VDMA Compact Cylinders
VDMA 24562
Magnetic Piston
Double Acting
∅ 20 to 125 mm

- **The mountings of VDMA 24562 can be used**
- **M/50 – Switches can be mounted flush with the profile**
- **Magnetic piston as standard**
- **VDMA pitch as standard (Ø 32 to 125 mm)**
- **Seals ensure low friction operation and long life**
- **Three different integrated guiding Systems: RM/192000/N2, .../N4, .../N6**

Technical Data

Medium:
Compressed air, filtered, lubricated or non-lubricated

Standard:

VDMA 24562 (Pitch and mountings)	Ø 32 to 125 mm
UNITOP (Pitch)	Ø 20 and 25 mm

Operation:

RM/192000/M	Double acting, magnetic piston, male piston rod thread, buffer cushioning
RM/192000/MX	Double acting, magnetic piston, female piston rod thread, buffer cushioning

Operating Pressure:
1 to 10 bar

Operating Temperature:
-5°C* to +80˚C max.
* Consult our Technical Service for use below +2°C

Cylinder Diameters:
20, 25, 32, 40, 50, 63, 80, 100, 125 mm

Strokes:
Standard: 5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 100 mm

Ø 20 and 25 mm	min. 5 mm	max. 200 mm
Ø 32 and 40 mm	min. 5 mm	max. 300 mm
Ø 50 and 63 mm	min. 10 mm	max. 400 mm
Ø 80 to 125 mm	min. 15 mm	max. 500 mm

Materials:
Profile barrel: Anodised aluminium
End covers:Anodised aluminium
Piston rod: Stainless steel (Ø 20 and 25 mm Austenitic, Ø 32 to 125 mm Martensitic)
Piston rod seals: Polyurethane
Piston seals: Nitrile rubber
'O'-rings: Nitrile rubber

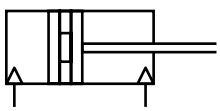
Ordering Examples
See page N **1.5.**095.04

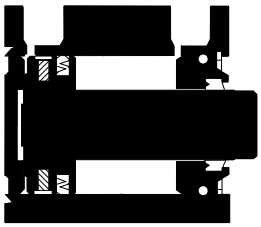
Mountings and Switches
See page N **1.5.**095.03 and .04

Guide Blocks
QA/8000/51/* – Plain Bearing
QA/8000/61/* – Roller Bearing (long coupling)
QA/8000/81/* – Plain Bearing (long coupling)
QA/8000/85/* – Plain Bearing (short coupling)
See page N **1.5.**095.18 to 22

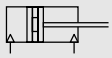
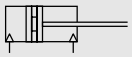
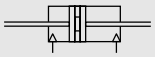
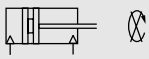
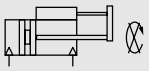
Assembly Kit for Four-position Cylinders
QM/192000/55 see page N **1.5.**095.17

Alternative Models
Single acting cylinders see page N **1.4.**087





Cylinder Variants

Symbol	Model Magnetic piston	Description	Dimensions Page
	**RM/192000/M**	Standard cylinder, male piston rod thread	4
	RM/192000/MX	Standard cylinder, female piston rod thread	4
	TRM/192000/M	Heat resistant (150°C), male piston rod thread, Ø 20 to 100 mm, max. stroke 200 mm	4
	TRM/192000/MX	Heat resistant (150°C), female piston rod thread, Ø 20 to 100 mm, max. stroke 200 mm	4
	RM/192000/**MU**	Cylinder with extended piston rod, male piston rod thread	4
	RM/192000/M**UX**	Cylinder with extended piston rod, female piston rod thread	4
	RM/192000/**JM**	Cylinder with double ended piston rod, male piston rod thread	5
	RM/192000/**JMX**	Cylinder with double ended piston rod, female piston rod thread	5
	RM/192000/**N2**	Cylinder with non-rotating piston rod (internal), male piston rod thread, Ø 20 to 100 mm	5
	RM/192000/**N2X**	Cylinder with non-rotating piston rod (internal), female piston rod thread, Ø 20 to 100 mm	5
	RM/192000/**N4**	Cylinder with guided piston rod, Ø 20 to 100 mm	6
	RM/192000/**N6**	Cylinder with external guiding , Ø 25 and 32 mm	7

For combinations of cylinder variants consult our Technical Service.

Model Codes

✶**RM/192**✶✶✶**/**✶✶✶**/**✶✶✶

Special Variants	**Substitute**
Heat resistant seals, 150°C max.	**T**

Cylinder Diameters (mm)	**Substitute**
20	**020**
25	**025**
32	**032**
40	**040**
50	**050**
63	**063**
80	**080**
100	**100**
125	**125**

Strokes (mm)		
ø 20 and 25	min. 5	max. 200
ø 32 and 40	min. 5	max. 300
ø 50 and 63	min. 10	max. 400
ø 80 to 125	min. 15	max. 500

Piston rod thread	**Substitute**
Female	**X**
Male	**None**

Variants **(magnetic piston)**	**Substitute**
Standard	**M**
Double ended piston rod	**JM**
Non-rotating piston rod (internal)	**N2**
Guided piston rod	**N4**
External guiding	**N6**
Extended piston rod	**MU**

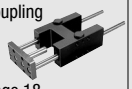
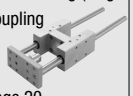
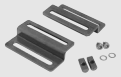
RM/192✶✶✶/MU✶/✶✶✶/✶✶✶ → Extension (mm)

Note: If option is not required, disregard option position within part number eg.
RM/192100/M/100. For combinations of cylinder variants consult our Technical Service.

Standard Strokes

Cylinder ∅	Strokes (mm) 5	10	15	20	25	30	40	50	60	80	100
20	●	●	●	●	●	●	●	●			
25	●	●	●	●	●	●	●	●			
32	●	●	●	●	●	●	●	●	●	●	●
40	●	●	●	●	●	●	●	●	●	●	●
50		●	●	●	●	●	●	●	●	●	●
63		●	●	●	●	●	●	●	●	●	●
80			●	●	●	●	●	●	●	●	●
100			●	●	●	●	●	●	●	●	●
125			●	●	●	●	●	●	●	●	●

Mountings

Cylinder ∅	Style 'A'  Page 08	Style 'B', 'G'  Page 08	Style 'C'  Page 08	Style 'D'  Page 09	Style 'D2'  Page 10	Style 'FH'  Page 12	Style 'L2'  Page 11	Style 'R'  Page 11
20	–	QM/192020/22	QM/192020/21	–	–	–	QM/8020/44	QM/192020/27
25	–	QM/192025/22	QM/192025/21	–	–	–	QM/8020/44	QM/192025/27
32	QM/8032/35	QA/8032/22	QA/8032/21	QA/8032/23	QA/8032/42	QA/8032/34	–	QA/8032/27
40	QM/8032/35	QA/8040/22	QA/8040/21	QA/8040/23	QA/8040/42	QA/8040/34	–	QA/8040/27
50	QM/8050/35	QA/8050/22	QA/8050/21	QA/8050/23	QA/8050/42	QA/8050/34	–	QA/8050/27
63	QM/8050/35	QA/8063/22	QA/8063/21	QA/8063/23	QA/8063/42	QA/8063/34	–	QA/8063/27
80	QM/8080/35	QA/8080/22	QA/8080/21	QA/8080/23	QA/8080/42	QA/8080/34	–	QA/8080/27
100	QM/8080/35	QA/8100/22	QA/8100/21	QA/8100/23	QA/8100/42	QA/8100/34	–	QA/8100/27
125	QM/8125/35	QM/8125/22	QM/8125/21	QM/8125/23	QA/8125/42	QA/8125/34	–	QM/8125/27
Cylinder ∅	Style 'S'  Page 12	Style 'SS'  Page 13	Style 'SW'  Page 09	Style 'UH'  Page 12	Style 'UR'  Page 11	Style 'US'  Page 10	Assembly Kit  Page 17	Guide Blocks Plain Bearing  Page 22
20	–	–	–	–	–	–	QM/192020/55	–
25	–	–	–	–	–	–	QM/192025/55	–
32	QA/8032/41	M/P19931	M/P19493	PQA/182032/40	QA/8032/33	M/P40310	QM/192032/55	QA/8032/51/*
40	QA/8040/41	M/P19932	M/P19494	PQA/182040/40	QA/8040/33	M/P40311	QM/192040/55	QA/8040/51/*
50	QA/8040/41	M/P19933	M/P19495	PQA/182050/40	QA/8050/33	M/P40312	QM/192050/55	QA/8050/51/*
63	QA/8063/41	M/P19934	M/P19496	PQA/182063/40	QA/8063/33	M/P40313	QM/192063/55	QA/8063/51/*
80	QA/8063/41	M/P19935	M/P19497	PQA/182080/40	QA/8080/33	M/P40314	QM/192080/55	QA/8080/51/*
100	QA/8100/41	M/P19936	M/P19498	PQA/182100/40	QA/8100/33	M/P40315	QM/192100/55	QA/8100/51/*
125	QA/8100/41	M/P19937	M/P19499	PQA/182125/40	QM/8125/33	M/P71355	QM/192125/55	–
Cylinder ∅	Guide Blocks ### Roller Bearing (long coupling  Page 18	Guide Blocks Plain Bearing (long coupling  Page 20	Guide Blocks Plain Bearing (short coupling  Page 20	Valve Mounting Kit  Page 17	Groove Key  Page 17	Groove Cover  Page 17		
20	–	–	–	–	M/P72816	M/P72725/1000		
25	–	–	–	–	M/P72816	M/P72725/1000		
32	QA/8032/61/*	QA/8032/81/*	QA/8032/85/*	–	M/P72816	M/P72725/1000		
40	QA/8040/61/*	QA/8040/81/*	QA/8040/85/*	–	M/P72816	M/P72725/1000		
50	QA/8050/61/*	QA/8050/81/*	QA/8050/85/*	QA/180050/22/54	M/P72816	M/P72725/1000		
63	QA/8063/61/*	QA/8063/81/*	QA/8063/85/*	QA/180050/22/54	M/P72816	M/P72725/1000		
80	QA/8080/61/*	QA/8080/81/*	QA/8080/85/*	QA/180080/22/54	M/P72816	M/P72725/1000		
100	QA/8100/61/*	QA/8100/81/*	QA/8100/85/*	QA/180080/22/54	M/P72816	M/P72725/1000		
125	–	–	–	QA/180080/22/54	M/P72816	M/P72725/1000		

For locking cartridge see page 18

Mountings

for cylinders with male piston rod thread | **for cylinders with female piston rod thread**

