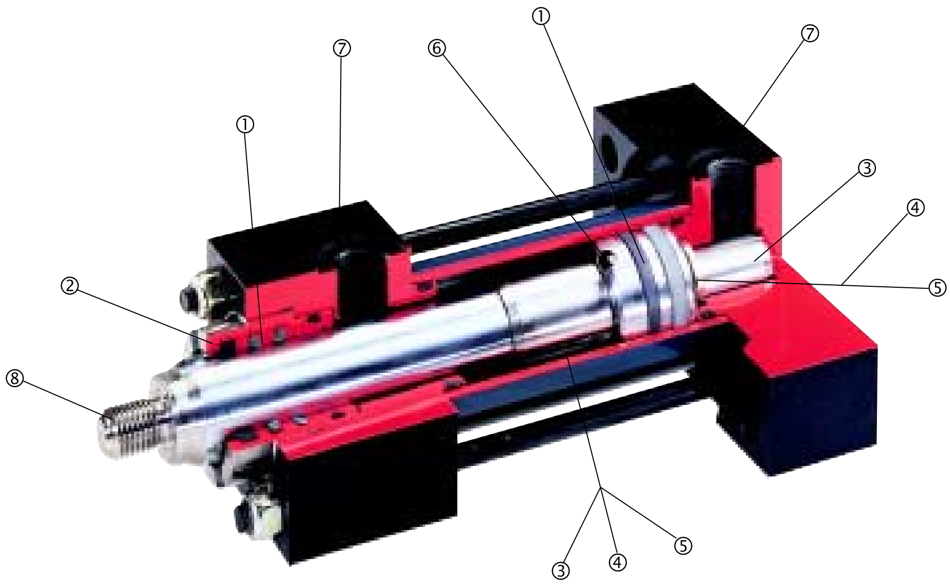
Compact Model H 160 CA

Hydraulic Cylinders

BOSCH

Automation Technology



① Standard version PU or PP seals Chamfering for seal mounting according to ISO 7425/1 (PU and PP), ISO 6195 C and ISO 5597 (PU)

② Screw-on sealing ring, for ø > 32, simple to install and remove

③ Progressive cushioning, high cushioning energy, cushioning length self-optimizing to suit working conditions

④ Floating cushioning rings: long life

⑤ Non-return valve with large orifice for rapid starting

⑥ Mechanical retention of piston on rod

⑦ Counterbores according to DIN 3852/ CNOMO E051180N

⑧ Protected thread on piston rod

- Bottom-out velocity self-adjusting no adjusting screw required
- Captive bleed screws, ø > 32 standard

Contents:

Note:

Our product range also includes further cylinder types

- H 160 M ISO
- C 80 H
- A 60 H
- VBH
- H 250 E.

For Catalogs and product information, see documentation list BEY 000/1 1 987 760 051.

For variant standard cylinders and special cylinders, please refer to BVY 015/4.

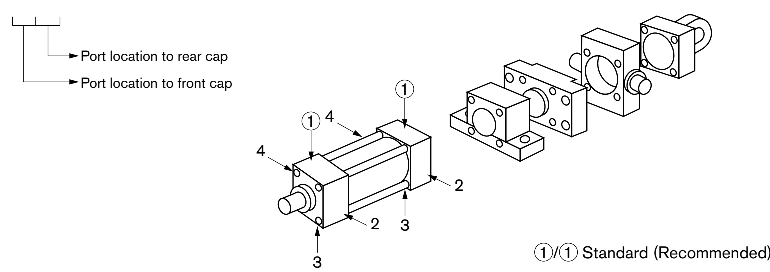
Ordering Code

Ordering code ➔	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
➔ Ordering example ➔	**H 160 CA**	63 × 28		MT4	N	PU	PU	3	G	250	S	A	11	140	I07

1	Series	**H 160 CA**	Hydraulic Cylinders 160 bar Compact Series									
2	ø Bore	└┴┴┘	25	32	40	50	63	80	100	125	160	200
3	ø Rod	└┴┴┘	12	14	18	22	28	36	45	56	70	90
			18	22	28	36	45	56	70	90	110	140

4	Mounting devices	**Single Rod**	**Double Rod**, ISO standard in preparation		NFE 48-106 DIN 24-554 ISO 6020/2
		ME5	**MDE5**	Front flange	
		ME6	–	Rear flange	
		MP5	–	Spherical bearing	
		MS2	MDS2	Side foot mounting	
		MT4	MDT4	Center trunnion	
		MX5	**MDX5**	Front cap tapped	NFE 47-016

5	Temperature range	**N**	Normal temperature, standard with PU
		V	High temperature or low friction, standard with PP
6	Piston seals	**PU**	Polyurethane, N version
		PP	PTFE and Viton, V version
7	Rod seals	**PU**	Polyurethane, N version
		PP	PTFE and Viton, V version
8	Cushioning	**O**	Without cushioning
		3	Cushioning at both ends
		4	Low energy cushioning, P max <70bar, D=< 125
9	Port type	**G**	BSP
		GS	Oversized BSPP
10	Stroke*		Please indicate in Full mm; >2700 mm only with factory approval
11	Stop Tube for long stroke	**E=-.-.-.**	With stop tube (except ø=25×12 and 32×14)
		S	Without stop tube
12	Rod end	**A**	Standard thread on rod end
		C	Thread with rod eye and spherical bearing
		T	Tenon
		SP	Special (use Intervention Form, – Consult Factory)
13	Port locations	└┴┘	



Possibilities:

Mounting	Front Cap	Rear Cap
MT1	1 or 3	1,2,3 or 4
MT2	1,2,3 or 4	1 or 3
MS2	1	1
ME5-ME6-MP5-MT4-MX5	1,2,3 or 4	1,2,3 or 4

14	Length XV (MT 4)	└┴┴┴┴┘	In full lengths for mounting MT4
15	Options (consult factory)	**RF-.-**	Gland drains, see page 27
		I..	Interventions, Consult Factory

* When stop tube is used indicate □ of effective stroke plus the length of the stop tube.

Specifications

Specifications											
Standard		ISO 6020 / 2, DIN 24554, NFE 48.016									
Type		Tie Rods									
Working pressure		maximum 160 bar (2300 psi) dynamic for high endurance life, see page 26. Recommended minimum pressure 15 bar (215 psi); lower or higher pressures: consult factory.									
Maximum peak pressure		240 bar (3500 psi)									
Mounting position		Unrestricted									
Ambient temperature		-20°C… + 80°C for N type seals									
		-20°C… + 160°C for V type seals									
Fluids		Mineral oil, such as Mobil DTE 25 or equivalent,other fluids on request									
Fluid viscosity		12…90mm²/s									
Fluid temperature		-20°C… + 80°C for N type seals									
		-20°C… + 160°C for V type seals									
Filtration	PU	Contamination equivalent to class 9–10 to be met with filter $\beta_{25} = 75$									
	PP	Contamination equivalent to class 7–8 obtained with filtration $\beta_{10} = 75$									
Rod and piston seals		see ordering code, page 2									
ø Bore [mm]		25	32	40	50	63	80	100	125	160	200
ø Rod [mm]		12 | 18	14 | 22	18 | 28	22 | 36	28 | 45	36 | 56	45 | 70	56 | 90	70 | 110	90 | 140
Min, stroke (mm)	w/o	–	–	–	–	–	–	–	–	–	–
cushioning	with	18	18	25	25	27	30	30	30	30	35
ME5, MS2, MX5 Recommended max. stroke		300	380	480	600	750	800	1000	1250	1280	1400
ME6, MP5, MT4		200	250	320	400	500	530	660	830	850	930
Factor W for max. rad. force. (Nmm)		625	625	1890	2950	4960	7375	14000	22050	43550	68800
Stroke tolerance		0/+2 mm (accordingto ISO 8131), for lesser tolerances consult factory,									
Speed max.	PU 160 bar	0.50 m/s			0.40 m/s			0.25 m/s			
	PU 100 bar	0.70 m/s			0.60 m/s			0.35 m/s			
	PP 160 bar	1.00 m/s			0.80 m/s			0.50 m/s			
Speed min.	PU	0.030 m/s									
recommended	PP	0.001 m/s									
Stroke end speed	cush.3	20 mm/s			15 mm/s			10 mm/s			
max. piston /cap	cush.4	50 mm/s			40 mm/s			30 mm/s		–	
Counterboring at ports		according to DIN 3852, ISO 1179-1									

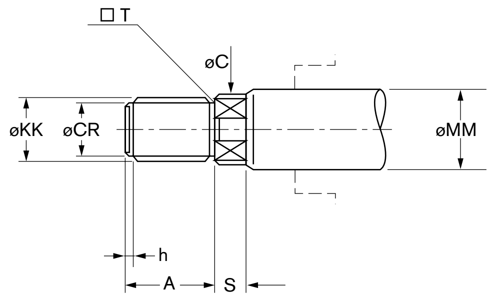
	Fluid compatibility – Seal material		
Seal–Material	Mineral oil HM–HV	HFC*	HFD
PU	+++	–	++
FPM	+++	++	+++
PTFE	+++	+++	+++
	+++ = excellant ++ = good	+ = acceptable	– = not acceptable

* For applications in excess of >50° consult factory

Dimensions

Rod end detail

Thread



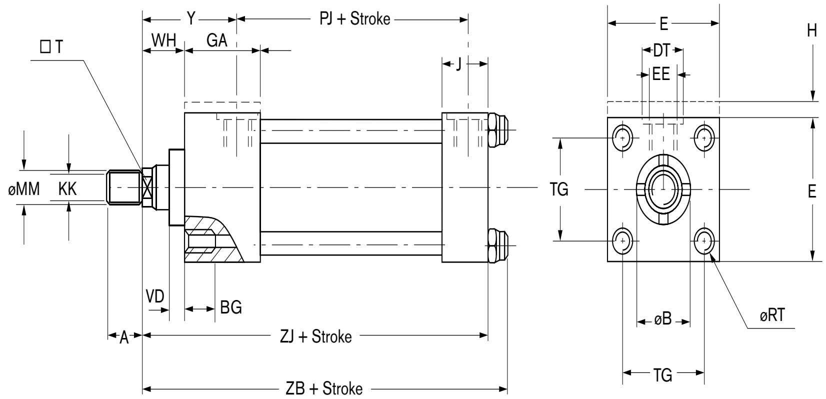
ø Bore	ø MM	ø KK	A	ø C	□ T	S	h	ø CR
25	12	M 10× 1.25	14				1	7.5
	18			15	13	5		
32	14	M 12 × 1.25	16				2.5	9.5
	22			19	17	5		
40	18	M 14 × 1.5	18	15	13	5	2	11
	28			25	22	5		
50	22	M 16 × 1.5	22	19	17	5	3	13
	36			33	30	8		
63	28	M 20 × 1.5	28	25	22	7	3	17
	45			42	36	10		
80	36	M 27 × 2	36	33	30	8	3	23.5
	56			53	46	10		
100	45	M 33 × 2	45	42	36	10	4	29.5
	70			67	60	15		
125	56	M42 × 2	56	53	46	10	5	38.5
	90			86	75	15		
160	70	M 48 × 2	63	67	60	15	3	44.5
	110			106	92	18		
200	90	M 64 × 3	85	86	75	15	4.5	59
	140			136	125	18		

Basic dimensions

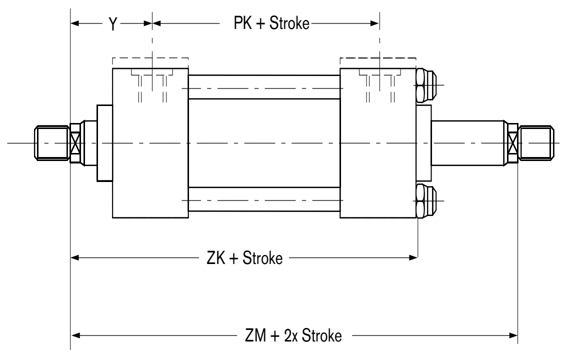
ø Bore	ø MM	ø KK	A	ø B f9	GA	J	WH ±2	□ T	ø EE	ø DT*
25	12	M 10× 1.25	14	24	46.5	22.5	15		G 1/4	25
	18			30				13		
32	14	M 12 × 1.25	16	26	46.5	23.5	25		G 1/4	25
	22			34				17		
40	18	M 14 × 1.5	18	30	52	33	25	13	G 3/8	28
	28			42				22		
50	22	M 16 × 1.5	22	34	57.8	33.8	25	17	G 1/2	34
	36			50				30		
63	28	M 20 × 1.5	28	42	55.8	33.8	32	22	G 1/2	34
	45			60				36		
80	36	M 27 × 2	36	50	65	39	31	30	G 3/4	42
	56			72				46		
100	45	M 33 × 2	45	60	67	40	35	36	G 3/4	42
	70			88				60		
125	56	M42 × 2	56	72	73.5	51.5	35	46	G 1	47
	90			108				75		
160	70	M 48 × 2	63	88	80.5	55.5	32	60	G 1	47
	110			133				92		
200	90	M 64 × 3	85	108	101	76	32	75	G 1 1/4	58
	140			163				125		

Dimensions

H 160 CA … MX 5



MDX 5



Tolerance to ISO 8131

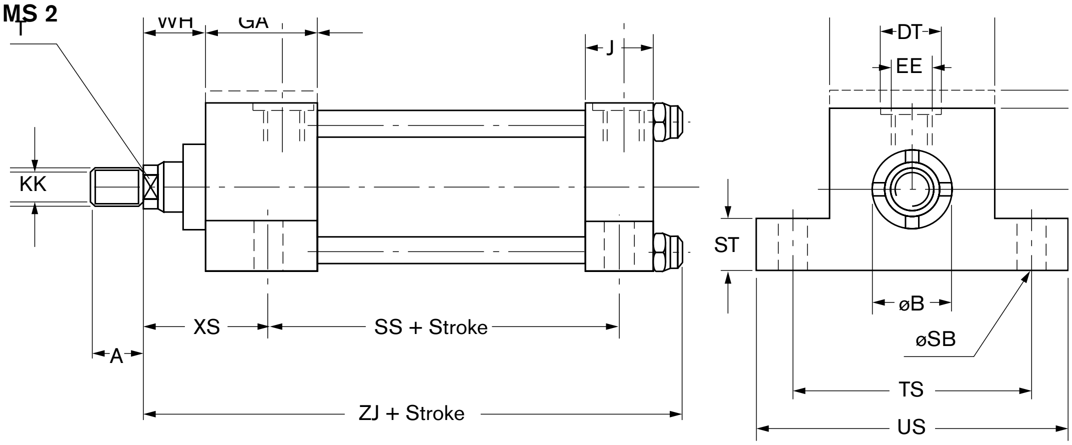
Location of bleed-screws
see page 13

ø Bore	E	H	Y ± 2	PJ ± 1.25	BG min	ø RT	TG	VD	ZJ ± 1	ZB	PK ± 1.25	ZK ± 1	ZM ± 2	Stroke max
25	40 $^{+2}$	5	50	53	8	M 5 × 0.8	28.3	6	114	121	54	139	154	250
32	45 $^{+2}$	5	60	56	9	M 6 × 1	33.2	12	128	137	58	153	178	300
40	63 $^{+2}$	–	62	73	12	M 8 × 1.25	41.7	12 12	153	166	71	170	195	400
50	75 $^{+2}$	–	67	74	18	M 12 × 1.75	52.3	9 9	159	176	73	182	207	500
63	90 $^{+2}$	–	71	80	18	M 12 × 1.75	64.3	13 13	168	185	81	191	223	600
80	115 $^{+3}$	–	82	101	24	M 16 × 2	82.7	9 9	190	212	92	215	246	700
100	130 $^{+3}$	–	82	101	24	M 16 × 2	96.9	10 10	203	225	101	230	265	800
125	165 $^{+3}$	–	86	117	27	M 22 × 2.5	125.9	9 7	232	260	117	254	289	1000
160	205 $^{+3}$	–	86	130	32	M 27 × 3	154.9	7 7	245	279	130	270	302	1100
200	245 $^{+3}$	–	98	165	40	M 30 × 3.5	190.2	7 7	299	336	160	324	356	1250

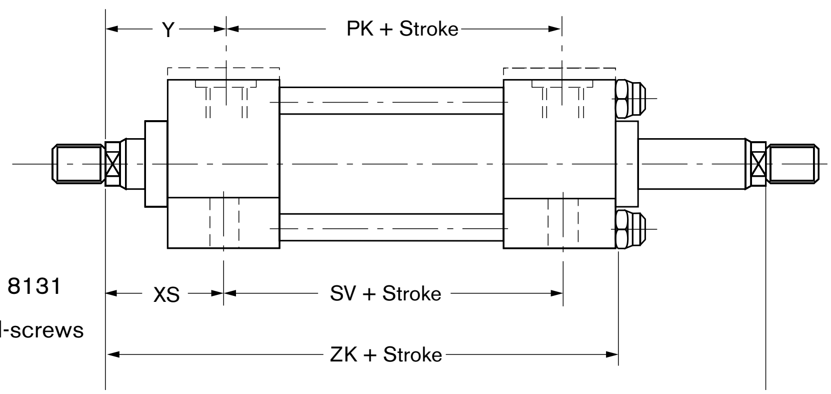
See page 4 for dimensions not stated here.

