DENISON HYDRAULICS

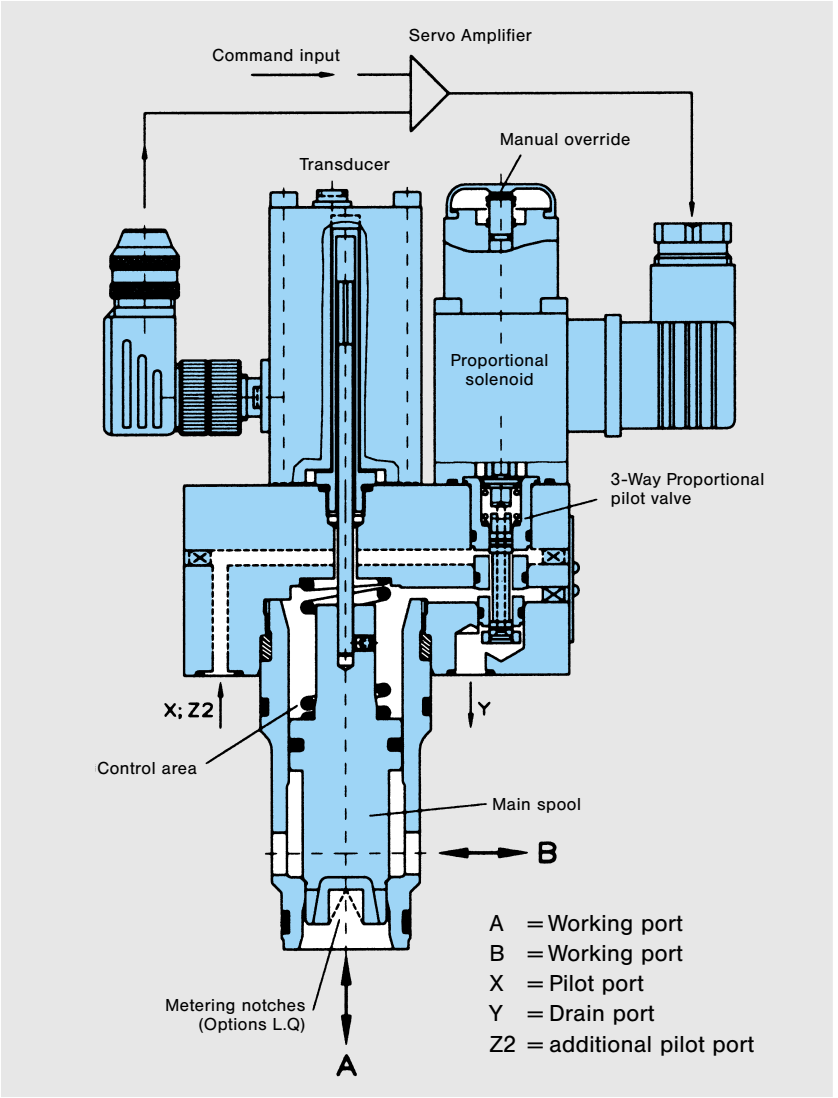
Proportional Throttle Valves – Cartridge Type
Cavity according to DIN 24342
Series C1FP

Publ. 5–EN 4300–A, replaces 5–EN 430–C

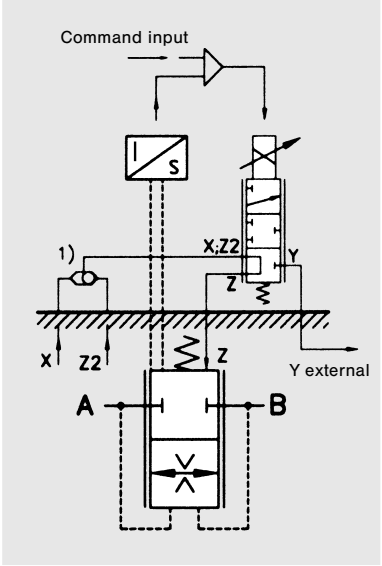
DENISON Hydraulics

FEATURES

- Electro-proportional flow control valve with flow control from A to B or B to A.
- Installation according to DIN 24342.
- No leakage across seat or poppet with valve closed.
- Self-correcting closed loop.
- Four different pilot oil options within DIN cover.
- Fail-safe operation provided with appropriate pilot oil option (internal or external pilot oil). Poppet closes on power failure.
- 20 % of the poppet stroke has positive overlap (no flow).
- Low hysteresis, high repeatability.
- C1FP proportional flow control in combination with a suitable pressure compensator ensures load independent flow control (PC Flow Control).
- Valve and electronics from one supplier ensures optimal performance.
- Infinite variable motion control provides optimum machine cycles.
- Each valve is factory tested prior to delivery.
- Increased system efficiency.
- For applications such as injection molding, die casting, metal and rubber presses.
- Worldwide DENISON service.



SYMBOL



1) Shuttle valve for flow in both directions (is only available in cover code D).

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GENERAL

The 2-port Proportional Flow Control Valve C1FP is a hydraulic pilot operated orifice, whose aperture corresponds to an electronic command signal.

An LVDT monitors the main poppet position. Any variation between the command signal and the required poppet position is corrected, thus ensuring high repeatability and almost hysteresis-free operation (see pages 12 and 13). Decreasing pilot pressure in Z results in opening of the main poppet. Increasing pilot pressure forces the spring-loaded poppet towards the closed position, thus reducing the aperture.

Sleeve, poppet and cover, together with the pilot valve and LVDT, form a complete unit. Installation and mounting are according to DIN 24342.

SAFETY

With no command signal applied (O-Position), sleeve and poppet provide the function of a poppet valve. A seal prevents leakage from pilot are Z to port B across the poppet guide. The characteristics of the design provide "Fail-Safe" performance in case of power failure or cable breakage, as well as maintaining load pressures without leakage (e.g. suspended loads on presses).

FLOW CHARACTERISTICS

Flow from A→B as well as B→A is possible. The range of main poppet metering notches allow a choice of "flow/command" characteristic. The flow characteristics for option "L" are linear and for option "Q" are progressive (see graph pages 6 . . . 9).

GENERAL

• Type of unit	Proportional Throttle Valve with position feedback
• Mounting position	Optional
• Flow direction	A→B; B→A
• Ambient temperature range	– 10 . . . + 50 °C
• Power failure condition	Wire breakage or power failure cause main poppet to close (fail-safe-position) blocking flow leakfree in both directions.