Cylinder ∅	Style 'AK' Page 15	Style 'F' Page 13	Style 'N2' Page 15	Style 'UF' Page 15	Style 'F' Page 14	Style 'N2' Page 14	Stud and Adaptor Page 14
20	QM/8025/38	QM/8025/25	M/P1501/89	QM/8025/32	QM/57016/25	M/P1501/79	M/P1710/21#
25	QM/8025/38	QM/8025/25	M/P1501/89	QM/8025/32	QM/57016/25	M/P1501/79	M/P1710/21#
32	QM/8025/38	QM/8025/25	M/P1501/89	QM/8025/32	QM/57020/25	M/P1501/60	M/P1710/22#
40	QM/8040/38	QM/8040/25	M/P1501/90	QM/8040/32	QM/57020/25	M/P1501/60	M/P1710/22#
50	QM/8050/38	QM/8050/25	M/P1501/91	QM/8050/32	QM/57025/25	–	M/P71470/1##
63	QM/8050/38	QM/8050/25	M/P1501/91	QM/8050/32	QM/57040/25	–	M/P71470/2##
80	QM/8080/38	QM/8080/25	M/P1501/92	QM/8080/32	QM/57063/25	–	M/P71470/3##
100	QM/8080/38	QM/8080/25	M/P1501/92	QM/8080/32	QM/57063/25	–	M/P71470/3##
125	QM/8125/38	QM/8125/25	M/P1501/105	QM/8125/32	QM/57063/25	–	–

Stud, ## Adaptor

Switches

Model	Cable	Plug (M8x1)	Cable (150°C max.)
Reed	M/50/LSU/..	M/50/LSU/CP	TM/50/RAU/2S
	M/50/RAC/5V	—	—
Solid state	M/50/EAP/..	M/50/EAP/CP	—
	M/50/EAN/..	M/50/EAN/CP	—

Model Reed	Solid State	Voltage V a.c.	V d.c.	Current Max.	Temperature °C	LED	Features	Cable/Plug Length	Cable Type	Plug-in Cable Straight	90°	Catalogue Page
M/50/LSU/*V	—	10 to 240	10 to 170	180 mA	-20° to +80°	●	—	2, 5, 10 m	PVC 2 x 0,25	—	—	N **4.3.**005
M/50/LSU/5U	—	10 to 240	10 to 170	180 mA	-20° to +80°	●	—	5 m	PUR 2 x 0,25	—	—	N **4.3.**005
TM/50/RAU/2S	—	10 to 240	10 to 170	180 mA	-20° to +150°	—	—	2 m	Silicon 2 x 0,25	—	—	N **4.3.**005
M/50/RAC/5V	—	10 to 240	10 to 170	180 mA	-20° to +80°	—	Changeover	5 m	PVC 3 x 0,25	—	—	N **4.3.**005
M/50/LSU/CP	—	10 to 60	10 to 75	180 mA	-20° to +80°	●	Plug M8x1	5 m	PVC 3 x 0,25	M/P73001/5	—	N **4.3.**005
—	M/50/EAP/*V	—	10 to 30	150 mA	-20° to +80°	●	PNP	2, 5, 10 m	PVC 3 x 0,25	—	—	N **4.3.**007
—	M/50/EAP/CP	—	10 to 30	150 mA	-20° to +80°	●	PNP, plug M8x1	5 m	PVC 3 x 0,25	M/P73001/5		N **4.3.**007
—	M/50/EAN/*V	—	10 to 30	150 mA	-20° to +80°	●	NPN	2, 5, 10 m	PVC 3 x 0,25	—	—	N **4.3.**007
—	M/50/EAN/CP	—	10 to 30	150 mA	-20° to +80°	●	NPN, plug M8x1	5 m	PVC 3 x 0,25	M/P73001/5	—	N **4.3.**007

* Insert cable length

Full information on switches (technical data, cable materials, dimensions etc.) please refer to relevant catalogue pages

Ordering Examples

Cylinders

To order a standard 50 mm bore magnetic piston cylinder with a 25 mm stroke and male piston rod thread quote: **RM/192050/M/25**

Mountings

To order a front flange mounting style 'G' for 50 mm bore cylinder quote: **QA/8050/22**

Switches

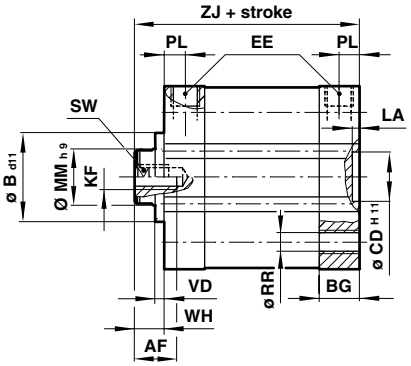
To order a reed switch with LED and 2 m cable length quote: **M/50/LSU/2V**

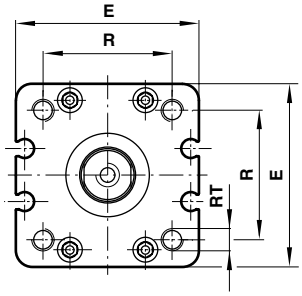
Theoretical Forces • Air Consumption

Cylinder ∅	Theoretical forces (N) at 6 bar Outstroke	Intstroke	Air consumption (l/cm stroke) at 6 bar Outstroke	Instroke
20	188	158	0,022	0,019
25	294	247	0,035	0,028
32	482	414	0,056	0,048
40	754	633	0,088	0,074
50	1178	990	0,137	0,114
63	1870	1680	0,218	0,195
80	3016	2722	0,35	0,32
100	4710	4416	0,55	0,51
125	7363	6882	0,86	0,79

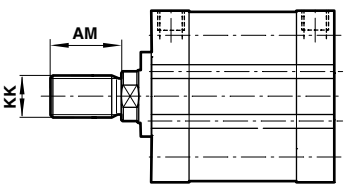
Basic Dimensions

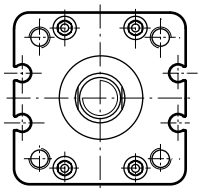
RM/192000/MX – Standard Cylinders
With female piston rod thread





RM/192000/M – Standard Cylinders
With male piston rod thread

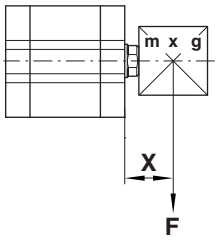




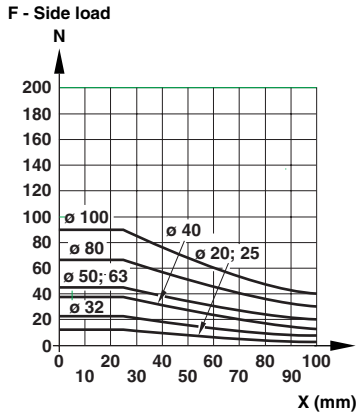
Cylinder ∅	AF	AM	∅ B d11	BG	∅ CD H11	❑ E	EE	KF	KK	LA	∅ MM h9
20	10	22	–	12	12	36	M 5	M6	M10x1,25	2,5	10
25	10	22	–	13	12	40	M 5	M6	M10x1,25	2,5	10
32	12	22	–	14,5	14	47	G 1/8	M8	M10x1,25	2,5	12
40	12	24	–	14,5	14	53	G 1/8	M8	M12x1,25	2,5	16
50	14	32	–	14,5	18	65,5	G 1/8	M10	M16x1,5	2,5	20
63	16	32	–	14,5	18	75	G 1/8	M12	M16x1,5	2,5	20
80	22	40	–	16,5	23	95	G 1/8	M16	M20x1,5	3	25
100	22	40	–	21,5	28	116	G 1/4	M16	M20x1,5	3	25
125	30	54	60	20,5	28	140	G 1/4	M20	M27x2	3	32

Cylinder ∅	PL	❑ R	∅ RR	RT	SW (A/F)	VD	WH	ZJ	at 0 mm	per 5 mm	
20	7,5	22	4,3	M5	8	–	6	43	0,12 kg	0,01 kg	
25	7,5	26	4,3	M5	8	–	6	45	0,15 kg	0,01 kg	
32	7,5	32,5	5,3	M6	10	–	7	51	0,23 kg	0,02 kg	
40	7,5	38	5,3	M6	13	–	7	52	0,30 kg	0,02 kg	
50	7,5	46,5	6,8	M8	17	–	8	53	0,46 kg	0,03 kg	
63	7,5	56,5	6,8	M8	17	–	8	58	0,70 kg	0,03 kg	
80	8,5	72	8,6	M10	22	–	10	65	1,23 kg	0,04 kg	
100	10,5	89	8,6	M10	22	–	10	77	2,20 kg	0,05 kg	
125	10,5	110	10,6	M12	27	4	18	89	3,60 kg	0,07 kg	

Side Load



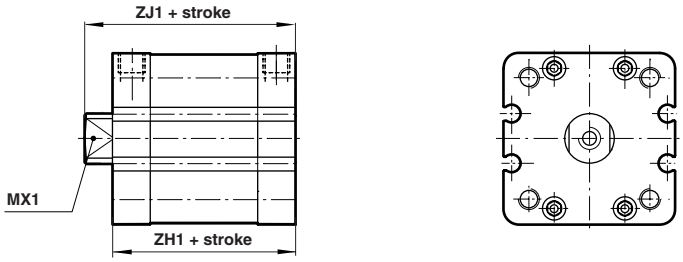
TRM/192000: F x 0,5



Cylinder Variants

RM/192000/N2X – Cylinder with Non-rotating Piston Rod

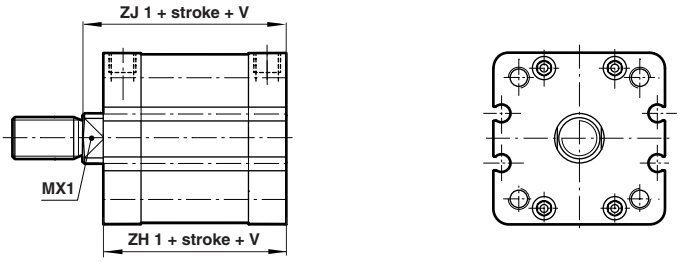
With female piston rod thread



Cylinder ∅	MX1	ZH1	ZJ1
20	8	47	53
25	8	49	55
32	10	54	61
40	13	55	62
50	16	55	63
63	16	60	68
80	21	65	75
100	21	77	87

RM/192000/N2 – Cylinder with Non-rotating Piston Rod

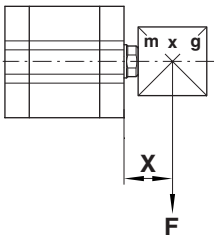
With male piston rod thread

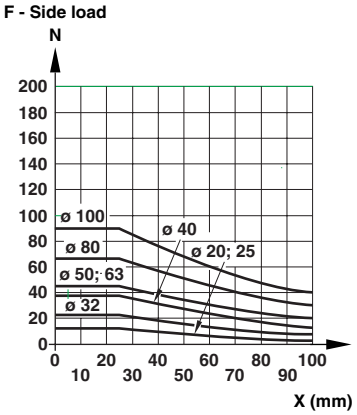


Torque

Cylinder ∅	Model	Torque max. (Nm)
20	RM/192020/N2	0,15
25	RM/192025/N2	0,25
32	RM/192032/N2	0,40
40	RM/192040/N2	0,75
50	RM/192050/N2	1,5
63	RM/192063/N2	1,5
80	RM/192080/N2	2,5
100	RM/192100/N2	2,5

