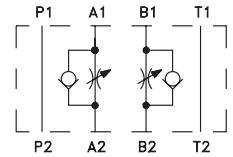


- Sandwich plate design for use in vertical stacking assemblies
- Meter-in or meter-out control as required
- Three possible arrangements:
 - throttle valve in channel A
 - throttle valve in channel B
 - throttle valves in channels A and B
- Flow adjustment - three adjustment elements
- Installation dimensions to ISO 4401:1994 and DIN 24 340-A6
- Subplates - see Catalogue HA 0002



Functional Description

Double throttle valves are used to control flow rates in two separate lines (A, B) of a hydraulic circuit. The modular design provides six functional symbols.

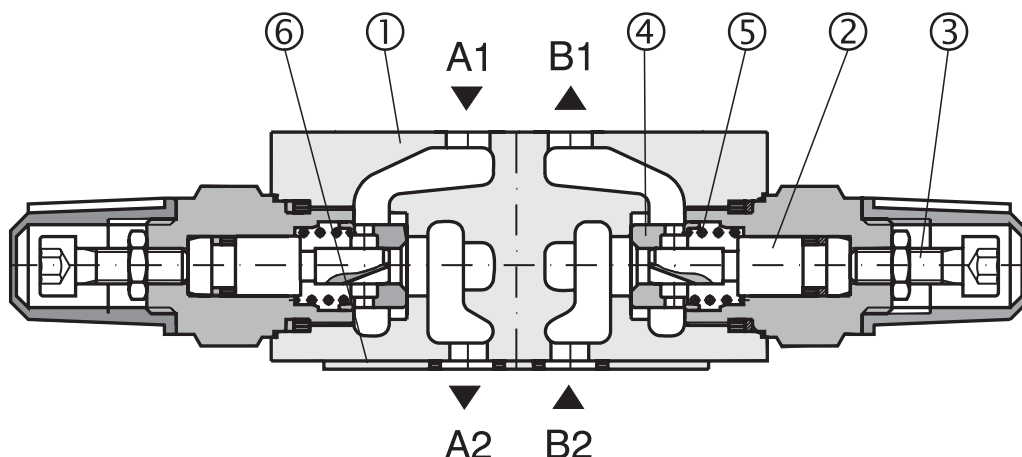
The throttle valve is built into channel A or B or into channels A and B. The valve restricts the fluid flow in one direction while providing reverse free-flow in the opposite direction. The throttling spool (2) is adjusted by means of a set screw (3) and each spool position corresponds with a certain passage area.

Fluid entering port A1 is throttled to port A2 via a groove and an annulus area. Fluid returning from port B2 shifts the valve seat (4) against the spring (5), thus creating a passage which allows reverse free-flow to port B1 (function as a check valve).

The sandwich design enables simple stacking with other components of the same size.

The separate O-ring plate (6) with fitted O rings provides sealing of the valve connecting surface. According to the valve arrangement, the meter-in or meter-out control is provided. Changing the meter-in mode into the meter-out mode can be done by turning the valve by 180° around its horizontal axis. The orientation of the throttle check valves in the valve body corresponds with the symbols shown on the name plate. The set screw can be operated by a key, by a hand knob or by a hand knob with keylock.

The basic surface treatment of the valve housing is phosphate coated, whereas the surfaces of the other parts are zinc coated.



Ordering Code

2VS3 - 06 -

Double Throttle Check Valve

Nominal size

no designation
V

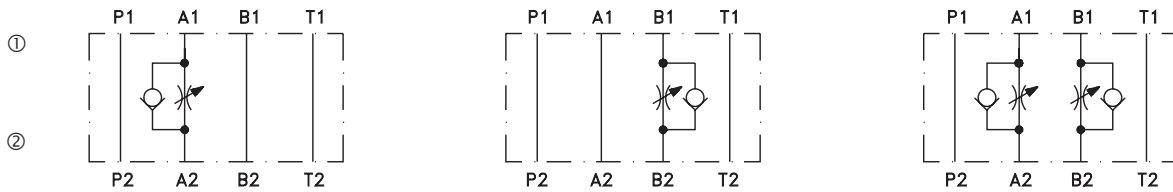
Seals
NBR
Viton

Adjustment element
S Hexagon set screw with locknut and protective cap
R Hand knob with scale
Z Hand knob with scale and keylock

Functional Symbols
A check valve in line A*
B check valve in line B*
C check valves in lines A and B*
* see Functional Symbols

FOR PREFERRED TYPES SEE BOLD TYPING IN ORDERING CODE AND TABLE OF PREFERRED TYPES ON PAGE 3

Functional Symbols



Notes: ① valve side
② subplate or manifold side
The orientation of the throttle check valves in the valve body corresponds with symbols shown on the name plate.

Technical Data

Nominal size	mm	06
Maximum flow rate	L/min	80
Maximum operating pressure	bar	320
Hydraulic fluid		Hydraulic oils of power classes (HL, HLP) to DIN 51524
Fluid temperature range for (NBR)	°C	-30 ... +100
Fluid temperature range for (Viton)	°C	-20 ... +120
Viscosity range	mm ² /s	20 ... 400
Maximum degree of fluid contamination		Class 21/18/15 according to ISO 4406
Weight	kg	1,2
Mounting position		unrestricted

Spare Parts

Seal kit

Type	Dimensions, quantity			Ordering number
	O-ring	Square ring	Back-up ring	
Standard NBR	18 x 2.65 NBR70 (2 pcs.)	9.25 x 1.68 (4 pcs.)	6.73 x 9.43 x 1.14 (2 pcs.)	15936300
	6.9 x 1.8 NBR70 (2 pcs.)	-	17.83 x 22.19 x 1.14 (2 pcs.)	
Viton	17.12 x 2.62 (2 pcs.)	-	9.43 x 6.73 x 1.14 (2 pcs.)	15936600
	9.25 x 1.78 (4 pcs.)	-	17.83 x 22.19 x 1.14 (2 pcs.)	
	6.75 x 1.78 (2 pcs.)	-	-	

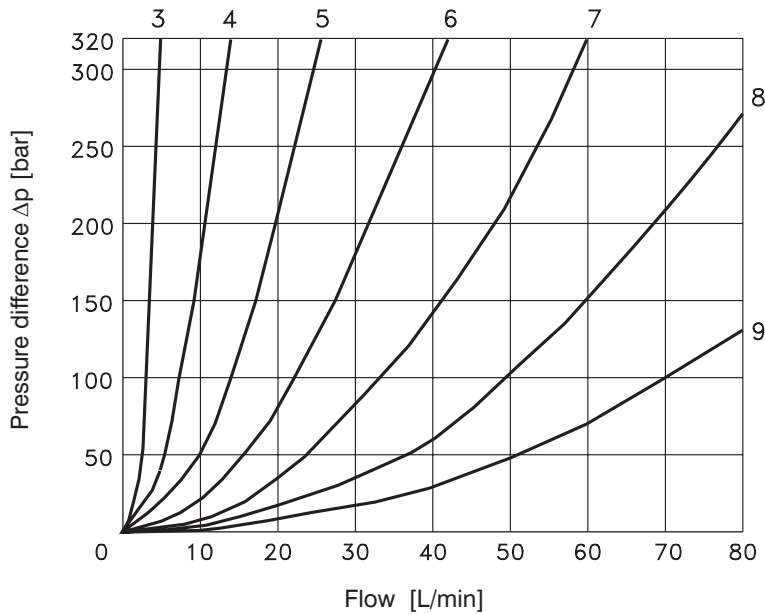
Δp-Q Characteristics

Measured at $v = 32 \text{ mm}^2/\text{s}$

Throttle valve

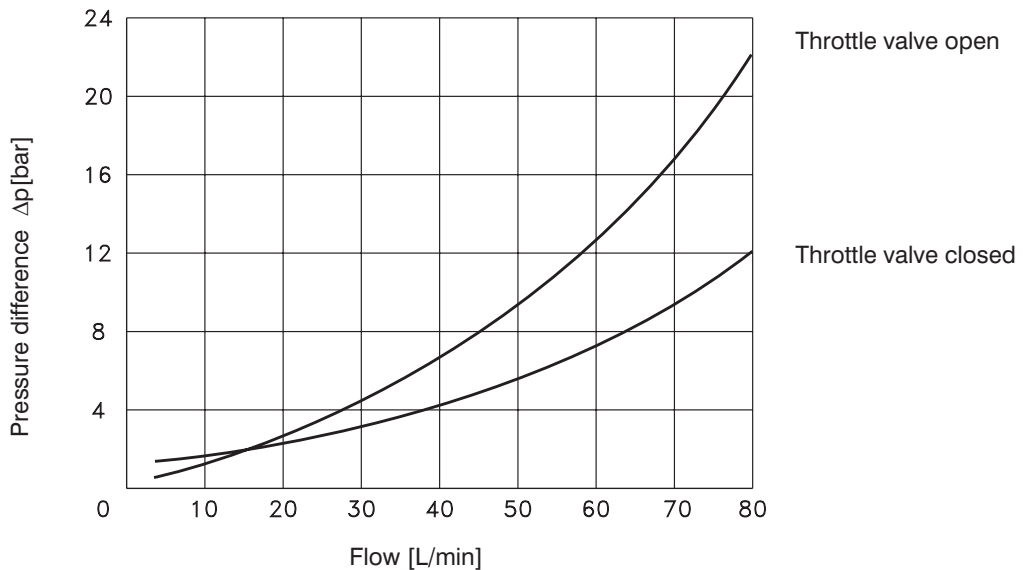
Pressure difference Δp related to flow from A1 to A2, (from B1 to B2)

- Throttle setting in turns (from the end stop)



Check valve

Pressure difference Δp related to flow from A2 to A1, (from B2 to B1)



Preferred Types of Valves

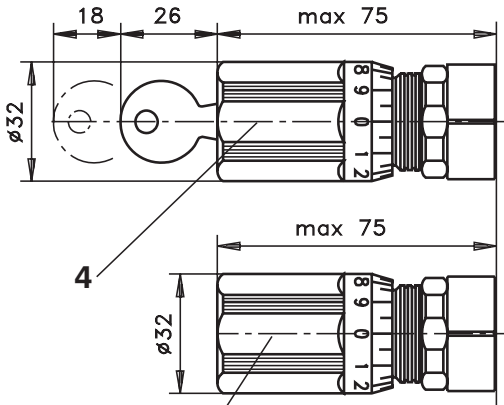
Type	Ordering Number
2VS3-06-CS	15929600

Caution!

- The packing foil is recyclable. The protective plate can be returned to manufacturer.
- Mounting bolts must be ordered separately. Tightening torque is 8.9 Nm.
- If the valve is used separately without a directional valve, a cover plate DK1-06/32-1 is to be ordered. This plate connects port A1 with B1 and A2 with B2 respectively (suitable for models 2VS3-06-Ax and 2VS3-06-Bx) - see catalogue Cover Plates and Crossover Cover Plates HA 0003.
- The technical information regarding the product presented in this catalogue is for descriptive purposes only. It should not be construed in any case as a guaranteed representation of the product properties in the sense of the law.

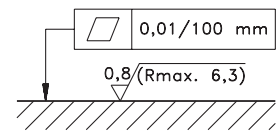
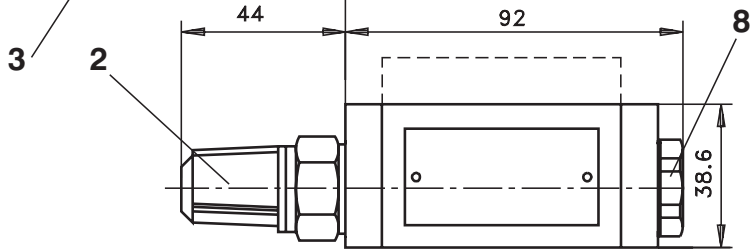
Valve Dimensions

Dimensions in millimetres



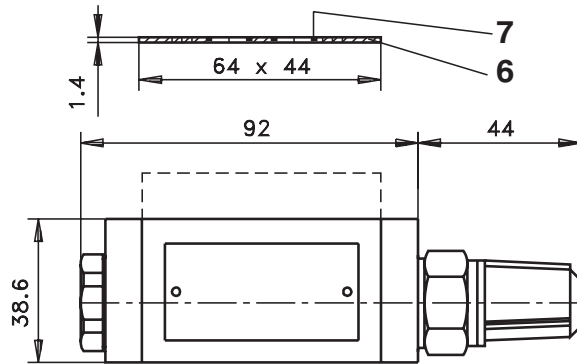
- 1 Name plate
- 2 Adjustment element - Inside HEX 5 with lock nut and protective cup
- 3 Adjustment element - hand knob with scale
- 4 Adjustment element - hand knob with scale and keylock
- With all adjustment elements:
clockwise rotation reduces flow
counter - clockwise rotation increases flow
- 5 Locknut HEX10
- 6 O-ring plate - supplied in delivery packet
- 7 Square ring 9.25x1.68 (4 pcs.) - supplied in delivery packet
- 8 Closing screw

2VS3-06A

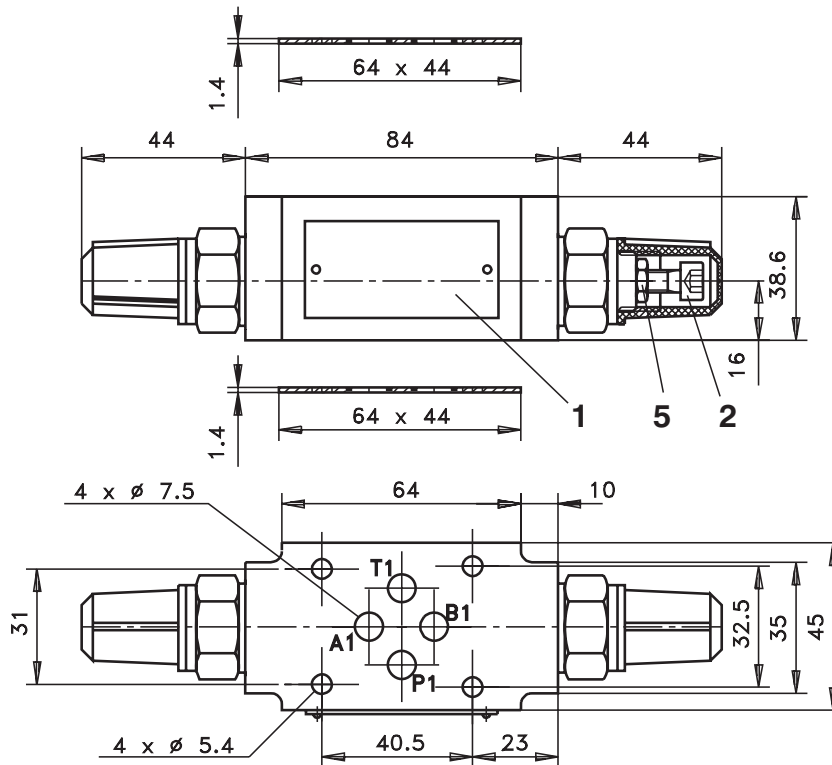


Required surface finish of interface

2VS3-06B

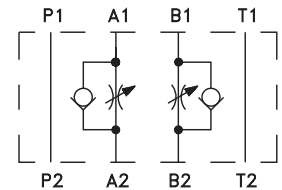


2VS3-06C



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- Sandwich plate design for use in vertical stacking assemblies
- Meter-in or meter-out control as required
- Three possible arrangements:
 - throttle valve in channel A
 - throttle valve in channel B
 - throttle valves in channels A and B
- Flow adjustment - hexagon set screw with locknut and protective cap
- Installation dimensions to ISO 4401:1994 and DIN 24 340-A6



Functional Description

Double throttle valves are used to control flow rates in two separate lines (A,B) of a hydraulic circuit. The modular design provides six functional symbols.

The valve body (1) has drilled channels and the throttle valve is built into channel A or B or into channels A and B. They restrict the fluid flow in one direction while providing reverse free-flow in the opposite direction. The throttling spool (2) is adjusted by means of a set screw (3) and each spool position corresponds with a certain area of passage.

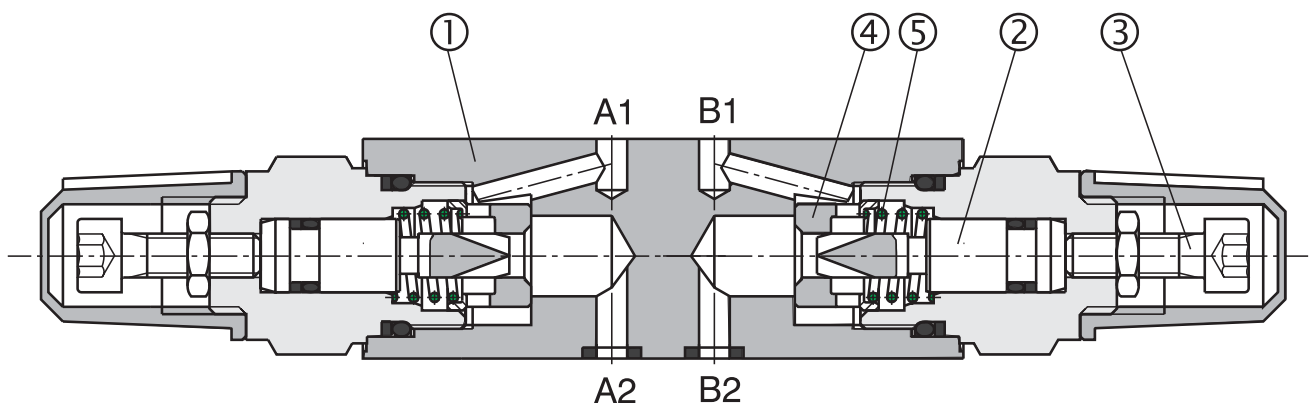
Fluid entering port A1 is throttled to port A2 via a groove and an annulus area. Fluid returning from port B2 shifts

the valve seat (4) against the spring (5), thus creating a passage which allows reverse free-flow to port B1 (function of a check valve).

The sandwich design enables simple stacking with other components of the same size.

According to the valve arrangement, the meter-in or meter-out control is provided. The orientation of the throttle check valves in the valve body corresponds with the symbols shown on the name plate.

The valve housing (1) is phosphate coated, the surfaces of the other parts are zinc coated.



Ordering Code

VSO1-04/M S

Double Throttle Check Valve

Nominal size

Modular design

no designation
V

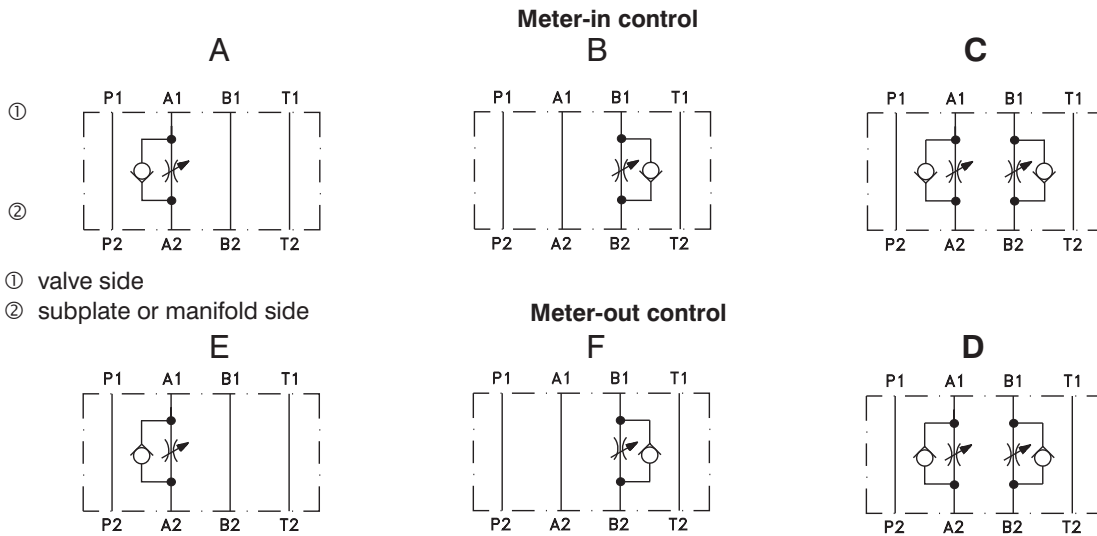
Seals
NBR
FPM (Viton)

Adjustment element
Hexagon set screw with locknut
and protective cap

A
B
C
E
F
D

Functional Symbols
check valve in line A*
check valve in line B*
check valves in lines A and B*
check valve in line A*
check valve in line B*
check valves in lines A and B*
* see Functional Symbols

Functional Symbols



Notes: The orientation of the throttle check valves in the valve body corresponds with symbols shown on the name plate.

Technical Data

Nominal size	mm	04
Maximum flow	L/min	25
Maximum operating pressure	bar	320
Hydraulic fluid	Hydraulic oils of power classes (HL, HLP) to DIN 51524	
Fluid temperature range for (NBR)	°C	-30 ... +100
Fluid temperature range for (Viton)	°C	-20 ... +120
Viscosity range	mm ² /s	20 ... 400
Maximum degree of fluid contamination	Class 21/18/15 to ISO 4406	
Weight	kg	0.8
Mounting position	unrestricted	

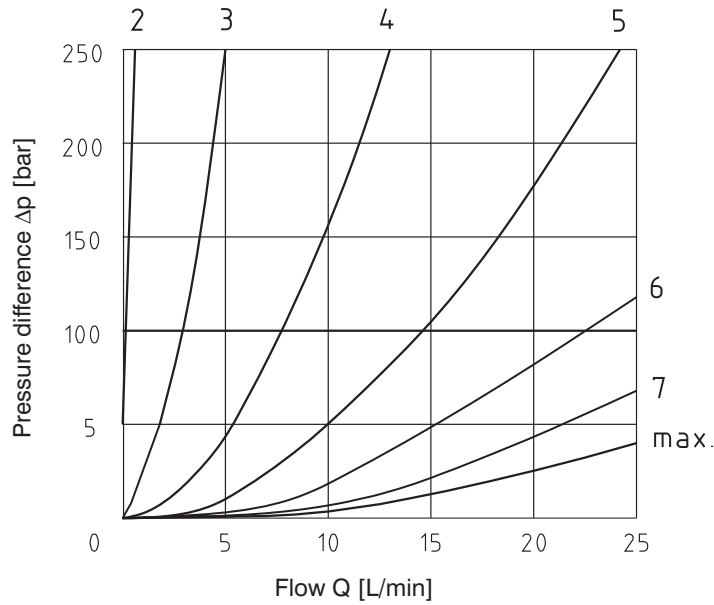
Δp-Q Characteristics

Measured at $v = 32 \text{ mm}^2/\text{s}$

Throttle valve

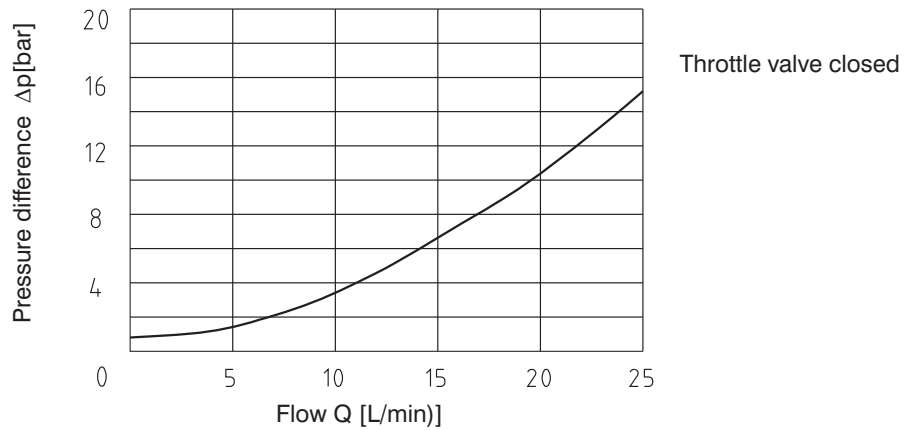
Pressure difference Δp related to flow from A1 to A2, (from B1 to B2)

- Throttle setting in turns (from the end stop)



Check valve

pressure difference Δp related to flow from A2 to A1 (from B2 to B1)



Spare Parts

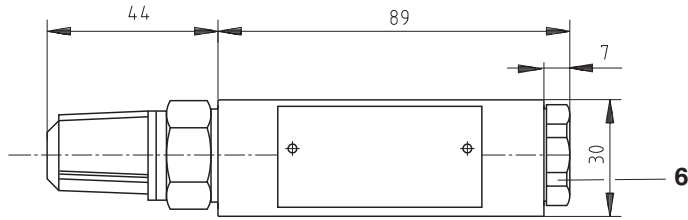
Seal kit

Type	Dimensions, quantity		Ordering number
	O-ring	Square ring	
Standard NBR70	-	7,65 x 1,68 (4 pcs.)	20718400
Viton	7,65 x 1,68 (4pcs.)	-	28618000

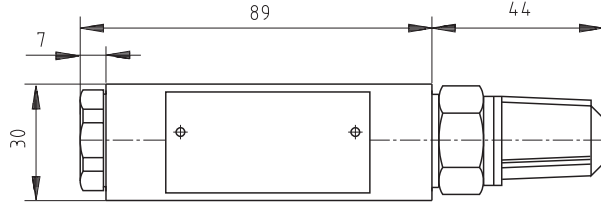
Valve Dimensions

Dimensions in millimeters

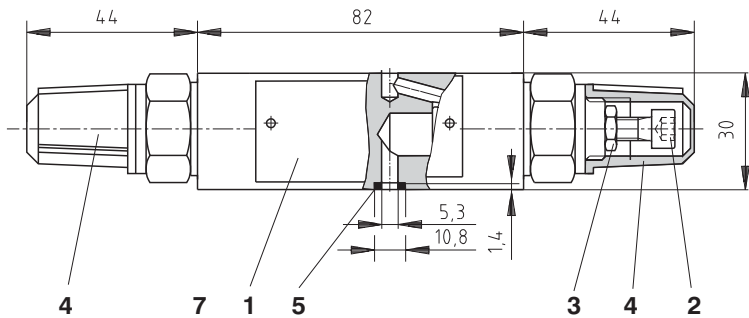
Typ VSO1-04/MAS
Typ VSO1-04/MES



Typ VSO1-04/MBS
Typ VSO1-04/MFS

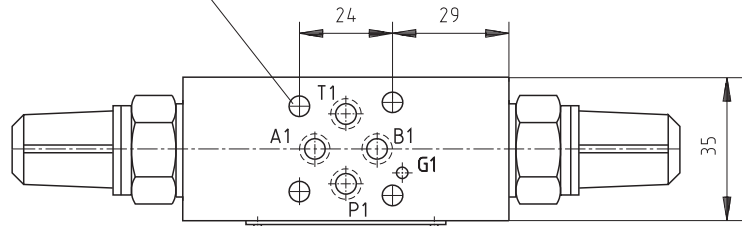


Typ VSO1-04/MCS
Typ VSO1-04/MDS

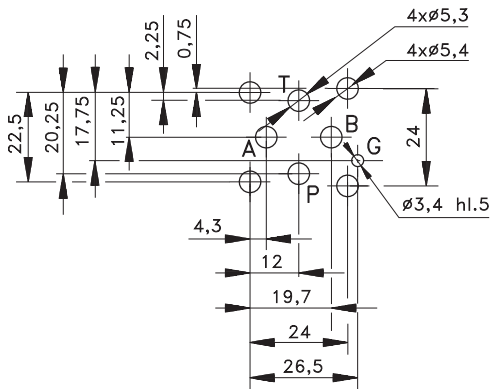


0,01/100 mm
0,8 (Rmax. 6,3)

Required surface finish of interface



Installation Dimensions



- 1 Name plate
- 2 Set screw - Inside HEX 5
Clockwise rotation = flow decrease
Counterclockwise rotation = flow increase
- 3 Locknut, HEX 10
- 4 Protective cap
- 5 Square ring (4 pcs.) supplied with valve
- 6 Closing screw
- 7 4 mounting holes

Caution!

- The packing foil is recyclable. The protective plate can be returned to manufacturer.
- A cover plate DK 1-04/32-x with the respective channel connection can be ordered separately - see catalogue HA 0003 - Cover plates.
- Mounting bolts M6x40 DIN 912-10.9 or studs must be ordered separately. Tightening torque 5 Nm.
- For applications outside these parameters, please consult the manufacturer.
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- In-line mounting
- Attachment under panel
- Three models:
 - Fine throttle valve
 - Fine throttle valve + check valve in parallel
 - Fine throttle valve + check valve in series
- Four throttle seat diameters



Functional Description

Fine throttle valves are used to control flow rates of pressure fluid. The connection threads in the valve body enable direct installation in line or hose. The valve is designed to be attached on the backside of a control panel by means of two bolts M6 (1). The outer bolt with the cylindrical head serves at the same time to limit to one revolution the hand knob.

The adjustment sensitivity of flow rate can be selected by using the respective seat diameter in the range from 2 up to 3.5 mm (see the flow characteristics).

