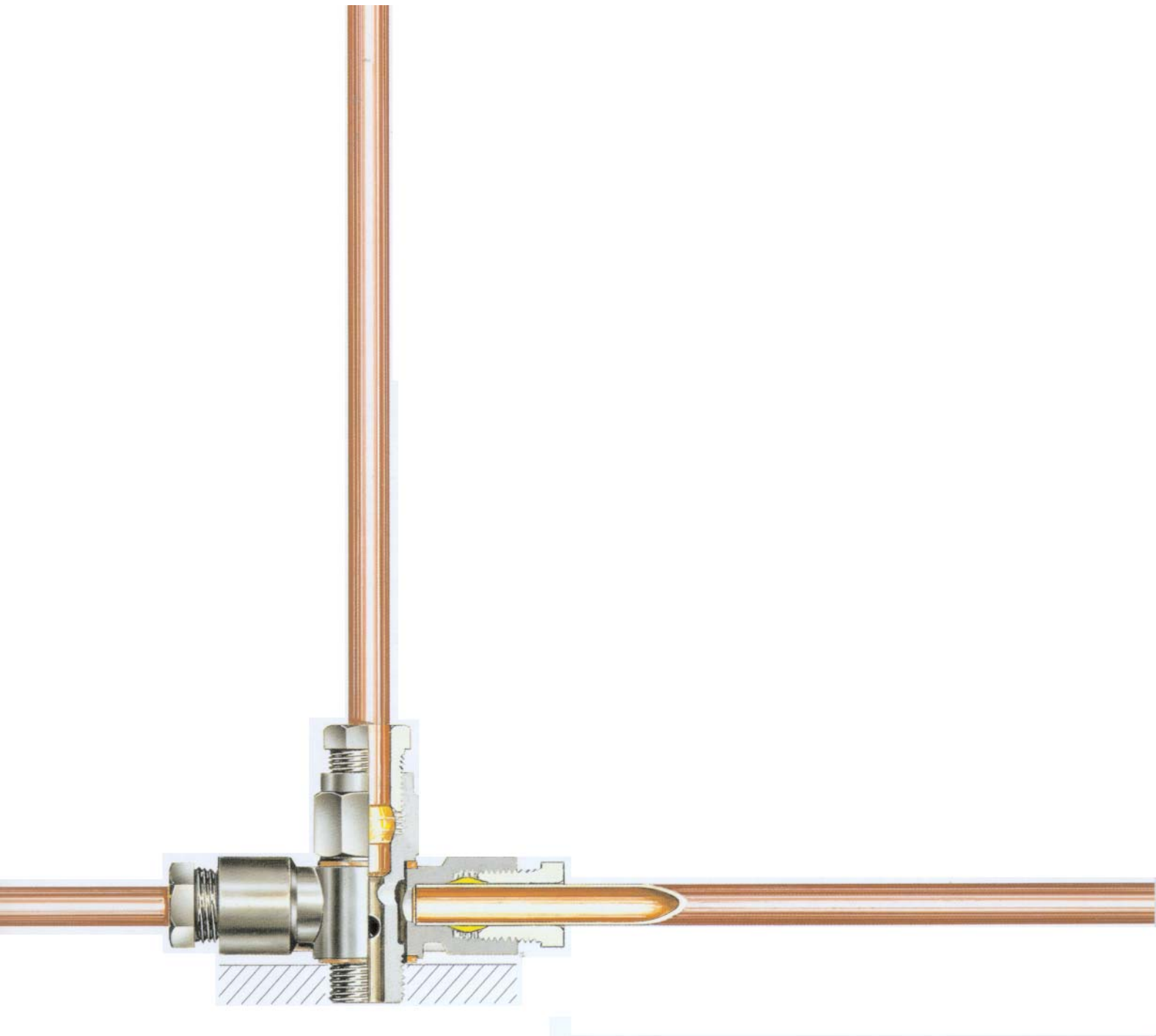


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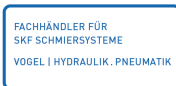
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**Please note:**  
**All equipment may only be installed and/or assembled by qualified personnel.**  
**Observe existing safety regulations.**

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		508-442	17				
		508-512K	11				
		508-602-2	15				

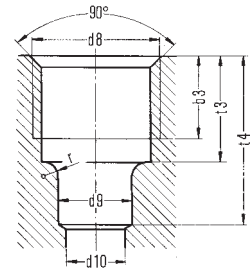
**Fittings for solderless tube connections** (double or single tapered rings) are primarily used for **VOGEL single-line central lubrication systems** (oil and grease, NLGI grades 000, 00) with pressures up to **45 bars**.

For higher pressures up to **250 bars**, like those **occurring especially in progressive central lubrication systems** (grease up to NLGI grade 2), it is customary to use **cutting-sleeve screw unions conforming to DIN 2353** (Page 18-20).

**Counterbores – DIN 3854 / DIN 3862 – for solderless tube connection**

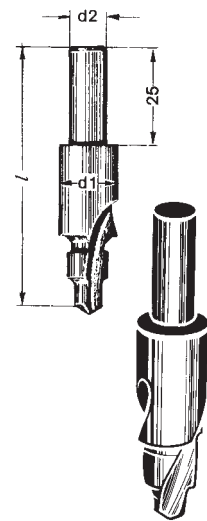
Specification for tube of counterbore diam.	d9 <sup>B11</sup>	d10	d8	b3	t3	t4	r	
1102 <sup>1)</sup>	2.5	2.5	1.5	M6x0.75	4.5	5.5	8.5	1.3
1404	4	4	3	M8x1	6.5	8.5	12.5	1.6
1406	6	6	4.5	M10x1	7	9	14	1.6
1408	8	8	6.5	M14x1.5	9	11.5	18.5	1.6
1410	10	10	8.5	M16x1.5	9	11.5	19.5	1.6
1412	12	12	10.5	M18x1.5	9.5	12	22	1.6

<sup>1)</sup> not shown in DIN standard

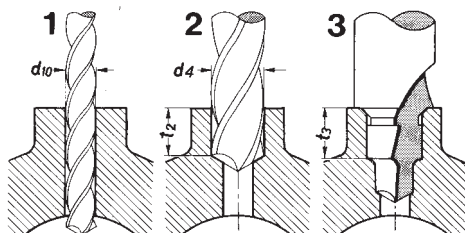


**Form counterbores to tap ports for solderless tube connection**

Form counterbore Order No.	tube diam.	for counterbore	l	Twist drill		d10	d4	t2	t3
				d1	d2				
902-111	2.5	1102	60.5	10	10	1.5	5	4.5	5.5
904-411	4	1404	65	10	10	3	6.5	7.5	8.5
906-411	6	1406	66	12	10	4.5	8.5	8	9
908-411	8	1408	70	16	10	6.5	12	10.5	11.5
910-411	10	1410	72	18	10	8.5	14	10.5	11.5
912-411	12	1412	75	20	10	10.5	16	11	12



**Provision of counterbore**



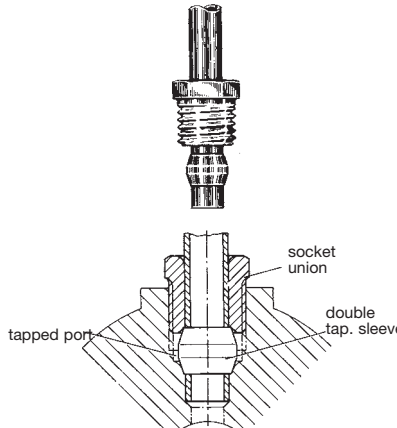
pre-drill holes  
bore hole to be tapped  
counterbore with form counterbore up to the stop

Form counterbore enlarges bore hole diam. d4 to core hole for ISO thread.

Remarks concerning operation 3  
When using a hand drill, take care not to tilt the counterbore out of the drill axis. Drill steadily without interruption. Increase pressure slightly at the stop.



**Connectors for steel and copper tubing**



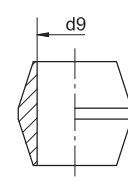
**Installation (steel and copper tubing)**

1. Push socket union and double tapered sleeve onto tube end.
2. Insert tube end into tapped port up to the stop
3. First tighten socket union finger-tight by hand. Then turn another 1½ turns.

**Double tapered sleeves – DIN standard 3862**

Order No.	for tube diam.	d9
402-001 *)	2.5	2.5
404-001	4	4
406-001	6	6
408-001	8	8
410-001	10	10
412-001	12	12

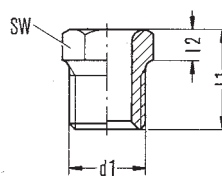
Material: brass



**Socket unions – DIN standard 3871**

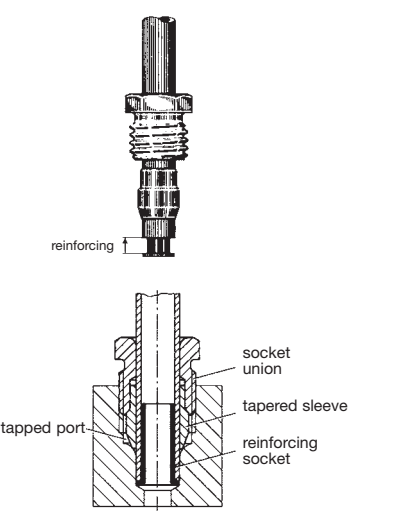
Order No.	for tube diam.	d1	l1	l2	sw
402-002 *)	2.5	M6x0.75	9	3	7
404-002	4	M8x1	12	4	8
406-002	6	M10x1	13	4	10
408-202	8	M14x1.5	16	4.5	14
410-002	10	M16x1.5	17	5.5	17
412-002	12	M18x1.5	18	6	19

Material: steel, galvanized surface



\*) not shown in DIN standard

**Connectors for steel, copper and plastic tubing**



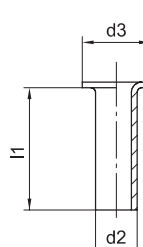
**Installation (plastic tubing)**

1. Insert reinforcing socket into plastic tube.
2. Push socket union and tapered sleeve onto tube end.
3. Insert tube end into counter-bored port up to the stop.
4. First tighten socket union finger-tight by hand. Then turn another 1½ turns.

**Reinforcing sockets (if plastic tubing is used)**

Order No.	for tube	d2	d3	l1
402-603	2.5x0.5	1.4	2.3	8
404-603	4x0.85	2.2	3.8	10
406-603	6x1	3.9	5.8	12
406-613	6x1.25	3.4	5.8	12
408-603	8x1.25	5.4	7.8	15
410-603	10x1.5	6.9	9.8	18
412-603	12x1.5	8.9	11.8	20

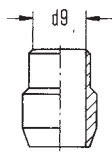
Material: brass



**Tapered sleeves**

Order No.	for tube diam.	d9
402-611	2.5	2.5
404-611	4	4
406-611	6	6
408-611	8	8
410-611	10	10
412-611	12	12

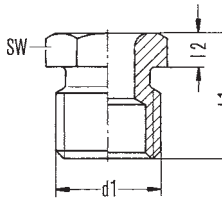
Material: brass



**Socket unions**

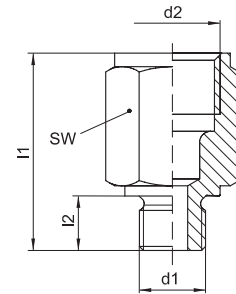
Order No.	for tube diam.	d1	l1	l2	sw
402-612	2.5	M6x0.75	9	3	7
404-612	4	M8x1	12	4	8
404-612-MS*)	4	M8x1	12	4	8
406-612	6	M10x1	13	4	10
406-612-MS*)	6	M10x1	13	4	10
408-612	8	M14x1.5	16	4.5	14
408-612-MS*)	8	M14x1.5	16	4.5	14
410-612	10	M16x1.5	17	5.5	17
410-612-MS*)	10	M16x1.5	17	5.5	17
412-612	12	M18x1.5	18	6	19

Material: steel, galvanized surface  
\*) Material: brass



**Adaptors with cylindrical thread (sealed by flat washer)**

Order No.	Tube diam.	d1	d2 *)	l1	l2	SW
402-004	2.5	M6	M6x0.75	13	5.5	9
402-003	2.5	M6x0.75	M6x0.75	13	5.5	9
402-006	2.5	M8x1	M6x0.75	15	7.5	11
404-061	4	M5	M8x1	20	5.5	11
404-063	4	M8	M8x1	22	8	11
404-003	4	M8x1	M8x1	18	7.5	11
404-006	4	M10x1	M8x1	18	7.5	14
404-040	4	G 1/8 A	M8x1	18	8	14
404-162	4	M12x1	M8x1	18	9	17
404-164	4	M14x1.5	M8x1	18	9	17
406-158	6	M8x1	M10x1	23	7.5	14
406-004	6	M10x1	M10x1	18	7.5	14
406-162	6	M12x1	M10x1	19	9	17
406-054	6	G 1/4 A	M10x1	20	10	17
301-005	6	M14x1.5	M10x1	18	9	17
406-166	6	M16x1.5	M10x1	19	9	19
406-055	6	G 3/8 A	M10x1	21	10	22
408-004	8	M10x1	M14x1.5	28	7.5	17
408-154	8	G 1/8 A	M14x1.5	29	8	17
408-162	8	M12x1	M14x1.5	29	9	17
301-020	8	G 1/4 A	M14x1.5	23	10	17
301-001	8	M14x1.5	M14x1.5	26	9	17
408-005	8	M16x1.5	M14x1.5	22	9	19
408-006	8	M18x1.5	M14x1.5	22	10	22
408-022	8	M22x1.5	M14x1.5	24	12	27
410-160	10	M10x1	M16x1.5	30	7.5	19
410-162	10	M12x1	M16x1.5	31	9	19
410-163	10	G 1/4 A	M16x1.5	30	10	19
410-164	10	M14x1.5	M16x1.5	29	9	19
410-004	10	M16x1.5	M16x1.5	23	9	19
410-018	10	M18x1.5	M16x1.5	24	10	22
410-171	10	G 1/2 A	M16x1.5	24	12	27
410-022	10	M22x1.5	M16x1.5	24	12	27
412-162	12	M12x1	M18x1.5	35	9	22
412-163	12	G 1/4 A	M18x1.5	35	10	22
412-164	12	M14x1.5	M18x1.5	33	9	22
412-004	12	M18x1.5	M18x1.5	24	10	22
412-014	12	M22x1.5	M18x1.5	26	12	27



