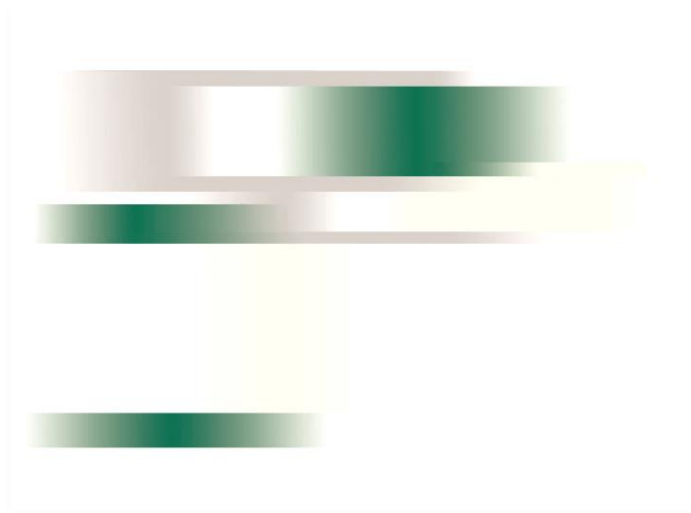


ZBD 1001 **Differential Cylinder**

Data sheet 09.20/DS13210



Differential Cylinder ZBD 1001

Description:

This series represents the logical and consistent supplementation of already ISO 6022 (250 bar) and ISO 6020/1 (160 bar) standard series. The consistent application of these standards enables standardized attachments can already be used in all rows of cylinders in accordance with DIN 24333, ISO 6022, ISO 6020/1 and DIN 24336.

In order to use the wide range of applications of a 100-bar-cylinder, 10 mounting types have been standardized.

The Storz hydraulic cylinders of ZBD 1001 series have dimensioned according to DIN 24336 and are therefore fully interchangeable with other brands under this standard.

There are the same mounting dimensions for cylinders with and without cushioning.

Attachments must be ordered separately.

Technical Specifications:

Nominal pressure:	100 bar (10 MPa)
Static test pressure:	150 bar (15 MPa)
Piston-Ø:	25 – 100 mm (others on request)
Area ratio:	1,25
Temperature range:	-20 °C ... +80 °C
Viscosity range:	(10 ... 600) 10 ⁻⁶ m ² /s
Stroke speed range:	0 – 0,5 m/s
Hydraulic fluid:	Mineral oil according to DIN 51524, HFD fluids

Differential Cylinder ZBD 1001

Technical specifications:

Piston- ϕ (mm)	Rod- ϕ MM (mm)	Piston area A_1 (cm ²)	Annular area A_2 (cm ²)	Force at 100 bar ¹⁾		Attenuation length	G_1 [kg]							G_2 [kg/mm]	
							Type of mounting							per 1 mm Stroke	
				Pressure [kN]	Pull [kN]		A	B	CA CB	CAA	CC CD	DA DB	EA		Form B
25	12 18	4,9	3,8	4,9	3,8	10,0	1,8	2,0	2,2	2,3	2,1	1,8	2,6	0,005	0,005
32	14 22	8,0	6,5	8,0	6,5	10,0	2,2	2,5	2,7	2,7	2,5	2,2	3,3	0,006	0,007
40	18 28	12,6	10,0	12,6	10,0	12,0	3,9	4,5	4,7	4,8	4,5	3,9	5,9	0,008	0,011
50	22 36	19,6	15,8	19,6	15,8	12,0	5,3	6,2	6,5	6,6	6,1	5,4	8,5	0,011	0,014
63	28 45	31,2	25,0	31,2	25,0	16,0	9,0	10,5	11,4	11,6	10,7	9,3	13,9	0,018	0,022
80	36 56	50,2	40,1	50,2	40,1	18,0	13,5	15,9	16,3	16,6	15,8	14,3	19,8	0,032	0,032
100	45 70	78,5	62,6	78,5	62,6	22,0	22,2	26,0	26,9	27,2	26,0	23,7	36,0	0,041	0,041

1) Theoretically static cylinder force (without consideration of efficiency and permissible loads on the attachments)

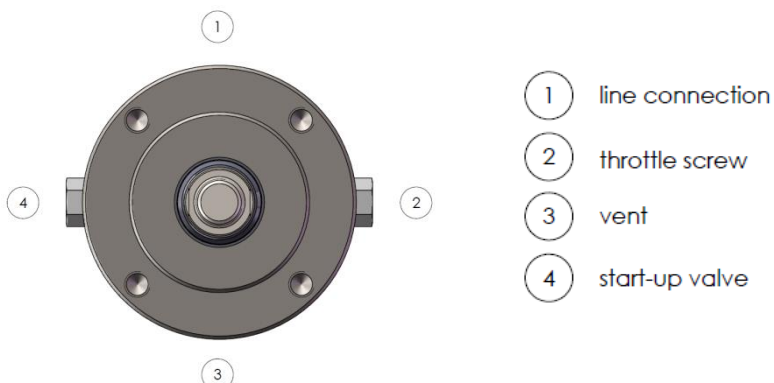
2) Stroke speed

The weight is calculated as follows: $G = G_1 + G_2 \times \text{Hub}$

Recommended average flow rate of the hydraulic fluid in the connection cross-sections

	Suction pipe	Return pipe	Pressure pipe up to 25 bar	25 - 63 bar	63 - 160 bar	160 - 250 bar	> 250 bar
Flow rate (Approximate value)	$\leq 1,5$ m/s	≤ 3 m/s	≤ 3 m/s	3 - 5 m/s	4 - 6 m/s	5 - 8 m/s	≤ 10 m/s

Locating connectors:

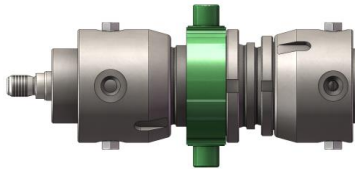


Differential Cylinder ZBD 1001

Mounting types:



A Basic form (p. 5)



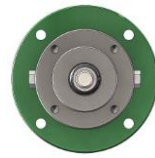
B Trunnion (p. 6)



CA Round flange at head (p. 7)



CAA Round flange on the cylinder head with rear centering (p. 8)



CB Round flange at base (p. 9)



CC Rectangular on the cylinder head (p. 10)



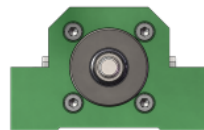
CD Rectangular on the cylinder base (p. 11)