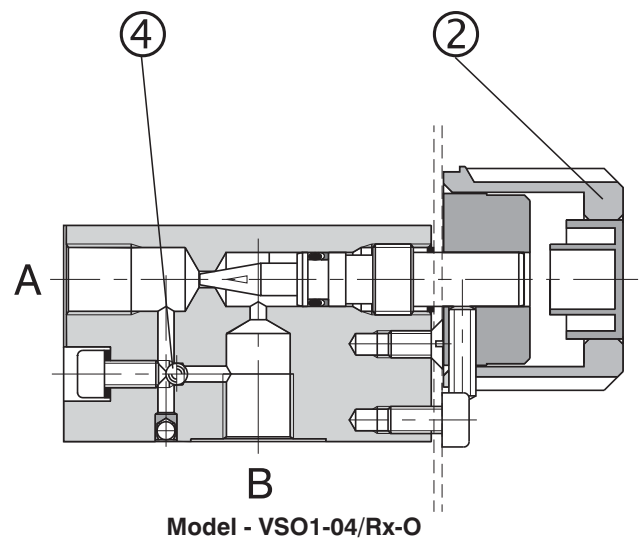
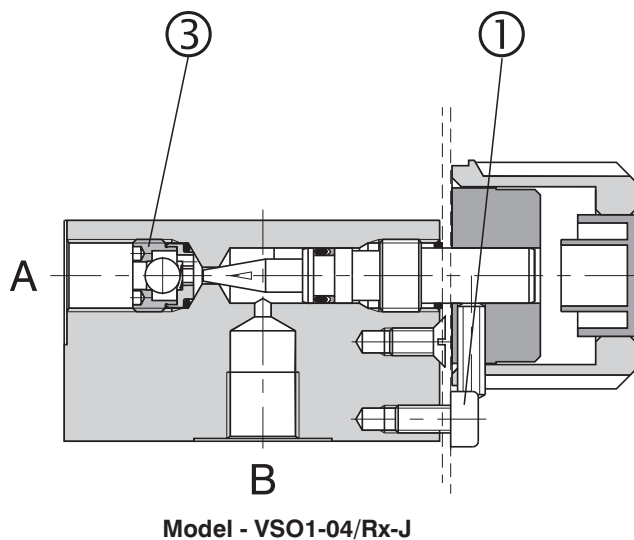
The attachment under the panel is carried out after removing the hand knob (2). The position of the hand

knob can then be adjusted either to the stop of the mounting bolt, or in line with the requested flow limitation, in a smaller angle of rotation.

If needed, the simple fine throttle valve can be completed with a check valve of the type VJO1-06/SG (3) HA 5004 which is installed in series.

To ensure the reverse free-flow through the valve, the model VSO1-04/Rx-O with a parallel ball valve (4) can be used.

The valve body is made of aluminum, the other parts of the valve do not have any surface treatment.



Ordering Code

VSO1-04/R -

Fine Throttle Valve

Nominal size

04 (D 02)

In-line mounting

Model
 without designation without check valve*
J with check valve in series*
O with check valve in parallel*
 * see Functional Symbols

2
2,5
3
3,5

Seat diameter

mm (0.787 in)
 mm (0.984 in)
 mm (0.118 in)
 mm (0.138 in)

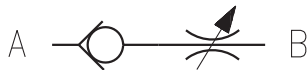
Other seat diameters after consultation.

Functional Symbols

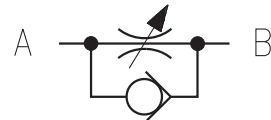
VSO1-04/Rx
 without check valve



VSO1-04/Rx-J
 with check valve in series



VSO1-04/Rx-O
 with check valve in parallel



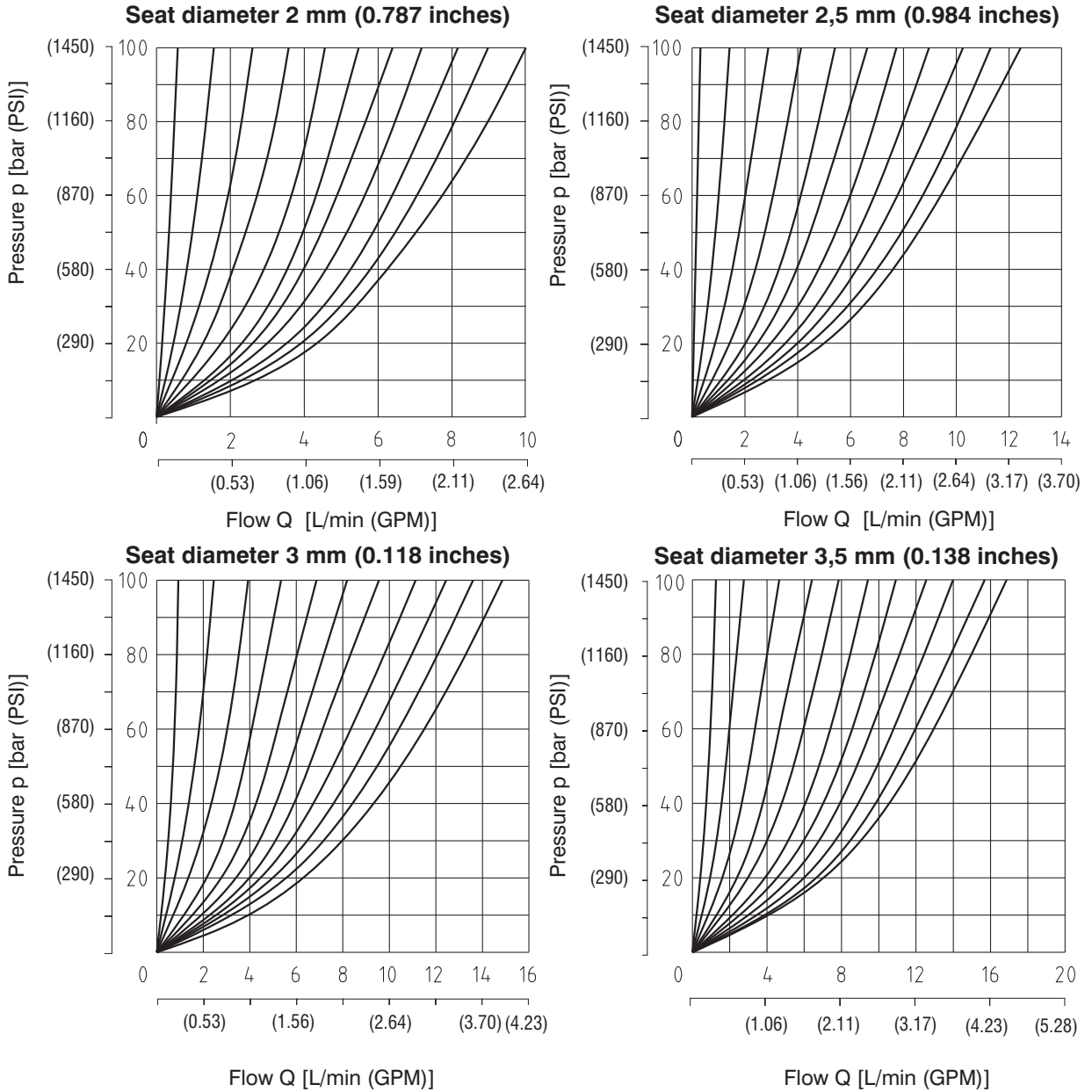
Technical Data

Nominal size	mm (US)	04 (D 02)
Max. operating pressure	bar (PSI)	100 (1450)
Hydraulic fluid		Hydraulic oils of power classes (HL, HLP) to DIN 51524
Fluid temperature range for (NBR)	°C (°F)	-30 ... +100 (-22... +212)
Viscosity range	mm ² /s (SUS)	20 ... 400 (98... 1840)
Maximum degree of fluid contamination		Class 21/18/15 to ISO 4406
Weight	kg (lbs)	0,22 (0.485)
Mounting position		unrestricted

p-Q Characteristics

Measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

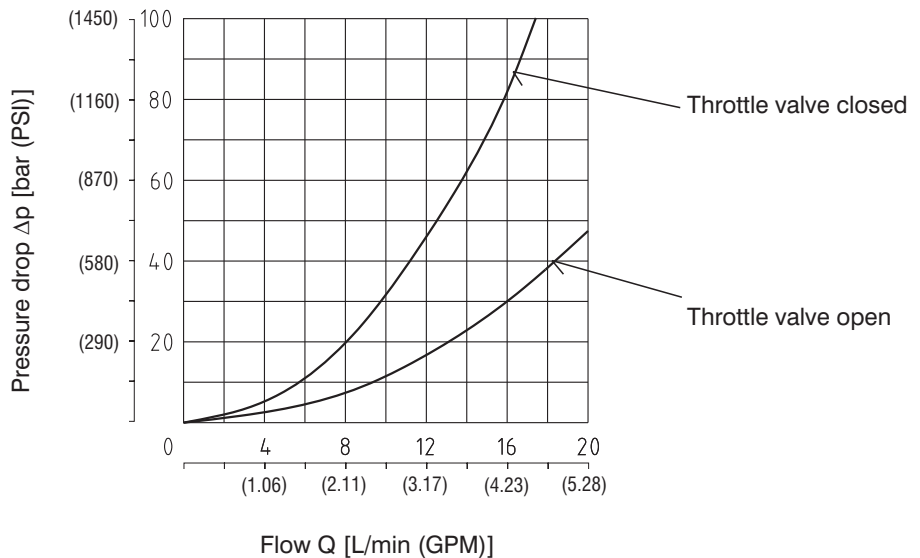
The characteristics were measured at hand knob positions set by 30°.



Δp -Q Characteristics

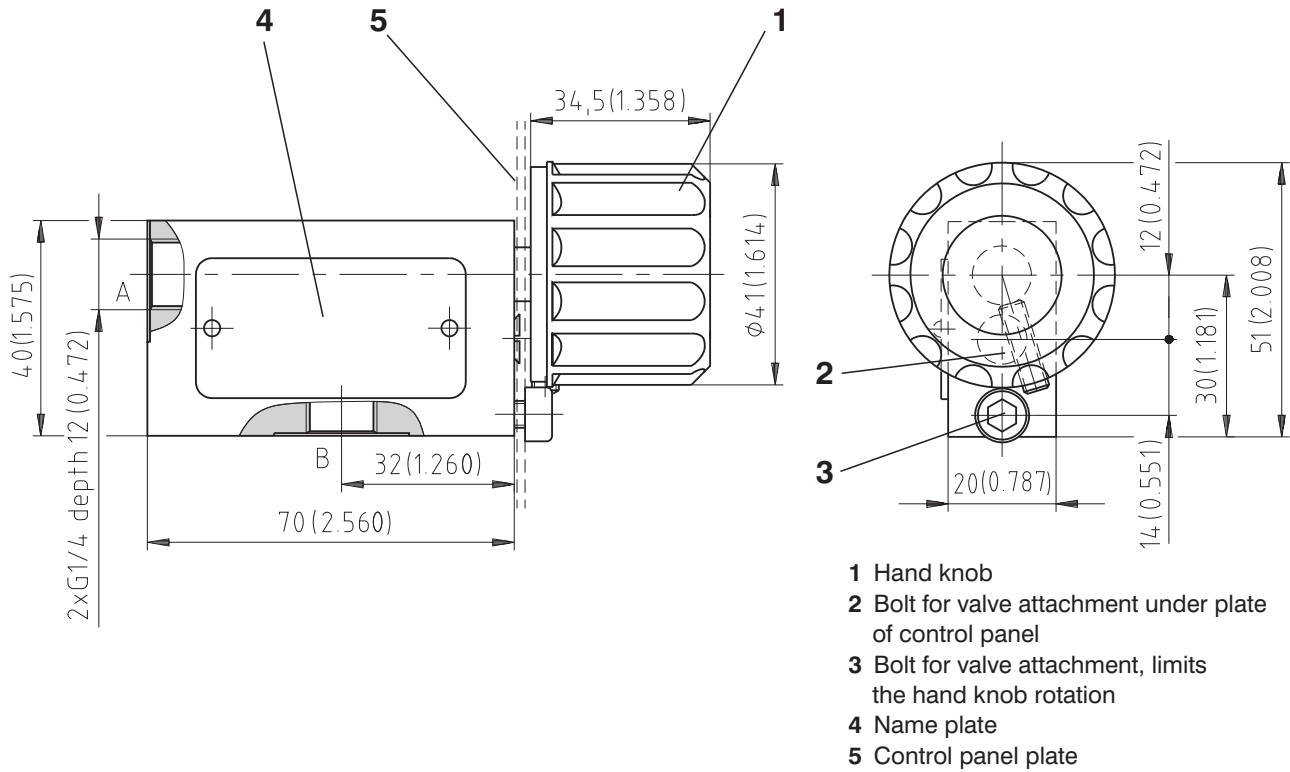
Measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Valid for model VSO1-04/R20,
flow direction B-A



Valve Dimensions

Dimensions in millimeters (inches)

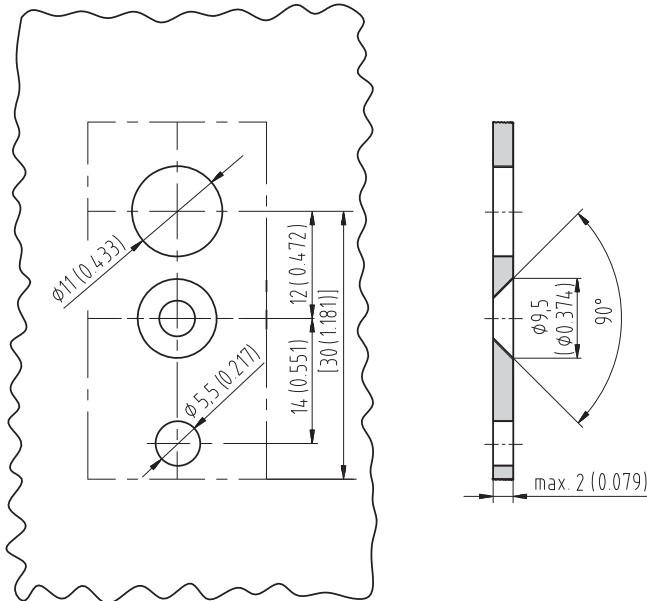


- 1 Hand knob
- 2 Bolt for valve attachment under plate of control panel
- 3 Bolt for valve attachment, limits the hand knob rotation
- 4 Name plate
- 5 Control panel plate

Board

Dimensions in millimeters (inches)

Installation Dimensions

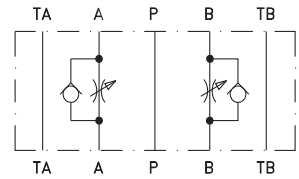


Caution!

- The packing foil is recyclable.
- The technical information regarding the product presented in this catalogue is for descriptive purposes only. It should not be construed in any case as a guaranteed representation of the product properties in the sense of the law.

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- Modular design for use in vertical stacking assemblies
- Meter-in or meter-out control
- Three functional symbols:
 - throttle valve in line A
 - throttle valve in line B
 - throttle valves in lines A and B
- Flow adjustment - hexagon set screw with locknut and protective cap
- Installation dimensions to ISO 4401-05-04-0-94 and DIN 24 340-A10



Functional Description

Double throttle valves are used to control flow rates in two separate lines (A, B) of a hydraulic circuit.

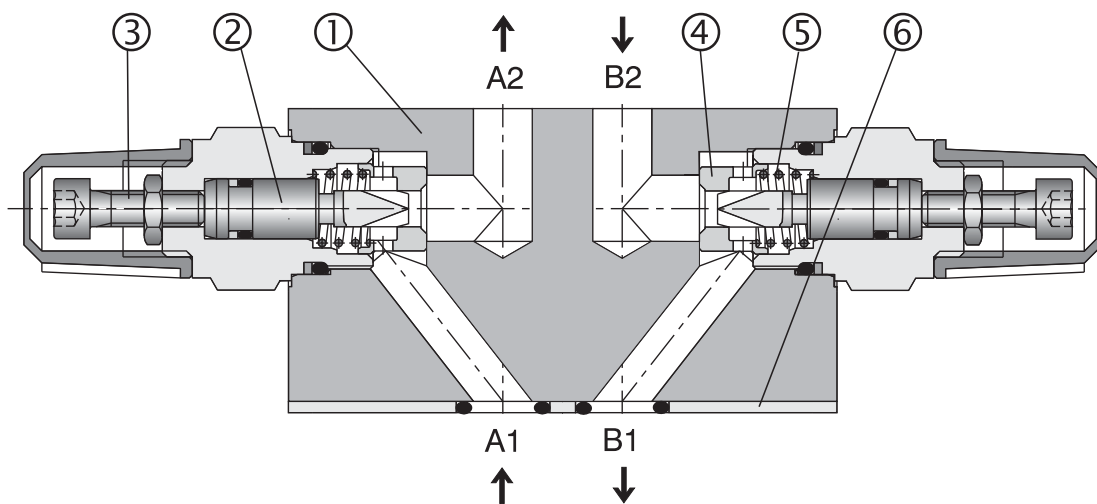
The valve body (1) has drilled channels and the throttle valve is built into channel A or B or into channels A and B. They restrict the fluid flow in one direction while providing reverse free-flow in the opposite direction. The throttling spool (2) is adjusted by means of set screw (3) and each spool position corresponds with a certain area of the flow passage.

Fluid entering port A1 is throttled to port A2 via a groove and an annulus area. Fluid entering port B2 shifts the valve seat (4) against the spring (5), thus creating a passage which allows reverse free-flow to port B1 (function of a check valve).

The modular design enables simple vertical stacking with other components of the same size. A separate O-ring plate (6) with fitted O-rings is mounted underneath the valve body, thus providing its sealing. According to the valve arrangement, the meter-in or meter-out control is provided. Changing the meter-in mode into the meter-out mode can be done by turning the valve body by 180° around its x-axis.

The orientation of the throttle/check valves in the valve body corresponds with the symbols shown on the name plate.

The basic surface treatment of the valve housing (1) is phosphate coated, whereas the surfaces of the other parts are zinc coated.



VSO2-10/MCS (meter-out control)

Ordering Code

VSO2-10/M

Double Throttle Check Valve

Nominal size

Modular design

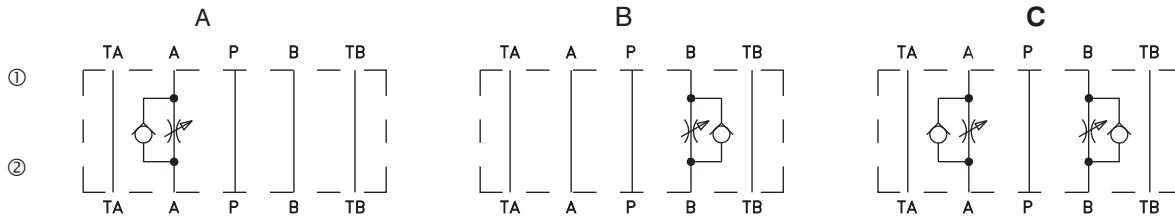
Seals
 no designation V Standard (NBR)
 Viton (FPM)

Adjustment element
 S Set screw with inside hexagon

A
 B
 C

Functional Symbols
 check valve in line A*
 check valve in line B*
 check valves in lines A and B*
 * see Functional Symbols

Functional Symbols



Notes: ① valve side
 ② subplate or manifold side
 The orientation of the symbol shown on the name plate corresponds with the function of the valve (meter-out control).

Technical Data

Nominal size	mm	10
Maximum flow rate	L/min	100
Maximum operating pressure	bar	350
Hydraulic fluid	Hydraulic oils of power classes (HL, HLP) to DIN 51524	
Fluid temperature range for (NBR)	°C	-30 ... +100
Fluid temperature range for (Viton)	°C	-20 ... +120
Viscosity range	mm ² /s	20 ... 400
Maximum degree of fluid contamination	Class 21/18/15 according to ISO 4406	
Weight	kg	2.15
Mounting position	unrestricted	

Caution!

- The packing foil is recyclable. The protective plate can be returned to manufacturer.
- Mounting bolts must be ordered separately. Tightening torque of the screws is 15 Nm.
- The technical information regarding the product presented in this catalogue is for descriptive purposes only. It should not be construed in any case as a guaranteed representation of the product properties in the sense of the law.

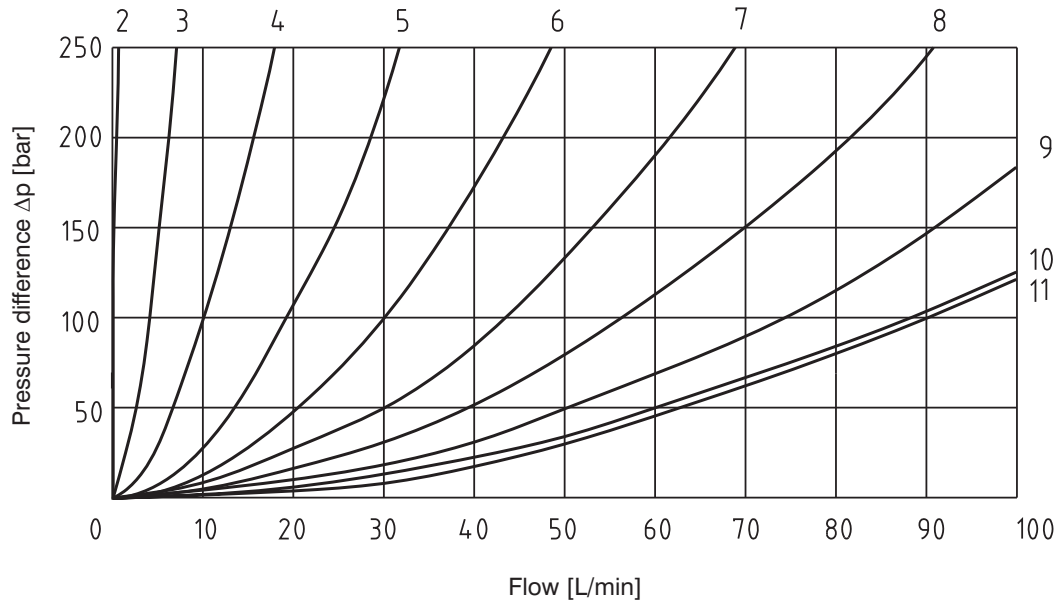
Δp-Q Characteristics

Measured at $v = 32 \text{ mm}^2/\text{s}$

Throttle valve

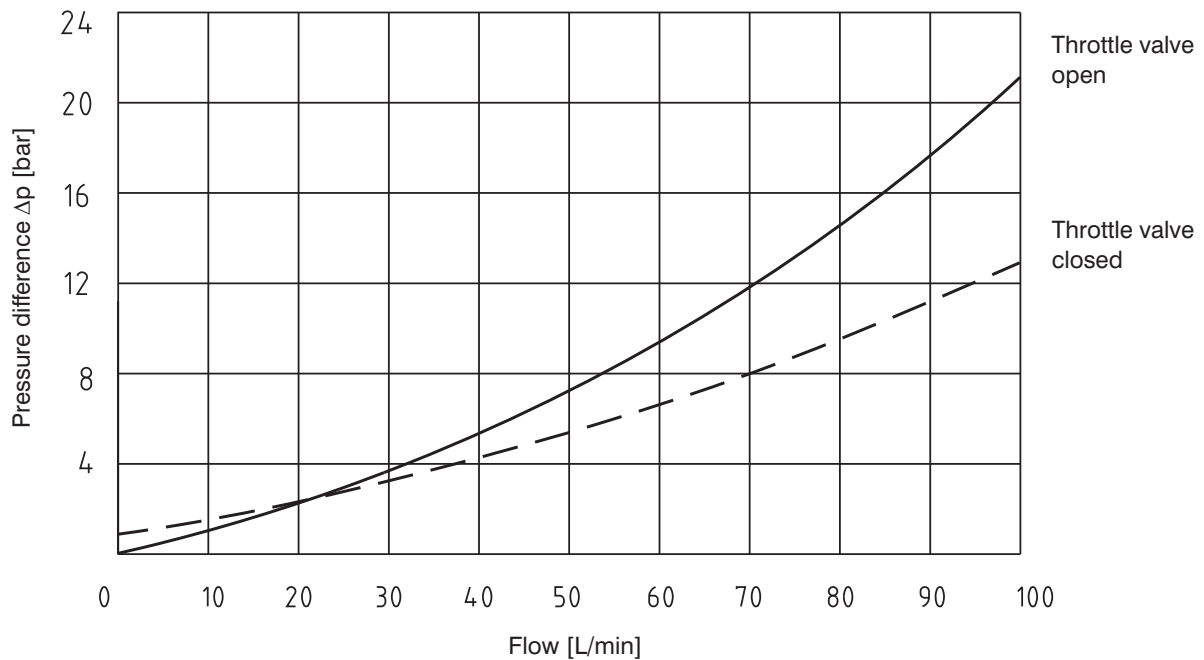
Pressure difference Δp related to flow from A1 to A2, (from B1 to B2)

- Throttle setting in turns (from the end stop)



Check valve

Pressure difference Δp related to flow from A2 to A1, (from B2 to B1)



Spare Parts

Seal kit

Type	Dimensions, quantity		Ordering number
	O-ring	Square ring	
Standard NBR70	-	12.42x1.68 (5 pcs.)	15991600
Viton	12.42x1.68 (5 pcs.)	-	22943800

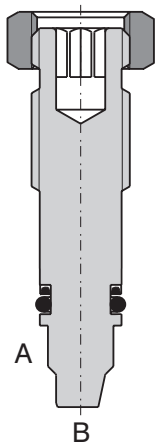
M12x1 • p_{max} 320 bar (4641 PSI) • Q_{max} 20 L/min (5.28 GPM)

- Screw-in cartridge design
- Use :
 - Metering in one direction
 - Metering in both directions
- Flow rate set by adjustment screw internal to hexagon lock-nut

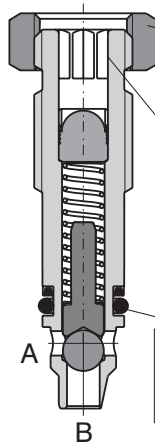


Functional Description

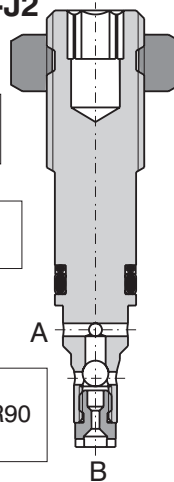
VSV2-1



VSV2-J1



VSV2-J2



Lock-nut outside HEX 19

Screw inside HEX 6

Seals
6,73x9,43x1,14 NBR90
6,9x1,8 NBR70

Throttle valve VSV2 is used to control the flow in a hydraulic system in one or both directions.

- 1) A higher sensitivity control is achieved by using the M12x1 screw thread
- 2) After loosening the lock nut the valve may be screwed out only up to the red marked safety notch; otherwise the valve could get completely unscrewed leading to working fluid escape.