Material: steel, galvanized surface

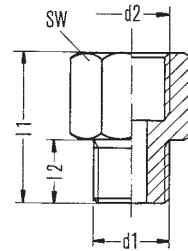
D406-004-MS	6	M10x1	M10x1	23	7.5	14
267-001.17	6	G 1/8 A	M10x1	24	8	14
406-163	6	M12x1	M10x1	19	9	17
D301-005-MS	6	M14x1.5	M10x1	20	9	17
406-167	6	M16x1.5	M10x1	19	9	19
267-001.19	6	M18x1.5	M10x1	21	10	22
D408-004-MS	8	M10x1	M14x1.5	29	7.5	17
D301-001-MS	8	M14x1.5	M14x1.5	28	9	17
D301-020-MS	8	G 1/4 A	M14x1.5	30	10	17
267-001.13	8	G 1/2 A	M14x1.5	24	12	27

Material: brass

\*) Ports tapped for solderless tube connection

**Reducing adaptors with cylindrical thread (sealed by flat washer)**

Order No.	d1	d2	l1	l2	sw	Material
406-024	M10x1	G 1/8	20	8	14	brass, galvanized surface
401-016-312	M10x1	G 1/4	26.5	7.5	17	brass
406-044-S1 <sup>1)</sup>	M10x1 tap.	G 1/4	22.5	8	17	steel, galvanized surface
P-78.01	M12x1	G 1/4	27	8.5	19	steel, galvanized surface
401-013-161	G 1/4 A	G 1/2	40	12	27	steel, galvanized surface
401-019-352	M14x1.5	G 1/8	20	9	17	brass
401-016-371	M16x1.5	G 1/4	30	12	19	steel, galvanized surface
243-001.10	M16x1.5	G 1/2	31	9	27	steel, galvanized surface
267-001.47	G 3/8 A	G 1/4	31	10	22	brass
267-001.60	G 3/8 A	G 1/2	34	10	27	brass
267-001.36	M18x1.5	G 3/8	32	10	22	steel, galvanized surface
243-001.20	M18x1.5	G 1/2	32	10	27	steel, galvanized surface
401-019-132	G 1/2 A	G 1/8	24	12	27	brass
DZ333	G 1/2 A	G 1/4	24	12	27	brass
401-013-131	G 1/2 A	G 1/2	40.5	12	27	brass
DZ334	G 1/2 A	G 3/8	31	12	27	brass
267-001.03	G 1/2 A	G 3/4	40	12	36	brass
401-011-132	G 1/2 A	G 1	49	14	41	steel, galvanized surface
433-890-131	G 1/2 A	G 1 1/4	53	14	55	steel, black finished surface
401-013-171	G 3/4 A	G 1/2	41	16	32	steel, galvanized surface
401-013-111	G 1 A	G 1/2	29	18	41	steel, black finished surface

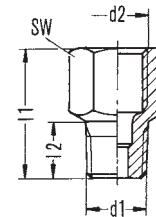


<sup>1)</sup> with tapered thread

**Adapters with tapered thread**

Tapered threads are used **without washers**, as they are **self-sealing**.  
It is not necessary to provide the ports with seal faces.

Order No.	Tube diam.	d1 <sup>1)</sup>	d2 <sup>*)</sup>	l1	l2	sw
402-003K	2.5	M6x0.75 tap.	M6x0.75	11.5	4.5	8
402-006K	2.5	M8x1 tap.	M6x0.75	15	8	9
402-008K	2.5	M10x1 tap.	M6x0.75	16	7.5	12
404-662K	4	M6 tap.	M8x1	19	5	11
404-663K	4	M6 tap.	M8x1	20	6	11
404-673K	4	M6x0.75 tap.	M8x1	20	6	11
404-047K	4	M7 tap.	M8x1	20	6	11
404-003K	4	M8x1 tap.	M8x1	17	7.4	11
404-045	4	M8x1 tap.	M8x1	62.5	7.4	11
404-006K	4	M10x1 tap.	M8x1	16	7.4	11
401-004-512	4	M10x1 tap.	M8x1	25	7.4	11
404-040K	4	R 1/8 tap.	M8x1	16	6	11
404-054K	4	R 1/4 tap.	M8x1	14	9	14
406-004K	6	M10x1 tap.	M10x1	23	7.4	14
301-105K	6	M12x1 tap.	M10x1	18	7.4	14
456-004K	6	R 1/8 tap.	M10x1	21	6	14
406-054K	6	R 1/4 tap.	M10x1	20	9	17



Material: steel, galvanized surface

<sup>1)</sup> Tapered thread according to DIN 158. short, resp. according to DIN 2999.

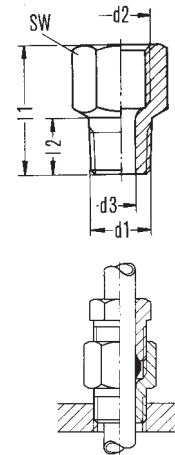
<sup>\*)</sup> Ports tapped for solderless tube connection

**Bulkhead connectors with tapered thread** for sealed tube passage through a wall without tube interruption

Order No.	Tube diam.	d1 <sup>1)</sup>	d2 <sup>*)</sup>	d3	l1	l2	sw
404-003DK	4	M8x1 tap.	M8x1	4.1	17	7.4	11
404-006DK	4	M10x1 tap.	M8x1	4.1	16	7.4	11
406-004DK	6	M10x1 tap.	M10x1	6.3	18	7.4	14
301-001DK	8	M14x1.5 tap.	M14x1.5	8.4	24	11	17
410-004DK	10	M16x1.5 tap.	M16x1.5	10.4	24	11	19

Material: steel, galvanized surface

<sup>1)</sup> Tapered thread according to DIN 158. short.



**Elbows with tapered thread**

Order No.	Tube diam.	d1 <sup>1)</sup>	d2 <sup>*)</sup>	d3	d4	l1	l2	l3	sw
504-510K	4	M10x1 tap.	M8x1	13	13	21	16	10	14
514-018K	4	R 1/8 tap.	M8x1	13	13	21	16	10	14
506-508K	6	M8x1 tap.	M10x1	12.5	14	18	18	10.5	14
506-510K	6	M10x1 tap.	M10x1	12.5	14	18	18	10.5	14
506-512K	6	M12x1 tap.	M10x1	12.5	14	18	18	10.5	14
508-512K	8	M12x1 tap.	M14x1.5	14	19.5	19.5	24	10	14

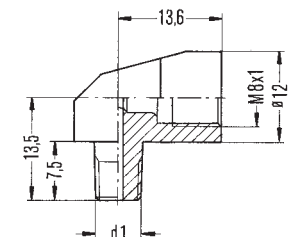
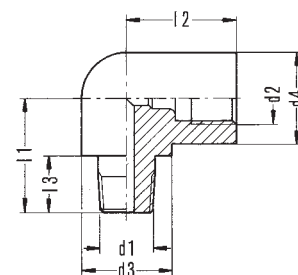
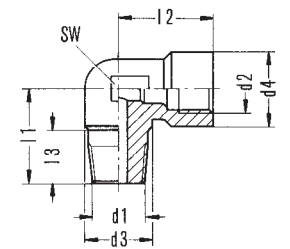
Material: die-cast zinc

Order No.	Tube diam.	d1 <sup>1)</sup>	d2 <sup>*)</sup>	d3	d4	l1	l2	l3	Material
502-206K	2.5	M6 tap.	M6x0.75	-	8	10	9.5	6	steel
506-202K	6	M10x1 tap.	M10x1	17	17	22	21	11	brass
403-006-651	6	R 1/4 tap.	M10x1	14	14	17	17.5	8.5	steel

Order No.	Tube diam.	d1 <sup>1)</sup>
504-200K	4	M6 tap.
504-201K	4	M8x1 tap.
504-202K	4	M10x1 tap.
504-203K	4	M6x0.75 tap.

Material: brass

<sup>1)</sup> Tapered thread according to DIN 158. short, resp. according to DIN 2999.



Dimensions in mm

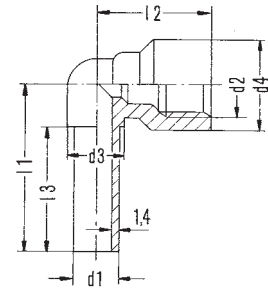
<sup>\*)</sup> Ports tapped for solderless tube connection

**Elbows with tube end** for installation in counterbores as per DIN 3854/DIN 3862

Order No.	Tube diam.	d1	d2 *)	d3	d4	l1	l2	l3
DY958	6	6	M10x1	8	14	30.8	21	22
DY960	8	8	M14x1.5	11	18	37	24.5	27
DY961	10	10	M16x1.5	15	23	42.5	26.5	29
DY962	12	12	M18x1.5	15	23	46	26.5	32

Material: brass

Tube end for tube connection



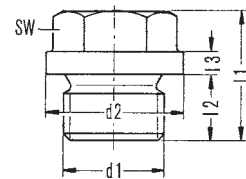
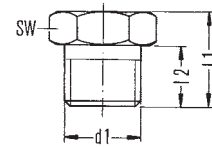
**Screw plugs**

Order No.	d1	l1	l2	sw
402-011	M6x0.75	9	5	9
404-011	M8x1	10	6	11
406-011	M10x1	12	7	12
408-211	M12x1	12	7	17
408-011	M14x1.5	12	7	17
410-011	M16x1.5	14	8	19
412-011	M18x1.5	15	10	22

Material: steel, galvanized surface

Order No.	d1	d2	l1	l2	l3	sw
DIN910-R1-8-5.8	G 1/8 A	14	17	8	3	11
DIN910-R1-4x8-5.8	G 1/4 A	18	17	8	3	14
DIN910-R3-8-5.8	G 3/8 A	22	21	12	3	17
DIN910-R1-2-5.8	G 1/2 A	26	26	14	4	19
DIN910-R3-4-5.8	G 3/4 A	32	30	16	4	24
DIN910-R1-5.8	G 1 A	39	32	16	5	27

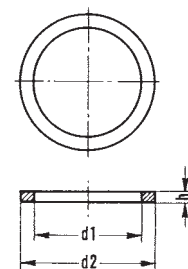
Material: steel, galvanized surface



**Flat washers**

Order No.	d1	d2	h	Suitable for thread	
				mm	inches
DIN7603-A6x10-CU	6.2	9.9	1	M6	-
DIN7603-A8x11.5-CU	8.2	11.4	1	M8	-
504-019	10.2	13.9	1	M10	G 1/8
508-215-CU	12.2	15.9	1.4	M12	-
508-320-CU	12.2	15.9	2	M12	-
DIN7603-A14x18-CU	14.2	17.9	1.5	M14	-
508-108	13.3	17.9	1.5	-	G 1/4
DIN7603-A16x20-CU	16.2	19.9	1.5	M16	-
DIN7603-A17x21-CU	17.2	20.9	1.5	-	G 3/8
DIN7603-A18x22-CU	18.2	21.9	1.5	M18	-
DIN7603-A20x24-CU	20.2	23.9	1.5	M20	-
DIN7603-A21x26-CU	21.2	25.9	1.5	-	G 1/2
DIN7603-A22x27-CU	22.2	26.9	1.5	M22	-

Material: copper

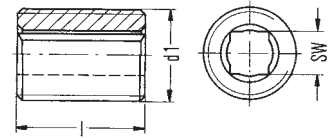


\*) Ports tapped for solderless tube connection

**Threaded sockets**

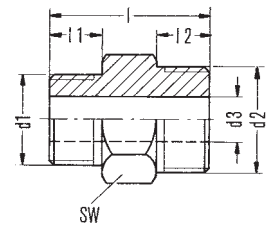
Order No.	d1	l	sw
404-203	M8x1	13	3.5
406-203	M10x1	15	3.5
458-012	M12x1	17	5.5
458-012-B 1)	M12x1	17	5.5
408-023	M14x1.5	18	5.5
410-003	M16x1.5	19	7
410-003-B 1)	M16x1.5	19	7
408-033-S3	G 1/4 A	15	5.5

Material: steel 1) Coated with micro-encapsulated adhesive



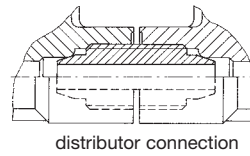
Order No.	d1	d2	d3	l	l1	l2	sw
406-103	M10x1	M12x1	5	20	6	7	14
408-103	M12x1	M14x1.5	6	21	7	7	17