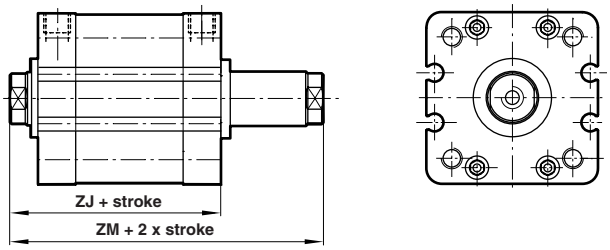
Side Load





RM/192000/JMX – Cylinder with Double Ended Piston Rod

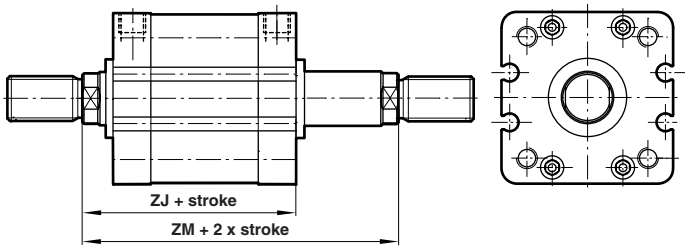
With female piston rod thread



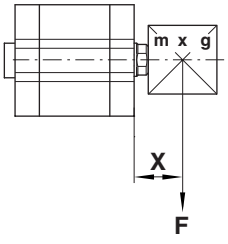
Cylinder ∅	ZJ	ZM	
20	43	49	
25	45	51	
32	51	58	
40	52	59	
50	53	61	
63	58	66	
80	65	75	
100	77	87	
125	89	107	

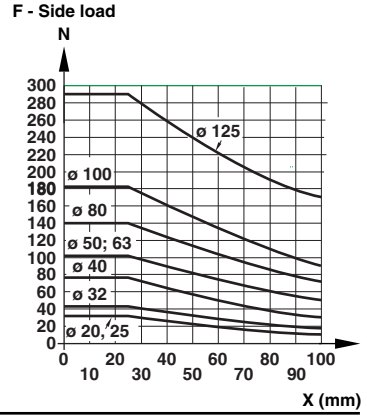
RM/192000/JM – Cylinder with Double Ended Piston Rod

With male piston rod thread



Side Load

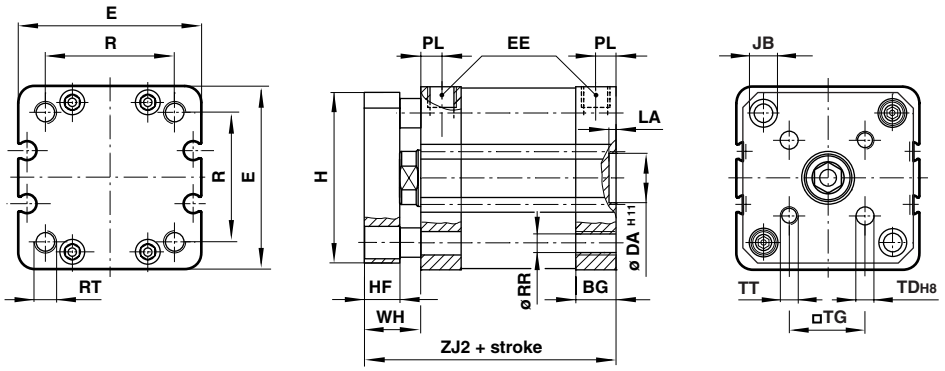




TRM/192000: F x 0,5

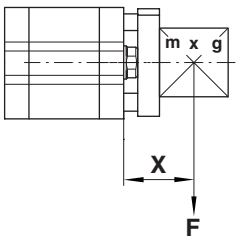
Cylinder Variants

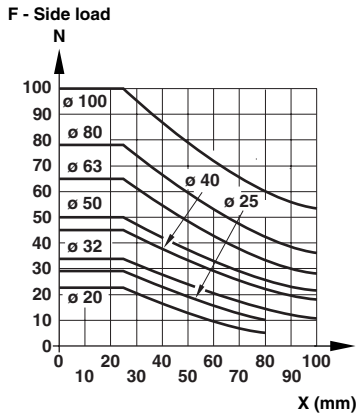
RM/192000/N4 – Cylinder with Guided Piston Rod

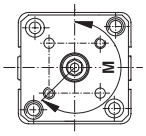


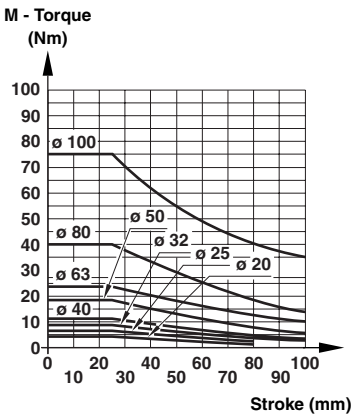
Cylinder ∅	BG	∅ DA H11	E	EE	H	HF	∅ JB	LA	PL	R	∅ RR	RT	∅ TD H8	❑ TG	TT	WH	ZJ2
20	12	12	36	M5	34	8	7,5	2,5	7,5	22	4,3	M5	4	12	M4	14	51
25	13	12	40	M5	38	8	7,5	2,5	7,5	26	4,3	M5	5	15,6	M5	14	53
32	14,5	14	47	G1/8	45	10	9	2,5	7,5	32,5	5,3	M6	5	19,8	M5	17	61
40	14,5	14	53	G1/8	51	10	9	2,5	7,5	38	5,3	M6	5	23,3	M5	17	62
50	14,5	18	65,5	G1/8	62,5	12	11	2,5	7,5	46,5	6,8	M8	6	29,7	M6	20	65
63	14,5	18	75	G1/8	72	12	11	2,5	7,5	56,5	6,8	M8	6	35,4	M6	20	70
80	16,5	23	95	G1/8	92	15	15	3	8,5	72	8,6	M10	8	46	M8	25	80
100	21,5	28	116	G1/4	112	15	15	3	10,5	89	8,6	M10	10	56,5	M10	25	92

Side Load and Torque

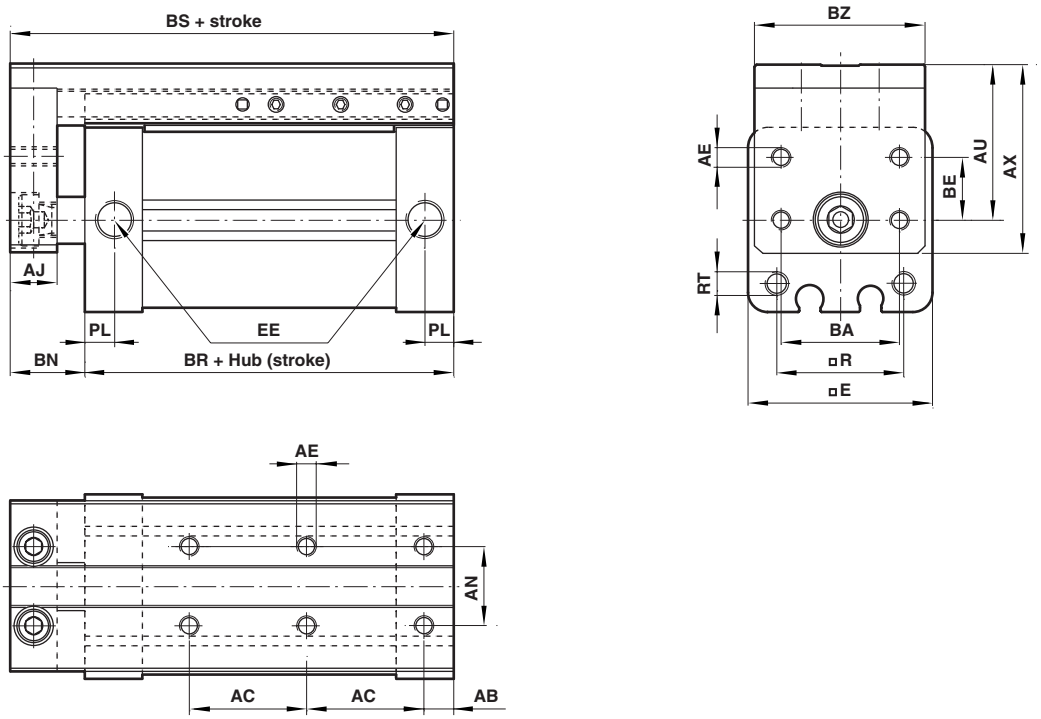






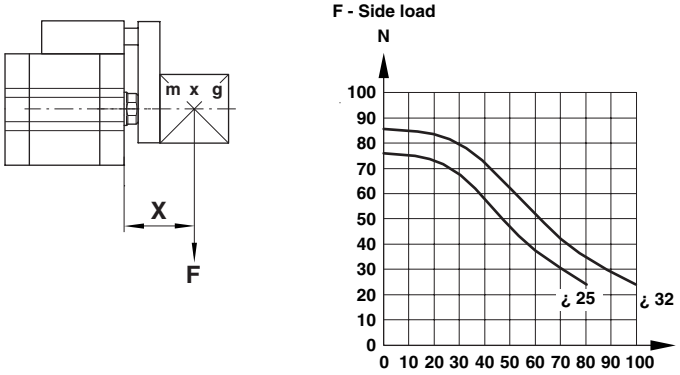


RM/192000/N6 – Cylinder with External Guiding



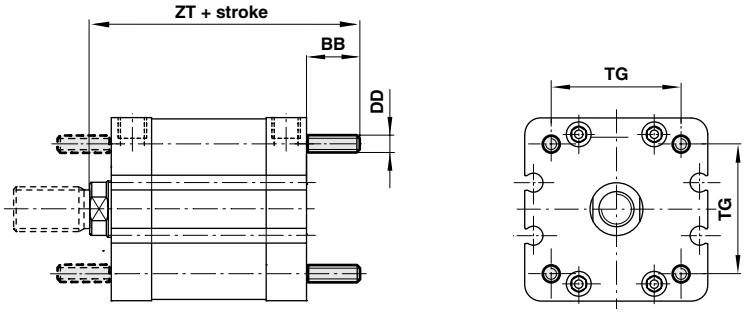
Typ	AB	AC	AE	AJ	AN	AU	AX	BA	BE	BN	BR	BS	BZ	E	EE	R	RT	PL	at 0 mm	per 5 mm
Ø 25	7,5	30	M5	12	20	37,5	44	30	16	19	39	57	43,5	40	M5	26	M5	7,5	0,31 kg	0,09 kg
Ø 32	7,5	30	M5	12	20	40,5	48,5	30	16	19	44	63	43,5	47	G1/8	32,5	M6	7,5	0,44 kg	0,12 kg

Side Load



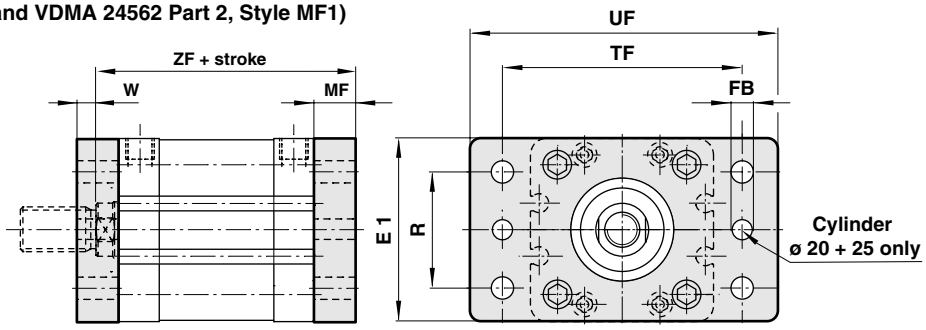
Mountings

QM/8000/35 – Front or Rear Stud Mounting Style 'A'
(Corresponds to DIN ISO 6431 Style MX1)