Ordering Code

VSV2 - /

Screw-in Cartridge Throttle Valve

	Model	
1	without check valve	
J1	with check valve, non regulated flow B→A	
J2	with check valve, non regulated flow A→B	

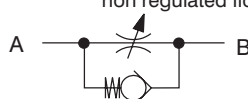
Thread
M12x1

Functional Symbols

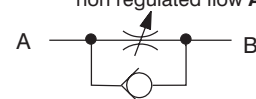
VSV2-1 without check valve



VSV2-J1 with check valve, non regulated flow B→A



VSV2-J2 with check valve, non regulated flow A→B



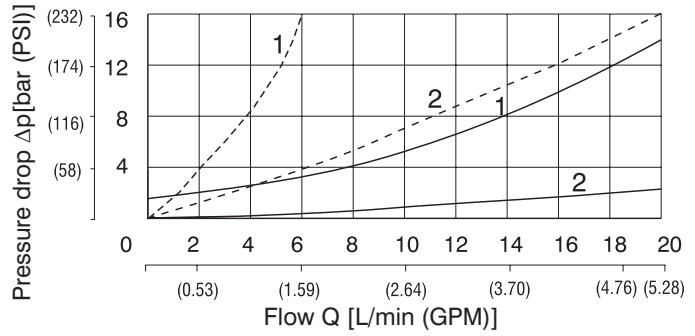
Technical Data

Nominal size	mm	M12x1
Max. operating pressure	bar (PSI)	320 (4641)
Hydraulic fluid		Hydraulic oils of power classes (HL, HLP) to DIN 51 524
Fluid temperature range	°C (°F)	-30 ... +100 (-22 ... +212)
Viscosity range	mm ² /s	20 ... 400
Maximum degree of fluid contamination		Class 21/18/15 to ISO 4406
Weight	kg (lbs)	0,11 (0.243)
Mounting position		unrestricted

Δp Characteristics

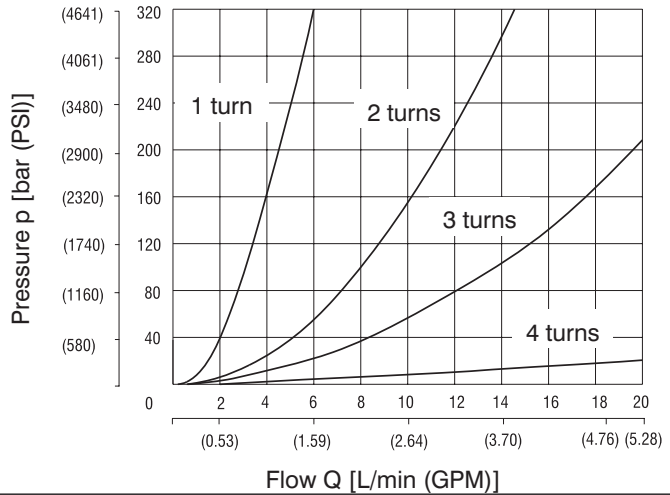
Measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

- VSV2-J1 - Flow direction B → A ————
 VSV2-J2 - Flow direction A → B - - - -
 1 - Throttle valve closed
 2 - Throttle valve open



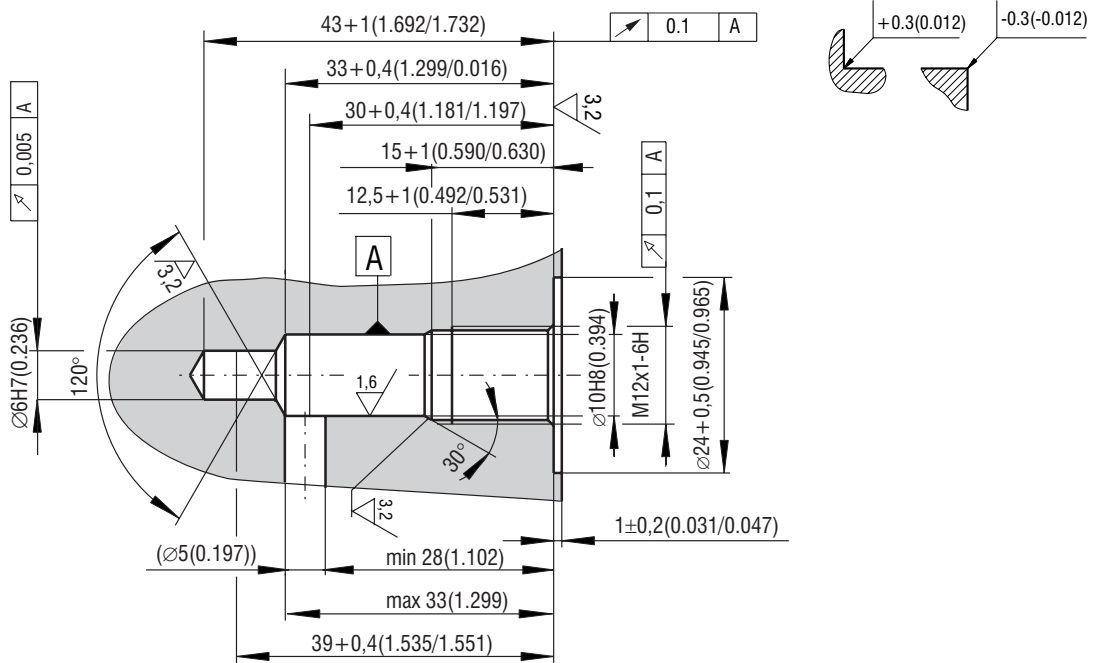
p-Q Characteristics

Measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)



Cavity

Dimensions in millimeters (inches)

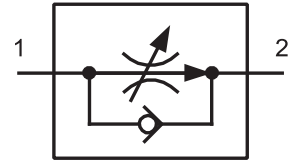


Caution!

- The packing foil is recyclable.
- The technical information regarding the product presented in this catalogue is for descriptive purposes only. It should not be construed in any way as a guaranteed representation of the product properties in any legal sense.

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- Volumetric flow control independent to the load
- Volumetric flow control independent to the viscosity
- Large flow range



Functional Description

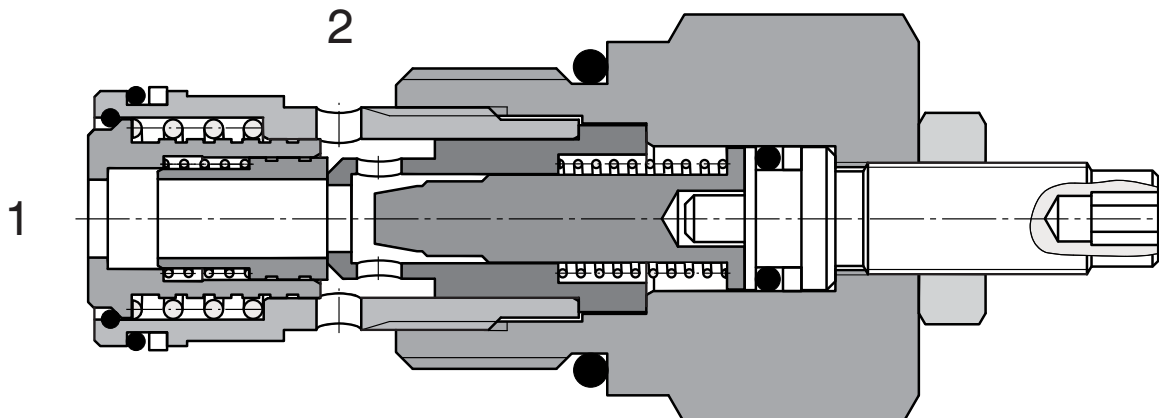
The valve consists of an adjustable measuring orifice plate after which it is installed a stabilizer of pressure drop and of an by-pass unidirectional valve formed by a bushing of the stabilizer gate valve fitted with a seat on the front surface.

During the flow from (1) to (2) the liquid flows through the centre of the stabilizer gate valve and applies pressure at the same time to the gate valve of the unidirectional valve to press it in the seat and then continues to flow through the throttling cross section to the side channel (2). The stabilizer has been designed to serve for maintaining a pressure difference arisen in front of the measuring orifice plate and after the measuring orifice plate at a constant level of approximately of 1.2 MPa given by the spring force so as to ensure a constant

rate of flow through the channel (2). The pressure in front of the throttling orifice plate acts to the side part of the stabilizer gate valve and the pressure in the channel (2) acts to back side of the stabilizer gate valve. Due to permanent equalizing the forces the position of the stabilizer gate valve changes with each change of pressure before and after the measuring orifice plate and in this way it results in appropriate decreasing or eventually appropriate increasing the flow cross section in the channel (2).

In the direction from (2) to (1) the liquid flows through the unidirectional valve with a small pressure drop.

As for appropriate basic surface finish the external parts are zinc coated.



Ordering Code

SF2C2A-K2/I

2 way flow control valve
with free flow check valve

Adjustable flow range
4 - 40 L/min
6 - 60 L/min

4
6

no designation

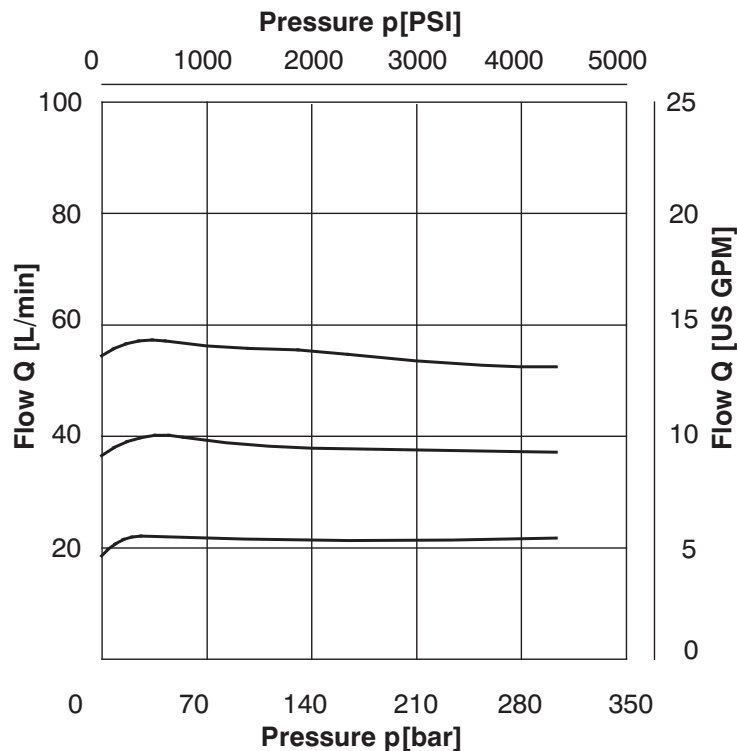
Seals
NBR

Technical Data

Cavity		M27 x 2
Adjustment range	L/min	4 - 60
Max. pressure	bar	350
Hydraulic fluid		Hydraulic oil (HM, HV) according to DIN 51524
Fluid temperature range	°C	-20 ... +90
Viscosity	mm ² /s	20 ... 400
Maximum degree of fluid contamination		According to ISO 4406, Class 21/18/15
Weight	kg	0.29
Maximum valve tightening torque in valve body or in control block	Nm	75 ⁺²
Mounting position		Unrestricted

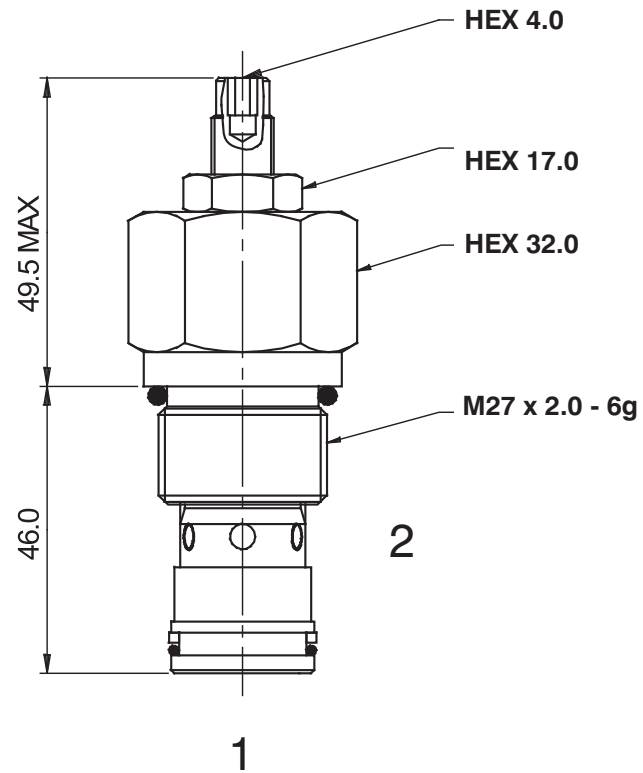
p-Q Characteristics

Measured at $\nu = 40 \text{ mm}^2/\text{s}$



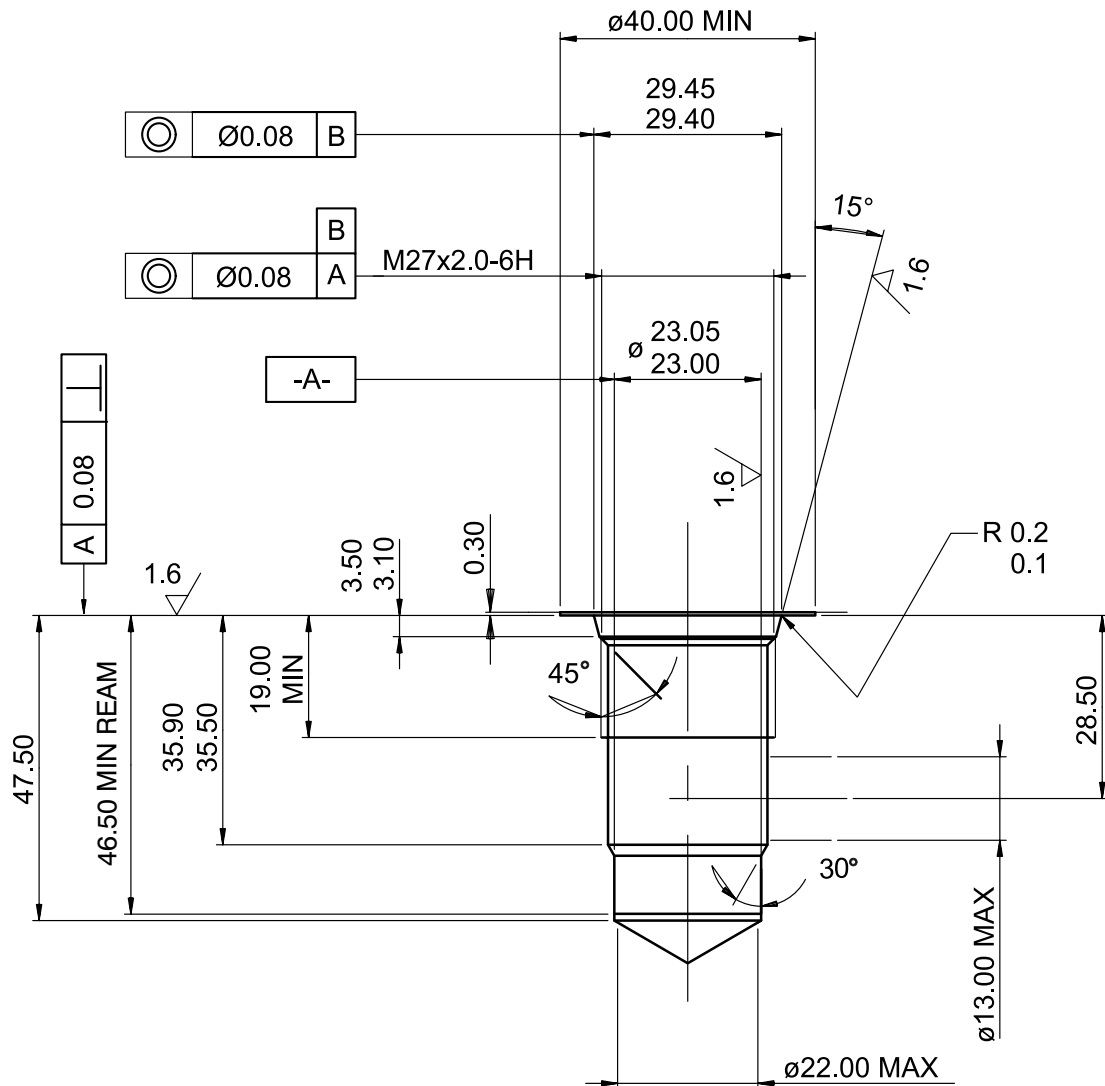
Dimensions

Measurements in millimeters



Cavity

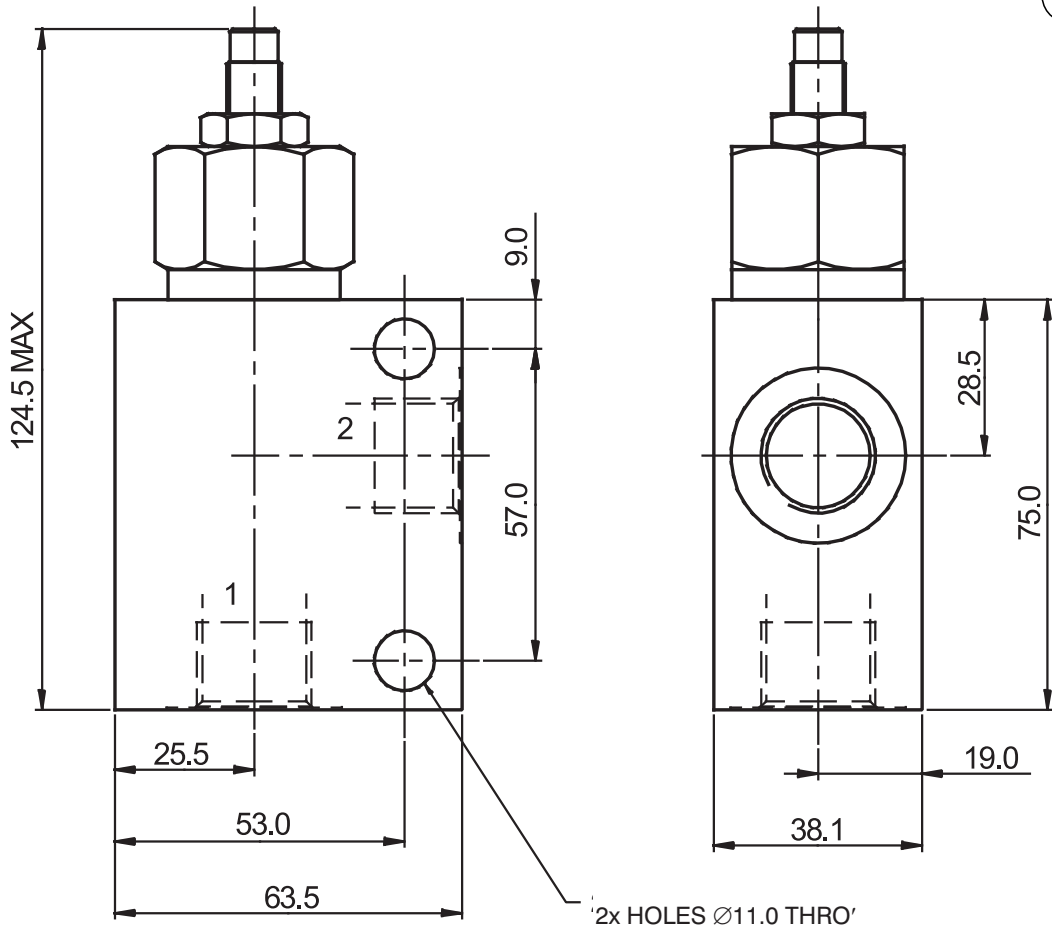
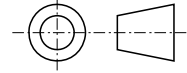
Measurements in millimeters



Valve Bodies

Measurements in millimeters

ISO A



Body without valve			
Material	Ports	Port size	Type code
Aluminium	1, 2	G1/2	SB-K2-0105AL
	1, 2	SAE 10, 7/8-14	SB-K2-0106AL
Steel	1, 2	G1/2	SB-K2-0105ST
	1, 2	SAE 10, 7/8-14	SB-K2-0106ST

The use of aluminium bodies is limited to a maximum operating pressure of 210 bar.

Spare Parts

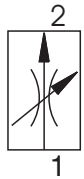
Seal kits on request.

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- Hardened and precision working parts
- Flow rate setting with adjustment screw or with hand wheel
- Quiet and stable flow setting over complete pressure range
- Fine low-torque adjustment



Functional Description

Pressure compensated flow control valves are installed in hydraulic systems where only small adjustment due to load induced changes flow are required.

The valve consists basically of throttling orifice (1), pressure compensator (2), bushing (3), adjustment screw (4) and spring (5).

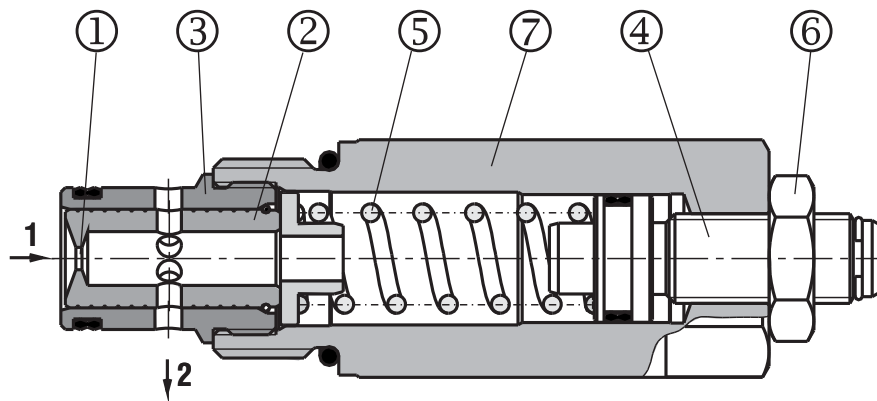
Throttling in direction 1 → 2 is realised on the throttling orifice. The flow rate depends on the orifice diameter and on the pressure difference at the orifice. The pressure difference can be adjusted in a certain range through preloading the spring (5), which results in the respective flow change. The allocation of the orifice diameters and the corresponding flow rates is apparent from the characteristics. The flow rate adjustment can be accomplished by adjustment screw (4). The clockwise rotation increases the flow rate, the anticlockwise rotation decreases the flow rate.

The flow rate stabilization is provided by pressure compensator (2), which is situated behind the throttling orifice and mounted into bushing (3). The pressure compensator continuously compares the pressure difference at the throttling orifice (1) with the value given by the spring preload.

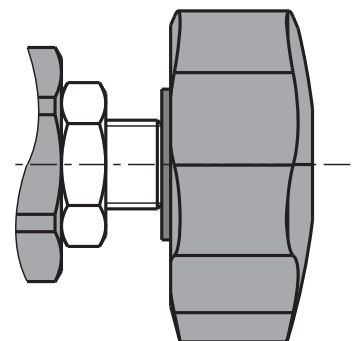
The valve cannot be fully closed for flow 0 L/min. In flow direction 2 → 1, the valve works as an ordinary throttle valve without pressure compensation feature. The pressure losses depend on the orifice diameter – see the respective characteristics.

The valve housing (7), the nut (6) and the adjustment screw (4) are zinc coated.

Model S



Model R



Ordering Code

SF22A-B2 /

2 way Flow Control Valve
pressure compensated
7/8-14 UNF

High performance

H

no designation
V

S
R

Seals
NBR
FPM (Viton)

Adjustment option
Inside hexagon 5 mm
Adjustable handknob

12
20
40

Flow rate
Flow 3,2-12 L/min (0.85-3.17 GPM)
Flow 5,1-20 L/min (1.35-5.28 GPM)
Flow 5,0-41 L/min (1.32-10.83 GPM)

Technical Data

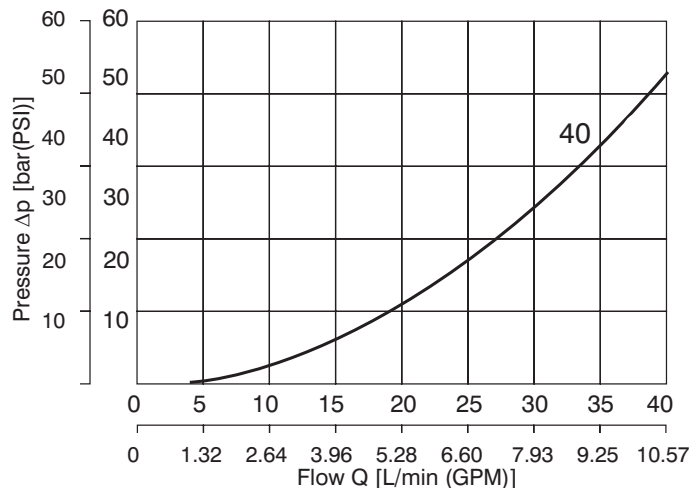
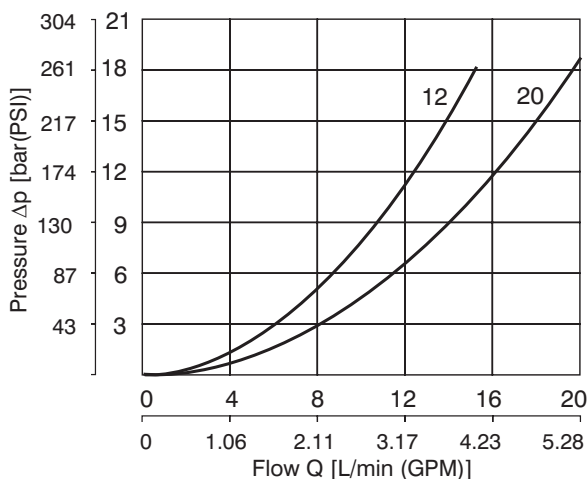
Valve size	B2		
Cartridge thread	7/8-14 UNF-2A		
Nominal Flow rate	12	20	40
Flow range	see Q- Δp characteristic		
Maximum working pressure	bar (PSI) 350 (5076)		
Hydraulic fluid	Hydraulic oils of power classes (HL, HLP) to DIN 51524		
Fluid temperature range (NBR)	°C (°F) -30... + 100 (-22 ... +212)		
Fluid temperature range (Viton)	°C (°F) -20 ... +120 (-4 ... +248)		
Viscosity range	mm ² /s (SUS) 10 ... 500 (49 ... 2450)		
Maximum degree of fluid contamination	Class 21/18/15 to ISO 4406		
Weight	kg (lbs) 0,220 (0.485)		
Mounting position	unrestricted		
Valve body (data sheet HA0018)	SB-B2		

Δp -Q Characteristics

Measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Flow directional 2→1 (Throttling without compensator)

Flow rate 12, 20, 40

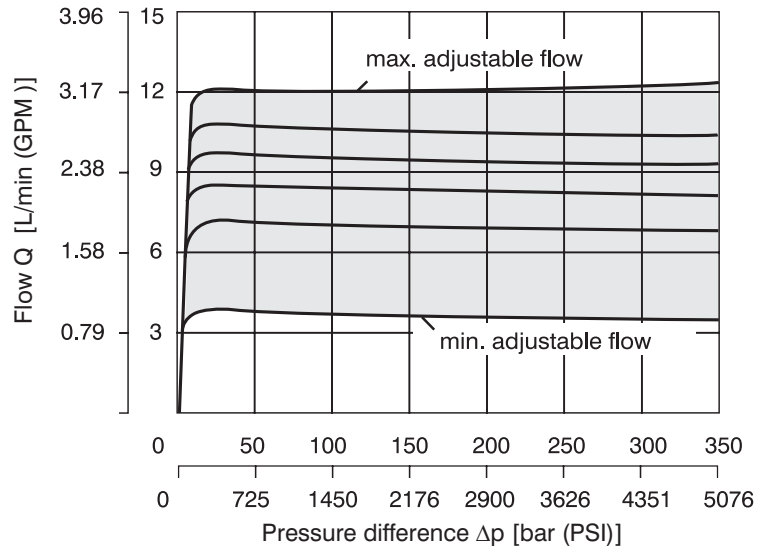


Δp-Q Characteristics

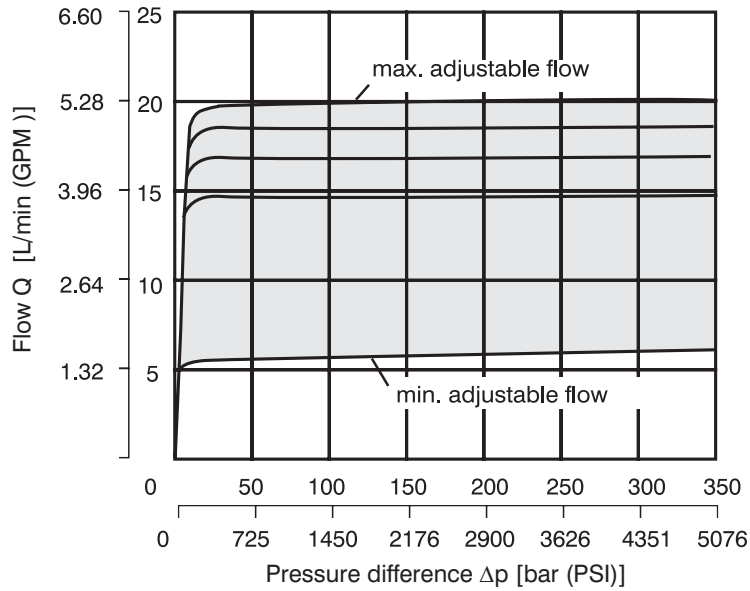
Measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Flow directional 1 → 2 (Controlled flow)