Material: steel, galvanized surface

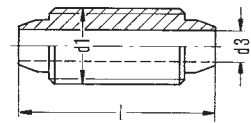


Order No.	d1	d3	l
406-233	M10x1	4	26

Material: brass



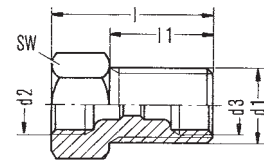
distributor connection



**Connectors, tube to tube**

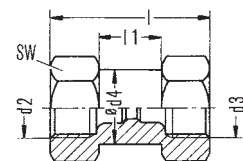
Order No.	Tube diam.	d1	d2 *)	d3 *)	l	l1	sw
404-008	4	M14x1.5	M8x1	M8x1	27	19	17
404-009	4	M14x1.5	M8x1	M8x1	38	30	17
406-008	6	M14x1.5	M10x1	M10x1	30	20	17
406-005	6 and 8	M16x1.5	M14x1.5	M10x1	35	23	19
408-008	8	M20x1.5	M14x1.5	M14x1.5	40	28	24
410-008	10	M20x1.5	M16x1.5	M16x1.5	42	27	24
412-008	12	M24x1.5	M18x1.5	M18x1.5	48	33	27

Material: steel, galvanized surface



Order No.	Tube diam.	d2 *)	d3 *)	ød4	l	l1	sw
404-010	4	M8x1	M8x1	10.8	27	13	11
406-010	6	M10x1	M10x1	13.8	30	10	14
406-805	6 and 8	M14x1.5	M10x1	16.8	35	11	17
408-010	8	M14x1.5	M14x1.5	16.8	40	14	17
410-010	10	M16x1.5	M16x1.5	18.8	42	13	19
412-010	12	M18x1.5	M18x1.5	21.8	48	18	22

Material: steel, galvanized surface



Dimensions in mm

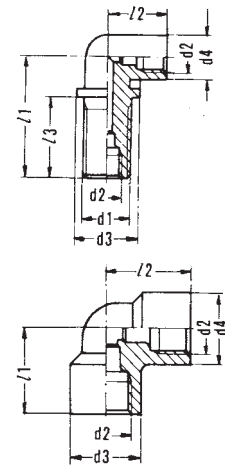
\*) Ports tapped for solderless tube connection

**Elbow connectors**

Order No.	Tube diam.	d1	d2 *)	d3	d4	l1	l2	l3	Material
504-003	4	M14x1.5	M8x1	18	12	33	16	22	die-cast zinc
504-103	4	M14x1.5	M8x1	18	12	33	18	22	brass
506-004	6	M14x1.5	M10x1	16.5	14	27	17.5	15	brass

Order No.	Tube diam.	d2 *)	d3	d4	l1	l2	Material
408-013	8	M14x1.5	20	20	23.5	23.5	die-cast zinc
410-013	10	M16x1.5	21	21	26	26	



**Bracketed connectors**

Order No.	Tube diam.	Material
504-004	4	die-cast zinc

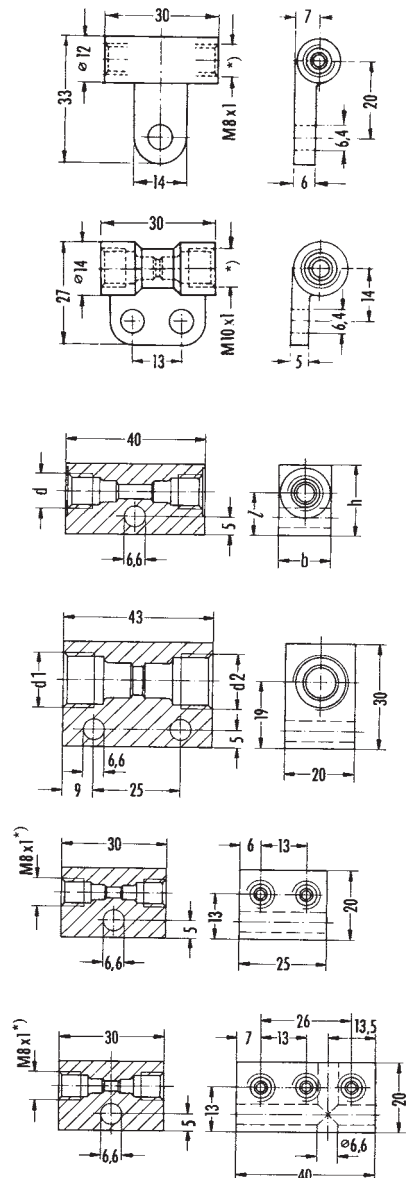
Order No.	Tube diam.	Material
506-010	6	brass

Order No.	Tube diam.	d *)	b	h	l	Material
DAR506	6	M10x1	15	20	12	aluminum
DAR508	8	M14x1.5	20	25	15	

Order No.	Tube diam.	d1 *)	d2 *)	Material
DAR510	10	M16x1.5	M16x1.5	steel,
DAR510-S1	8 and 10	M14x1.5	M16x1.5	galvanized surface

Order No.	Tube diam.	Material
DAR524	4	steel, galvanized surface

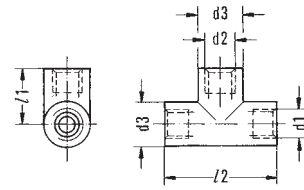
Order No.	Tube diam.	Material
DAR534	4	steel, galvanized surface



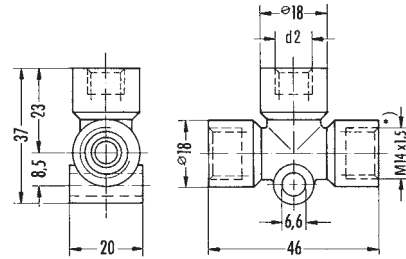
\*) Ports tapped for solderless tube connection

Tee connectors

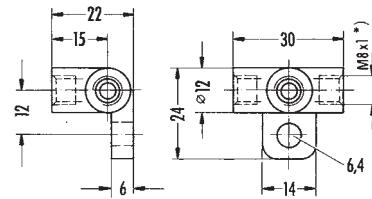
Order No.	Tube diam.	d1 *)	d2 *)	d3	l1	l2	Material
504-008	4	M8x1	M8x1	12	15	30.5	die-cast zinc
506-408	6 and 4	M10x1	M8x1	14	18	36	
506-008	6	M10x1	M10x1	14	18	36	
510-102	10	M16x1.5	M16x1.5	20	25	50	



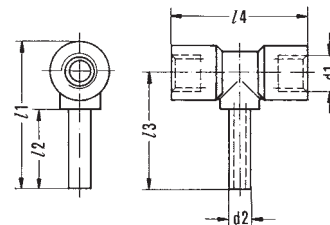
Order No.	Tube diam.	d2 *)	Material
508-602-2	8 and 6	M10x1	die-cast zinc
508-002-2	8	M14x1.5	



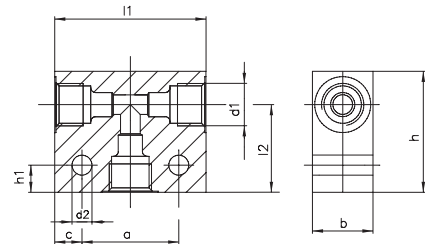
Order No.	Tube diam.	Material
504-045	4	die-cast zinc



Order No.	Tube diam.	d1 *)	d2	l1	l2	l3	l4	Material
DY964	6	M10x1	6	40	22	32	37	brass
DY966	8	M14x1.5	8	45	25	36	46	

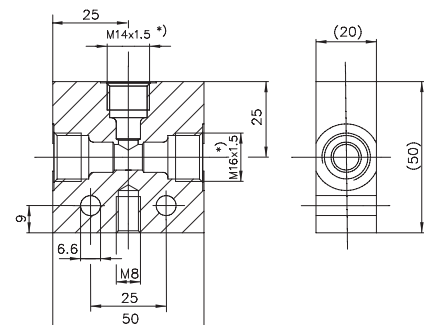


Order No.	Tube diam.	d1 *)	d2	a	b	c	h	h1	l1	l2	Material
DAT506	6	M10x1	6.6	22	20	9	30	9	40	20	aluminum
DAT508	8	M14x1.5	6.6	32	20	9	40	9	50	29	aluminum
DAT510	10	M16x1.5	7	25	20	13.5	40	15	52	29	steel 1)
DAT512	12	M18x1.5	6.6	42	25	9	40	9	60	29	aluminum



1) galvanized surface

Order No.	Tube diam.	Material
DAT510-S1	8 (1x) 10 (2x)	steel, galvanized surface



Dimensions in mm

\*) Ports tapped for solderless tube connection



Cross joints

Order No.	Tube diam.	d1 *)	a	b	h	l1	l2	Material
DAK506	6	M10x1	22	20	40	40	20	aluminum
DAK508	8	M14x1.5	32	20	50	50	25	
DAK512	12	M18x1.5	42	25	60	60	30	

Order No.	Tube diam.	d1 *)	Material
DAK510-S1	10	M16x1.5	steel, galvanized surface

Distributor manifolds

Order No.	Number of ports	Main tube port diam.	d1 *)	d2	d3	l	l1	h	h1	b	t
321-661	1	6	M10x1	M10x1	-	41	-	20	11	18	-
322-541	2	4	M8x1	2x M8x1	-	49	-	17	10.5	13	13
322-561	2	6	M10x1	2x M8x1	-	52	-	17	10.5	13	13
322-581	2	8	M14x1.5	2x M8x1	-	61	-	20	11	18	13
322-661	2	6	M10x1	2x M10x1	-	58	-	20	11	18	17
322-661-S1	2	8	M14x1.5	2x M10x1	-	72	-	20	11	18	22
323-541	3	4	M8x1	3x M8x1	-	62	-	17	10.5	13	13
323-561	3	6	M10x1	3x M8x1	-	65	-	17	10.5	13	13
323-581	3	8	M14x1.5	3x M8x1	-	74	-	20	11	18	13
323-661	3	6	M10x1	3x M10x1	-	75	-	20	11	18	17
323-661-S1	3	8	M14x1.5	3x M10x1	-	94	-	20	11	18	22
324-561	4	6	M10x1	4x M8x1	-	78	-	17	10.5	13	13
324-581	4	8	M14x1.5	4x M8x1	-	87	-	20	11	18	13
324-761	4	6	M10x1	4x M10x1	-	92	34	20	11	18	17
324-861	4	6	M10x1	2x M10x1	2x M10x1	58	-	20	11	18	17
325-565	5	6	M10x1	5x M8x1	-	91	-	17	10.5	13	13
325-861	5	6	M10x1	5x M10x1	-	109	51	20	11	18	17
326-581	6	8	M14x1.5	6x M8x1	-	113	39	20	11	18	13
326-661	6	6	M10x1	6x M10x1	-	126	68	20	11	18	17
326-663	6	6	M10x1	3x M10x1	3x M10x1	75	17	20	11	18	17
327-761	7	6	M10x1	7x M10x1	-	143	85	20	11	18	17
328-561	8	6	M10x1	8x M8x1	-	130	52	17	10.5	13	13
328-581	8	8	M14x1.5	8x M8x1	-	139	65	20	11	18	13
328-761	8	6	M10x1	8x M10x1	-	160	102	20	11	18	17
328-861	8	6	M10x1	4x M10x1	4x M10x1	92	34	20	11	18	17
329-761	9	6	M10x1	9x M10x1	-	177	119	20	11	18	17
329-561	10	6	M10x1	10x M8x1	-	156	78	17	10.5	13	13
330-581-S1	10	8	M14x1.5	10x M8x1	-	201	85	20	11	18	17
330-761	10	6	M10x1	10x M10x1	-	194	136	20	11	18	17
330-861	10	6	M10x1	5x M10x1	5x M10x1	109	51	20	11	18	17
331-761	11	6	M10x1	11x M10x1	-	211	153	20	11	18	17
332-761	12	6	M10x1	12x M10x1	-	228	170	20	11	18	17
332-861	12	6	M10x1	6x M10x1	6x M10x1	126	68	20	11	18	17
334-861	14	6	M10x1	7x M10x1	7x M10x1	143	85	20	11	18	17
336-861	16	6	M10x1	8x M10x1	8x M10x1	160	102	20	11	18	17
338-861	18	6	M10x1	9x M10x1	9x M10x1	177	119	20	11	18	17
340-861	20	6	M10x1	10x M10x1	10x M10x1	194	136	20	11	18	17
342-861	22	6	M10x1	11x M10x1	11x M10x1	211	153	20	11	18	17
344-861	24	6	M10x1	12x M10x1	12x M10x1	228	170	20	11	18	17

Material: aluminum alloy

\*) Ports tapped for solderless tube connection



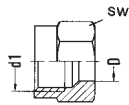
## Cutting sleeve screw unions acc. to DIN 2353

### Cutting sleeves



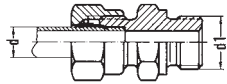
Order No.	D (tube diam.)
406-331 <sup>1)</sup>	6
406-301	6
408-301	8
410-301	10
412-301	12

### Union nuts



Order No.	D (tube diam.)	d1	sw
406-332 <sup>1)</sup>	6	M10x1	12
406-302	6	M12x1.5	14
408-302	8	M14x1.5	17
410-302	10	M16x1.5	19
412-302	12	M18x1.5	22

### Straight screw-in connectors

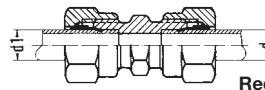


The cutting sleeve screw unions shown correspond to the L-series.