DA Swivel eye at base (p. 12)



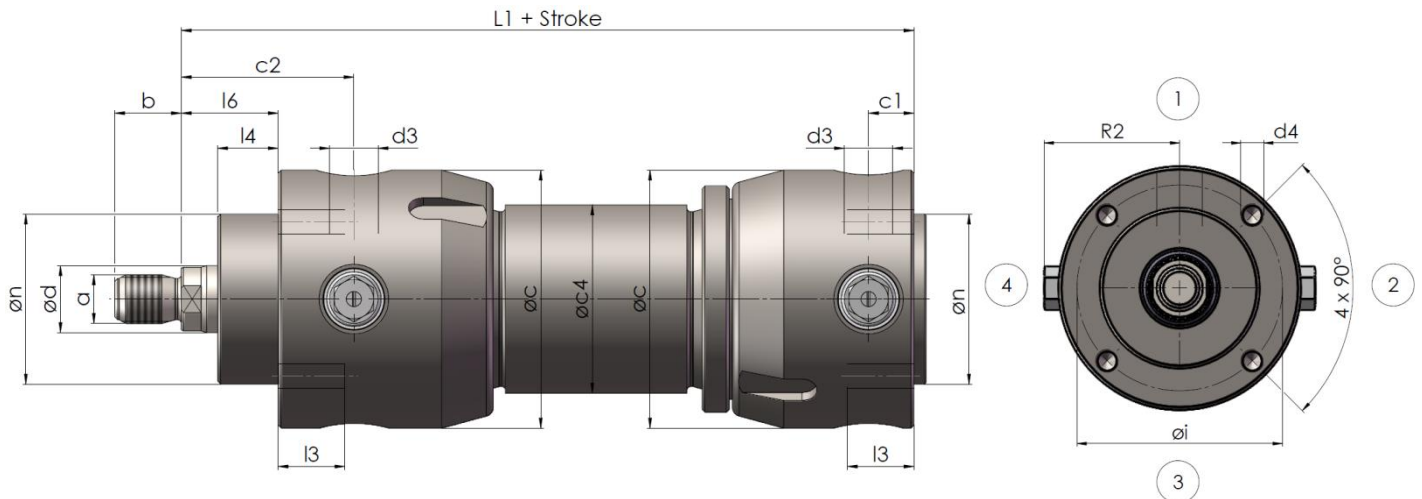
DB Spherical bearing at base (p. 13)



EA Foot mounting (p. 14)

Differential Cylinder ZBD 1001

Mounting type A – Basic form

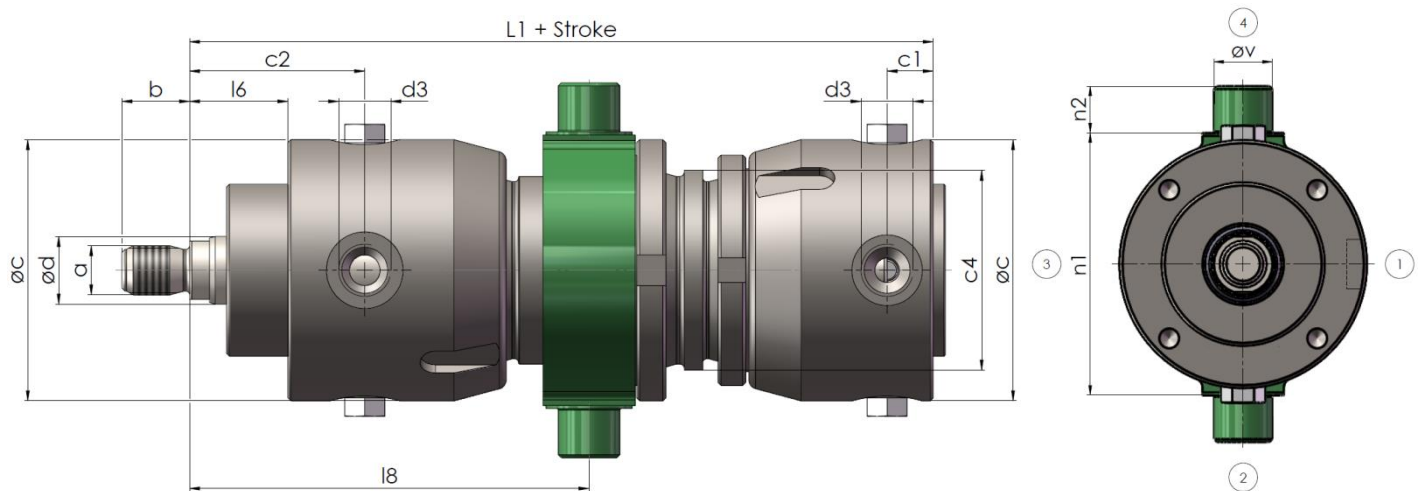


Piston-Ø (mm)	Rod-Ø d (mm)	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	L1 + Stroke	Pipe connection d3 Whitworth pipe thread / Metric thread	Rod thread a	b js15	Ø c	c1	c2	Ø c4	d4	Ø i j13	l4	l6	l13	Ø n f8	R2 max.	Minimum stroke ¹⁾
25	12 18	4,9	3,8	114	G1/4 M14x1,5	M10x1,25	14	55	12	44	33	M5	42	13	23	12	30	37	22
32	14 22	8,0	6,5	124	G1/4 M14x1,5	M12x1,25	16	60	12	52	40	M6	48	15	25	14	35	39	32
40	18 28	12,6	10,0	132	G3/8 M18x1,5	M14x1,5	18	75	15	54	50	M6	58	17	27	14	45	47	47
50	22 36	19,6	15,8	142	G3/8 M18x1,5	M16x1,5	22	85	15	58	60	M8	72	20	33	16	56	51	58
63	28 45	31,2	25,0	165	G1/2 M22x1,5	M20x1,5	28	100	19	70	75	M10	83	24	37	20	63	58	79
80	36 56	50,2	40,1	175	G1/2 M22x1,5	M27x2	36	120	19	71	95	M10	102	24	37	20	82	67	91
100	45 70	78,5	62,6	200	G3/4 M27x2	M33x2	45	145	22	86	115	M12	122	30	46	24	100	73	121

¹⁾ Production-related minimum stroke. Shorter stroke lengths by using a spacer sleeve possible