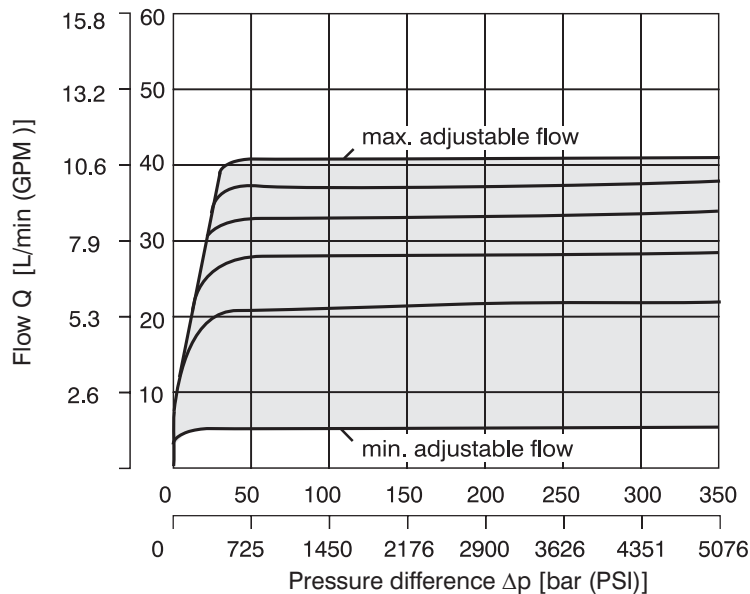
Flow rate 12



Flow rate 20

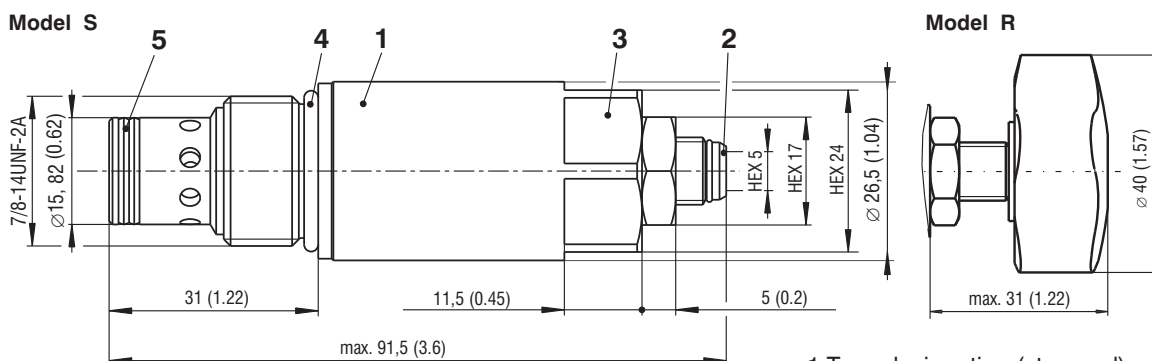


Flow rate 40



Valve Dimensions

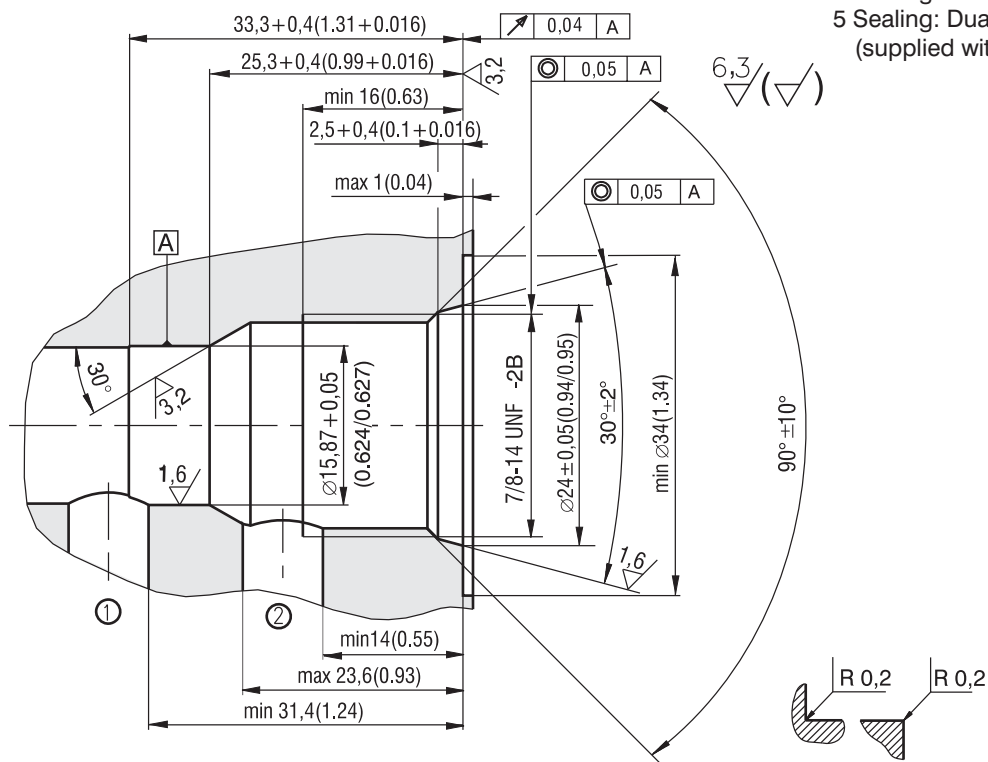
Dimensions in millimeters (inches)



- 1 Type designation (stamped)
- 2 Screw for fine flow adjustment
 - inside hexagon 5 mm
 - anticlockwise rotation = flow decrease
 - clockwise rotation = flow increase
- 3 Spanner size 24 mm
tightening torque 60+5 Nm (44.3+3.7 lbf.ft)
- 4 Sealing: O-ring 19,4x2,1 (supplied with valve)
- 5 Sealing: Dualseal 13,47 x 15,87 x 3,1 (supplied with valve)

Cavity

Dimensions in millimeters (inches)



Spare Parts

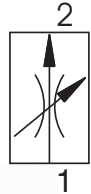
Type	Dimensions, quantity		Ordering number
NBR	O-ring	Dualseal - PU	
	19,4 x 2,1 (1pc)	13,47 x 15,87 x 3,1 (1pc)	20159100
FPM (Viton)	19,4 x 2,1 (1pc)	13,47 x 15,87 x 3,1 (1pc)	20143900
	19,4 x 2,1 (1pc)	13,47 x 15,87 x 3,1 (1pc)	20159100
19,4 x 2,1 (1pc)	13,47 x 15,87 x 3,1 (1pc)	20144100	

Caution!

- The plastic packaging is recyclable. .
- Certified documentation is available per request.

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- Cartridge design
- Flow rate setting with adjustment screw
- For use in meter-in, meter-out and bleed-off applications



Functional Description

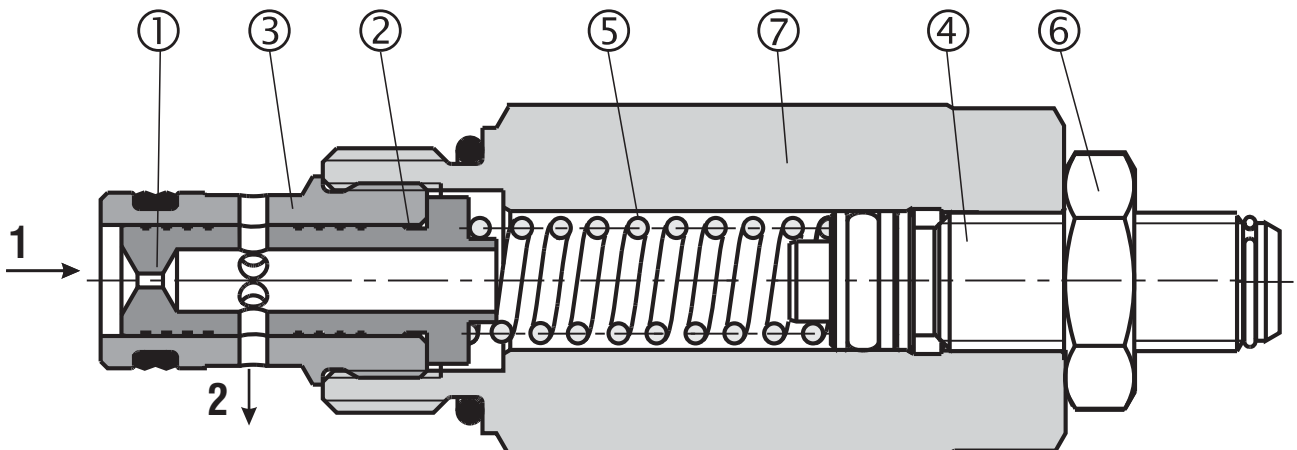
Pressure compensated flow control valves are installed in hydraulic systems where only small speed or revolution variation due to load changing are required. The valve consists of throttling orifice (1), pressure compensator (2), bushing (3), adjustment screw (4) and spring (5).

Throttling in direction 1 → 2 is realised on the throttling orifice. The flow rate depends on the orifice diameter and on the pressure difference at the orifice. The pressure difference can be adjusted in a certain range through preloading the spring (5), which results in the respective flow change. The allocation of the orifice diameters and the corresponding flow rates is apparent from the characteristics. The flow rate adjustment can be accomplished by adjustment screw (4). The clockwise rotation increases the flow rate, the anticlockwise rotation decreases the flow rate.

The flow rate stabilization is provided by pressure compensator (2), which is situated behind the throttling orifice and mounted into bushing (3). The pressure compensator continuously compares the pressure difference at the throttling orifice (1) with the value given by the spring preload.

In flow direction 2 → 1, the valve works as an ordinary throttle valve without pressure compensation feature. The pressure losses depend on the orifice diameter – see the respective characteristics.

The valve housing (7), the nut (6) and the adjustment screw (4) are zinc coated.



Ordering Code

SF22A-A2 /

**2 Way Cartridge Flow Control Valve
3/4-16UNF**

High performance

H

**no designation
V**

Seals
Standard (NBR)
Viton (FPM)

**2
6
12**

Nominal flow rates
Flow 2 L/min (0.53 GPM)
Flow 6 L/min (1.59 GPM)
Flow 12 L/min (3.17 GPM)

Technical Data

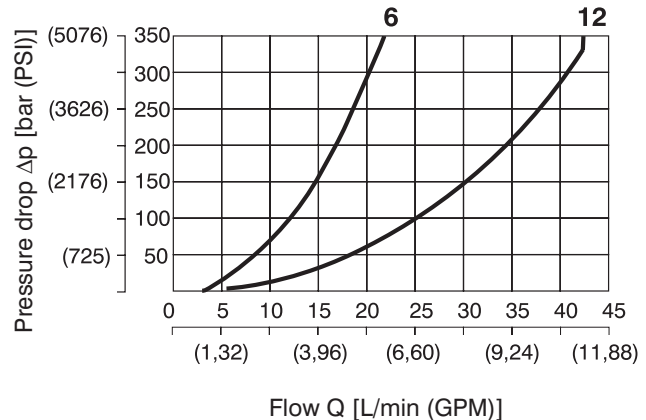
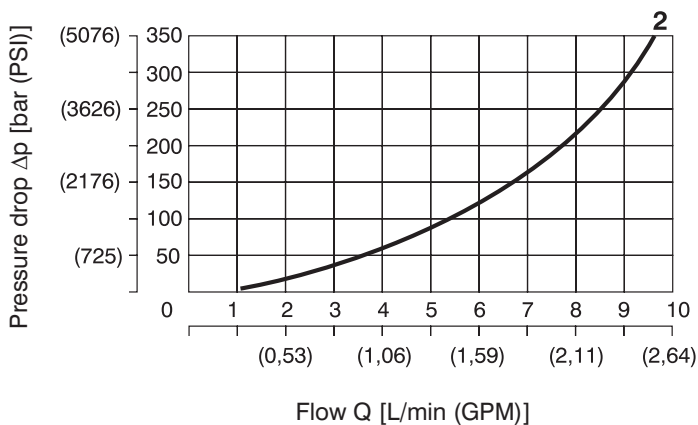
Valve size	A2		
Cartridge cavity	3/4-16 UNF-2A		
Nominal flow rates	L/min (GPM)	2 (0.53)	6 (1.59) 12 (3.17)
Flow range	see Q-Δp characteristic		
Maximum working pressure	bar (PSI)	350 (5076)	
Hydraulic fluid	Hydraulic oils of power classes (HL, HLP) to DIN 51524		
Fluid temperature range (NBR)	°C (°F)	-30... + 100 (-22 ... +212)	
Fluid temperature range (Viton)	°C (°F)	-20 ... +120 (-4 ... +248)	
Viscosity range	mm ² /s (SUS)	10 ... 500 (49 ... 2450)	
Maximum degree of fluid contamination	Class 21/18/15 to ISO 4406		
Weight	kg (lbs)	0,186 (0.410)	
Mounting position	unrestricted		
Valve body (data sheet HA 0018)	SB-A2		

Δp-Q Characteristics

Measured at v = 32 mm²/s (156 SUS)

Flow directional 2 → 1 (Throttling without compensator)

Nominal flow rates 2, 6, 12

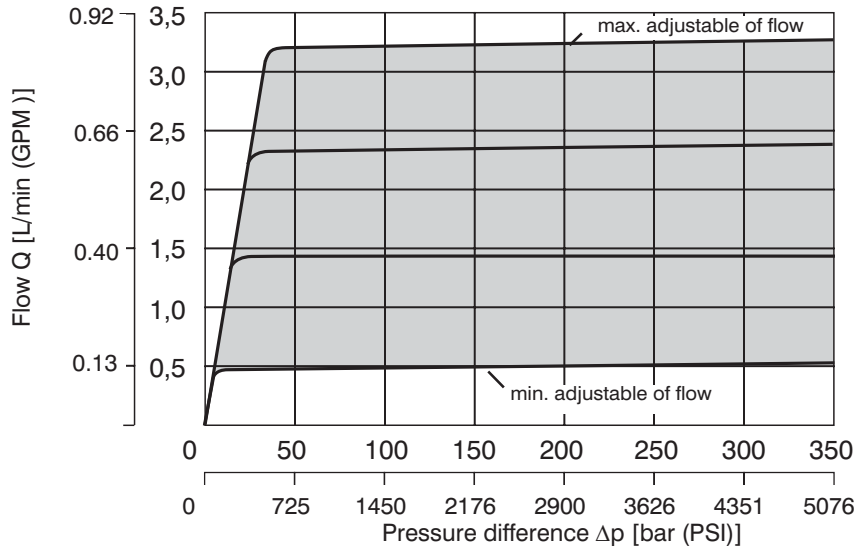


Δp-Q Characteristics

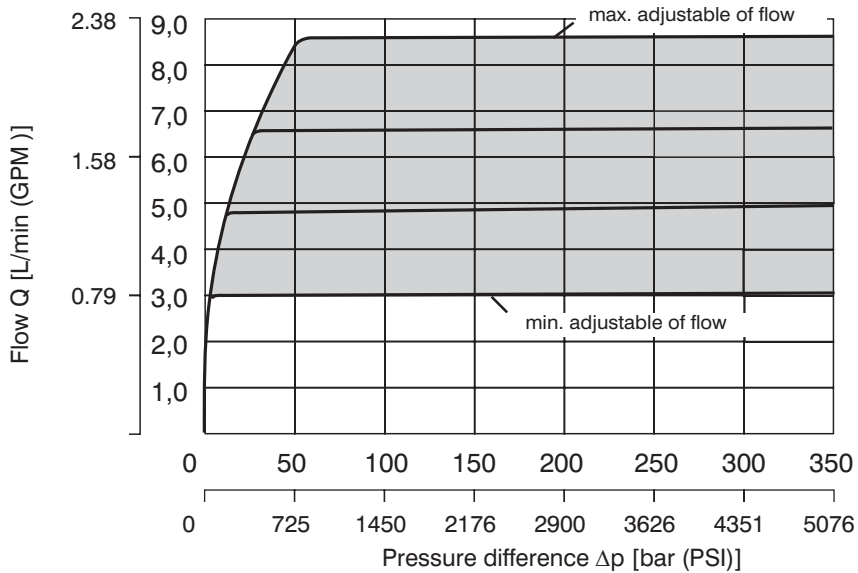
Measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Flow direction 1 → 2 (Controlled flow)

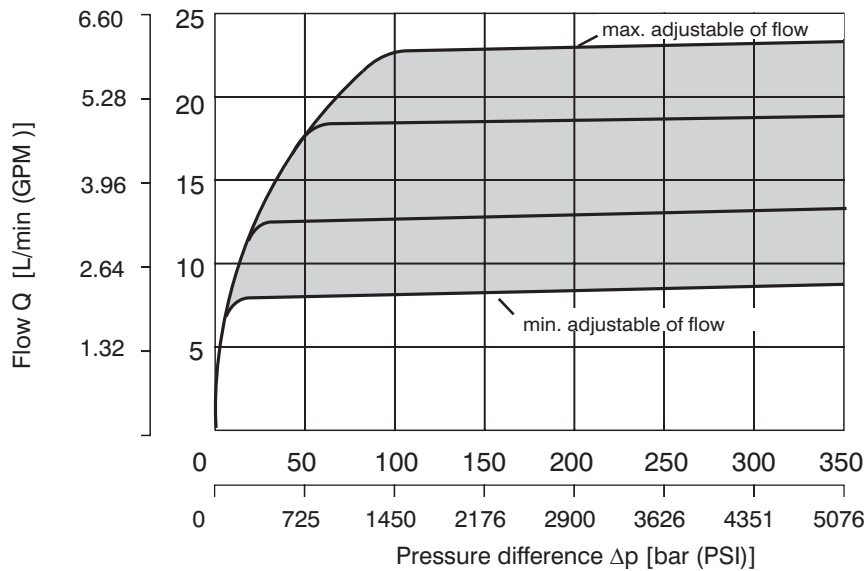
Nominal flow rate 2 L/min (0.53GPM)



Nominal flow rate 6 L/min (1.59 GPM)

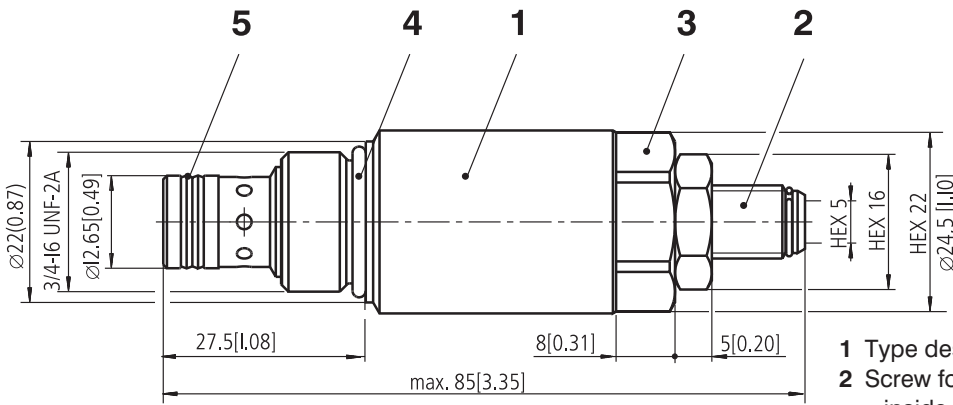


Nominal flow rate 12 L/min (3.17 GPM)



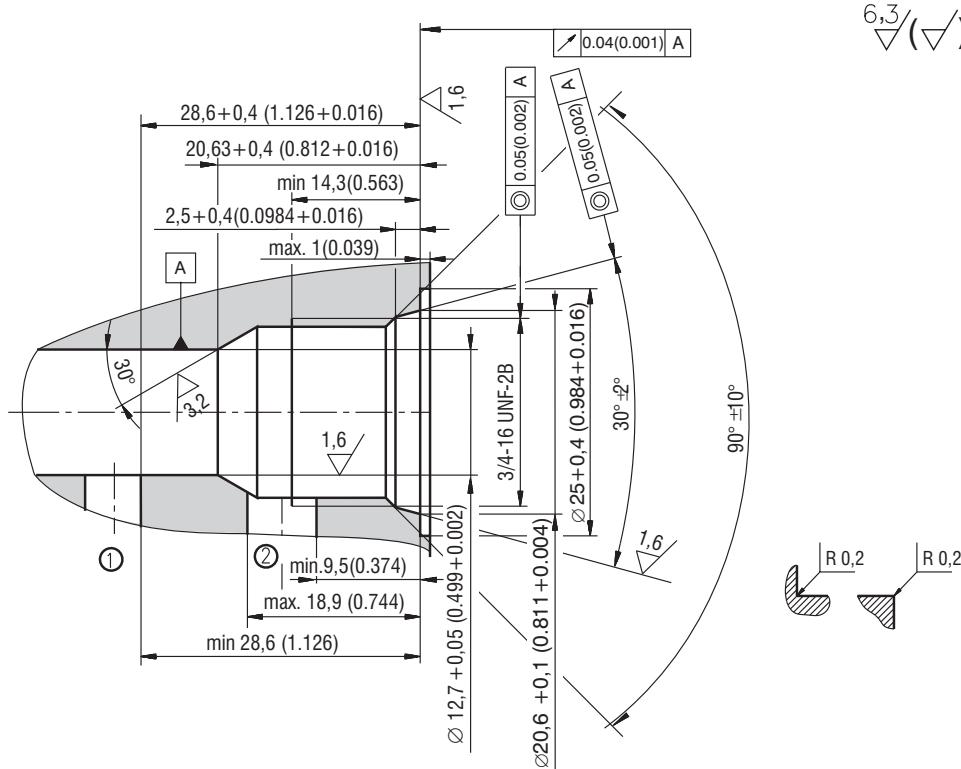
Valve Dimensions

Dimensions in millimeters and inches



- 1 Type designation (stamped)
- 2 Screw for fine flow adjustment
 - inside hexagon 5 mm (0.20 inch)
 - anticlockwise rotation = flow decrease
 - clockwise rotation = flow increase
- 3 Wrench flats size 22 mm (0.87 inch), tightening torque 30 Nm (22.1 lbs)
- 4 Sealing: O-ring 17 x 1,8 supplied with valve
- 5 Sealing: Dualseal 10,3 x 12,7 x 3,1 supplied with valve

Cavity



Spare Parts

Dimensions in millimeters

Seal kit

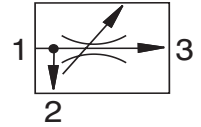
Type	Dimensions, quantity		Ordering number
	O-ring	Dualseal - PU	
Standard - NBR		10,3 x 12,7 x 3,1 (1 pc.)	20157700
Viton	17 x 1,8 (1pc.)		15606500

Caution!

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- ❑ Hardened and precision working parts
- ❑ Flow rate setting with adjustment screw or with hand wheel
- ❑ Quiet and stable flow setting over complete pressure range
- ❑ Bypass port 2 may be fully pressurized
- ❑ Fine low-torque adjustment



Functional Description

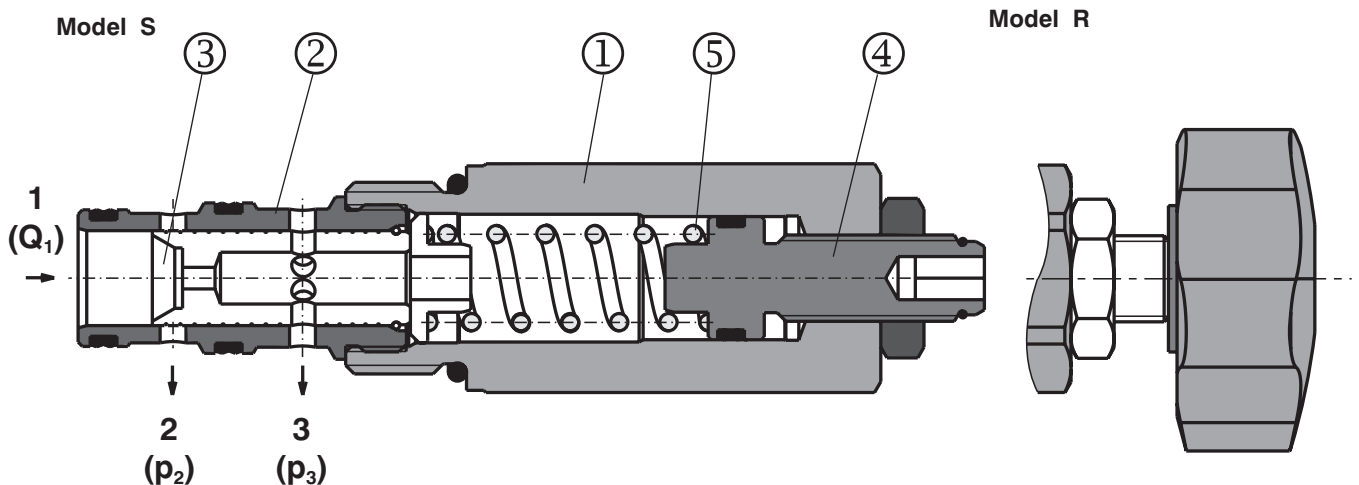
Throttle valves with pressure compensators are used to ensure a constant flow rate and thereby a constant speed of the actuator independently of the load induced pressure changes.

The valve consists of a body (1) with thread 7/8-14-UNF, bush (2) pressure compensator spool (3), adjusting screw (4) with locking nut and spring.

The working fluid enters the valve from its nose side (1), goes through the throttle orifice in the spool and flows out through the radial holes (3) to the consu-

mer. The spool of the compensator keeps constant pressure gradient by draining off a part of fluid through the radial holes (2). Thereby the constant flow through the valve is assured. The flow rate can be preset by adjusting the screw with lock nut. When the flowing in a reverse direction, the pressure compensator is functionless.

The valve body, adjustment screw and lock nut are zinc coated.



Ordering Code

SF32A-B3/

3 way Flow Control Valve
pressure compensated
7/8-14 UNF

no designation
V

Seals
NBR
FPM (Viton)

S
R

Adjustment option
Inside hexagon 5 mm
Adjustable handknob

High performance

H

Flow rate

10	Flow 5-10 L/min (1.32-2.64 GPM)
14	Flow 6-14 L/min (1.59-3.70 GPM)
22	Flow 11-22 L/min (2.91-5.81 GPM)
30	Flow 17-30 L/min (4.49-7.93 GPM)

Technical Data

Valve size	B3			
Cartridge thread	7/8-14 UNF-2A			
Nominal flow rates	10	14	22	30
Flow range	see Q-Δp characteristic			
Maximum working pressure	bar (PSI) 350 (5076)			
Hydraulic fluid	Hydraulic oils of power classes (HL, HLP) to DIN 51524			
Fluid temperature range NBR	°C (°F) -30... + 100 (-22 ... +212)			
Fluid temperature range FPM(Viton)	°C (°F) -20 ... +120 (-4 ... +248)			
Viscosity range	mm ² /s (SUS) 10 ... 500 (49 ... 2450)			
Maximum degree of fluid contamination	Class 21/18/15 to ISO 4406			
Weight	kg (lbs) 0,235 (0.518)			
Mounting position	unrestricted			
Valve body (data sheet HA0018)	SB-B3			

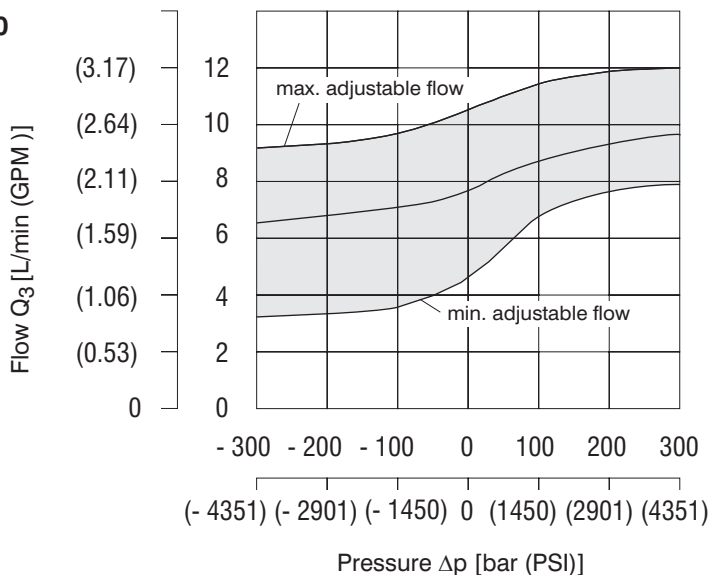
p-Q Characteristics

Measured at v = 32 mm²/s (156 SUS)

$$Q_3 = f(p_3 - p_2)$$

Q₃ : Flow 1 → 3
Δp = (p₃-p₂)
Q₁ = 50 L/min (13.21 GPM)

Flow rate 10



p-Q Characteristics

Measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

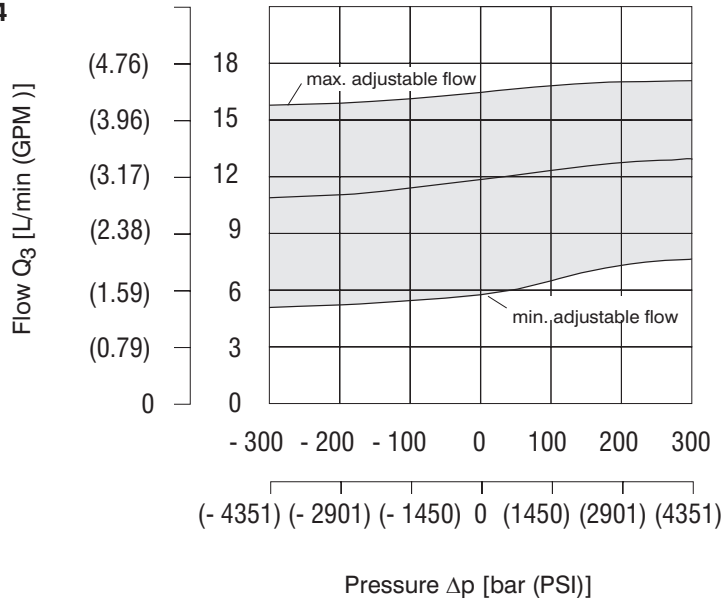
$$Q_3 = f(p_3 - p_2)$$

Q₃ : Flow 1 → 3

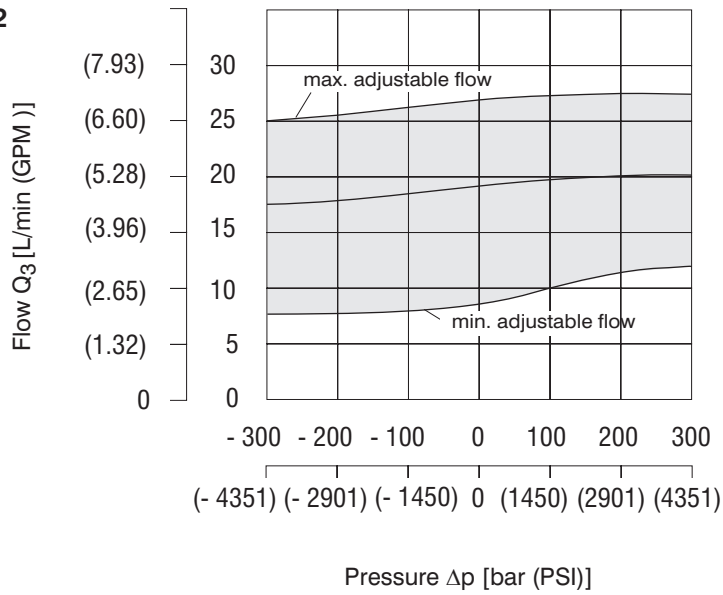
$\Delta p = (p_3 - p_2)$

Q₁ = 50 L/min (13.21 GPM)