Dimensions

H 160 CA … MS 2



MDS 2



Tolerance to ISO 8131

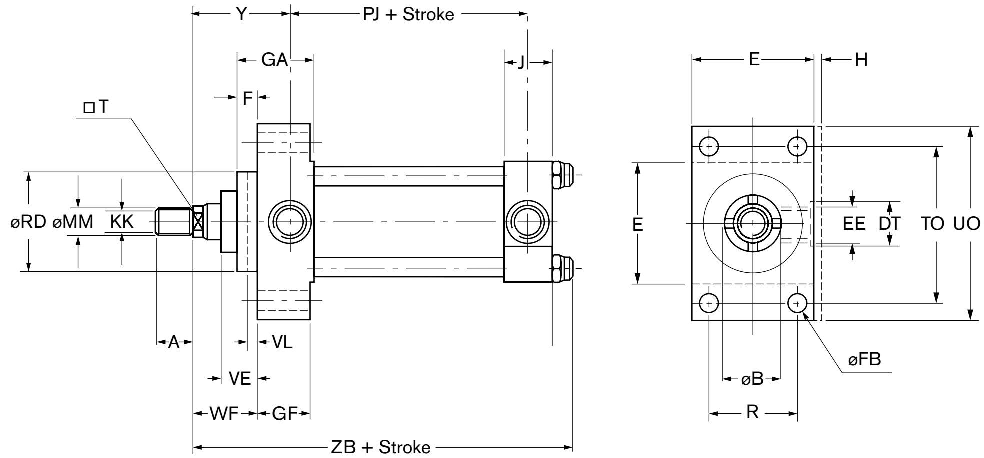
Location of bleed-screws see page 13

ø Bore	E	H	Y ±2	LH h 10	SS ± 1.25	ø SB H 13	ST	TS JS 13	XS ±2	ZJ ±1	PJ ± 1.25	US	PK ± 1.25	SV ±1	ZK ±1	ZM ±2	Stroke max.
25	40^{+2}	5	50	19	73	6.6	8.5	54	33	114	53	72	54	88	139	154	250
32	45^{+2}	5	60	22	73	9	12.5	63	45	128	56	84	58	88	153	178	300
40	63^{+2}	–	62	31	98	11	12.5	83	45	153	73	103	71	105	170	195	400
50	75^{+2}	–	67	37	92	14	19	102	54	159	74	127	73	99	182	207	500
63	90^{+2}	–	71	44	86	18	26	124	65	168	80	161	81	93	191	223	600
80	115^{+3}	–	77	57	105	18	26	149	68	190	93	186	92	110	215	246	700
100	130^{+3}	–	82	63	102	26	32	172	79	203	101	216	101	107	230	265	800
125	165^{+3}	–	86	82	131	26	32	210	79	232	117	254	117	131	254	289	1000
160	205^{+3}	–	86	101	130	33	38	260	86	245	130	318	130	130	270	302	1100
200	245^{+3}	–	98	122	172	39	44	311	92	299	165	381	160	172	324	356	1250

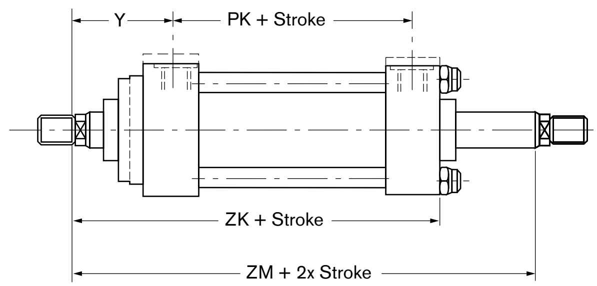
See page 4 for dimensions not stated here.

Dimensions

H 160 CA … ME 5



MDE 5



Tolerance to ISO 8131

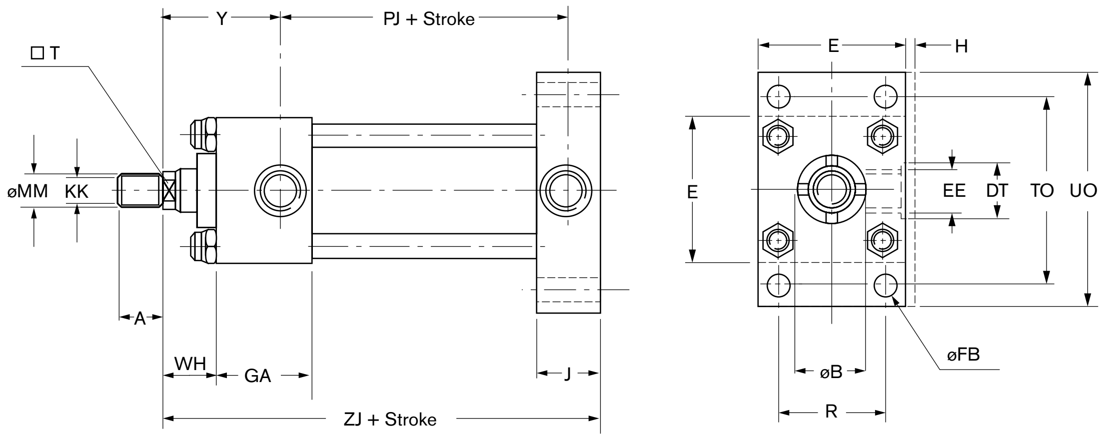
Location of bleed-screws see page 13

ø Bore	E	H	Y ±2	PJ ±1.25	R JS13	TO JS13	UO	VL	WF ±2	F	øFB H13	GF	øRD f8	VE	ZB	PK± 1.25	ZK ±1	ZK ±2	Stroke max.
25	40^{+2}	5	50	53	27	51	65	3	25	10	5.5	25			121	54	139	154	250
													38	16					
32	45^{+2}	5	60	56	33	58	70	3	35	10	6.6	25			137	58	153	178	300
													42	22					
40	63^{+2}	–	62	73	41	87	110	3	35	10	11	38	62	22	166	71	170	195	400
													62	22					
50	75^{+2}	–	67	74	52	105	130	4	41	16	14	38	74	25	176	73	182	207	500
													74	25					
63	90^{+2}	–	71	80	65	117	145	4	48	16	14	38	75	29	185	81	191	223	600
													88	29					
80	115^{+3}	–	77	93	83	149	180	4	51	20	18	45	82	29	212	92	215	246	700
													105	29					
100	130^{+3}	–	82	101	97	162	200	5	57	22	18	45	92	32	225	101	230	265	800
													125	32					
125	165^{+3}	–	86	117	126	208	250	5	57	22	22	58	105	31	260	117	154	189	1000
													150	29					
160	205^{+3}	–	86	130	155	253	300	5	57	25	26	58	125	32	279	130	270	302	1100
													170	32					
200	245^{+3}	–	98	165	190	300	360	5	57	25	33	76	150	32	336	160	324	356	1250
													210	32					

See page 4 for dimensions not stated here.

Dimensions

H 160 CA … ME 6



Tolerance to ISO 8131

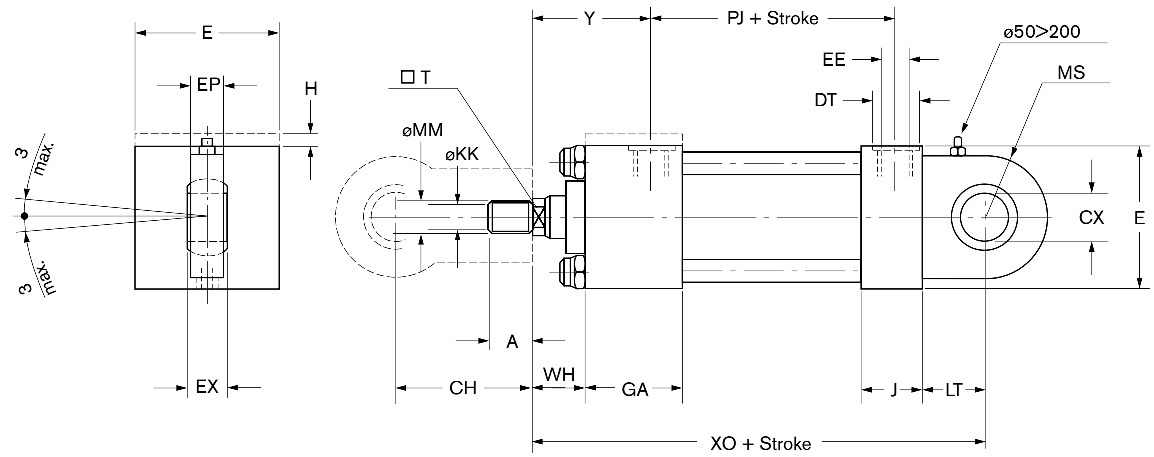
Location of bleed-screws
see page 13

ø Bore	E	H	Y ±2	PJ ±1.25	R JS13	TO JS13	UO	øFB H13	ZJ ±1	Stroke max.
25	40^{+2}	5	50	53	27	51	65	5.5	114	250
32	45^{+2}	5	60	56	33	58	70	6.6	128	300
40	63^{+2}	–	62	73	41	87	110	11	153	400
50	75^{+2}	–	67	74	52	105	130	14	159	500
63	90^{+2}	–	71	80	65	117	145	14	168	600
80	115^{+3}	–	77	93	83	149	180	18	190	700
100	130^{+3}	–	82	101	97	162	200	18	203	800
125	165^{+3}	–	86	117	126	208	250	22	232	1000
160	205^{+3}	–	86	130	155	253	300	26	245	1100
200	245^{+3}	–	98	165	190	300	360	33	299	1250

See page 4 for dimensions not stated here.

Dimensions

H 160 CA … MP 5



Tolerance to ISO 8131

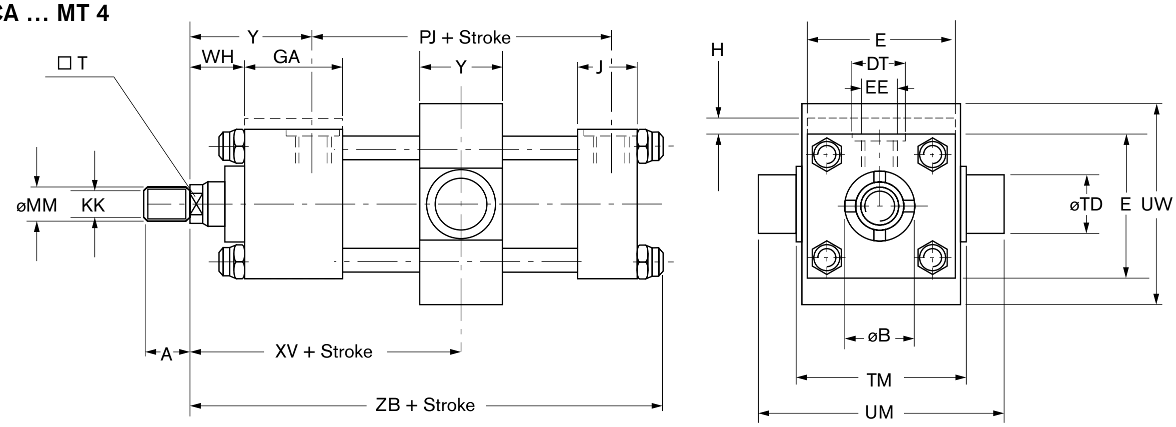
Location of bleed-screws
see page 13

ø Bore	E	H	Y ±2	EP h 15	EX	CH	ø CX	LT	MS	PJ ±1.25	XO ±1.25	Stroke max.
25	40^{+2}	5	50	8	$10^{-0.12}$	42	$12^{-0.008}$	16	20	53	130	250
32	45^{+2}	5	60	11	$14^{-0.12}$	48	$16^{-0.008}$	20	22.5	56	148	300
40	63^{+2}	–	62	13	$16^{-0.12}$	58	$20^{-0.012}$	25	29	73	178	400
50	75^{+2}	–	67	17	$20^{-0.12}$	68	$25^{-0.012}$	31	33	74	190	500
63	90^{+2}	–	71	19	$22^{-0.12}$	85	$30^{-0.012}$	38	40	80	206	600
80	115^{+3}	–	77	23	$28^{-0.12}$	105	$40^{-0.012}$	48	50	93	238	700
100	130^{+3}	–	82	30	$35^{-0.12}$	130	$50^{-0.012}$	58	62	101	261	800
125	165^{+3}	–	86	38	$44^{-.015}$	150	$60^{-0.015}$	72	80	117	304	1000
160	205^{+3}	–	86	47	$55^{-0.15}$	185	$80^{-0.015}$	92	100	130	337	1100
200	245^{+3}	–	98	57	$70^{-0.20}$	240	$100^{-0.020}$	116	120	165	415	1250

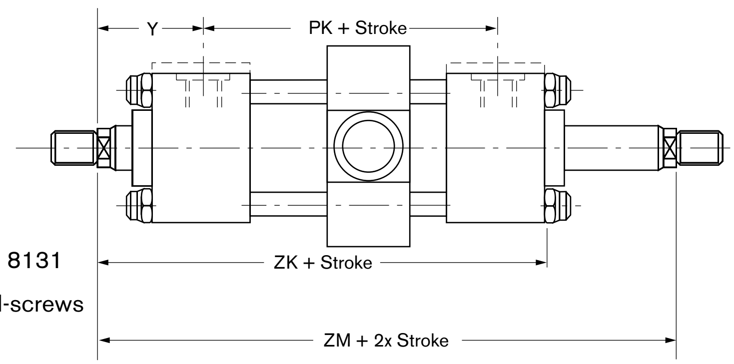
See page 4 for dimensions not stated here.