Differential Cylinder ZBD 1001

Mounting type B – Trunnion

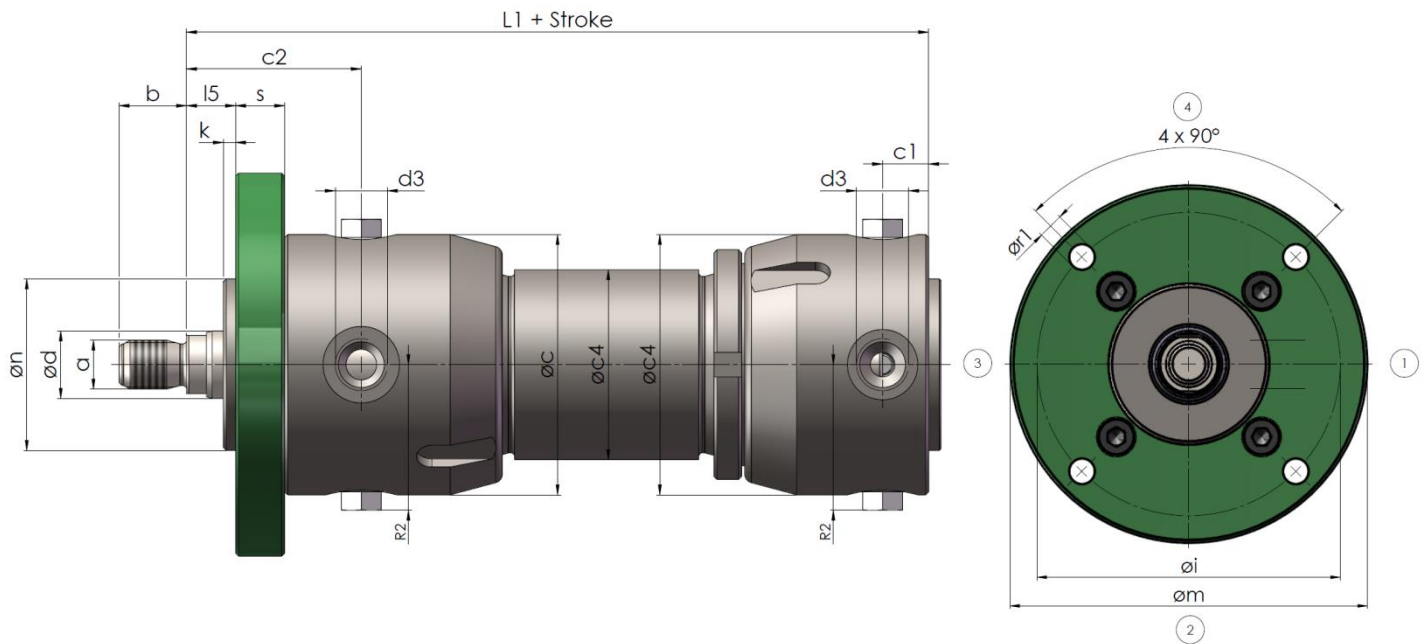


Piston- ϕ (mm)	Rod- ϕ d (mm)	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	L1 + Stroke	Pipe connection d3 Whitworth pipe thread / Metric thread	Rod thread a	b js15	ϕ c	c1	c2	ϕ c4	l6	l8 min.	l8 max. = Stroke +	n1 h13	n2 js16	R2 max	ϕ v f8	Minimum stroke ¹⁾
25	12 18	4,9	3,8	114	G1/4 M14x1,5	M10x1,25	14	55	12	44	33	23	92	40	60	8	37	10	52
32	14 22	8,0	6,5	124	G1/4 M14x1,5	M12x1,25	16	60	12	52	40	25	105	46	65	10	39	12	60
40	18 28	12,6	10,0	132	G3/8 M18x1,5	M14x1,5	18	75	15	54	50	27	110	44	80	12	47	16	66
50	22 36	19,6	15,8	142	G3/8 M18x1,5	M16x1,5	22	85	15	58	60	33	122	42	90	16	51	20	80
63	28 45	31,2	25,0	165	G1/2 M22x1,5	M20x1,5	28	100	19	70	75	37	150	47	110	20	58	25	105
80	36 56	50,2	40,1	175	G1/2 M22x1,5	M27x2	36	120	19	71	95	37	155	45	125	25	67	32	110
100	45 70	78,5	62,6	200	G3/4 M27x2	M33x2	45	145	22	86	115	46	182	55	150	32	73	40	130

¹⁾ Production-related minimum stroke. Shorter stroke lengths by using a spacer sleeve possible