<sup>1)</sup> Compact type, LL-series.

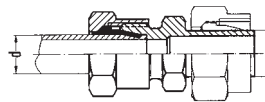
Order No.	Tube diam. d	d1
404-413	4	M8x1 tap.
404-403	4	M10x1 tap.
406-403	6	M10x1
406-413	6	M14x1.5
406-463W	6	G 3/8 A
408-413	8	M14x1.5
410-403	10	M14x1.5
410-413	10	M16x1.5
410-463	10	M18x1.5
412-423	12	M14x1.5
412-403	12	M16x1.5
412-453	12	M18x1.5
415-403	15	M18x1.5
418-403	18	M22x1.5
406-443 <sup>1)</sup>	6	M6 tap.
406-433 <sup>1)</sup>	6	M8x1 tap.
406-423 <sup>1)</sup>	6	M10x1 tap.
441-008-511 <sup>1)</sup>	8	M10x1 tap.
410-443	10	M10x1 tap.
404-403W <sup>1)</sup>	4	R 1/8 tap.
408-423W <sup>1)</sup>	8	R 1/8 tap.
415-423W	15	R 3/8 tap.
406-403W	6	G 1/8 A
408-403W	8	G 1/4 A
408-413W	8	G 3/8 A
408-453W	8	G 1/2 A
410-403W	10	G 1/4 A
410-413W	10	G 3/8 A
410-433W	10	G 1/2 A
410-443W	10	R 1/8 tap.
412-423W	12	G 1/4 A
412-403W	12	G 3/8 A
412-433	12	M18x1.5
412-453W	12	G 1/2 A
415-403W	15	G 1/2 A
415-433W	15	G 3/8 A
415-443W	15	G 3/4 A
418-403W	18	G 1/2 A
441-015-171	15	G 3/4 A
441-022-171	22	G 3/4 A

### Straight connectors (tube to tube)



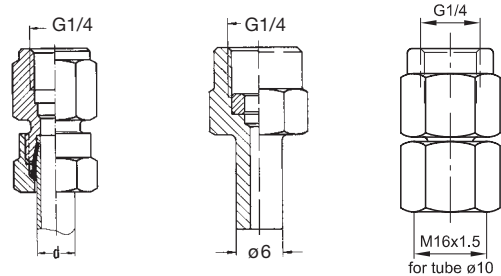
Reducing connectors			
Order No.	Tube diam. d, d1	Order No.	Tube diam. d, d1
404-404 <sup>1)</sup>	4	504-410	6 4
406-406	6	504-412	8 4
408-408	8	506-410	8 6
410-410	10	506-412	10 6
412-412	12	508-410	10 8
415-415	15	506-413	12 6
418-418	18	508-412	12 8
		510-410	12 10
		508-413	15 8
		510-412	15 10
		512-410	15 12
		510-413	18 10
		512-412	18 12
		515-410	18 15

### Reducing connectors



Order No.	Tube diam. d	ø d1
408-406	6	8
410-406	6	10
443-706-121	6	12
443-706-151	6	15
443-706-181	6	18
410-408	8	10
443-708-121	8	12
443-708-151	8	15
443-708-181	8	18
412-410	10	12
415-410	10	15
443-710-181	10	18
443-712-151	12	15
418-412	12	18
422-412	12	22
443-715-181	15	18

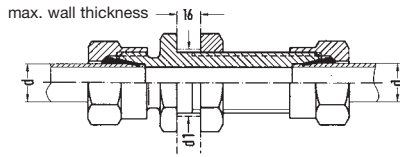
### Connectors for pressure gauges



Order No.	Tube diam. d	Order No.	Order No.
406-411	6	248-610.01	
408-411	8		
410-411	10		441-110-163
412-411	12		

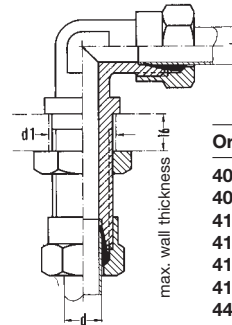
## Cutting sleeve screw unions acc. to DIN 2353

### Straight bulkhead connectors



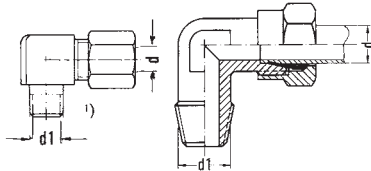
Order No.	Tube diam. d	ø d1
406-416	6	12.5
408-416	8	14.5
410-416	10	16.5
412-416	12	18.5
415-416	15	22.5
418-416	18	26.5
422-416	22	30.5

### Elbow bulkhead connectors



Order No.	Tube diam. d	ø d1
406-409	6	12.5
408-409	8	14.5
410-409	10	16.5
412-409	12	18.5
415-409	15	22.5
418-409	18	26.5
443-190-901	22	30.5

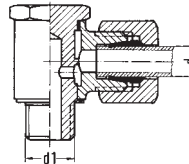
### Elbow screw-in connectors



Order No.	Tube diam. d	d1
404-425 <sup>1)</sup>	4	M10x1 tap.
406-445 <sup>1)</sup>	6	M6 tap.
406-435 <sup>1)</sup>	6	M8x1 tap.
406-425 <sup>1)</sup>	6	M10x1 tap.
406-405	6	M10x1 tap.
410-405	10	M14x1.5 tap.
410-425	10	M16x1.5 tap.
412-405	12	M16x1.5 tap.
415-405	15	M18x1.5 tap.
406-405W	6	R 1/8 tap.
406-515W	6	R 1/4 tap.
408-425W	8	R 1/8 tap.
408-405W	8	R 1/4 tap.
410-405W	10	R 1/4 tap.
412-405W	12	R 3/8 tap.
415-405W	15	R 1/2 tap.
418-405W	18	R 1/2 tap.

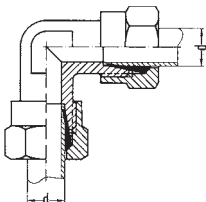
<sup>1)</sup> Compact type, LL-series.

### Banjo fittings



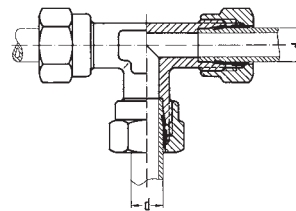
Order No.	Tube diam. d	d1
445-529-041	4	M8x1
445-519-061	6	G 1/8 A
445-531-061	6	M10x1
445-516-061	6	G 1/4 A
445-516-081	8	G 1/4 A
445-516-101	10	G 1/4 A
445-535-101	10	M14x1.5
445-521-122	12	G 3/8 A
445-513-181	18	G 1/2 A
445-517-222	22	G 3/4 A

### Elbow connectors (tube to tube)



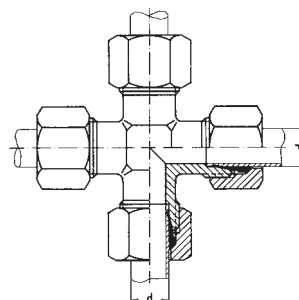
Order No.	Tube diam. d
443-215-001	15
443-218-001	18
443-290-001	22

### Tee-connectors



Order No.	Tube diam. d
406-407	6
408-407	8
410-407	10
412-407	12
415-407	15
418-407	18
422-407	22

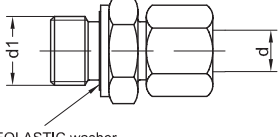
### Four-way connectors



Order No.	d
446-308-001	8
446-310-001	10
446-312-001	12
446-315-001	15

## Cutting-sleeve screw unions with Eolastic washer and EO2 function nut

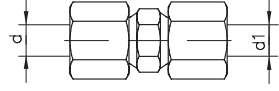
### Straight screw-in connectors with Eolastic washer and EO2 function nut



EOLASTIC washer

Order No.	Tube diam. d	d1
471-004-191	4	G 1/8 A
471-004-311	4	M10x1
471-006-192	6	G 1/8 A
471-006-161	6	G 1/4 A
471-006-311	6	M10x1
471-006-351	6	M14x1.5
471-008-161	8	G 1/4 A
471-008-211	8	G 3/8 A
471-008-351	8	M14x1.5
471-008-391	8	M18x1.5
471-010-161	10	G 1/4 A
471-010-211	10	G 3/8 A
471-010-312	10	M10x1
471-010-351	10	M14x1.5
471-010-391	10	M18x1.5
471-012-161	12	G 1/4 A
471-012-211	12	G 3/8 A
471-012-391	12	M18x1.5
471-015-131	15	G 1/2 A

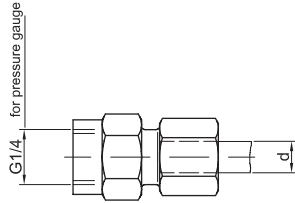
### Straight connectors (tube to tube) with EO2 function nut



Order No.	Tube diam. d	d1
474-508-081	8	
474-512-121	12	
474-515-151	15	

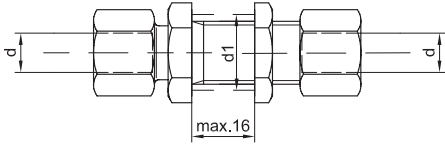
Max. operating pressure 315 bars

### Connectors for pressure gauges with EO2 function nut



Order No.	Tube diam. d
441-106-162	6
474-108-163	8
474-112-163	12

### Straight bulkhead connectors with EO2 function nut

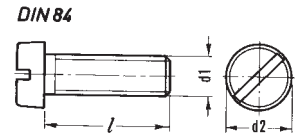


Order No.	Tube diam. d	d1
474-606-331	6	12.5
474-608-351	8	14.5
474-610-351	10	16.5
474-612-391	12	18.5
474-615-431	15	22.5
474-618-441	18	26.5

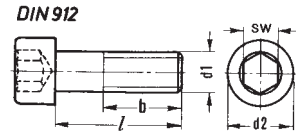
Max. operating pressure 315 bars

**Fixing bolts**

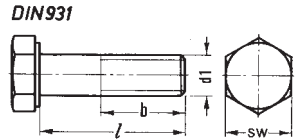
Order No.	d1	l	d2
DIN84-M3x5-4.8	M3	5	5.5
DIN84-M5x8-4.8	M5	8	8.5
DIN84-M5x16-4.8	M5	16	8.5
DIN84-M5x20-4.8	M5	20	8.5
DIN84-M6x16-4.8	M6	16	10
DIN84-M6x20-4.8	M6	20	10
DIN84-M6x25-4.8	M6	25	10



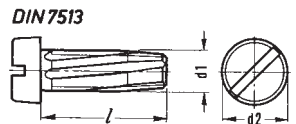
Order No.	d1	l	d2	b	sw
DIN912-M4x20-8.8	M4	20	7	14	3
DIN912-M6x16-8.8	M6	16	10	18	5
DIN912-M6x25-8.8	M6	25	10	18	5
DIN912-M6x60-8.8	M6	60	10	18	5
DIN912-M8x16-8.8	M8	16	13	12	6



Order No.	d1	l	b	sw
DIN931-M6x30-5.8	M6	30	18	10



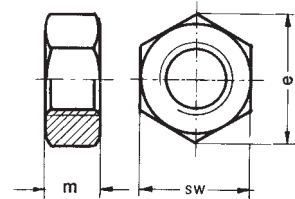
Order No.	d1	l	d2
DIN7513-BM4x20	M4	20	7
DIN7513-BM4x25	M4	25	7
DIN7513-BM5x10	M5	10	8.5
DIN7513-BM6x16	M6	16	10
DIN7513-BM6x25	M6	25	10



Material: Steel

**Nuts**

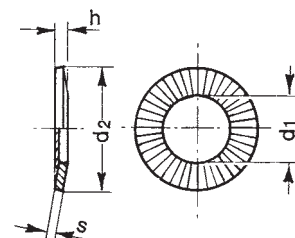
Order No.	Thread	m	sw	e
DIN934-M5-8	M5	4	8	9.2
DIN934-M6-8	M6	5	10	11.5
DIN936-M14x1.5-5	M14x1.5	8	22	25.4
DIN936-M16x1.5-5	M16x1.5	8	24	27.7
DIN936-M20x1.5-5	M20x1.5	9	30	34.6



Material: Steel

**Lock washers**

Order No.	for bolt	d1	d2	s	h
650-050	M5	5.3	9	0.6	0.9
650-060	M6	6.4	10	0.7	0.9
650-080	M8	8.4	13	0.8	1.2
650-100	M10	10.5	16	1	1.5
650-120	M12	13	18	1.1	1.5
650-140	M14	15	22	1.2	1.8
650-160	M16	17	24	1.3	1.9
650-180	M18	19	27	1.5	2.2
650-200	M20	21	30	1.5	2.2



Material: Spring steel

Dimensions in mm

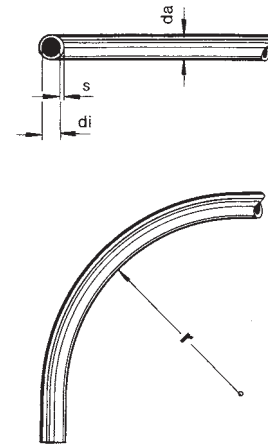
## Steel and plastic tubing

## Steel tubing

Order No.	$\varnothing da$ $\pm 0.05$	s $\pm 0.03$	Minimum bending radius r		Design pressure [bars]	Burst press. [bars]
			bent with mandrel	bent with grooved disk		
WV-RO2.5x0.5 VERZI	2.5	0.5	5	–	580	1410
WV-RO4x0.7 VERZI	4	0.7	8	7	500	1220
WV-RO6x0.7 VERZI	6	0.7	25	12	320	850
WV-RO6x1 VERZI	6	1	25	12	500	1250
WV-RO8x0.7 VERZI	8	0.7	46	19	230	675
WV-RO8x1 VERZI	8	1	46	19	340	840
WV-RO10x1 VERZI	10 *)	1	76	27	270	660

\*)  $\varnothing da \pm 0.07$ VERZI = 25  $\mu\text{m}$  galvanization - yellow passivated.