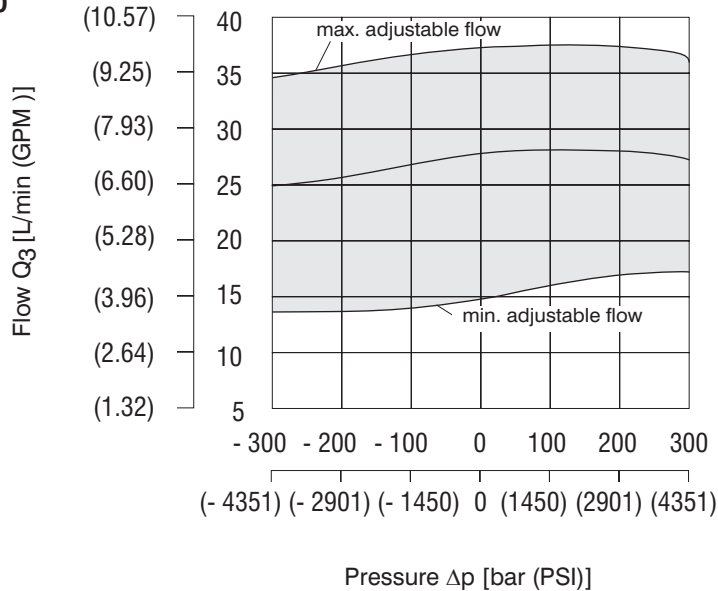
Flow rate 14



Flow rate 22

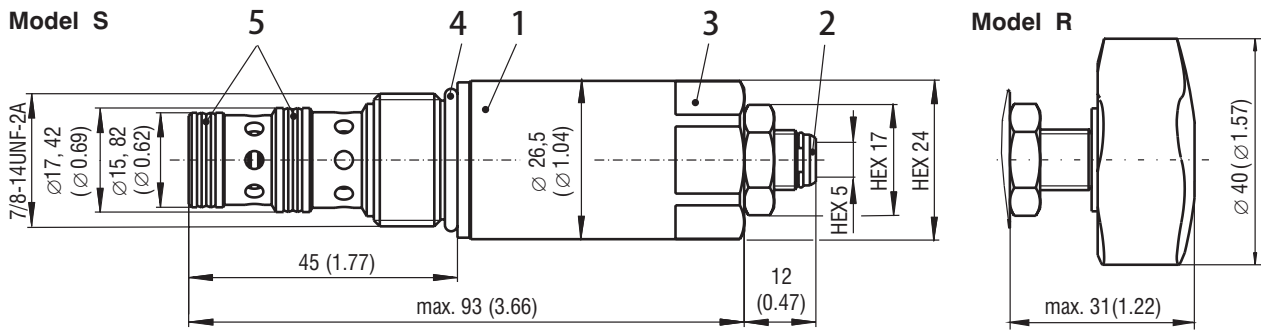


Flow rate 30



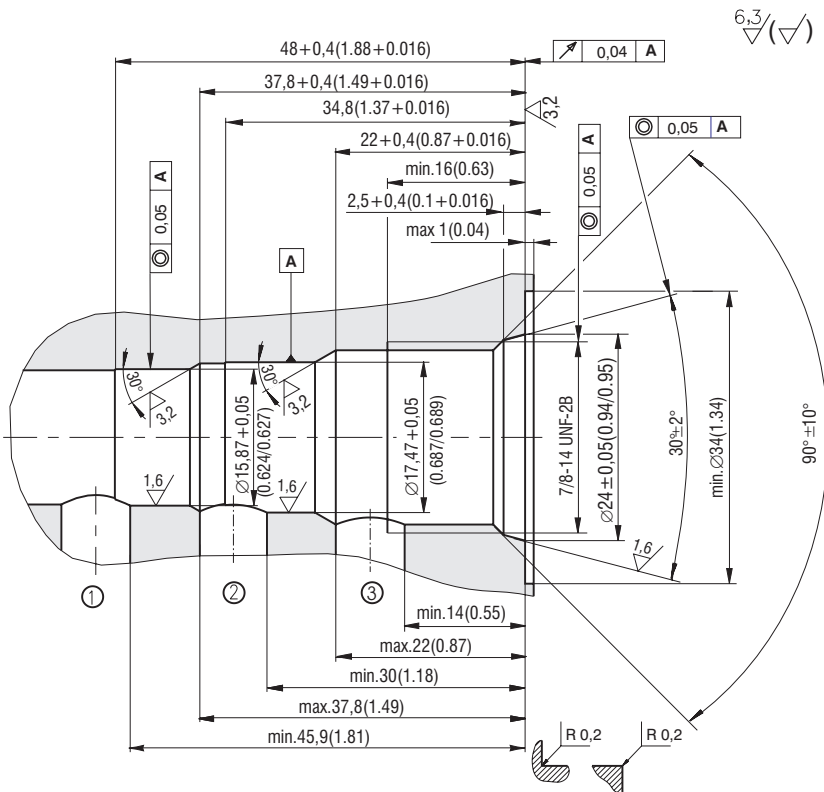
Valve Dimensions

Dimensions in millimeters (inches)



Cavity

Dimensions in millimeters (inches)



- 1 Type designation (stamped)
- 2 Screw for fine flow adjustment
 - inside HEX 5
 - anticlockwise rotation = flow decrease
 - clockwise rotation = flow increase
- 3 Spanner size 24 mm
tightening torque 60+5 Nm (44.3+3.7 lbf.ft)
- 4 Sealing: O-ring 19,4x2,1 (supplied with valve)
- 5 Sealing: Dualseal 17,47 x 15,07 x 3,1
11.87 x 14.27 x 3.1 (supplied with valve)

Spare Parts

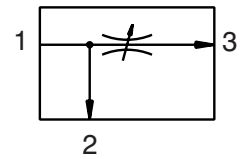
Type	Dimensions, quantity		Ordering number
NBR	O-ring	Dualseal - PU	
	19.4 x 2.1(1 pc)	17.47 x 15.07 x 3.1(1pc)	20143900
		11.87 x 14.27 x 3.1(1pc)	24220800
FPM (Viton)	19.4 x 2.1(1 pc)	17.47 x 15.07 x 3.1(1pc)	20158500
		11.87 x 14.27 x 3.1(1pc)	24220800
			20158500

Caution!

- The plastic packaging is recyclable.
- Certified documentation is available per request.

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- Priority style
- Constant flow largely independent to load and viscosity
- Port 2 can be pressurized
- Various flow ranges available



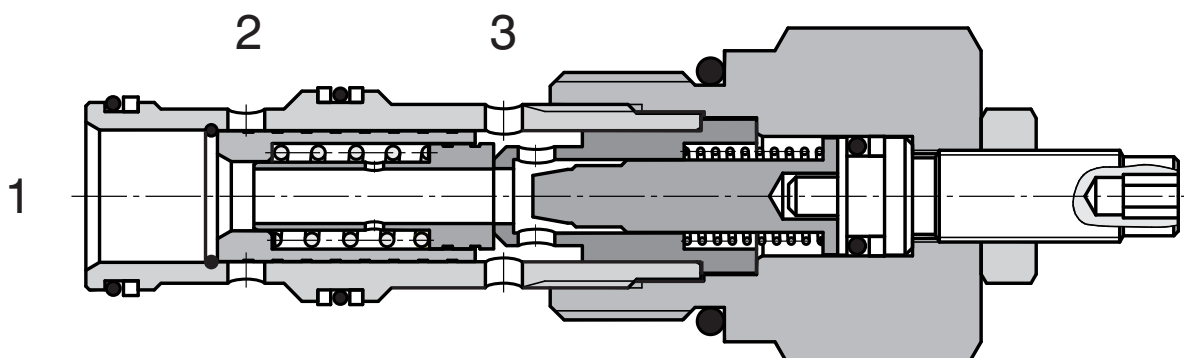
Functional Description

The valve consists of an adjustable measuring orifice plate after which it is installed a stabilizer of pressure drop. During the flow from (1) to (3) the liquid flows through the centre of the stabilizer slide valve and then through radial orifices to the side channel (3). The stabilizer has been designed to serve for maintaining a pressure difference arisen on the measuring orifice plate at a constant level of approximately of 12 bar given by the spring force so as to ensure a constant rate of flow through the channel (3). The excessive flow of the liquid cause a dynamic pressure in channel (1) by means of which the slide valve of the stabilizer is shifted against the spring and opens the flow cross section to the channel (2) through which the excessive liquid flows out either to the drain or to another consumer. The channel (2) can be loaded by

pressure. Due to permanent equalizing the forces the position of the stabilizer gate valve changes with each change of pressure before and after the measuring orifice plate and in this way it results in appropriate decreasing or eventually appropriate increasing the flow cross section of channels.

The liquid can flow through the valve also in opposite direction from (3) to (1), however, in a limited extent taking into consideration the fact that the liquid shall flow through the throttling cross section.

As for appropriate basic surface finish the external parts are zinc coated.



Ordering Code

SF32A-K3/I

3 Way Flow Control Valve

no designation

Seals
NBR

Adjustable flow range

4 - 40 L/min

4

6 - 60 L/min

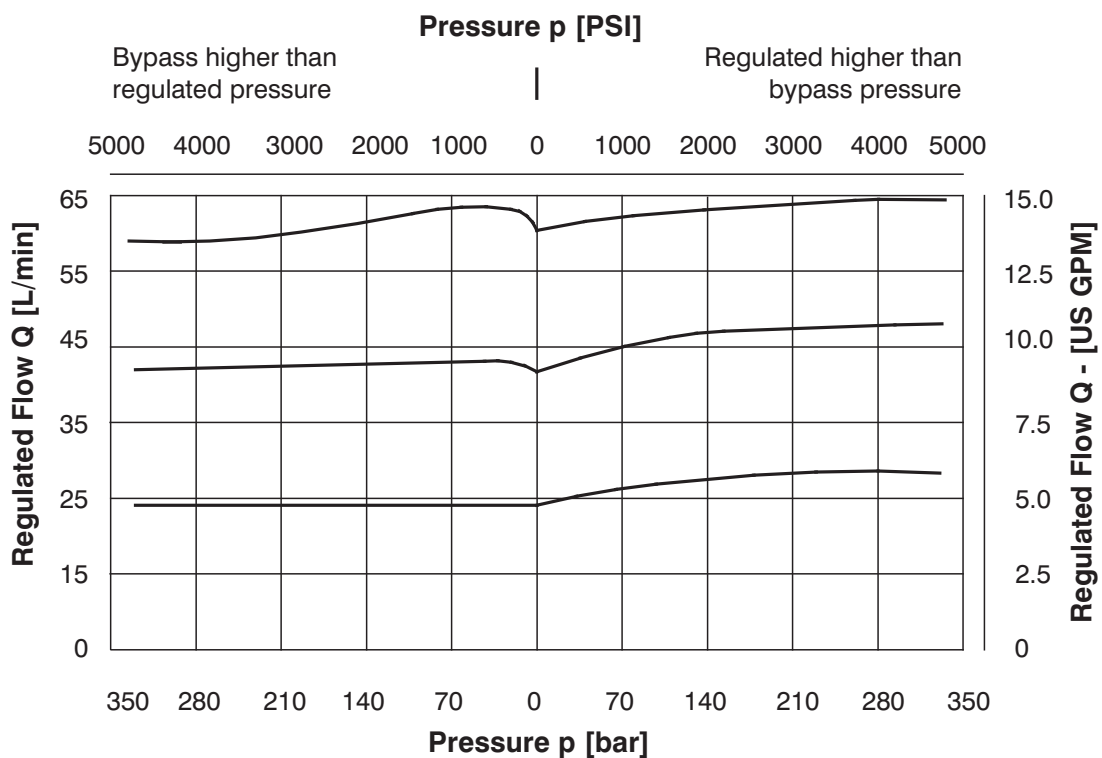
6

Technical Data

Cavity		M27 x 2
Adjustment range	L/min	4 - 60
Max. pressure	bar	350
Hydraulic fluid		Hydraulic oil (HM, HV) according to DIN 51524
Fluid temperature range	°C	-20 ... +90
Viscosity	mm ² /s	20 ... 400
Maximum degree of fluid contamination		According to ISO 4406, Class 21/18/15
Weight	kg	0.16
Maximum valve tightening torque in valve body or in control block	Nm	75 ⁺²
Mounting position		Unrestricted

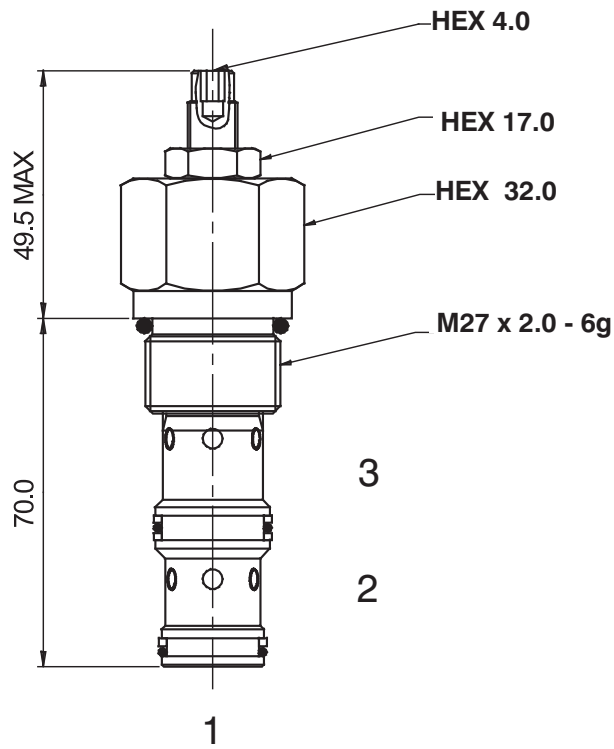
p-Q Characteristics

Measured at $v = 40 \text{ mm}^2/\text{s}$



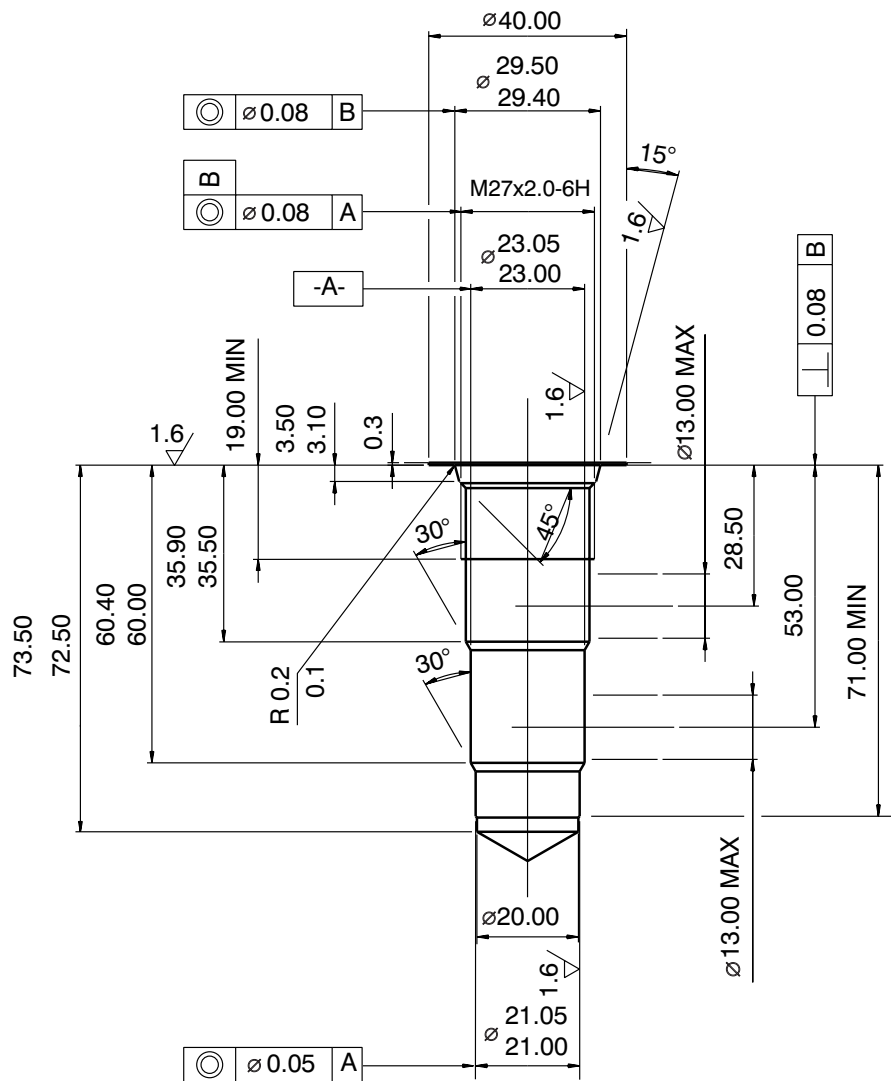
Dimensions

Measurements in millimeters



Cavity

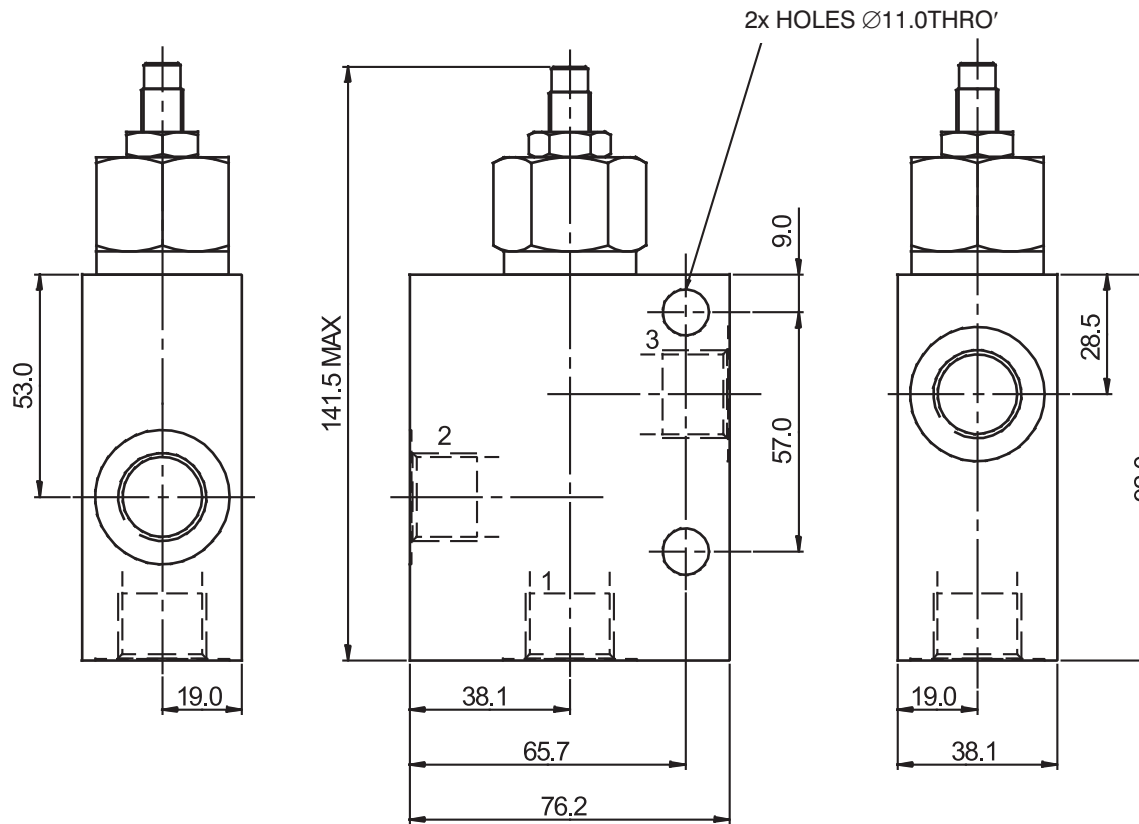
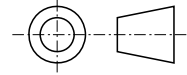
Measurements in millimeters



Valve Bodies

Measurements in millimeters

ISO A



Body without valve			
Material	Ports	Port size	Type code
Aluminium	1, 2, 3	G1/2	SB-K3-0105AL
	1, 2, 3	SAE 10, 7/8-14	SB-K3-0106AL
Steel	1, 2, 3	G1/2	SB-K3-0105ST
	1, 2, 3	SAE 10, 7/8-14	SB-K3-0106ST

The use of aluminium bodies is limited to a maximum operating pressure of 210 bar.

Spare Parts

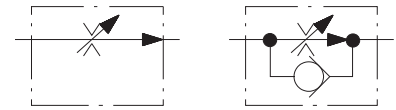
Seal kits on request.

Caution!

- The packing foil is recyclable.
- The technical information regarding the product presented in this catalogue is for descriptive purposes only. It should not be construed in any case as a guaranteed representation of the product properties in the sense of the law.

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- Sandwich plate design for use in vertical stacking assemblies
- For use in meter-in, meter-out or bleed-off applications
- Available with reverse free-flow check valve
- Flow rate setting with adjustment knob
- Installation dimensions to ISO 4401-AB-03-4-A and DIN 24 340 -A6
- Subplates - see catalogue HA 0002



Functional Description

Pressure compensated flow control valves are designed to provide adjustable controlled flow rates independent of changes in inlet and/or outlet pressure.

2 way valves are used in meter-in, meter-out or bleed-off and or parallel applications.

The flow control valve consists basically of housing (1), throttling spool (2), spring (3), pressure compensator (4) and a hand knob (5) with adjustment mechanism.

Flow control valve VSS1-206-A

Fluid from port A1 passes through orifice area (6) of the throttling spool, proceeds through its internal bore to the orifice area (7) modulated via the metering edge of the pressure compensator (4) and onwards to port A2. The flow rate depends on the orifice area (6) and is determined by rotating the adjustment knob (5). The knob can be fixed at the adjusted position via tightening screw (9). The spring pushes both the throttling spool and the spool of the pressure compensator to their extreme positions and provided that there is no flow through the valve, holds the orifice area (7) fully open. An introduction of flow to port A1 exposes inlet pressure through bore (8) to the bottom area of the compensator spool and causes this spool to move in closing direction, thus decreasing the pressure difference at the orifice area (6) of the throttling spool. The movement of the

compensator stops as soon as a new equilibrium is reached. The pressure compensator compares continuously the pressure difference at the orifice area (6) with the amount preset by the spring pretension and modulates the orifice area (6) accordingly, thus holding the flow rate constant.

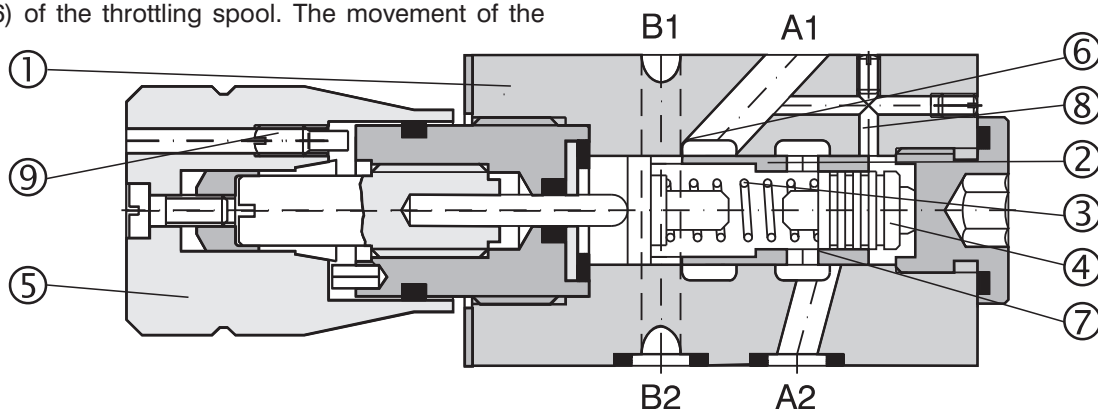
Flow control valve VSS1-206-B

This type of valve functions on the same principle as the previous one, however, reverse free-flow from port A2 to port A1 is provided for by the built-in check valve. Connection of port A1 with port P1 is ensured by cover plate or by directional valve situated at the upper face of housing (1) - see Functional symbols (vertical stacking assemblies).

Flow control valve VSS1-206-C

This valve has the same function as the valve described above, the only difference being the changed flow direction, i.e. controlled flow in direction A2 → A1 and free-flow in direction A1 → A2.

The basic surface treatment of the valve housing is phosphate coated, whereas the surface of the other parts are zinc coated.



Ordering Code

VSS1-206-

Flow Control Valve

2 way design

Nominal size

Flow rate L/min

Q = 6,3

Q = 12

Q = 22

6,3

12

22

no designation
V

Seals

NBR

Viton

Model

A-02

for subplate mounting - without check valve

A-11

sandwich plate design - without check valve

B-11

sandwich plate design - with check valve,

meter-in mode

C-11

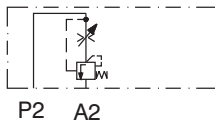
sandwich plate design - with check valve,

meter-out mode

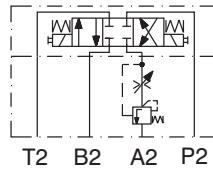
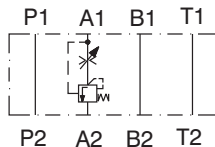
Functional Symbols

A - without check valve

Model A-02



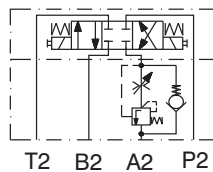
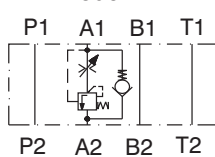
Model A-11



Typical application of the valve in stacking assembly *

B - with check valve, meter-in mode

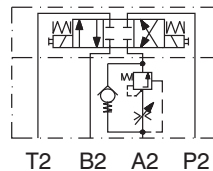
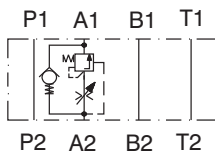
Model B-11



Typical application of the valve in stacking assembly *

C - with check valve, meter-out mode

Model C-11



Typical application of the valve in stacking assembly *

* Directional valve must be ordered separately.