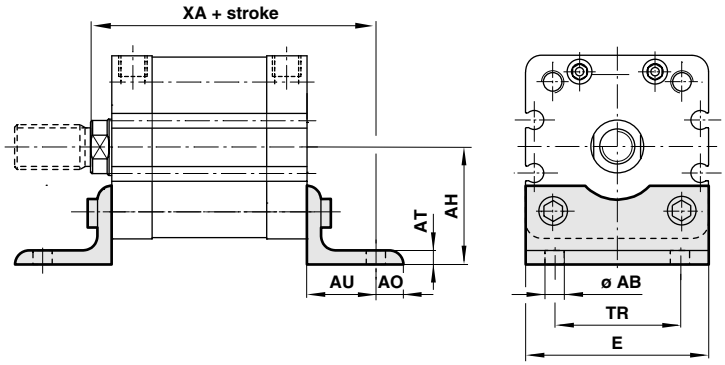


QA/8000/22 – Rear Flange Mounting Style 'B'
(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MF2)

QA/8000/22 – Front Flange Mounting Style 'G'
(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MF1)



QA/8000/21 – Foot Mounting Style 'C'
(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MS1)

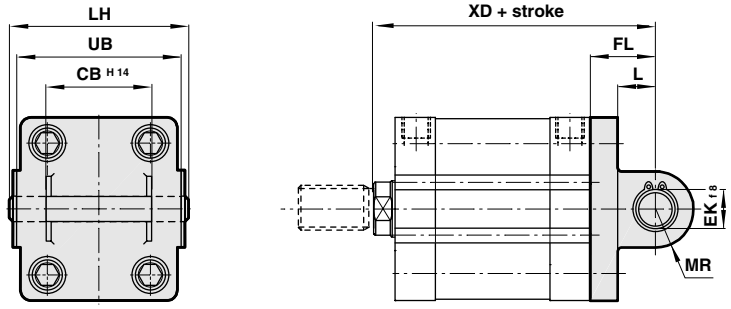


Cylinder ∅	∅ AB	AH	AO	AT	AU	BB	DD	E	E1	∅ FB	MF	R
20	6,6	27	6	4	16	–	–	36	36	6,6	10	–
25	6,6	30	7	4	16	–	–	40	40	6,6	10	–
32	7	32	8	4	24	17	M6	48	50	7	10	32
40	9	36	9	4	28	17	M6	53	55	9	10	36
50	9	45	10	5	32	23	M8	64	65	9	12	45
63	9	50	12	5	32	23	M8	74	75	9	12	50
80	12	63	19	5	41	28	M10	98	100	12	16	63
100	14	71	19	5	41	28	M10	115	120	14	16	75
125	16	90	20	9	45	34	M12	140	140	16	20	90

Cylinder ∅	TF	TG	TR	UF	W	XA	ZF	ZT	Style 'A'	Style 'B', 'G'	Style 'C'	
20	55	–	22	70	4	59	53	–	–	0,16 kg	0,03 kg	
25	60	–	26	76	4	61	55	–	–	0,20 kg	0,04 kg	
32	64	32,5	32	80	3	75	61	68	0,02 kg	0,25 kg	0,15 kg	
40	72	38	36	90	3	80	62	69	0,02 kg	0,35 kg	0,18 kg	
50	90	46,5	45	110	4	85	65	76	0,05 kg	0,70 kg	0,30 kg	
63	100	56,5	50	125	4	90	70	81	0,05 kg	0,80 kg	0,39 kg	
80	126	72	63	154	6	106	81	93	0,08 kg	1,35 kg	0,80 kg	
100	150	89	75	186	6	118	93	105	0,08 kg	2,20 kg	0,95 kg	
125	180	110	90	224	2	134	109	123	0,14 kg	1,70 kg	2,40 kg	

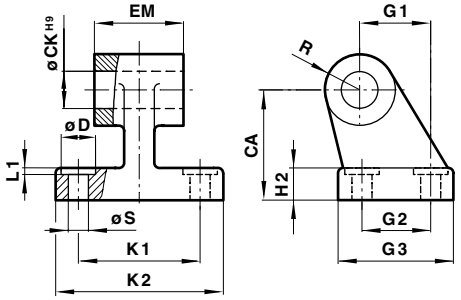
QA/8000/23 – Rear Clevis Mounting Style ‘D’

(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MP2)



M/P194 . . – Bracket Style ‘SW’

(Corresponds to VDMA 24562, Part 2)
For Clevis Mounting Style ‘D’

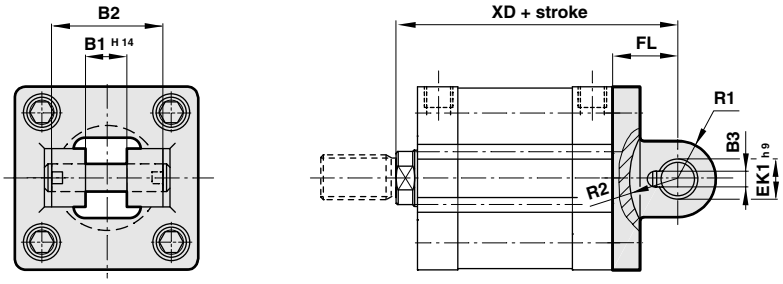


Cylinder ∅	CA	CB H14	∅ CK H9	∅ D	∅ EK f8	EM	FL	G 1	G 2	G 3	H 2	K 1
32	32	26	10	11	10	26	22	21	18	31	8	38
40	36	28	12	11	12	28	25	24	22	35	10	41
50	45	32	12	15	12	32	27	33	30	45	12	50
63	50	40	16	15	16	40	32	37	35	50	12	52
80	63	50	16	18	16	50	36	47	40	60	14	66
100	71	60	20	18	20	60	41	55	50	70	15	76
125	90	70	25	20	25	70	50	70	60	90	20	94

Cylinder ∅	K 2	L	L 1	LH	MR	R	∅ S	UB	XD	Style ‘D’	Style ‘SW	
32	51	13	1,6	52	9	10	6,6	45	73	0,11 kg	0,05 kg	
40	54	16	1,6	60	12	11	6,6	52	77	0,16 kg	0,07 kg	
50	65	17	1,6	68	12	13	9	60	80	0,22 kg	0,14 kg	
63	67	22	1,6	79	15	15	9	70	90	0,34 kg	0,18 kg	
80	86	22	2,5	99	15	15	11	90	101	0,54 kg	0,28 kg	
100	96	27	2,5	119	20	19	11	110	118	0,90 kg	0,42 kg	
125	124	31	3,2	139	25	22	14	130	139	2,70 kg	2,70 kg	

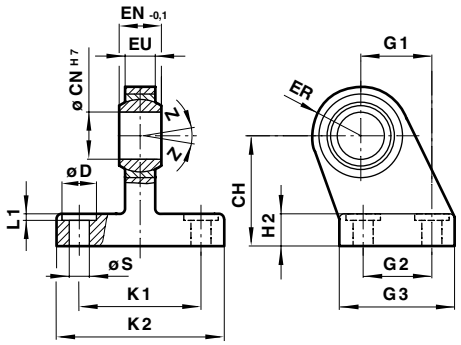
QA/8000/42 – Rear Clevis Mounting Style ‘D2’

(Corresponds to VDMA 24562 Part 2)



M/P403 . . – Bracket Hinge Style ‘US’

(Corresponds to VDMA 24562 Part 2)
For Clevis Mounting Style ‘D2’

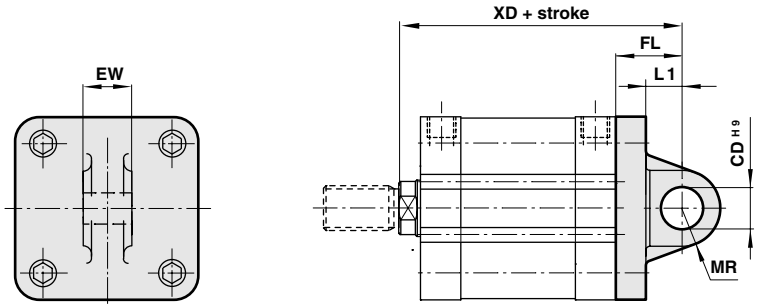


Cylinder ∅	B1 H14	B2	B3	CH	∅ CN H7	∅ D	∅ EK h9	EN -0,1	ER	EU	FL	G 1	G 2
32	14	34	3,3	32	10	11	10	14	16	10,5	22	21	18
40	16	40	4,3	36	12	11	12	16	19	12	25	24	22
50	21	45	4,3	45	16	15	16	21	21	15	27	33	30
63	21	51	4,3	50	16	15	16	21	24	15	32	37	35
80	25	65	4,3	63	20	18	20	25	28	18	36	47	40
100	25	75	4,3	71	20	18	20	25	30	18	41	55	50
125	37	97	6,3	90	30	20	30	37	40	25	50	70	60

Cylinder ∅	G 3	H 2	K1	K 2	L1	R1	R2	∅ S	XD	Z	Style ‘D2’	Style ‘US’	
32	31	8	38	51	1,6	11	17	6,6	73	13°	0,20 kg	0,19 kg	
40	35	10	41	54	1,6	12	20	6,6	77	13°	0,23 kg	0,24 kg	
50	45	12	50	65	1,6	14,5	22	9	80	13°	0,36 kg	0,46 kg	
63	50	12	52	67	1,6	18	25	9	90	15°	0,55 kg	0,59 kg	
80	60	14	66	86	2,5	22	30	11	101	15°	0,90 kg	1,03 kg	
100	70	15	76	96	2,5	22	32	11	118	15°	1,45 kg	1,40 kg	
125	90	20	94	124	3,2	30	42	14	139	15°	2,70 kg	3,10 kg	

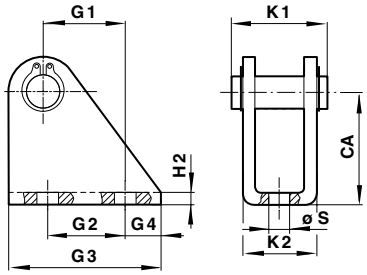
QA/8000/27 – Rear Eye Mounting Style ‘R’

(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MP4)



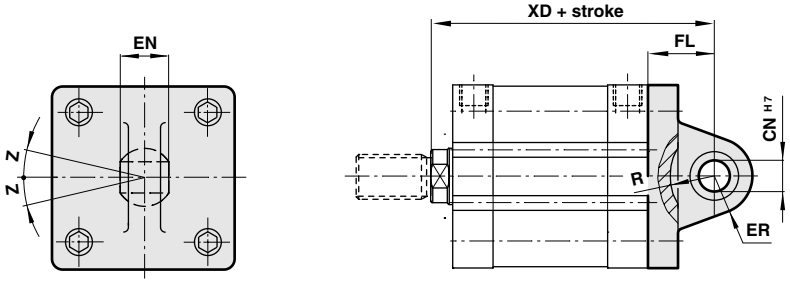
QM/8020/44 – Bracket Hinge Style ‘L2’

For Rear Eye Mounting Style ‘R’



QA/8000/33 – Universal Rear Eye Mounting Style ‘UR’

(Corresponds to VDMA 24562 Part 2)