Dimensions

H 160 CA … MT 4



MDT 4



Tolerance to ISO 8131

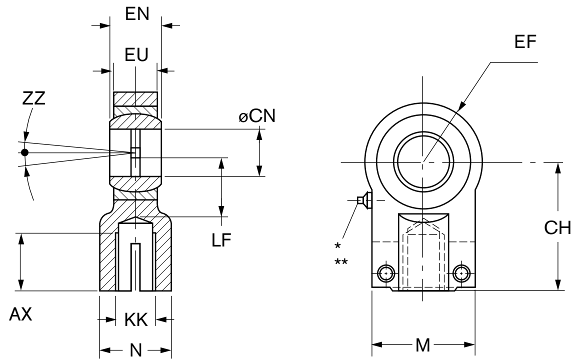
Location of bleed-screws see page 13

ø Bore	E	H	Y ±2	BD	PJ ±1.25	ø TD f8	Tm h14	UM	UW	XV min.	XV max.	ZB	PK ±1.25	ZK ±1	ZM ±2	Stroke min.	Stroke max.
25	40^{+2}	5	50	20	53	12	48	68	42	74	79	121	54	139	154	0	250
32	45^{+2}	5	60	25	56	16	55	79	75	93	83	137	58	156	178	10	300
40	63^{+2}	–	62	30	73	20	76	108	92	106	91	166	71	170	195	15	400
50	75^{+2}	–	67	40	74	25	89	129	80	86	102	176	73	182	207	0	500
63	90^{+2}	–	71	50	80	32	100	150	96	116	106	185	81	191	223	10	600
80	115^{+3}	–	77	60	93	40	127	191	123	129	118	212	92	215	246	11	700
100	130^{+3}	–	82	70	101	50	140	220	136	141	124	225	101	230	265	17	800
125	165^{+3}	–	86	90	117	63	178	278	174	157	132	260	117	254	289	25	1000
160	205^{+3}	–	86	110	130	80	215	341	210	171	131	279	130	270	302	40	1100
200	245^{+3}	–	98	130	165	100	279	439	269	202	154	336	160	324	356	48	1250

See page 4 for dimensions not stated here.

Dimensions

Rod eye with spherical bearing C

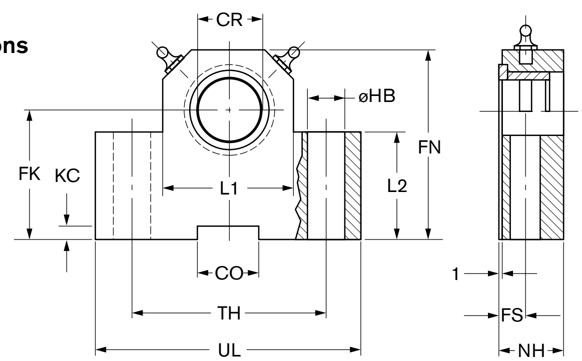


* without greasing

** only bore

ø Bore	ø KK	AX min.	CH	CN	EF max.	EN	EU min.	LF max.	M max.	N max.	Z max.	
25	M 10 × 1.25	15	42	$12^{0}_{-0.008}$	20	$10^{0}_{-0.12}$	8	16	40	17	3°	**1 812 124 800***
32	M 12 × 1.25	17	48	$16^{0}_{-0.008}$	22.5	$14^{0}_{-0.12}$	11	20	45	21	3°	**1 812 124 801****
40	M 14 × 1.5	19	58	$20^{0}_{-0.012}$	27.5	$16^{0}_{-0.12}$	13	25	55	25	3°	**1 812 124 802****
50	M 16 × 1.5	23	68	$25^{0}_{-0.012}$	32.5	$20^{0}_{-0.12}$	17	30	62	30	3°	**1 812 124 803**
63	M 20 × 1.5	29	85	$30^{0}_{-0.012}$	40	$22^{0}_{-0.12}$	19	35	80	36	3°	**1 812 124 804**
80	M 27 × 2	37	105	$40^{0}_{-0.012}$	50	$28^{0}_{-0.12}$	23	45	90	45	3°	**1 812 124 805**
100	M 33 × 2	46	130	$50^{0}_{-0.012}$	62.5	$35^{0}_{-0.12}$	30	58	105	55	3°	**1 812 124 806**
125	M 42 × 2	57	150	$60^{0}_{-0.015}$	80	$44^{0}_{-0.15}$	38	68	134	68	3°	**1 812 124 807**
160	M 48 × 2	64	185	$80^{0}_{-0.015}$	102.5	$55^{0}_{-0.15}$	47	92	156	78	3°	**1 812 124 808**
200	M 64 × 3	86	240	$100^{0}_{-0.02}$	120	$70^{0}_{-0.2}$	57	116	190	100	3°	**1 812 124 809**

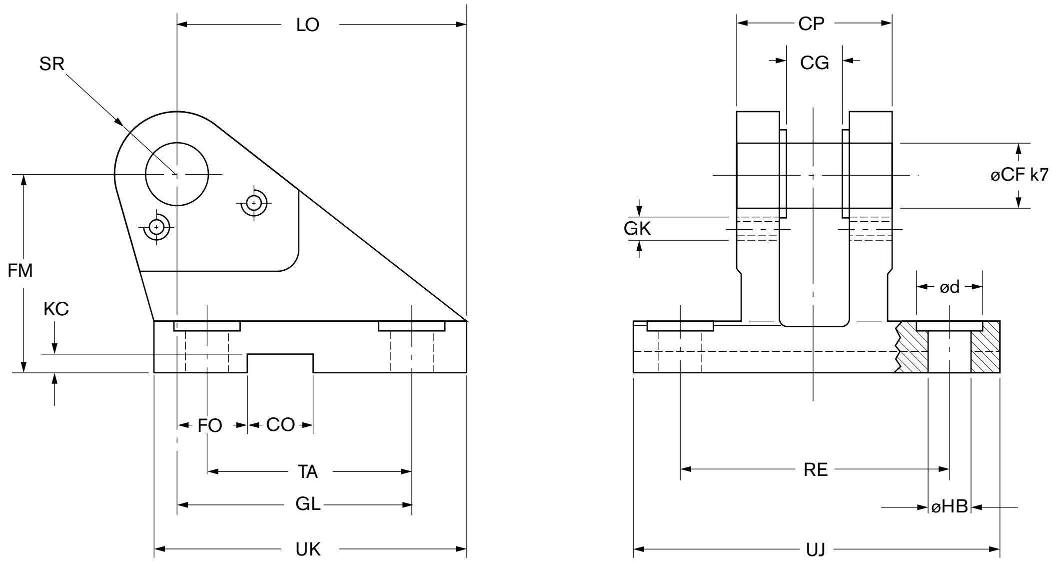
Trunnion bearings for center trunions



ø Bore	ø CR	CO	FK	FN max.	FS	ø HB	KC +0.3	NH max.	TH	UL	L_1	L_2	
25	$12^{+0.018}_{-0}$	$10^{+0}_{-0.043}$	$38^{\pm0.31}$	55	$8^{\pm0.18}$	$9^{+0.22}_{-0}$	3.3	17	$40^{\pm0.31}$	63	25	25	**1 812 130 865**
32	$16^{+0.018}_{-0}$	$16^{+0}_{-0.043}$	$45^{\pm0.31}$	65	$10^{\pm0.18}$	$11^{+0.27}_{-0}$	4.3	21	$50^{\pm0.31}$	80	30	30	**1 812 130 866**
40	$20^{+0.021}_{-0}$	$16^{+0}_{-0.043}$	$55^{\pm0.37}$	80	$10^{\pm0.18}$	$11^{+0.27}_{-0}$	4.3	21	$60^{\pm0.37}$	90	40	38	**1 812 130 867**
50	$25^{+0.021}_{-0}$	$25^{+0}_{-0.052}$	$65^{\pm0.37}$	90	$12^{\pm0.22}$	$14^{+0.27}_{-0}$	5.4	26	$80^{\pm0.44}$	110	56	45	**1 812 130 868**
63	$32^{+0.025}_{-0}$	$25^{+0}_{-0.052}$	$75^{\pm0.37}$	110	$15^{\pm0.22}$	$18^{+0.27}_{-0}$	5.4	33	$110^{\pm0.44}$	150	70	52	**1 812 130 869**
80	$40^{+0.025}_{-0}$	$36^{+0}_{-0.062}$	$95^{\pm0.44}$	140	$16^{\pm0.22}$	$22^{+0.33}_{-0}$	8.4	41	$125^{\pm0.50}$	170	88	60	**1 812 130 870**
100	$50^{+0.030}_{-0}$	$36^{+0}_{-0.062}$	$105^{\pm0.44}$	150	$20^{\pm0.26}$	$26^{+0.33}_{-0}$	8.4	51	$160^{\pm0.50}$	210	90	72	**1 812 130 871**
125	$63^{+0.030}_{-0}$	$50^{+0}_{-0.062}$	$125^{\pm0.50}$	195	$25^{\pm0.26}$	$33^{+0.39}_{-0}$	11.4	61	$200^{\pm0.58}$	265	136	87	**1 812 130 872**
160	$80^{+0.030}_{-0}$	$50^{+0}_{-0.062}$	$150^{\pm0.50}$	230	$31^{\pm0.31}$	$39^{+0.39}_{-0}$	11.4	81	$250^{\pm0.65}$	325	160	112	**1 812 130 873**
200	$100^{+0.032}_{-0}$	$63^{+0}_{-0.074}$	$200^{\pm0.58}$	300	$42^{\pm0.31}$	$52^{+0.46}_{-0}$	12.4	101	$320^{\pm0.70}$	410	200	150	**1 812 130 874**

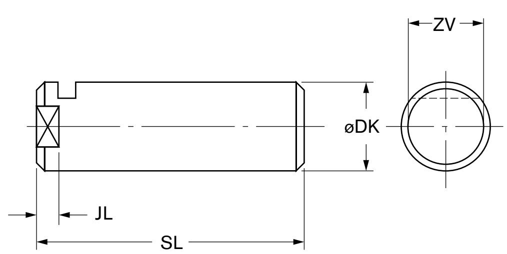
Dimensions

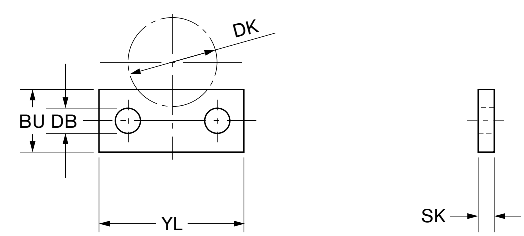
Clevis bearing



ø Bore	ø CF SR	CP h 14	CG +0.3	CO N 9	ø d H 15	FM js 11	GK	GL js 13	ø HB H 13	LO	FO js 14	KC +0.3	RE js 13	TA js 13	UJ	UK	
25	12	30	10	10	18	40	M 6	46	9	56	16	3.3	55	40	75	60	**1 815 805 808**
32	16	40	14	16	22	50	M 6	61	11	74	18	4.3	70	55	95	80	**1 815 805 809**
40	20	50	16	16	26	55	M 6	64	13.5	80	20	4.3	85	58	120	90	**1 815 805 810**
50	25	60	20	25	30	65	M 6	78	15.5	98	22	5.4	100	70	140	110	**1 815 805 811**
63	30	70	22	25	33	85	M 6	97	17.5	120	24	5.4	115	90	160	135	**1 815 805 812**
80	40	80	28	36	40	100	M 8	123	22	148	24	8.4	135	120	190	170	**1 815 805 813**
100	50	100	35	36	53	125	M 8	155	30	190	35	8.4	170	145	240	215	**1 815 805 814**
125	60	120	44	50	71	150	M 10	187	39	225	35	11	200	185	270	260	**1 815 805 815**
160	80	160	55	50	82	190	M 10	255	45	295	35	11	240	260	320	340	**1 815 805 816**
200	100	200	70	63	89	210	M 10	285	48	335	35	12	300	300	400	400	**1 815 805 817**

Trunnion bearings for center trunions



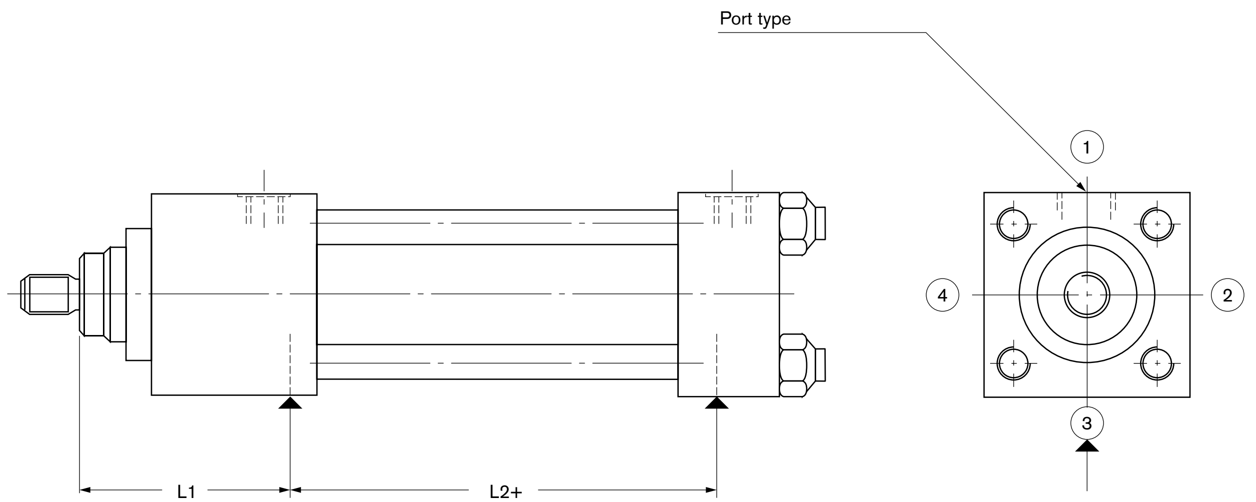


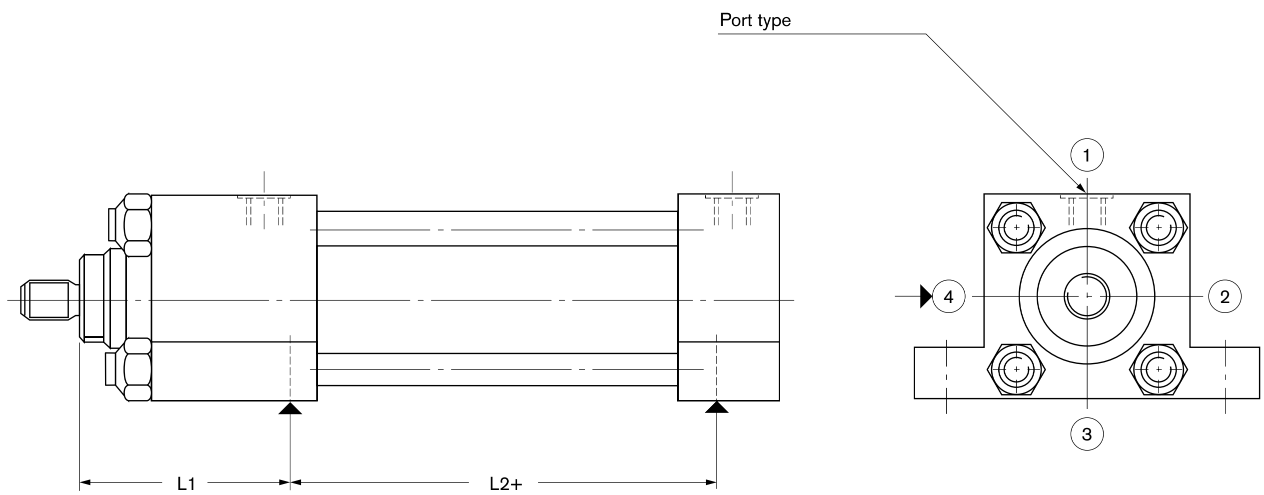
ø DK h 6	SL	JL	ZV	
12	40	4.5	10	**1 813 103 803**
16	50	5.5	13	**1 813 103 804**
20	62	5.5	17	**1 813 103 805**
25	72	5.5	22	**1 813 103 806**
30	85	7.5	24	**1 813 103 807**
40	100	9.5	32	**1 813 103 808**
50	122	10.0	41	**1 813 103 809**
60	145	11.0	50	**1 813 103 810**
80	190	15.0	70	**1 813 103 811**
100	235	15.0	90	**1 813 103 812**

