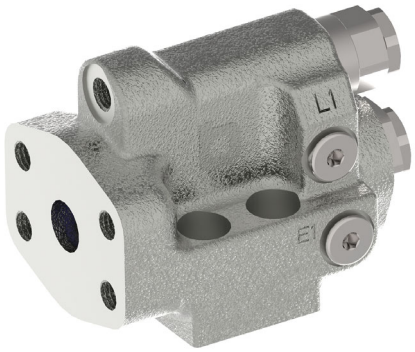
Excavator Pipe-Rupture Valve

Q_{max} = 350 l/min, p_{max} = 420 bar
Hydraulic-proportional two-stage seat valve
Series CFS...



- Fulfils safety requirements in accordance with ISO 8643 and EN 474
- Leak-free load holding
- Compact design → very low weight
- Satisfies exacting demands on corrosion protection
- The control assembly is guaranteed to close → it closes even with a broken spring
- No impact, or only very low impact on the existing hydraulic system → easy to retrofit
- Pressure relief independent of return-line pressure
- Thermal expansion pressure relief is integrated in pressure relief valve
- Long service life

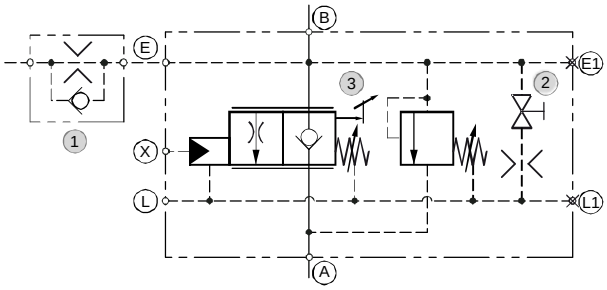
1 Description

The excavator pipe-rupture valve is used wherever so required by the standards ISO 8643 and EN 474 for excavators with a lifting device (e.g. a load hook on the bucket). The actuators concemed are the lift cylinder, the stick cylinder and the adjusting cylinder.

The valve should also be used on machines in which a pipe-rupture on the actuators could produce dangerous situations (e.g. machines for materials handling and demolition). The excavator pipe-rupture valve, series CFS (Compact Flow Control and Safety Valve), prevents uncontrolled lowering of the actuator in the event of a pipe- or hose-rupture. In addition, the CFS valve holds the actuator in its position when the main valve is centred. The valve also includes a secondary pressure-relief function, which protects the actuator against overload. The inlet and actuator ports on the CFS are standard SAE flanged ports, and the valve can therefore be retrofitted to existing equipment without any difficulty. Thanks to its load-independent, two-stage opening principle, variations in load pressure – even right up to the maximum – have no effect on the fine-control characteristics and the hydraulic performance of the valve. The design of the valve means that it can be operated by very small lowering pressures. The valve is set at the machine in a way that ensures that the excavator pipe-rupture function has no effect on the hydraulic values that have already been set in the machine (pre-opening principle).

This means that excavators with and without a materials handling function can be equipped with the same basic hydraulic system (the machine's work cycles remain the same). When the main spool valve is a closed-centre model and a secondary valve is connected in parallel, no pressure summing occurs. There is no need for a large-bore, external tank return line.

2 Symbol



Optionally available functions

1	Balance valve (parallel applications)
2	Mechanical emergency lowering
3	Adjustable stroke limiter

3 Technical data

General characteristics		Description, value, unit
Designation		excavator pipe-rupture valve
Design		hydraulic-proportional two-stage seat valve
Size	NS 16 NS 20	SAE 3/4“ (6000 PSI) – nominal size 16 SAE 1“ (6000 PSI) – nominal size 20
Mounting method		flange-mounting
Port Supply port Actuator port Pilot port Drain port Balance-line port	SAE threads fittings (optional) A NS 16 / 20 B NS 16 / 20 X L / L1 E / E1	according to SAE J518 according to DIN 3852, part 1 and 2 according to ISO 8434-1 SAE 3/4“ (6000 PSI) / SAE 1“ (6000 PSI) SAE 3/4“ (6000 PSI) / SAE 1“ (6000 PSI) G ¼“ G ¼“ G ¼“
Weight		3.7 … 4.2 kg
Mounting attitude		unrestricted
Ambient temperature range		- 25 °C … +100 °C (others on application)
Surface Protection		valve is zinc plated (Cr VI-free) mounting screws zinc-flake coated (e.g. with Geomet® finish)

