

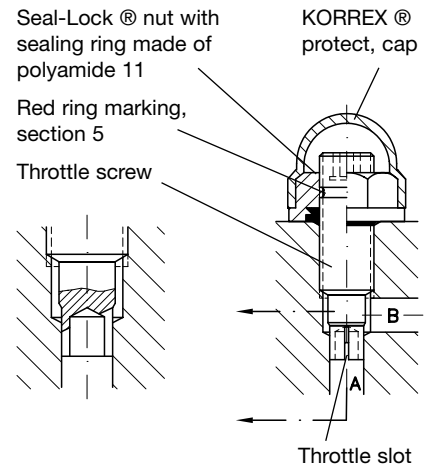
Slot type throttles type Q, QR and QV

Pressure p_{\max} = 400 bar
Flow Q_{\max} = 120 lpm

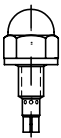
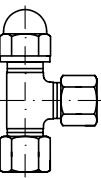

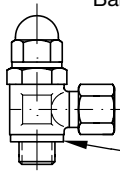

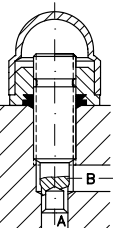
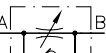
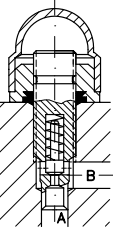
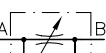
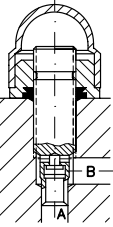
1. General

According to DIN ISO 1219-1, throttle valves belong to the group of flow valves. Their functional task within the hydraulic circuit is to generate a vari-ably adjustable pressure corresponding to the throttle drop characteristic, with which, for example, it is possible to control the velocity of cylinders in accumulator circuits and to limit the oil flow in control circuits etc. The throttle valves described here are slotted throttles and are optionally available with or without a built-in check valve, so that the throttle effect is present in either both or only one flow direction. The throttle cross section is adjustable with a hexagon socket screw key after undoing a self-sealing locknut. The end of the adjustment distance is shown by a red ring marking visible on the end of the knob. Refer to sect. 5 for important notes on this.

The groove width of the slot type throttles remains constant over a certain adjustment distance in each case, i.e. the throttle cross section changes in a linear manner in contrast to the needle valve or ball valve designs (annular gap throttles), something which allows fine adjustments to be made even when the flow values are low. The slotted throttle is largely insensitive to microcontamination by virtue of the favorable length/to width ratio.



2. Types availables, main data

Max. pressure loading capacity Q..20.. to 50.. = 400 bar Q..20 HL.. = 315 bar Q..60 = 315 bar	Throttle screw for location hole	Throttle valve for line installation					Flow rate Q _{max}						
		Corner valve	Banjo bolt 1)	Banjo fitting									
			for pipe-Ø (mm)			Outside diameter of the sealing rings differs, see sect. pos. 4.2	for pipe-Ø (mm)	approx. (lpm)					
Single throttle throttling A →B and B→A largely the same 		Q 20	Q 20 T 6	6	Q 20 H 2)	Q 20 H 6 K 2)	6	12					
						Q 20 H 8 K 2)	8						
						Q 20 HL 8 K 2)	8						
						Q 20 HL 10 K	10						
						Q 30	Q 30 T 8	8	Q 30 H	Q 30 H 10	Q 30 H 10 K	10	25
						Q 40	Q 40 T 10	10	Q 40 H	Q 40 H 12	Q 40 H 12 K	12	50
						Q 50	Q 50 T 12	12	Q 50 H	Q 50 H 16	Q 50 H 16 K	16	90
Q 60	---	---	Q 60 H	Q 60 H 20	Q 60 H 20 K	20	120						
Restrictor check valve throttling B→A 		QR 20	QR 20 T 6	6	QR 20 H 2)	QR 20 H 6 K 2)	6	12					
						QR 20 H 8 K 2)	8						
						QR 20 HL 8 K 2)	8						
						QR 20 HL 10 K	10						
						QR 30	QR 30 T 8	8	QR 30 H	QR 30 H 10	QR 30 H 10 K	10	25
						QR 40	QR 40 T 10	10	QR 40 H	QR 40 H 12	QR 40 H 12 K	12	50
						QR 50	QR 50 T 12	12	QR 50 H	QR 50 H 16	QR 50 H 16 K	16	90
QR 60	---	---	QR 60 H	QR 60 H 20	QR 60 H 20 K	20	120						
Restrictor check valve throttling A →B 		QV 20	QV 20 T 6	6	QV 20 H 2)	QV 20 H 6 K 2)	6	8					
						QV 20 H 8 K 2)	8						
						QV 20 HL 8 K 2)	8						
						QV 20 HL 10 K	10						
						QV 30	QV 30 T 8	8	QV 30 H	QV 30 H 10	QV 30 H 10 K	10	12
						QV 40	QV 40 T 10	10	QV 40 H	QV 40 H 12	QV 40 H 12 K	12	20
						QV 50	QV 50 T 12	12	QV 50 H	QV 50 H 16	QV 50 H 16 K	16	30
QV 60	---	---	QV 60 H	QV 60 H 20	QV 60 H 20 K	20	50						

