

ZBD 1605

Standard Hydraulic Cylinder



Description:

Standard hydraulic cylinder **ZBD 1605** (tie-rod design)
NP 160 bar (16MPa)
DIN 24 554, modified selection series from ISO 6020/2

The STORZ hydraulic cylinder series ZBD 1605 for a nominal pressure of 160 bar corresponds to DIN 24 554.

By defining the mounting dimensions, installation length, area ratios, piston rod ends and connection threads, international interchangeability of these hydraulic cylinders is ensured.

The same installation dimensions apply to cylinders with and without end position cushioning.

Two rod diameters are assigned as standard to each piston diameter (corresponding area ratios $\phi = 1,25$ and $\phi = 2$).

As standard, 5 standardized mounting types and 5 seal variants are available.

Technical data:

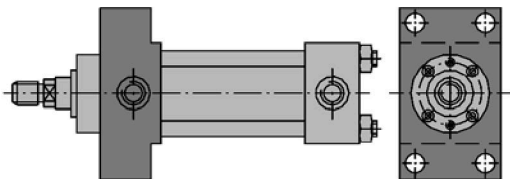
Nominal pressure	160 bar (16 MPa)
Static test pressure	240 bar (24 MPa)
Piston Ø	25 - 200 mm
Area ratio ϕ	1,25 and 2
Temperature range (of the hydraulic fluid) ϑ min. ... ϑ max.	- 10° ... + 80° C
Viscosity range v min. ... v max.	(10... 600) 10⁻⁶ m²/s
Stroke speed range u min. ... u max.	0 - 0,5 m/s or 0 - 1 m/s depending on seal variant. Higher speed on request.
Hydraulic fluid	Mineral oil according to DIN 51524 For HFA, HFB and also HFC and HFD fluids please consult us.



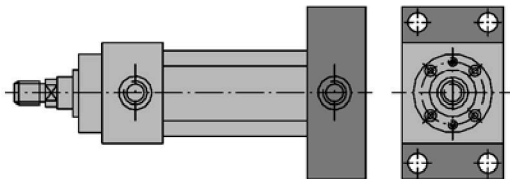
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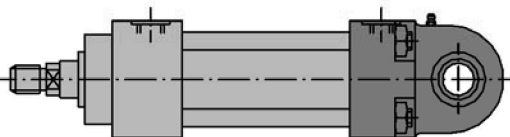
Available mounting types



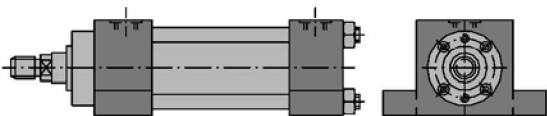
ME5 Rectangular flange at cylinder head 4



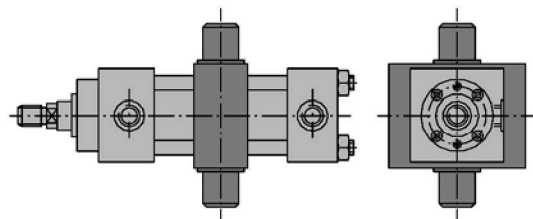
ME6 Rectangular flange at cylinder cap 5



MP5 Swivel eye at cylinder cap 6



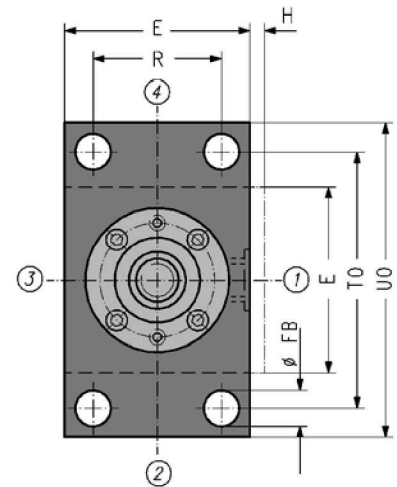
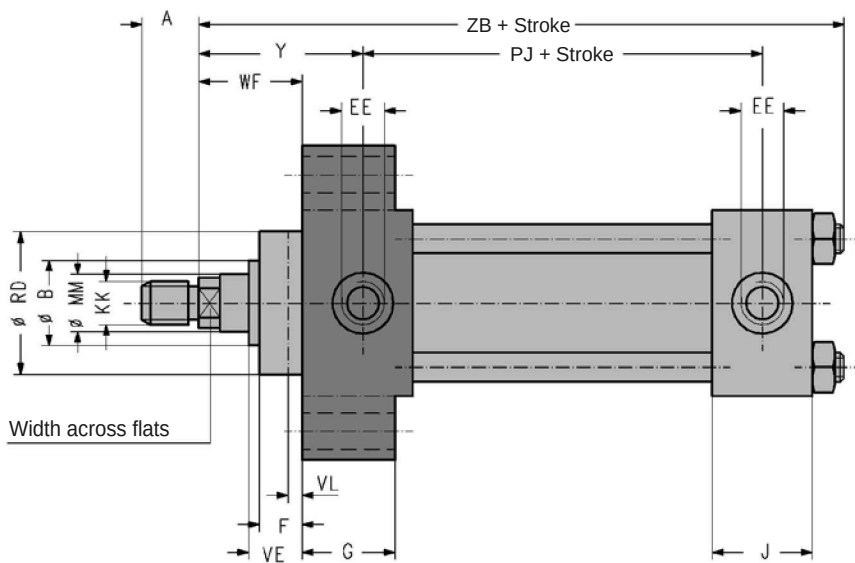
MS2 Side foot mounting 7