Differential Cylinder ZBD 1001

Mounting type CA – Round flange at head

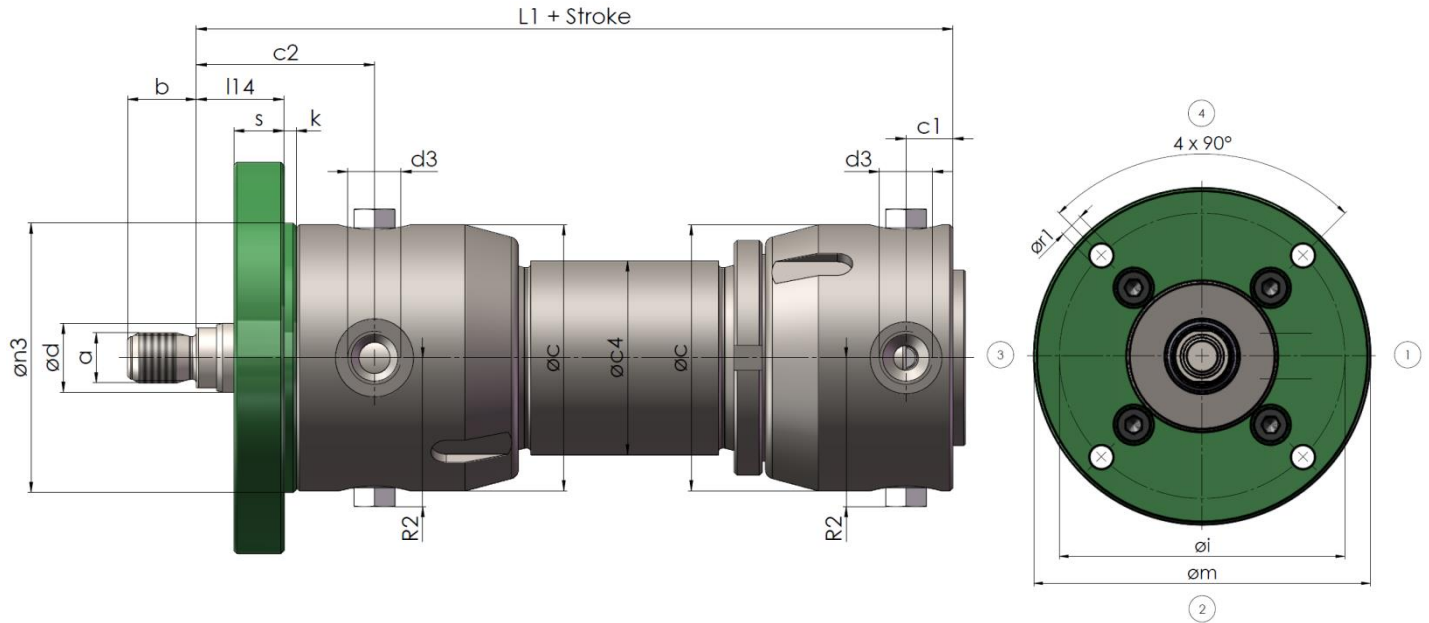


Piston-Ø (mm)	Rod-Ø d (mm)	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	L1 + Stroke	Pipe connection d3 Whitworth pipe thread / Metric thread	Rod thread a	b js15	Ø c	c1	c2	Ø c4	k	Ø i js13	l5	Ø m-1	Ø n f8	Ø r1 H13	R2 max	s	Minimum stroke ¹⁾
25	12 18	4,9	3,8	114	G1/4 M14x1,5	M10x1,25	14	55	12	44	33	3	72	13	85	30	5,5	37	10	22
32	14 22	8,0	6,5	124	G1/4 M14x1,5	M12x1,25	16	60	12	52	40	3	78	13	92	35	6,6	39	12	32
40	18 28	12,6	10,0	132	G3/8 M18x1,5	M14x1,5	18	75	15	54	50	3	96	13	110	45	6,6	47	14	47
50	22 36	19,6	15,8	142	G3/8 M18x1,5	M16x1,5	22	85	15	58	60	4	106	17	125	56	9	51	16	58
63	28 45	31,2	25,0	165	G1/2 M22x1,5	M20x1,5	28	100	19	70	75	4	132	17	155	63	11	58	20	79
80	36 56	50,2	40,1	175	G1/2 M22x1,5	M27x2	36	120	19	71	95	4	150	17	175	82	14	67	20	91
100	45 70	78,5	62,6	200	G3/4 M27x2	M33x2	45	145	22	86	115	5	175	21	205	100	18	73	25	121

¹⁾ Production-related minimum stroke. Shorter stroke lengths by using a spacer sleeve possible

Differential Cylinder ZBD 1001

Mounting type CAA – Round flange on the cylinder head with rear centering

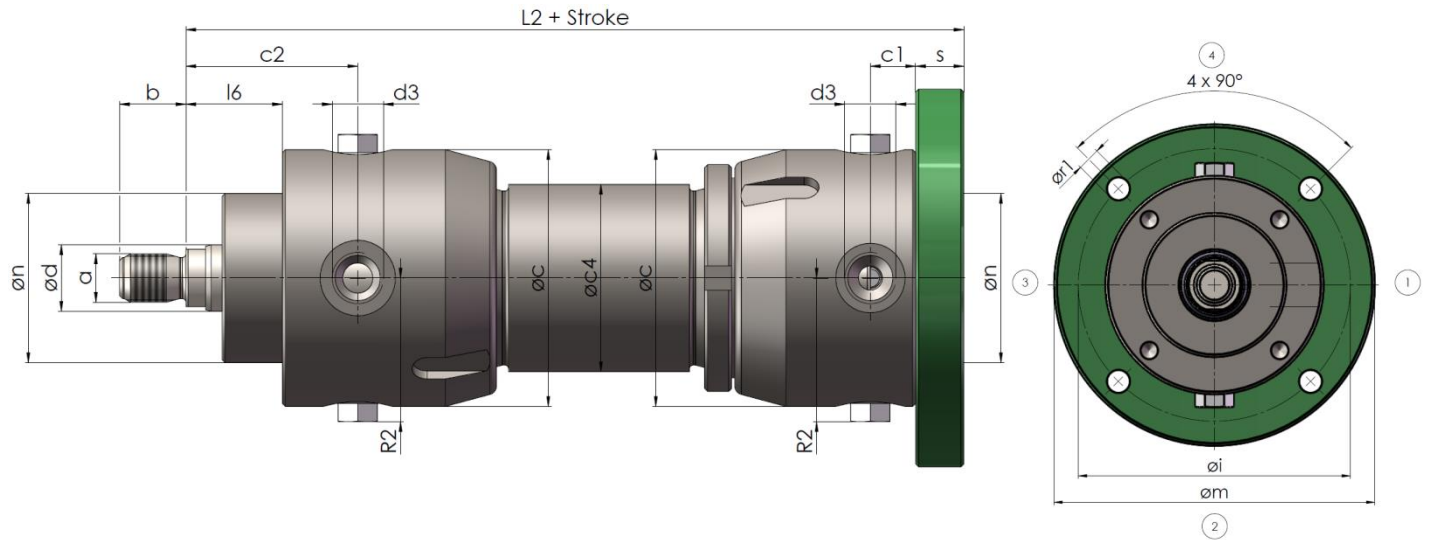


Piston- ϕ (mm)	Rod- ϕ d (mm)	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	L1 + Stroke	Pipe connection d3 Whitworth pipe thread / Metric thread	Rod thread a	b js15	ϕ c	c1	c2	ϕ c4	k	ϕ i js13	l14	ϕ m-1	ϕ n3 f8	ϕ r1 H13	R2 max	s	Minimum stroke ¹⁾
25	12 18	4,9	3,8	114	G1/4 M14x1,5	M10x1,25	14	55	12	44	33	3	72	20	85	60	6	37	10	22
32	14 22	8,0	6,5	124	G1/4 M14x1,5	M12x1,25	16	60	12	52	40	3	78	22	92	64	6,6	39	12	32
40	18 28	12,6	10,0	132	G3/8 M18x1,5	M14x1,5	18	75	15	54	50	3	96	24	110	78	6,6	47	14	47
50	22 36	19,6	15,8	142	G3/8 M18x1,5	M16x1,5	22	85	15	58	60	4	106	29	125	86	9	51	16	58
63	28 45	31,2	25,0	165	G1/2 M22x1,5	M20x1,5	28	100	19	70	75	4	132	33	155	106	11	58	20	79
80	36 56	50,2	40,1	175	G1/2 M22x1,5	M27x2	36	120	19	71	95	4	150	33	175	125	14	67	20	91
100	45 70	78,5	62,6	200	G3/4 M27x2	M33x2	45	145	22	86	115	5	175	41	205	146	18	73	25	121

