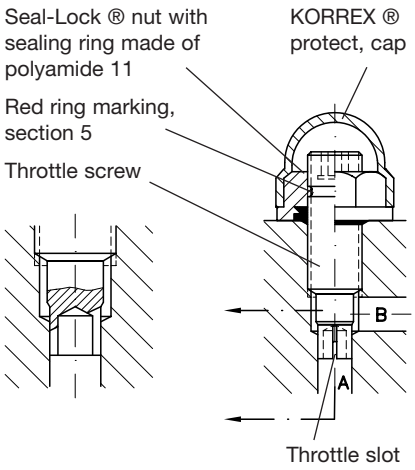
Slot type throttles type Q, QR and QV

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

1. General

According to DIN 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 areoptionally 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: Corner valve		Banjo bolt [1]	Banjo fitting			Flow rate Q_{max}
			for pipe-Ø (mm)		with sealing edge ring	with plastic sealing ring	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** [2] / **H 8** [2]	**Q 20 H 6 K** [2] / **H 8 K** [2]	6 8	12
					Q 20 HL 8 [2] / **HL 10**	**Q 20 HL 8 K** [2] / **HL 10 K**	8 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** [2] / **H 8** [2]	**QR 20 H 6 K** [2] / **H 8 K** [2]	6 8	12
					QR 20 HL 8 [2] / **HL 10**	**QR 20 HL 8 K** [2] / **HL 10 K**	8 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** [2] / **H 8** [2]	**QV 20 H 6 K** [2] / **H 8 K** [2]	6 8	8
					QV 20 HL 8 [2] / **HL 10**	**QV 20 HL 8 K** [2] / **HL 10 K**	8 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

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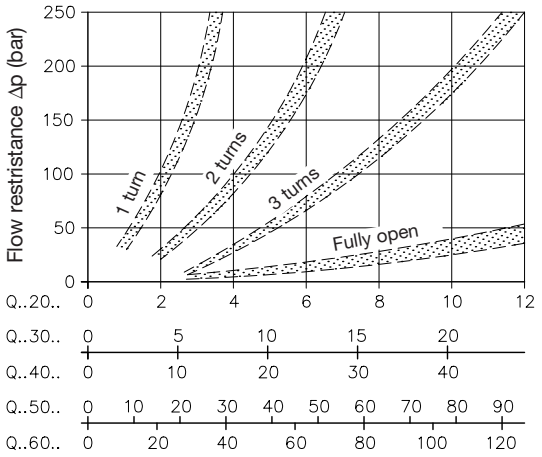
3. Characteristic data

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 mm²/sec; opt. operation approx. 10... 500 mm²/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

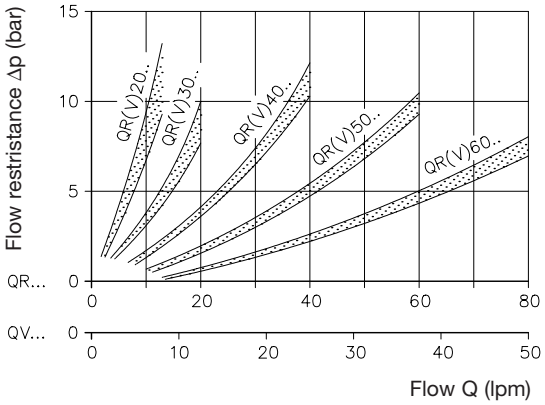
The characteristics must be regarded only as recommended values for the Δp-Q ratio within the relevant adjustment range. Different basic resistances of the various housing designs have only a slight effect in the fine adjustment range up to approx. 2...3 turns and would only be noticeable with the throttle 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 (weigth) approx.

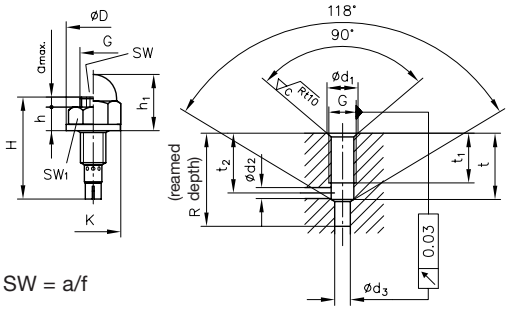
Throttle screw	Corner valve	Banjo bolt	Banjo fitting
Q(R,V) 20 = 15 g	Q(R.V) 20 T 6 = 115 g	Q(R.V) 20 H = 40 g	Q(R.V) 20 H 6(K) = 150 g
Q(R,V) 30 = 25 g	Q(R.V) 30 T 8 = 135 g	Q(R.V) 30 H = 70 g	Q(R.V) 20 H 8(K) = 150 g
Q(R,V) 40 = 40 g	Q(R.V) 40 T10 = 180 g	Q(R.V) 40 H = 90 g	Q(R.V) 20 HL 8(K) = 150 g
Q(R,V) 50 = 55 g	Q(R.V) 50 T12 = 255 g	Q(R.V) 50 H = 130 g	Q(R.V) 20 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