MT4 Trunnion, variable 8

further mounting types on request

Mounting type ME 5 rectangular flange at cylinder head



① ② ③ ④ side determination

Piston Ø (mm)	Rod Ø (mm) MM	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	ZB max + Stroke	Pipe connection EE Whitworth pipe thread	Rod thread KK	A _{h15}	Ø B _{max}	Ø RD _{f8}	VE _{max}	VL	E ¹⁾	F _{max}	Ø FB ^{H13}	G	H ²⁾	J	PJ ±1,25 + Stroke	R _{js13}	TO _{js13}	UO	WF ±2	Y ±2	Cushioning length	Width across flats
25	12 18	4,9	3,8 2,4	121	G 1/4	M 10 x 1,25	14	24 30	38 38	16	3	40	10	5,5	25	45	25	53	27	51	65	25	50	14 14	10 15
32	14 22	8,0	6,5 4,2	137	G 1/4	M 12 x 1,25	16	26 34	42 42	22	3	45	10	6,6	25	50	25	56	33	58	70	35	60	16 16	12 19
40	18 28	12,6	10,0 6,4	166	G 3/8	M 14 x 1,5	18	30 42	62 62	22	3	63	10	11	38	-	38	73	41	87	110	35	62	18 18	15 24
50	22 36	19,6	15,8 9,4	176	G 1/2	M 16 x 1,5	22	34 50	74 74	25	4	75	16	14	38	-	38	74	52	105	130	41	67	20 20	19 30
63	28 45	31,2	25,0 15,3	185	G 1/2	M 20 x 1,5	28	42 60	75 88	29	4	90	16	14	38	-	38	80	65	117	145	48	71	22 22	24 36
80	36 56	50,3	40,1 25,6	212	G 3/4	M 27 x 2	36	50 72	82 105	29	4	115	20	18	45	-	45	93	83	149	180	51	77	25 25	30 46
100	45 70	78,5	62,6 40,1	225	G 3/4	M 33 x 2	45	60 88	92 125	32	5	130	22	18	45	-	45	101	97	162	200	57	82	28 28	36 60
125	56 90	122,7	98,1 59,1	260	G 1	M 42 x 2	56	72 108	105 150	32	5	165	22	22	58	-	58	117	126	208	250	57	86	30 30	46 75
160	70 110	201,1	162,6 106,0	279	G 1	M 48 x 2	63	88 133	125 170	32	5	205	25	26	58	-	58	130	155	253	300	57	86	32 32	60 95
200	90 140	314,2	250,5 160,0	336	G 1 1/4	M 64 x 3	85	108 163	150 210	32	5	245	25	33	76	-	76	165	190	300	360	57	98	40 40	75 120

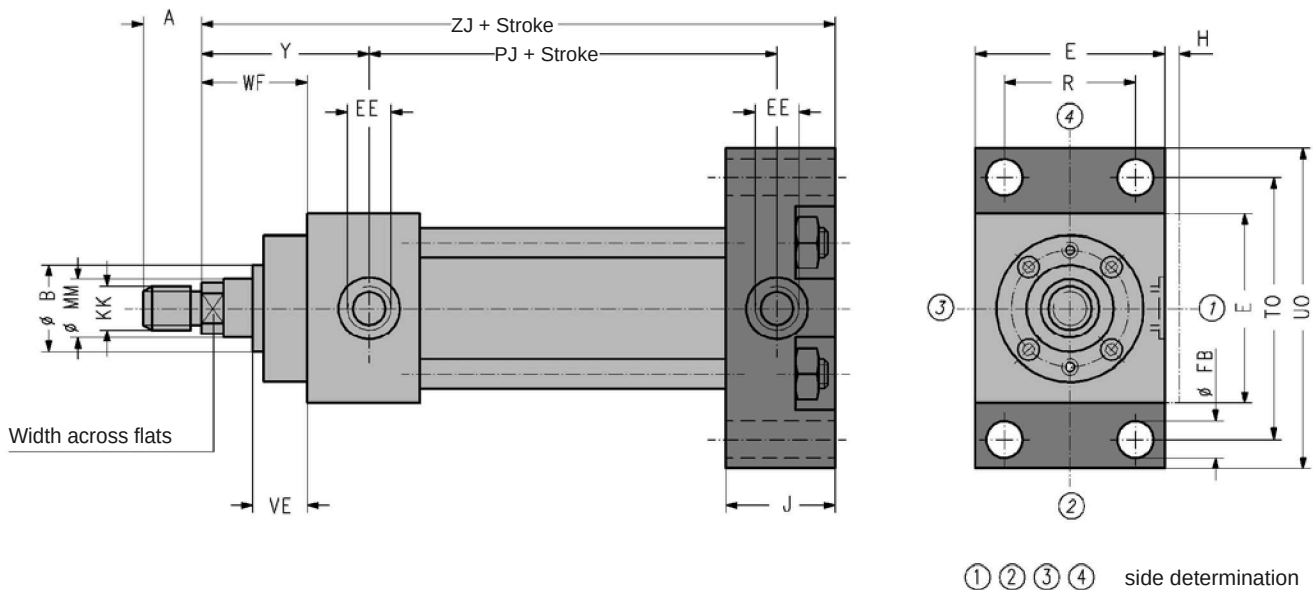
Remarks:

For all untoleranced dimensions in the dimension table, the tolerances according to DIN 7168, deviations and degree of accuracy coarse apply; for the exception see footnote 1). Stroke tolerance ≤1250 mm ^{+2/-0}. For hydraulic cylinders 25/18 and 32/22, consultation with the manufacturer is required for rod-side adjustable cushioning. All cylinders have a bleed screw at the head and cap end.