ø DK	ø DB	BU	SK	YL	DIN 91210.9	
12	6.4	15	3	27	M 6 × 12	**1 811 038 800**
16	6.4	15	3	40	M 6 × 12	**1 811 038 801**
20	6.4	18	4	40	M 6 × 16	**1 811 038 802**
25	6.4	18	4	40	M 6 × 16	**1 811 038 803**
30	6.4	20	5	45	M 6 × 16	**1 811 038 804**
40	8.4	20	6	62	M 8 × 20	**1 811 038 805**
50	8.4	25	8	65	M 8 × 20	**1 811 038 806**
60	10.5	25	8	80	M 10 × 25	**1 811 038 807**
80	10.5	30	10	90	M 10 × 25	**1 811 038 808**
100	10.5	40	12	120	M 10 × 25	**1 811 038 809**

Dimensions

Location of bleed-screws

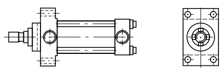
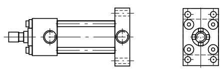
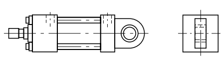
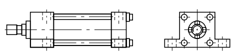
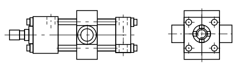
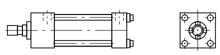


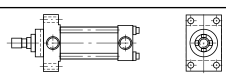
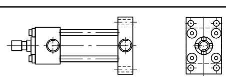
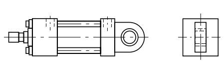
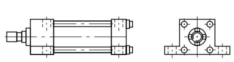
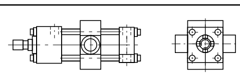
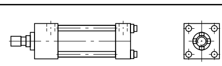


ø Bore			Bleed-screw	
	L1	L2	ø	S
25	55	43	M 5	2.5
32	65	46	M 5	2.5
40	70.5	56	M 6	
50	74	60	M 6	3
63	79	64	M 6	3
80	86	75	M 8	4
100	92	81	M 8	4
125	98.5	92	M 8	4
160	102.5	97	M 8	4
200	123	110	M 8	4

Calculation

Weight of the cylinders and rod accessories (kg)

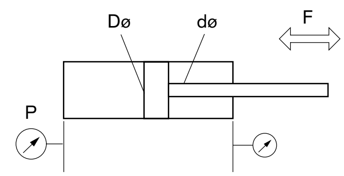
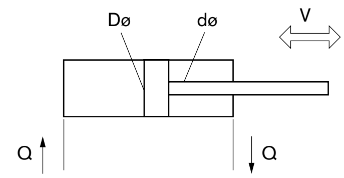
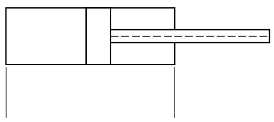
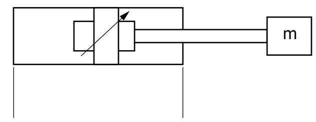
ø Bore		25	32	40		50		60	
ø Rod		18	22	18	28	22	36	28	45
	**ME 5**	1.22	1.58	3.74	3.84	5.55	5.70	7.73	8.22
	**ME 6**	1.26	1.64	3.81	3.90	5.70	5.86	8.16	8.46
	**MP 5**	1.13	1.52	3.22	3.31	4.94	5.10	7.30	7.60
	**MS 2**	1.22	1.68	3.38	3.48	5.34	5.49	8.03	8.46
	**MT 4**	1.35	1.92	4.12	4.21	6.56	6.72	9.22	9.52
	**MX 5**	1.10	1.47	3.11	3.20	4.76	4.91	6.99	7.29
Additional Weight per 100 mm stroke		0.58	0.64	0.76	1.06	1.12	1.62	1.44	2.20
Rod eye with spherical bearing		0.20	0.40	0.70	0.70	1.10	1.10	1.50	1.50

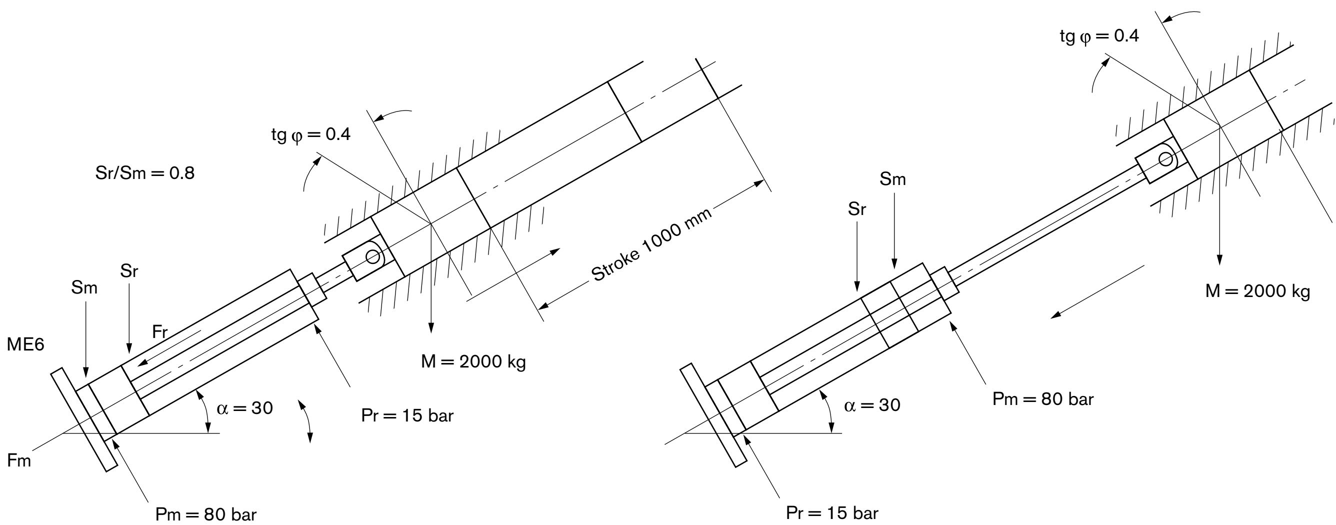
ø Bore		80		100		125		160		200	
ø Rod		36	56	45	70	56	90	70	110	90	140
	**ME 5**	13.83	14.96	19.12	20.79	37.21	40.08	60.35	63.89	111.83	117.76
	**ME 6**	14.96	15.61	20.43	21.51	40.11	41.57	65.64	67.31	119.42	122.27
	**MP 5**	13.48	14.13	19.27	20.05	37.31	38.77	62.95	64.63	114.15	117.00
	**MS 2**	13.81	14.46	19.73	20.52	37.20	38.65	61.56	63.24	111.91	114.79
	**MT 4**	17.43	18.08	24.01	24.79	45.89	47.35	77.42	79.10	146.13	149.00
	**MX 5**	11.90	13.55	18.15	18.93	34.96	36.42	58.49	60.17	106.06	108.91
Additional Weight per 100 mm stroke		2.16	3.28	3.30	5.10	6.28	9.34	8.74	13.18	13.42	20.50
Rod eye with spherical bearing		3.50	3.50	6.00	6.00	8.50	8.50	17.00	17.00	32.00	32.00

Calculation

Calculation of cylinders:

Cylinders can be calculated by using the diagrams shown on page 16 – 17.

page 17 Pressure p Force F Diameter ø Efficiency η 	page 18 Flow Q Speed v Diameter ø 
page 19 Buckling length 	page 21 Cushioning–capacity 



Example:

Stroke time 3 sec.
Load-friction coefficient = 0.4
Available pressure = 80 bar

To be determined:

Piston and rod ø

Piston rod advance:

Overall efficiency $\eta = \eta_1 \times \eta_2$
η_1 = efficiency of cylinder 0.9 (approximate)
η_2 = efficiency of system $= \frac{Pm \times Sm - Pr \times Sr}{Pm \times Sm} = \frac{Pm \times Sm - 0.8\, Pr \times Sm}{Pm \times Sm} = \frac{Pm - 0.8\, Pr}{Pm} = \frac{80 - 0.8 \times 15}{80} = 0.85$

Calculation

Force required to move a mass:

$F = 0.4 \times M \times g \times \cos a + M \times g \times \sin a = 0.4 \times 2000 \times 9.81 \times 0.866 + 2000 \times 9.81 \times 0.5 = 16606\ N = 1661\ daN.$

The graph on p. 17 shows the following:
Force 1661 daN, h = 0.765;
max. pressure 80 bar;
cylinder piston ø 63.

Piston rod return:

$F = 0.4 \times M \times g \times \cos a - M \times g \times \sin a = 0.4 \times 2000 \times 9.81 \times 0.866 - 2000 \times 9.81 \times 0.5 = -3013.6\ N = -301\ daN.$

No problems with force on return.

Testing the buckling length:

The table on pg. 19 shows the following:
80 bar for Pm; cylinder 63 × 28 in,
L = 818 mm.
For ME 6, K = 1.5 (pg. 20).

$$H = \frac{L}{K} = \frac{818}{1.5} = 545\ mm.$$

If piston rod buckles:
2 possibilities:
Select rod ø 45
L = secure against buckling
– Change type of mounting,
e.g. MS2 with coefficient 0.7.

Test of cushioning:

Average speed $\frac{1}{3} = 0.33$ m/s.

Correction factor F = 1.07 (pg. 22)

Max. speed $1.07 \times 0.33 = 0.356$ m/s.

Cushioning capacity during rod advance (pg. 21):

$$= \frac{M \times v^2}{2} - M \times g \times La \times \sin a = \frac{2000 \times 0.356^2}{2} - 2000 \times 9.81 \times 0.028 \times 0.5 = -147.94\ \text{joules.}$$

No problems with cushioning during rod advance.

Damping capacity during rod return:

$$= \frac{M \times v^2}{2} + M \times g \times La \times \sin a = \frac{2000 \times 0.356^2}{2} + 2000 \times 9.81 \times 0.026 \times 0.5 = 381.79\ \text{joules.}$$

The graph on pg. 23 shows the following:
350 joules for Pm 80 bar,
$V_{max} = 0.4$ m/s, thus cushioning takes place at 0.356 m/s:

$= 350 \times 0.356/0.4 = 311.5$ joules

The cylinder cannot absorb this energy.
The next largest, ø 80, must be selected.
Check of buckling for a rod of ø 56.

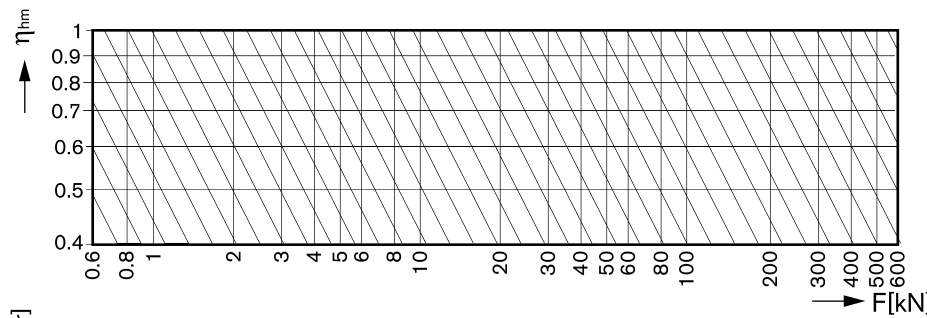
Required pumping power:

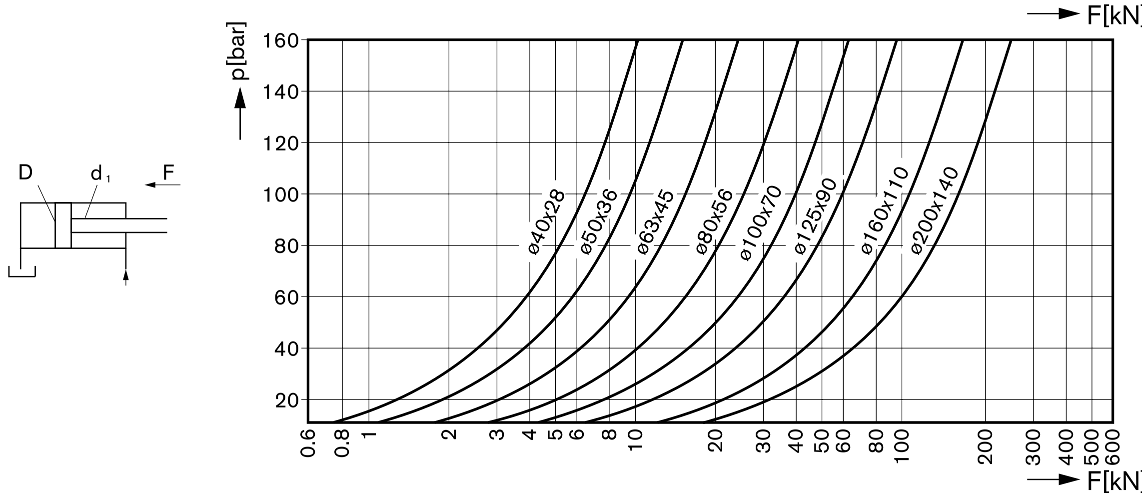
The graph on pg. 18 shows the following:
ø 80 × 56 at 0.356 m/s

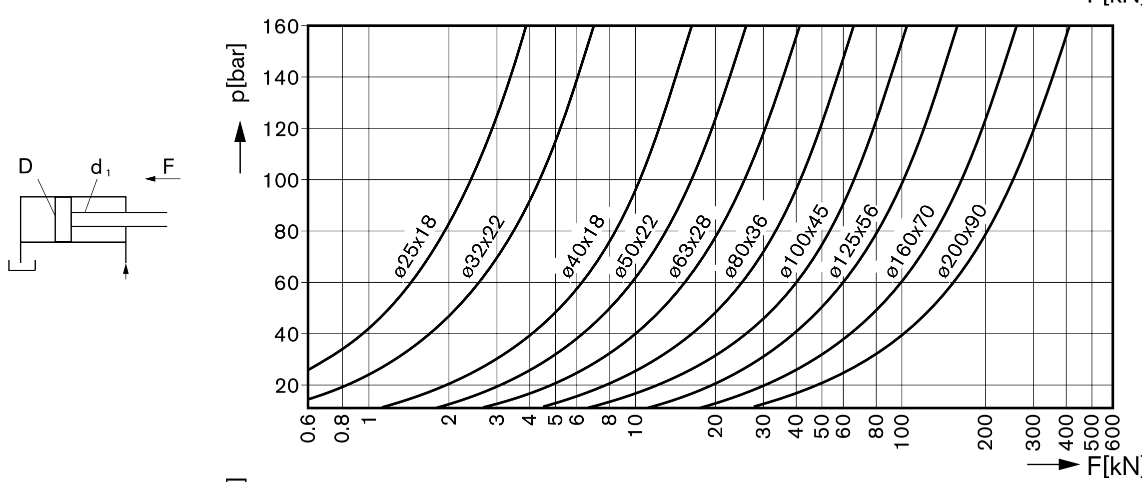
advance = 110 l/min.
return = 57 l/min.