¹⁾ Production-related minimum stroke. Shorter stroke lengths by using a spacer sleeve possible

Differential Cylinder ZBD 1001

Mounting type CB – Round flange at cylinder base

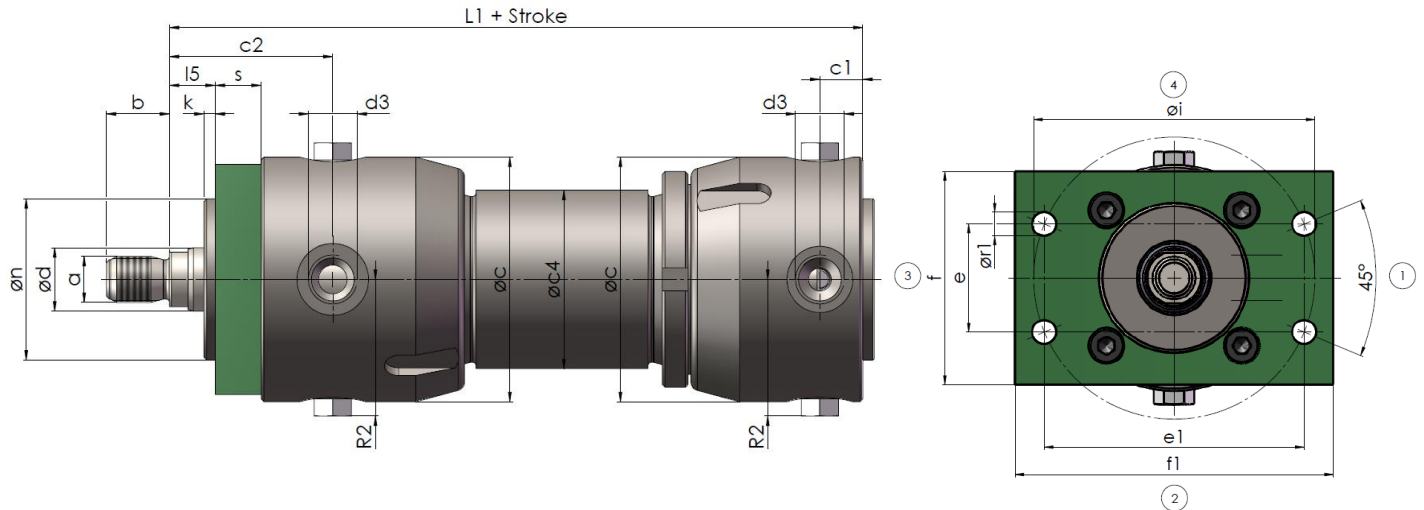


Piston-ø (mm)	Rod-ø d (mm)	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	L2 + Stroke	Pipe connection d3 Whitworth pipe thread / Metric thread	Rod thread a	b js15	ø c	c1	c2	ø c4	k	ø i js13	l6	ø m-1	ø n f8/H8	ø r1 H13	R2 max	s	Minimum stroke ¹⁾
25	12 18	4,9	3,8	124	G1/4 M14x1,5	M10x1,25	14	55	12	44	33	3	72	23	85	60	5,5	37	10	22
32	14 22	8,0	6,5	136	G1/4 M14x1,5	M12x1,25	16	60	12	52	40	3	78	25	92	64	6,6	39	12	32
40	18 28	12,6	10,0	146	G3/8 M18x1,5	M14x1,5	18	75	15	54	50	3	96	27	110	78	6,6	47	14	47
50	22 36	19,6	15,8	158	G3/8 M18x1,5	M16x1,5	22	85	15	58	60	4	106	33	125	86	9	51	16	58
63	28 45	31,2	25,0	185	G1/2 M22x1,5	M20x1,5	28	100	19	70	75	4	132	37	155	106	11	58	20	79
80	36 56	50,2	40,1	195	G1/2 M22x1,5	M27x2	36	120	19	71	95	4	150	37	175	125	14	67	20	91
100	45 70	78,5	62,6	225	G3/4 M27x2	M33x2	45	145	22	86	115	5	175	46	205	146	18	73	25	121

¹⁾ Production-related minimum stroke. Shorter stroke lengths by using a spacer sleeve possible