Technical Data

Nominal size	mm	06		
Maximum flow rate	L/min	6,3	12	22
Minimum flow rate	cm ³ /min	60		
Max. operating pressure	bar	320		
Minimum pressure drop	bar	see performance curves		
Hydraulic fluid		Hydraulic oils of power classes (HL, HLP) to DIN 51524		
Fluid temperature range for (NBR)	°C	-30 ... +100		
Fluid temperature range for (Viton)	°C	-20 ... +120		
Viscosity range	mm ² /s	20 ... 400		
Maximum degree of fluid contamination for Q ≤ (1 L/min) for Q > (1 L/min)		Class 20/17/14 according to ISO 4406 Class 21/18/15 according to ISO 4406		
Weight	kg	0.8		
Mounting position		unrestricted		

Characteristics

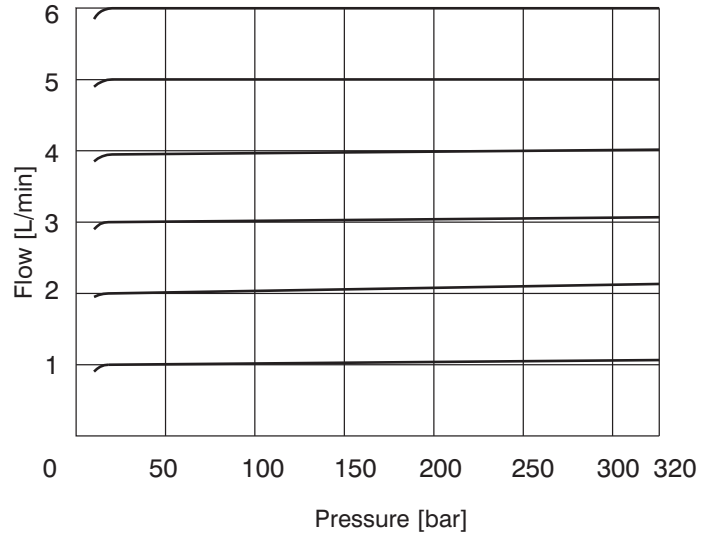
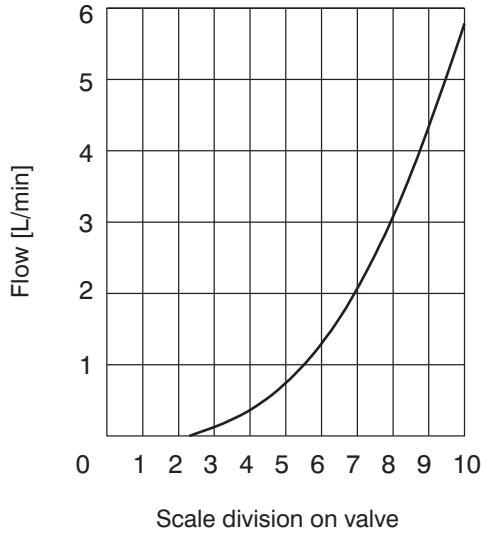
Measured at $v = 32 \text{ mm}^2/\text{s}$

Flow rate dependent upon scale adjustment setting
(flow control P → A)

Flow rate dependent upon pressure

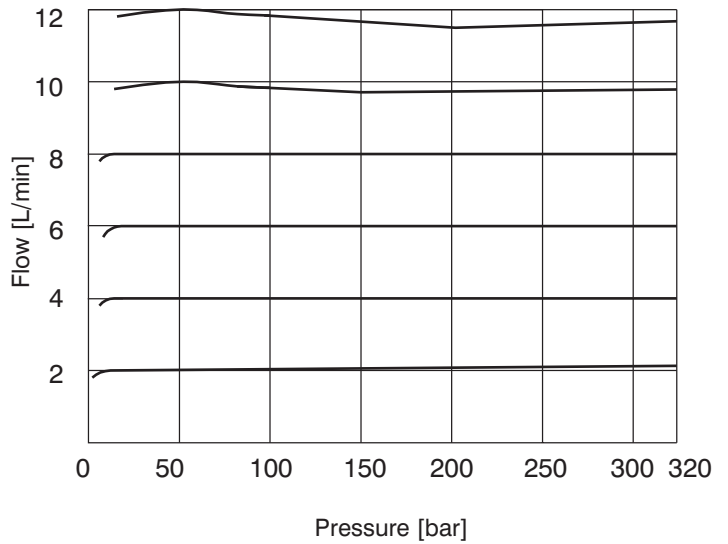
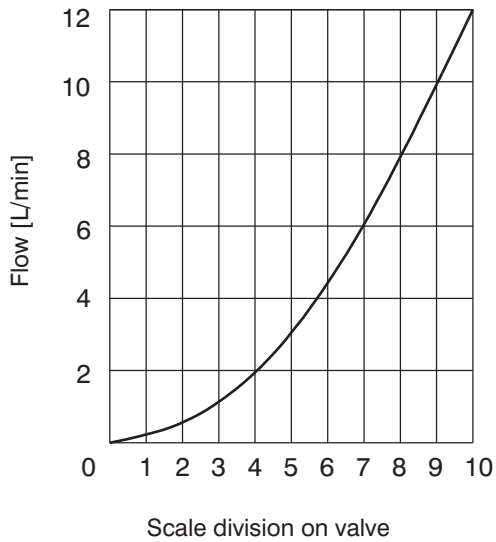
Model

VSS1-206-6.3x-xx



Model

VSS1-206-12x-xx



Characteristics

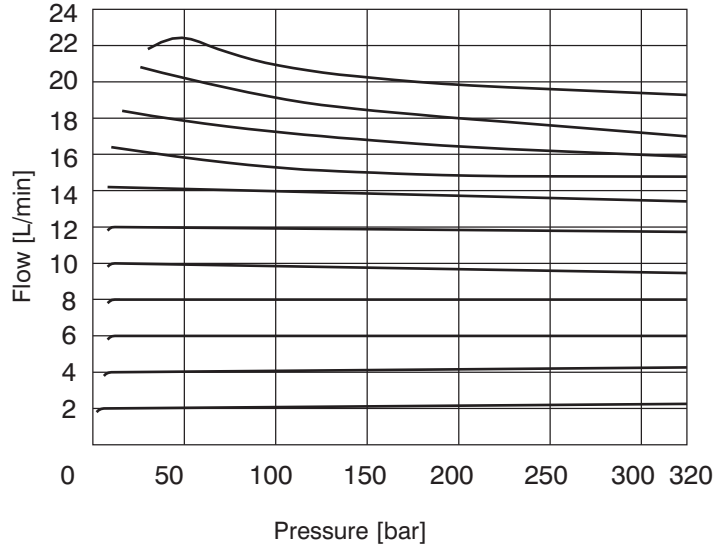
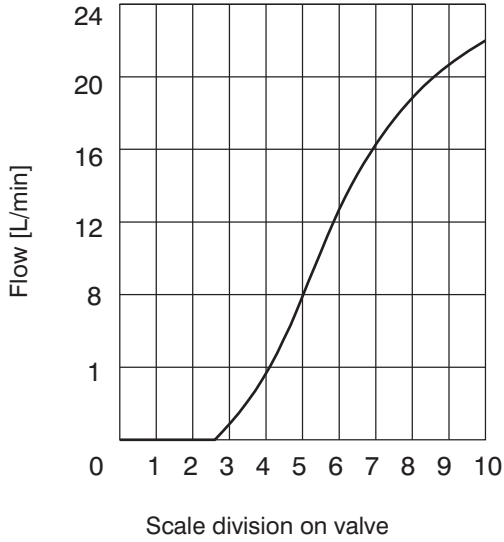
Measured at $v = 32 \text{ mm}^2/\text{s}$

Flow rate dependent upon scale adjustment setting
(flow control P → A)

Flow rate dependent upon pressure

Model

VSS1-206-22x-xx

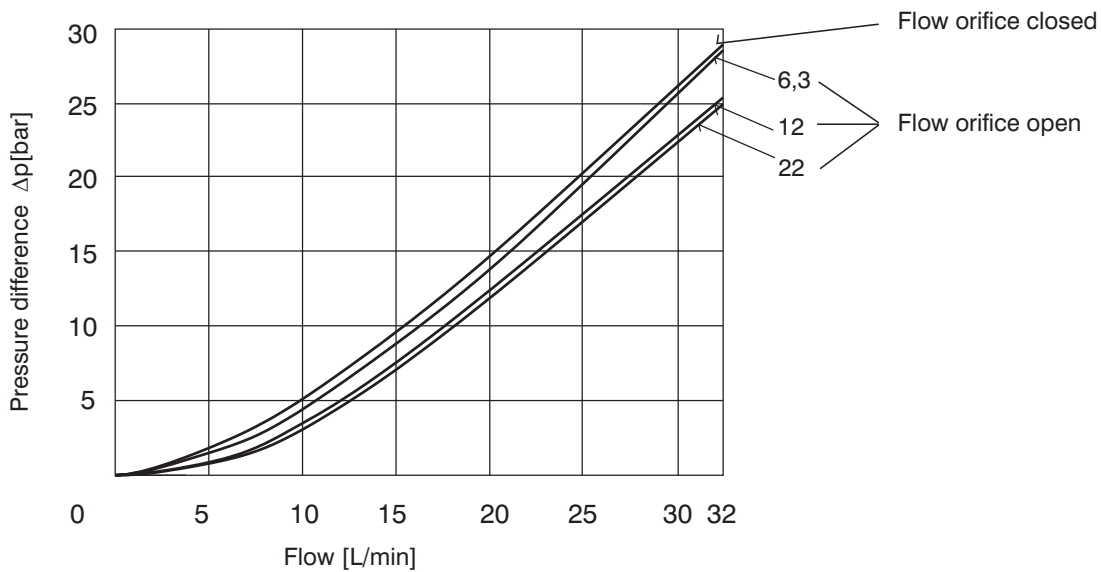


Δp-Q Characteristics

Measured at $v = 32 \text{ mm}^2/\text{s}$

Check valve

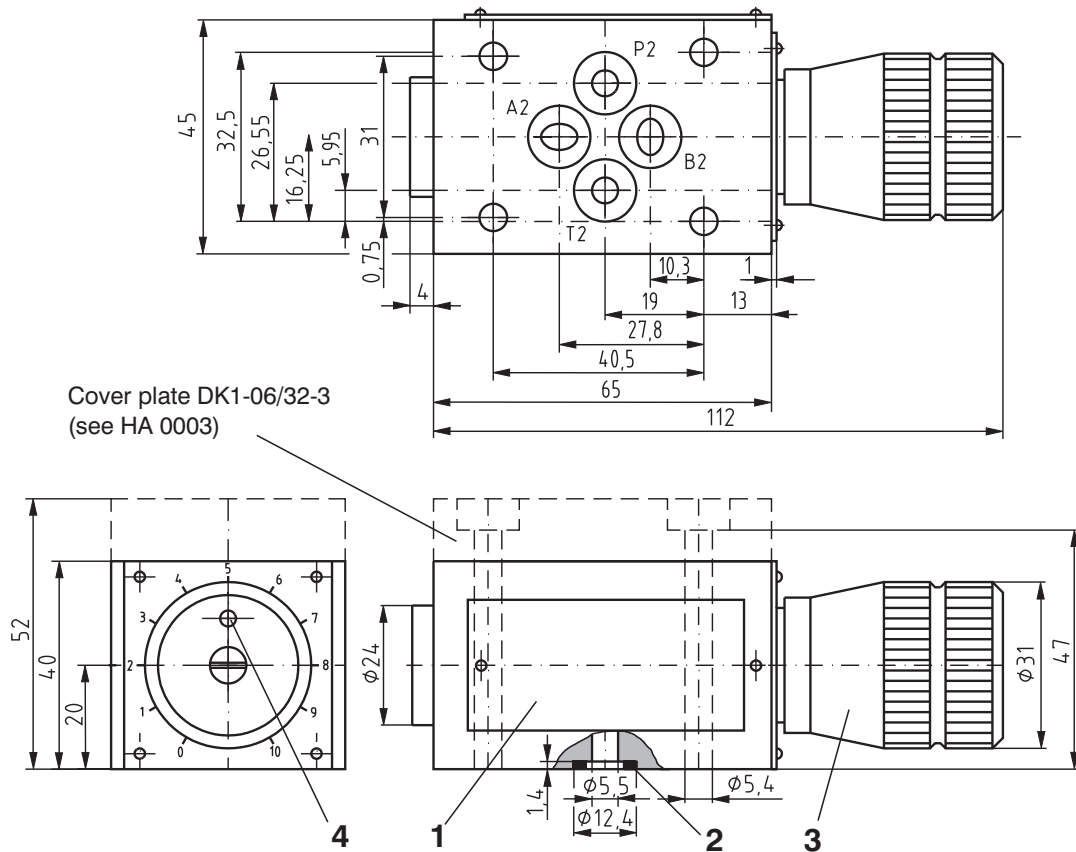
Pressure difference Δp related to flow from (A → P)



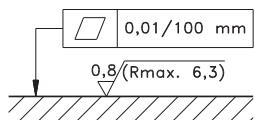
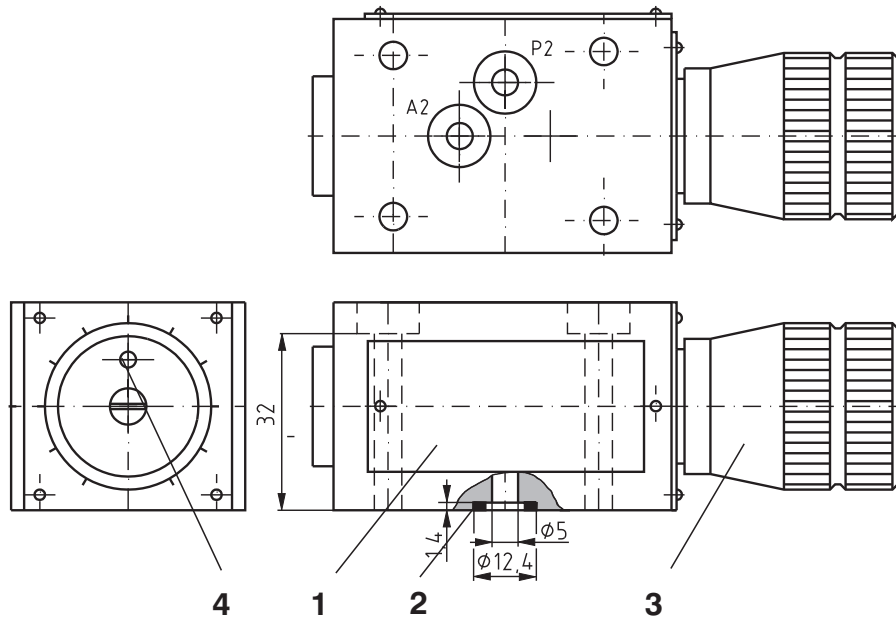
Valve Dimensions

Dimensions in millimetres

Models A-11, B-11, C-11



Models A-02



Required surface finish of interface

- 1 Name plate
- 2 O-rings, Type Square ring 012 (9.25x1.68) (4pcs.) or compatible supplied in delivery packet
- 3 O-rings, Type Square ring 012 (9.25x1.68) (2pcs.) or compatible supplied in delivery packet
- 4 Adjustment mechanism:
clockwise rotation - flow decrease
counter-clockwise rotation - flow increase
- 5 Hole with set screw for fixing the handknob in set position

Spare Parts

Seal kit

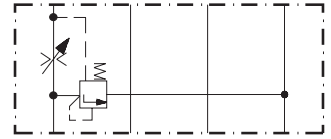
Type	Dimensions, quantity		Ordering number
	Square ring	O-ring	
Standard NBR 70	9,25 x 1,68 (4 pcs.)	-	15608800
Viton V90	-	9,25 x 1,78 (4 pcs.)	20152400

Caution!

- The packing foil is recyclable.
- The transport plate is to be returned to the supplier.
- The technical information regarding the product presented in this catalogue is for descriptive purposes only. It should not be construed in any case as a guaranteed representation of the product properties in the sense of the law.

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- 3 way pressure compensated flow control valve with integral reverse check valve
- Sandwich plate design for use in vertical stacking assemblies
- Flow rate setting with adjustment knob
- Installation dimensions to ISO 4401-03-02-0-94 and DIN 24 340-A6
- Subplates - see Data Sheet HA 0002



Functional Description

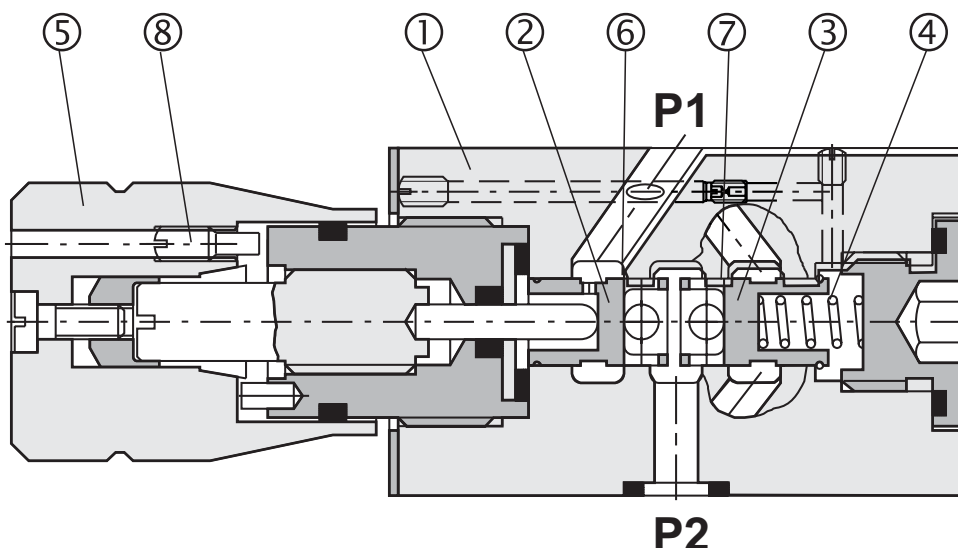
3 way pressure compensated flow control valves are designed to provide adjustable controlled flow rates independent of changes in system pressure.

The flow control valve consists basically of housing (1), throttling spool (2), pressure compensator (3), spring (4) and hand knob (5) with adjustment mechanism.

Fluid from port P2 is divided into two parts, one part of flow passes through orifice area (6) of the throttling spool and onwards through bore P to port P1, the other part proceeds through orifice area (7) of the compensator to port T. The flow rate depends on the

orifice area (6) and is determined by rotating the adjustment knob (5). The knob can be fixed at the set position via adjustment screw (8). The compensator compares continuously the pressure difference at the orifice area (6) with the amount preset by the spring pretension and modulates accordingly the orifice area (7) of the compensator which relieves the excessive flow to tank, thus holding the flow rate constant.

The valve housing is phosphate coated, the surfaces of the other parts are zinc coated.



Ordering Code

VSS1-306-16-11

Flow Control Valve

3 way design

Valve size

no designation
V

Seal
NBR
FPM (Viton)

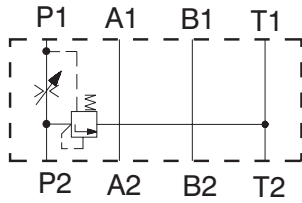
Sandwich plate design without cover plate

Flow rate
Q = 16 L/min

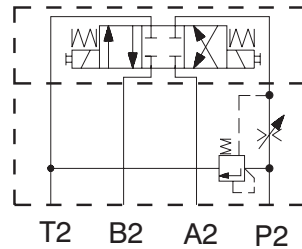
FOR PREFERRED TYPES SEE BOLD TYPING IN ORDERING CODE AND TABLE OF PREFERRED TYPES ON PAGE 3

Functional Symbols

Functional symbol of the valve



Typical application of the valve in stacking assembly*



*Directional valve must be ordered separately

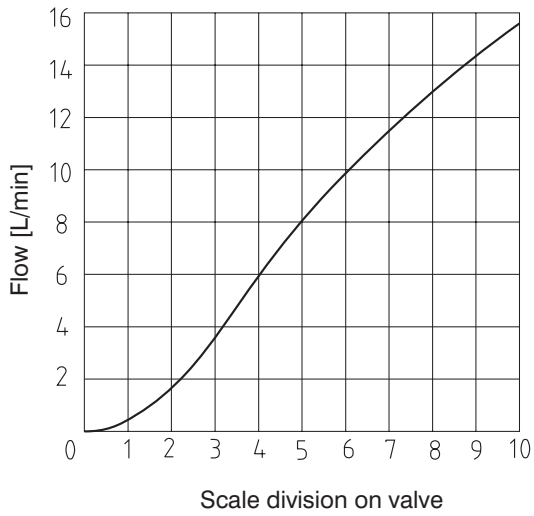
Technical Data

Valve size	mm	06
Maximum flow	L/min	16
Minimum flow	cm ³ /min	60
Maximum operating pressure	bar	320
Hydraulic fluid	Hydraulic oils of power classes (HL, HLP) to DIN 51524	
Fluid temperature range for (NBR)	°C	-30 ... +100
Fluid temperature range for (Viton)	°C	-20 ... +120
Viscosity range	mm ² /s	20 ... 400
Maximum degree of fluid contamination	Class 21/18/15 to ISO 4406	
Permissible flow rate variation at pressure change 6 ... 100%	%	± 10
Weight	kg	0.8
Mounting position	unrestricted	

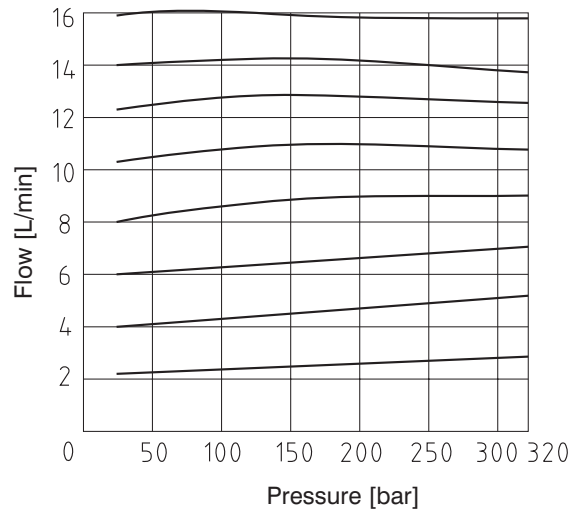
Characteristics

Measured at $v = 32 \text{ mm}^2/\text{s}$

Flow rate dependent upon scale adjustment setting

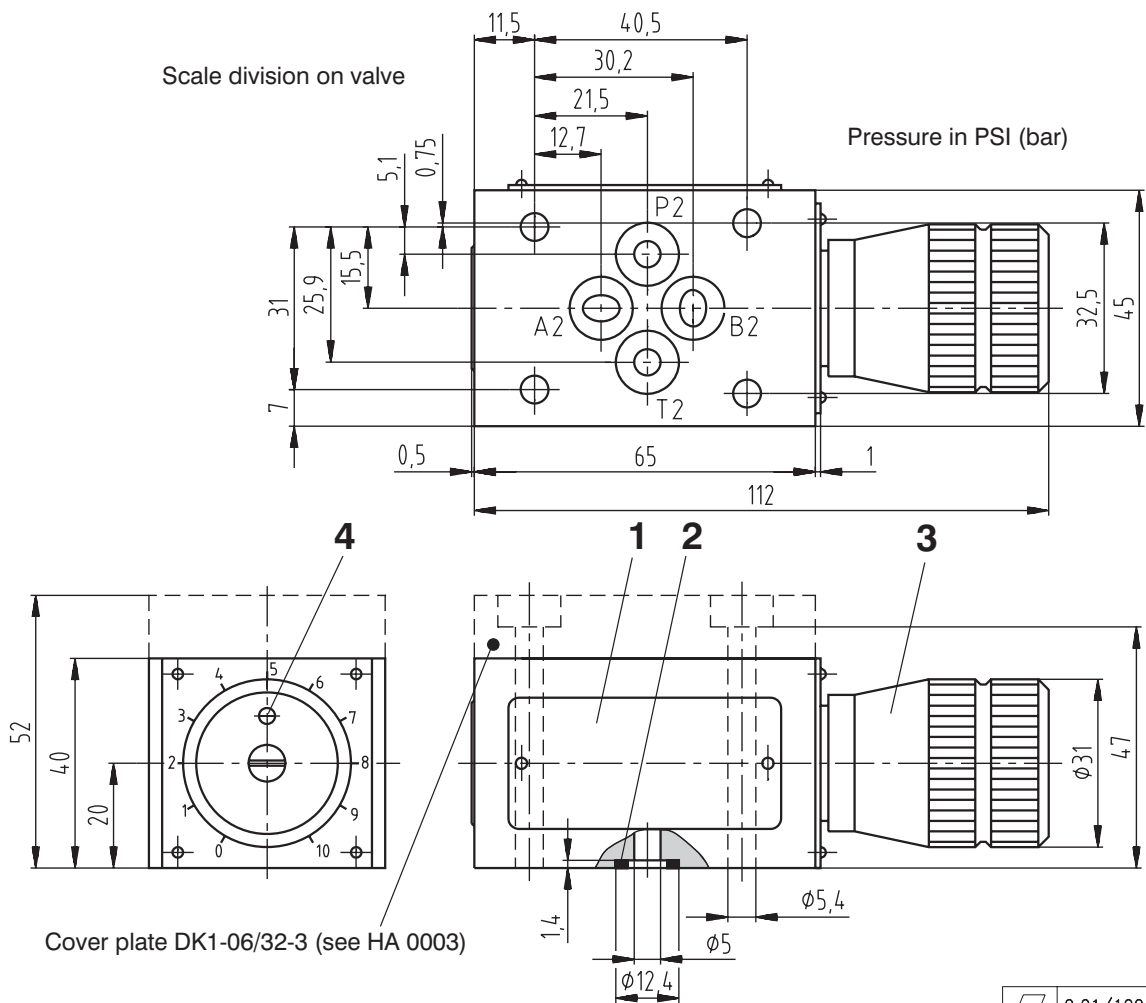


Flow rate dependent upon pressure



Valve Dimensions

Dimensions in millimeters



Spare Parts

Seal kit

Type	Dimensions, quantity	Ordering number
	O-ring	
Standard NBR	19,6 x 2,3 (1pc.)	20794900
	8/4 1078 NBR80 (1 pc.)	
	16 x 2 (1 pc.)	
	9,25x1,68 (4 pcs.)	
	14 x 2 (1 pc.)	
Viton	19.3 x 2.4 (1 pc.)	20794800
	3 x 2.4 (1 pc.)	
	16 x 2 (1 pc.)	
	9.25 x 1.78 (4 pcs.)	
	14 x 2 (1 pc.)	

Preferred Types of Valves

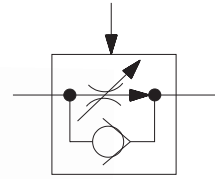
Type	Ordering number
VSS1-306-16-11	20794000

Caution!

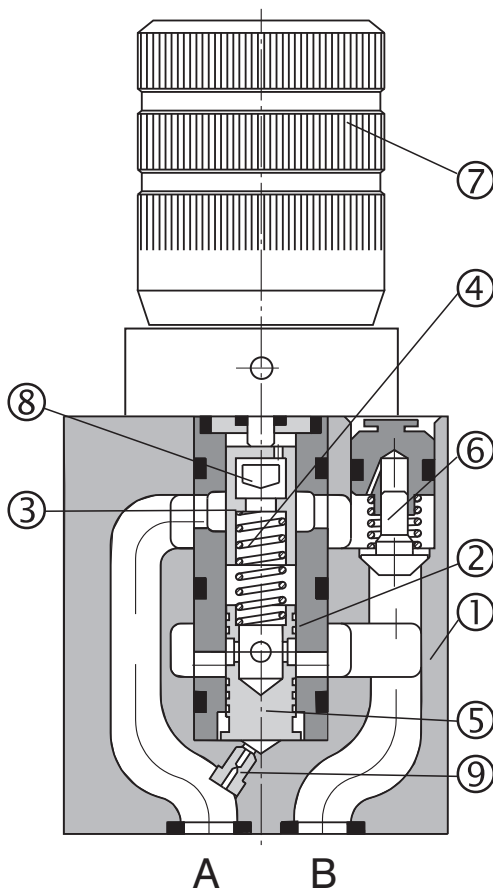
- The packing foil is recyclable.
- The transport plate is to be returned to the supplier.
- Mounting bolts M5x60 or assembly studs (4 pcs.) must be ordered separately. Tightening torque 8.9 Nm.
- The technical information regarding the product presented in this catalogue is for descriptive purposes only. It should not be construed in any case as a guaranteed representation of the product properties in the sense of the law.

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 www.argo-hytos.com

- 2 way pressure compensated flow control valve with integral reverse check valve
- Subplate mounting
- Flow rate setting:
 - with adjustment knob
 - with adjustment knob and keylock
- For use in meter-in, meter-out or bleed-off applications
- External pilot closing of pressure compensator
- Installation dimensions to ISO 4401-03-02-0-94 and DIN 24 340-A6
- Subplates - see catalogue HA 0002



Functional Description



Pressure compensated flow control valves VSS2-062 are designed to provide adjustable controlled flow rates independent of changes in pressure and temperature.

They consist basically of housing (1), sleeve (2), throttling spool (3), spring (4), pressure compensator (5) and hand knob (7) with the respective setting mechanism.

The valve housing is phosphate coated.

Flow control valve VSS2-062-xxQ/Jx0-1

(without external pilot closing of pressure compensator)

Flow throttling in direction A → B takes place at the throttling area (8) which can be adjusted by hand knob (7). To ensure the flow rate stability in port B, a pressure compensator (5) is located behind the throttling area (8).

The spring (4) pushes both the throttling spool (3) and the pressure compensator (5) into their extreme positions, and provided that there is no flow through the valve, holds the pressure compensator open.

An introduction of flow to port A exposes inlet pressure through orifice (9) to the bottom area of the compensator spool and causes this spool to move in closing direction, thus decreasing the pressure difference at the throttling area (8). The movement of the compensator spool stops as a new equilibrium is reached. The pressure compensator compares continuously the pressure difference at the throttling area (8) with the amount preset by the spring preloading and accomplishes the required control, thus holding the flow rate constant.

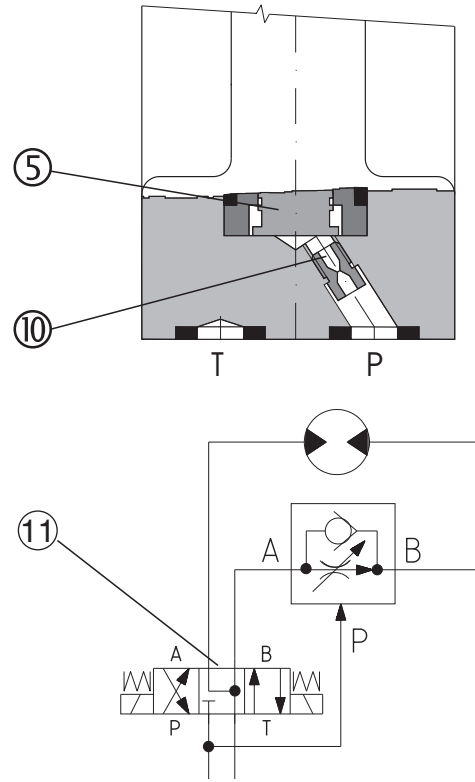
Flow control valve VSS2-206-x/JxA-1
(with external pilot closing of pressure compensator)

This model functions on the same principle as the previous one. However, with this type of valve, the bottom surface area of the compensator is connected to an external port P via orifice (10), rather than being internally connected to port A. This arrangement enables external pilot closing of pressure compensator, which function can be described using the circuit diagram shown.