¹⁾ Customer-furnished EO parts, see section 4.2

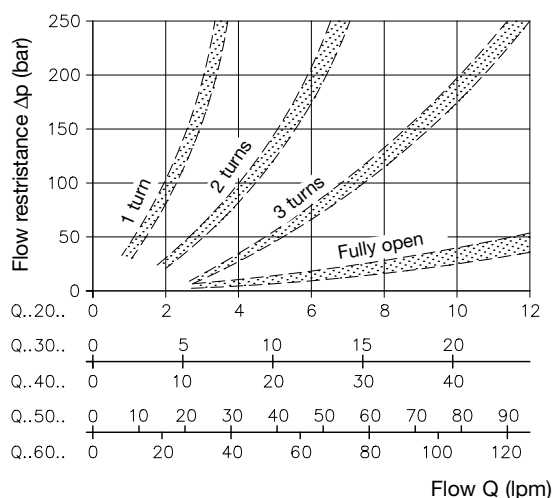
²⁾ Optional version with thread seal ring (see dimensional drawing in sect. 4.2). Simply add a D to the basic type coding e.g. Q 20 HD 8

3. Characteristic data

Design	Slot type throttle
Line connection	Directly screwed into location hole of manifolds unit bodies or pipe mounting (housing design, see note in section 4.2)
Installation position	Any
Surface treatment	Housing versions electro-galvanized and yellow chromated (cC)
Pressure fluid	Hydraulic oil conforming DIN 51524 part 1 to 3: ISO VG 10 to 68 conforming DIN 51519. Viscosity limits: min. approx. 4, max. approx. 1500 mm ² /sec; opt. operation approx. 10... 500 mm ² /sec. Also suitable are biologically degradable pressure fluids type HEPG (Polyalkylenglycol) and HEES (Synth. Ester) at service temperatures up to approx. +70°C.
Temperature	Ambient: approx. -40 ... +80°C Fluid: -25 ... +80°C, Note the viscosity range ! Permissible temperature during start: -40°C (Note start-viscosity!), as long as the service temperature is at least 20K higher for the following operation. Biological degradable pressure fluids: Note manufacturer's specifications. By consideration of the compatibility with seal material not over +70°C.

Throttle characteristic
 Δp -Q

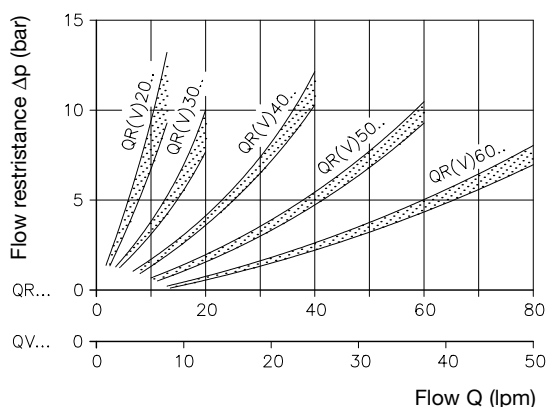
The characteristics must be regarded only as recommended values for the Δp -Q ratio within the relevant adjustment range. Different basic resistances of the various housing designs have only a slight effect in the fine adjustment range up to approx. 2...3 turns and would only be noticeable with the throttle fully open (red ring marking, sect. 5.1) if at all.
The turns for opening are counted from the closed state.



The throttle setting of the valve is always made with a pressure gauge at the installation site, since the flow resistance ranges from the theoretical value ∞ (throttle closed) to a lower limit value, which is determined by the intrinsic resistance of the angle deflection A → B. See the important note in sect. 5. The throttle screws are not suitable for an oil leak-free blocking position (do not forcibly turn into the closed position) .

Δp -Q curves
(back pressure via the check valve) in direction
A → B with type QR..
B → A with type QV..

It depends on the throttle opening and is between a limit curve for a closed throttle through to a fully opened throttle, corresponding to the above characteristics. The characteristics opposite show the tendency for a throttle which is opened by 3 turns.



Oil viscosity during the measurement appr. 60 mm²/s

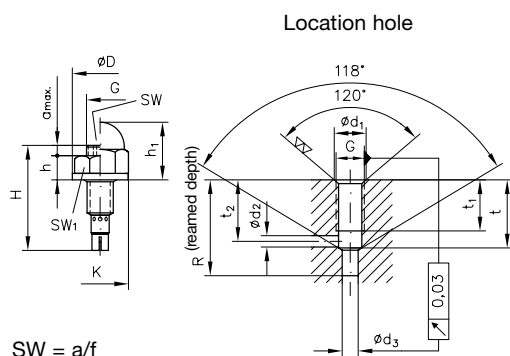
Mass (weight) approx.