1) Tolerances according to DIN 7168 part 1 sg (very coarse).

2) Dimension H applies only to the cyl. head or head flange for piston Ø 25 and 32.

Mounting type ME 6 rectangular flange at cylinder cap



Piston Ø (mm)	Rod Ø (mm) MM	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	ZB _{max} + Stroke	Pipe connection EE Whitworth pipe thread	Rod thread KK	A _{h15}	Ø B _{max}	VE _{max}	E ¹⁾	Ø FB H ¹³	H ²⁾	J	PJ ±1,25 + Stroke	R _{js13}	TO _{js13}	UO	WF ±2	Y ±2	Cushioning length	Width across flats
25	12 18	4,9	3,8 2,4	114	G 1/4	M 10 x 1,25	14	24 30	16	40	5,5	45	25	53	27	51	65	25	50	14 14	10 15
32	14 22	8,0	6,5 4,2	128	G 1/4	M 12 x 1,25	16	26 34	22	45	6,6	50	25	56	33	58	70	35	60	16 16	12 19
40	18 28	12,6	10,0 6,4	153	G 3/8	M 14 x 1,5	18	30 42	22	63	11	-	38	73	41	87	110	35	62	18 18	15 24
50	22 36	19,6	15,8 9,4	159	G 1/2	M 16 x 1,5	22	34 50	25	75	14	-	38	74	52	105	130	41	67	20 20	19 30
63	28 45	31,2	25,0 15,3	168	G 1/2	M 20 x 1,5	28	42 60	29	90	14	-	38	80	65	117	145	48	71	22 22	24 36
80	36 56	50,3	40,1 25,6	190	G 3/4	M 27 x 2	36	50 72	29	115	18	-	45	93	83	149	180	51	77	25 25	30 46
100	45 70	78,5	62,6 40,1	203	G 3/4	M 33 x 2	45	60 88	32	130	18	-	45	101	97	162	200	57	82	28 28	36 60
125	56 90	122,7	98,1 59,1	232	G 1	M 42 x 2	56	72 108	32	165	22	-	58	117	126	208	250	57	86	30 30	46 75
160	70 110	201,1	162,6 106,0	245	G 1	M 48 x 2	63	88 133	32	205	26	-	58	130	155	253	300	57	86	32 32	60 95
200	90 140	314,2	250,5 160,0	299	G 1 1/4	M 64 x 3	85	108 163	32	245	33	-	76	165	190	300	360	57	98	40 40	75 120

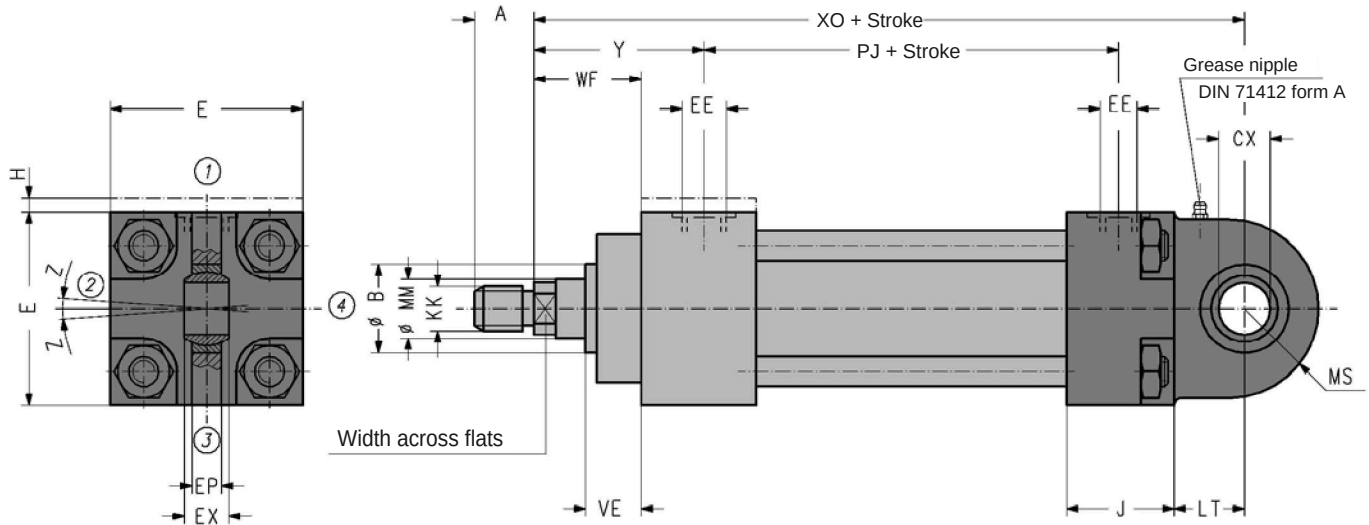
Remarks:

For all untoleranced dimensions in the dimension table, the tolerances according to DIN 7168, deviations and degree of accuracy coarse apply; for the exception see footnote 1). Stroke tolerance ≤1250 mm ⁻²/o. For hydraulic cylinders 25/18 and 32/22, consultation with the manufacturer is required for rod-side adjustable cushioning. All cylinders have a bleed screw at the head and cap end.