HYDRAULIC CHARACTERISTICS

• Max. operating pressure	A, B, X, Z2 = 350 bar, Y = 100 bar
• Min. inlet pressure in A:	A→B = 12 bar
in B:	B→A = 15 bar
• Cracking pressure in A:	A→B = 3.6 bar
in B:	B→A = 4.5 bar
• Fluid	Mineral oil according to DIN 51524/25 (other fluids on request)
• Contamination level	Fluid must be cleaned before and continuously during operation by filters that maintain a cleanliness level of NAS 1638 Class 8 (Class 9 for 15 Micron and smaller). This approximately corresponds to ISO 17/14.
• Fluid temperature range	– 18 . . . + 80 °C
• Viscosity range	10 . . . 650 cSt; optimal 30 cSt

• max. flow A→B (at Δ p = 10 bar)	C1FP 05	C1FP 08	C1FP 10	C1FP 12
– linear (L)	200 l/min	400 l/min	640 l/min	880 l/min
– progressive (Q)	120 l/min	210 l/min	300 l/min	380 l/min

• Pilot control				
– Pilot oil (max. dynamic)	min. 3 l/min at px 100 bar			
	C1FP 05	C1FP 08	C1FP 10	C1FP 12
– Pilot volume (100 % stroke)	2.1 cm^3	4.6 cm^3	8.2 cm^3	12.7 cm^3
– Leakage X→Y	max. 350 cm^3/min at 100 bar and 30 cSt			

• Pilot oil inlet	Depending on main flow direction from A, B or X external (Code C) or from A & B (Code D). Note: Consider pilot valve leakage with internal pilot at fail safe position.
• Pilot drain	External Y
• Hysteresis	< 1 %
• Repeatability	< 1 %

ELECTRIC CHARACTERISTICS (SOLENOID)

• Nominal voltage	12 V DC
• Coil resistance R20 (cold Start 20 °C)	3.4 Ω +/– 5 %
• Working current	1000 mA
• Max. current (peak)	3000 mA
• Relative operating period	100 %
• Max. coil temperature	+ 155 °C (temp. class F)
• Dither current	PWM 5 kHz
• Type of protection (DIN 40500)	IP 65 (IEC 14434/5)

TRANSDUCER CHARACTERISTICS

• Supply voltage Us	+ 20 . . . 28 V DC (from servo amplifier)
• Permissible ripple from Us	≦ 5 %
• Max. current consumption Is	≦ 40 mA
• Output signal	4 . . . 20 mA
• Sensitivity	2 mA/mm
• Measuring stroke	8 mm

ORDERING CODE

Model number C1FP .. . . A . .

Series

Size
05 = NG 16
08 = NG 25
10 = NG 32
12 = NG 40

Flow characteristics
L = linear
Q = progressive

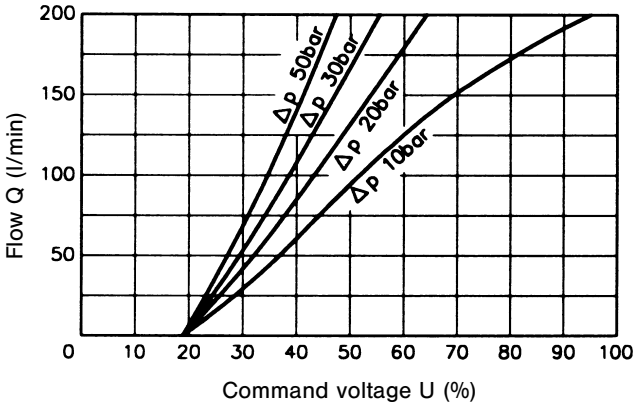
Control cover
C = Standard
D = with shuttle valve in X and Z2 (not for NG 16)

Design letter
A = original

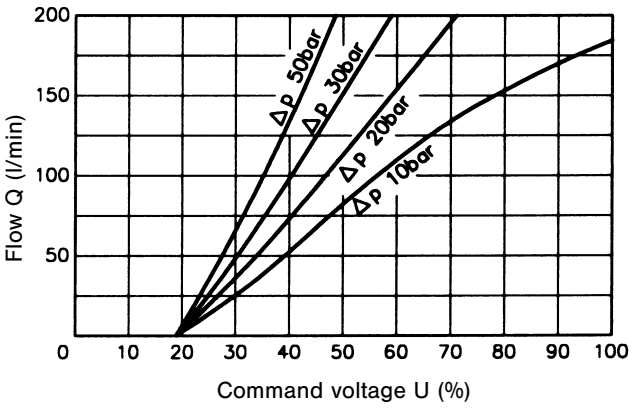
Seal class
1 = NBR-seals
5 = FPM-seals (Viton®)