Hydraulic characteristics		Description, value, unit
Maximum operating pressure		420 bar
Maximum pressure at the flow- or return port A		420 bar (see sect. 6.2.4 Releasing pressure at port A)
Maximum pressure at the actuator- / load port B		420 bar
Maximum pressure at the balance-line port E / E1		420 bar
Maximum pressure at the pilot port X		100 bar
Maximum pressure at the drain port L		see sect. 6.2.3 Leakage-oil drain
Maximum flow rate	NS 16 NS 20	250 l/min 350 l/min
Leakage rates (HLP 46 at 40°C)		max. leakage A → L: 0.3 l/min max. leakage X → L: 0.1 l/min
Secondary pressure relief		320 ... 420 bar → secure setting (others on application)
Factory setting tolerance of the secondary pressure relief valve		0 … + 14.0 bar
Flow direction		A → B, free flow through check valve B → A, controlled flow
Operator type		hydraulic proportional

Hydraulic characteristics	Description, value, unit
Opening pressure range	4.4 … 10 bar (others on application)
Pressure setting (in factory)	setting is done at 20 l/min (B → A) and 33 bar load pressure. the pilot pressure can therefore be set in a range from 11 … 16.6 bar
Full opening	The set opening pressure + pilot-pressure range 18 bar + drain-oil back pressure (see sect. 6.2.3 Leakage-oil drain)
Opening pilot ratio	480:1
Hydraulic fluid	HL and HLP mineral oil to DIN 51 524; for other fluids, please contact BUCHER
Hydraulic fluid temperature range	-20 °C … +80 °C
Viscosity range	10…650 mm^2/s (cSt), recommended 15...250 mm^2/s (cSt)
Minimum fluid cleanliness Cleanliness class to ISO 4406 : 1999	class 20/18/15

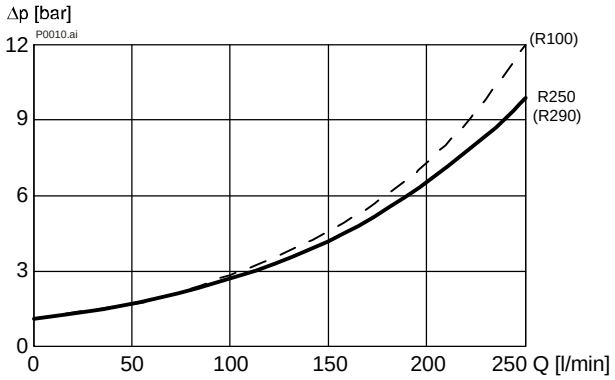
4 Performance graphs

measured with oil viscosity 33 mm^2/s (cSt)

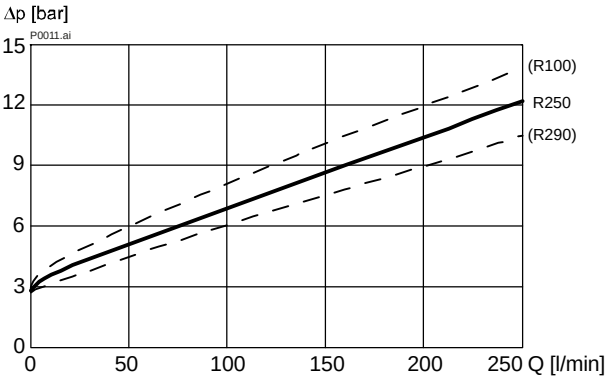
The different types of spool differ mainly in the characteristics of the start of opening. All types are designed for a maximum flow rate of 250 l/min (CFS 16) or 350 l/min (CFS 20). Based on our experience, we recommend the R250 spool type as a standard configuration.

4.1 Nominal size 16

Δp = f (Q) Pressure drop - Flow rate characteristic
Lifting (A → B)

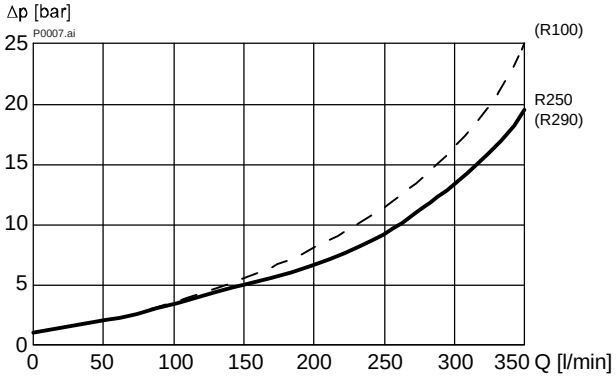


Δp = f (Q) Pressure drop - Flow rate characteristic
Lowering (B → A, spool fully open)