Location hole



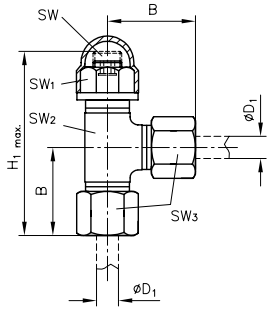
SW = a/f

Type	G	D	H	a_{max}	d_1 +0.3	d_2	d_3 H11
Q(R,V) 20	M8x1	17	32	5	10.2	5.5	5
Q(R,V) 30	M10x1	21	36	5	12.4	6.5	6.5
Q(R,V) 40	M12x1.5	23	41	6	15.2	7.5	8
Q(R,V) 50	M14x1.5	27	46	6	16.8	9	9
Q(R,V) 60	M16x1.5	30	58	6	19.0	11	11

Type	h	h_1	$t^{+0.5}$	t_1	t_2	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

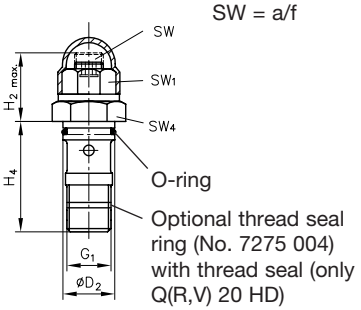


Type	B	H_1	D_1	a/f
Q(R,V) 20 T 6	31	56.5	6	4
Q(R,V) 30 T 8	32	58.5	8	5
Q(R,V) 40 T10	34	63.5	10	6
Q(R,V) 50 T12	38	72.5	12	8

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

Location hole



Type	G_1 3)	G_2 3)	D_2	D_3H9	D_4	H_2	H_4	d_4
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

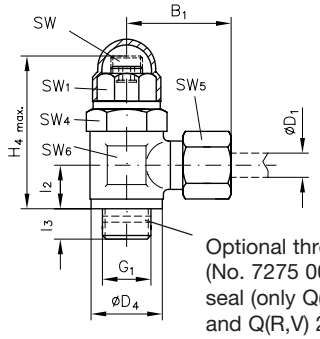
Type	L	L_1	t_3	t_4	a/f	a/f1	a/f4	Max. torque	O-ring NBR 90 Sh
Q(R,V) 20 H	23	10	10	7	4	13	19	50 Nm	12.5x1.5
Q(R,V) 30 H	27	12	13	9	5	17	24	75 Nm	16x1.5
Q(R,V) 40 H	27	12	13	9	6	19	24	75 Nm	16x1.5
Q(R,V) 50 H	35	15	14	9	8	22	30	130 Nm	20x1.5
Q(R,V) 60 H	43	18	20	10	10	24	36	250 Nm	25x1.5

Index of costomer-furnished EO-parts:

Banjo bolt	Pipe-Ø d_a	Swiveling housing	EO-parts are customer furnished 1) Cutting ring 2)	Plastic ring 2)	Progressive ring	Union nut
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

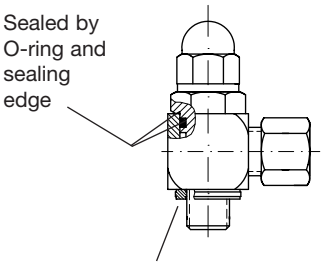
1) Parker Hannifin GmbH, division ERMETO Am Metallwerk 9, D-33659 Bielefeld
2) Observe the differing external-Ø of the seal rings, see also versions with swiveling housing at page 4!
3) G... (BSPP)

Threaded pipe connections



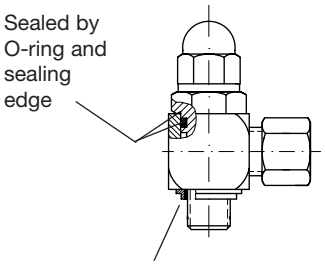
Optional thread seal ring (No. 7275 004) with thread seal (only Q(R,V) 20 HD 6(8) and Q(R,V) 20 HD 6(8)K

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



Sealed by cutting ring DKA

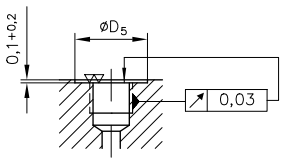
Type Q(R, V) ...H...K



Sealed by plastic ring KDS

SW = a/f

Sink for all types

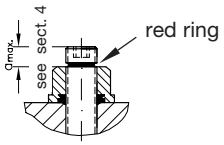


[1]) G... (BSPP)

Type	G1 [1])	B1	D1	D4	D5	H4	l2	l3	a/f	a/f1	a/f5	a/f6	a/f4	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

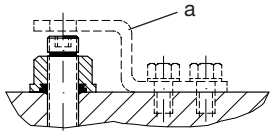
5. Notes for operation

5.1 Maximum adjustment distance

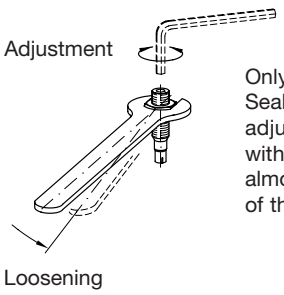


At the maximum adjustment length (guideline dimension a_{max}), the ring marking will become visible. Further unscrewing will not achieve any further change (reduction) in the Δp-value. From a design point of view, an internal stop to prevent further or complete unscrewing cannot be provided. The red 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.