1) Tolerances according to DIN 7168 part 1 sg (very coarse).

2) Dimension H applies only to the cyl. head or head flange for piston Ø 25 and 32.

Mounting type MP 5 swivel eye at cylinder cap



① ② ③ ④ side determination

Piston Ø (mm)	Rod Ø (mm) MM	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	ZB _{max} + Stroke	Pipe connection EE Whitworth pipe thread	Rod thread KK	A _{h15}	Ø B _{max}	VE _{max}	Ø CX ¹⁾	E ²⁾	EP _{h15}	EX	H ³⁾	J	LT _{min}	MS _{max}	PJ ±1,25 + Stroke	WF ±2	Y ±2	Z _{min}	Cushioning length	Width across flats
25	12 18	4,9	3,8 2,4	130	G 1/4	M 10 x 1,25	14	24 30	16	12-0,008	40	8	10-0,12	45	25	16	20	53	25	50	3°	14 14	10 15
32	14 22	8,0	6,5 4,2	148	G 1/4	M 12 x 1,25	16	26 34	22	16-0,008	45	11	14-0,12	50	25	20	22,5	56	35	60	3°	16 16	12 19
40	18 28	12,6	10,0 6,4	178	G 3/8	M 14 x 1,5	18	30 42	22	20-0,012	63	13	16-0,12	-	38	25	29	73	35	62	3°	18 18	15 24
50	22 36	19,6	15,8 9,4	190	G 1/2	M 16 x 1,5	22	34 50	25	25-0,012	75	17	20-0,12	-	38	31	33	74	41	67	3°	20 20	19 30
63	28 45	31,2	25,0 15,3	206	G 1/2	M 20 x 1,5	28	42 60	29	30-0,012	90	19	22-0,12	-	38	38	40	80	48	71	3°	22 22	24 36
80	36 56	50,3	40,1 25,6	238	G 3/4	M 27 x 2	36	50 72	29	40-0,012	115	23	28-0,12	-	45	48	50	93	51	77	3°	25 25	30 46
100	45 70	78,5	62,6 40,1	261	G 3/4	M 33 x 2	45	60 88	32	50-0,012	130	30	35-0,12	-	45	58	62	101	57	82	3°	28 28	36 60
125	56 90	122,7	98,1 59,1	304	G 1	M 42 x 2	56	72 108	32	60-0,015	165	38	44-0,15	-	58	72	80	117	57	86	3°	30 30	46 75
160	70 110	201,1	162,6 106,0	337	G 1	M 48 x 2	63	88 133	32	80-0,015	205	47	55-0,15	-	58	92	100	130	57	86	3°	32 32	60 95
200	90 140	314,2	250,5 160,0	415	G 1 1/4	M 64 x 3	85	108 163	32	100-0,020	245	57	70-0,20	-	76	116	120	165	57	98	3°	40 40	75 120

Remarks:

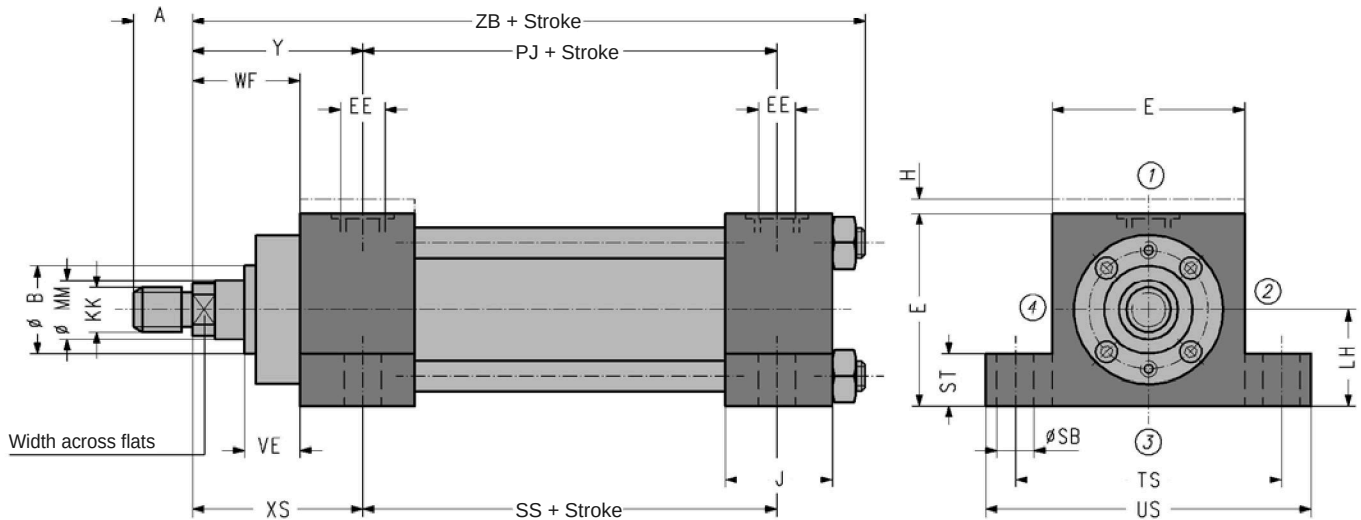
For all untoleranced dimensions in the dimension table, the tolerances according to DIN 7168, deviations and degree of accuracy coarse apply; for the exception see footnote 2). Stroke tolerance ≤1250 mm ⁻²/o. For hydraulic cylinders 25/18 and 32/22, consultation with the manufacturer is required for rod-side adjustable cushioning. All cylinders have a bleed screw at the head and cap end.

