RE 17 014/05.03

Replaces: 06.96

Hydraulic cylinder, tie rod design with integrated postioning measuring system

Type CDW 160

Series 1X
Nominal pressure:
160 bar (16 MPa)

H/A 2407

Type CDW 160 ../…

Overview of contents

Contents	**Seite**
Description	2
Technical data	2
Ordering details	3
Position transducer	4, 5
Cylinder data	
Piston Ø 40	6, 7
Piston Ø 50	8, 9
Piston Ø 63	10, 11
Piston Ø 80	12, 13
Piston Ø 100	14, 15
Piston Ø 125	16, 17
Piston Ø 160	18, 19
Piston Ø 200	20, 21
Connection plates for mounting valves	22, 23
Valve connection plates – dimensions and porting patterns	24, 25
Permissible stroke lengths	26, 27
Buckling calculation	27
Forces; areas	28
Stop tube extension	28
Spare parts diagram	29

Features

- Integrated positiong measuring system
- Mounting option for servo or proportional valve
- Operating pressure up to a max. of 160 bar
- 5 mounting styles
- Piston Ø: 40 to 200 mm
- Piston rod Ø: 28 to 140 mm

Description

Hydraulic cylinder, series CDW 160 with a nominal pressure of 160 bar, similar to DIN 24 554
Cylinders of this standard largley comply with ISO 6020/2.
This series meets the requirements of the automotive industry.

The basis of this range is an easily seviced modular system.

- The cylinder head and base are fixed to the cylinder tube using the tie rod principle. Therefore simple assembly and dis-assembly is ensured for maintenance work.
- Connection threads are to ISO 228/1 pipe threads.
- Bleed points, standard
- Adjustable end position cushioning, except for piston Ø 40
- Installation length identical for models with or without cushioning.
- Strokes freely selectable within the maximum available stroke range.
- Piston rod end with male thread for self-aligning clevis CGKA.

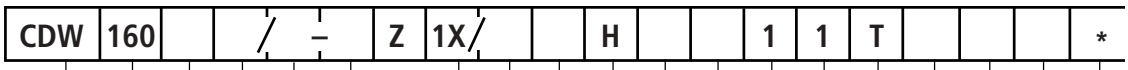
Technical data (for applications outside these parameters, please consult us!)

Nominal pressure [1]	bar	160	
Static test pressure	bar	240	
Installation		Optional	
Pressure fluid		Mineral oils to DIN 51 524 (HL, HLP)	
		Phosphate ester (HFD-R)	
Pressure fluid temperature range	°C	–20 to +70	
Viscosity range	mm^2/s	2.8 to 380	
Stroke velocity	m/s	1.0 (dependent on connection port)	
Permissible stroke and overall length tolerances to DIN 24 554		Stroke length in mm	Permissible deviation in mm
General tolerances: to DIN 7168-g and DIN 7168-sg		0 to 1250	$^{0}_{+1}$
		1251 to 2000	$^{+1}_{-2}$

[1] The stated nominal pressure are valid for applications with shock-free operation. If extreme loads occur, e.g. as happens in high sequence cycles, the fixings and piston rod thread connections need to be designed for durability (fatigue strength).

Cylinders that lie outside the above stated parameters are also available if required.
Please contact us giving exact details of the application.

Ordering details



Single rod cylinder with position transducer **= CDW**

Series 160 **= 160**

For mounting styles, see pages 6 to 21

Piston Ø mm	Piston rod Ø mm	Area ratio φ	Ordering details
40	–	–	–
	28	2 : 1	**40/ 28**
50	–	–	–
	36	2 : 1	**50/ 36**
63	–	–	–
	45	2 : 1	**63/ 45**
80	36	1.25 : 1	**80/ 36**
	56	2 : 1	**80/ 56**
100	45	1.25 : 1	**100/ 45**
	70	2 : 1	**100/ 70**
125	56	1.25 : 1	**125/ 56**
	90	2 : 1	**125/ 90**
160	70	1.25 : 1	**160/ 70**
	110	2 : 1	**160/110**
200	90	1.25 : 1	**200/ 90**
	140	2 : 1	**200/140**

Stroke length in mm

Series **= 1X**
(10 to 19: unchanged installation and connection dimensions)

Connections/subplates
Pipe connection threads to ISO 228/1 **= 1**
(connection sizes are associated with the piston Ø)

With valve connection plate
(valve spool rotated by 90° with respect to cylinder axis)
NS 6 **= 3**
NS 10 **= 4**
NS 16 **= 5**
NS 25 **= 6**

With valve connection plate
(valve spool parallel with cylinder axis)
NS 6 **= 7**
NS 10 **= 8**
NS 16 **= 9**
NS 25 **= 0**

Further details in clear text

Evaluation
C = Analogue output: 4 to 20 mA
F = Analogue output: 0 to 10 V
D = Digital output SSi
V = Without postion transducer, but prepared for installation

Position transducer
T = Pos. transducer (magneto-strictive) (see page 5)

Stop tube extention
Enter according to page 28

Seals
T = For low friction operation
Piston: glide ring
Piston rod: glide ring

Connections
1 = Position at cylinder base

Connections
1 = Position at cylinder head

Pressure fluid
M = Seals, suitable for mineral oils DIN 51 524 (HL, HLP)
V = [2] (FKM) seals, suitable for phosphate ester (HFD-R)

End position cushioning
U = Without
K = [1] Botton end
S = [1] Head end
D = [1] Both ends

Piston rod ends
H = Thread for self-aligning clevis

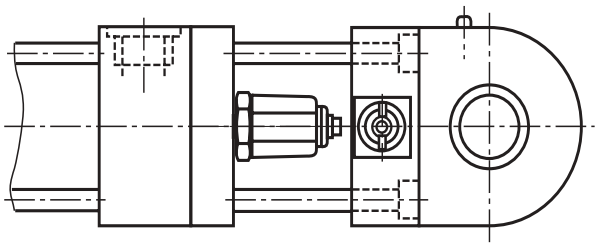
Piston rod type
H = Hardened and harad chrome plated up to piston rod Ø ≤ 110 mm
C = Hard chrome plated for piston rod Ø 140 mm