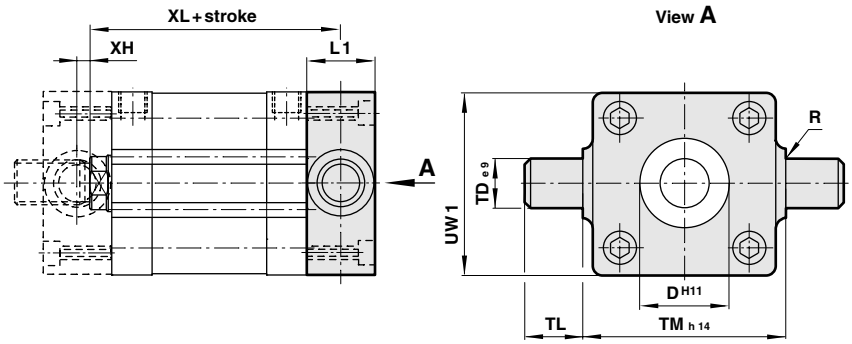


Cylinder ∅	CA	∅ CD H9	∅ CN H7	EN	ER	EW	FL	G 1	G 2	G 3	G4	H2
20	30	8	–	–	–	15,8	20	16	20	32	6	4
25	30	8	–	–	–	15,8	20	16	20	32	6	4
32	–	10	10	14	16	25,8	22	–	–	–	–	–
40	–	12	12	16	19	27,8	25	–	–	–	–	–
50	–	12	16	21	21	31,7	27	–	–	–	–	–
63	–	16	16	21	24	39,7	32	–	–	–	–	–
80	–	16	20	25	28	49,7	36	–	–	–	–	–
100	–	20	20	25	30	59,7	41	–	–	–	–	–
125	–	25	30	37	40	69,7	50	–	–	–	–	–

Cylinder ∅	K 1	K 2	L 1	MR	R	∅ S	XD	Z	Style ‘L2’	Style ‘R’	Style ‘UR’	
20	29,5	24	14	8	–	6,6	63	–	0,08 kg	0,02 kg	–	
25	29,5	24	14	8	–	6,6	65	–	0,08 kg	0,03 kg	–	
32	–	–	13	9	14,5	–	73	13°	–	0,09 kg	0,17 kg	
40	–	–	16	12	18	–	77	13°	–	0,11 kg	0,25 kg	
50	–	–	17	12	19	–	80	13°	–	0,17 kg	0,40 kg	
63	–	–	22	15	24	–	90	15°	–	0,24 kg	0,55 kg	
80	–	–	22	15	24	–	101	15°	–	0,37 kg	0,90 kg	
100	–	–	27	20	29	–	118	15°	–	0,59 kg	1,50 kg	
125	–	–	33	25	36	–	139	15°	–	3,20 kg	2,70 kg	

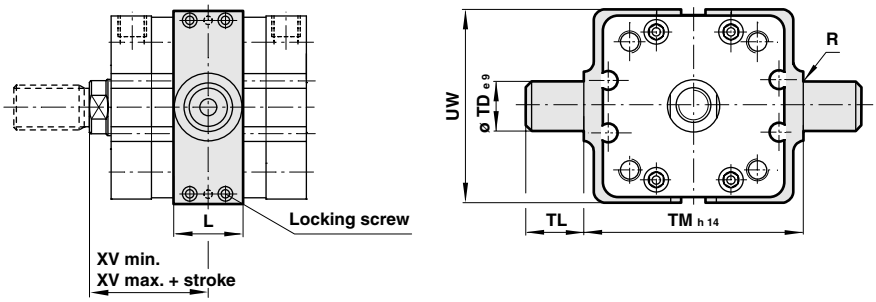
QA/8000/34 – Front or Rear Detachable Trunnion Mounting Style 'FH'

(Corresponds to VDMA 24562 Part 2, Style MT 5/6)



PQA/182000/40 – AdjustableTrunnion Mounting Style 'UH'

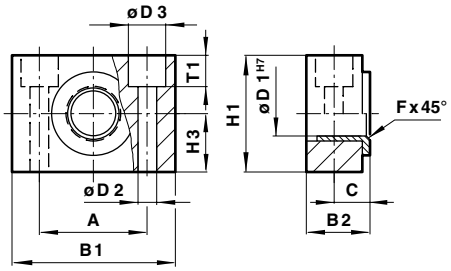
(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MT4)



Note:
Style 'UH': It is most important that the locking screws which secure the mounting to the cylinder barrel are tightened to the torque figures shown in the table below.
For maximum energy input, consult our Technical Service.

QA/8000/41 – Swivel Bearing Style 'S'

For Trunnion Mountings Style 'FH', 'UH'

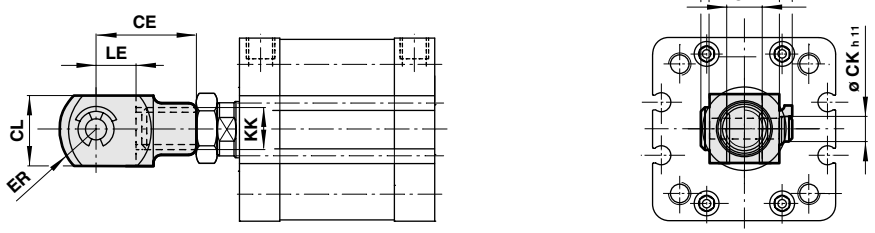


Cylinder ∅	A	B 1	B 2	C	∅ D H11	∅ D 1 H7	∅ D 2	∅ D 3	F x 45°	H 1	H 3	L	L 1	R
32	32	46	18	10,5	30	12	6,6	11	1	30	15	25	16	1
40	36	55	21	12	35	16	9	15	1,6	36	18	28	20	1,6
50	36	55	21	12	40	16	9	15	1,6	36	18	28	24	1,6
63	42	65	23	13	45	20	11	18	1,6	40	20	36	24	1,6
80	42	65	23	13	45	20	11	18	1,6	40	20	36	28	1,6
100	50	75	28,5	16	55	25	14	20	2	50	25	48	38	2
125	50	75	28,5	16	60	25	14	20	2	50	25	48	50	2

Cylinder ∅	∅ TD e9	TL	TM h14	T 1	UW	UW 1	XH	XL	XV min.	XV max.	Torque Nm	Style 'FH'	Style 'S'	Style 'UH'
32	12	12	50	6,8	58	50	1	59	35	23	2	0,20 kg	0,11 kg	0,16 kg
40	16	16	63	9	65	55	3	62	36	23	3,5	0,38 kg	0,16 kg	0,35 kg
50	16	16	75	9	80	65	4	65	37	24	3,5	0,60 kg	0,16 kg	0,65 kg
63	20	20	90	11	96	75	4	70	41	25	5	1,10 kg	0,23 kg	0,85 kg
80	20	20	110	11	116	100	4	79	45	30	6	1,90 kg	0,23 kg	1,20 kg
100	25	25	132	13	140	120	9	96	57	31	6	3,50 kg	0,42 kg	2,30 kg
125	25	25	160	13	163	145	7	114	63	44	6	6,50 kg	0,42 kg	3,30 kg

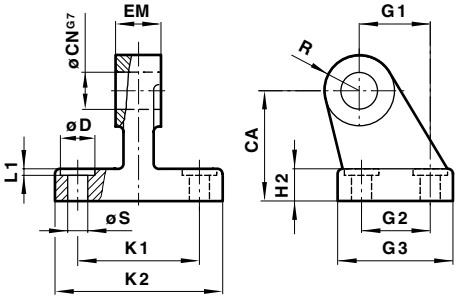
QM/8000/25 – Piston Rod Clevis Mounting Style ‘F’

(Corresponds to DIN ISO 8140)
For cylinders with male piston rod thread
Order nut style ‘N2’ separately (page N 1.4.087.03)



M/P199 . . – Bracket Style ‘SS’

For model QM/8000/25 – Piston Rod Clevis Mounting Style ‘F’

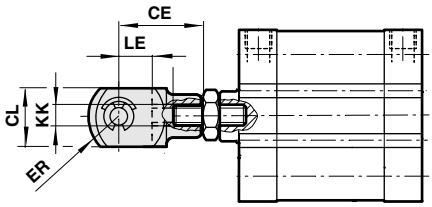


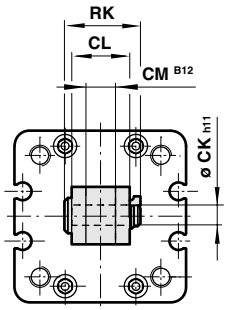
Cylinder ∅	CA	CE	∅ CK h11	❑ CL	CM	∅ CN G7	∅ D	EM	ER	G 1	G 2	G 3
20	–	40	10	20	10	–	–	–	16	–	–	–
25	–	40	10	20	10	–	–	–	16	–	–	–
32	32	40	10	20	10	10	11	10	16	21	18	31
40	36	48	12	24	12	12	11	12	19	24	22	35
50	45	64	16	32	16	16	15	16	25	33	30	45
63	50	64	16	32	16	16	15	16	25	37	35	50
80	63	80	20	40	20	20	18	20	32	47	40	60
100	71	80	20	40	20	20	18	20	32	55	50	70
125	90	110	30	55	30	30	20	30	45	70	60	90

Cylinder ∅	H 2	KK	K 1	K 2	L1	LE	R	RK	∅ S	Style ‘F’	Style ‘SS’	
20	–	M10x1,25	–	–	–	20	–	28	–	0,09 kg	–	
25	–	M10x1,25	–	–	–	20	–	28	–	0,09 kg	–	
32	8	M10x1,25	38	51	1,6	20	10	28	6,6	0,09 kg	0,15 kg	
40	10	M12x1,25	41	54	1,6	24	11	32	6,6	0,13 kg	0,20 kg	
50	12	M16x1,5	50	65	1,6	32	13	41,5	9	0,33 kg	0,48 kg	
63	12	M16x1,5	52	67	1,6	32	15	41,5	9	0,33 kg	0,50 kg	
80	14	M20x1,5	66	86	2,5	40	15	50	11	0,67 kg	0,75 kg	
100	15	M20x1,5	76	96	2,5	40	19	50	11	0,67 kg	1,20 kg	
125	20	M27x2	94	124	3,2	54	22	62	14	1,35 kg	2,50 kg	

QM/57000/25 – Piston Rod Clevis Mounting Style 'F'

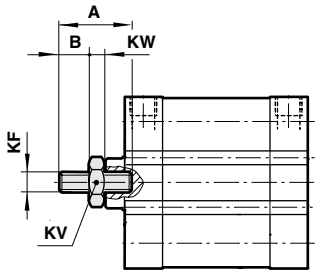
For cylinders with female piston rod thread
Order stud and nut style 'N2' or adaptor separately (page N 1.5.095.03)

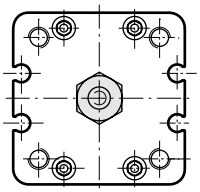




M/1 . . . – Stud and Nut (ø 20 to 40 mm)
M/1470/ . . – Adaptor (ø 50 to 125 mm)