When there is no flow through the valve (directional valve (11) in its middle position), pressure in port P acts at the bottom area of the compensator via orifice (10) and holds the compensator in its upper closed position. When the directional valve is shifted to its left position, the port A is connected to the system pressure, but the closed compensator avoids abrupt flow increase in port B. Hence, lunge of the actuator during start-up is prevented. The function of the compensator is the same, as the function described above.

This model with external pilot closing of the compensator can only be used in meter-in circuits.

Reverse free-flow from port B to port A, with both types of the flow control valves, is provided for by a built-in check valve (6).



Ordering Code

VSS2-206- [] /J [] [] -1 []

Flow Control Valve

2 way design

Nominal size

Max. flow rate in L/min

0,6	0,6Q
1,6	1,6Q
3,2	3,2Q
6,3	6Q
16	16Q
32	32Q

Built-in check valve

no designation
V

Seals
NBR
FPM (Viton)

Design

Variant

- A with external pilot closing of the pressure compensator
- O without external pilot closing of the pressure compensator

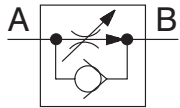
Adjustment

- Z hand knob with keylock
- O hand knob without keylock

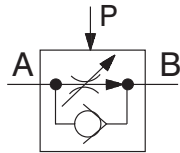
Functional Symbols

Flow control valve: simplified

without external pilot

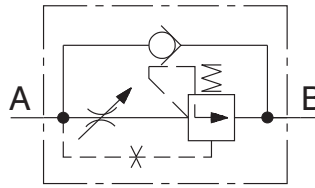


with external pilot

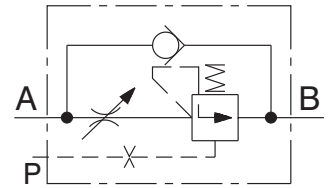


Flow control valve: detailed

without external pilot



with external pilot



Technical Data

Nominal size	mm	06					
Maximum flow	L/min	0,6	1,6	3,2	6,3	16	32
Minimum flow	cm ³ /min	10	15	20	25	60	250
Maximum working pressure at port A	bar	320					
Maximum working pressure at port B	bar	320					
Pressure drop	bar	8.5 ... 14					
Hydraulic fluid		Hydraulic oils of power classes (HL, HLP) to DIN 51524					
Fluid temperature range for (NBR)	°C	-30 ... +100					
Fluid temperature range for (Viton)	°C	-20 ... +120					
Viscosity range	(mm ² /s)	20 ... 400					
Maximum degree of fluid contamination - for Q ≤ 1 L/min - for Q > 1 L/min		Class 20/17/14 to ISO 4406 Class 21/18/15 to ISO 4406					
Permissible flow rate variation for Q > 2.5 Q _{min} at pressure change 6 to 100%	%	± 5					
Weight	kg	1.1					
Mounting position		unrestricted					

Spare Parts

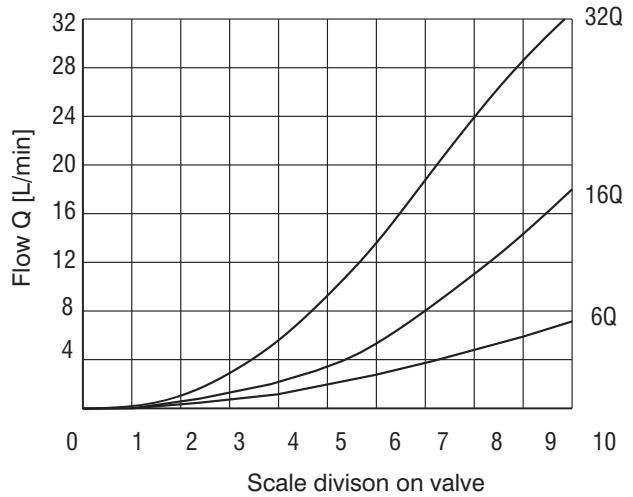
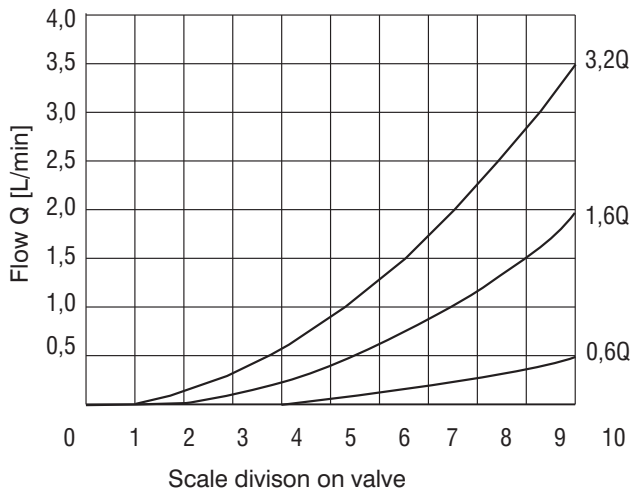
Seal kit

Type	Dimensions, quantity		Ordering number
	Square ring	O-ring	
Standard NBR 70	9,25 x 1,68 (4 pcs.)	-	15608800
Viton V90	-	9,25 x 1,78 (4 pcs.)	20152400

Characteristics

Measured at $v = 32 \text{ mm}^2/\text{s}$

Flow rate A → B dependent upon scale adjustment setting

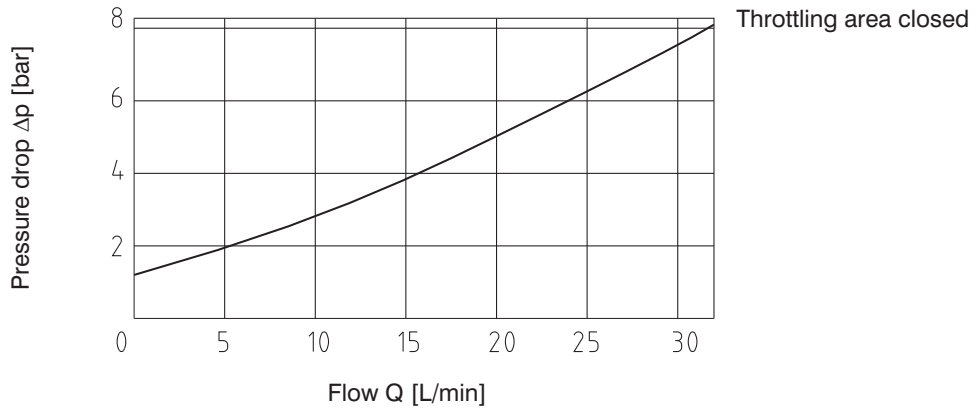


Δp -Q Characteristic

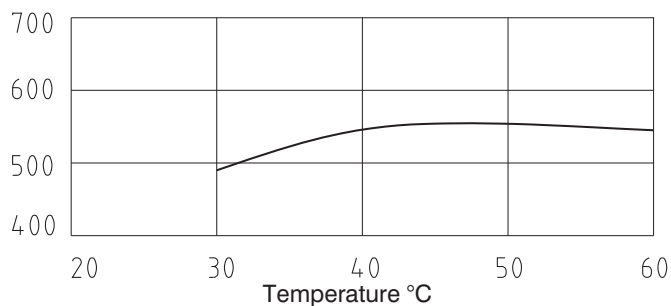
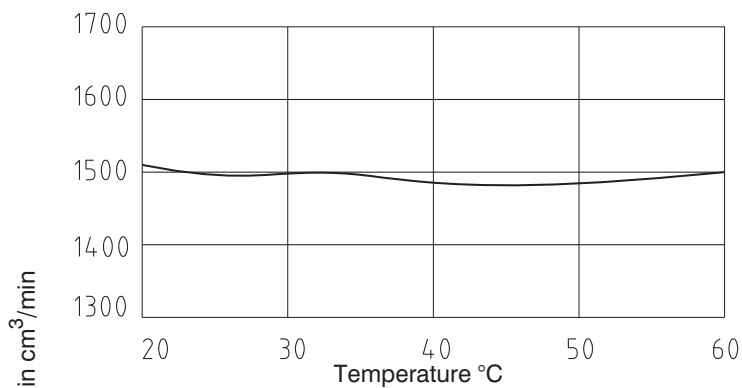
Measured at $v = 32 \text{ mm}^2/\text{s}$

Check valve

Pressure difference Δp related to flow from B → A



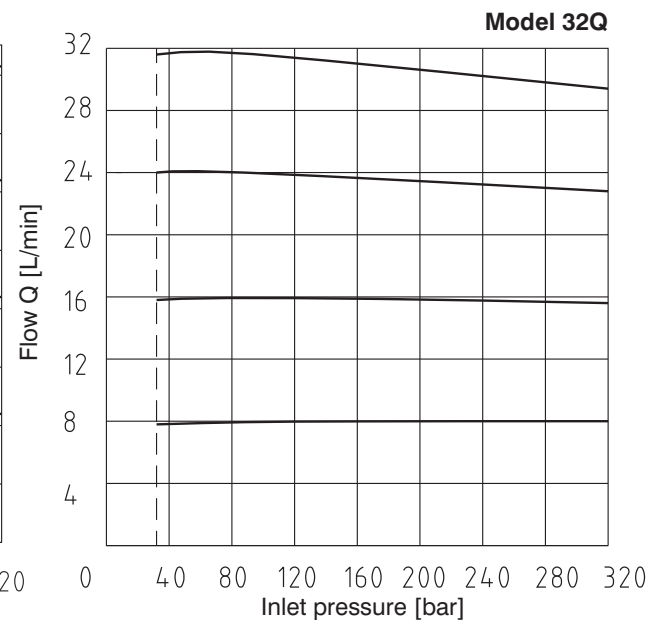
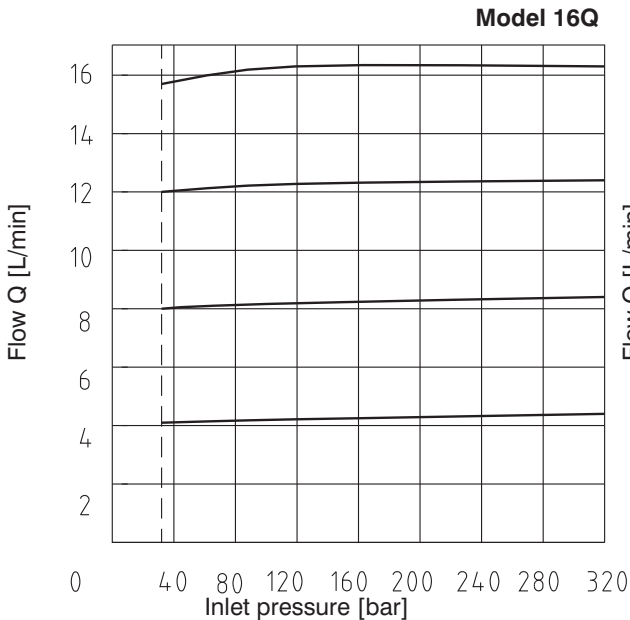
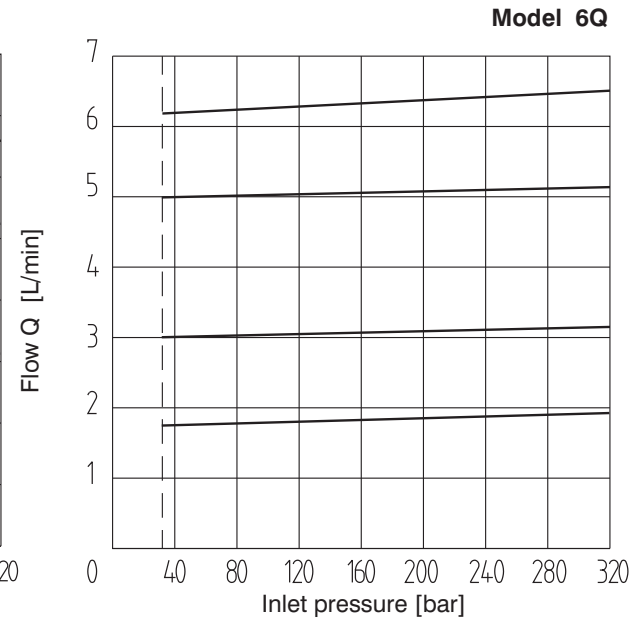
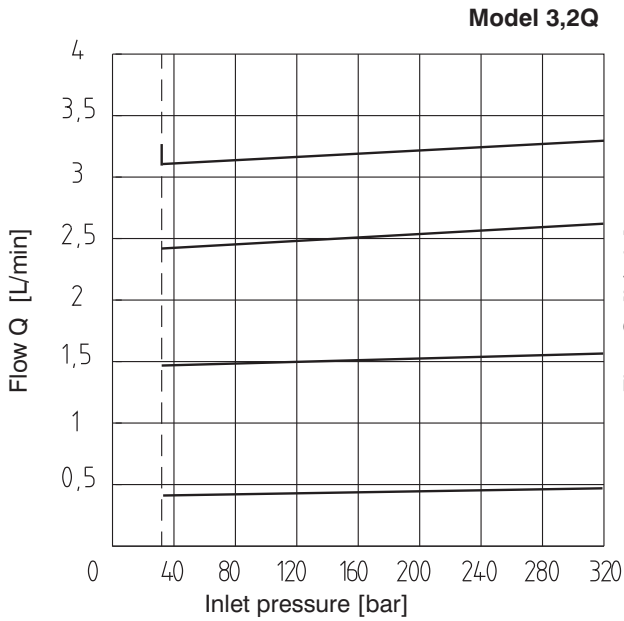
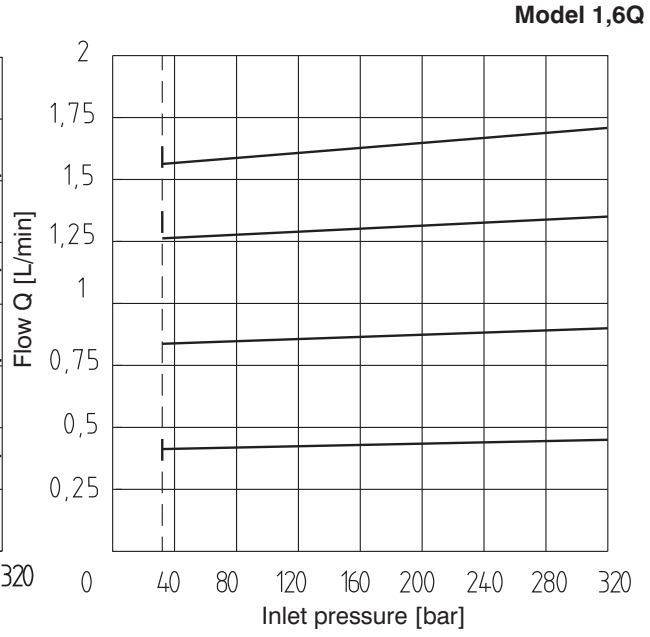
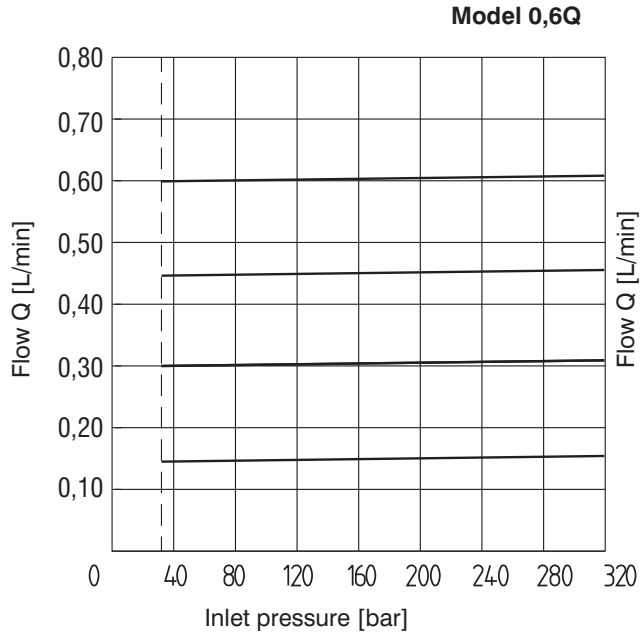
Dependency Flow-Temperature



Characteristics $Q = f(p)$

Measured at $v = 32 \text{ mm}^2/\text{s}$

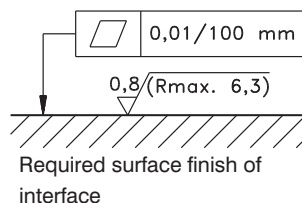
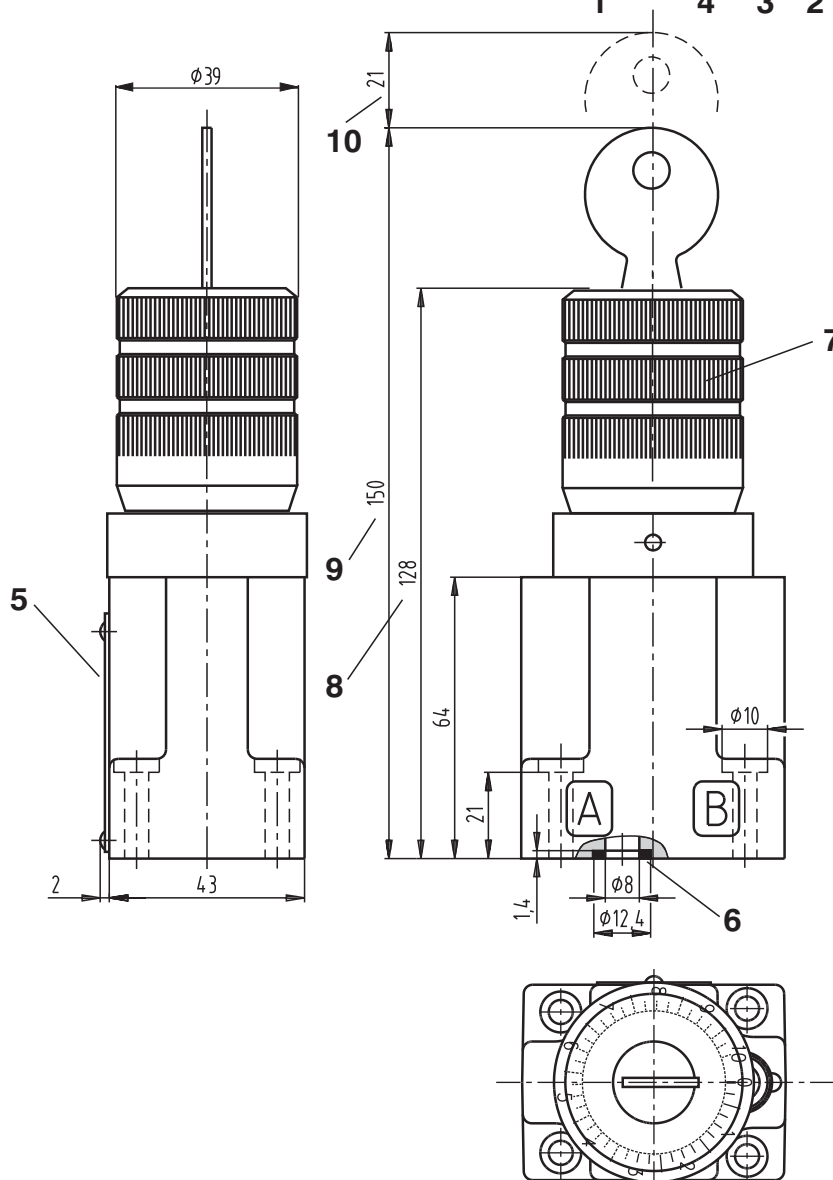
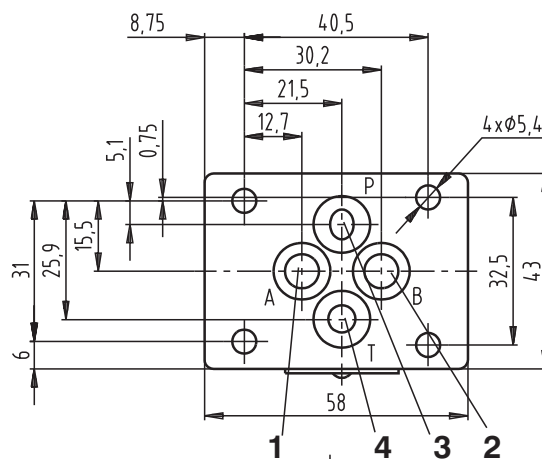
Flow rate dependent upon pressure



Valve Dimensions

Dimensions in millimeters

- 1 Port A (inlet)
- 2 Port B (outlet)
- 3 Port P (hole $\varnothing 5.2$ mm solely with type permitting external closing of the compensator, otherwise just the counterbore for O-ring)
- 4 Counterbore for O-ring (position for T port)
- 5 Name plate
- 6 Square ring 012 - KANTSEAL (4 pcs.) (9.25x1.68 NBR70)
- 7 Flow adjustment knob
- 8 Height of the valve with hand knob without keylock
- 9 Height of the valve with hand knob with keylock
- 10 Distance required to remove the key



Caution!

- The packing foil is recyclable.
- Mounting bolts M5x30 DIN 912-10.9 (4 pcs.) must be ordered separately. Tightening torque of the bolts is 8.9 Nm.
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- Wide range of throttling orifices
- Two models:
 - cartridge
 - screw-in cartridge valve

VSK4



VSK2

Functional Description

The pressure compensated flow control valves VSK are designed to control flow rates practically independent of pressures and temperatures. The set up flow rate is constant and depends on the orifice area. The 2-way flow control valves can be used in meter-in, meter out or bleed-off applications.

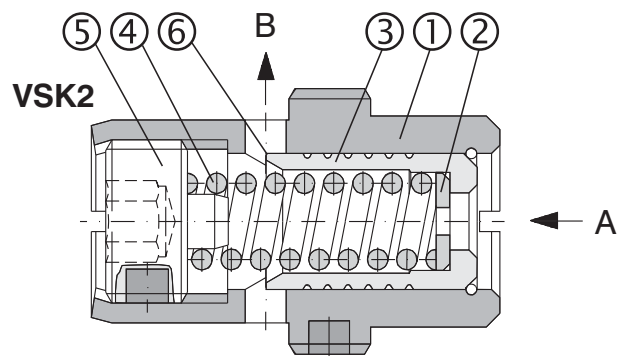
The valve consists of housing (1), throttling orifice (2), pressure compensator (3), spring (4) and adjustment screw (5).

Throttling in the direction $A \rightarrow B$ takes place on the throttling area of the orifice (2). To provide for the independence between flow rate and pressure, a pressure compensator (3) with the metering edge (6) is located behind the throttling orifice. The spring (4) pushes the compensator to its extreme right position. Provided that there is flow passing through the valve, the input pressure acts on the face area of the pressure compensator and shifts it to the left, thus reducing the flow area of the metering edge (6) which results in decreasing the pressure difference at the throttling orifice. The movement of the compensator stops as soon as the equilibrium is reached and the pressure difference returns to its required value. The pressure compensator continuously compares the pressure difference at the orifice area (2) with the value preset by the spring pretension and ensures the necessary control, thus holding the flow rate constant. The flow rate of the VSK2 can be adjusted in a small range by setting the adjustment screw (5).

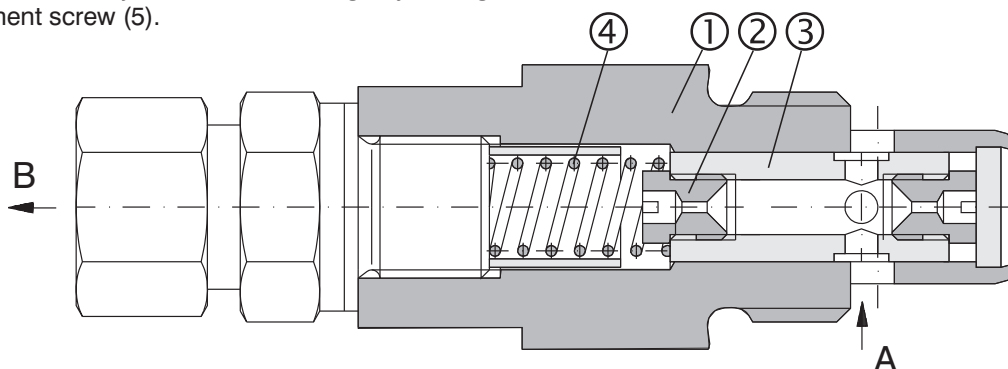
The flow rate in direction $B \rightarrow A$ is also given by the orifice area (2), but the function of the pressure compensator is excluded.

The function of the VSK4 is similar, but in this case, the pressure compensator (3) is located in front of the throttling orifice (2).

The housing of the VSK2 valve does not have any surface treatment, the housing of the VSK4 is phosphate coated. All the other parts are zinc coated.