Length delivered: 5 m. Stainless steel tubing on request.



**Plastic tubing: WVN715, semirigid (without plasticizer)**  
**WVN716, flexible (containing plasticizer)**

Order No.	$\varnothing da$	s	$\varnothing di$	Minimum bending radius r	Permissible operating pressure 1) [bar]	Burst press. [bar]	Increase in volume at permissible operating press. [ccm/m]
WVN715-RO2.5x0.5	2.5	0.5	1.5	25	56	170	–
WVN715-RO4x0.85	4 <sup>+0.05</sup> -0.15	0.85	2.3	38	61	183	0.3
WVN715-RO6x1	6	1	4	63	45	136	0.3
WVN715-RO6x1.25	6	1.25	3.5	63	59	179	0.35
WVN715-RO8x1.25	8	1.25	5.5	76	42	126	0.35
WVN715-RO10x1.5	10 <sup>+0.05</sup> -0.2	1.5	7 <sup>+0.15</sup> -0.05	89	40	120	0.55
WVN715-RO12x1	12	1	10	110	21	62	0.65
WVN715-RO12x1.5	12	1.5	9	110	32	97	0.55
WVN716-RO4x0.85	4 <sup>+0.05</sup> -0.15	0.85	2.3	38	36	109	0.25
WVN716-RO6x1.25	6 <sup>+0.05</sup>	1.25	3.5 <sup>+0.15</sup>	63	35	106	0.35
WVN716-RO8x1.25	8 <sup>-0.2</sup>	1.25	5.5 <sup>-0.05</sup>	80	25	76	0.75

**Important!**

For screwed tube joints use only tube connections with reinforcing socket.

**Material WVN715:** optionally polyamide 11 (PA 11 H) semirigid (not containing plasticizer) or polyamide 12 (PA 12 H) semirigid (not containing plasticizer) acc. to DIN 73378.

**Material WVN716:** optionally polyamide 11 (PA 11 PH) flexible (containing plasticizer) or polyamide 12 (PA 12 PH) flexible (containing plasticizer) acc. to DIN 73378.

**Color:** natural-colored; on request, also green, red or black.

**Material properties:** Very good resistance and insensitivity to oils, greases, lubricants, all fuels, chlorine-free detergents and solvents.

At room temperature good resistance to diluted mineral acids, organic acids, bases and saline solutions 2).

Inappropriate for concentrated mineral acids, concentrated acetic acid, phenols, cresols, chlorinated hydrocarbons, chlorine, acetones and ketones.

**Melting point:** For PA 11: 182 °C; for PA 12: 172 °C

**Permissible operating temperature range:** from approx. -40 °C to +80 °C

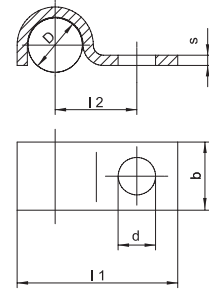
1) The operating pressures quoted are based on 23 °C. At higher temperatures these pressures are reduced in conformity with the pressure efficiency set out in DIN 73378.

Temperature range	Pressure efficiency
up to 30 °C	83 %
up to 40 °C	72 %
up to 50 °C	64 %
up to 60 °C	57 %
up to 70 °C	52 %
up to 80 °C	47 %

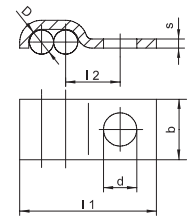
2) In borderline cases it is advisable to inquire beforehand.

Fixing clips

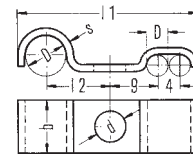
Order No.	for tube diam. D	b	d	l1	l2	s
602-001	2.5	10	3.5	11.25	5	1.5
604-001	4	10	5.5	18.5	9	1.5
606-010	6	10	5.5	20.5	10	1.5
608-001	8	10	5.5	23.5	12	1.5
610-001	10 or 1/8"	10	5.5	25.5	13	1.5
612-001	12	20	6.8	35	18	2



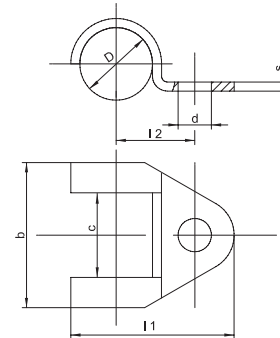
Order No.	for tube diam. D	for tube number	b	d	l1	l2	s
602-002	2.5	2	10	3.5	13.8	5	1.5
604-002	4	2	10	5.5	22.6	9	1.5
604-003	4	3	10	5.5	26.6	9	1.5
DIN72571-2x6-ST	6	2	10	4.8	26.5	10	1
DIN72571-2x8-ST	8	2	10	4.8	30.5	11	1
DIN72571-2x10-ST	10	2	10	4.8	33.5	11	1



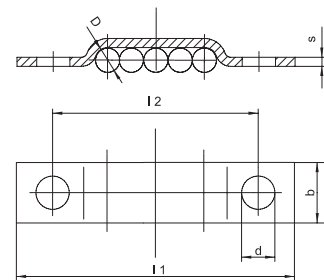
Order No.	for tube diam. D	b	d	l1	l2	s
608-003	8 and 4	10	5.5	34	12	1.5



Order No.	for tube diam. or socket diam. of tee ø D	b	c	d	l1	l2	s
604-004	12	24	14	5.5	27	13	1.5
606-014	14 or 1/4"	30	15	6.3	32.5	16	2
608-004	18 or 3/8"	36	20	7	40	21	2
610-004	20 or 1/2"	36	20	7	40	21	2



Order No.	for tube diam. D	for tube number	b	d	l1	l2	s
604-014	4	4	10	5.5	42	30	1.5
604-015	4	5	10	5.5	46	34	1.5
604-016	4	6	10	5.5	50	38	1.5
604-018	4	8	10	5.5	58	46	1.5
DIN72573-3x6-ST	6	3	10	4.8	45	33	1
DIN72573-4x6-ST	6	4	10	4.8	51	39	1
DIN72573-5x6-ST	6	5	10	4.8	57	45	1
DIN72573-6x6-ST	6	6	10	4.8	64	52	1
DIN72573-3x8-ST	8	3	10	4.8	51	39	1
DIN72573-4x8-ST	8	4	10	4.8	59	47	1
DIN72573-5x8-ST	8	5	10	4.8	68	56	1
DIN72573-6x8-ST	8	6	10	4.8	76	64	1
DIN72573-3x10-ST	10	3	10	4.8	55	43	1
DIN72573-4x10-ST	10	4	10	4.8	67	55	1
DIN72573-5x10-ST	10	5	10	4.8	77	65	1



Material: mild steel



Hoses

Operating pressure: 45 bars / 15 bars (for short time only)

for main lines **Operating pressure 45 bars (for short time only)**

Standard		Metal-braided		Tube diam. d1	Thread d3	Rubber d2	Metal-braided d4	Max. increase in volume at ≈ 80 bars [ccm/m]
Order No. 2)	With tapered sleeve and socket union on both ends Order No.	Order No. 2)	With tapered sleeve and socket union on both ends Order No.					
714-...(-VS)	714-...-K	714-...-M(-VS)	714-...-MK	4	M8x1	11	12 ±0.5	2.5
716-...(-VS)	716-...-K	716-...-M(-VS)	716-...-MK	6	M10x1	13	14 ±0.8	3.6
718-...(-VS)	718-...-K	718-...-M(-VS)	718-...-MK	8	M14x1.5	15	16 ±0.8	4.4

**Material:**  
Hose: mineral-oil-resistant CR rubber inside; 2 layers of braided rayon; outside rubber conditionally oil-resistant, resistant to light cracks and ozone.  
Metal braid: galvanized steel wire; tube ends: galvanized steel tubing.

for secondary lines **Operating pressure 15 bars (for short time only)**

Standard		Tube diam. d1	Thread d3	Rubber d2
Order No.	With claw groove for Vogel quick connectors Order No.			
734-... <sup>3)</sup>	734-...-VS <sup>3)</sup>	4	M8x1	8.8

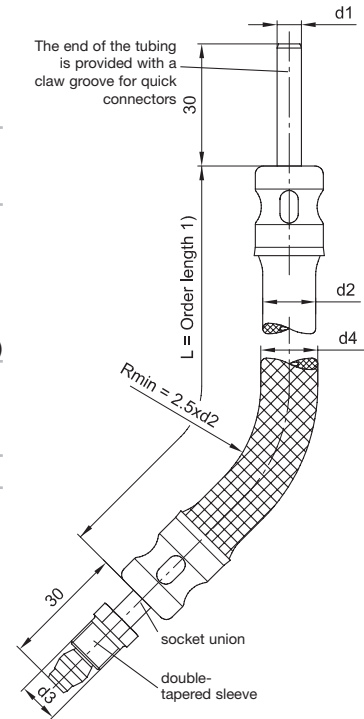
**Material** Hose: oil-proof rubber inside and outside with a layer of braided rayon  
Tube ends: steel tubing  
The ends of the tubing are bonded to the hose and cannot be detached.

**Permissible operating temperature: -30 °C to +70 °C**

- 1) Order length in mm; other lengths available.  
Standardized lengths ±5 mm with ø4 tubing: 180, 220, 260, 300, 380, 420, 450, 500, 580  
with ø6 tubing: 220, 300, 340, 380, 420, 500, 580  
with ø8 tubing: 340, 450, 580

**Order examples:**  
Standard with socket unions and tapered sleeves, ø4 tubing, 300 mm long, order No.: **714-300-K**  
Standard ø4 tubing with claw groove for quick connectors, 300 mm long, order No.: **714-300-VS**  
Metal-braided ø6 tubing, 420 mm long, order No.: **716-420-M**  
Metal-braided ø8 tubing, with claw groove for quick connectors, 450 mm long, order No.: **718-450-M-VS**

- 2) Version with claw groove on ends of tubing for VOGEL quick connectors, order No.: ...-VS  
3) **Please note!** These hoses must not be used as main lines but only to connect distributors to lube points.



Hoses suitable for self-installation

Operating pressure: 45 bars

①	②	③	Hose diam. d2	Increase in volume at approx. 40 bars [ccm/m]
Tube diam. d1	Male body Order No.	Shell Order No.		
4	406-704-001(-VS) <sup>2)</sup>	8 406-804-001	14	WVN701-4 11 1
6	406-706-001(-VS) <sup>2)</sup>	8 406-806-001	17	WVN701-6 13 1.4
8	406-708-001(-VS) <sup>2)</sup>	10 406-808-001	19	WVN701-8 15 1.4

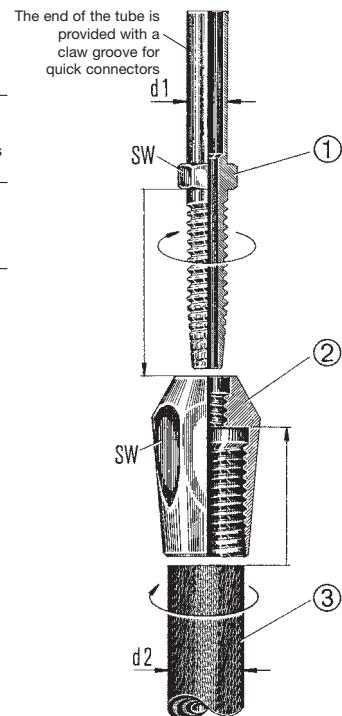
- 1) **Please quote length when ordering.** Max. length available 20 m.  
2) Version with claw groove on ends of tubing for VOGEL quick connectors, order No.: ...-VS

**Material**  
Hose: Perbunan, resistant to mineral oils, with two layers of braided rayon  
Male body: steel, galvanized  
Shell: brass

**Permissible operating temperature: -40 °C to +70 °C**

**Installation instructions**

- Apply thin film of oil to thread and inside of hose of parts ① ② ③ to be connected.
- Clamp shell ② in vise and screw in hose ③ by turning it to the left up to the stop.
- Screw in male body ① with a wrench up to the stop. **Do not tighten!**



High pressure hoses

Operating pressure: 280 - 330 bars

Order No.	Tube diam.	Hose diam.	Length 1)		Permissible operating pressure [bars]	Burst pressure [bars]
	d1	d2	l+5	l1		
SLH6-180	6	10	180	22	330	840
SLH8-180	8	11.8	180	30	320	800
SLH10-180	10	14	180	30	280	700

1) Order length in mm; other lengths available.