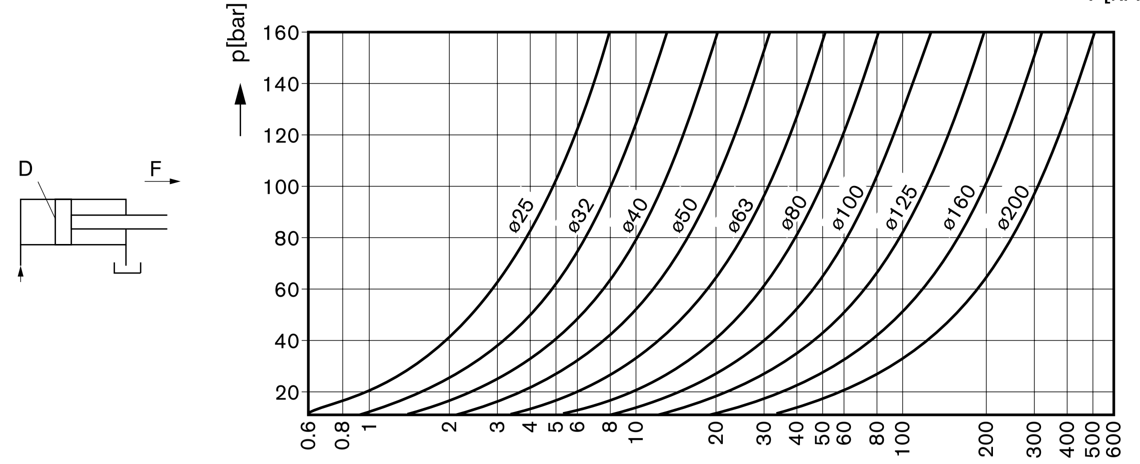
Calculation

Pressure p
Force F
Diameter ø
Efficiency ▫nm





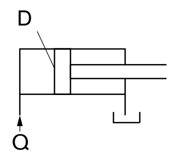


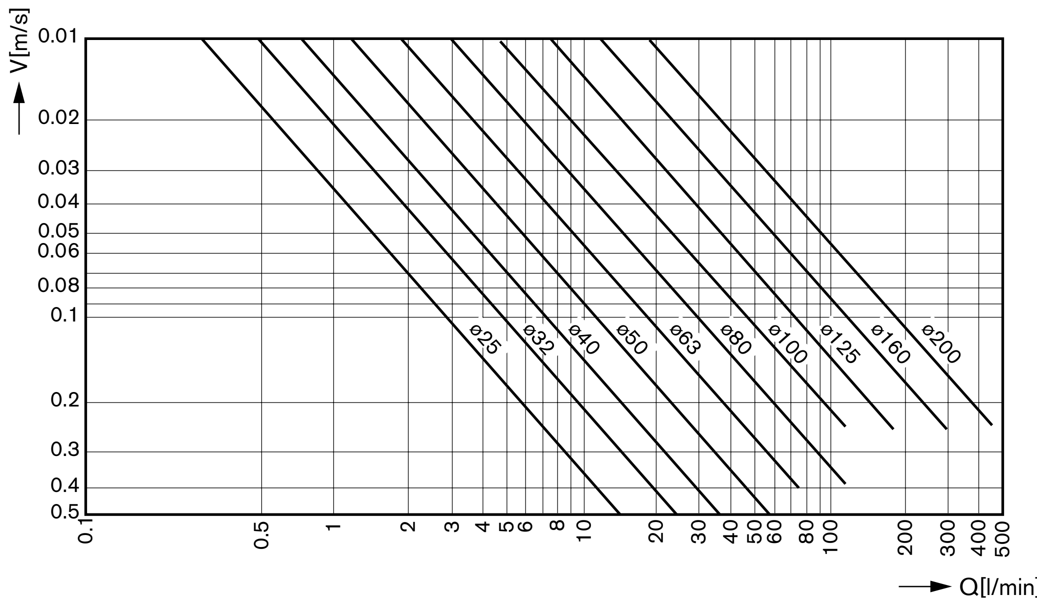


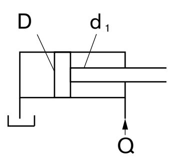
Efficiency ▫nm (friction)

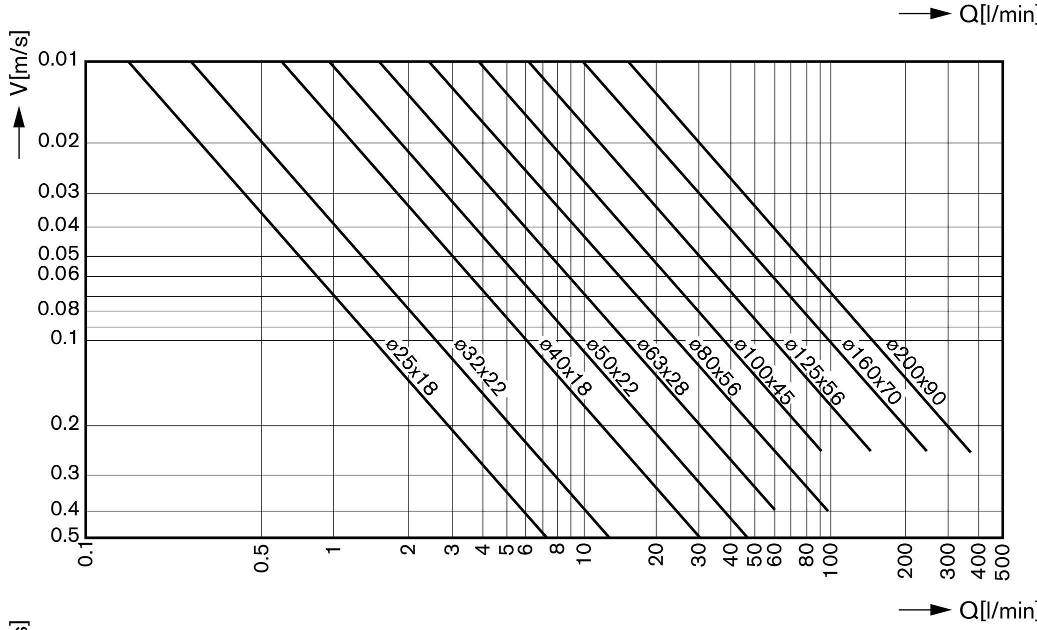
Calculation

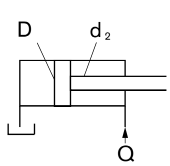
Flow Q
Speed v
Diameter ø

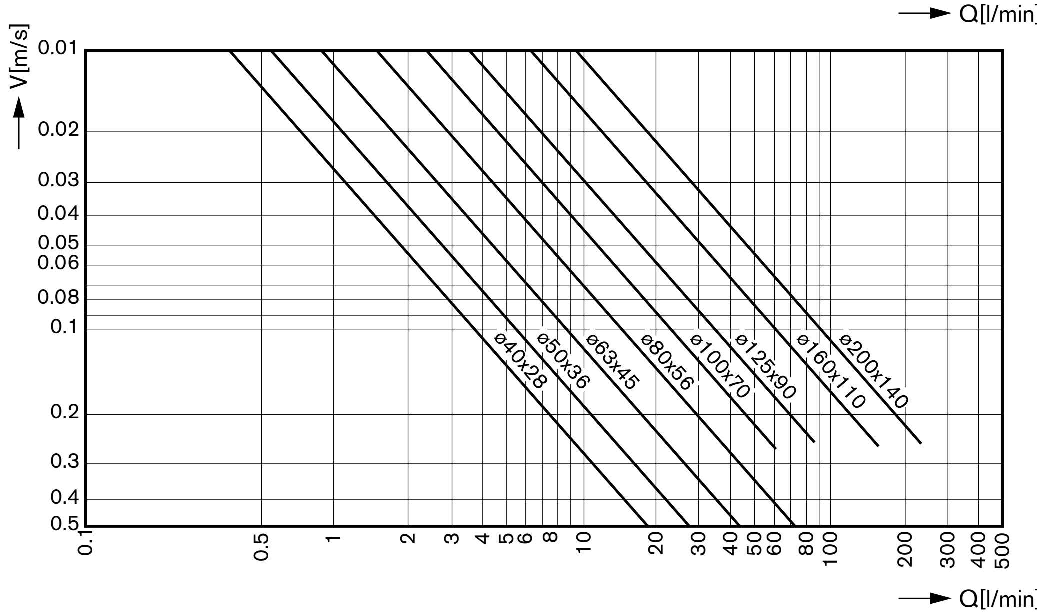








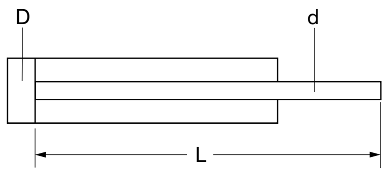




Calculation

Buckling length:

Based on load **F**, the free buckling length **L** is determined by table below. This one has to be divided by the correction factor **K**, according to mounting type (see page 20). The maximum stroke **H** of the specific application is:

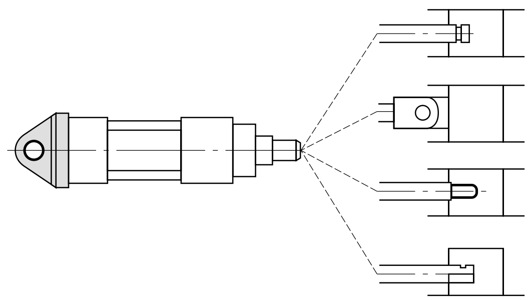
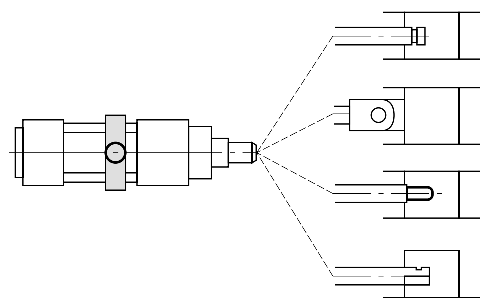
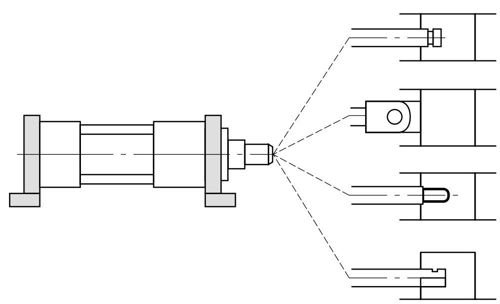
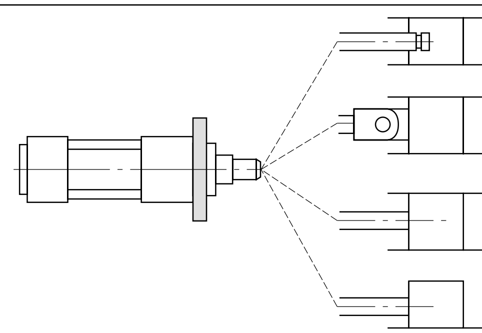
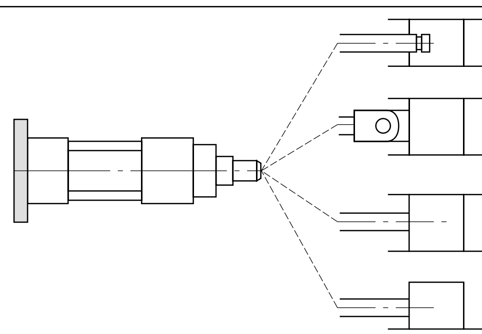


$$H = \frac{L}{K}$$

Max. buckling length L in mm if K = 1

ø Bore	ø Rod	p (bar)															
		10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160
25	12	1118	787	640	552	491	446	411	382	358	337	319	303	289	275	263	252
	18	2521	1779	1450	1254	1119	1020	942	880	828	784	746	712	683	656	633	611
32	14	1188	836	679	585	520	471	433	402	376	353	333	315	298	283	269	255
	22	2941	2076	1692	1462	1305	1189	1098	1025	964	913	868	829	794	763	735	710
40	18	1571	1106	899	774	688	625	574	533	499	469	443	420	399	379	361	343
	28	3812	2691	2193	1895	1682	1541	1424	1329	1251	1184	1126	1075	1031	991	955	922
50	22	1877	1321	1073	924	822	745	685	636	594	558	527	498	473	449	426	405
	36	5042	3559	2901	2508	2239	2040	1885	1760	1656	1567	1491	1425	1365	1313	1265	1222
63	28	2414	1699	1380	1189	1057	959	881	818	765	719	679	643	610	579	551	524
	45	6252	4413	3597	3109	2776	2529	2337	2182	2052	1943	1848	1766	1692	1627	1568	1514
80	36	3142	2212	1797	1548	1377	1249	1149	1067	998	938	886	839	797	758	721	687
	56	7624	5381	4386	3791	3384	3083	2848	2659	2501	2367	2252	2151	2061	1981	1909	1843
100	45	3928	2765	2246	1935	1721	1561	1436	1333	1247	1173	1108	1049	996	947	902	859
	70	9530	6727	5482	4739	4230	3854	3560	3323	3126	2959	2815	2689	2577	2477	2386	2304
125	56	4867	3425	2783	2397	2132	1934	1778	1651	1544	1452	1371	1298	1233	1172	1115	1061
	90	12604	8897	7252	6269	5597	5100	4712	4399	4139	3918	3728	3561	3414	3282	3163	3055
160	70	5939	4179	3394	2923	2598	2356	2165	2009	1878	1764	1664	1574	1492	1416	1344	1275
	110	14707	10380	8459	7311	6526	5945	5492	5126	4822	4563	4340	4145	3972	3817	3677	3550
200	90	7857	5530	4493	3870	3442	3123	2872	2667	2494	2346	2215	2099	1993	1895	1804	1717
	140	19060	13453	10964	9477	8460	7707	7121	6647	6253	5919	5630	5377	5153	4953	4773	4608

Calculation

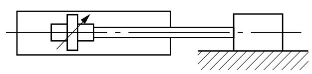
Mounting type	Load Guidance	K
MP 5		2
		2
		1.5
		4
MT 4		1.5
		1.5
		1
		3
MS 2		0.7
		0.7
		0.5
		2
ME 5 **MX 5**		0.7
		0.7
		0.5
		2
ME 6		1.5
		1.5
		1
		4

Calculation

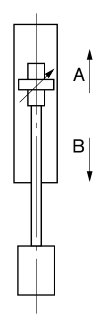
Cushioning capacity:

During deceleration of masses by end cushioning, the cushioning capacity must not be exceeded.
For this reason the kinetic energy due to the inertial mass must be calculated and compared with permitted values in the diagrams on page - 23.