Throttle screw	Corner valve	Banjo bolt	Banjo fitting
Q(R,V) 20 = 15 g	Q(R,V) 20 T 6 = 115 g	Q(R,V) 20 H = 40 g	Q(R,V) 20 H 6(K) = 150 g
Q(R,V) 30 = 25 g	Q(R,V) 30 T 8 = 135 g	Q(R,V) 30 H = 70 g	Q(R,V) 20 H 8(K) = 150 g
Q(R,V) 40 = 40 g	Q(R,V) 40 T10 = 180 g	Q(R,V) 40 H = 90 g	Q(R,V) 20 HL 8(K) = 150 g
Q(R,V) 50 = 55 g	Q(R,V) 50 T12 = 255 g	Q(R,V) 50 H = 130 g	Q(R,V) 30 HL 10(K) = 150 g
Q(R,V) 60 = 100 g		Q(R,V) 60 H = 230 g	Q(R,V) 30 H 10 = 250 g
			Q(R,V) 40 H 12 = 290 g
			Q(R,V) 50 H 16 = 470 g
			Q(R,V) 60 H 20 = 830 g

4. Dimensions

All dimensions are in mm, subject to change without notice!

4.1 Throttle screws



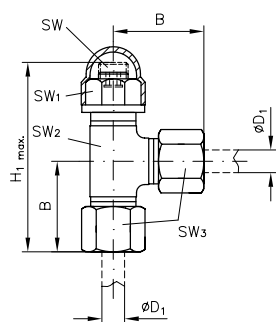
$$SW = a/f$$

Type	G	D	H	a _{max}	d1 +0.3	d2	d3 H11
Q(R,V) 20	M 8x1	17	32	5	10	5.5	5
Q(R,V) 30	M 10x1	21	36	5	12.5	6.5	6.5
Q(R,V) 40	M 12x1.5	23	41	6	15.5	7.5	8
Q(R,V) 50	M 14x1.5	27	46	6	16.5	9	9
Q(R,V) 60	M 16x1.5	30	58	6	19.5	11	11

Type	h	h1	t+0.5	t1	t2	K	R	a/f	a/f1	Max. torque
Q(R,V) 20	8.5	18	18	14	15	17	25	4	13	8 Nm
Q(R,V) 30	9	24	20.5	16	17	22	30	5	17	14 Nm
Q(R,V) 40	10	26	23.5	16	19.5	24	32	6	19	22 Nm
Q(R,V) 50	11	28	27	19	22	28	37	8	22	50 Nm
Q(R,V) 60	18	32	32	22	26	31	41	10	24	70 Nm

4.2 Throttle valve for inline installation

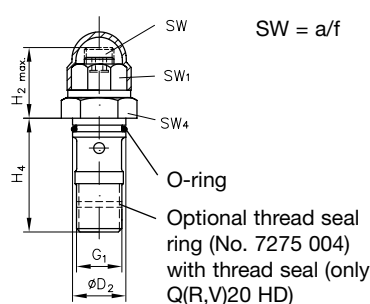
Corner valve



Type	B	H1	D1	a/f
Q(R,V) 20 T 6	31	56.5	6	4
Q(R,V) 30 T 8	32	58.5	8	5
Q(R,V) 40 T10	34	63.5	10	6
Q(R,V) 50 T12	38	72.5	12	8

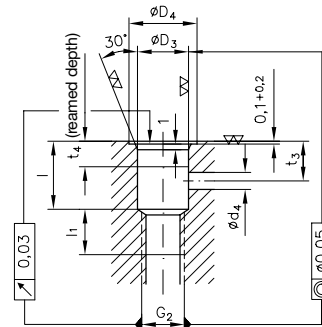
Type	a/f1	a/f2	a/f3
Q(R,V) 20 T 6	13	14	17
Q(R,V) 30 T 8	17	17	19
Q(R,V) 40 T10	19	19	22
Q(R,V) 50 T12	22	22	24

Banjo bolt



$$SW = a/f$$

Location hole



Type	G1 ³⁾	G2 ³⁾	D2	D3 +0.1	D4	H2	H4	d4
Q(R,V) 20 H	G 1/4 A	G 1/4	15.45	15.5	20	20	33	5
Q(R,V) 30 H	G 3/8 A	G 3/8	18.95	19	25	21	38	8
Q(R,V) 40 H	G 3/8 A	G 3/8	18.95	19	25	23.5	38	12
Q(R,V) 50 H	G 1/2 A	G 1/2	22.95	23	30	27	49.5	12
Q(R,V) 60 H	G 3/4 A	G 3/4	28.95	29	35	34	59.5	15

Type	l	l1	t3	t4	a/f	a/f1	a/f4	Max. torque	O-ring NBR 90 Sh
Q(R,V) 20 H	23	10	10	7	4	13	19	50 Nm	12.5x1.5
Q(R,V) 30 H	27	12	13	9	5	17	24	75 Nm	16x1.5
Q(R,V) 40 H	27	12	13	9	6	19	24	75 Nm	16x1.5
Q(R,V) 50 H	35	15	14	9	8	22	30	130 Nm	20x1.5
Q(R,V) 60 H	43	18	20	10	10	24	36	250 Nm	25x1.5