1) When using spherical bearings: tolerances (observe the manufacturers' specifications).

2) Tolerances according to DIN 7168 part 1 sg (very coarse).

3) Dimension H applies only to the cyl. head or head flange for piston Ø 25 and 32.

Mounting type MS 2 side foot mounting



① ② ③ ④ side determination

Piston Ø (mm)	Rod Ø (mm) MM	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	ZB max + Stroke	Pipe connection EE Whitworth pipe thread	Rod thread KK	A _{h15}	Ø B _{max}	VE max	E ¹⁾	H ²⁾	J	LH _{h10}	PJ ±1,25 + Stroke	Ø SB ^{H13}	SS ±1,25 + Stroke	ST	TS _{JS13}	US	WF ±2	XS ±2	Y ±2	Cushioning length	Width across flats
25	12 18	4,9	3,8 2,4	121	G 1/4	M 10 x 1,25	14	24 30	16	40	45	25	19	53	6,6	73	8,5	54	72	25	33	50	14 14	10 15
32	14 22	8,0	6,5 4,2	137	G 1/4	M 12 x 1,25	16	26 34	22	45	50	25	22	56	9	73	12,5	63	84	35	45	60	16 16	12 19
40	18 28	12,6	10,0 6,4	166	G 3/8	M 14 x 1,5	18	30 42	22	63	-	38	31	73	11	98	12,5	83	103	35	45	62	18 18	15 24
50	22 36	19,6	15,8 9,4	176	G 1/2	M 16 x 1,5	22	34 50	25	75	-	38	37	74	14	92	19	102	127	41	54	67	20 20	19 30
63	28 45	31,2	25,0 15,3	185	G 1/2	M 20 x 1,5	28	42 60	29	90	-	38	44	80	18	86	26	124	161	48	65	71	22 22	24 36
80	36 56	50,3	40,1 25,6	212	G 3/4	M 27 x 2	36	50 72	29	115	-	45	57	93	18	105	26	149	186	51	68	77	25 25	30 46
100	45 70	78,5	62,6 40,1	225	G 3/4	M 33 x 2	45	60 88	32	130	-	45	63	101	26	102	32	172	216	57	79	82	28 28	36 60
125	56 90	122,7	98,1 59,1	260	G 1	M 42 x 2	56	72 108	32	165	-	58	82	117	26	131	32	210	254	57	79	86	30 30	46 75
160	70 110	201,1	162,6 106,0	279	G 1	M 48 x 2	63	88 133	32	205	-	58	101	130	33	130	38	260	318	57	86	86	32 32	60 95
200	90 140	314,2	250,5 160,0	336	G 1 1/4	M 64 x 3	85	108 163	32	245	-	76	122	165	39	172	44	311	381	57	92	98	40 40	75 120

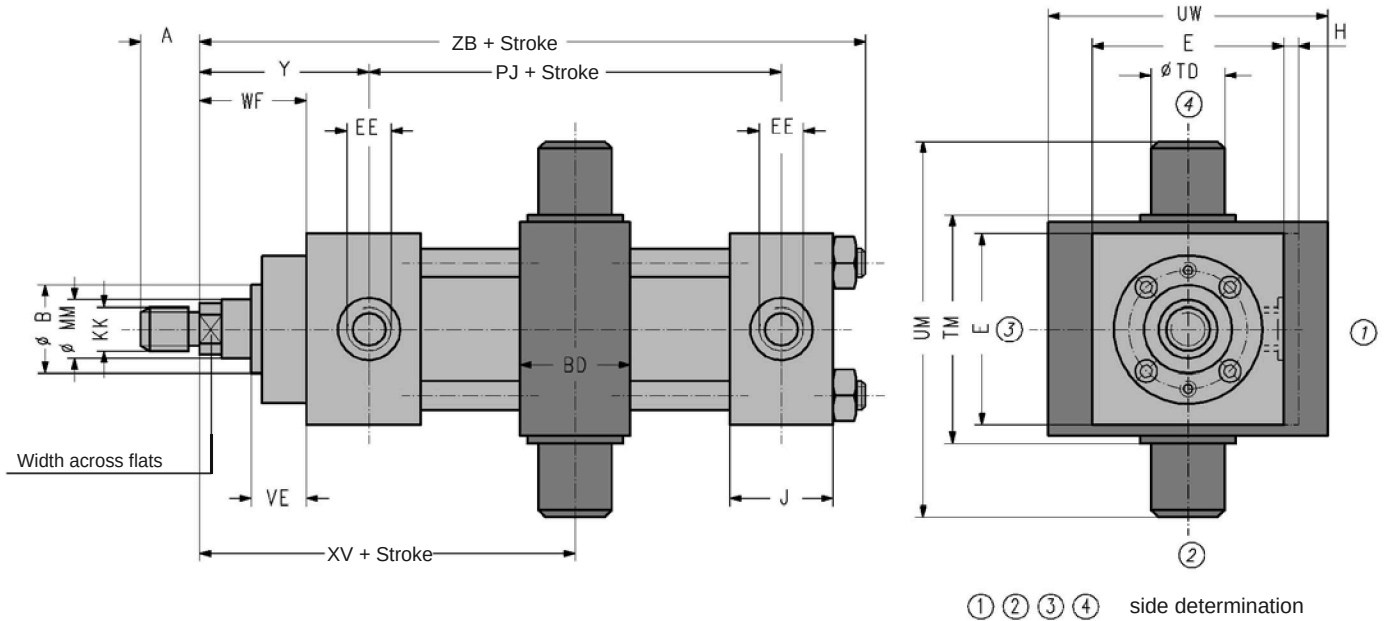
Remarks:

For all untoleranced dimensions in the dimension table, the tolerances according to DIN 7168, deviations and degree of accuracy coarse apply; for the exception see footnote 1). Stroke tolerance ≤1250 mm ^{+2/-0}. For hydraulic cylinders 25/18 and 32/22, consultation with the manufacturer is required for rod-side adjustable cushioning. All cylinders have a bleed screw at the head and cap end.