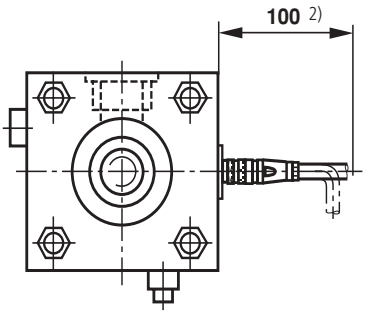
[1] Possible from piston Ø 50

[2] Special versions only available on request

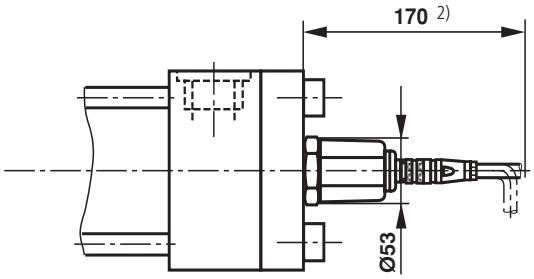
Position transducer (dimensions in mm)

Mounting style B with plug-in connector (possible from piston ø 50 onwards)

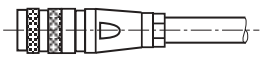




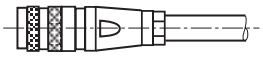
Mounting styles C, D, E and **F** in cable version



1) For analogue output:
6-pin Amphenol - Plug-in connector
Material No. **R901072231**



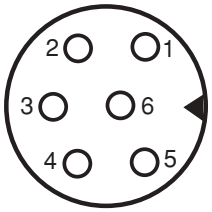
1) For digital output:
7-pin Amphenol - Plug-in connector
Material No. **R901079551**



1) Included within the scope of supply
2) Space required to remove the plug-in connector

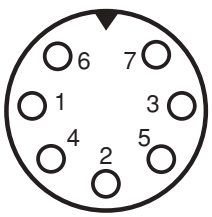
Connection allocation

Postion transducer (analogue version)
Component plug (viewed onto pin side)



Pin	Cable	Signal / current	Signal / voltage
1	Grey	4...20 mA	0 -10 V
2	Pink	Gnd	Gnd
3	Yellow	n.c.	10-0 V
4	Green	n.c.	Gnd
5	Brown	+24 V dc. (±25%)	+24 V dc (±25%)
6	White	Gnd	Gnd

Position transducer (digital version)
Component plug (viewed onto pin side)



Pin	Cable	Signal / SSi
1	Grey	Data (–)
2	Pink	Data (+)
3	Yellow	Pulse (+)
4	Green	Pulse (–)
5	Brown	+24 V dc. (+20%/–15%)
6	White	0 V
7	–	n.c.

Position transducer (dimensions in mm)

Functional description

The position transducer which is pressure-tight up to 350 bar operates without mechanical contact and absolute. The basis for this position transducer is the magneto-strictive effect. Thus a torsion impulse is released through the contact of two magnetic fields. This impulse runs on the wave guide inside the transducer from the measuring point to the sensor head. The running time is constant and nearly temperature-independent.

It is proportional to the position of the magnets and thus a measure for the actual position value and is converted into a direct analogue or digital output in the sensor.

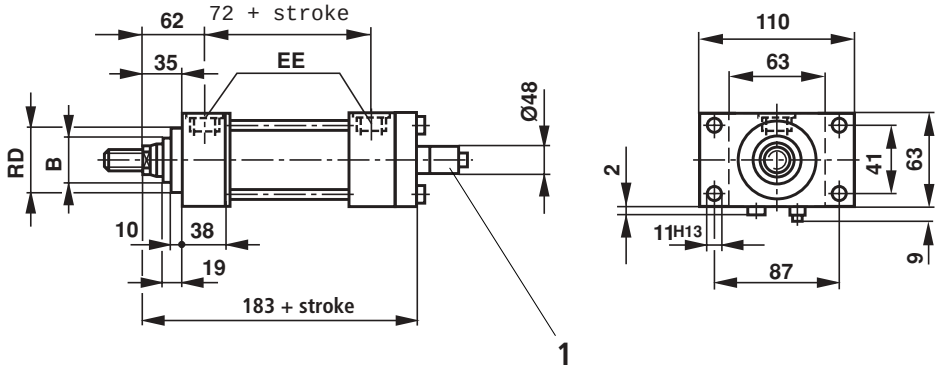
Technical data (for applications outside these parameters, please consult us!)

Measuring length		mm	50 to 1500
Operating pressure		bar	350
Analogue output:	0 to 10V		Load resistance: ≥ 5 kOhm Resolution: infinity
	4 to 20 mA		Load resistance: Ohm ≥ 100 Resolution: infinity
Digital output:	SSi 24 Bit Grey coded		Resolution: 5 µm
Linearity (absolute accuracy)			≤ ±0.05% (referring to measuring length), min ±0.05 mm
Reproducability			≤ ±0.001% (referring to measuring length), min ±0.006 mm
Hysteresis		mm	≤ 0.03
Supply voltage	With analogue output		24 V DC (±25 %) Current consumption: 80 mA, Residual ripple: ≤ 1% s-s
	With digital output		24 V DC (+20 % / –15%) Current consumption: 55 mA, Residual ripple: ≤ 1% s-s
Protection	Pipe and flange		IP 67
	Sensor electronics		IP 65
Operating temperature:	Sensor electronics	°C	–40 to +65
	Measurement rod	°C	–40 to +75
Temperature co-efficient:	Voltage	ppm/°C	70
	Current	ppm/°C	90

Piston Ø 40/28 (dimensions in mm)

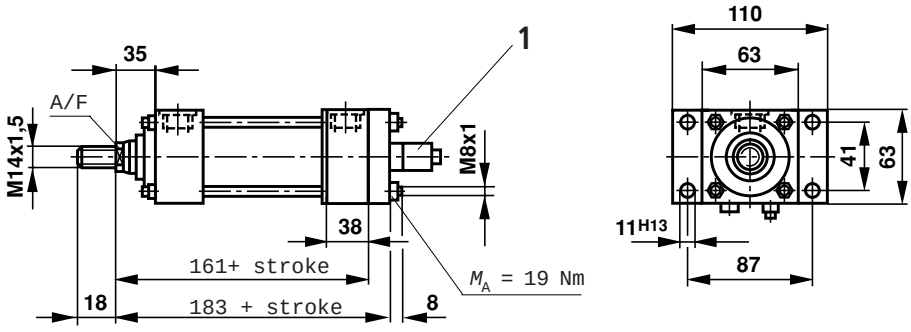
Mounting style B self-aligning clevis at cylinder base(ISO 6099; Fig. MP5) **Not possible**

