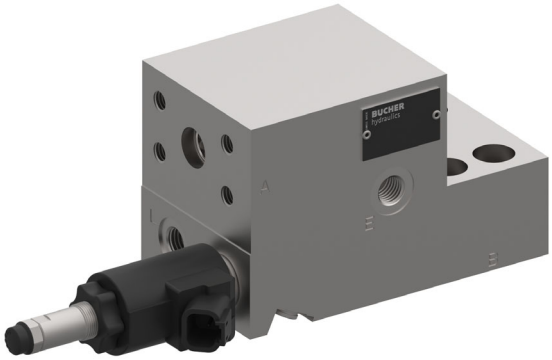
Excavator Pipe-Rupture Valve

Q_{max} = 350 l/min [92 gpm], p_{max} = 420 bar [6000 psi]
Electrically proportional pilot operated seat valve, flat design
Series CFS-E 16-A... / CFS-E 20-A...



- Fulfils safety requirements in accordance with ISO 8643 and EN 474
- Electrical control for maximum controllability
- Main connection and solenoid in the direction of the cylinder
- No hydraulic control oil line required
- Leak-free load holding when the joystick is not actuated
- Flat design → valve with nose, no sandwich plate necessary
- 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
- Thermal expansion pressure relief is integrated in pressure relief valve

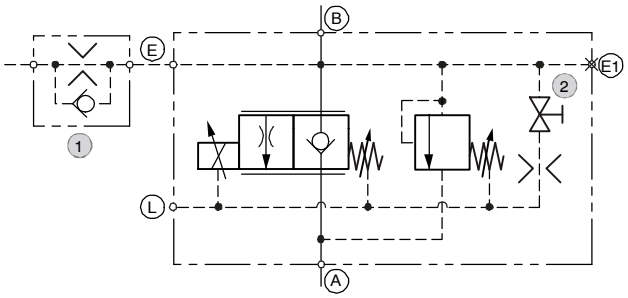
1 Description

The excavator pipe-rupture valve is used wherever required by ISO 8643 and EN 474 for excavators with a lifting device (e.g. a load hook on the bucket). Suiting actuators 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 of the valve. The valve is opened from B to A via the proportional solenoid. A control pressure line is not required. 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 material 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



Optional available functions:

1	Balance valve (parallel applications)
2	Mechanical emergency lowering

3 Technical data

General characteristics			Description, value, unit	
Designation			excavator pipe-rupture valve	
Design			electrically proportional pilot operated seat valve, flat design	
Size			size 16, SAE 3/4", 6000 psi size 20, SAE 1", 6000 psi	
Mounting method			flange-mounting	
Ports				
Supply port	A	Size 16	SAE 3/4", 6000 psi	ISO 6162-2 DN 19 M10 (SAE J518 Code 62-12, M10x1.5)
		Size 20	SAE 1", 6000 psi	ISO 6162-2 DN 25 M12 (SAE J518 Code 62-16, M12x1.75)
Actuator port	B	Size 16	SAE 3/4", 6000 psi	ISO 6162-2 DN 19 M10 (SAE J518 Code 62-12, M10x1.5)
		Size 20	SAE 1", 6000 psi	ISO 6162-2 DN 25 M12 (SAE J518 Code 62-16, M12x1.75)
Drain port	L		G 1/4" 9/16-18 UNF-2B	ISO 1179-1 or ISO 11926-1 (SAE-6, SAE J1926-1)
Balance-line port	E / E1		G 1/4" 9/16-18 UNF-2B	ISO 1179-1 or ISO 11926-1 (SAE-6, SAE J1926-1)
Weight			ca. 7.0 kg	(ca. 15.5 lbs)
Mounting attitude			unrestricted	
Ambient temperature range			-25 °C … +50 °C (others on application)	(-13 °F … +122 °F)
Surface Protection			Valve body with zinc-nickel coating according to DIN EN ISO 19598	

Hydraulic characteristics		Description, value, unit	
Maximum operating pressure		420 bar	(6000 psi)
Maximum pressure at the flow- or return port A		420 bar (see sect. 7.2.3 Releasing pressure at port A)	
Maximum pressure at the actuator- / load port B		420 bar	(6000 psi)
Maximum pressure at the balance-line port E / E1		420 bar	(6000 psi)
Maximum pressure at the drain port L		see sect. 7.2.2 Leakage-oil drain	
Maximum flow rate			
	Size 16	250 l/min	(66 gpm)
	Size 20	350 l/min	(92 gpm)
Secondary pressure relief		320 ... 420 bar → secure setting (others on application)	(4600 … 6000 psi)
Factory setting tolerance of the secondary pressure relief valve		0 … + 14.0 bar	[0 … + 200 psi]