Order example: high-pressure hose SLH 8, 600 mm long, Order No.: SLH 8/600

Material

Inner liner: PA 11/12 or PE-E  
 Reinforcement: 1 braided layer of synthetic fibre with high tensile strength  
 Outer cover PA 11/12  
 Resistant to mineral oils.

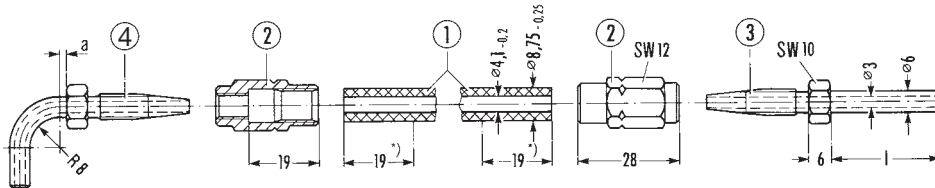
Permissible operating temperature: -40 °C to +100 °C



High pressure hoses for self-installation

Operating pressure: 325 bars / 130 bars

for main lines (connection: pump – feeder) and secondary lines (connection: feeder – lubrication point)



\*) Take length of engaged thread into account twice when determining the length of the hose.

Designation	Order No.	l	a
① High pressure hose, max. length supplied 50 m	982-750-091		
High pressure hose, max. length supplied 50 m filled with NLGI grade 2 grease	982-750-091+AF2		
② Sleeve	853-540-010		
③ Tube stud, straight	853-370-002(-VS) 1)	20	
	853-380-002(-VS) 1)	30	
	853-390-002(-VS) 1)	66	
④ Tube stud, 90° angle	853-380-003(-VS) 1)		2
	853-390-003(-VS) 1)		13

Technical data

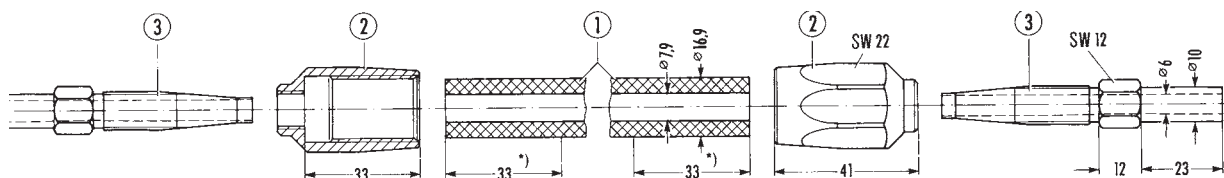
Hose: operating pressure 325 bars  
 burst pressure 800 bars  
 min. bending radius 35 mm

Materials

hose:  
 inner lining: unplasticized polyester  
 liner layer: braided synthetic fibers  
 outer cover: weatherproof polyurethane  
 sleeve, tube stud: steel, galvanized

1) Version with claw groove on ends of tubing for VOGEL quick connectors, order No. ...-VS

for main lines (connection: pump – feeder)



\*) Take length of engaged thread into account twice when determining the length of the hose.

Designation	Order No.
① High pressure hose, max. length supplied 100 m	WVN711-10
High pressure hose, max. length supplied 50 m filled with NLGI grade 2 grease	WVN711-10+AF2
② Sleeve	406-810-002
③ Tube stud	406-710-002

Technical data

Hose: operating pressure 130 bars  
 burst pressure 315 bars  
 min. bending radius 55 mm

Materials

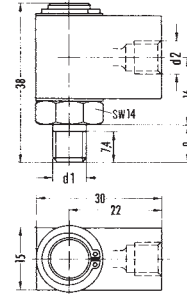
hose:  
 inner lining: Perbunan  
 liner layer: diagonally woven synthetic fibers  
 outer cover: weatherproof neoprene  
 sleeve, tube stud: steel, galvanized

### Rotating joints

Rotating joints connect fixed tubing with oscillating and rotating machine parts.

Order No.	Tube outside diam.	d1	d2 *)	Max. speed [rpm]	Max. pressure oil [bars]	Max. pressure air [bars]
401-504-192	4	G 1/8 A	M8x1	100	30	8
401-504-292	4	M8x1	M8x1	100	30	8
401-506-313	6	M10x1	M10x1	100	30	8

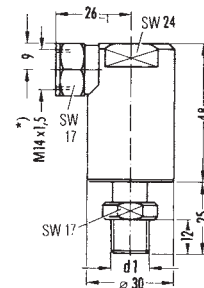
Flow media: mineral oils, oiled compressed air



Order No.	Tube outside diam.	d1	d2 *)	Max. speed [rpm]	Max. pressure oil [bars]	Max. pressure air [bars]
DLY930-2	8	G 1/4 A		1400	20 1)	8
DLY931	8	R 1/4 tap.		1400	20 1)	8

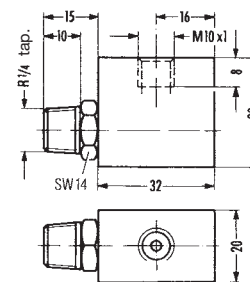
Flow media: mineral oils, oiled compressed air

1) 30 bars in single-line central lubrication systems for a short time.



Order No.	Tube outside diam.	Max. speed [rpm]	Max. pressure [bars]
DLY932	6	1400	5

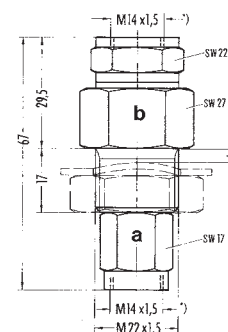
Flow medium: mineral oil



Order No.	Tube outside diam.	Max. speed [rpm]	Max. pressure [bars]
408-120	8	Part a rotating in part b	20

Flow medium: mineral oil

The rotating joint is also available with nut DIN936-M22x1.5 and spring washer DIN137-B22.

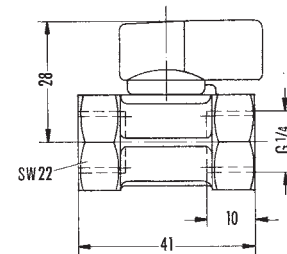
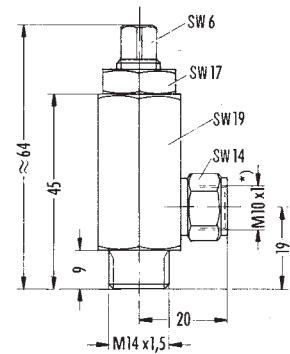


**Shut-off valves**

Order No.	Max. pressure	Max. temperature	Spindleway
202-085-S	60 bars	80°C	max. 3 revs.

Direction of flow optional

Order No.	Max. pressure	Max. temperature
161-600-036	16 bars	90°C



**Quick-disconnect couplings**

**Coupling, complete**

Order No.	Tube diam.	d 1 *)	l2	Flow direction
207-168-2	6	M10x1	62	optional
207-188-2	8	M14x1.5	66.5	

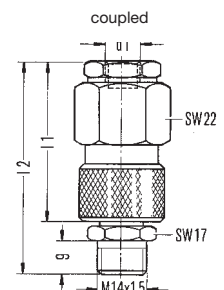
**Outer coupling member**

Order No.	Tube diam.	l1
207-168.U7	6	48.5
207-188.U11	8	53

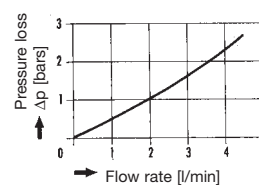
**Inner coupling member**

Order No.	207-168.U2
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Both coupling members are shut off when disconnected!



Pressure loss as a function of the flow rate based on an operating oil viscosity of 140 mm<sup>2</sup>/s

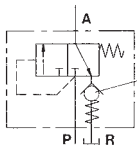


**Relief valves**

These valves are installed in distributor systems fitted with a pump without pressure relief equipment, mainly in the main line downstream from the pump.

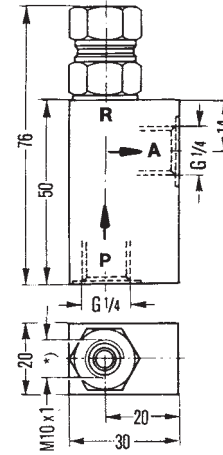
With longer main lines and high-viscosity oils the pressure relief time, which influences the reversing of the distributors, can become too long. The installation of the second relief valve at a suitable position in the main line, e.g. at half the main line length, may remedy this problem.

**Order No. 202-275-2**



check valve = residual pressure valve 0.5 bar

P = inlet  
A = outlet  
R = return

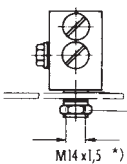


**Relief valve with bleed valve and safety valve**

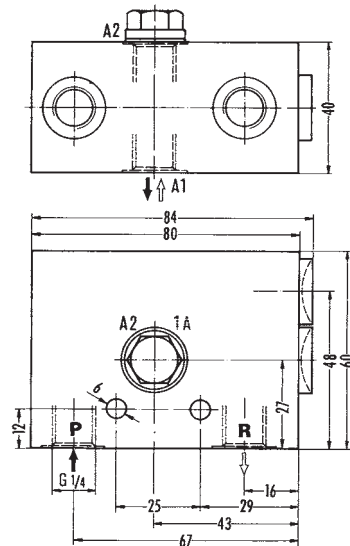
**Order No. 202-175-30**

Adaptors\*) for tube diam. 6: Order No. 406-054  
for tube diam. 8: Order No. 301-020  
for tube diam.10: Order No. 410-163

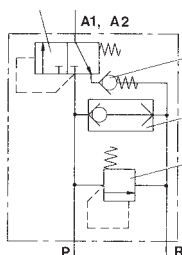
**Fitted to reservoir**



For P and R  
two adaptors each, 408-160  
washers 508-108



relief valve



check valve = residual pressure valve 0.5 bar  
bleed valve  
safety valve 30 bars

\*) Ports tapped for solderless tube connection

**Safety valves, adjustable (poppet valve)**

**Characteristic values according to VDI guidelines 3276**

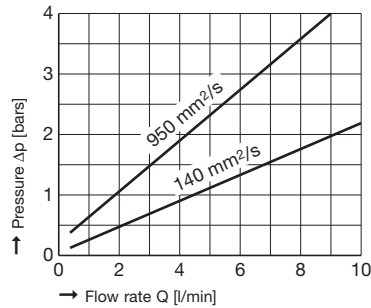
Order No.	Hydraulic characteristics		Operating pres. max. [bars]	Oil temperature max.	Viscosity range mm <sup>2</sup> /s
	Rated flow rate [l/min]	Adjustable pres. range min. [bar] max. [bars]			
WVN200-10E6	see	0.1 <sup>1)</sup> 6 ± 1	40		
WVN200-10E12	pressure-	0.1 <sup>1)</sup> 12 ± 1.5	40		
WVN200-10E25	loss	0.1 <sup>1)</sup> 25 ± 2.5	40	80 °C	2 to 1000
WVN200-10E35	parameter	0.1 <sup>1)</sup> 35 ± 2.5	40		
WVN200-10E60		0.5 60 ± 5	70		

<sup>1)</sup> With increasing flow rate and increasing viscosity this value is slightly higher.

**General characteristics**

Design: poppet valve with hydraulic cushioning directly controlled  
 Lubricant: oil  
 Connecting thread: G 1/4  
 Mounting position: optional

**Pressure loss parameter**



With increasing flow rate, the pressure upstream from the valve will also rise in accordance with the curves.

**Adaptors \*)**

for valves **WVN200-10E6** to **WVN200-10E35**

f. tube diam. 8: order No. 301-020  
 f. tube diam. 10: order No. 410-163  
 f. tube diam. 12: order No. 412-163

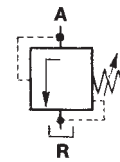
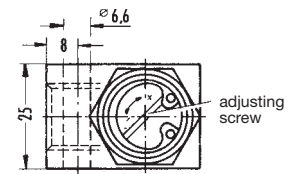
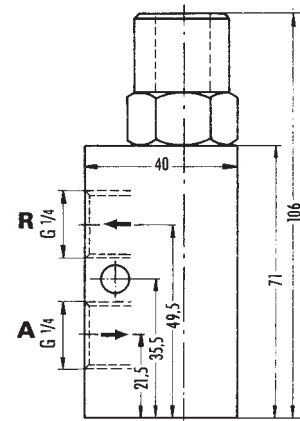
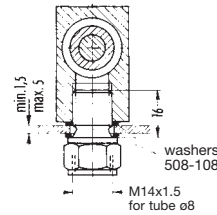
Washer: order No. 508-108

for valves **WVN200-10E60**

f. tube diam. 8: order No. 408-403 W  
 f. tube diam. 10: order No. 410-403 W

Washer: order No. 508-108

If installed on a reservoir, use **two special adaptors 408-160** with long tube ends.