Mounting style C Rectangular flange at cylinder head (ISO 6099; Fig. ME5)



1 Position transducer, for dimensions see page 4

Mounting style D Rectangular flange at cylinder base (ISO 6099; Fig. ME6)

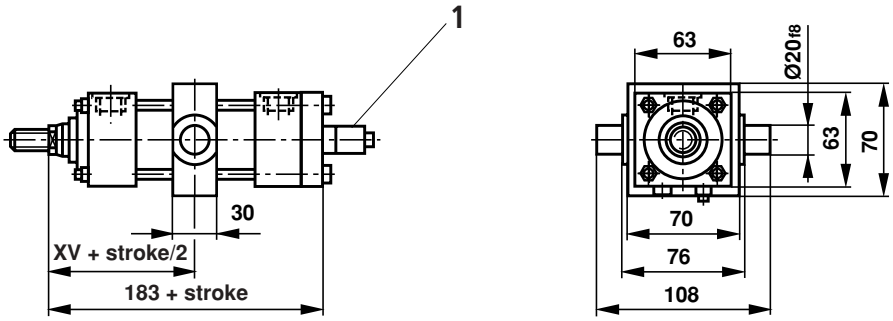


1 Position transducer, for dimensions see page 4

[7]) Only possible with control manifold

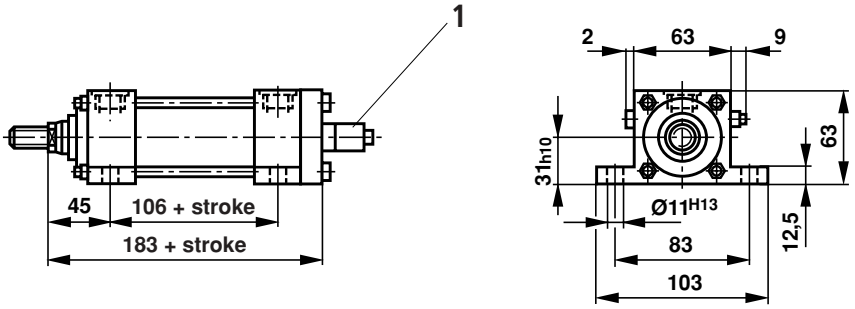
Piston rod Ø	RD centring $Ø_{f8}$	B Ø	EE connection 1	EE connection 4 [7]	XV trunnion size Average	XV trunnion size Min.	XV trunnion size Max.	A/F	Available stroke lengths in mm Min.	Available stroke lengths in mm Max.
28	62	42	G 1/2	NS 10	$98 + \frac{\text{stroke}}{2}$	107	88 + stroke	24	100	1000

Mounting style E Centre trunnion mounting (ISO 6099; Fig. MT 4)



1 Position transducer, for dimensions see page 4

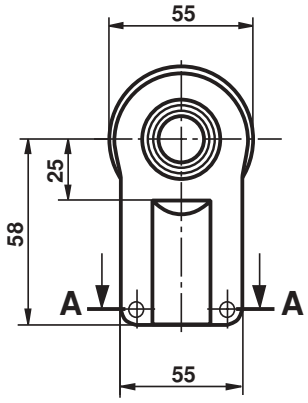
Mounting style F Foot mounting (ISO 6099; Fig. MS 2)

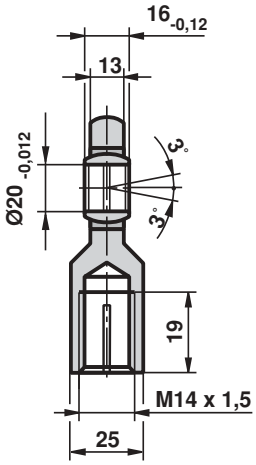


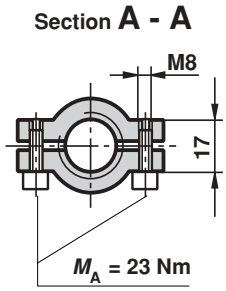
1 Position transducer, for dimensions see page 4

Self-aligning clevis CGKA 20 to DIN 24555
Material No. **R900306874**

Weight: 0.4 kg





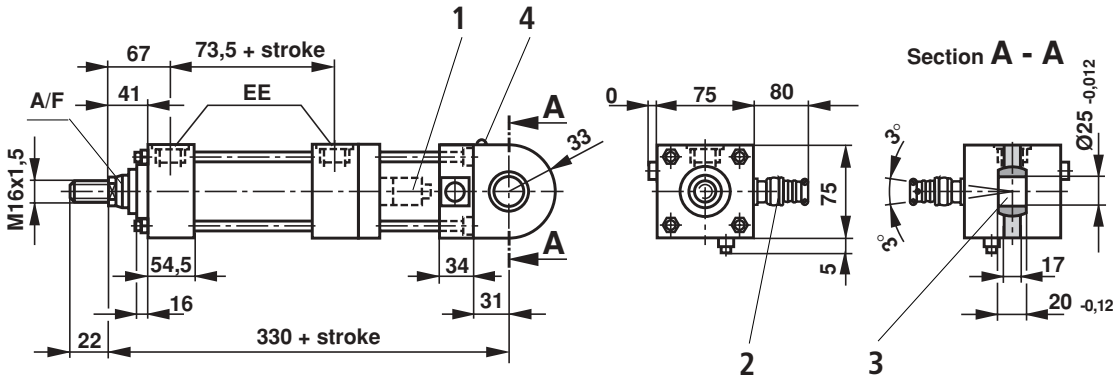


Lubrication via bore Ø 2.5

Piston rod Ø	Cushioning length		Cushioning area in cm²		Weight in kg (single rod cylinder)					
					0-stroke (to mounting styles)					Additional per 100 mm stroke
	Base end	Head end	Base end	Head end	B	C	D	E	F	
28	–	–	–	–	4.5	5.3	5.2	6.0	4.8	1.2