1) Tolerances according to DIN 7168 part 1 sg (very coarse).

2) Dimension H applies only to the cyl. head or head flange for piston Ø 25 and 32.

Mounting type MT 4 trunnion, variable



Piston Ø (mm)	Rod Ø (mm) MM	Piston area A ₁ (cm ²)	Annular area A ₂ (cm ²)	ZB max + Stroke	Pipe connection EE Whitworth pipe thread	Rod thread KK	A _{h15}	Ø B _{max}	VE _{max}	BD _{max} ¹⁾	E _{max} ²⁾	H ⁴⁾	J	PJ ±1,25 + Stroke	Ø TD _{f8}	TM _{h14}	UM	UW _{max}	WF ±2	XV ±2 ³⁾	Y ±2	Cushioning length	Width across flats	Minimum stroke
25	12 18	4,9	3,8 2,4	121	G 1/4	M 10 x 1,25	14	24 30	16	20	40	45	25	53	12	48	68	63	25		50	14 14	10 15	10
32	14 22	8,0	6,5 4,2	137	G 1/4	M 12 x 1,25	16	26 34	22	25	45	50	25	56	16	55	79	75	35		60	16 16	12 19	14
40	18 28	12,6	10,0 6,4	166	G 3/8	M 14 x 1,5	18	30 42	22	30	63	-	38	73	20	76	108	92	35		62	18 18	15 24	19
50	22 36	19,6	15,8 9,4	176	G 1/2	M 16 x 1,5	22	34 50	25	40	75	-	38	74	25	89	129	112	41		67	20 20	19 30	27
63	28 45	31,2	25,0 15,3	185	G 1/2	M 20 x 1,5	28	42 60	29	50	90	-	38	80	32	100	150	126	48	variabel	71	22 22	24 36	41
80	36 56	50,3	40,1 25,6	212	G 3/4	M 27 x 2	36	50 72	29	60	115	-	45	93	40	127	191	160	51		77	25 25	30 46	48
100	45 70	78,5	62,6 40,1	225	G 3/4	M 33 x 2	45	60 88	32	70	130	-	45	101	50	140	220	180	57		82	28 28	36 60	51
125	56 90	122,7	98,1 59,1	260	G 1	M 42 x 2	56	72 108	32	90	165	-	58	117	63	178	278	215	57		86	30 30	46 75	71
160	70 110	201,1	162,6 106,0	279	G 1	M 48 x 2	63	88 133	32	110	205	-	58	130	80	215	341	260	57		86	32 32	60 95	94
200	90 140	314,2	250,5 160,0	336	G 1 1/4	M 64 x 3	85	108 163	32	130	245	-	76	165	100	279	439	355	57		98	40 40	75 120	96

Remarks:

For all untoleranced dimensions in the dimension table, the tolerances according to DIN 7168, deviations and degree of accuracy coarse apply; for the exception see footnote 2). Stroke tolerance ≤1250 mm ^{+2/-0}. For hydraulic cylinders 25/18 and 32/22, consultation with the manufacturer is required for rod-side adjustable cushioning. All cylinders have a bleed screw at the head and cap end.

1) These identification letters were defined in accordance with ISO 6099.

2) Tolerances according to DIN 7168 part 1 sg (very coarse).

3) The desired XV value must be stated when ordering. Tolerance + 2.

4) Dimension H applies only to the cyl. head or head flange for piston Ø 25 and 32.

Buckling load diagram

Determination of the permissible

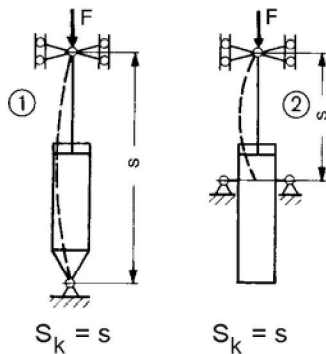
buckling load F_k perm.

1. Determine buckling length S_k from clamping case (1) (6) and clamping length s .
2. Using S_k , rod diameter d and the grid chart, determine the permissible buckling load (safety factor in the elastic range is $s = 4$).