Modifications

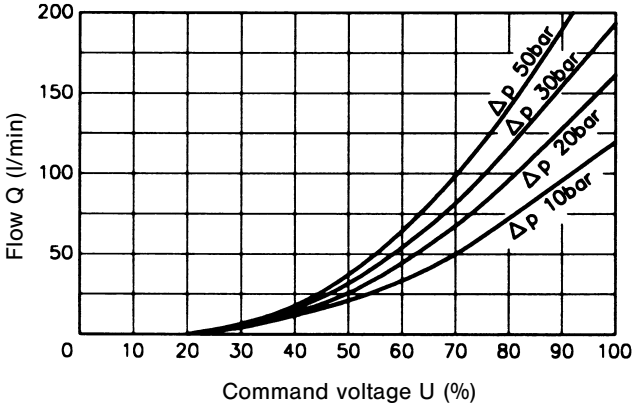
Flow characteristics linear A→B



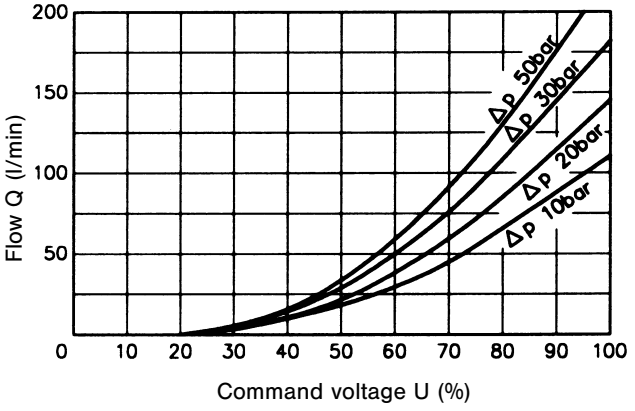
Flow characteristics linear B→A



Flow characteristics progressive A→B



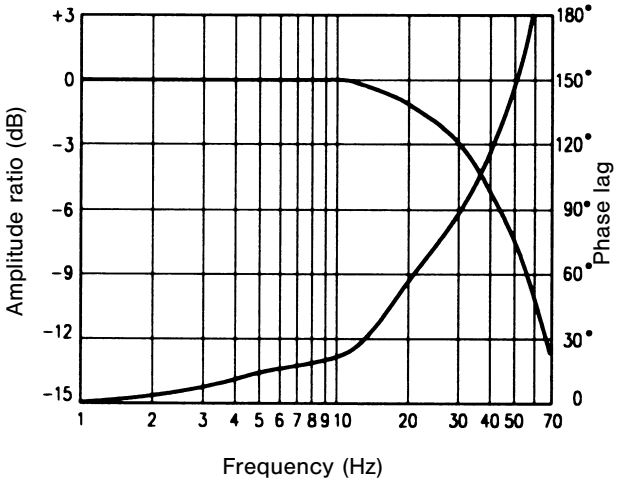
Flow characteristics progressive B→A



Frequency

for A, B and X = 50 bar

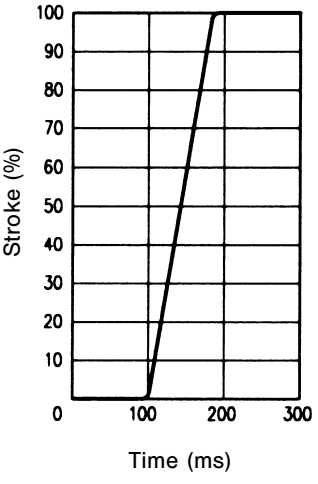
Signal 50 % ± 10 %



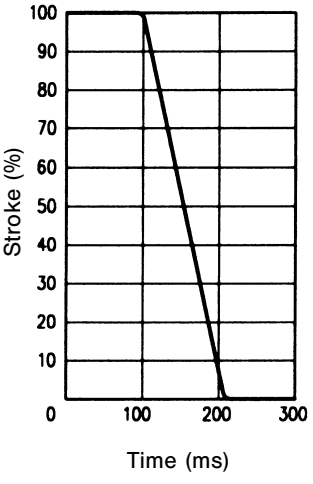
Response time

for A and X = 20 bar; B = 10 bar

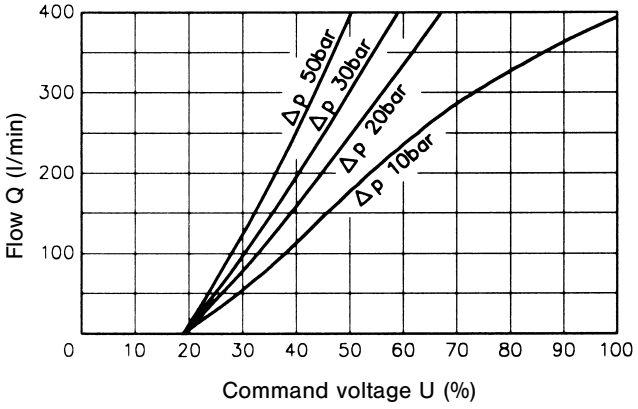
Open



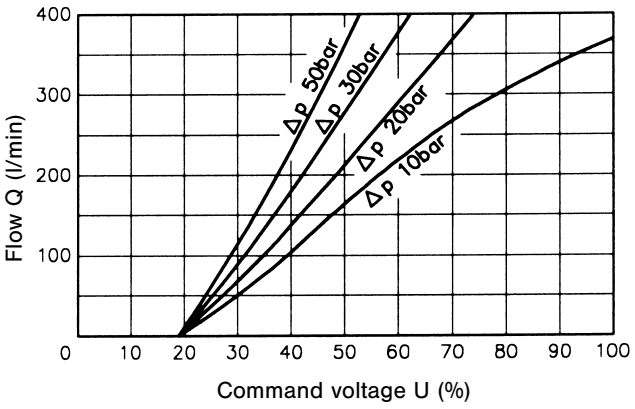
Close



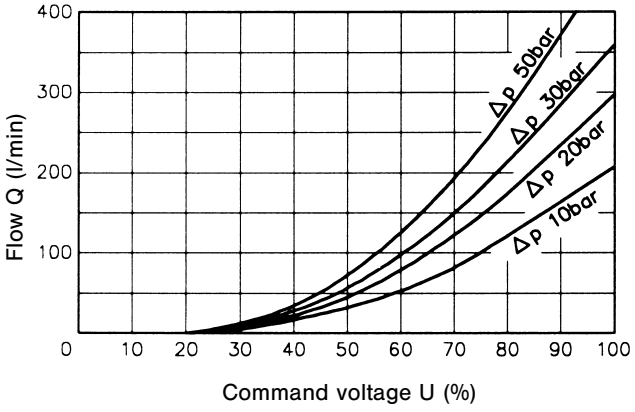
Flow characteristics linear A→B



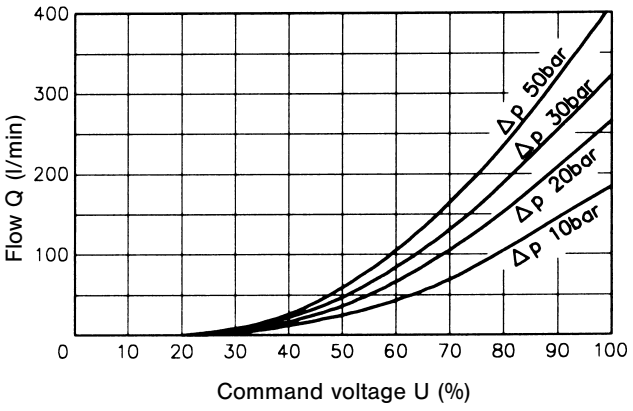
Flow characteristics linear B→A



Flow characteristics progressive A→B



Flow characteristics progressive B→A



Frequency

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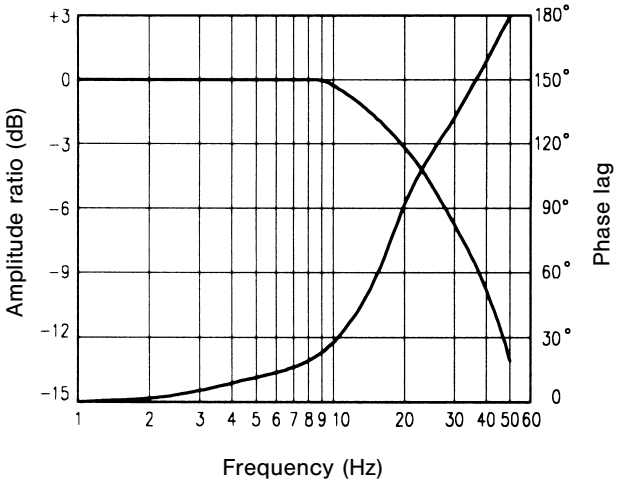
Signal 50 % ± 10 %