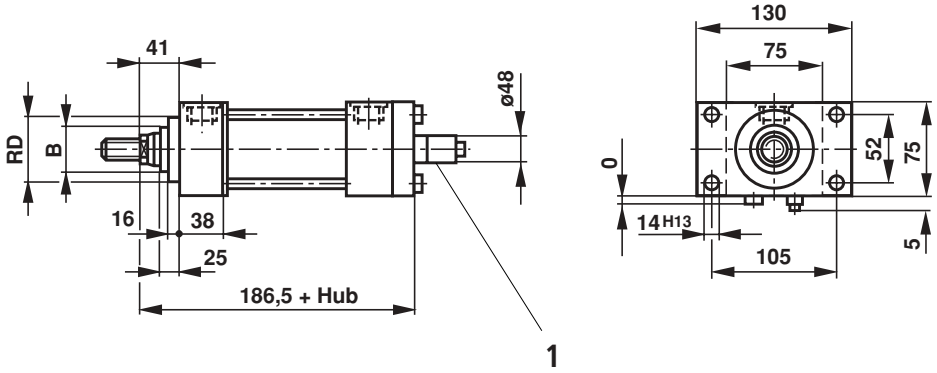
Piston Ø 50/36 (dimensions in mm)

Mounting style B Clevis eye at cylinder cap (ISO 6099; Fig. MP5)



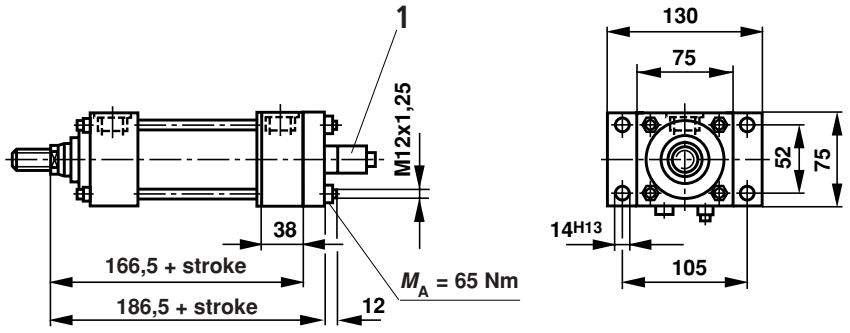
1 Position transducer, for dimensions see page 4 **2** Straight connector **3** Associated pin $Ø_{h6}$ **4** Grease nipple; cone head form A to DIN 71412

Mounting style C Rectangular flange at cylinder head (ISO 6099; Fig. ME5)



1 Position transducer, for dimensions see page 4

Mounting style D Rectangular flange at cylinder base (ISO 6099; Fig. ME6)

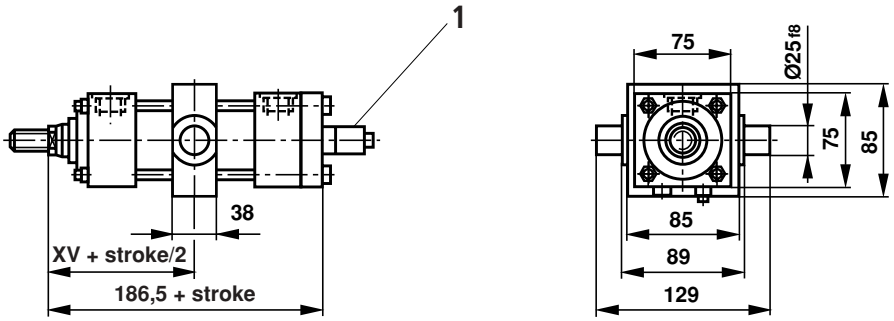


1 Position transducer, for dimensions see page 4

[7]) Only possible with control manifold

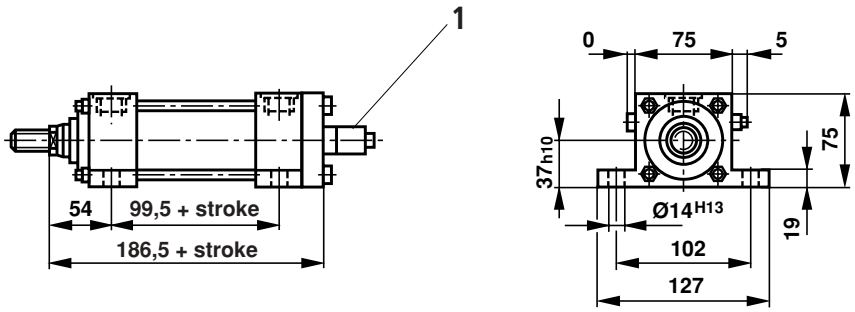
Piston rod Ø	RD $Ø_{f8}$	B centring Ø	EE connection 1	EE connection 4 [7]	XV trunnion size Average	XV trunnion size Min.	XV trunnion size Max.	A/F	Available stroke lengths in mm Min.	Available stroke lengths in mm Max.
36	74	50	G 3/4	NS 10	$103.5+\frac{\text{stroke}}{2}$	117	90 + stroke	30	100	1200

Mounting style E Centre trunnion mounting (ISO 6099; Fig. MT 4)



1 Position transducer, for dimensions see page 4

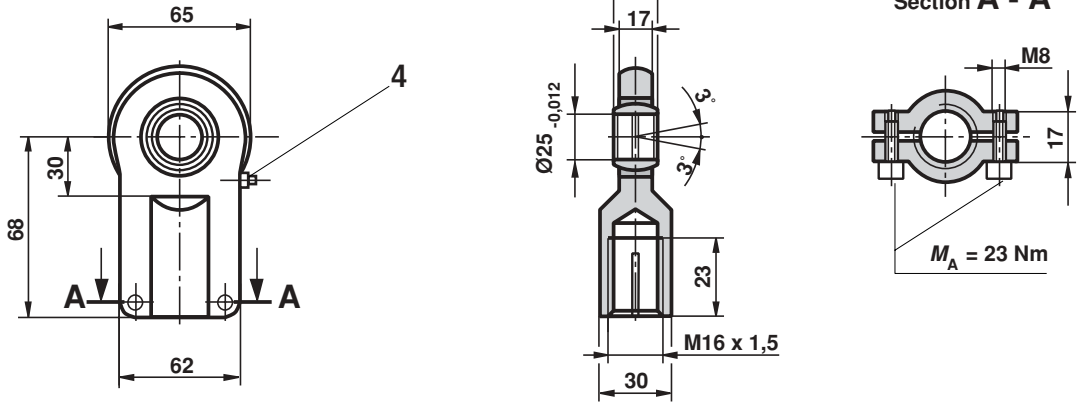
Mounting style F Foot mounting (ISO 6099; Fig. MS 2)