VSK4



Ordering Code

VSK - - /

Constant Flow-Control Valve

Model

Cartridge

2

Screw - in cartridge

4

no designation

Type

Standard

Connection thread

Metric thread (M18x1.5 for VSK2)

M2

Metric thread (M22x1.5 for VSK4)

M4

Pipe thread (G 3/8 only for VSK2)

G4

Orifice diameter in mm/100

VSK2	55	80	100	-	120	-	-	-	-	160	180	-	210	230	-	260
VSK4	-	-	100	110	120	130	135	140	150	160	180	200	-	-	250	-

Technical Data

Nominal size	mm	06
Maximum flow	L/min	See table of flow rates
Maximum working pressure	bar	320
Minimum pressure difference	bar	See the performance curves
Hydraulic fluid	Hydraulic oils of power classes (HL, HLP) to DIN 51 524	
Fluid temperature range for (NBR)	°C	-30 ... +100
Viscosity range	mm ² /s	20 ... 400
Maximum degree of fluid contamination	Class 21/18/15 to ISO 4406	
Weight - VSK2	kg	0,025
VSK4 with connector		00,2
Mounting position	unrestricted	

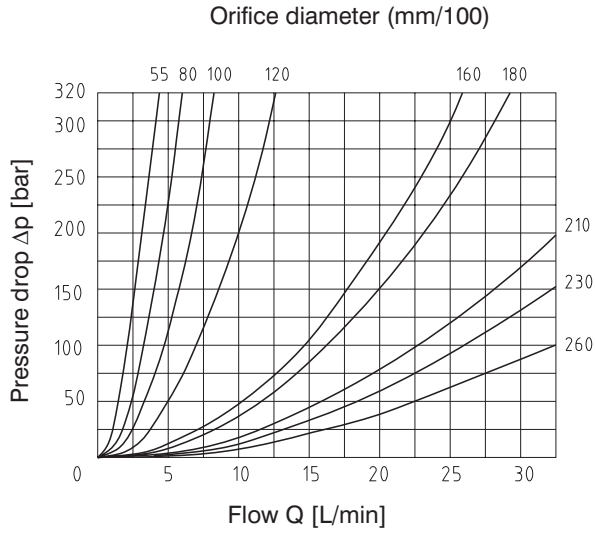
Approximate flow rates corresponding with the orifice diameter

VSK2		VSK4	
ID of the orifice [mm/100]	Flow range L/min adjustable through spring pretension at 32 bar	ID of the orifice [mm/100]	Flow range L/min an input pressure 32 bar
55	0,3 - 0,6	100	2,1
80	1,4 - 1,7	110	2,4
100	1,8 - 2,4	120	3,0
120	3,1 - 4,0	130	3,8
160	5,5 - 6,5	140	4,3
180	5,6 - 7,1	150	4,9
210	8,5 - 10,8	160	6,3
230	10,7 - 13,3	180	6,6
260	12,0 - 16,4	200	8,7
		250	12,5
		135/S	6,0

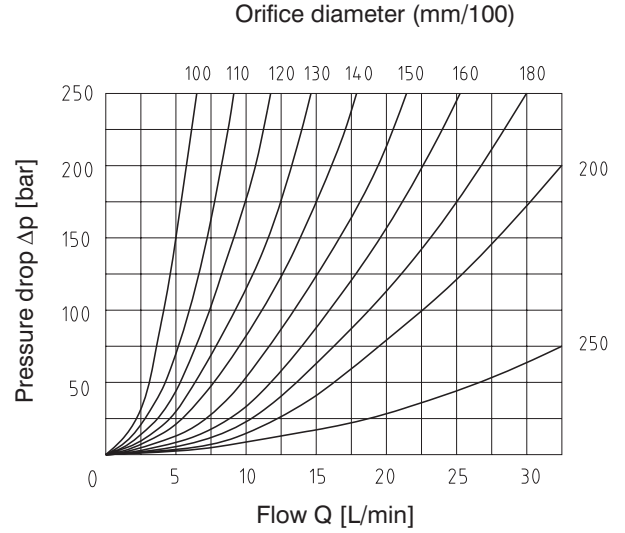
Δp-Q Characteristics (B → A)

Measured at $v = 32 \text{ mm}^2/\text{s}$

VSK2



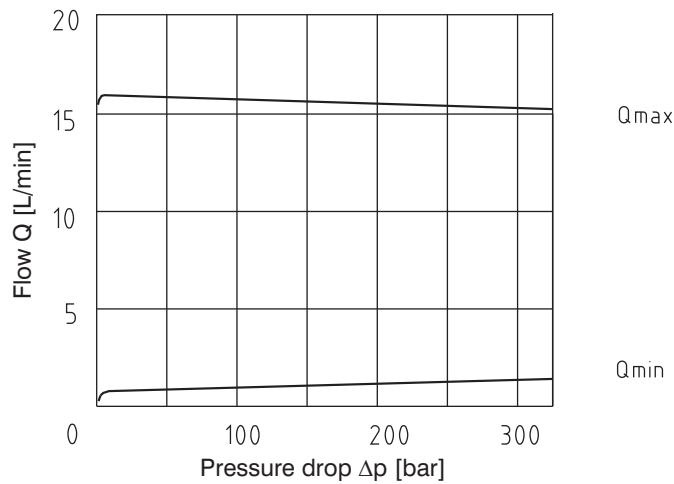
VSK4



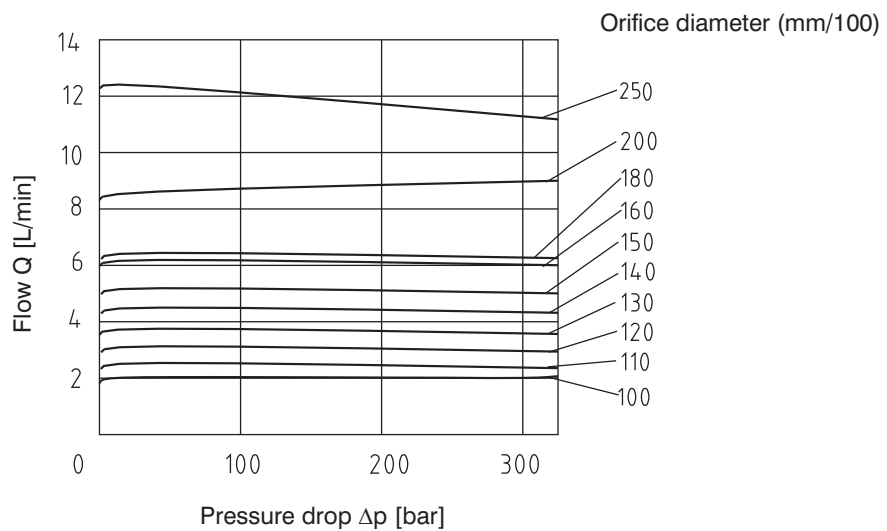
Δp-Q Characteristics (A → B)

Measured at $v = 32 \text{ mm}^2/\text{s}$

VSK2



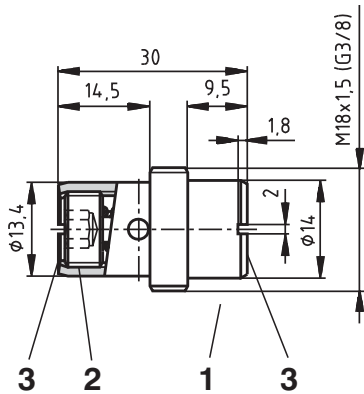
VSK4



Valve Dimensions

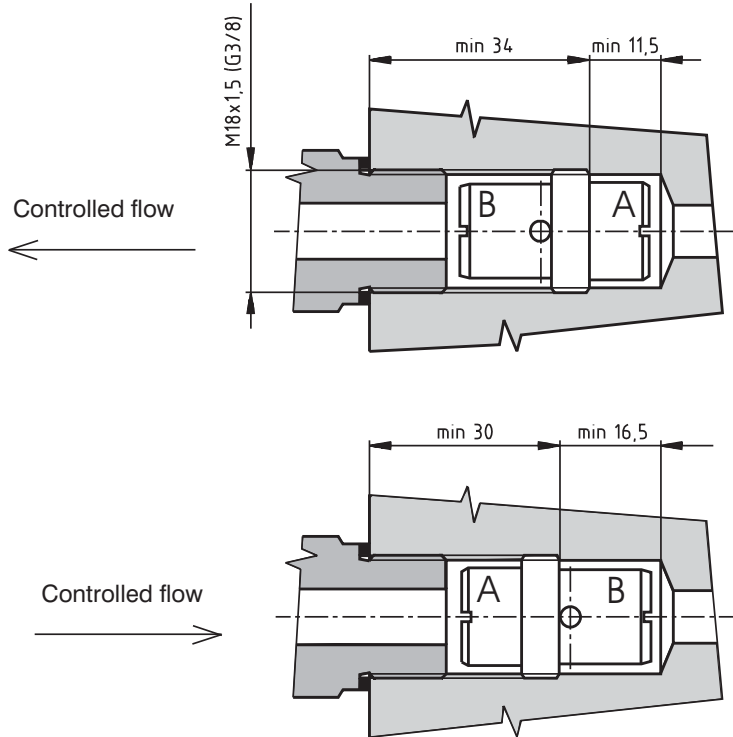
Dimensions in millimeters

VSK2-M4-x

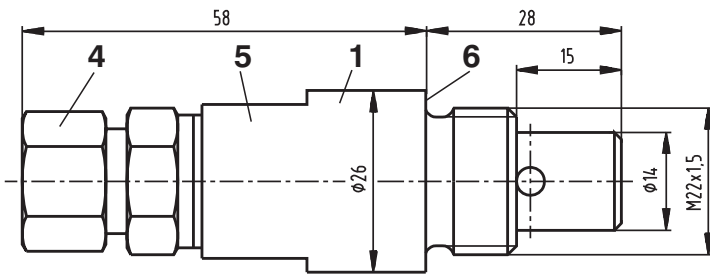


- 1 Type designation (stamped)
- 2 Screw for fine flow adjustment (with VSK2 only)
 - inside HEX5
 - anti clockwise rotation = flow decrease
 - clockwise rotation = flow increase
- 3 Slot for screwing-in in mounting cavity of VSK2
- 4 Straight connector GE10-PRL-ED for pipe with $\varnothing D$ 10 mm
- 5 Wrench flats size 22 mm, tightening torque $M_d = 30$ Nm
- 6 Sealing edge

Cavity

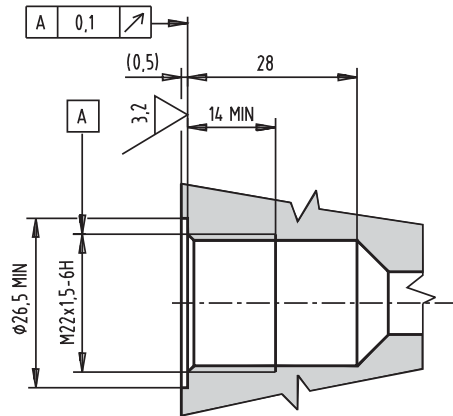


VSK4-M4-x



Controlled flow
←

Cavity

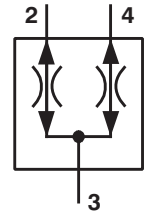


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- Divert flows largely independent to the load
- Combine flows largely independent to the load
- May be used for synchronisation controls
- May be used as differential lock



Functional Description

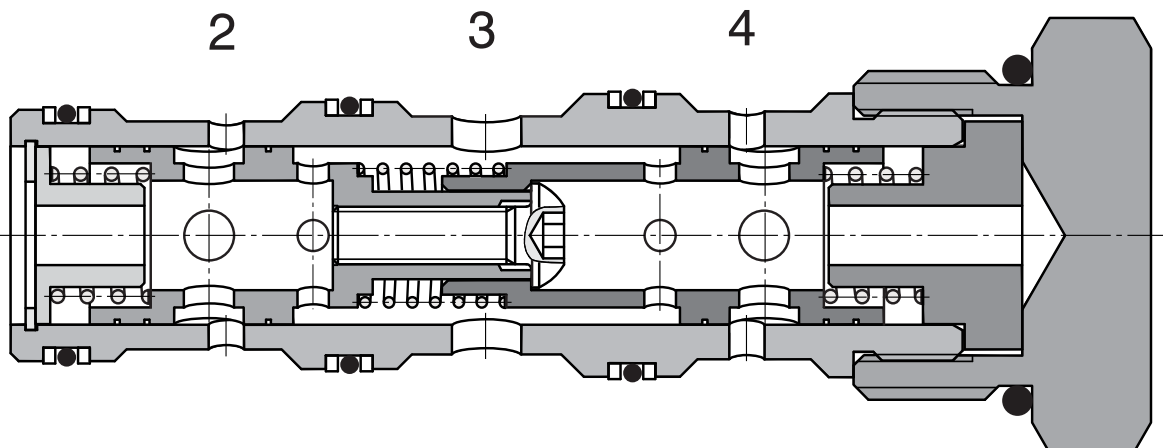
The valve consists of a valve body, two regulating slide valves mutually connected with a defined stroke and with a fixed measuring orifice plate and three centring springs.

The liquid flows from the channel (3) through the measuring orifice plates to the channels (2) and (4). At the same time the regulating slide valves are pressed by the pressure difference one from the other against the outer centring springs. If the load of the channels (2) and (4) is the same the regulating slide valves are held symmetrically to both the channels. At a different load the slide valve on the side of the lower load shifted by an increased pressure drop so far against the spring located behind the slide valve as a new force balance is created caused by changed cross sections of both the regulating slide valves. By this regulating course it is ensured the ratio of division is maintained also at a different load and it is compensated in essence also at a variation of load pressures.

If the liquid cannot flow through one of the channels (2) and (4) the increased dynamic pressure in this channel causes the displacement of both the slide valves to the opposite side and it results in the fact that the other channel is closed. Then, a negligible rate of flow of the liquid only can flow through the released orifice of the nozzle enabling for example the balance of end positions of two consumers.

In the opposite direction of flow both the regulating slide valves are pressed one to the other. Also in this case different load pressures or eventually their changes by changing the position of the regulating slide valves cause a change of throttling cross sections, therefore, the combining the flows occurs also in the same ratio of division.

As for appropriate basic surface finish the external parts are zinc coated.



Ordering Code

SFD2F-D4/I

Flow Divider / Combiner

no designation

Seals
NBR

Capacity (input)

33 - 100 L/min

50 - 150 L/min

100

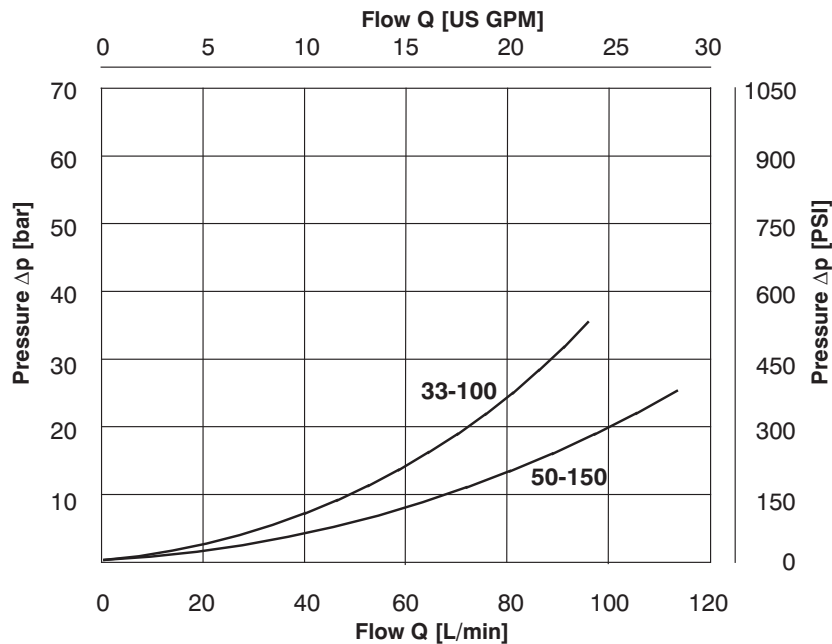
150

Technical Data

Cavity		1-5/16-12 UN-2A
Maximum flow	L/min	150
Max. pressure	bar	350
Division ratio	%	50 - 50
Maximum variation of flow	%	± 10
Pressure drops		see Δp - Q characteristics
Hydraulic fluid		Hydraulic oil (HM, HV) according to DIN 51524
Fluid temperature range	°C	-20 ... +90
Viscosity	mm ² /s	20 ... 400
Maximum degree of fluid contamination		According to ISO 4406, Class 21/18/15
Weight	kg	0.36
Maximum valve tightening torque in valve body or in control block	Nm	70 ⁺²
Mounting position		Unrestricted

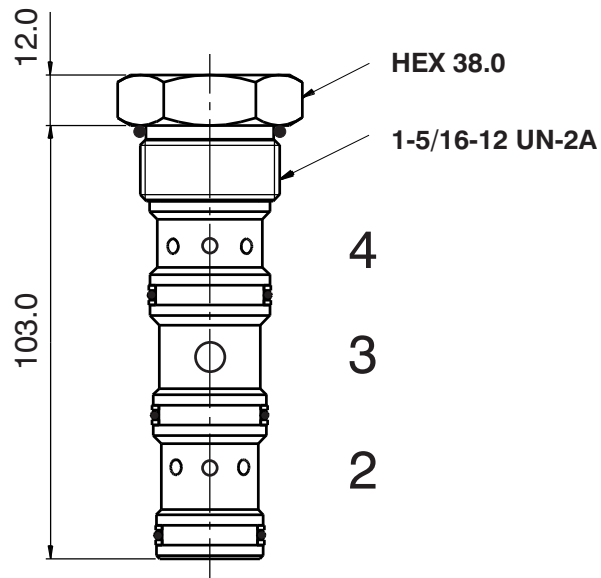
p-Q Characteristics

Measured at $v = 40 \text{ mm}^2/\text{s}$



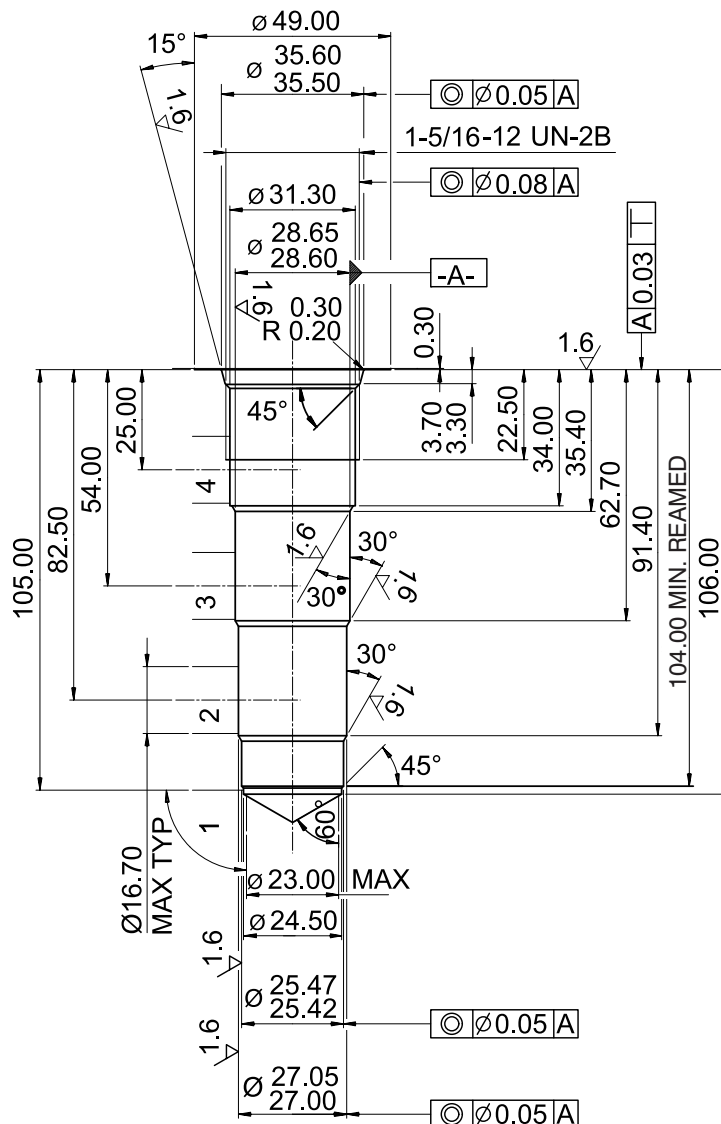
Dimensions

Measurements in millimeters



Cavity

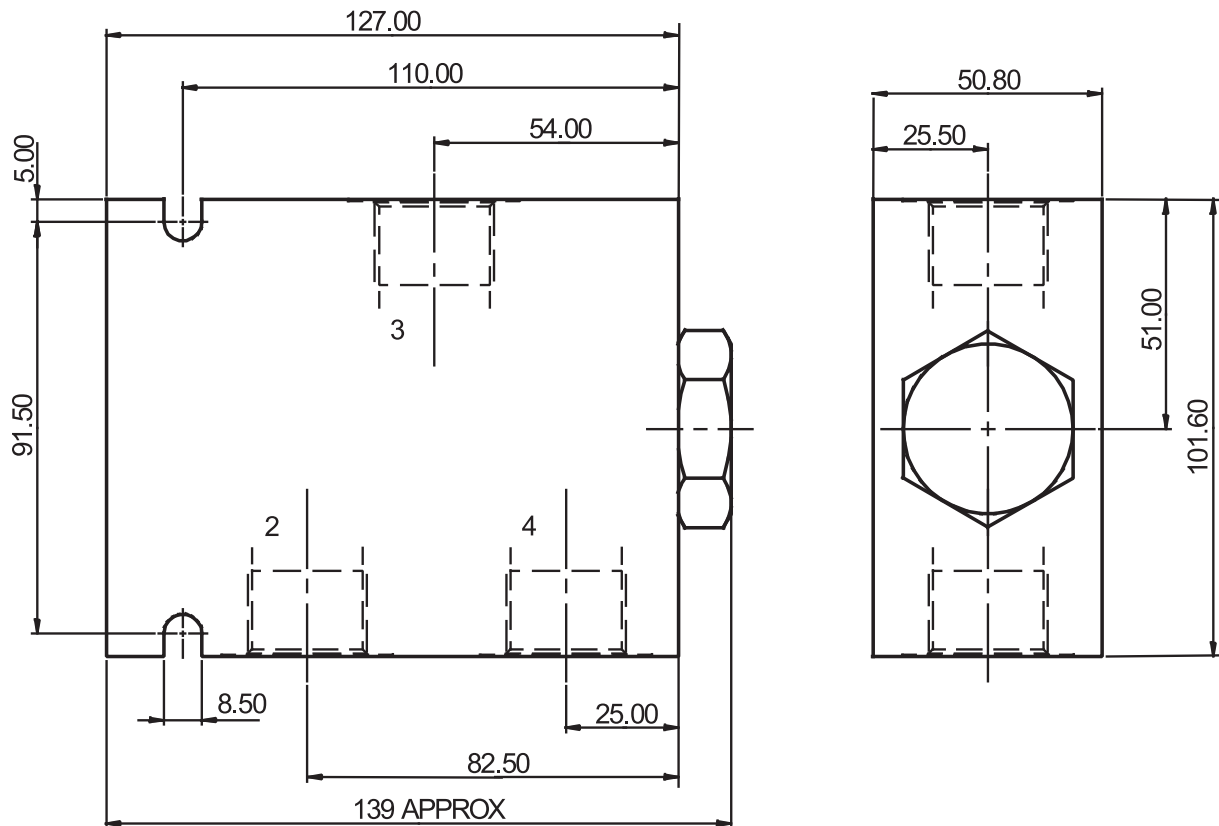
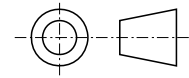
Measurements in millimeters



Valve Bodies

Measurements in millimeters

ISO A



Body without valve			
Material	Ports	Port size	Type code
Aluminium	2, 3, 4	G1/2	SB-D4-0105AL
	2, 3, 4	SAE 10, 7/8-14	SB-D4-0106AL
Steel	2, 3, 4	G1/2	SB-D4-0105ST
	2, 3, 4	SAE 10, 7/8-14	SB-D4-0106ST

The use of aluminium bodies is limited to a maximum operating pressure of 210 bar.

Spare Parts

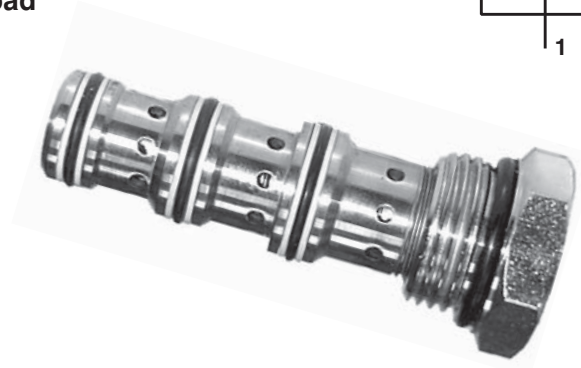
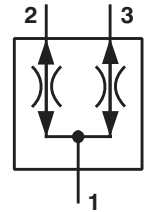
Seal kits on request.

Caution!

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- Divert flows largely independent to the load
- Combine flows largely independent to the load
- May be used for synchronisation controls
- May be used as differential lock



Functional Description

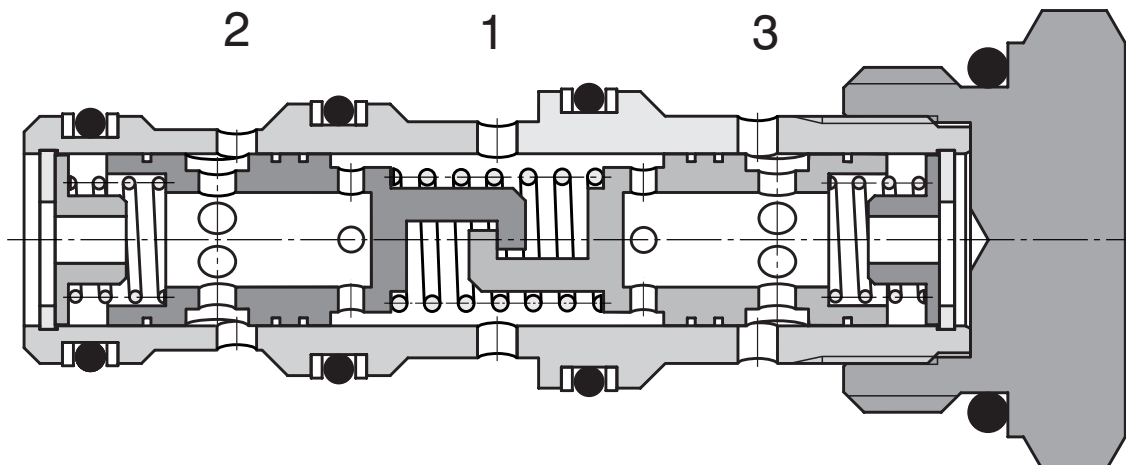
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In the opposite direction of flow both the regulating slide valves are pressed one to the other. Also in this case different load pressures or eventually their changes by changing the position of the regulating slide valves cause a change of throttling cross sections, therefore, the combining the flows occurs also in the same ratio of division.

As for appropriate basic surface finish the external parts are zinc coated.



Ordering Code

SFD2F-B3/I

Flow Divider / Combiner

no designation

Seals
NBR

Capacity (input)

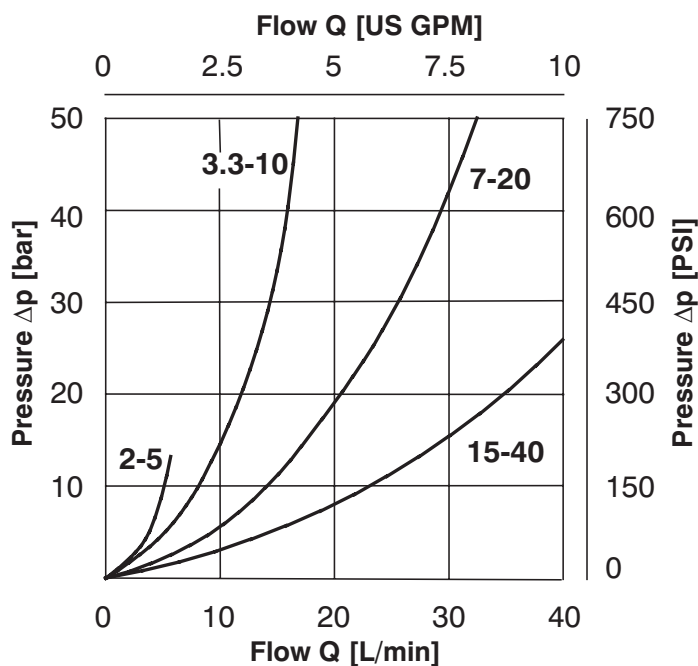
2 - 5 l/min	5
3,3 - 10 l/min	10
7 - 20 l/min	20
15 - 40 l/min	40

Technical Data

Cavity		7/8-14 UNF-2A
Maximum flow	L/min	40
Max. pressure	bar	350
Division ratio	%	50 - 50
Maximum variation of flow	%	± 10
Pressure drops		see Δp - Q characteristics
Hydraulic fluid		Hydraulic oil (HM, HV) according to DIN 51524
Fluid temperature range	°C	-20 ... +90
Viscosity	mm ² /s	20 ... 400
Maximum degree of fluid contamination		According to ISO 4406 (1999), Class 21/18/15
Weight	kg	0.10
Maximum valve tightening torque in valve body or in control block	Nm	34 ⁺²
Mounting position		any

p-Q Characteristics

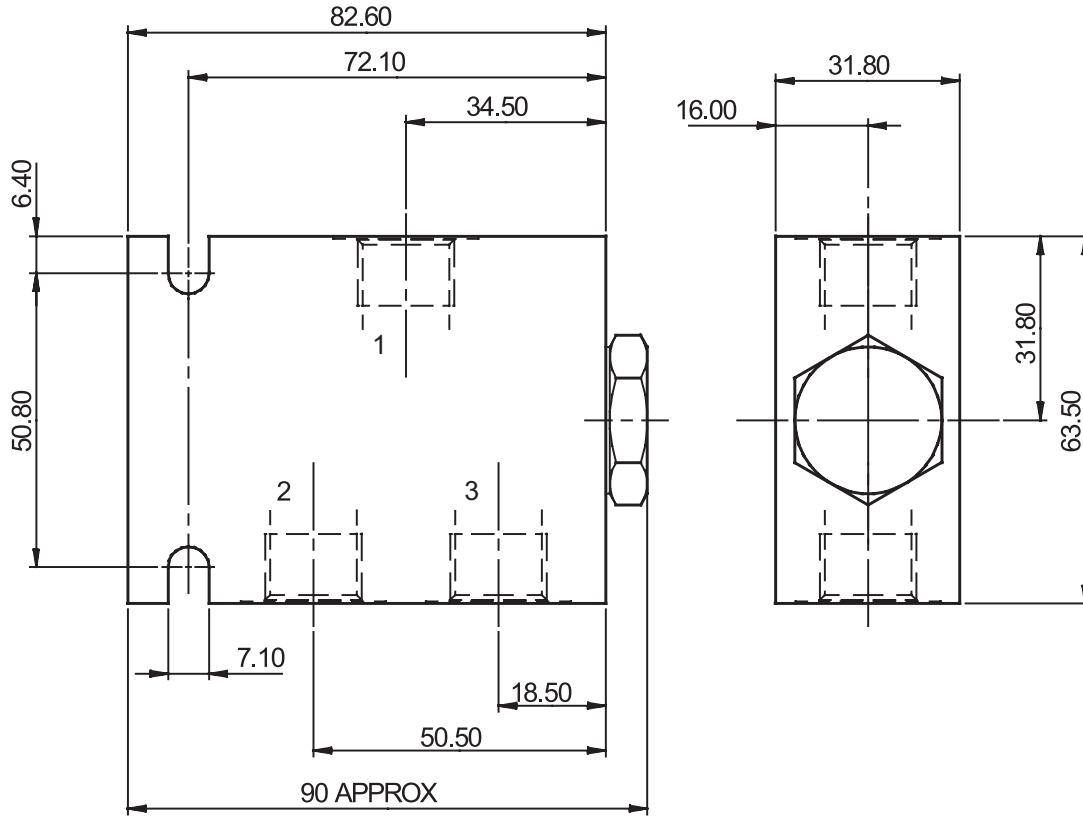
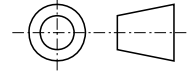
Measured at $v = 40 \text{ mm}^2/\text{s}$



Valve Bodies

Measurements in millimeters

ISO A



Body without valve			
Material	Ports	Port size	Type code
Aluminium	1, 2, 3	G3/8	SB-B4-0203AL
	1, 2, 3	SAE 8, 3/4-16	SB-B4-0204AL
Steel	1, 2, 3	G3/8	SB-B4-0203ST
	1, 2, 3	SAE 8, 3/4-16	SB-B4-0204ST

The use of aluminium bodies is limited to a maximum operating pressure of 210 bar.

Spare Parts

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