Hydraulic characteristics	Description, value, unit
Flow direction	A → B, free flow through check valve B → A, controlled flow
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 (-4 °F … +176 °F)
Viscosity range	2.8 … 1500 mm^2/s (cSt), recommended 15 … 250 mm^2/s (cSt)
Minimum fluid cleanliness Cleanliness class to ISO 4406 : 1999	class 20/18/15

Electrical characteristics	Description, value, unit
Actuator type	solenoid coil
Solenoid coil type	D36
Supply voltage	12 / 24 V DC
Supply voltage tolerance	± 10 %
Nominal power consumption	V DC = 27 W
Relative duty cycle	100 %
Ambient temperature range	-30 °C … +50 °C (-22 °F … +122 °F) (others on application)
Electrical connection coil	see ordering code
Protection class solenoid coil to ISO 20 653 / EN 60 529	see ordering code (with appropriate mating connector and proper fitting and sealing)

4 Construction and function

4.1 The different types of function/application

4.1.1 Function monitoring

The pipe rupture valve only acts as a monitoring element, so that in the case of a pipe rupture the ISO 8643 standard is complied with. The lowering movement is controlled by the main spool. Load acts on the main spool.

4.1.2 Function load-bearing

The lowering movement of the load bearing function is controlled (monitored) by the pipe rupture valve. Load acts on pipe rupture valve.

ATTENTION!:
This function is only available on request at Bucher Hydraulics!

4.1.3 Function float position

The floating position is an intelligent function of the boom that gives short cycle times, saves fuel, protects attachments and significantly simplifies handling of the excavator.

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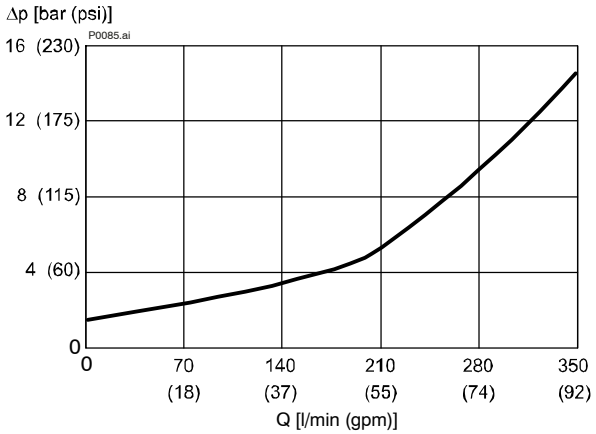
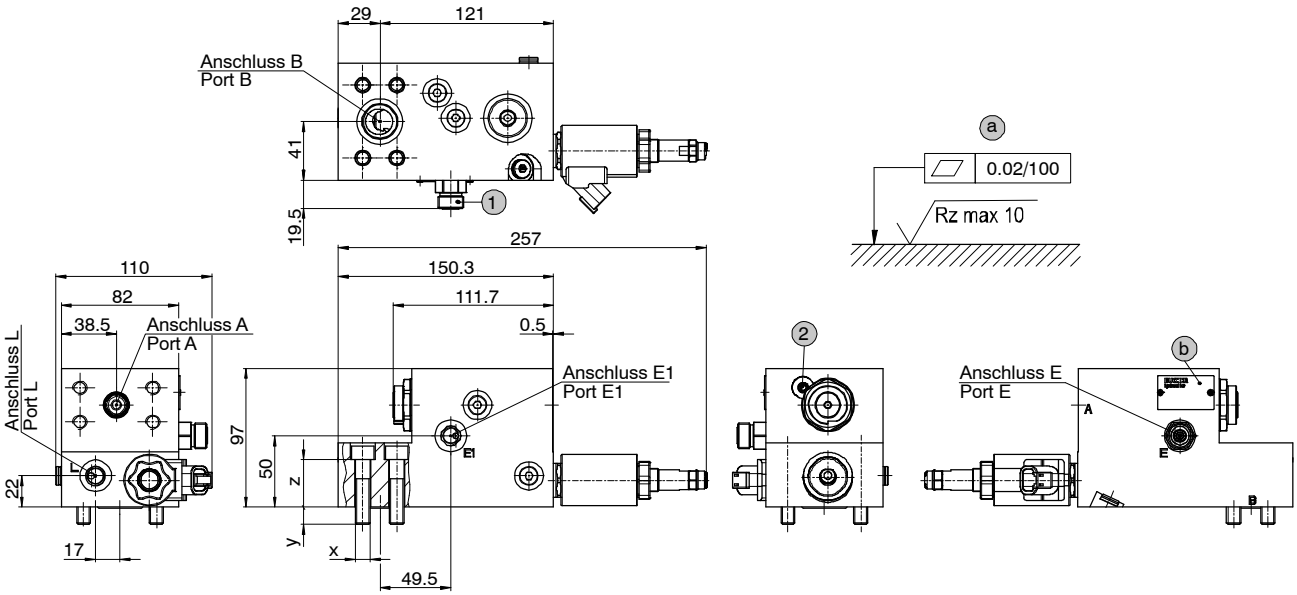
5 Performance graphs