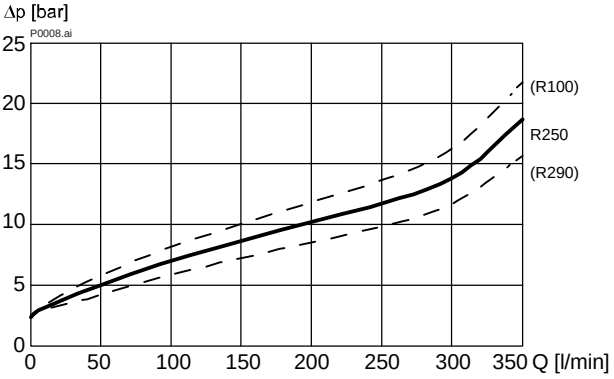


4.2 Nominal size 20

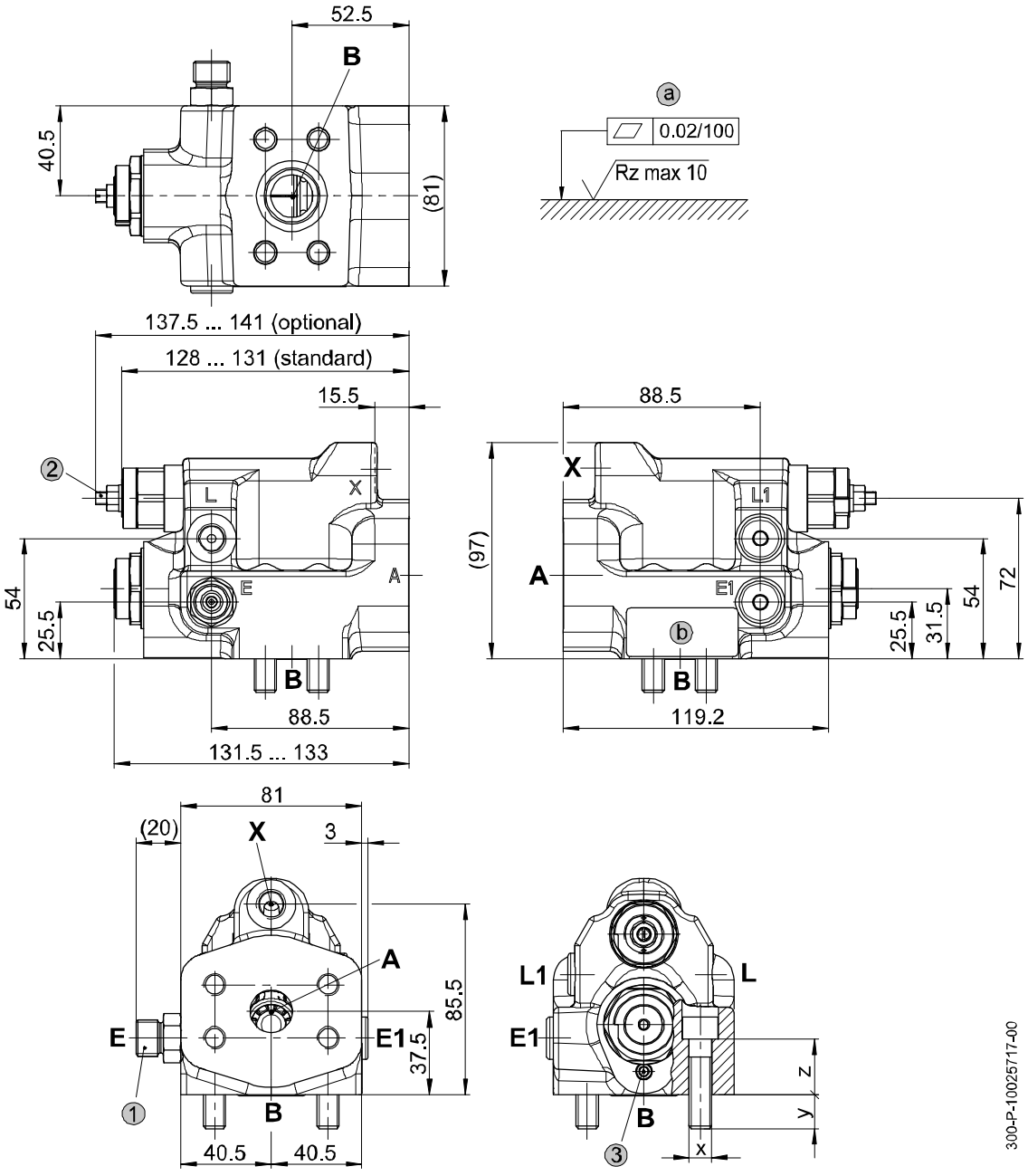
Δp = f (Q) Pressure drop - Flow rate characteristic
Lifting (A → B)