Differential Cylinder ZBD 1001

Mountring type CC – Rectangular on the cylinder head

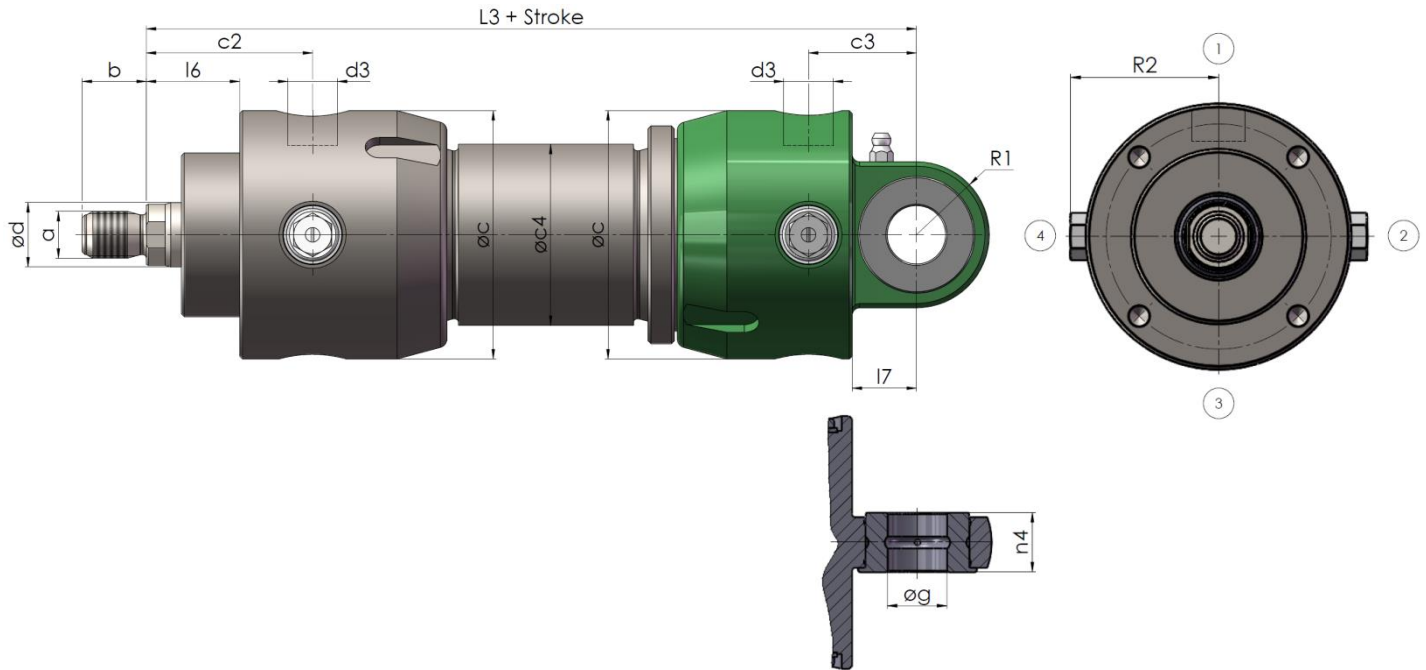


Piston-Ø (mm)	Rod-Ø d (mm)	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	L1 + Stroke	Pipe connection d3 Whitworth pipe thread / Metric thread	Rod thread a	b js15	Ø c	c1	c2	Ø c4	s	Ø i js13	l5	k	Ø n f8	Ø r1 H13	R2 max	e js13	e1 js13	f	f1	Minimum stroke ¹⁾
25	12 18	4,9	3,8	114	G1/4 M14x1,5	M10x1,25	14	55	12	44	33	10	72	13	3	30	5,5	37	27,5	66,5	55	80	22
32	14 22	8,0	6,5	124	G1/4 M14x1,5	M12x1,25	16	60	12	52	40	12	78	13	3	35	6,6	39	29,8	72,1	60	85	32
40	18 28	12,6	10,0	132	G3/8 M18x1,5	M14x1,5	18	75	15	54	50	14	96	13	3	45	6,6	47	36,7	88,7	70	105	47
50	22 36	19,6	15,8	142	G3/8 M18x1,5	M16x1,5	22	85	15	58	60	16	106	17	4	56	9	51	40,6	98	80	120	58
63	28 45	31,2	25,0	165	G1/2 M22x1,5	M20x1,5	28	100	19	70	75	20	132	17	4	63	11	58	50,5	121,9	100	145	79
80	36 56	50,2	40,1	175	G1/2 M22x1,5	M27x2	36	120	19	71	95	20	150	17	4	82	14	67	57,4	138,6	125	165	91
100	45 70	78,5	62,6	200	G3/4 M27x2	M33x2	45	145	22	86	115	25	175	21	5	100	18	73	67	161,7	150	190	121

¹⁾ Production-related minimum stroke. Shorter stroke lengths by using a spacer sleeve possible

Differential Cylinder ZBD 1001

Mounting type DA – Swivel eye at base



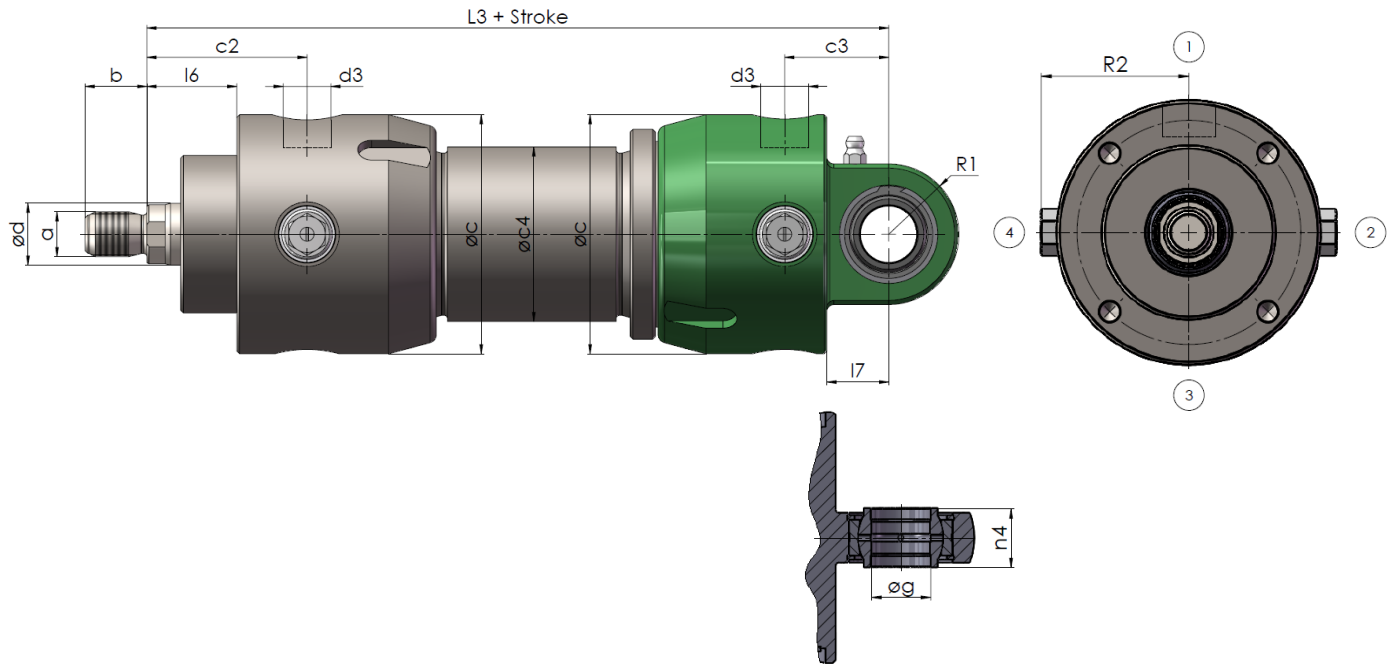
Piston-Ø (mm)	Rod-Ø d (mm)	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	L3 + Stroke	Pipe connection d3 Whitworth pipe thread / Metric thread	Rod thread a	b js15	Ø c	c2	c3	Ø c4	l6	l7	n4 h12	Øg H9	R1 max	R2 max	Minimum stroke ¹⁾
25 ²⁾	12 18	4,9	3,8	128	G1/4 M14x1,5	M10x1,25	14	55	44	26	33	23	14	10	10	14	37	22
32 ²⁾	14 22	8,0	6,5	140	G1/4 M14x1,5	M12x1,25	16	60	52	28	40	25	16	12	12	16	39	32
40	18 28	12,6	10,0	150	G3/8 M18x1,5	M14x1,5	18	75	54	33	50	27	18	16	16	20	47	47
50	22 36	19,6	15,8	164	G3/8 M18x1,5	M16x1,5	22	85	58	37	60	33	22	20	20	25	51	58
63	28 45	31,2	25,0	194	G1/2 M22x1,5	M20x1,5	28	100	70	48	75	37	29	25	25	32	58	79
80	36 56	50,2	40,1	208	G1/2 M22x1,5	M27x2	36	120	71	52	95	37	33	32	32	40	67	91
100	45 70	78,5	62,6	240	G3/4 M27x2	M33x2	45	145	86	62	115	46	40	40	40	50	73	121