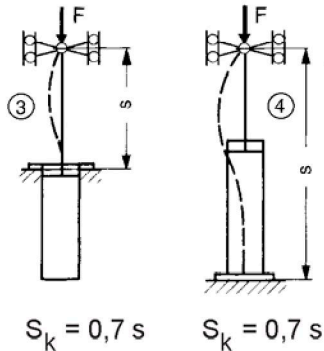
Example (see grid chart)

Clamping case (3) $s = 1200$ mm (from the dimension drawing of the cylinder)
 $S_k = 0,7 s$ (see clamping case (3))
 $= 840$ mm
 From the grid chart: F_k perm. $= 22000$ N

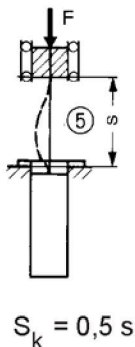
Euler case 2



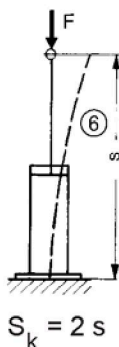
Euler case 3



Euler case 4



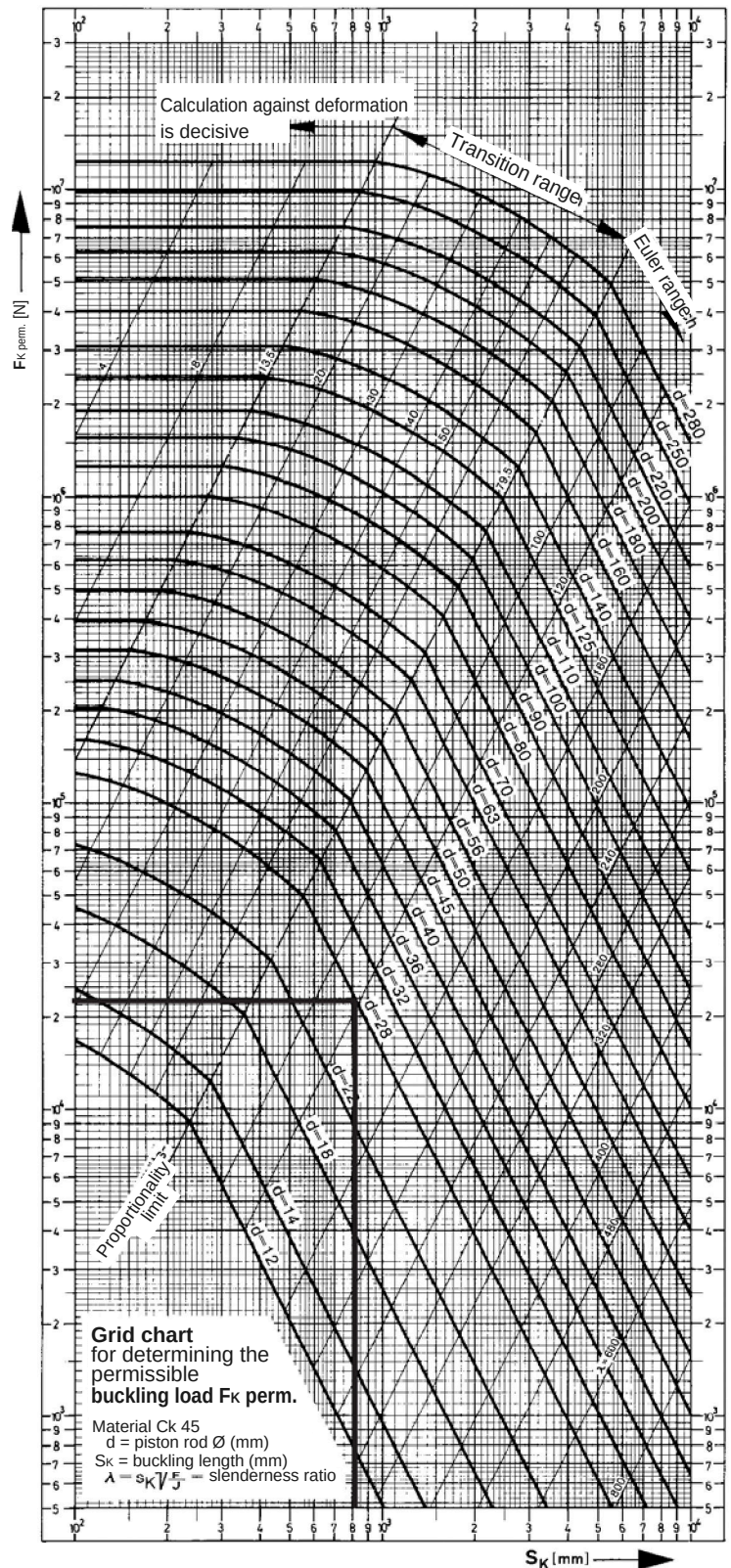
Euler case 1



Determination of the buckling length S_k

for the different clamping cases.

Explanation: The buckling length S_k is the length of that imaginary bar, pivoted at both ends, which for identical cross-sectional dimensions has the same ideal buckling load as the bar under investigation.



Buckling load diagram applies only to vertical cylinder installation and centrally applied force (without bending moments or lateral forces)!