For cylinders with female piston rod thread



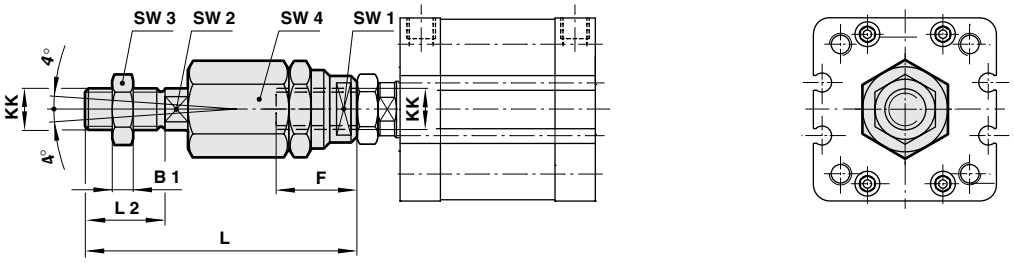


Cylinder ∅	A	B	CE	∅ CK h11	❑ CL	CM B12	ER	KF
20	25	–	20	5	10	5	8	M5
25	25	–	20	5	10	5	8	M6
32	25	–	24	6	12	6	9,5	M8
40	25	–	24	6	12	6	9,5	M8
50	29	12	26	8	14	7	11,5	M10
63	35	15	40	10	20	10	16	M12
80	45	20	56	14	27	14	21	M16
100	45	20	56	14	27	14	21	M16

Cylinder ∅	KK	KV (AF)	KW	LE	RK	Style 'F'	Nut	Stud or Adaptor
20	M6	10	3	10	14,5	0,01 kg	0,01 kg	0,01 kg
25	M6	10	3	10	14,5	0,01 kg	0,01 kg	0,01 kg
32	M8	13	4	12	17,5	0,02 kg	0,01 kg	0,01 kg
40	M8	13	4	12	17,5	0,02 kg	0,01 kg	0,01 kg
50	M10x1,25	12	5	12	20,5	0,04 kg	–	0,02 kg
63	M12x1,25	13	5	20	29	0,09 kg	–	0,04 kg
80	M16x1,5	17	5	28	36,5	0,22 kg	–	0,08 kg
100	M16x1,5	17	5	28	36,5	0,22 kg	–	0,08 kg

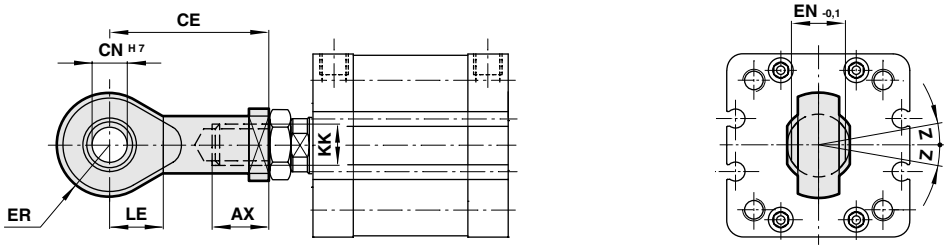
QM/8000/38 – Piston Rod Swivel Mounting Style ‘AK’

For cylinders with male piston rod thread
Order nut style ‘N2’ separately (page N 1.5.095.03)



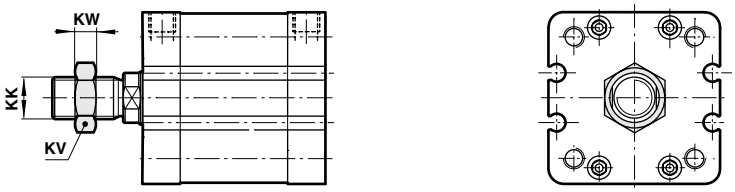
QM/8000/32 – Universal Piston Rod Eye Mounting Style ‘UF’

(Corresponds to DIN ISO 8139)
For cylinders with male piston rod thread
Order nut style ‘N2’ separately (page N 1.5.095.03)



M/P1501/ . . – Nut Style ‘N2’

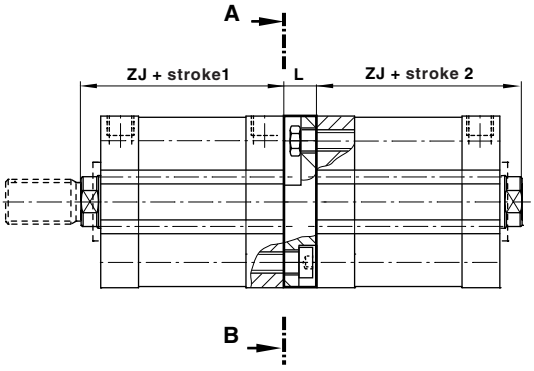
For cylinders with male piston rod thread

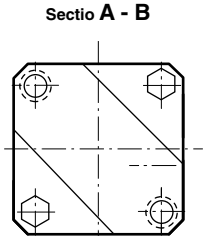


Cylinder ∅	AX	B1	CE	∅ CN H7	EN -0,1	ER	F	KK	KV (A/F)	KW	L
20	20	5	43	10	14	14	26	M 10 x 1,25	17	5	73
25	20	5	43	10	14	14	26	M 10 x 1,25	17	5	73
32	20	5	43	10	14	14	26	M 10 x 1,25	17	5	73
40	22	6	50	12	16	16	26	M 12 x 1,25	19	6	77
50	28	8	64	16	21	21	34	M 16 x 1,5	24	8	106
63	28	8	64	16	21	21	34	M 16 x 1,5	24	8	106
80	33	10	77	20	25	25	42	M 20 x 1,5	30	10	122
100	33	10	77	20	25	25	42	M 20 x 1,5	30	10	122
125	51	13,5	110	30	37	35	40	M 27 x 2	41	13,5	147

Cylinder ∅	L 2	LE	SW 1 (A/F)	SW 2 (A/F)	SW 3 (A/F)	SW 4 (A/F)	Z	Style ‘AK’	Style ‘N2’	Style ‘UF’	
20	20	15	19	12	17	30	13°	0,20 kg	0,01 kg	0,09 kg	
25	20	15	19	12	17	30	13°	0,20 kg	0,01 kg	0,09 kg	
32	20	15	19	12	17	30	13°	0,20 kg	0,01 kg	0,09 kg	
40	24	17	19	12	19	30	13°	0,20 kg	0,01 kg	0,13 kg	
50	32	22	30	19	24	42	15°	0,65 kg	0,02 kg	0,33 kg	
63	32	22	30	19	24	42	15°	0,65 kg	0,02 kg	0,33 kg	
80	40	26	30	19	30	42	15	0,72 kg	0,03 kg	0,67 kg	
100	40	26	30	19	30	42	15	0,72 kg	0,03 kg	0,67 kg	
125	54	36	40	24	41	55	15	1,70 kg	0,09 kg	1,35 kg	

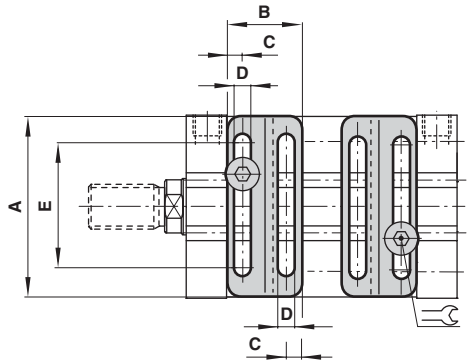
QM/192000/55 – Assembly Kit for Four-position Cylinders

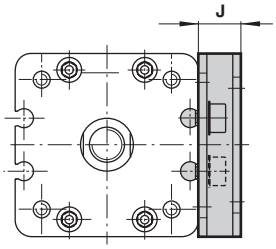




Cylinder ∅	L	ZJ
20	10	43
25	10	45
32	12,5	51
40	12,5	52
50	15	53
63	15	58
80	20	65
100	20	77
125	25	89

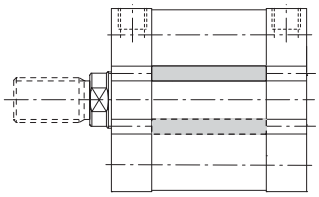
QA/1800.0/22/54 – Valve Mounting Kit

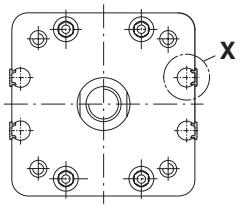


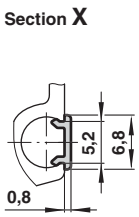


Cylinder ∅	A	B	C	D	E	F	G	H	J	SW	Kit kg
50 + 63	60	37	7	4,5	46	8,5	5,5	2	12	3	0,02
80 – 125	90	37	7	4,5	76	8,5	6,5	2	12	3	0,02

M/P72725/1000 – Groove Cover

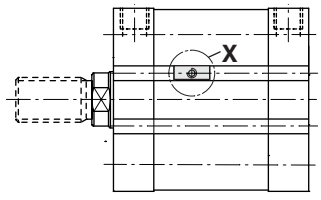


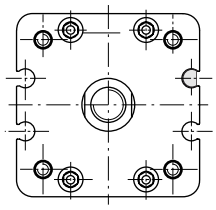


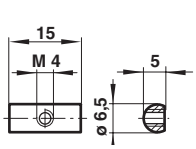


M/P72816 – Groove Key

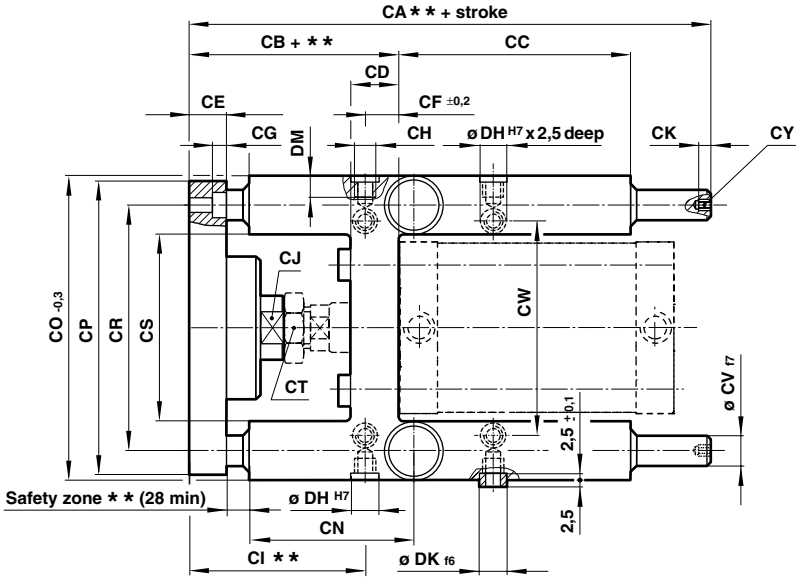
Weight: 0,01 kg

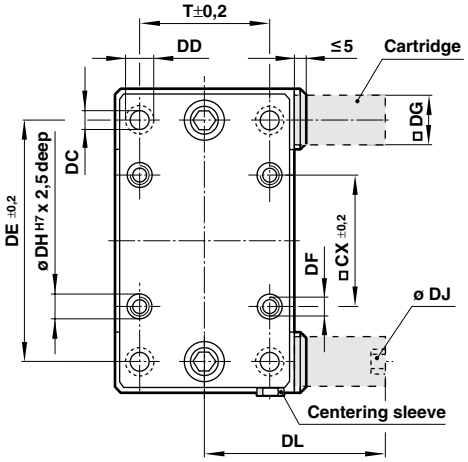


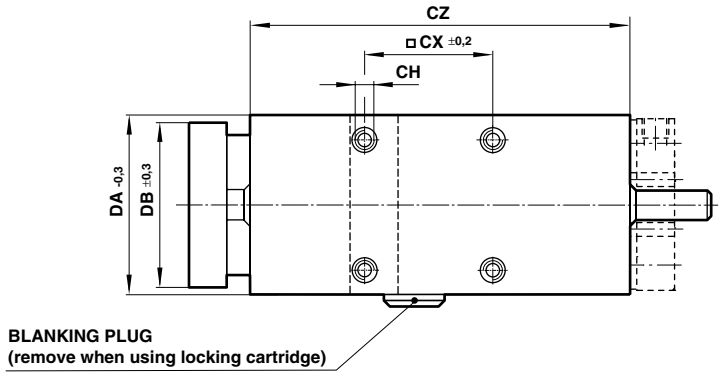




QA/8000/61/* – Guide Blocks with Roller Bearings (long coupling)







*** * = Notice adjustment range**

Attention:

To use these guide blocks (QA/8000/61) you have to order a cylinder with extended piston rod and male piston rod thread (/MU)!