Index of customer-furnished EO-parts:

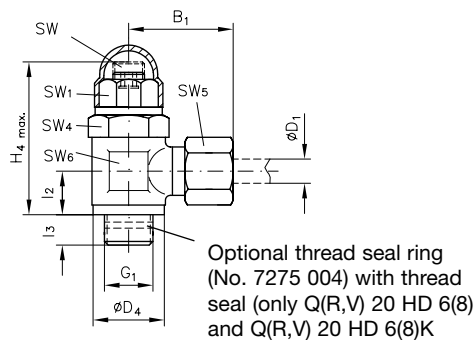
Banjo bolt	Pipe-Ø d _a	Swiveling housing	EO-parts are customer furnished ¹⁾				Union nut
			Cutting ring ²⁾	Plastic ring ²⁾	Progressive ring		
Q(R,V) 20 H	6	XWH 6-SR-A3C	DKA 1/4	KD 1/4	DPR 6-L/S	M 6-S-A3C	
Q(R,V) 20 H	8	XWH 8-SM/SR-A3C	DKA 1/4	KD 1/4	DPR 8-L/S	M 8-S-A3C	
Q(R,V) 20 HL	8	XWH 8-LR-A3C	DKA 1/4	KD 1/4	DPR 8-L/S	M 8-S-A3C	
Q(R,V) 20 HL	10	XWH 10-LR-A3C	DKA 1/4	KD 1/4	DPR 10-L/S	M 10-S-A3C	
Q(R,V) 30 H	10	XWH 10-SM/SR-A3K	DKA 3/8	KD 3/8	DPR 10-L/S	M 10-S-A3C	
Q(R,V) 40 H	12	XWH 12-SR-A3C	DKA 3/8	KD 3/8	DPR 12-L/S	M 12-S-A3C	
Q(R,V) 50 H	16	XWH 16-SR-A3C	DKA 1/2x4.5	KD 1/2	DPR 16-L/S	M 16-S-A3C	
Q(R,V) 60 H	20	XWH 20-SM/SR-A3C	DKA 3/4	KD 3/4	DPR 20-L/S	M 20-S-A3C	

¹⁾ Parker Hannifin GmbH, division ERMETO Am Metallwerk 9, D-33659 Bielefeld

²⁾ Observe the differing external-Ø of the seal rings, see also versions with swiveling housing at page 4!

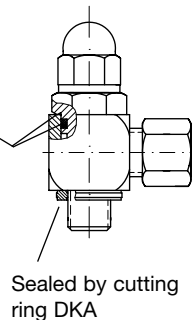
³⁾ G... (BSPP)

Threaded pipe connections



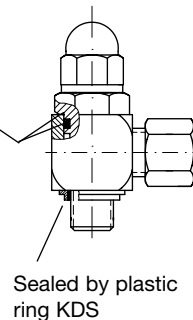
Type Q(R, V) ...H...

Sealed by
O-ring and
sealing
edge



Type Q(R, V) ...H...K

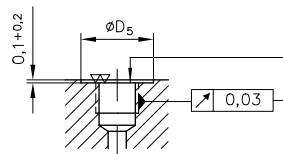
Sealed by
O-ring and
sealing
edge



$$SW = a/f$$

Sink for all types

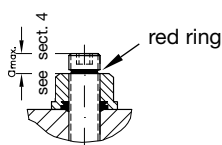
1) G... (BSPP)



Type	G ₁ 1)	B ₁	D ₁	D ₄	D ₅	H ₄	l ₂	l ₃	a/f	a/f ₁	a/f ₅	a/f ₆	a/f ₄	Max. torque
Q(R,V) 20 H 6 (K)	G 1/4 A	31	6	18.9	20	42.5	14	9	4	13	17	22	19	50 Nm
Q(R,V) 20 H 8 (K)	G 1/4 A	31	8	18.9	20	42.5	14	9	4	13	19	22	19	50 Nm
Q(R,V) 20 HL 8 (K)	G 1/4 A	29	8	18.9	20	42.5	14	9	4	13	17	22	19	50 Nm
Q(R,V) 20 HL 10 (K)	G 1/4 A	30	10	18.9	20	42.5	14	9	4	13	19	22	19	50 Nm
Q(R,V) 30 H 10 (K)	G 3/8 A	35	10	22	25	50	16.5	9	5	17	22	27	24	75 Nm
Q(R,V) 40 H 12 (K)	G 3/8 A	35	12	22	25	52	16.5	9	6	19	24	27	24	75 Nm
Q(R,V) 50 H 16 (K)	G 1/2 A	40	16	26.9	30	62.5	21.5	14	7	22	30	32	30	130 Nm
Q(R,V) 60 H 20 (K)	G 3/4 A	48	20	32.9	35	78	24	16	10	24	36	41	36	250 Nm