Calculation of kinetic energy:

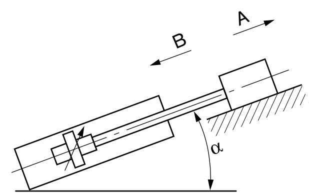


$$E = \frac{1}{2} m \cdot v^2$$



$$A: E = \frac{1}{2} mv^2 - mg \cdot l_a$$

$$B: E = \frac{1}{2} mv^2 + mg \cdot la$$



$$A : E = \frac{1}{2} mv^2 - mg \cdot l_a \cdot \sin a$$

$$B : E = \frac{1}{2} mv^2 + mg \cdot l_a \cdot \sin a$$

Cushioning length and masses

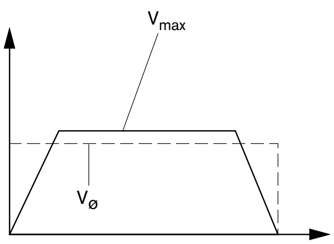
ø Bore [mm]		25	32	40		50		63		80		100		125		160		200	
ø Rod [mm]		18	22	18	28	22	36	28	45	36	56	45	70	56	90	70	110	90	140
l_a [mm]	front	19	20	24	25	25	28	28	27	27	31	31	25	25	30	30	28	50	45
	rear	16	16	26	26	26	26	26	26	29	29	29	29	29	29	40	40	53	53
[kg]	piston	0.21	0.39	0.54	0.72	0.82	1.20	1.42	2.03	2.62	3.62	4.70	6.33	8.03	11.19	15.59	20.02	29.64	37.67
	rod*	0.10	0.15	0.10	0.24	0.15	0.40	0.24	0.63	0.40	0.97	0.63	1.51	0.97	2.50	1.5	3.73	2.50	6.04
v_{max}[m/s]		0.5	0.5	0.5		0.5		0.4		0.4		0.25		0.25		0.25		0.25	
		$v > v_{max}$: on request																	

* per 50 mm stroke

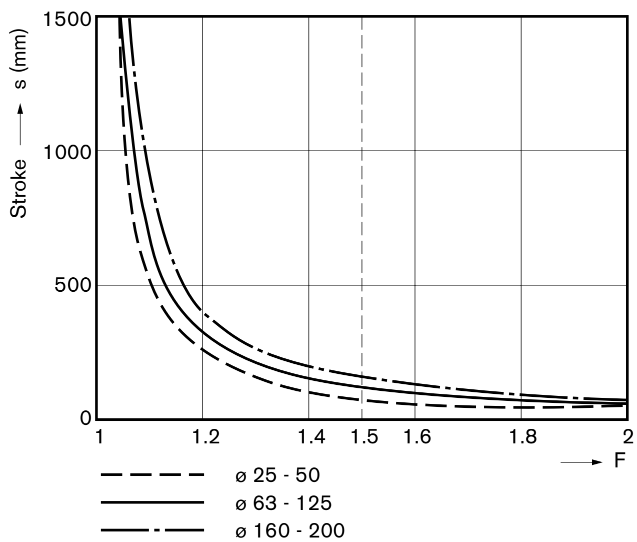
Calculation

Speed correction:

In a typical speed profile with acceleration and deceleration, the maximum velocity v_{max} is greater than the average velocity v_{avg}. This must be considered particularly with shorter strokes and must be adjusted with a correction factor F.

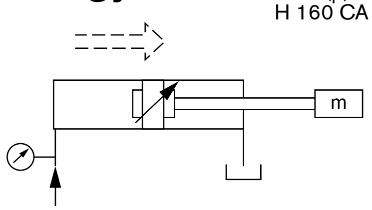


$V_{max} = V_{ø} \times F$

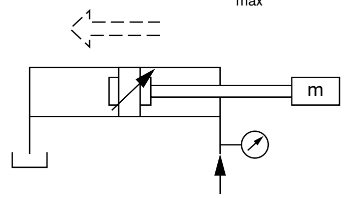


Cushioning energy

$E = f(p)$
H 160 CA ... 3 ...

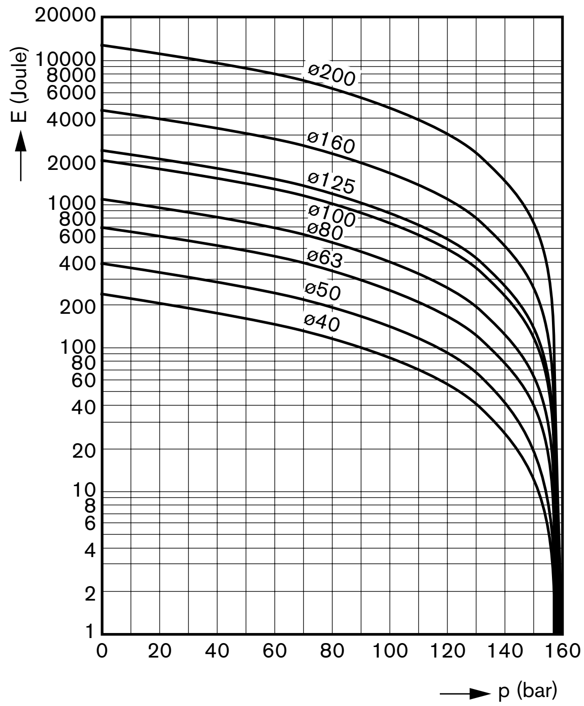


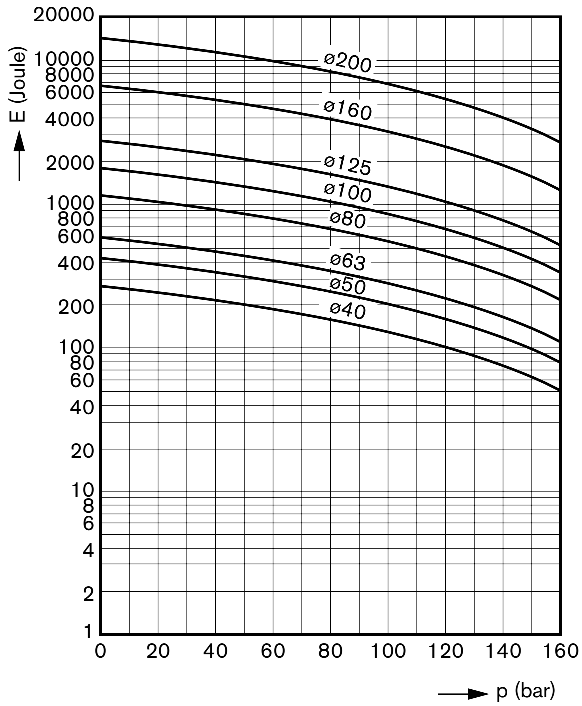
$E_U = E_{max} \cdot \frac{v_U}{v_{max}}$



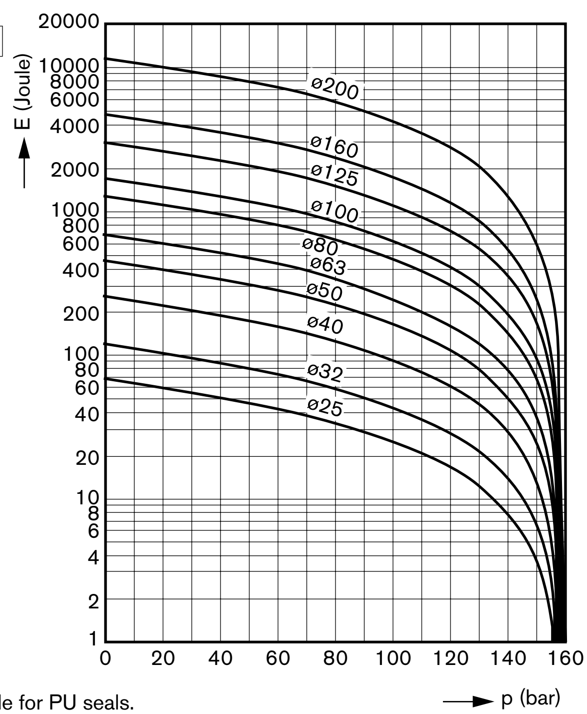
E_U = Absorbed energy
E_{max} = Max. energy see characteristic curve
v_U = Effective operating speed
v_{max} = Max. speed for PU

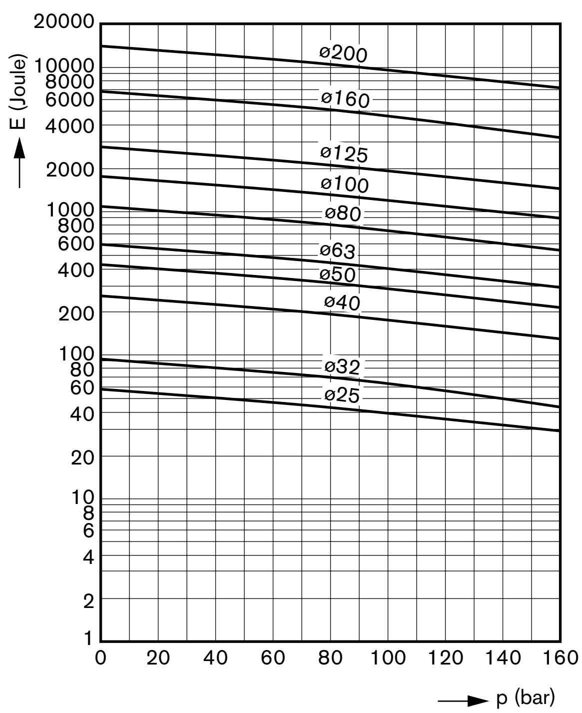
D, d_1





D, d_2

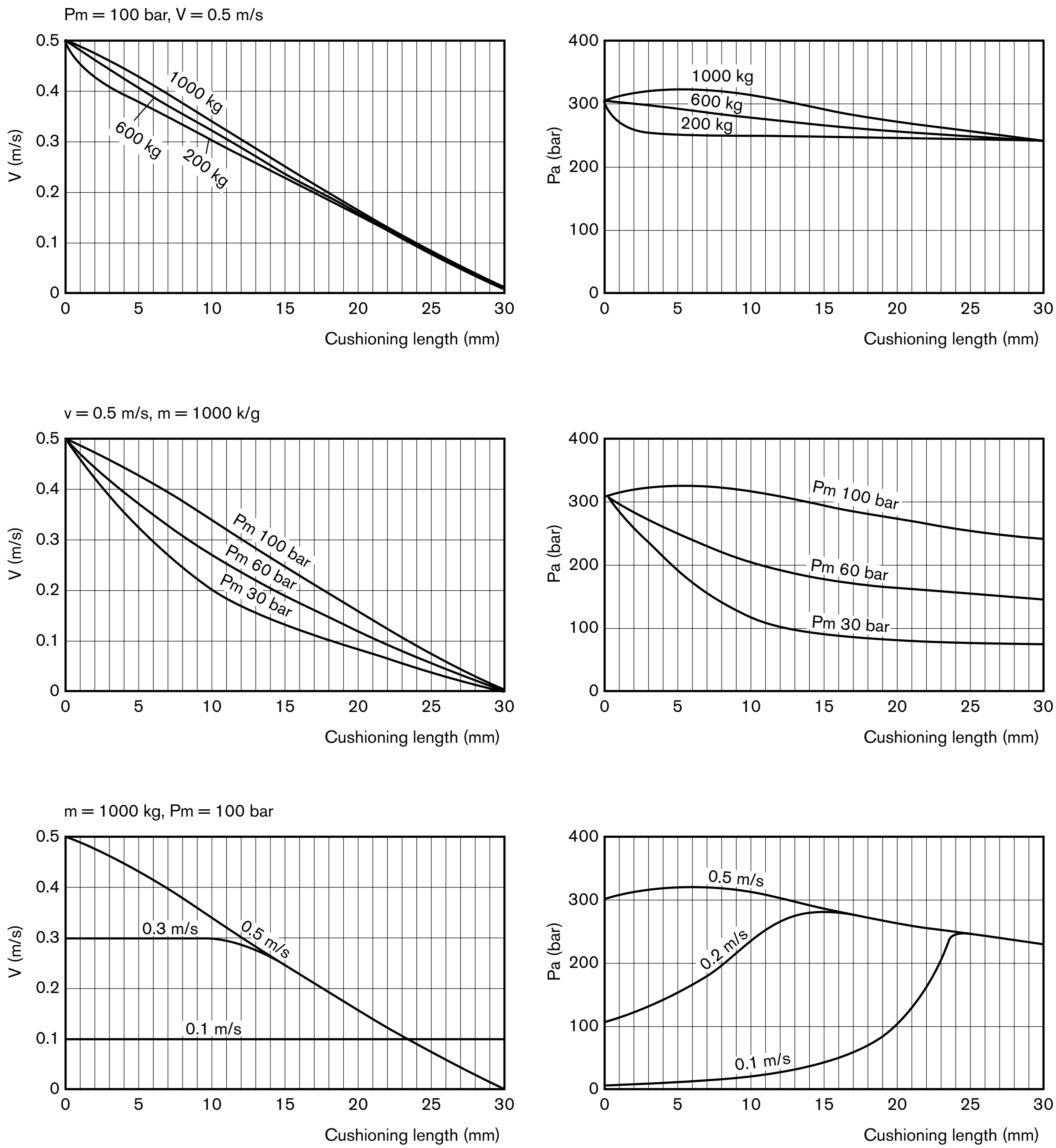




Applicable for PU seals.
For $v_u > v_{max}$, please consult us.

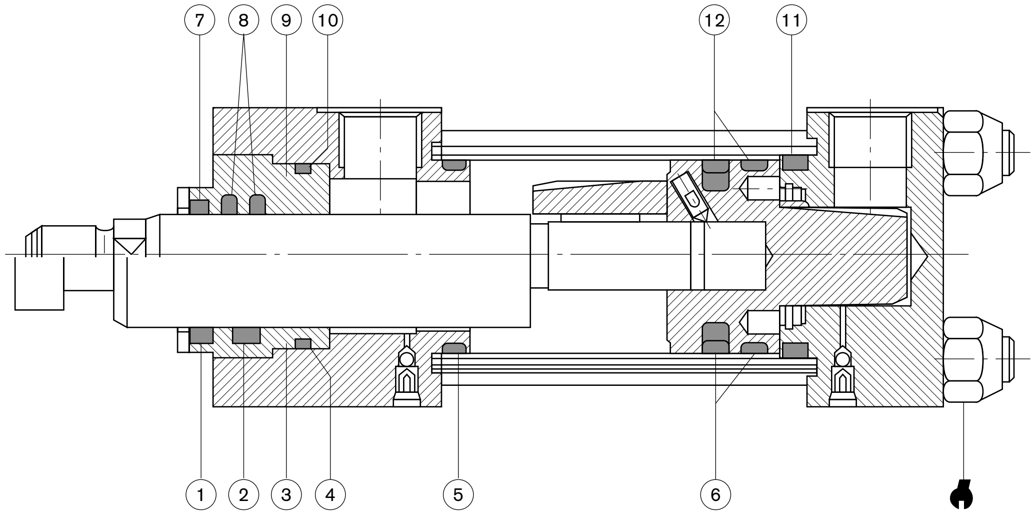
Calculation

Example:



The progressive cushioning is self-optimizing to suit the working conditions, as shown in the graphs containing variable parameters for a cylinder of ø 50. Therefore, the effective cushioning length depends on the cushioning energy to be absorbed; i.e. there is less lost time at lower speeds and thus shorter cycle times.
This cushioning is insensitive to temperature.