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

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



6 Dimensions & sectional view



Ports				Screw data (see sect. 6.1)			
Valve size	A	B	L, E, E1	x	y	z	M_A
CFS-E 16-…	SAE 3/4" 6000 psi	SAE 3/4" 6000 psi	G 1/4"	M10	12	33	55 [Nm] ± 8%
CFS-E 20-…	SAE 1" 6000 psi	SAE 1" 6000 psi	G 1/4"	M12	12	33	100 [Nm] ± 8%

a	Required quality of the mating surface	1	Option with balance valve
b	Nameplate with: - type designation - serial number - test number	2	Option with emergency lowering

7 Installation and commissioning

IMPORTANT!:
Designing excavator pipe rupture valves requires specialst technical knowledge and product knowledge.
Safety applications must be verified by adequate tests to ensure safety in actual use.

IMPORTANT!:
In order for Bucher Hydraulics to be able to design the the excavator pipe rupture valve correctly, please refer to the technical design data sheet 300-D-9050103.
(LOGinternal area; registration required).

7.1 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!:
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!:
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!:
Release all hydraulic pressure from the system before any disassembly work.

7.2 Adjustment information

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

7.2.1 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

7.2.2 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 pressure relief valve.

7.2.3 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.

8 Ordering code

e.g. CFS – E 16 – A – B N O – E L – ___ – SV ___ – Z – N 24 D DT – _ _

CFS	=	series
E	=	electrically
16	=	size – SAE 3/4"
20	=	size – SAE 1"
A	=	model / version
B	=	Block design (cubic)
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)
E	=	spool type E (other spool types on request)
L	=	additional function e.g. load-bearing type L (defined by Bucher Hydraulics)
___	=	opening point setting value in mA (defined by Bucher Hydraulics)
SV	=	secondary pressure relief
...	=	setting for secondary pressure relief
Z	=	ports L, E and E1: BSP threads according to DIN 1179-1 **(standard)**
U	=	ports L, E and E1: UNF threads according to ISO 11926-1 (other thread types on request)
N	=	solenoid coil type D36, 27 W
24	=	voltage value e.g. 24 V
D	=	current type DC
D	=	Deutsch plug connection 45° DT04-2P (IP67/69K), without mating plug
DT	=	Deutsch plug connection 45° DT04-2P (with protection diode, IP67/69K), without mating plug (other plug types on request)
(blank)	=	single operation, E and E1 plugged **(standard)**
R	=	parallel operation, balance valve in E, E1 plugged
L	=	parallel operation, balance valve in E1, E plugged (other versions on request)
(blank)	=	without emergency lowering **(standard)**
N	=	with mechanical emergency lowering

IMPORTANT!:
After acceptance (according to ISO 8643), the definitive setting values are hydraulically measured and recorded by Bucher Hydraulics.

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9 Related data sheets

Reference	Description
300-D-9050103	Technical design sheet for excavator pipe rupture valves
400-P-120110	Solenoid coil type D36…

IMPORTANT!:
Additional documentation and 3D models (.stp or .igs format) can be downloaded from *www.bucherhydraulics.com*
(LOGintern area; registration is necessary)

We also offer customised solutions.
Please talk to our sales team.

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