5. Notes for operation

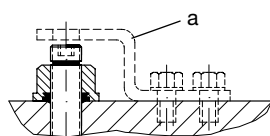
5.1 Maximum adjustment distance



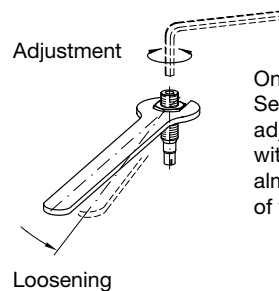
At the maximum adjustment length (guideline dimension a_{max}), the ring marking will become visible. Further unscrewing will not achieve any further change (reduction) in the Δp -value. From a design point of view, an internal stop to prevent further or complete unscrewing cannot be provided. The red ring marking accordingly also represents the end of the permissible adjustment length. If it is exceeded, the number of load-bearing threads will be reduced, and if unscrewed too far there is the risk that the throttle screw might be torn out at high pressure. This point should, if necessary, be included in the operating manual or the operating instructions for the system.

Caution:

Do not unscrew throttle screw beyond red marking ring!



If necessary (e.g. for accident prevention), appropriate securing elements (a) are to be attached to the unit bodies into which the Q-screw is inserted, so as to prevent the screw from turning out-wards any further. This also applies to housing designs as in section 4.2.



Only slight loosening of the Seal-Lock-nut is required for adjusting the throttle screw with an Allen key. This way almost no fluid will escape out of the bore.

Throttle and restrictor check valves type CQ, CQR, and CQV

For screwing-in into simple tapped holes

Operating pressure $p_{\max} = 700 \text{ bar}$
Flow $Q_{\max} = 50 \text{ lpm}$

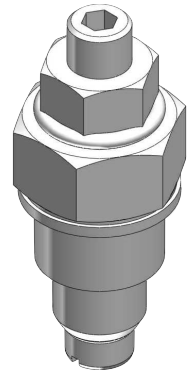
Additional valves also suited for simple tapped holes

- Pressure valves type CMV and CSV D 7710 MV
- Pressure controlled 2-way directional valve type CNE D 7710 NE
- Check valves type CRK, CRB and CRV D 7712
- Flow control valves type CSJ D 7736
- Pressure reducing valves type CDK D 7745
- Pressure-dependent shut-off valve type CDSV D 7876

1. General

Throttles serve to limit the flow within control circuits. The throttle valves detailed here are slot-type throttles, with or without check valve enabling free flow in one and restricted flow in the other direction.

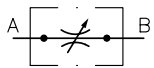
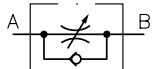
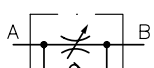
The twin sealing of the setting spindle ensures adjustment without any leakage.



2. Available versions, main data

Order examples:

CQ 2
CQR 2
CQV 2

Symbol	Type and size	Nomenclature
	CQ 2	Throttle Rather equal throttle characteristic for A→B and B→A
	CQR 2	Throttle check valve Throttling direction B→A
	CQV 2	Throttle check valve Throttling direction A→B

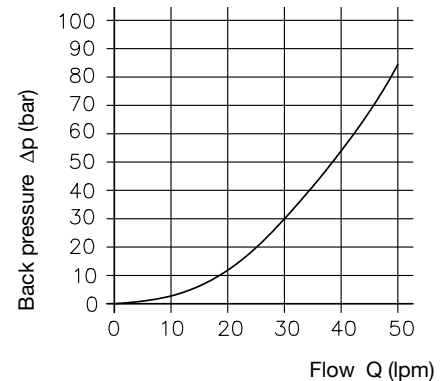
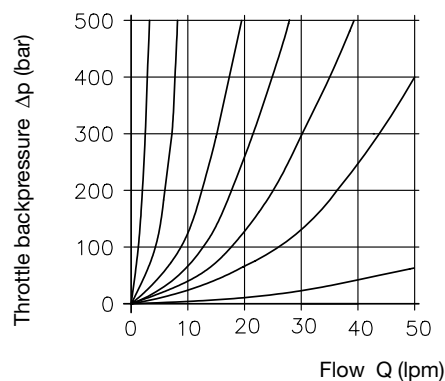
3. Additional parameters

Δp - Q curves

Throttled flow direction
Guideline figure per turn of the setting spindle, counted from blocked position

Free flow
A→B (type CQR)
B→A (type CQV)

Oil viscosity during measurements
approx. $50 \text{ mm}^2/\text{s}$

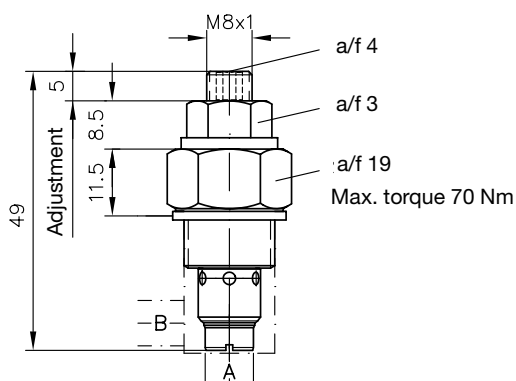


Continuation of parameters:

Nomenclature	Throttle and restrictor check valve	
Design	Slot-type throttle	
Installed position	Any	
Surface	Housing nitrous hardened, sealing nut zinc galvanized	
Flow	In throttled flow direction: dep. on setting, see $\Delta p - Q$ curve The flow figures are viscosity dependent.	
Pressure max.	700 bar	
Pressure fluid	Hydraulic fluid acc. to DIN 51524 table 1 to 3; ISO VG 10 to 68 acc. to DIN 51519 Viscosity range: min. approx. 4; max. approx. 1500 mm ² /s (viscosity during start) Optimal operation range: approx. 10...500 mm ² /s Also suitable are biologically degradable pressure fluids of the type HEPG (Polyalkylenglycol) and HEES (synth. Ester) at operation temperatures up to approx. +70°C.	
Temperaturas	Ambient: approx. -40...+80°C Oil: -25...+80°C, pay attention to the viscosity range! Start temperature down to -40°C are allowable (Pay attention to the viscosity range during start !), as long as the operation temperature during consequent running is at least 20K (Kelvin) higher. Biological degradable pressure fluids: Pay attention to manufacturer's information. With regard to the compatibility with sealing materials do not exceed +70°C.	
Mass (weight)	ca. 90 g	
$\Delta p - Q$ curve	Throttled flow direction Guideline figure per turn of the setting spindle, counted from blocked position	Free flow A→B (type CQR) B→A (type CQV)

4. Dimensions

All dimensions in mm, subject to change without notice!



Screw-in and locking

Before screwing the valve body into the manifold loosen the counter/sealing nut until the travel stop

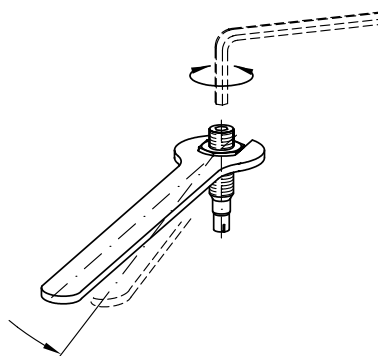
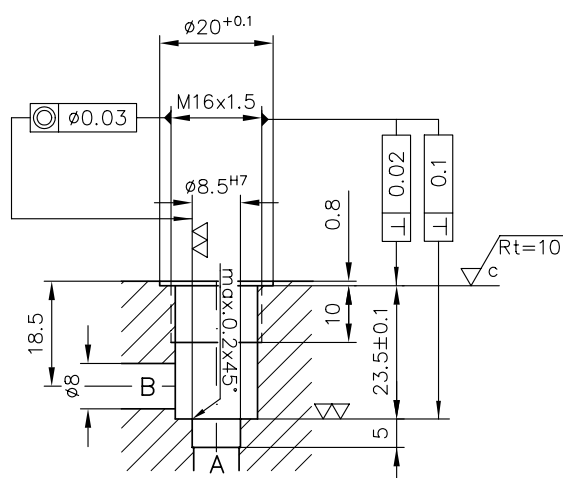
1. Screw-in the valve body
2. Tighten the counter/sealing nut with correct torque
(For torque, see dimensional drawing)

Adjustment

The lock nut as to be loosened a little bit prior to rotating the setting spindle with an Allan key

The twin sealing of the setting spindle ensures adjustment without any leakage.

Mounting hole



Precision throttle type FG and FGS

for screw-in into control oil inlets or outlets of hydraulically actuated hydraulic units

Operating pressure p_{\max} = 300 (400) bar

Flow Q_{\max} = 0.15 lpm

1. General

The precision throttle serves to delay the switching rate of pressure oil actuated valves:

- Response time setting of directional control valves
- Pulsations prevention
- Vibration dampening

The attenuation effect is achieved by means of thread with an adjustable screw length.

2. Available versions, main data

Coding examples:

FG 1 Throttle screw for screw-in into mounting hole (not available as type FGS)
FG 2 - S Version with thread type throttle and swivel housing
FGS H6 K Version with thread type throttle (locked against complete removal) and swivel housing

Sealing of the mounting hole

without = Standard, via sealing edge ring DKA 1/4

K = Seal KDS 14 A3C (only with FGS)

Table 1: Basic type and function

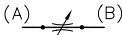
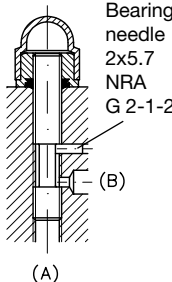