Seal kits



Seal kits

Pos		ø Bore									
		25	32	40	50	63	80	100	125	160	200
⑥ + 2 × ⑤ PU	**1 817 005 …**	**828**	**829**	**830**	**831**	**832**	**833**	**834**	**835**	**836**	**837**

Pos		ø Bore									
		25		32		40		50		63	
			18		22	18	18	22	36	28	45
① ② ④ PU	**1 817 006 …**	**–**	**–**	**–**	**–**	**832**	**833**	**834**	**835**	**836**	**837**
① ② ③ ④ PU	**1 817 005 …**	**–**	**–**	**–**	**–**	**922**	**923**	**924**	**925**	**926**	**927**

Pos		ø Bore									
		80		100		125		160		200	
		36	56	45	70	56	90	70	110	90	140
①②④ PU	**1 817 006 …**	**835**	**838**	**839**	**840**	**838**	**841**	**842**	**843**	**841**	**844**
①②③④ PU	**1 817 005 …**	**925**	**928**	**929**	**930**	**928**	**931**	**932**	**933**	**931**	**934**

Seals are mounted in the guide ring.

Tightening torques

ø Bore		25	32	40	50	63	80	100	125	160	200
	[Nm]	3	6.5	12	37	40	90	100	240	450	600

When ordering replacement caps, tubes, rods etc., please state cylinder part no.

Technical Data

Maximum Pressure

The H160 CA cylinder range is rated at 160 bar (2300 psi) dynamic working pressure, as defined by the ISO Norm 6020 /2 for all mounting types. Higher pressures can be approved after factory consultation. An authorization to exceed 160 bar begins with the completion of the Technical Specification for Hydraulic Cylinders form in accordance with the ISO 9001 standards. Attention must be given to pressure increases in applications with differential or throttle valves. Maximum pressure inside the cylinder chamber should never exceed 240 bar (3500 psi).

Minimum Pressure

A certain minimum pressure is required to assure proper operation of the cylinder. We recommend a 15 bar (215 psi) minimum. However, some lower pressure applications can be approved with factory consultation.

Maximum Speed

To assure long cylinder life in intensive applications the maximum speed is limited by the factory. The speed is determined by the seal type, cylinder diameter and operating pressure, see page 3. If higher speeds are necessary, consult factory.

Minimum Speed

To avoid the “Stick-Slip” effect, we recommend the use of a minimum speed as indicated in page 3. If lower speeds are necessary, consult factory.

Cushioning

The use of cushioning is recommended at speeds greater than 20 mm /sec. (0.8 inches/sec.) to assure proper energy dissipation, without auxiliary sources, and to prevent damage to the cylinder, as well as the machine components. To avoid potential problems associated with the screw-adjustable cushioning (i.e. shock, improper adjustment by vibration or untrained personnel, leakage at screw seal, etc.) the Bosch series H160 CA has a progressive, self-adjusting cushioning system. Advantages of this cushioning system are:

- progressive deceleration
- short cushioning time
- cushioning length in accordance with piston speed
- low cushioning pressure with no pressure peaks thereby insuring the safety and endurance of the cylinder and it’s environment
- low sensitivity to variations in pressure, temperature and moving loads
- automatic limitation of the stop-speed of the piston resulting in greater safety and reliability
- special design features of the check valve and floating bushings assure high capacity of oil flow resulting in fast acceleration
- applications: pressure 30 to 160 bar (435 psi to 2300 psi) = cushioning 3 pressure 15 to 70 bar (215 psi to 1000 psi), low energy and shorter cushioning time = cushioning 4

Each cylinder with standard progressive cushioning has to complete its full design stroke. The use of external fixed or adjustable stops requires precautionary measures. Please discuss these measures with the factory.

Piston Rod

The piston rod is made of high quality steel, case hardened and chromed providing high resistance to mechanical shocks, oxidation and high life expectancy. For applications in corrosive environments we recommend as an option the use of hard-chromed stainless steel.
The rod end is threaded with a chamfer thereby insuring its protection.
The DIN 24554 and NFE 48.016 norms calls for only one rod end thread per piston diameter. This assures the full transfer of dynamic forces within the norms described and allows a favorable application of fittings conforming to ISO 8133. This means smaller dimensions of the fittings and of course, better prices.

Piston Rod Diameter

The dimensions indicated in this catalog correspond to a standard that is in preparation. The double rod, often used to reduce flow requirements, to insure identical forward and reverse movement or to command a position switch, have a naturally higher friction than is normally experienced with single rod cylinders.
The rod ends selected can be different. The rod diameters in standard form, must be the same. Consult factory for variation requests. For applications where the rod is fixed and the cylinder body moves, care must be given to the radial forces on the glands.

Technical Data

Seals

We offer as standard seals either the polyurethane (PU) or PTFE/Viton (PP).
The housings for the seals are according to ISO 5597 for PU rod seals, ISO 7425-1 for PU and PP piston seals, ISO 6194-C for PU and PP rod wipers. Replacement of seals from one type to another only requires the replacement of the piston seals (piston for both seal types is the same), the tube-cap seals and the gland assembly.
These seals can be used for normal mineral oil applications.
For HFA, HFB, HFC and other fluids the exact fluid specification should be discussed with the factory.
With PU seals higher piston speeds can be applied when pressure is < 100 bar (1450 psi) and a frequency < 3Hz.
Long stroke cylinders are recommended with PU seals.

Rod Gland

Rod glands in gray-iron castings are screwed into place in a one-piece construction for bore diameters => 40mm. For smaller diameters the casings are 2 or 3 piece construction with grooved seal housings. Simple assembly is then assured. For replacement purposes one can specify the proper seal kit with gland or without gland.

Piston

The piston is of mono block design including integrated cushioning screwed, loctited and setscrew positioned onto the piston rod. The seal locations have identified positions and are designed according to ISO 7425-1 for PU and PP seals and therefore can be interchanged quite simply.

Bore Sizes

Bore diameters of >200mm according to ISO 6020/3, consult factory.

Seals for Tube/End Caps

A closed housing design with both O-ring and backup seal are aligned and supported on both sides to insure a high degree of sealing, especially for long stroke cylinders.

Durability

Bosch cylinders follow a set of recommended standards for durability determined by an interprofessional commission and hydraulic cylinder association group:

>= 10,000,000 continuous cycles (unloaded) or 3000km (1800 miles) at 70% maximum pressure, without load on the rod, a maximum speed of 0.5 m/sec (1.75 feet/sec) with a failure rate of < 5%.

Care should be used when aggressive fluids outside of the cylinder are present, for example, the use of coolants and cleaning fluid. Because of the many different compounds available on the market, please consult the factory.

Buckling

A cylinder engaged in mechanical compression is exposed to the possibility of buckling. As a result the stroke length is limited and depends on the operating pressure, mounting style and load guiding. The theoretical stroke as a mathematical value is indicated on page 19 and is a function of operating pressure and bore diameter. This value must be divided by the load guiding factor. This then determines the permitted stroke. Longer strokes can lead to buckling and the destruction of the cylinder. If the required stroke of your cylinder exceeds the permitted stroke, consider another type of mounting or another type of load guiding, or a larger bore size in combination with a lower pressure. Use the calculation program in hydraulic cylinder CD ROM (# 1 987 760 009) as a helpful tool.

Radial Force on Piston Rod

In order to avoid premature wear in the gland and seals we recommend that radial loads on the piston be reduced. The values on page 3 have been established in accordance with industrial manufacturing groups.

Standard Strokes

The use of stroke lengths are standardized by ISO 4393. They are required by all major automotive companies in order to limit the variety of cylinders, thereby simplifying stock keeping. The indicated stroke lengths must be stated in full mm.

Technical Data

Stroke Tolerances

According to standard ISO 8131 the stroke tolerance is 0 /+ 2mm for strokes up to 1250mm (49 in.). For longer strokes consult factory. A reduced tolerance of +/- 0.3mm can be obtained as a higher priced option. A smaller reduction in tolerance would not take into account the elasticity of a tie rod cylinder.

Recommended Maximum Strokes

The recommended maximum strokes on page 3 insure a proper functioning in all applications at a maximum pressure of 160 bar (2300 psi). However, buckling must be taken into consideration. When pressures $<$ 160 bar are used or when pulling a load, longer strokes are possible. When the cylinder is exposed to heavy mechanical loads and long strokes we recommend the ISO 6020 /1 H160M series.

Minimum Strokes

Cylinders with intermediate trunnion mounting MT 4 require a certain minimum stroke due to the trunnion, see page 3. For cylinders with cushioning a minimum stroke is recommended to obtain a sensible motion. If a very short stroke is required we recommend the use of a cylinder without cushioning. Please discuss this with the factory.

Stop Tube

In order to reduce the charge in the gland on long stroke cylinders we recommend a stop tube. Therefore the distance between piston and rod gland will increase so the cylinder becomes more stable, the life expectancy increases and proper function is provided for. This precaution is not necessary for a cylinder mounted vertically-rod down, strongly guided and without lateral movement. Stop tube length depends on the mounting type and the load guiding factor and are available in 50mm (2 in.) increments for all diameters, except the 25×12 and 32×14, which have limited strokes. We recommend the use of PU seals due to the associated radial forces.

Tie Rod Support

For cylinders with long strokes a support is necessary to stabilize the tie rod. This option can be called for in the Technical Specification for Hydraulic Cylinders form.

External Support

Long stroke cylinders have a tendency to bend. As a consequence, this creates high friction and premature wearing of the seals. To avoid bending these cylinders an external support in the machine is often required. This support must be provided by the machine builder.

Ports

Standard ports are BSPP according to ISO 8138 and ISO 6020/2. The chamfer is designed to ISO 1179.

Oversize Ports

The ports sizes for the H160CA cylinder series are properly sized for high speed. If oversized ports are required the position and dimensions of the ports abrogate the ISO standards.

Port Positions

The DIN 24554 standard recommends as standard the position 1, 1. Other port positions can be provided as indicated on page 2.

Air Bleeds

Integrated air bleed, non removable according to ISO 4413 and NFE EN 982 (for bore sizes larger than 32mm) are standard equipment on the end caps. ISO standard dimensions are not effected. For air bleed position see pages 13 and 25.

Gland Drain

Using state of the art seal technology that provides optimum sealing means that gland drains are not normally required. Only in certain stress applications, such as extend $>$ 2× the retract speed, with long strokes, constant pressure on the seals and so on, a gland drain can be useful. For extend speed $>$ 15× retract consult factory.
The position of the gland drain is called out in the alphanumeric description i.e. RF1 or RF2, see ordering guide.
Standard ISO dimensions are followed except for size 63×45.

Technical Data

Mountings

MX5 : To the standard NFE 48.016 (for description see ISO 6099) calling for a 4-bolt mounting arrangement.
MX7 : Similar to the MX5, but with extended tie rods and countersunk screws in the end cap (for description see ISO 6099).
MS2 : With thrust key we offer a keyway for a standardized key which reduces the load on the four mounting bolts. The Norm is in preparation. Please consult factory. Port position 2 and 4 are not available in the standard program because of interference between fittings and mounting bolts.

Mounting Bolts

For affixing mounting styles ME.., MS.., mounting bolts grade 12.9 and nuts grade 80 minimum are to be used. For torque values see dimension drawings in the catalog.

Start-Up

For the cylinder to operate as designed it is important to follow setup procedures.

- the alignment of the cylinder and the load must be proper to avoid adverse load influences and premature wear
- avoid radial forces on the rod
- carefully clean the tubes and fittings before mounting
- purge the air from the system and use a clean and filtered oil

It is recommended that the cylinder rod be retracted 100% and synchronized mechanically in this position with the zero point of the load. Then fully extend the rod and be sure the load is synchronized (between the rod end and the load) at its 100% position.

Cylinder Surface Protection

A primer coat, for oxidation protection, is applied to all cylinders before shipping. Other finish coats can be applied by the customer over the primer coat. A white epoxy coating can be delivered on demand, recommended for applications in aggressive or high humidity environments.

Shelf Life of the Cylinders

All Bosch cylinders are tested with mineral oil to ISO grade IGV 046. The oil is drained and the ports sealed with a plastic plug. The residual oil protects the cylinder against rust for at least one year when the environmental conditions are dry and temperate. Cylinders with long strokes or are stored in exceptional situations, i.e. humid, very warm or very cold environments, or endure long storage periods please consult the factory. If cylinders are warehoused for more than two years we advise a seal change before cylinder installation.

Accessories

The rod eye ‘C’ with spherical bearing can be supplied already mounted onto the cylinder. Other accessories must be ordered separately. Accessories to be warehoused already have been protected against corrosion.

Cylinder Rod ‘Boot’

In applications where the rod is subject to contamination the rod and seals can be protected by a boot. Please consult factory.

Integrated Position Sensors

Cylinders can be equipped with proximity sensors, for example a potentiometer or ultrasonic with a broad choice of input signals. The cylinder can be supplied with standard ports or in a subplate mount in NG6, NG10 & NG16. For more information consult factory. This type of cylinder will deviate from certain Norm dimensions.

Loose Tolerances in Mounting

Cylinders with loose tolerances such as trunnion mount, rod eye with spherical bearing etc. should be avoided in systems where tight position control is necessary. Consult factory for further information.

Stroke End Position Sensors

Inductive proximity switches can be installed onto the cylinder, but in certain cases special end caps must be provided. Consult factory.

Piston Rod Clamping Device

Clamping devices can be mounted onto the front cap of the cylinder to maintain the piston rod’s position during long periods of inactivity, or for safety reasons. In no case is the clamping device to be used as a brake.

Technical Data

CD ROM

In addition to the catalog one can request the Bosch CD ROM with a calculation program for determining cylinders, as well as a CAD program in DXF format. Consult factory. Ordering number is 1 987 760 009.

