (G 3/8")  |
| 6 | Plug-in connector (separate order)           |    | G 502/01 (G 1/2")  |
| 7 | Plug-in connector (separate order)           |    | Valve fixing screws: 4-M5 (GB/T70.1); $M_A = 7 \text{ Nm}$   |
| 8 | Space required to remove plug-in connector   |    |  |
| 9 | Integrated control electronics               |    |  |

## Notice

### Notice

1. The fluid must be filtered. Minimum filter fineness is 20  $\mu\text{m}$ .
2. The tank must be sealing up and an air filter must be installed on air entrance.
3. Products without subplate when leaving factory, if need them, please ordering specially.
4. Valve fixing screws must be high intensity level (class 10.9). Please select and use them according to the parameter listed in the sample book.
5. Roughness of surface linked with the valve is required to  $\frac{0.8}{\sqrt{\text{mm}}}$ .
6. Surface finish of mating piece is required to 0.01/100mm.