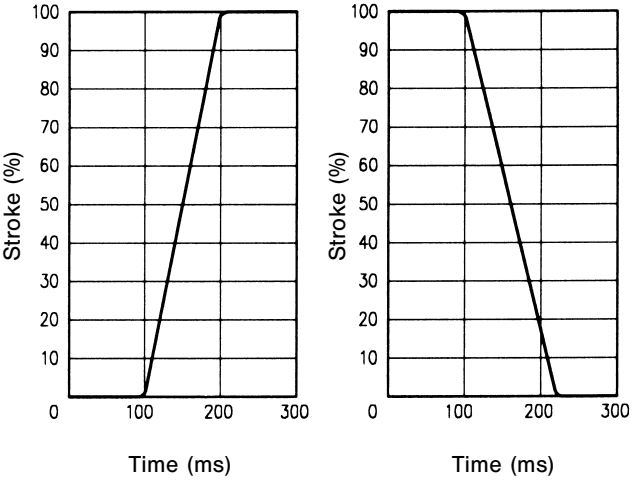


Response time

for A and X = 20 bar; B = 10 bar

Open

Close



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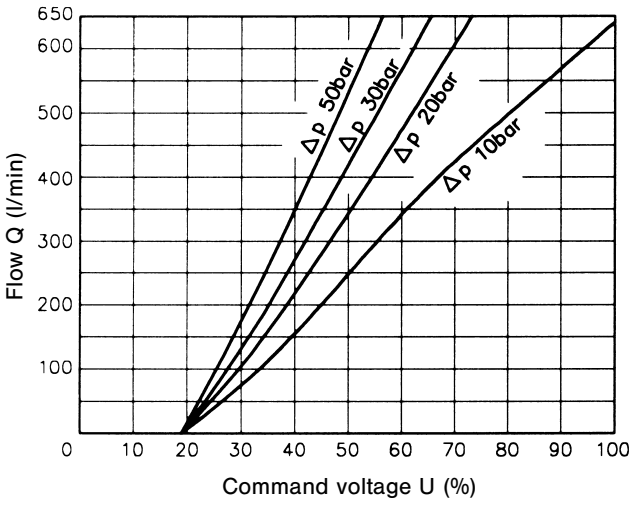
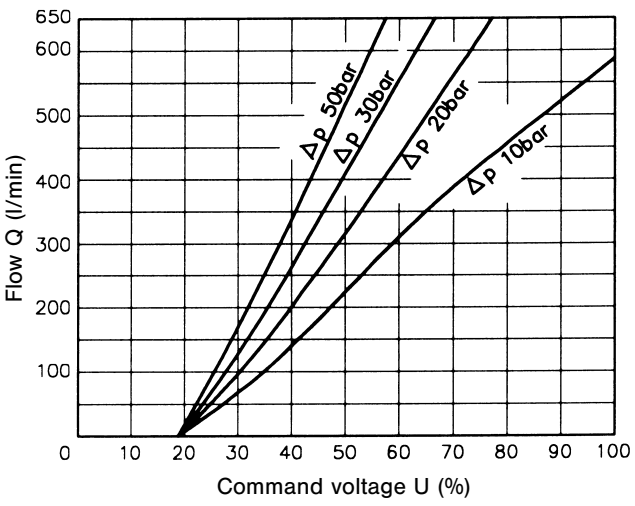
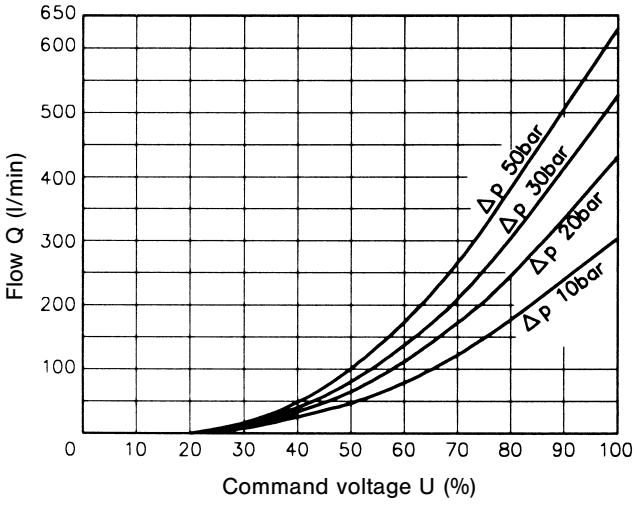
Flow characteristics linear A→B



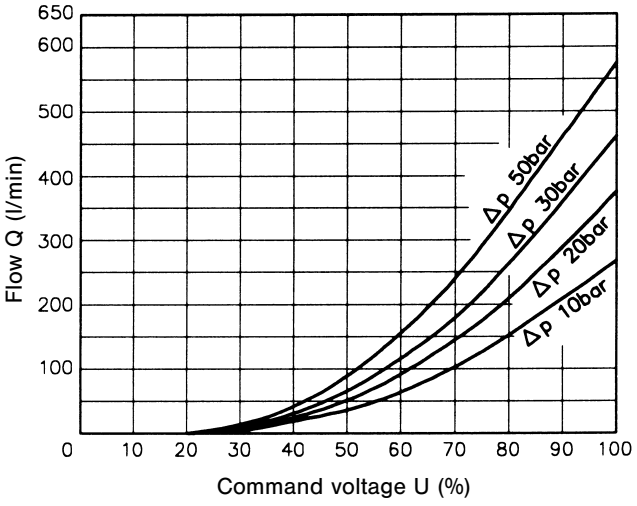
Flow characteristics linear B→A



Flow characteristics progressive A→B



Flow characteristics progressive B→A



Frequency

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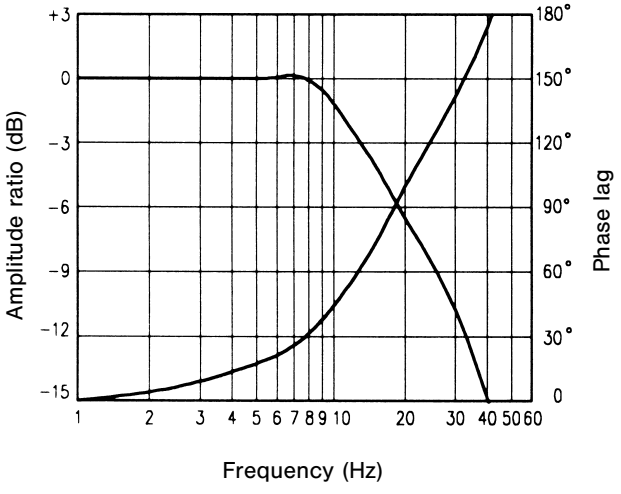

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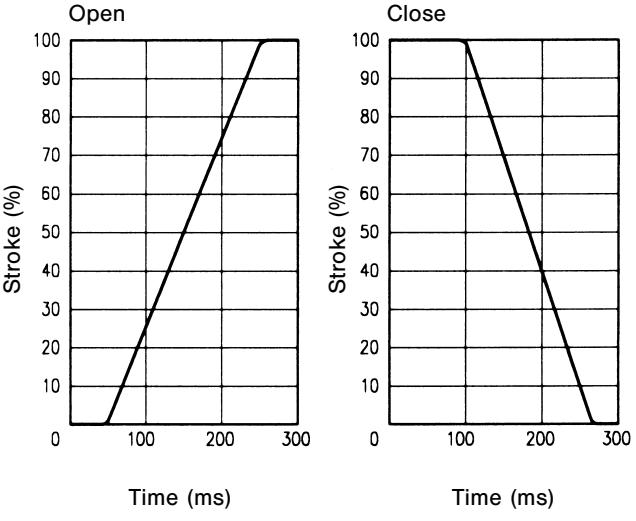