¹⁾ Production-related minimum stroke. Shorter stroke lengths by using a spacer sleeve possible

²⁾ Without grease nipple

Differential Cylinder ZBD 1001

Mounting type DB – Spherical bearing at base



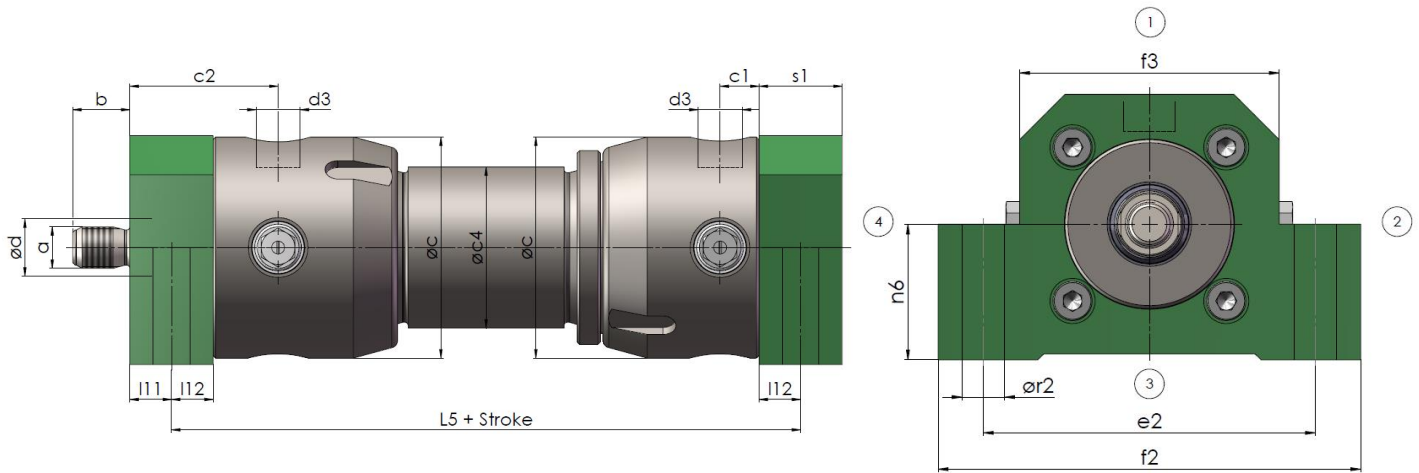
Piston- $\varnothing$ (mm)	Rod- $\varnothing$ d (mm)	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	L3 + Stroke	Pipe connection d3 Whitworth pipe thread / Metric thread	Rod thread a	b js15	$\varnothing$ c	c2	c3	$\varnothing$ c4	l6	l7	n4 h12	$\varnothing$ H7	R1 max	R2 max	Minimum stroke ¹⁾
25 ²⁾	12 18	4,9	3,8	128	G1/4 M14x1,5	M10x1,25	14	55	44	26	33	23	14	9	10	14	37	22
32 ²⁾	14 22	8,0	6,5	140	G1/4 M14x1,5	M12x1,25	16	60	52	28	40	25	16	12	12	16	39	32
40	18 28	12,6	10,0	150	G3/8 M18x1,5	M14x1,5	18	75	54	33	50	27	18	16	16	20	47	47
50	22 36	19,6	15,8	164	G3/8 M18x1,5	M16x1,5	22	85	58	37	60	33	22	20	20	25	51	58
63	28 45	31,2	25,0	194	G1/2 M22x1,5	M20x1,5	28	100	70	48	75	37	29	25	25	32	58	79
80	36 56	50,2	40,1	208	G1/2 M22x1,5	M27x2	36	120	71	52	95	37	33	32	32	40	67	91
100	45 70	78,5	62,6	240	G3/4 M27x2	M33x2	45	145	86	62	115	46	40	40	40	50	73	121

¹⁾ Production-related minimum stroke. Shorter stroke lengths by using a spacer sleeve possible

²⁾ Without grease nipple

Differential Cylinder ZBD 1001

Mounting type EA – Foot mounting



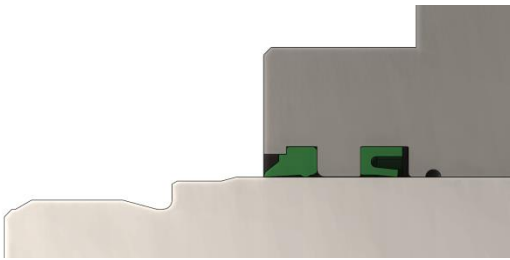
Piston-Ø (mm)	Rod-Ø d (mm)	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	L5 + Stroke	Pipe connection d3 Whitworth pipe thread / Metric thread	Rod thread a	b js15	Ø c	c1	c2	Ø c4	s1	l11	l12	f2	f3	e2 js13	n6	Ør2 H13	Minimum stroke ¹⁾
25	12 18	4,9	3,8	111	G1/4 M14x1,5	M10x1,25	14	55	12	44	33	20	13	10	80	52	68	30	6,6	22
32	14 22	8,0	6,5	119	G1/4 M14x1,5	M12x1,25	16	60	12	52	40	20	15	10	100	59	80	32	9	32
40	18 28	12,6	10,0	130	G3/8 M18x1,5	M14x1,5	18	75	15	54	50	25	14,5	12,5	120	74	95	40	11	47
50	22 36	19,6	15,8	141	G3/8 M18x1,5	M16x1,5	22	85	15	58	60	32	17	16	140	86	110	45	14	58
63	28 45	31,2	25,0	160	G1/2 M22x1,5	M20x1,5	28	100	19	70	75	32	21	16	170	101	140	55	16	79
80	36 56	50,2	40,1	173	G1/2 M22x1,5	M27x2	36	120	19	71	95	35	19,5	17,5	180	121	150	63	18	91
100	45 70	78,5	62,6	194	G3/4 M27x2	M33x2	45	145	22	86	115	40	26	20	232	150	195	75	22	121