Description of norms

ISO 6020 /2: Mounting dimensions for single rod cylinders, 16 Mpa 160 bar-Part 2: compact series
DIN 24554 : Limited choice (mountings, rod ends, etc.) of the ISO 6020/2 demanded by large worldwide customers and end-users.
NFE 48.016 : Identical to DIN 24554 but with additional mounting MX5, tenon at rod end and double rod.
ISO 6020 /3: Mounting dimensions for single rod cylinders, 16 Mpa bar-Part 3: compact series with bores from 250 to 500 mm (10 in. - 20 in.)
ISO 6099 : Identification code for mounting dimensions and mounting types
ISO 6195 : Housings for rod wiper rings in reciprocating applications-dimensions and tolerances
ISO 5597 : Housings for piston and rod seals in reciprocating applications-dimensions and tolerances
ISO 7425 /1: Housings for elastomer-energized, plastic-faced seals-dimensions and tolerances-Part 2: Piston seal housings
ISO 7425 /2: Housings for elastomer-energized, plastic-faced seals-dimensions and tolerances-Part 2: Rod seal housings
ISO 8131 : Single rod cylinders, 16 Mpa (160 bar, 2300 psi) compact series-Tolerances
ISO 8133 : Single rod cylinders, 16 Mpa (160 bar, 2300 psi) compact series-Mounting dimensions
ISO/FDIS 8138 : Single rod cylinders, 16 Mpa (160 bar, 2300 psi) compact series-Port dimensions
ISO 6547 : Piston seal housings incorporating bearing rings-Dimensions and tolerances
ISO 3320 : Cylinder bores and piston rod diameters-Metric series
ISO 3222 : Nominal pressures
ISO 4393 : Basic series of piston strokes
ISO 4395 : Piston rod thread dimensions and types
DIN : Deutsches Institut für Normung, the German standard
Afnor : French norm organization
NFE : French norm

Trouble Shooting Guide

Trouble Shooting Guide for Hydraluic Cylinders

If you encounter problems with the operation of Bosch hydraulic cylinders the following information will be helpful in determining a solution. Problems can manifest in several different ways. We isolated the most common problems into six categories.

Category 1 : The cylinder does not move.

Category 2 : The cylinder moves too slowly.

Category 3 : The cylinder moves to fast.

Category 4 : The cylinder moves in spurts, or irregularly.

Category 5 : The cushioning does not soften the stroke or “spring back” is noted.

Category 6 : The cylinder does not stay on position.

Category 1 : The cylinder does not move.

CAUSE	SOURCE	SOLUTION
Too little pressure	- misadjustment of the pressure regulator - pressure drop ahead of the installation - excessive consumption ahead or leak	- adjust - check pump and capacity of the system
Mechanical jamming	- misalignment	- disconnect the cylinder from the mechanism and align
Resisting force greater than motivating force	- friction, capacity - pressure shortage	- increase pressure - increase pressure
Excessive leakage of the cylinder	- faulty piston seal (detected through the leakage at the valve air bleeds)	- disconnect the coupling of the return piping cylinder/valve - check if there is a leak. if not, check the valve - if there is a leak, disconnect, change the seal, check the state of the cylinder
Too little flow	- ball valve closed - throttle valve closed - plug on the valve air bleed	- open valve - control adjustment - remove the plug
The valve does not reverse	- side gate jammed - ineffective reversing signal or pressure level to low	- free by using manual auxiliary commands - consult the schematic and the description of the installation

Category 2 : The cylinder moves too slowly.

CAUSE	SOURCE	SOLUTION
Too little flow	- throttle valve closed - pump is too small - valve jammed in intermediate position - leaks at the connections - clogged filters	- control adjustment - re-size pump - check valve - re-tighten the connections - disconnect and replace the filter
Resisting force greater than motivating force	- load too large for cylinder - mechanical defect	- re-size cylinder - disconnect and repair the mechanical parts
Leaks at the valve	- rod seals: may be bad if there are leaks at the valve air bleeds	- leakage may be caused by a defect of the cylinder - disconnect hose or hard pipe, blank off air bleeds 2 and 4 and check for leakage. If there is a leak, disconnect the valve, check the state of the rod (scratches). Change the seals if damaged

Trouble Shooting Guide

Trouble Shooting Guide for Hydraluic Cylinders

Category 3 : The cylinder moves to fast.

CAUSE	SOURCE	SOLUTION
Too much flow	- throttle valve opening	- control adjustment
Motivating force		- set or adapt throttle

Category 4 : The cylinder moves in spurts, or irregularly.

CAUSE	SOURCE	SOLUTION
Mechanical friction	- see category 1	- see category 1
Lack of pressure	- see category 1	- see category 1
Resisting force slightly different from the motivating force	- see category 1	- see category 1
Front guide	- poor guiding	- disconnect, change seal if necessary

Category 5 : The cushioning does not soften the stroke or “spring back” is noted.

CAUSE	SOURCE	SOLUTION
Faulty cushioning	- faulty setting of the cushioning screw - faulty cushioning seal - deteriorated quick starting valve	- adjust the cushioning screw - disconnect and change - disconnect and change
Insufficient cushioning capacity	- 100% of stroke is not reached - load too large - speed too high - pressure too high	- review installation - see catalog technical data - see catalog technical data - see catalog technical data

Category 6 : The cylinder does not stay on position

CAUSE	SOURCE	SOLUTION
Too much leakage of the cylinder	- see category 1	- see category 1
Too much leakage of the valve	- see category 2	- see category 2
Leakage at the connections	- poor tightening of the connections - faulty hose or piping - leaky check valve	- re-tighten or change the connections - check valve, clean or change if necessary

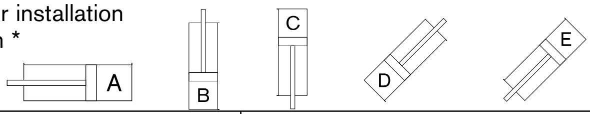
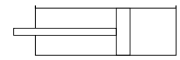
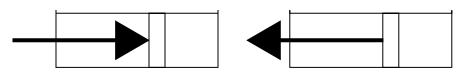
Appendix

BOSCH – Automation Technology	To: ATUS/SPM1	Fax No.: 414-554-8103

1

Technical Specification for Hydraulic Cylinders

2 Customer:	3 Batch size/qty. p. a.: /	Request no.:
4 Branch/Plant/Application:		

Cylinder installation position * 		Must be filled in	Front 	Rear
5 Piston/rod ø	/	21 Port locations		
6 Type of fastening/rod end	/	22 Port size		
7 Total stroke		23 Location of bleed screws		
8 Effective stroke/support ext. E	E=	24 Location of leakage drain		
9 Fluid		25 Max. pressure bar		
10 Contamination class	NAS/…………/ß…………=75	26 Min. pressure bar		
11 Fluid/ambient temp.	°C/ °C	27 Cushioning *	0 3 4 NA AH BT	0 3 4 NA AH BT
12 Seal: rod/piston	/			
13 Environmental conditions				
14 Protection: rod/bore	/	28 Max. speed	m/s	m/s
15 Local guidance factor	K=	29 Min. speed	m/s	m/s
16 Lateral/vertical play	/	30 Stroke time	s	s
17 Cycles per hour/day	/	31 Cushioning time	s	s
18 Impacts/shock load *	Yes / No	32 Force	daN	daN
19 Vibration: ampl./frequency	/ Hz	33 Mass at rod end	lbs.	lbs.
20 Presrcribed standards		34 Equivalent mass at rod end (indirect drive)	lbs.	lbs.

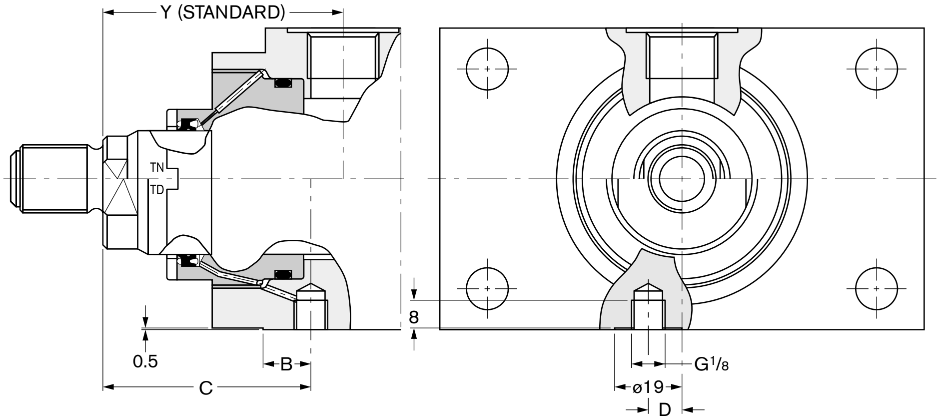
35 Remarks (drawing, replacement cylinders, competitors):

36 Alphanumerical cylinder designation:				
37 Market price: $/unit	Desired delivery date:		Date of request:	
38 Requesting party:	Location:		Tel:	Fax:
39 List price (net): $/unit	41 Suggested delivery:		Date of reply:	
40 Basic ref. no.:		42 Part number:		

* Circle as appropriate

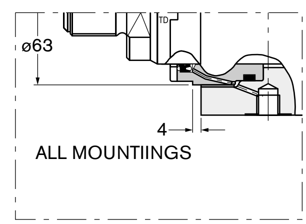
Drain Port G1/8 H160CA

MOUNTING | MDE5 ME5 | ø25 TO 200

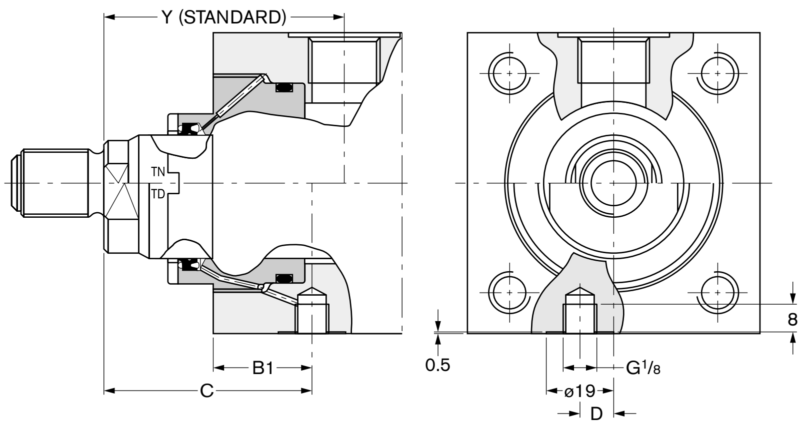


NOT ISO DIMENSION

ø63 × 45

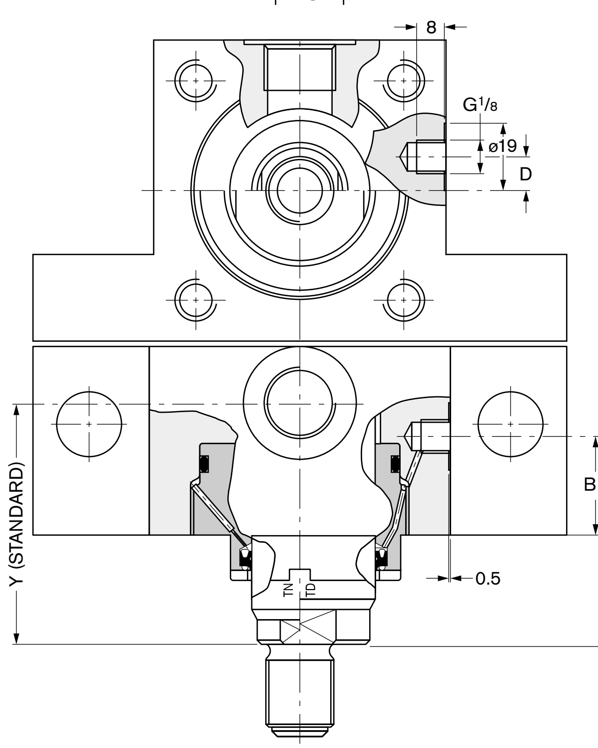


MOUNTING | ME6–MP5–MT4 MDT4 | ø40 TO 200



	B	B1	C	D
ø25	12		37	13
ø32	11		46	18
ø40	22	32	57	10
ø50	17	33	58	0
ø63	12	28	60	0
ø80	12	32	63	0
ø100	12	34	69	0
ø125	12	34	69	0
ø160	12	37	69	0
ø200	12	37	69	0

MOUNTING | MDS2 MS2 | ø40 TO 200

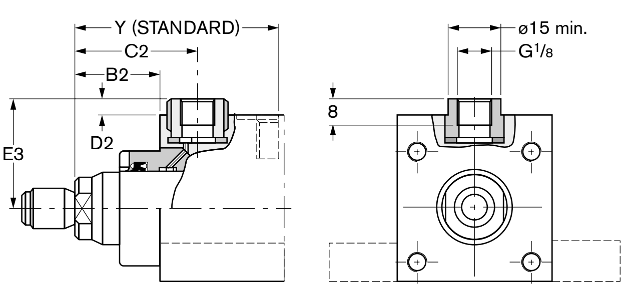


MOUNTING

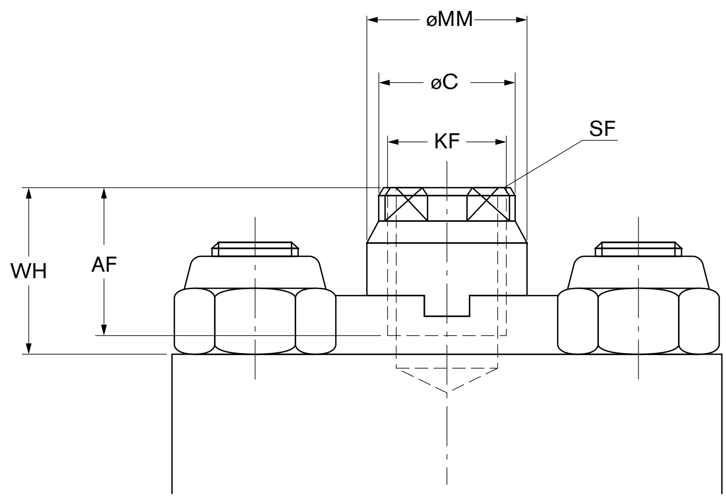
ME6–MP5–MS2
MT4–MDS2–MDT4

ø25 and 32

	B2	C2	D2	E3
ø25	11	26	5	30
ø32	11	36	5	32.5



Rod End Internal Threads



ø	øMM	KF	AF	øC	SF
25	12	M8×1	14	11	10
	18	M12×1.25	18	17	15
32	14	M10×1.25	16	13	11
	22	M16×1.5	22	21	18
40	18	M12×1.25	18	17	15
	28	M20×1.5	28	25	22
50	22	M16×1.5	22	21	18
	36	M27×2	36	33	30
63	28	M20×1.5	28	25	22
	45	M33×2	45	42	36
80	36	M27×2	36	33	30
	56	M42×2	56	53	46
100	45	M33×2	63	42	35
	70	M48×2	63	67	60
125	56	M42×2	56	53	46
	90	M64×3	85	86	75
160	70	M48×2	63	67	60
	110	M80×3	95	106	92
200	90	M64×3	85	86	75
	140	M100×3	112	136	125

Bosch Automation Technology

NORTH AMERICA
Robert Bosch Corporation
Automation Technology Division
Fluid Power Products
7505 Durand Avenue
Racine, Wisconsin 53406
Phone (414) 554-8595
Fax (414) 554-8103
FAXline: (888) 308-3424
www.boschat.com

Robert Bosch Corporation
Automation Technology Division
Factory Automation Products
816 East Third Street
Buchanan, MI 49107
Phone (616) 695-0151
Fax (616) 695-5363
FAXline: (888) 308-3424
www.boschat.com

Robert Bosch Corporation
Automation Technology Division
Industrial Electronic Products
40 Darling Drive
Avon, CT 06001-4217
Phone (860) 409-7070
Fax (860) 409-7080
FAXline: (888) 308-3424
www.boschat.com

EUROPE
Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Postfach 30 02 07
D-70442 Stuttgart
Telefax (0711) 811-7712

For more information, you may contact your nearest Bosch distributor:

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