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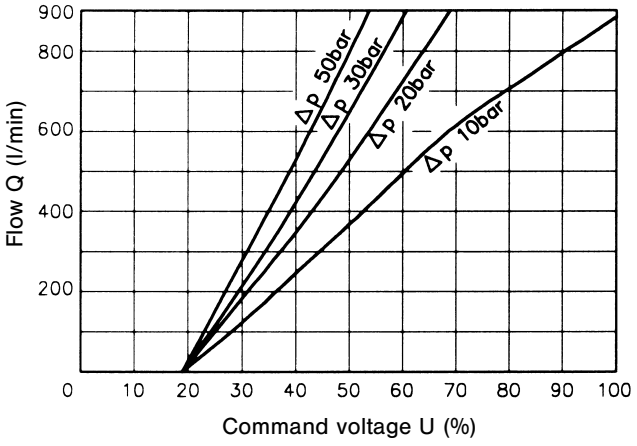
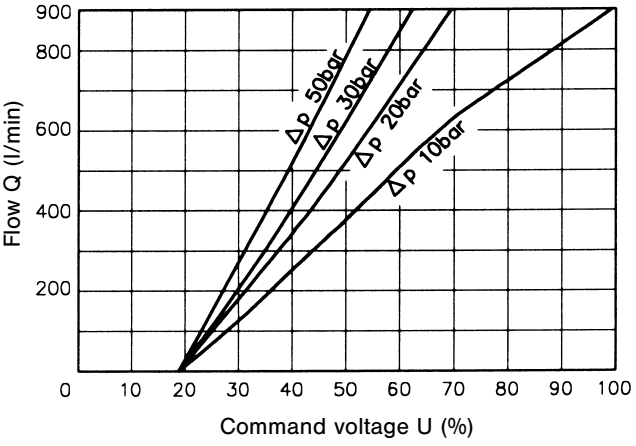
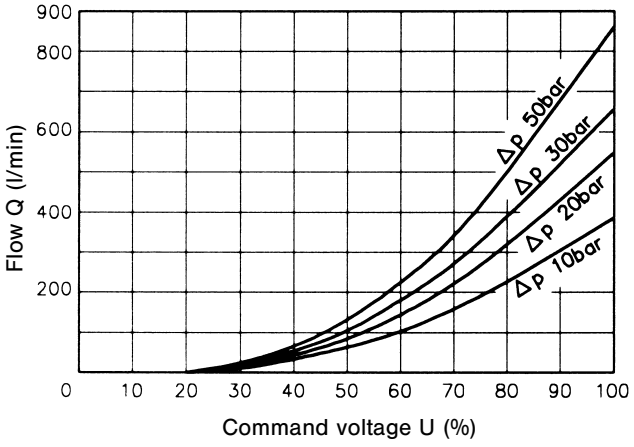
Flow characteristics linear A→B



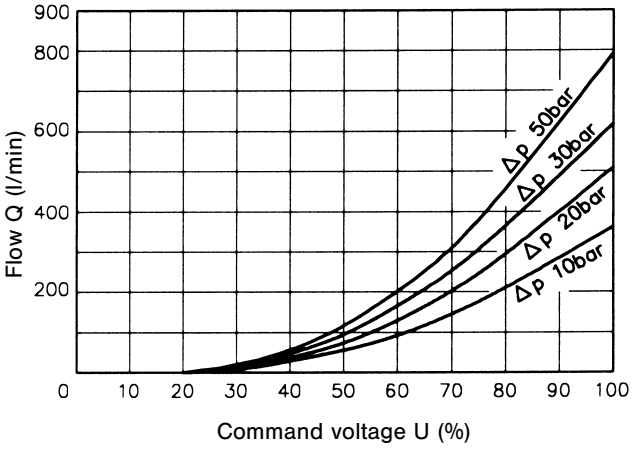
Flow characteristics linear B→A



Flow characteristics progressive A→B



Flow characteristics progressive B→A



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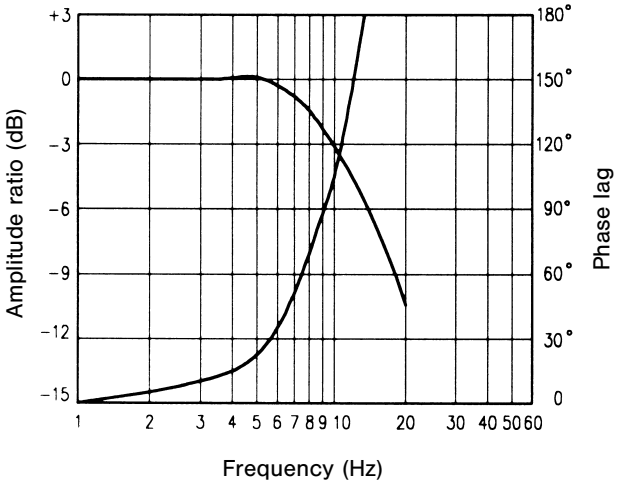
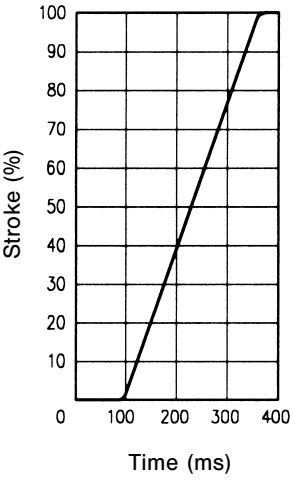