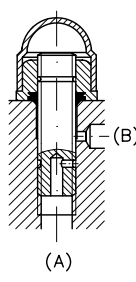
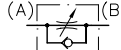
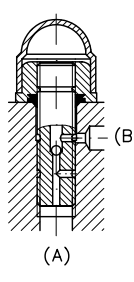
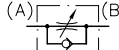
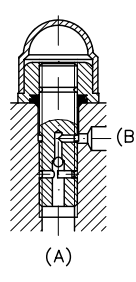
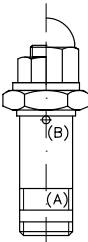
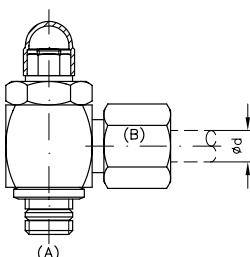
Version	With lock against complete removal	Standard (suited for screw-in into mounting hole)		
Codings, symbol and schematic cross-sectional view	<div>FGS 1)</div> <div></div> <div></div> <div>Bearing needle 2x5.7 NRA G 2-1-2</div>	<div>FG</div> <div></div> <div></div>	<div>FG 1</div> <div></div> <div></div>	<div>FG 2</div> <div></div> <div></div>
1) Only available as version with swivel housing (see table 2)				
Function	Throttling direction	A → B and B → A		B → A
	Free flow direction	None		A → B
				B → A

Table 2: Version with housing

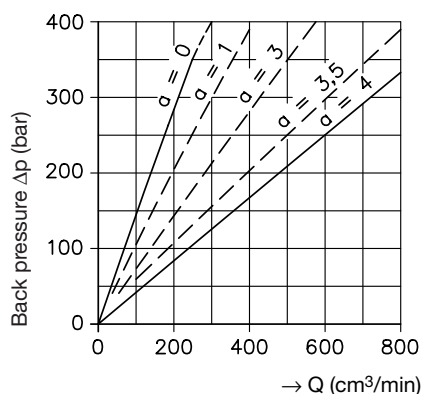
Banjo bolt		Swivel housing		List of ERMETO components not scope of delivery			
FG	- S			Ød	Housing	Tapered an cutting ring	Coupling nut
FG 1							
FG 2							
		FGS	H 6	6	XWH 6-SR-A3C	DPR 6-LS	M 6-S-A3C
		FG	- S 6		Xswve 6-SR		
		FG 1	- S 6				
		FG 2	- S 6				
		FGS	H 8	8	XWH 8-SM/SR-A3C	DPR 8-LS	M 8-S-A3C
		FG	- S 8		Xswve 8-SR		
FG 1	- S 8						
FG 2	- S 8						

3. Additional Data

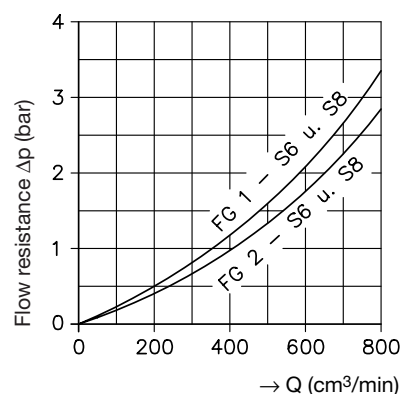
Design	Thread type throttle
Installed position	Any
Flow	In throttled direction: Depending on the setting, refer to the Δp -Q-a curves. The flow rate values are dependent on the viscosity.
Pressure max.	Type FG, FG 1 and FG 2 = 300 bar Type FGS = 400 bar
Pressure fluid	Hydraulic oil conforming DIN 51524 part 1 to 3; ISO VG 10 to 68 acc. to DIN 51519 Viscosity limits: min. approx. 4; max. approx. 1500 mm ² /sec opt. operation: approx. 10 ... 500 mm ² /sec Also suitable for biological degradable pressure fluids types HEPG (Polyalkylenglycol) and HEES (Synth. Ester) at service temperatures up to approx. +70°C
Temperature	Ambient: approx. -40 ... +80 C Fluid: -25 ... +80°C, note the viscosity range Permissible temperature during start: -40°C (observe start-viscosity!), as long as the service temperature is at least 20 K (Kelvin) higher for the following operation. Biological degradable pressure fluids: Observe manufacturer's specifications. Considering the compatibility with seal material not over +70°C.
Mass (Weight) approx.	Thread type throttle = approx. 15 g Version with banjo bolt = approx. 40 g Version with swivel housing = approx. 110 g

Δp -Q curves

Throttled flow direction
(Δp -Q-a)



Flow direction
A → B (FG 1...)
B → A (FG 2...)



Oil viscosity during measurement 50 mm²/s

Viscosity influence: The flow will be reduced in a ratio of approx. $50/p_x$, with setting unchanged (p_x = viscosity).