1 Position transducer, for dimensions see page 4

Self-aligning clevis CGKA 25 to DIN 24555
Material No. **R900327191**

Weight: 0.7 kg

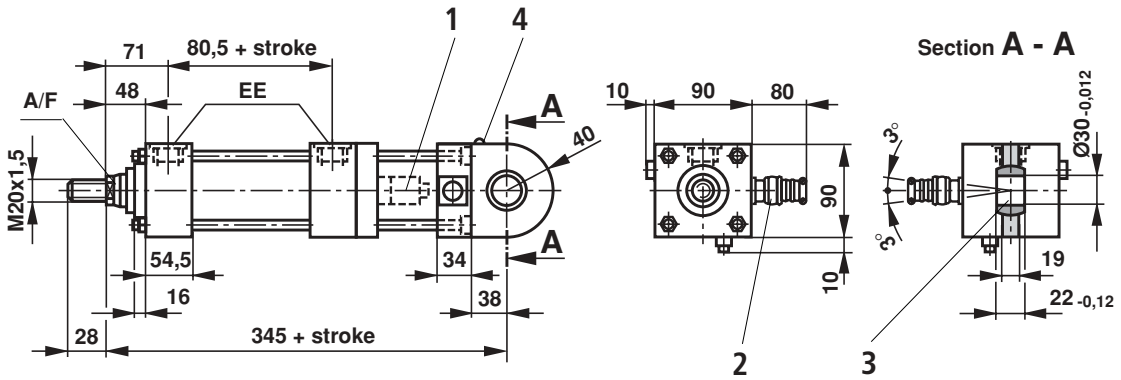


4 Grease nipple; cone head form A to DIN 71412

Piston rod Ø	Cushioning length		Cushioning area in cm²		Weight in kg (single rod cylinder)					
					0-stroke (to mounting styles)					Additional per 100 mm stroke
	Base end	Head end	Base end	Head end	B	C	D	E	F	
36	20	20	7.06	7.06	6.1	7.5	7.4	9.2	7.0	1.8

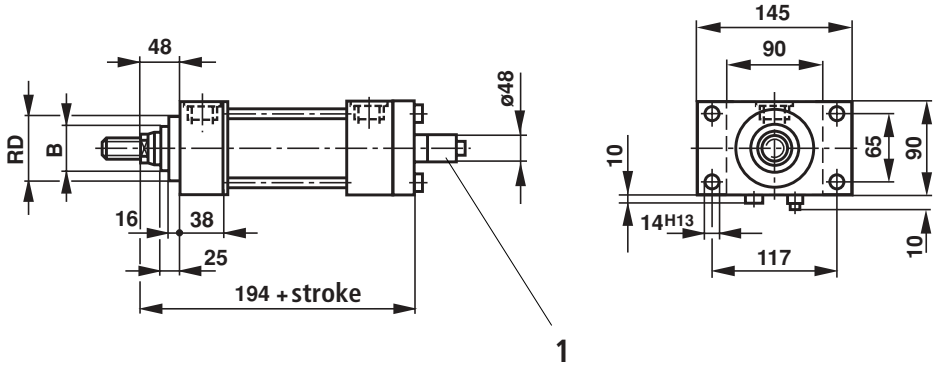
Piston Ø 63/45 (dimensions in mm)

Mounting style B Self-aligning clevis at cylinder base (ISO 6099; Fig. MP5)



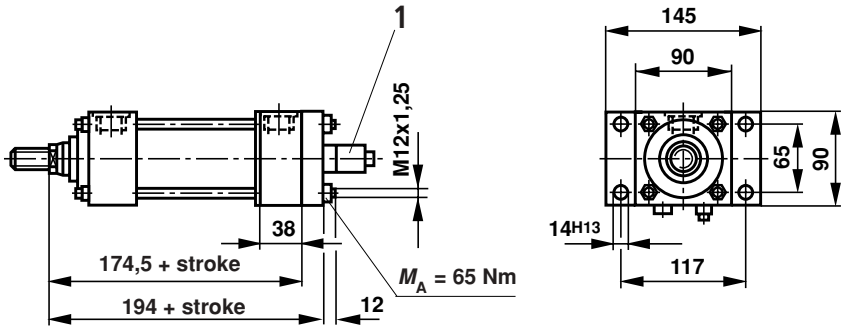
1 Position transducer, for dimensions see page 4 **2** Straight connector **3** Associated pin $Ø_{h6}$ **4** Grease nipple; cone head form A to DIN 71412

Mounting style C Rectangular flange at cylinder head (ISO 6099; Fig. ME5)



1 Position transducer, for dimensions see page 4

Mounting style D Rectangular flange at cylinder base (ISO 6099; Fig. ME6)