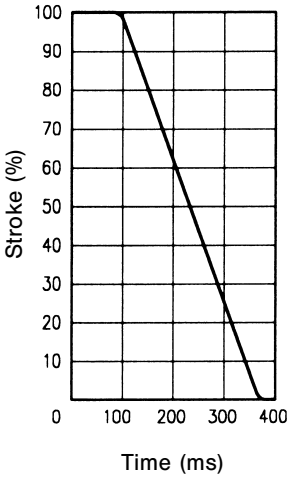
Response time

for A and X = 20 bar; B = 10 bar

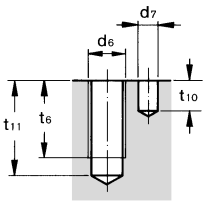
Open



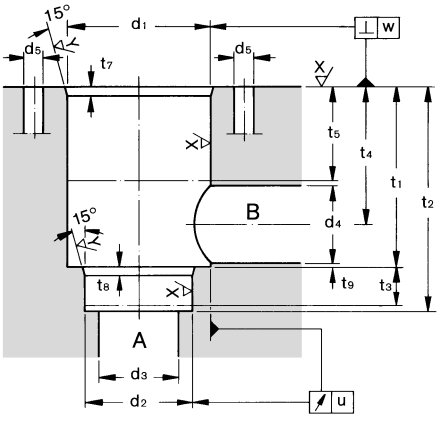
Close



Section A–B



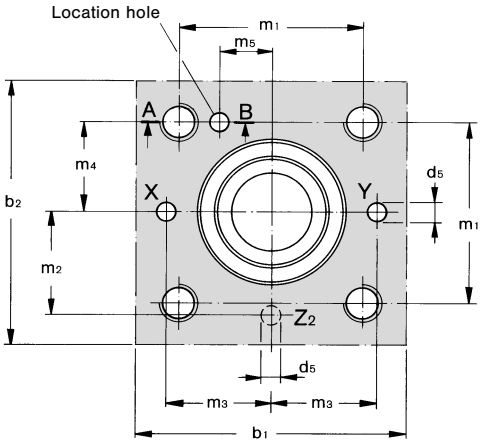
Cavity



Ra max (µm) X = 1.6 Y = 2.5

Dimension	Tolerance	NG16	NG25	NG32	NG40
b_1 [1]		65	85	102	125
b_2 [1]		65	85	102	125
d_1	H7	32	45	60	75
d_2	H7	25	34	45	55
d_3		16	25	32	40
d_4 [2]	min.	16	25	32	40
	max.	25	32	40	50
d_5 [3]	max.	4	6	8	10
d_6		M8	M12	M16	M20
d_7	H13	4	6	6	6
m_1	± 0.2	46	58	70	85
m_2	± 0.2	25	33	41	50
m_3	± 0.2	25	33	41	50
m_4	± 0.2	23	29	35	42.5
m_5	± 0.2	10.5	16	17	23
t_1	$^{0}_{+0.1}$	43	58	70	87
t_2	$^{0}_{+0.1}$	56	72	85	105
t_3 [5]		11	12	13	15
t_4 [2]	d_4 min.	34	44	52	64
	d_4 max.	29.5	40.5	48	59
t_5 [5]		20	30	30	30
t_6 [4]		20	25	35	45
t_7		2	2.5	2.5	3
t_8		2	2.5	2.5	3
t_9	min.	0.5	1.0	1.5	2.5
t_{10}	min.	10	10	10	10
t_{11} [4]	max.	25	31	42	53
u		0.03	0.03	0.03	0.05
w		0.05	0.05	0.1	0.1

Configuration for control cover



A = Working port
B = Working port
X = Pilot port
Y = Drain port
Z2 = additional pilot port

[1]) Cover parts (adjusting devices, pilot heads) can exceed dimension b_1 and b_2.

[2]) Port B can vary around the centre line of port A.
Note:
Holes for mounting screws and pilot oil must be not be damaged.

[3]) Drilling depth and drilling angle of pilot ports are related to circuitry and arrangement of valves within the manifold.

[4]) Recommended depth of screw (minimum) for cast iron is dia. of thread times 1.25.

[5]) Close-tolerances work depth.

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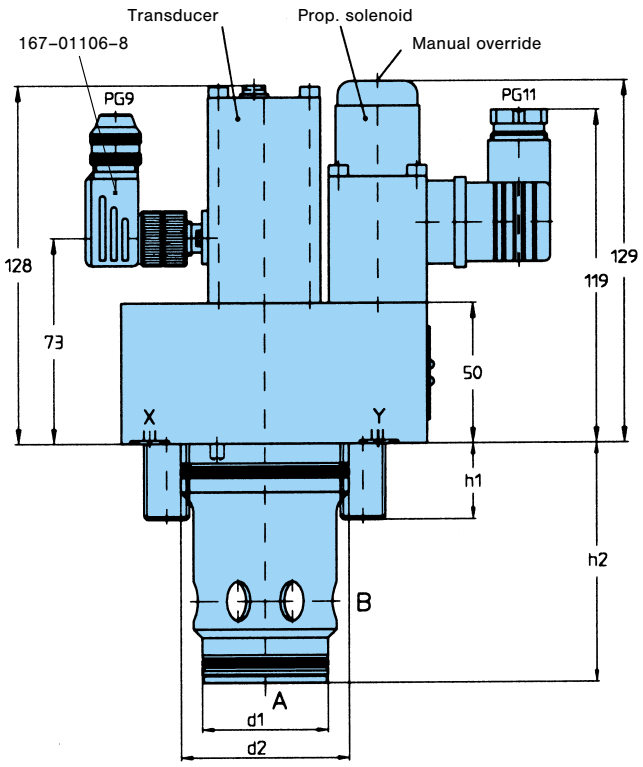
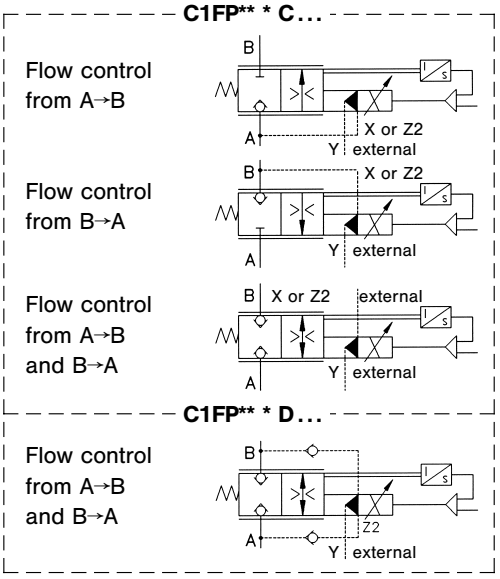
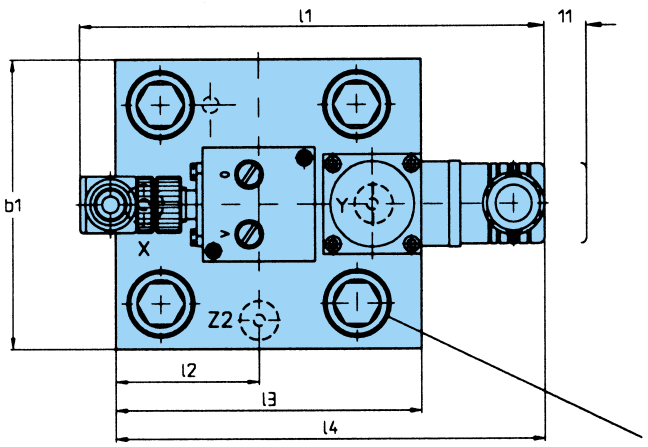
DIMENSIONS



Pilot pressure must be supplied from the manifold to the cover (X or Z2) to obtain desired function:





Dimensions

	C1FP05 NG 16	C1FP08 NG 25	C1FP10 NG 32	C1FP12 NG 40
l_1	171	165	165	171
l_2	32.5	42	51	61.5
l_3	95.5	100	109	125
l_4	139	144	153	169
b_1	65	85	102	125
h_1	14	18	27	31
h_2	56	72	85	105
d_1	ø 25 f7	ø 34 f7	ø 45 f7	ø 55 f7
d_2	ø 32 f7	ø 45 f7	ø 60 f7	ø 75 f7
Weight	3.0 kg	3.7 kg	5.4 kg	7.5 kg

4 Mounting screws DIN 912-12.9
(are included in valve order)

Series	Dimensions	Torque
C1FP05	M 8 x 55	35 Nm
C1FP08	M12 x 55	130 Nm
C1FP10	M16 x 60	330 Nm
C1FP12	M20 x 60	640 Nm