Please note: The magnetic switch M/50 must be installed and fixed before the cylinder and the guide block are assembled. In this case the LED of the M/50 switch is not visible.

Cylinder ∅	Extension
32	19
40	23
50	29
63	29
80	36
100	41

Cylinder ∅	CA**	CB + **	CC	CD	CE	CF ±0,2	CG	CH	CI**	CJ (A/F)	CK	CN	CO –0,3
32	177	100 + 5	65	28	12	15,3	6,5	M6	84,5	13	5	60,5	97
40	192	111 + 5	69	33	12	23	6,5	M6	88	15	6	67	115
50	237	128 + 10	65	40	15	33,8	9	M8	94	22	6	75,5	137
63	237	128 + 10	97	40	15	29,3	9	M8	98,5	22	6	80	152
80	280	151 + 10	112	50	20	37	11	M10	114	27	7	92	189
100	280	156 + 10	112	55	20	40,5	11	M10	115,5	27	7	93	213

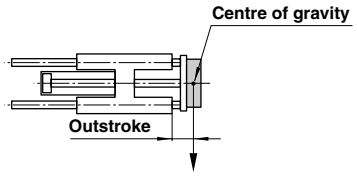
Cylinder ∅	CP	CR	CS	CT (A/F)	∅ CV f7	CW	❑ CX ±0,2	CY (A/F)	CZ	DA –0,3	DB ±0,3	∅ DC	∅ DD
32	90	74	50,5	17	12	61	32,5	5	125	50	45	6,6	11
40	110	87	58,5	19	16	69	38	6	140	58	54	6,6	11
50	130	104	70,5	24	20	85	46,5	6	150	70	63	9	15
63	145	119	85,5	24	20	100	56,5	6	182	85	80	9	15
80	180	148	105,5	30	25	130	72	8	215	105	100	11	18
100	200	172	130,5	30	25	150	89	8	220	130	120	11	18

Cylinder ∅	DE ±0,2	DF	∅ DG	∅ DH H7	DJ	∅ DK f6	DL	DM	at 0 mm	per 100 mm	T ± 0,2		
32	78	M 6	22,5	9	M 5	9	70,5	14	1,20 kg	0,18 kg	32,5		
40	84	M 6	27,5	9	M 5	9	74,5	14	2,20 kg	0,32 kg	38,0		
50	100	M 8	32,5	11	G 1/8	11	91,5	16	3,60 kg	0,49 kg	46,5		
63	105	M 8	32,5	11	G 1/8	11	91,5	16	4,60 kg	0,49 kg	56,5		
80	130	M 10	54,5	13	G 1/8	13	141,5	20	8,70 kg	0,77 kg	72,0		
100	150	M 10	54,5	13	G 1/8	13	141,5	20	11,0 kg	0,77 kg	89,0		

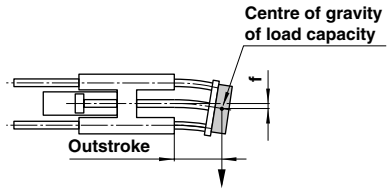
** Notice adjustment range

Note: Supplied complete with mounting screws for cylinders and two centering sleeves.

Maximum load for QA/8000/61/*

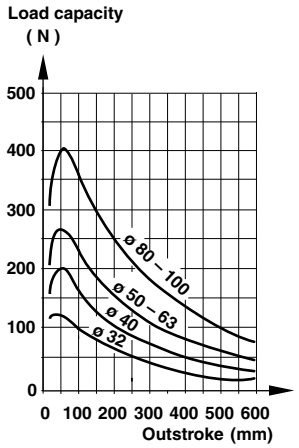


Max. load capacity is dependent on the outstroke of a horizontally installed guide unit. In the case of short stroke operation, the load capacity figures taken from the diagram must be multiplied by the correction factor (diagram 2). In the curves of load capacity (diagram 1), the short stroke corrections have already been taken into account for an outstroke > 60 mm.

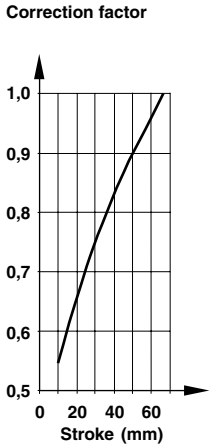


The total deflection of guide rods will be determined by the addition of the amount of deflection caused by own weight (according to diagram 3) plus the amount of deflection due to load capacity (according to diagram 4).

Max. load capacity depending on outstroke
(diagram 1)

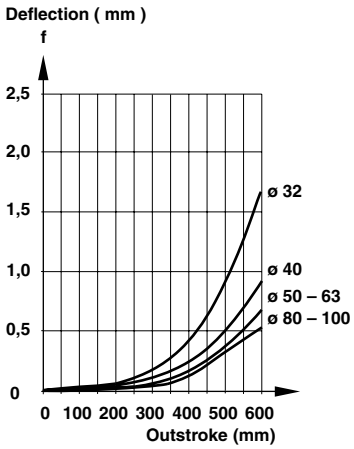


(diagram 2)

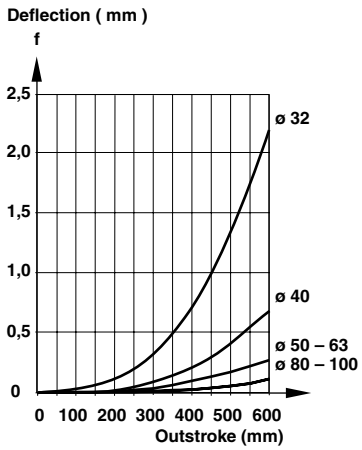


Reduction of load capacity for short-stroke operation

Deflection caused by own weight
(diagram 3)



Deflection caused by a load of 10 N
(diagram 4)



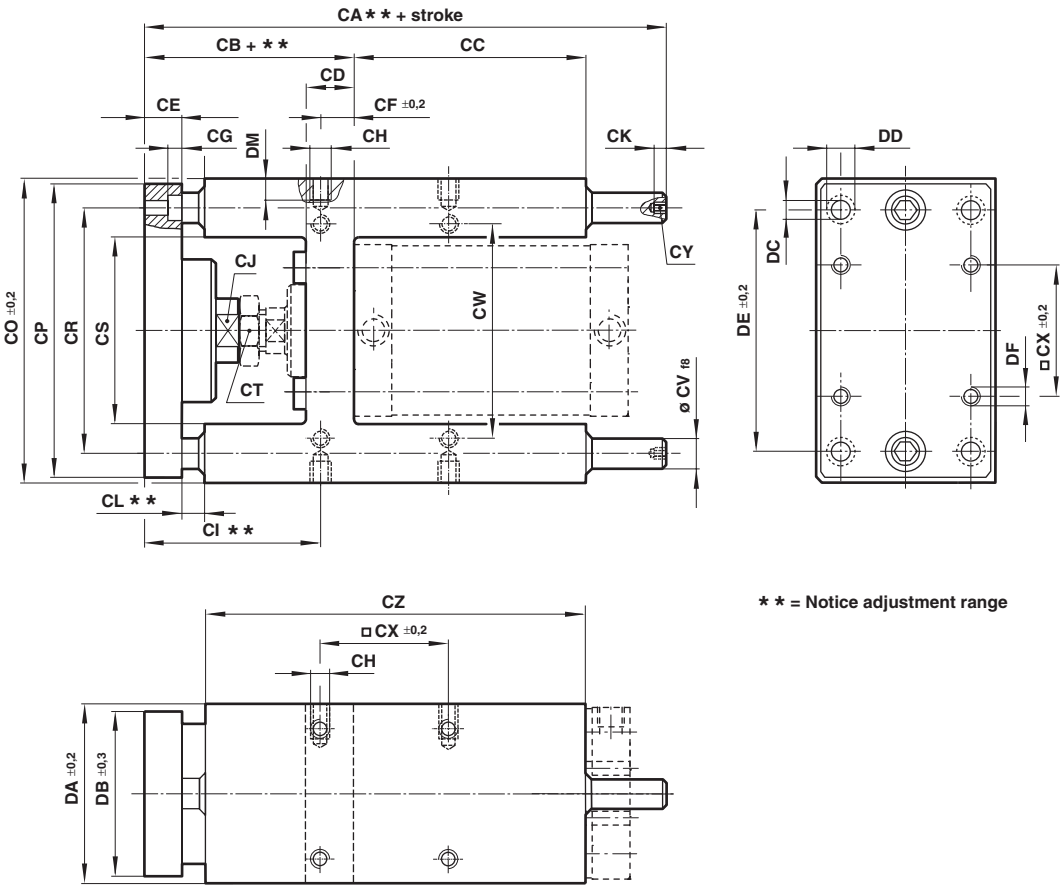
In the case of shock load applications, the figures given in the diagrams above must be reduced by a factor of 2.