**Safety valves (ball valves) for flow rates from 0.5 to 2 l/min**

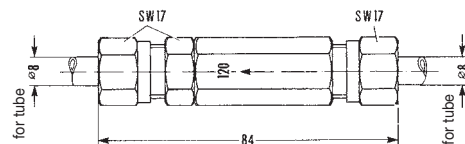
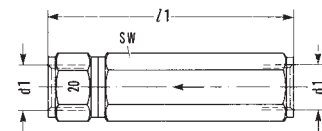
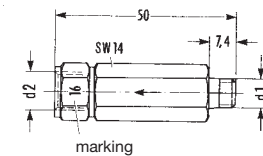
Order No.	Tube diam.	Opening pressure [bars]	Marking	d1	d2 *)
WVN200-4A16	4	16	16	M8x1 tap.	M8x1
WVN200-4A25		25	25		

Order No.	Tube diam.	Opening pressure [bars]	Marking	d1 *)	l1	sw
WVN200-6B0.5	6	0.5	0.5	M10x1	61	14
WVN200-6B16		16	16			
WVN200-6B40		40	40			
WVN200-8B0	8	0.04	0	M14x1.5	71	17
WVN200-8B3		3	3			
WVN200-8B5		5	5			
WVN200-8B12		12	12			
WVN200-8B16		16	16			
WVN200-8B20		20	20			
WVN200-8B32		32	32			
161-212-054 <sup>1)</sup>		8	20			

<sup>1)</sup> This valve is designed as a plunger valve. Because of this design it can also be used for regulating tasks, whereas the ball valves should be used as safety valves.

Order No.	Tube diam.	Opening pressure [bars]	Marking
WVN200-8D50	8	50	50
WVN200-8D75		75	75
WVN200-8D120		120	120
WVN200-8D220		220	220

Cutting sleeve screw unions according to DIN 2353



Dimensions in mm

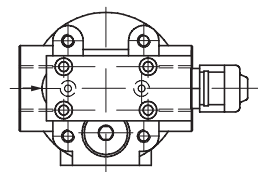
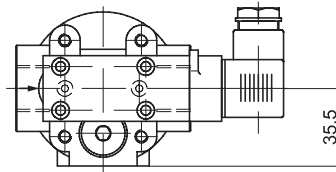
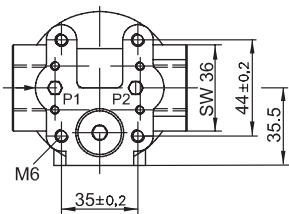
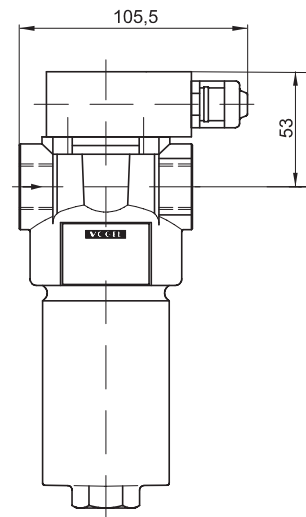
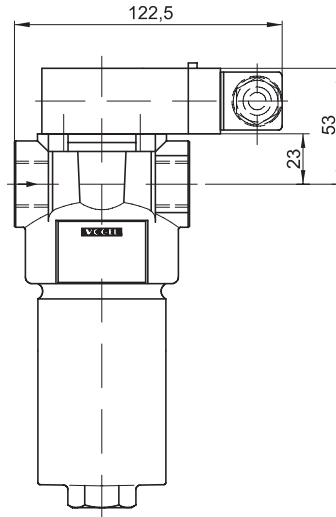
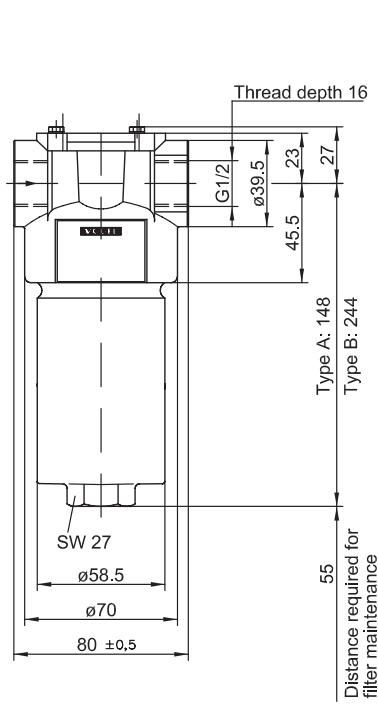
\*) Ports tapped for solderless tube connection

Pressure filters

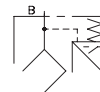
**Version without fouling indicator**  
fouling indicator can be retrofitted

**Version with electrical fouling indicator**  
(176-200-001 or 176-200-002)

**Version with visual fouling indicator**  
(169-200-110; 169-200-111 or 169-200-118)

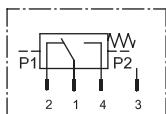


Symbols

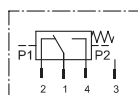


- H 1
- H 2
- H 3
- H 4
- H 5
- H 6
- H 7
- H 8

Unit socket  
DIN 43650-AF3

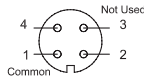


E 1

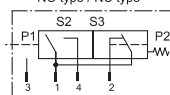


E 2

Sensor socket M12x1

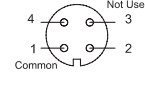


H 3

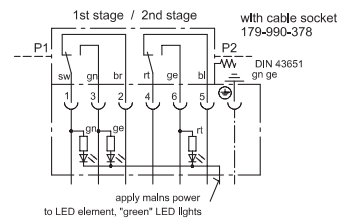


E 3

Sensor socket M12x1



H 5



H 7

E 4

## Pressure filters

Type	Filter compl. Order No.	Symbol *) H/E/V	Rated flow [l/min]	Fine-ness [µm]	Filtration 1) filter-material	ACFTD-capacity [g/ccm] (filter area)	Port	Bypass or reversing valve opening press. [bars]	Fouling indicator Order No.	Operating pressure [bars]	Filter element press.-stable up to [bars]	Spare filter element Order No.
A	169-460-170	H8/-	16	3	fleece	1.8	G 1/2	-	-	63	160	169-400-078
A	169-160-181	H5/V							169-200-118		80	
A	169-460-110	H1/-							-			
A	169-460-111	H2/V	40		paper	4.2	G 1/2	7	169-200-111	63	20	169-400-035
A	169-460-112	H3/E1							176-200-002			
A	169-460-112-V70	H3/E2							176-200-003			
B	169-460-140	H8/-							-			
B	169-460-142	H7/E1	63		fleece	7	G 1/2	-	176-200-002	63	160	169-400-065
B	169-460-143	H6/E4						176-100-002				
A	169-460-145	H6/E4							176-100-002			
A	169-460-146	H8/-	40	10	fleece	3.2	G 1/2	-	-	63	160	169-400-064
A	169-460-141	H7/E1							176 200-002			
A	169-460-184	H5/V							169-200-118			
A	169-460-232	H4/E3							176-200-002			
A	169-460-233-V57	H3/E2							176-200-003			
A	169-460-233-V64	H3/E2							176-200-003			
A	169-460-233-V70	H3/E3	25	10	fleece	3.4	G 1/2	RV 2x0.25	176-200-003	63	160	169-400-130
A	169-460-234	H4/E3							176-200-004			
A	169-460-234-V57	H4/E3							176-200-004			
A	169-460-234-V64	H4/E3							176-200-004			
A	169-460-234-V70	H4/E3							176-200-004			
A	169-460-130	H1/-							-			
A	169-460-131	H2/V	55	15	paper	6	G 1/2	7	169-200-111	63	20	169-400-038
A	169-460-132	H3/E1							176-200-002			
B	169-460-150	H1/-							-			
B	169-460-152	H3/E1	80	15	paper	12	G 1/2	7	176-200-002	63	20	169-400-050
A	169-460-160	H8/-							-			
A	169-460-162	H7/E1	55	20	fleece	5	G 1/2	-	176-200-001	63	160	169-400-039
A	169-460-186	H8/-							-			
A	169-460-187	H5/V							169-200-118			
A	169-460-115	H8/-							-			
A	169-460-116	H6/E4	50	60	screen fabric	(245 ccm)	G 1/2	-	176-100-002	63	20	169-400-041
A	169-460-117	H5/V							169-200-111			
A	169-460-123	H5/V							169-200-110			
A	169-460-120	H1/-						3.5	-			
A	169-460-121	H2/V						3.5	169-200-110			
A	169-460-122	H3/E1						3.5	176-200-001			

\*) See page 30 for symbols (H = hydraulic, E = electr., V = visual)

**Applications**

In the pressure circuits of hydraulic and lubrication systems.

**Features**

Protection against wear:

by filter elements that meet maximum demands on the cleanliness class during full-flow filtration.

Functional protection:

by installation directly upstream of the hydraulic components. Individual specification of the rated volumetric flow makes sure the bypass valve remains closed at  $v \leq 200 \text{ mm}^2/\text{s}$ .

**Filter elements**

Flow passes through from the outside to the inside. Thanks to star crimping of the filter material:

- large filter surface
- high collection of dirt
- low pressure loss
- specially long intervals between changes

**Filter maintenance**

A fouling indicator signals when it's time to service the filter, so optimal exploitation of the filter elements is achieved.

**Materials**

Head: Al-alloy

Bottom part of housing: Al-alloy

Seals: NBR (Viton on request)

Filter material: fleece – based on inorganic microfiber fleece  
paper – cellulose, impregnated with resin.

**Accessories**

Electrical and/or visual fouling indicators are available on request – optionally with two or more switching points.

**Filters for higher pressures on request with indication of the following details:**

- rated flow [l/min] and  $D_{\text{pressureuck}}$  [bars]
- filter fineness [µm] or desired particle cleanliness to ISO 4406. e.g. 13/9.
- with or without bypass valve
- visual or electrical fouling indicator



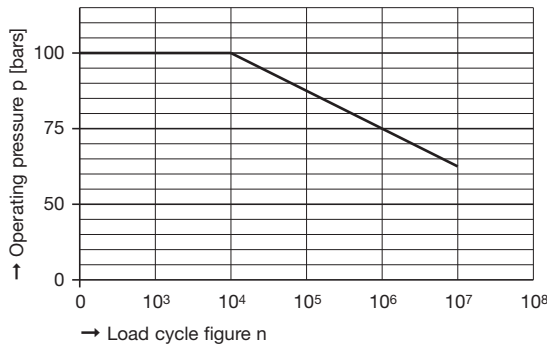
**Pressure filters**

**Characteristics**

**Operating pressure**

0 ... 63 bars, min. 10<sup>7</sup> load cycles  
 Rated pressure based on DIN 24550  
 0 ... 100 bars, min. 10<sup>4</sup> load cycles  
 Quasi-static operating pressure

**Permissible pressures for other load-cycle figures**



**Rated volumetric flow**

Up to 80 l/min (cf. table).

The indicated volumetric flow rates are based on the following criteria:

- Closed bypass when  $v \leq 200 \text{ mm}^2/\text{s}$
- Useful life > 1000 hours of operation with an average amount of fouling amounting to 0.08 g per l/min volumetric flow
- Flow rate in the connecting lines:  
 up to 40 bars  $\leq 4.5 \text{ m/s}$   
 up to 250 bars  $\leq 8.0 \text{ m/s}$

**Filter fineness**

3  $\mu\text{m}$  ... 20  $\mu\text{m}$   
 $\beta$  values to ISO 4572-81 (cf. table and diagram Dx)

**ACFTD capacity**

$\alpha$  values in grams of test contaminant ACFTD determined in accordance with ISO 4572-81

**Working substances**

Mineral oil and ecofriendly hydraulic fluids

**Temperature range of working substances**

- 30 to +100 °C (- 40 °C in the starting phase)

**Viscosity at rated volumetric flow**

- at operating temperature:  $v < 60 \text{ mm}^2/\text{s}$
- as starting viscosity:  $v_{\text{max}} = 1200 \text{ mm}^2/\text{s}$

**Mounting position**

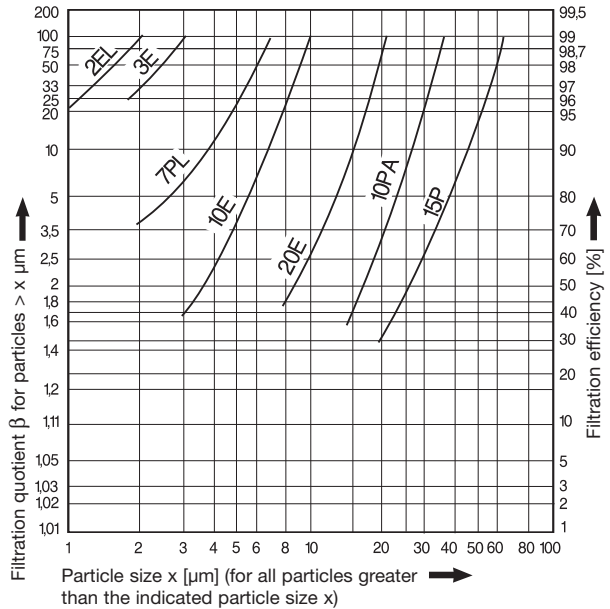
Preferably vertical, head on top

**Connection**

Threaded connection to ISO 228 or DIN 13. (See table for size)

**DX characteristics for filter finesses**

Filtration quotient  $\beta$  as a function of the particle size  $x$  determined in a multipass test to ISO 4572-81.



**The abbreviations stand for the following filtration figures and/or finesses:**

**With Exapor and paper elements:**

- 3E** =  $\beta_3 \geq 75$  fleece (3  $\mu\text{m}$  absolute)
- 10E** =  $\beta_{10} \geq 75$  fleece (10  $\mu\text{m}$  absolute)
- 20E** =  $\beta_{20} \geq 75$  fleece (20  $\mu\text{m}$  absolute)
- 10PA** = paper (10  $\mu\text{m}$  nominal)
- 15P** = paper (15  $\mu\text{m}$  nominal)

Scattering around characteristics 10PA and 15P has to be expected due to the structure of the filter material used for the 10PA and 15P elements.