Order No.: 701–00065–8
Weight: 0.25 kg

This servo amplifier is designed for the operation of the Proportional-Throttle-Valve C1FP with position control. The output stage uses pulse width modulation, which, together with a PID regulator and transducer, forms a closed circuit position control system. The position is recorded by the transducer (actual value) and compared to the nominal value by the PID regulator. The resulting differential signal is regulated against zero, so matching the actual value to the nominal value. The output stage features short-circuit protection and incorporates current limiting. There are five different input lines for five different command signals. External control of the servo amplifier can be exercised by means of the emergency stop. This input (pin z6) is designed for use as an NC loop. By use of a common zero potential for the power input, the command signal and the reference voltage, it is possible to run several servo amplifiers from a single power supply. The servo amplifier has a ramp generator which produces the ramp up and ramp down signals. The ramp function can be switched off by applying a positive voltage to pin b6. On the front panel there are potentiometers to adjust the ramp circuits (up/down), flow gain (Imax) and the zero point (Imin) independently from each other. The zero-point adjustment enables the positive overlap of the poppet to be bypassed. This enable the output to step directly to the pre-adjusted Imin flow, when the command signal exceeds 2 %. For a command signal of less than 2 %, the flow remains zero. The operating status of the servo amplifier is shown by LED's on the front panel. These indicate, when illuminated, power on, ramp function off, and "fail safe" stop. In the event of a short-circuit in the output stage, or where either the transducer or the "fail safe" circuit goes open-circuit, the output stage is blocked, and the "fail safe" LED is illuminated. Measuring sockets are provided to measure the nominal solenoid current, the command voltage, and the transducer feedback signal.

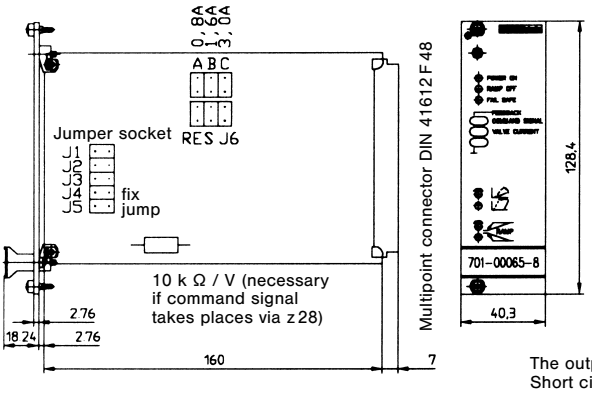
Characteristics – Servo Amplifier

- Supply voltage
  - nominal: 24 V DC
  - battery voltage: 23...35 V DC
  - rectified AC-voltage: 18...25 V U_{eff} (full wave bridge)
- transducer: approx. 20 V ± 10 % stabilized (from amplifier)
- Reference voltage: ± 15 V 25 mA ± 5 %; ± 10 V[1]) 10 mA ± 0.5 % } from amplifier [1]) stabilized
- Valve current I_{nom}: 1000 mA
- Current consumption max.: approx. 3000 mA
- Short circuit protection: for solenoid and reference voltages
- Inputs (only positive (+) command signals):
  1. 4...20 mA, 100 Ω
  2. 0...20 mA, 100 Ω
  3. 0... 5 V, 10 k Ω / V
  4. 0...10 V, 10 k Ω / V

  } input impedance
  5. free choice (R1000 = 10 k Ω / V)
- Outputs
  - solenoid: d12, d14
  - transducer: d8 (+ 20 V), b8 (Gnd), z8 (signal)
- External stop: illuminates on "Fail Safe", implement as closed circuit connection with an input voltage between 4 and 24 V DC; input impedance 4.7 k Ω. This input voltage is required for normal operation.
- Potentiometers for
  - flow gain I_{max}: ...1000 mA current consumption at 100 % command signal
  - zero point I_{min}: 0...50 % of I_{max}
  - ramp up: 0.1...10 s ± 20 % ≙ 1...100 V/s
  - ramp down: 0.1...10 s ± 20 % ≙ 1...100 V/s
  - proportional: Proportional part of the PID-controller. Should be used for optimisation of system performance (dynamic).
- Ramp off: illuminates when "Ramp off", implement as closed circuit connection with an input voltage between 4 and 24 V DC; input impedance 4.7 k Ω. This input voltage disables both ramps.
- Measuring socket
  - solenoid current: 1 V ≙ 1 A ± 5 %
  - command voltage: approx. 0...10 V at 100 % command signal (depends on Imax-adjustment)
  - feedback: 0...– 5 V for full displacement at 100 % command signal
- Connector: DIN 41612; F48 (3 rows, 48 pins)

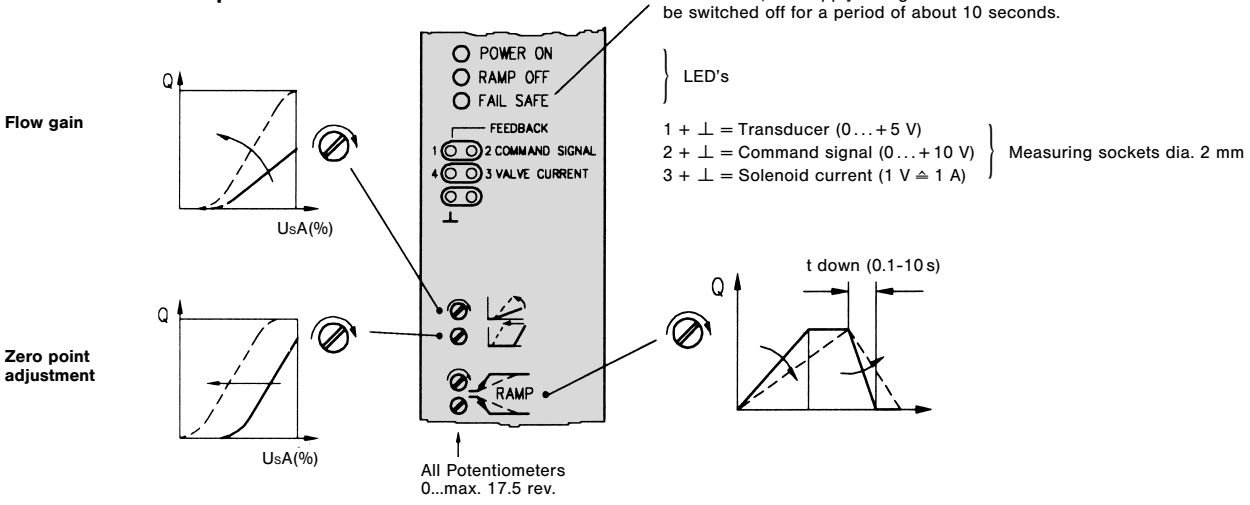
Note: Transformer, potentiometer, see page 14, card holder see page 15.