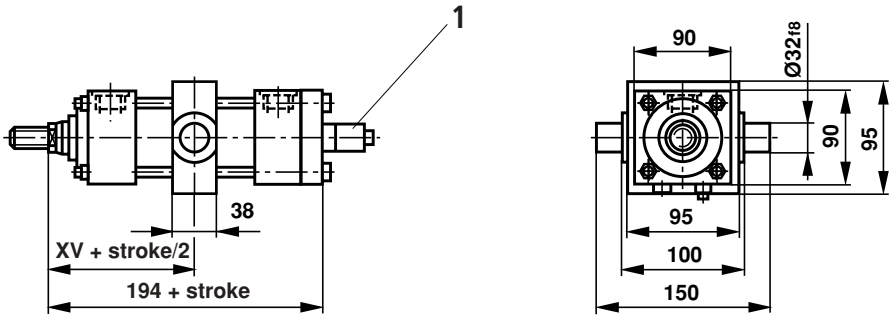


1 Position transducer, for dimensions see page 4

[7]) Only possible with control manifold

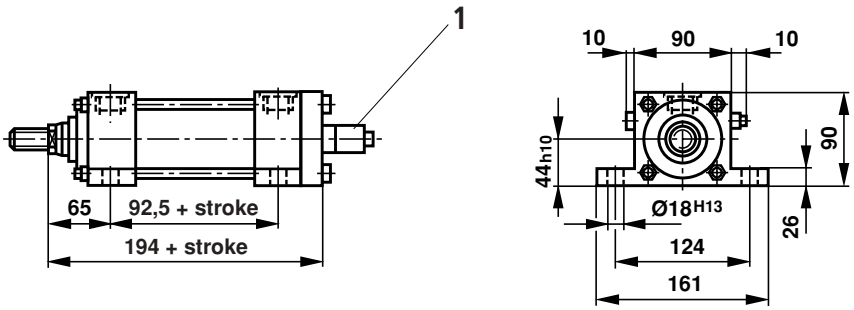
Piston rod Ø	RD centring $Ø_{f8}$	B Ø	EE connection 1	EE connection 4 [7]	EE connection 5 [7]	XV trunnion size Average	XV trunnion size Min.	XV trunnion size Max.	A/F	Available stroke lengths in mm Min.	Available stroke lengths in mm Max.
45	88	60	G 3/4	NS 10	NS 16	$111 + \frac{\text{stroke}}{2}$	132	91 + stroke	36	100	1200

Mounting style E Centre trunnion mounting (ISO 6099; Fig. MT 4)



1 Position transducer, for dimensions see page 4

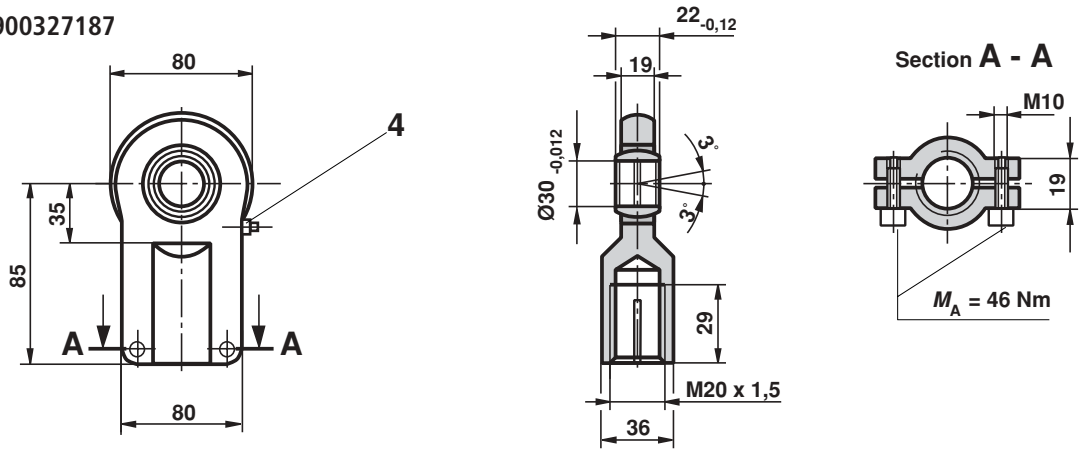
Mounting style F Foot mounting (ISO 6099; Fig. MS 2)



1 Position transducer, for dimensions see page 4

Self-aligning clevis CGKA 30 to DIN 24555
Material No. **R900327187**

Weight: 1.3 kg

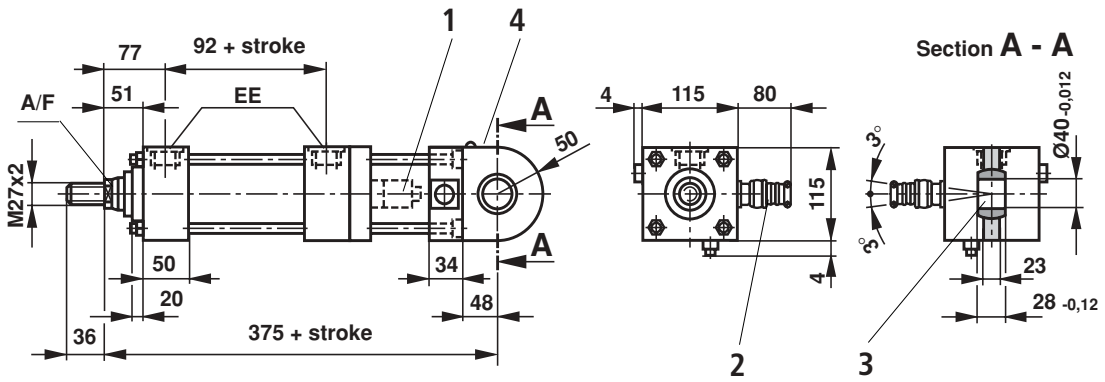


4 Grease nipple; cone head form A to DIN 71412

Piston rod Ø	Cushioning length		Cushioning area in cm²		Weight in kg (single rod cylinder)					
					0-stroke (to mounting styles)					Additional per 100 mm stroke
	Base end	Head end	Base end	Head end	B	C	D	E	F	
45	22.0	22.0	13.0	13.0	10.3	11.3	11.2	13.1	11.1	2.6

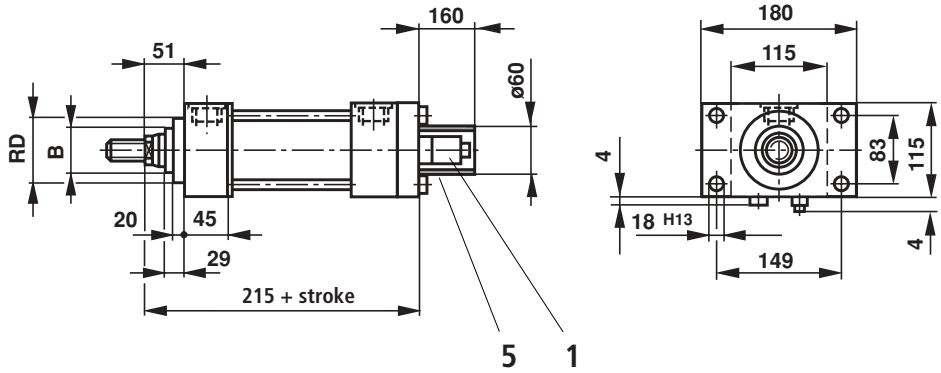
Piston Ø 80/ $\frac{36}{56}$ (dimensions in mm)