Δp = f (Q) Pressure drop - Flow rate characteristic
Lowering (B → A, spool fully open)



5 Dimensions & sectional view



Design	Ports			Screw data (see sect. 6.1)			
	A	B	X, L, L1, E, E1	x	y	z	M_A
CFS 16-A	SAE 3/4“ 6000 psi	SAE 3/4“ 6000 psi	G 1/4“	M10	15	25	55 [Nm] ± 8%
CFS 20-A	SAE 1“ 6000 psi	SAE 1“ 6000 psi	G 1/4“	M12	16	24	100 [Nm] ± 8%

a	Required quality of the mating surface	1	Option with balance valve (08S - DIN 3861)
b	Nameplate with: - type designation - serial number - test number	2	Option with stroke limiter (adjustable)
		3	Option with emergency lowering

6 Installation and commissioning

6.1 Assembly / disassembly

ATTENTION!:
Only qualified personnel with mechanical skills may carry out any maintenance work. Generally, the only work that should ever be undertaken is to check, and possibly replace, the seals. When changing seals, oil or grease the new seals thoroughly before fitting them.

IMPORTANT!:
The valve may only be used for its intended purpose within its nominal rating. If you plan to use it outside the nominal rating, you must contact the valve manufacturer.
The ultimate responsibility for safety in the installation and use rests with the end-machine manufacturer of the mobile application.

IMPORTANT!:
During commissioning, it is essential that all air is bled from the hydraulic system.
Port threads are formed in accordance with DIN 3852 T1.
Fixing screws to DIN 912, strength class 12.9, must be used to mount the valve.
Pay attention to the specified tightening torques!
Before fitting the valve, remove all plastic protectors and plastic residues.

IMPORTANT!:
Protect seals and flange faces from damage.
The mating flange face must be of the quality specified in the catalogue sheet!
Pay attention to the port designations.

IMPORTANT!:
Release all hydraulic pressure from the system before any disassembly work.

6.2 Adjustment information

6.2.1 Pilot valve

During testing, the pilot valve for the lowering function is factory-set to the opening pressure stipulated by the customer and then locked.
The change in pressure is 5.8 bar per turn.
- clockwise → increases the pressure
- anticlockwise → decreases the pressure

ATTENTION!:
The pilot valve adjusting screw has no end stop - it can be completly unscrewed!

IMPORTANT!:
The warranty will be voided if the valve is worked on or tampered with!

6.2.2 Secondary pressure relief valve (SV)

During testing, the secondary pressure-relief valve (SV) is factory-set to the pressure setting / operating pressure stipulated by the customer and then locked. The pressure is set with flow Q = 0.75 l/min.

The change in pressure is 94 bar per turn.
- clockwise → increases the pressure
- anticlockwise → decreases the pressure