¹⁾ Production-related minimum stroke. Shorter stroke lengths by using a spacer sleeve possible

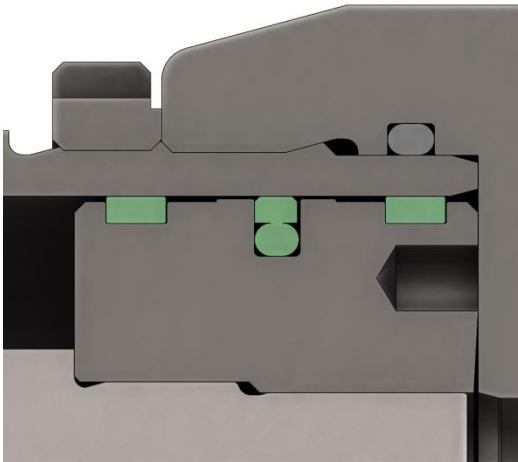
Differential Cylinder ZBD 1001

Seal variations – Schematic diagram

Rod seal

Code letter	Schematic diagram	Characteristic
P (Standard version)		U seal of perbunan (NBR) Temperature range: -40 °C to +100 °C Hydraulic fluid: Mineral oil Generally used in industry Minimum leakage
PV (Viton)		U seal of fluorelastomer rubber (FPM) Temperature range: -20 °C to +130 °C At higher operating temperatures and the HFC fluids

Piston seal

Code letter	Schematic diagram	Characteristic
G (Standard version)		Teflon seal with buna N o-ring seal Temperature range: -10 °C to +80 °C Hydraulic fluid: Mineral oil
GV (Viton)		Teflon seal with FPM o-ring Temperature range: -20 °C to +130 °C Hydraulic fluid: Mineral oil At higher operating temperatures and the HFC fluids

Differential Cylinder ZBD 1001

Model code:

ZBD 1001 - [] - [] - [] - [] - [] - [] - [] - [] - [] - []

Double-acting hydraulic cylinder

Nominal Pressure 100 bar (10 Mpa)
optionally with or without cushioning

Piston diameter in mm

Piston rod diameter in mm

Mounting type

- A Basic form
- B Trunnion (XV dimension to be stated when ordering)
- CA Round flange at head
- CAA Round flange on the cylinder head with rear centering
- CB Round flange at cylinder base
- CC Rectangular on the cylinder head
- CD Rectangular on the cylinder base
- DA Swivel eye at base
- DB Spherical bearing at base
- EA Foot mounting

Stroke in mm

Sealing variant

- PG Standard version, U seal / Teflon seal
- PVGV Viton version, U seal / Teflon seal

Cushioning

- 0 without
- 1 both sides
- 2 only on the cylinder head side
- 3 only on the cylinder base side

Surface of piston rod

- B Standard version, hard-chrome plated
- C Induction hardened and hard-chrom plated

Piston rod end

- 1 External thread

Material of piston rod

- C Standard version, structural steel / heat treatable steel
- N Stainless steel

Pipe connection

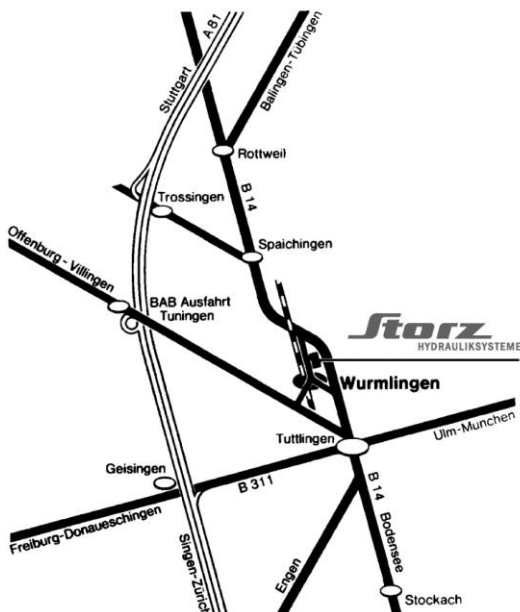
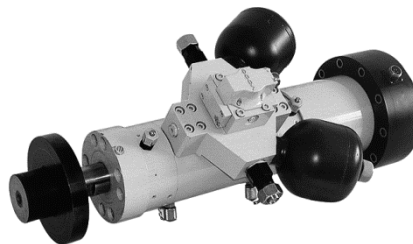
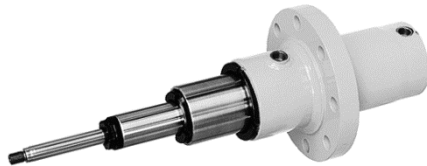
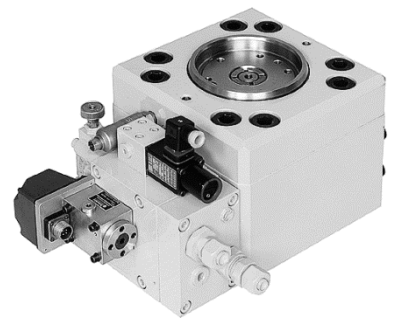
- G Standard version, Whitworth pipe thread
- M Metric thread

Construction Code

(to be assigned by the manufacturer)



Hydraulic cylinder standard
Hydraulic telescopic cylinders
Hydraulic cylinders with displacement encoder
Hydraulic adjustment cylinder
Testing cylinders
Special cylinders for all applications
Standardized mounting parts
Hydraulic power units and components



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