Mounting style B self-alinging clevis at cylinder base (ISO 6099; Fig. MP5)



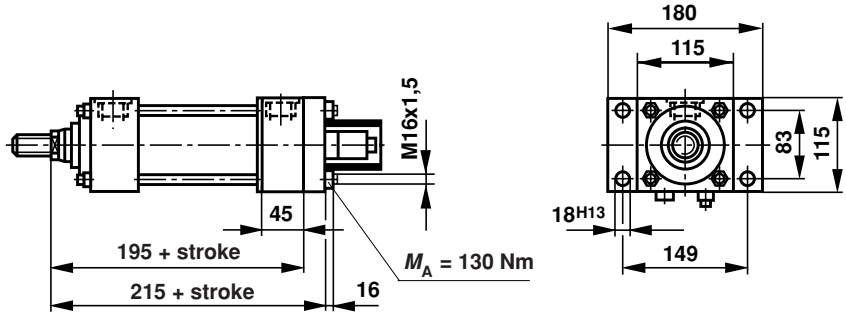
1 Position transducer, for dimensions see page 4 **2** Straight connector **3** Associated pin $Ø_{h6}$ **4** Grease nipple; cone head form A to DIN 71412

Mounting style C Rectangular flange (ISO 6099; Fig. ME5)



1 Position transducer, for dimensions see page 4 **5** Protective tube

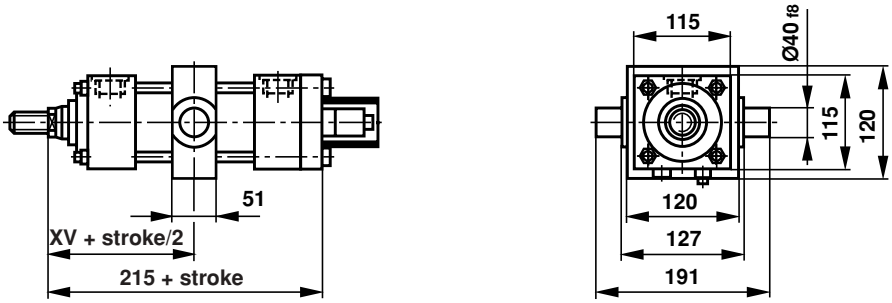
Mounting style D Rectangular flange at cylinder base (ISO 6099; Fig. ME6)



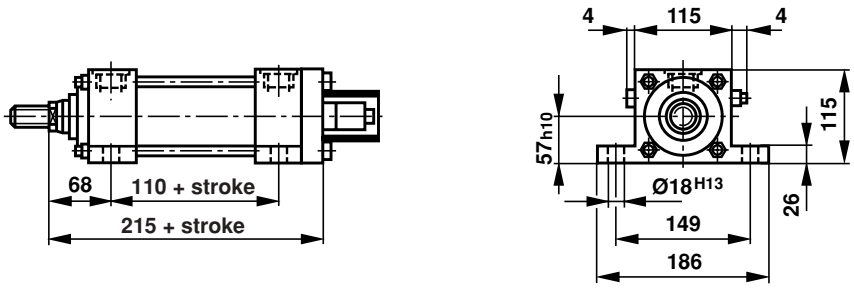
[7]) Only possible with control manifold

Piston rod Ø	RD centring $Ø_{f8}$	B Ø	EE connection 1	EE connection 4 [7]	EE connection 5 [7]	XV trunnion size Average	XV trunnion size Min.	XV trunnion size Max.	A/F	Available stroke length in mm Min.	Available stroke length in mm Max.
36	82	50	G 1	NS 10	NS 16	$123 + \frac{\text{stroke}}{2}$	147	99 + stroke	30	100	1500
56	105	72							46	100	1500

Mounting style E Centre trunnion mounting (ISO 6099; Fig. MT 4)



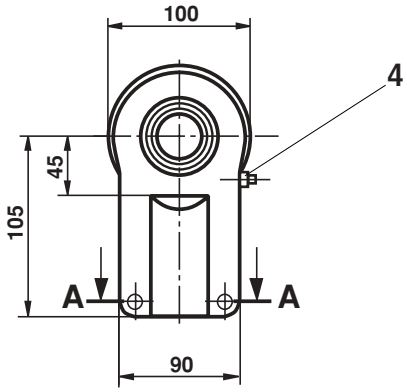
Mounting style F Foot mounting (ISO 6099; Fig. MS 2)

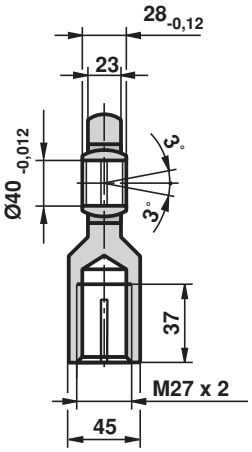


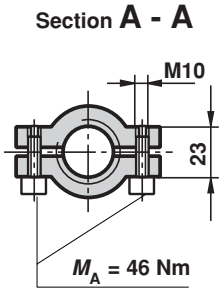
Self-aligning clevis CGKA 40 to DIN 24555