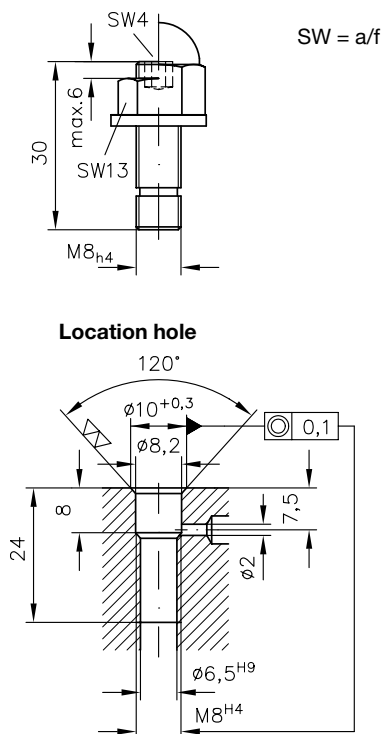
It is therefore recommended to use a setting for a above 1, when viscosities below 400 to 500 mm²/s are anticipated in the later use (applications outside etc.). See also description regarding a_{max} in sect. 5.

4. Dimensions

All dimensions in mm, subject to change without notice!

4.1 Throttle screw for screw-in into mounting hole

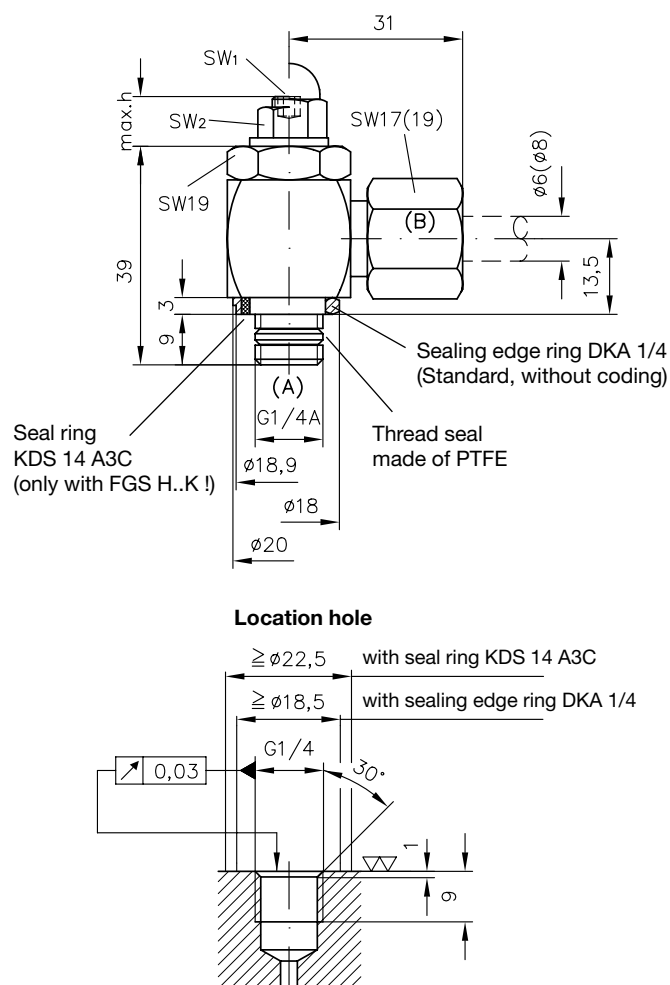
Type FG, FG 1 and FG 2



4.2 Housing design (Swivel housing)

Type FGS H 6(8)
 FG - S 6(8)
 FG 1 - S 6(8)
 FG 2 - S 6(8)

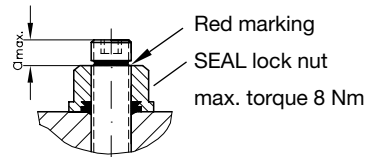
$SW = a/f$



5. Instructions for Operation

Max. setting range 6 mm

Effective restriction
from 0 to 4 mm



Setting range a

The greatest throttling action is achieved at $a = 0$ (the throttle screw and lock nut are flush with one another).

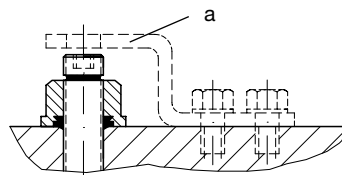
The throttling action is terminated when the red ring mark appears (= end of the permissible setting range). Do not unscrew the throttle screw any farther, since the number of supporting threads will decrease.

Type FGS: Locked via bearing needle 2x5.7 NRA G 2-1-2

Type FG, FG 1(2): The design of the screw does not allow the provision of a mechanical safeguard which would prevent the screw from being unscrewed farther or removed. Hence, special reference must be made in the operation manual or instructions for use to the red mark as the end of the permissible setting range.

If necessary (e.g. for accident prevention), appropriate securing element (a) are to be attached to the manifold into which the FG-screw is inserted, so as to prevent the screw from turning outwards any further.

This also applies to housing designs ...-S, ...-S 6(8).



Lock nut

Prior to setting the throttle screw, loosen the SEAL lock nut completely to remove the tension from the elastomer sealing ring provided in the thread.