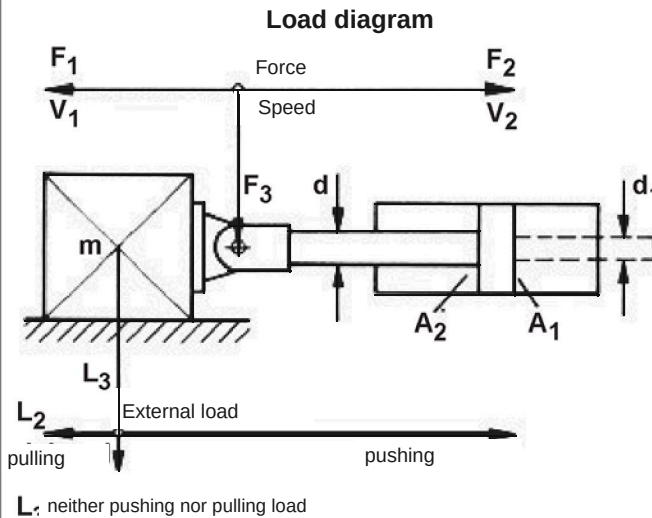
ZBD 1605 -		/	-	-	-											Additional specifications
Double-acting hydraulic cylinder																
Nominal pressure 160 bar (16 MPa) optionally with or without end position cushioning Installation dimensions according to DIN 24 554																
Piston diameter in mm																
Piston rod diameter in mm																
Mounting types																
ME 5	Rectangular flange at cylinder head															
ME 6	Rectangular flange at cylinder cap															
MP 5	Swivel eye at cylinder cap															
MS 2	Side foot mounting															
MT 4	Trunnion															
Cylinder stroke in mm																
Rod seal																
R	U-cup seal (material polyurethane AU) Standard version															
K	U-cup seal (material Perbunan NBR)															
KV	U-cup seal (material Viton)															
Piston seal																
G	Teflon seal Standard version															
H	Compact seal															
GV	Teflon seal (Viton version)															
End position cushioning																
0	without															
1	both ends															
2	head end only															
3	cap end only															
Piston rod surface																
C	induction-hardened and hard chrome-plated															
Piston rod end																
1	External thread															
2																
3	Special version (marked by additional specifications)															
Piston rod material																
C	tempered steel															
Pipe connection																
G	Whitworth pipe thread (preferably)															
M	Metric ISO thread (on request)															
Version code (specified by the manufacturer)																
Additional specifications																

Type: ZBD 1605 - 80/36 - ME5 - 200 - R G 1 C 1 C G.

Requirements list for hydraulic cylinders

Customer address		Telephone/Fax	
.....		Contact person	
.....		Department	

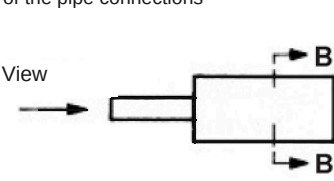
Load diagram



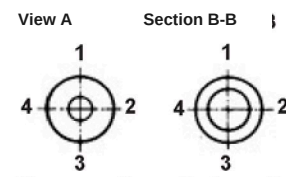
L_2 neither pushing nor pulling load

13	Required cylinder forces	F_1	N
		F_2	N
14	max. Side force	F_3	N
15	Switching frequency	Double strokes per min.	
		Double strokes per sec.	
16	min. + max. Amplitude (α_{min} ; α_{max}) + associated frequency (f)	$\alpha_{min} + f$	
		$\alpha_{max} + f$	
17	Moving mass		kg
18	Temperature range of hydraulic fluid $\vartheta_{min} \dots \vartheta_{max}$	°C	
	Ambient temperature range $\vartheta_{min} \dots \vartheta_{max}$	°C	

desired radial position of the pipe connections



View A Section B-B



Rod side Cap end

19	Size of pipe connections	Cap end	Rod side
20	Piston rod material	Standard	Stainless
21	Painting	Standard	without
		Special	

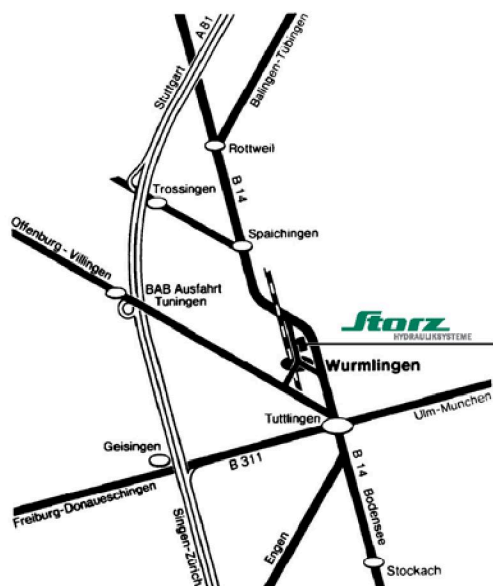
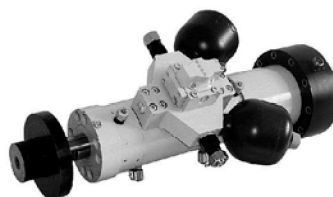
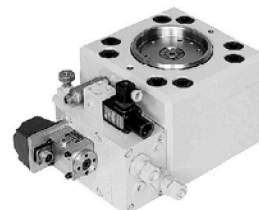
Cylinder data					
1	Operating pressure	min	bar		
		max	bar		
2	Piston Ø	D	mm		
		d	mm		
3	Rod Ø	d	mm		
		d ₁	mm		
4	Mounting type				
5	Stroke	S	mm		
6	Stroke speed max.	V_{1max}	m/s		
		V_{2max}	m/s		
7	Hydraulic fluid				
8	Rod seal Wiper				
9	Piston seal				
10	Piston rod end				
11	Air bleed	yes		M 8x1	no
				R 1/4"	
12	End position cushioning		Cap end		
			Rod side ite		

Accessories		
End positions		
Position feedback		
Clamping head		
Position measuring system with indication of the Pos. accuracy	inductive	yes no
	digital	yes no
	Ultrasonic	yes no
	potentiometric	yes no
	capacitive	yes no
		
Remarks and notes on the application or special requests please with date and signature!		

Product range



Hydraulic cylinders to DIN/ISO
Hydraulic standard cylinders
Hydraulic telescopic cylinders
Hydraulic cylinders with position measuring systems
Test-machine cylinders
Special cylinders for all applications
Standardized mounting parts
Hydraulic power units and components
Plant engineering



Storz
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