Separate Locking Cartridge

Cylinder ∅	Model	Forces *
32	QA/8032/63	600 N
40	QA/8040/63	1000 N
50	QA/8050/63	1500 N
63	QA/8050/63	1500 N
80	QA/8080/63	3000 N
100	QA/8080/63	3000 N

* Retention forces per cartridge

QA/8000/81/* — Guide Blocks with Plain Bearings (long coupling)
QA/8000/85/* — Guide Blocks with Plain Bearings (short coupling)



** = Notice adjustment range

Cylinder ∅	CA**/81	CA**/85	CB + **/81	CB + **/85	CC	CD	CE	CF ±0,2	CG	CH	CI**/81	CI**/85
32	174	149	89 + 5	64 + 5	75	24	12	4,3	6,5	M 6	84,7	59,7
40	189	164	99 + 5	74 + 5	80	28	12	11	6,5	M 6	88	63
50	210	181	113 + 10	88 + 10	78	34	15	18,8	8,5	M 8	94,2	69,2
63	235	210	114 + 10	89 + 10	106	34	15	15,3	9	M 8	98,7	73,7
80	265	240	139 + 10	114 + 10	111	50	20	25	11	M 10	114	89
100	288	265	145 + 10	120 + 10	128	55	20	30	11	M 10	115	90

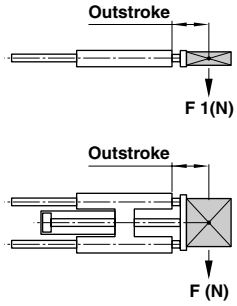
Cylinder ∅	CJ	CK	CL/81	CL/85	CO ±0,2	CP	CR	CS	CT	∅ CV f8	CW	❑ CX ±0,2
32	15	5	27	2	97	93	74	51	17	12	61	32,5
40	15	6	27	2	115	112	87	58,2	19	16	69	38
50	20	6	28	3	137	134	104	70,2	24	20	85	46,5
63	20	6	27	2	152	147	119	85,2	24	20	100	56,5
80	26	7	35	10	189	180	148	105,5	30	25	130	72
100	26	7	35	10	213	206	173	130,5	30	25	150	89

Cylinder ∅	CY	CZ	DA ±0,2	DB ±0,3	∅ DC	∅ DD	DE ±0,2	DF	DM	at 0 mm/81	at 0 mm/85	per 100 mm
32	5	125	49	45	6,6	11	78	M 6	12	1,20 kg	1,15 kg	0,18 kg
40	6	140	58	55	6,6	11	84	M 6	12	2,20 kg	2,15 kg	0,32 kg
50	6	148	70	65	9	15	100	M 8	16	3,60 kg	3,55 kg	0,49 kg
63	6	178	85	80	9	15	105	M 8	16	4,60 kg	4,55 kg	0,49 kg
80	8	195	105	100	11	18	130	M 10	20	8,70 kg	8,65 kg	0,77 kg
100	8	218	130	120	11	18	150	M 10	20	11,0 kg	10,95 kg	0,77 kg

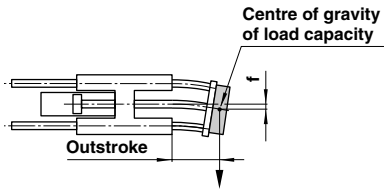
** Notice adjustment range

Note: Supplied complete with mounting screws for cylinder

Maximum load for QA/8000/81/* and /85/*



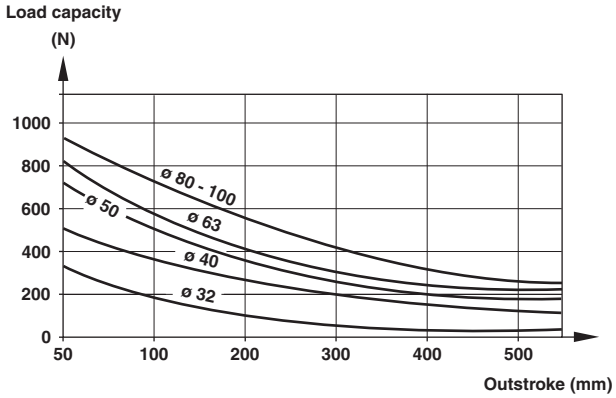
F 1= F x 0,9
Static Force: F 2 = F x 2



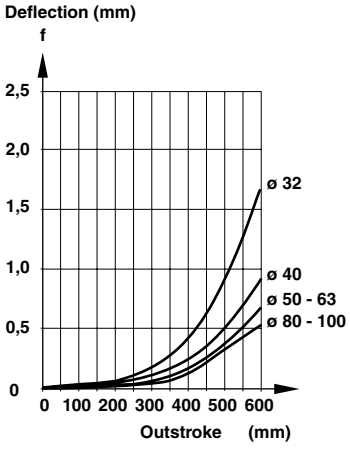
Max. load capacity (diagram 1) is dependent on the outstroke of a horizontally installed guide unit.

The total deflection of guide rods will be determined by the addition of the amount of deflection caused by own weight (according to diagram 2) plus the amount of deflection due to load capacity (according to diagram 3).

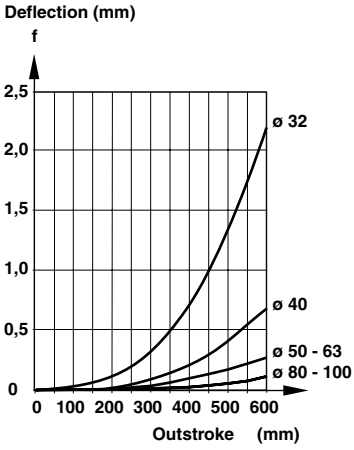
Max. load capacity depending on outstroke
(diagram 1)



Deflection caused by own weight
(diagram 2)

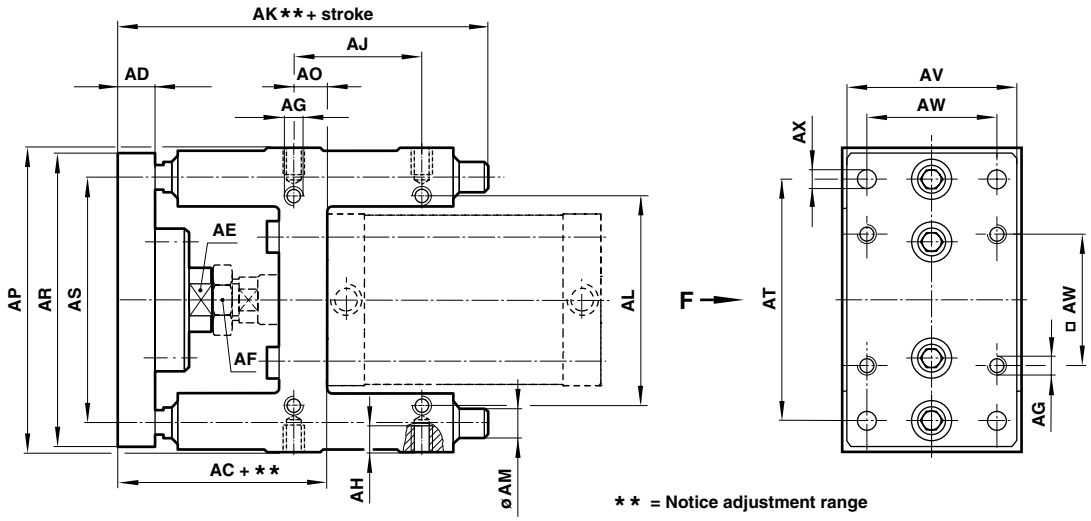


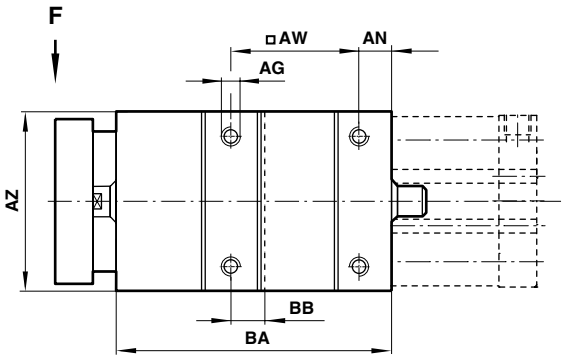
Deflection caused by a load of 10 N
(diagram 3)



In the case of shock load applications, the figures given in the diagrams above must be reduced by a factor of 2.

QA/8000/51/* – Guide Blocks with Plain Bearings





Attention:

To use these guide blocks (QA/8000/51/*) you have to order a cylinder with extended piston rod and male piston rod thread (/MU)!

Please note: The magnetic switch M/50 must be installed and fixed before the cylinder and the guide block are assembled. In this case the LED of the M/50 switch is not visible.

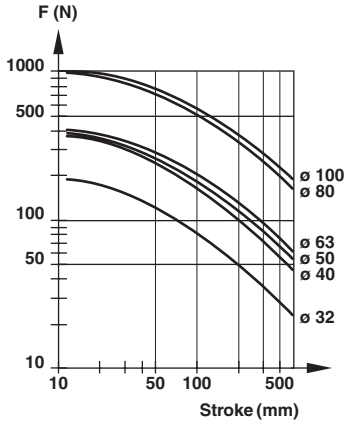
Cylinder ∅	Extension
32	19
40	23
50	29
63	29
80	36
100	41

Cylinder ∅	AC + **	AD	AE (A/F)	AF (A/F)	AG	AH	AJ	AK**	AL	∅ AM	AN	AO
32	69 + 2	12	15	17	M 6	10	32,5	110	58	10	6	9
40	74 + 2	12	15	19	M 6	10	38	122	64	12	6	11
50	91,5 + 4	15	22	24	M 8	12	46,5	135	80	12	6	19
63	92 + 4	15	22	24	M 8	12	56,5	153	95	12	7	15
80	106 + 6	15	27	30	M 10	15	50	180	130	16	9	14
100	111 + 6	15	27	30	M 10	17	70	199	150	16	9	19
Cylinder ∅	AP	AR	AS	AT	AV	❑ AW	∅ AX	AZ	BA	BB	at 0 mm	per 100 mm
32	100	90	74	78	45	32,5	6,6	48	76	9	1,00 kg	0,06 kg
40	106	100	80	84	50	38	6,6	56	85	11	1,20 kg	0,09 kg
50	125	120	96	100	60	46,5	9	66	99	19	1,80 kg	0,09 kg
63	132	125	104	105	70	56,5	9	76	114	15	2,20 kg	0,09 kg
80	165	155	130	130	90	72	11	98	134,5	25	4,10 kg	0,16 kg
100	185	175	150	150	110	89	11	118	153,5	28,5	5,80 kg	0,16 kg

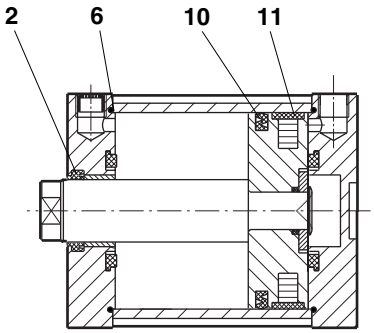
** Notice adjustment range

Note: Supplied complete with mounting screws for cylinder

Maximum load for QM/8000/51/*



Spares



Cylinder ∅	Model	Spares kit	Comprising Item	Description	Quantity
20	RM/192020/M	QM/192020/00	2	Piston rod seal	1
25	RM/192025/M	QM/192025/00	6	'O'-ring	2
32	RM/192032/M	QM/192032/00	10	Piston seal	1
40	RM/192040/M	QM/192040/00	11	Wear ring (∅ 63 up to 125 mm)	1
50	RM/192050/M	QM/192050/00			
63	RM/192063/M	QM/192063/00			
80	RM/192080/M	QM/192080/00			
100	RM/192100/M	QM/192100/00			
125	RM/192125/M	QM/192125/00			

Note: Please quote the cylinder type number when ordering spares kits

Warning

These products are intended for use in industrial compressed air systems only. Do not use these products where pressures and temperatures can exceed those listed under '**Technical Data**'.

Before using these products with fluids other than those specified, for non-industrial applications, life-support systems, or other applications not within published specifications, consult NORGREN.

Through misuse, age, or malfunction, components used in fluid power systems can fail in various modes.

The system designer is warned to consider the failure modes of all component parts used in fluid power systems and to provide adequate safeguards to prevent personal injury or damage to equipment in the event of such failure.
System designers must provide a warning to end users in the system instructional manual if protection against a failure mode cannot be adequately provided.
System designers and end users are cautioned to review specific warnings found in instruction sheets packed and shipped with these products.