Dimensions Plug-in module 3HE according to IEC 297

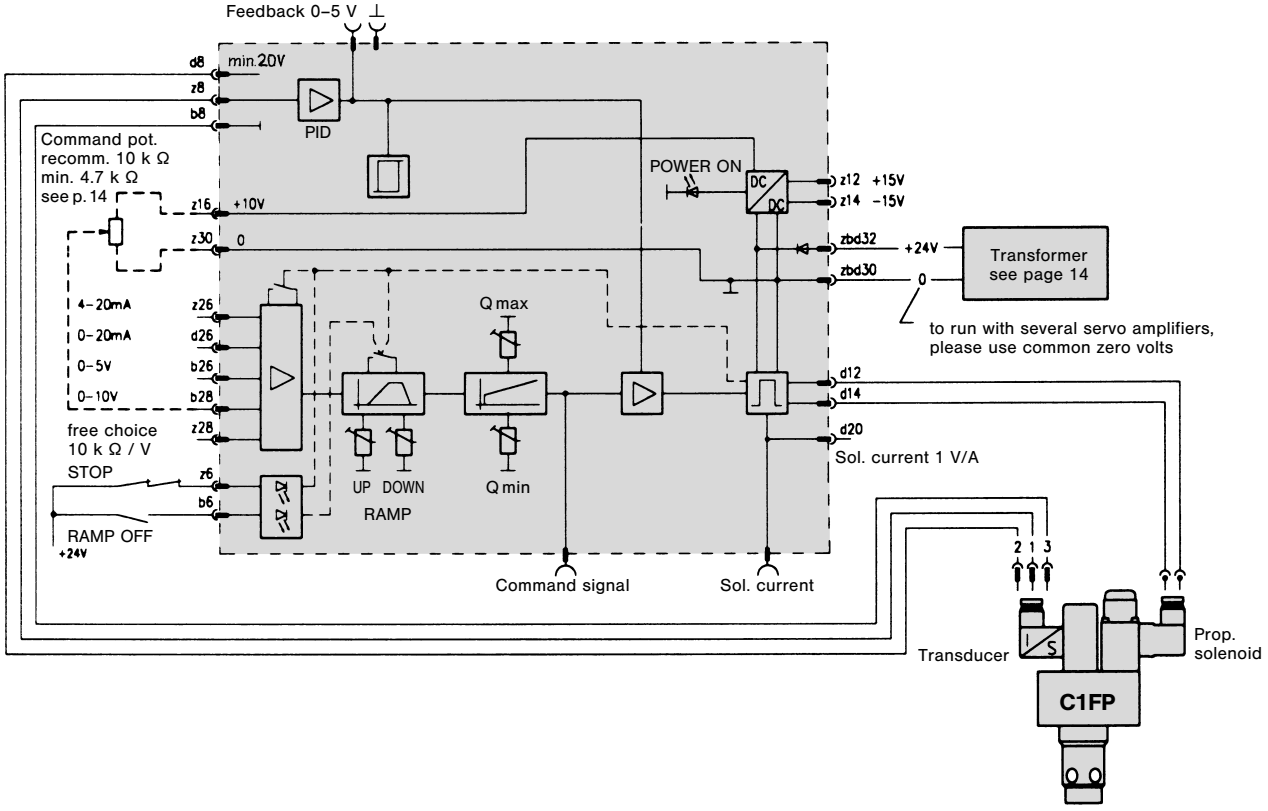


Details on the front panel

The output stage is short circuit proof.
Short circuits at the output and supply input voltage falling below 20.5 V will result in the shutdown of the output stages, causing the "Fail Safe" LED to come on.
In that event, the supply voltage must be switched off for a period of about 10 seconds.



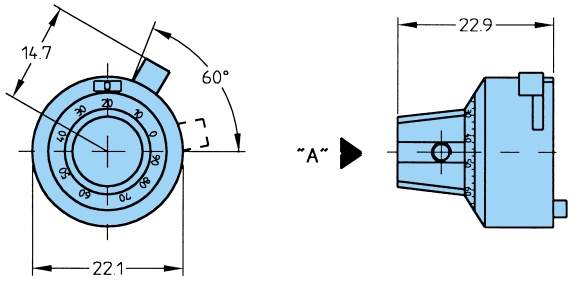
Schematic block diagram and terminal assignment



Ordering Code | Back to Content

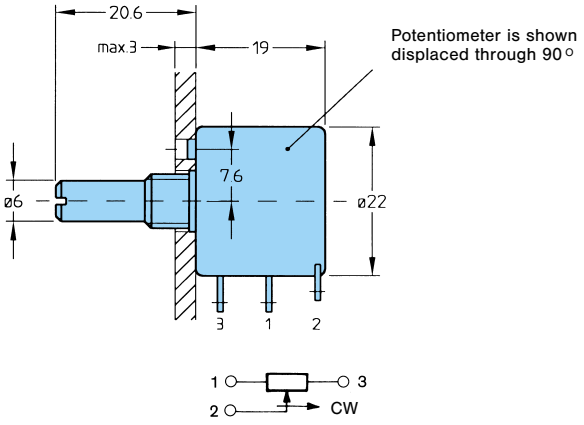
Potentiometer-Adjusting knob
Order No. 701–00014–8

View "A"

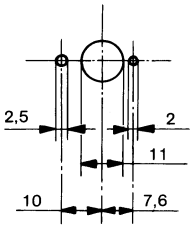


Adjusting knob with scale 0...100
and with revolution counter.
Adjustment is lockable.

Potentiometer

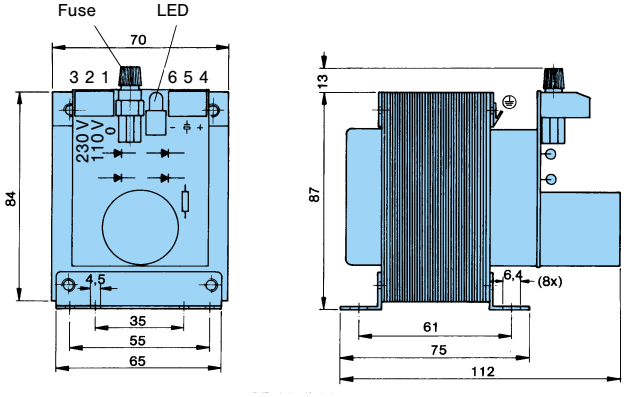


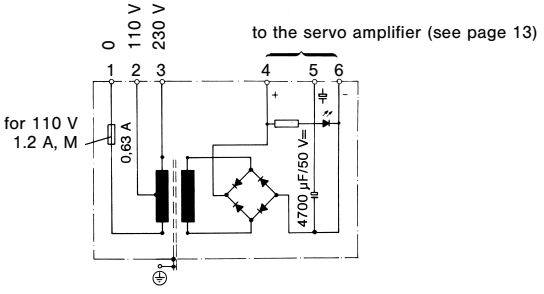
Panel opening



Potentiometer-Characteristics	Potentiometer Order No.	
	701–00012–8	701–00013–8
Angle of rotation	360°	3600°
Linearity	± 0.5 %	± 0.25 %
Resolution-Drift	0.11% of 360°	0.02 % of 3600°

Transformer
Order No. 701–00017–8
Weight: 2 kg





The mains transformer 701–00017–8 supplies the servo amplifier.
Secondary voltage is rectified and smoothed.
Warning: Connector pin 4 and 5 must be connected by an external wiring.
It carries a LED function indicator and the primary fuse.
Note: in 110-V operation the standard fuse must be replaced by a 1.2 A fuse.

Order No. 701–00066–8
Holder for individual mounting according to DIN 41612,
design F 48