6.2.3 Leakage-oil drain

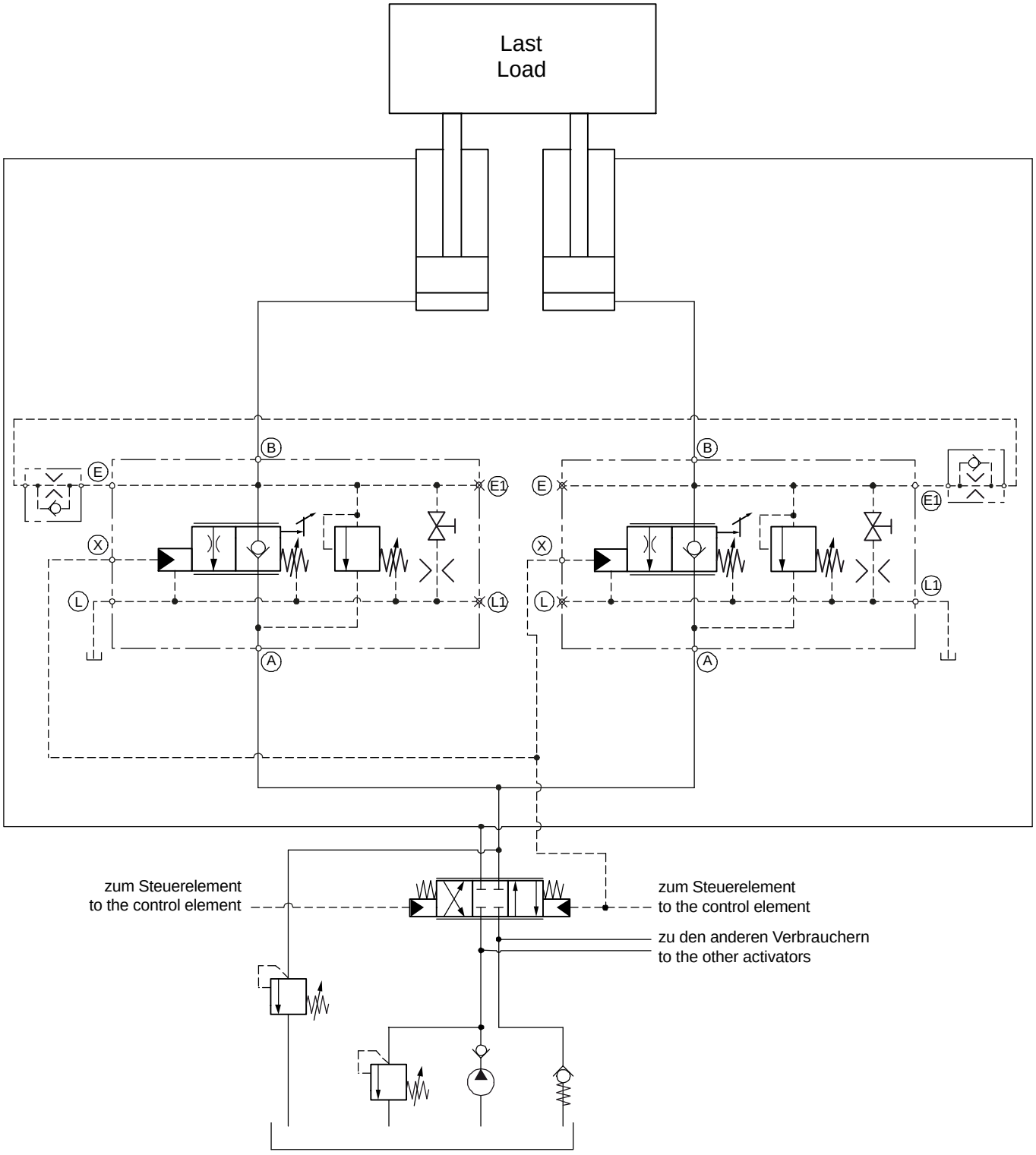
The leakage oil from both pilot cartridges as well as their spring chambers is drained to port L. This port should be drained to tank with the least possible back-pressure. Any tank preload- or back-pressure in the drain line has a 1:1 effect on the opening values of the pilot valve and the pressure relief valve.

6.2.4 Releasing pressure at port A

In the case of a closed volume at the supply or return port A, pressure must be released from it. Maximum allowable static pressure in the closed position is 10 bar.

7 Application examples

7.1 Parallel application



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8 Ordering code

e.g. CFS | 16 | - | A | - | E | S | N | O | - | R | 250 | - | ... | - | SV | ... | - | Z | - | | - | _ | - | _ | ...

CFS	=	series
16	=	nominal size – SAE 3/4“
20	=	nominal size – SAE 1“
A	=	model / version
E	=	EN 474, ISO 8643 and DIN 24093
S	=	standard design
N	=	NBR (Nitril) seals **(standard)**
V	=	FKM (Viton) seals
T	=	MIL (Low temperature) seals
O	=	without fixing screws **(standard)**
D	=	with Geomet fixing screws. (ZL) 12.9 DIN912
R	=	regulating spool **(standard)** (other spool designs on application)
100	=	lowering flow rate 100 l/min
250	=	lowering flow rate 250 l/min **(standard)**
290	=	lowering flow rate 290 l/min (other flow rates on application)
...	=	factory-set setting range for opening pressure (final value will be entered after commissioning)
SV	=	secondary pressure relief
...	=	setting for secondary pressure relief
Z	=	ports X, L, E: pipe thread G1/4” **(standard)**
UNF	=	ports X, L, E: UNF 9/16-18
V	=	ports X, L: fittings package with pipe thread
(blank)	=	single operation, E and E1 plugged, L open **(standard)**
R	=	parallel operation, balance valve in E, E1 & L1 plugged
L	=	parallel operation, balance valve in E1, E & L plugged
E	=	parallel operation, without balance valve, E & L open, E1 & L1 plugged
E1	=	parallel operation, without balance valve E1 & L1 open, E & L plugged (other versions on application)
(blank)	=	without emergency lowering **(standard)**
N	=	with mechanical emergency lowering
(blank)	=	without stroke limiter **(standard)**
H	=	with adjustable stroke limiter
...	=	setting for stroke limiter (final value will be entered after commissioning)

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