**With screen elements:**

- 60 S** = screen fabric with mesh width of 60  $\mu\text{m}$   
 Tolerances for mesh widths to DIN 4189.

For special applications it is also possible to use special filter materials with finesses that deviate from these characteristics.

Screen filters

These filters should preferably be used in delivery lines for intermittently operated central lubrication systems!  
 To clean the scree filter element, screw out the hexagon nut (WAF13). The filter element can then be pulled out without detachment of the tubing.

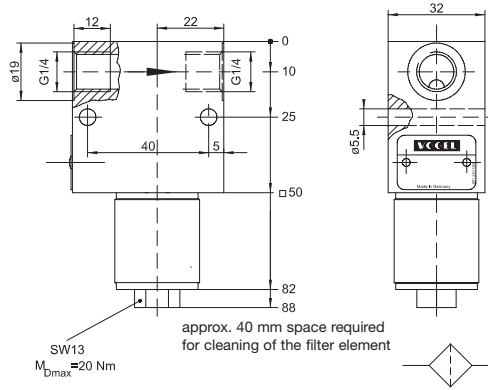


Fig. 1

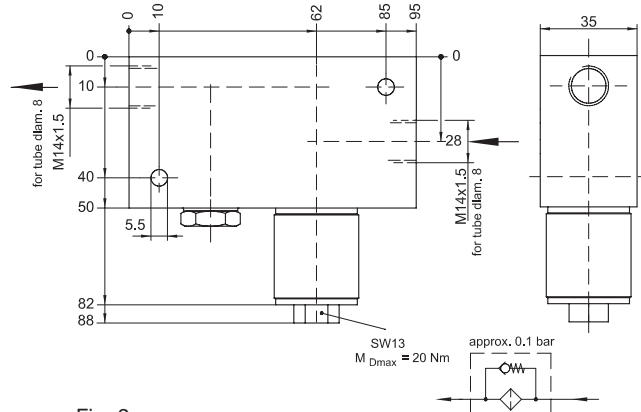


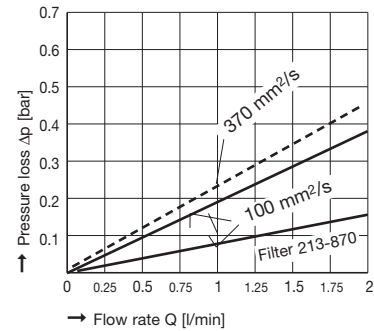
Fig. 2

Order No.	Flow rate [l/min]	Operating pressure max. [bars]	Mash opening width [mm]	Screen area [cm <sup>2</sup> ]	Fig.	Mounting position
213-870	2 2)	60	0.063	21	1	preferably as shown
213-870F *)		60	0.16	20	1	
213-880	2 1)	60	0.025	21	1	
213-890	2	60	0.32	21	1	
213-900	2 1)	45	0.025	21	2	
213-910 **)		60	0.025	20	1	
213-920	2 1)	60	0.01	21	1	
213-930	2 1)	45	0.16	21	2	
213-940 ***)	2 1)	60	0.01	21	-	

- 1) Based on an operating viscosity of the lubricant amounting to 100 mm<sup>2</sup>/s, a pressure loss of approx. 0.38 bar and a clean filter.
- 2) Based on an operating viscosity of the lubricant amounting to 370 mm<sup>2</sup>/s, a pressure loss of approx. 0.5 bar and a clean filter.
- \*) for grease, NLGI grades 000 to 2
- \*\*\*) for grease, NLGI grade 000
- \*\*\*) filter with fouling indicator

Adaptors

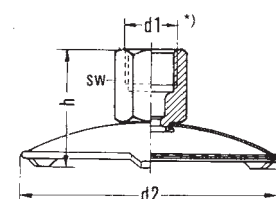
for tube diam. 6: order No. 406-054  
 for tube diam. 8: order No. 301-020  
 for tube diam. 10: order No. 410-163  
**Washer:** order No. 508-108



Strainers

These filters are designed for pumps in intermittently operated central lubrication systems.

Order No.	Tube diam.	d1	d2	h	sw	Wire mesh acc. to DIN 4189
206-444	6	M10x1	70	28	14	0.56 x 0.22
208-444	8	M14x1.5	70	33	17	0.56 x 0.22
208-555	8	M14x1.5	49	33	17	0.56 x 0.22
210-444	10	M16x1.5	70	35	19	0.56 x 0.22
210-555	10	M16x1.5	49	35	19	0.56 x 0.22
212-444	12	M18x1.5	70	38	22	1.5 x 0.3



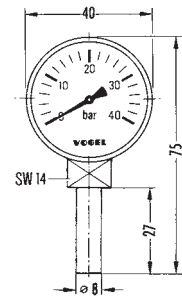
Dimensions in mm

\*) Ports tapped for solderless tube connection

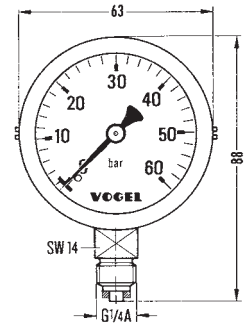
**Pressure gauges**

Order No.	Indication range	
248-602.25	0-10 bars	
169-102-506	0-25 bars / 0-360 psi	
248-602.20	0-40 bars	for grease
169-104 008	0-40 bars	for oil
169-106-004	0-60 bars	

Fixed by means of a double tapered sleeve and socket union (solderless tube connection) in counterbore acc. to DIN 3854/DIN 3862.



Order No.	Indication range	Adaptor Order No.	d
169-100-100	-1-0 bar		
169-101-004	0-10 bars		
248-604.00	0-25 bars		
248-602.00	0-40 bars		
248-603.00	0-60 bars	301-134	M10x1
169-106-007	0-6 Mpa		
248-601.00	0-100 bars	301-034	M14x1.5
169-116-000	0-160 bars		
169-120-000	0-250 bars		
248-605.00	0-400 bars		

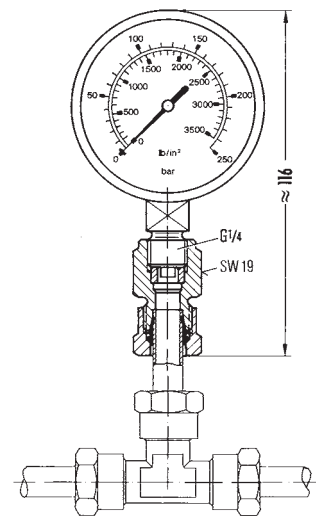


Washer, order No. 248-610.02, must be ordered separately for every pressure gauge.

**Gedämpfte Ausführung mit Glyzerinfüllung**

Order No.	Indication range	Mounting position	Pressure gauge connectors Order No.	for tube diam.
248-604.10	0-25 bars			
169-106-003	0-60 bars / 0-800 psi			
248-603.10	0-60 bars			
169-106-009	0-6 Mpa	vertically	408-411	8
248-601.10	0-100 bars / 0-1450 psi		410-411	10
169-110-009	0-10 Mpa		412-411	12
169-125-000	0-250 bars / 0-3600 psi			
169-140-001	0-400 bars			

Washer, order No. 248-610.02, must be ordered separately for every pressure gauge.

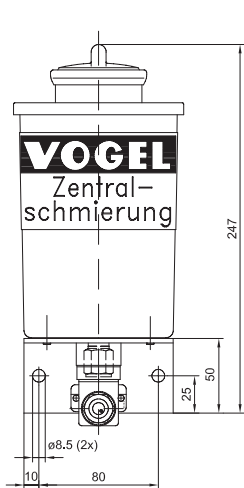


\*) Ports tapped for solderless tube connection nach DIN 2367

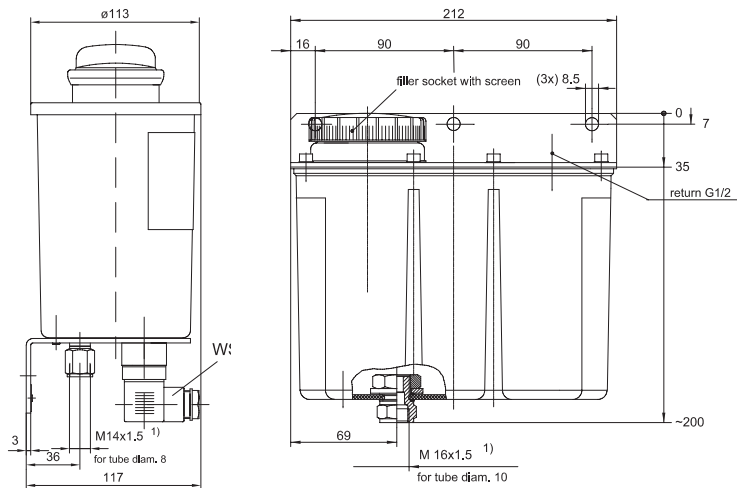
Oil reservoirs – plastic

Plastic reservoirs

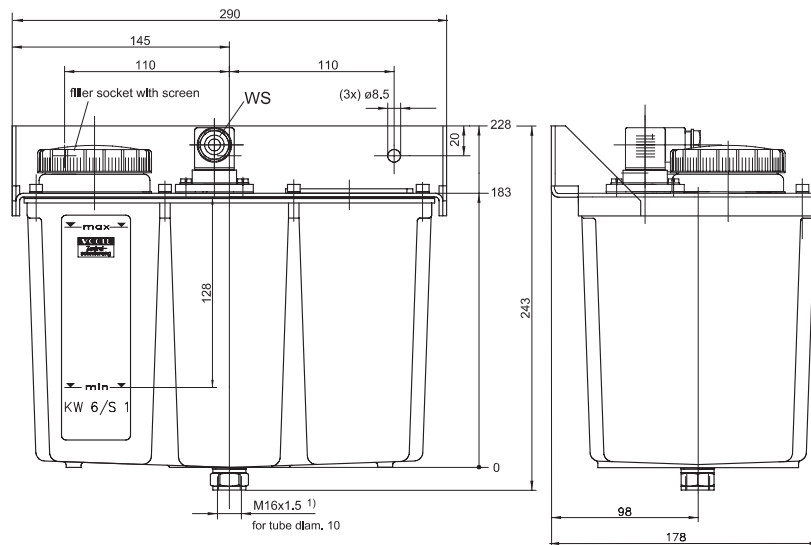
Order No.	Reservoir capacity [liters]	Level indicator WS	Type of contact	Seal material
K1	1	–	–	NBR
KW1	1	for min. filling level	changeover	NBR
KW1-S2	1	for min. filling level	NC	NBR
K3-S2	3	–	–	NBR
KW3-S1	3	for min. filling level	changeover	NBR
KW3-S3	3	for min. and max. filling level	1 NC, 1 NO	NBR
KW3-S5	3	for min. filling level with advance warning	2 NCs	NBR
K6-S5	6	–	–	NBR
KW6-S1	6	for min. filling level	changeover	NBR
KW6-S2	6	for min. filling level with advance warning	2 NCs	NBR
KW6-S81	6	for min. filling level	changeover	Viton
KW6-V57	6	for min. filling level with advance warning	2 NCs	NBR



1-liter reservoir (shown: KW1)



3-liter reservoir (shown: K3-S2)



6-liter reservoir (shown: KW6-S1)

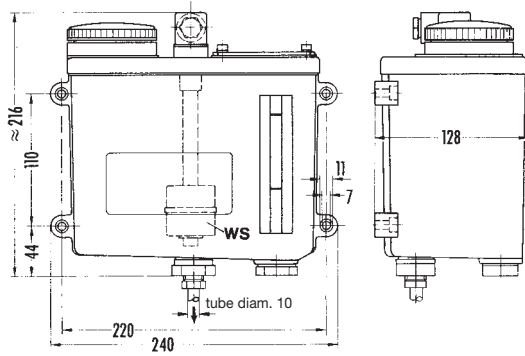
Dimensions in mm

1) Ports tapped for solderless tube connection nach DIN 2367

**Oil reservoirs – metal**

**Metal reservoirs**

Order No.	Reservoir capacity [liters]	Level indicator WS	Type of contact	Seal material
<b>B3-S1</b>	3	–	–	NBR
<b>BW3-S9</b>	3	for min. filling level with advance warning	2 NOs	NBR
<b>BW3-S81</b>	3	for min. filling level	changeover	Viton
<b>162-210-005</b>	3	for min. filling level	changeover	NBR
<b>B7</b>	6	–	–	NBR
<b>BW7-S6</b>	6	for min. and max. filling level	2 NCs	NBR
<b>BW7-S7</b>	6	for min. filling level with advance warning	2 NCs	NBR
<b>BW7-S8</b>	6	for min. filling level	changeover	Viton
<b>BW7-S11</b>	6	for min. filling level with advance warning	1 NO, 1 NC	NBR
<b>BW7-S12</b>	6	for min. filling level with advance warning	1 NO, 1 NC	NBR
<b>162-310-005</b>	6	for min. filling level	changeover	NBR



**3-liter reservoir**



**6-liter reservoir (shown: BW7-S6)**











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