Material No. **R900327188**

Weight: 2.3 kg





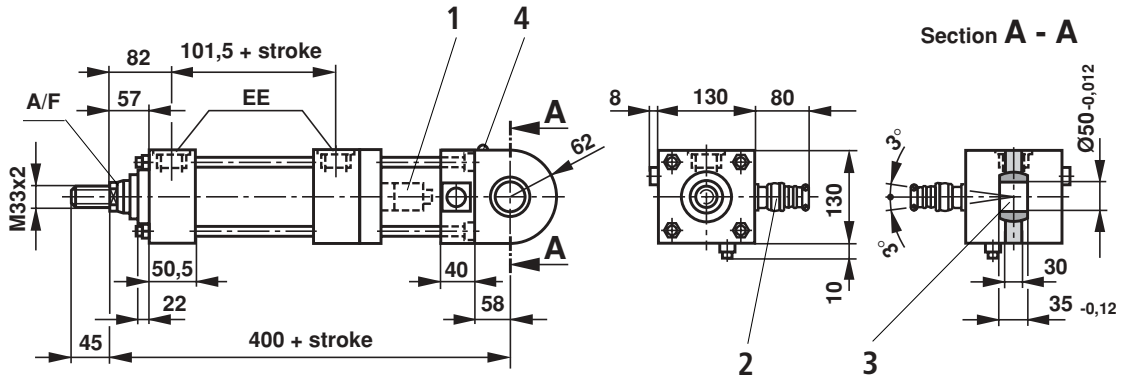


4 Grease nipple; cone head form A to DIN 71412

Piston rod Ø	Cushioning length		Cushioning area in cm²		Weight in kg (single rod cylinder)					
					0-stroke (to mounting styles)					Additional per 100 mm stroke
	Base end	Head end	Base end	Head end	B	C	D	E	F	
36	25	25	37.70	37.70	17.4	19.2	18.6	22.3	18.2	3.0
56			37.70	22.00	18.2	20.0	19.4	23.1	19.0	4.1

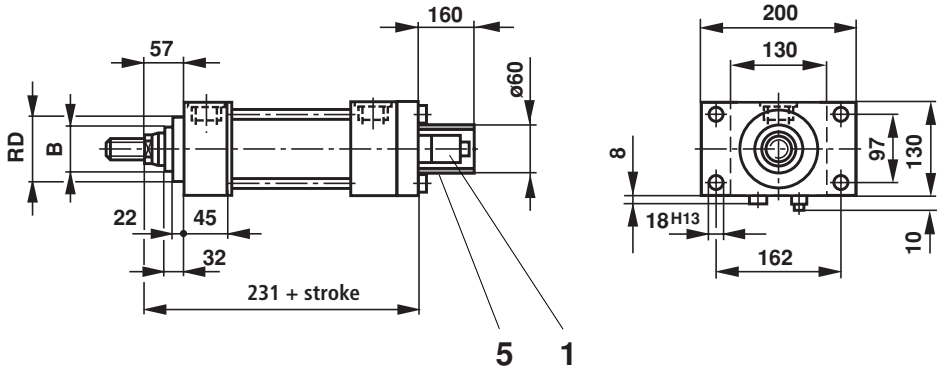
Piston Ø 100/ $\frac{45}{70}$ (dimensions in mm)

Mounting style B Self-aligning clevis at cylinder base (ISO 6099; Fig. MP5)



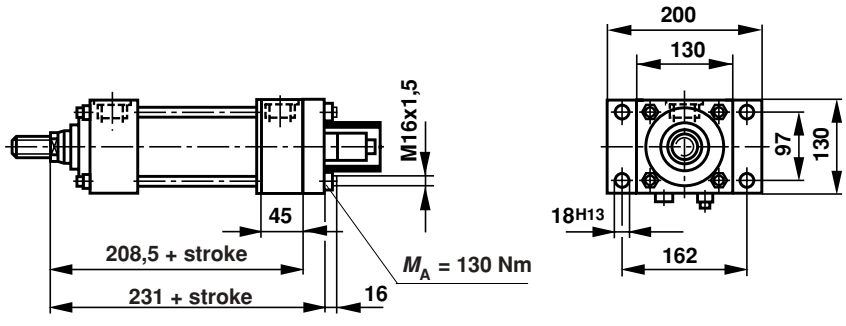
1 Position transducer, for dimensions see page 4 **2** Straight connector **3** Associated pin $Ø_{h6}$ **4** Grease nipple; cone head form A to DIN 71412

Mounting style C Rectangular flange at cylinder head (ISO 6099; Fig. ME5)



1 Position transducer, for dimensions see page 4 **5** Protective tube

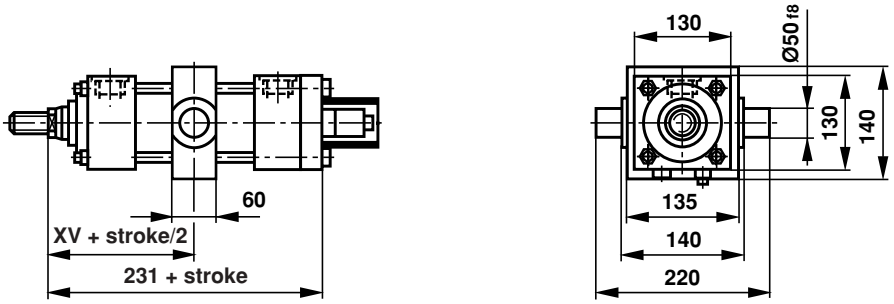
Mounting style D Rectangular flange at cylinder base (ISO 6099; Fig. ME6)



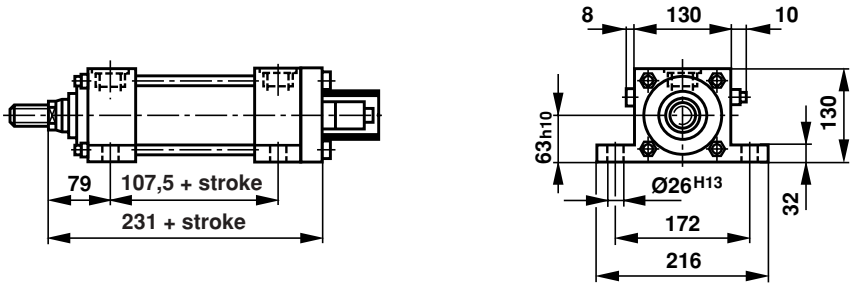
7) Only possible with control manifold

Piston rod	RD centring	B	EE connection			XV trunnion size			A/F	Available stroke length in mm	
Ø	$Ø_{f8}$	Ø	1	4 7)	5 7)	Average	Min.	Max.		Min.	Max.
45	92	60	G 1	NS 10	NS 16	$133 + \frac{\text{stroke}}{2}$	158	107 + stroke	36	100	1500
70	125	88							60	100	1500

Mounting style E Centre trunnion mounting (ISO 6099; Fig. MT 4)



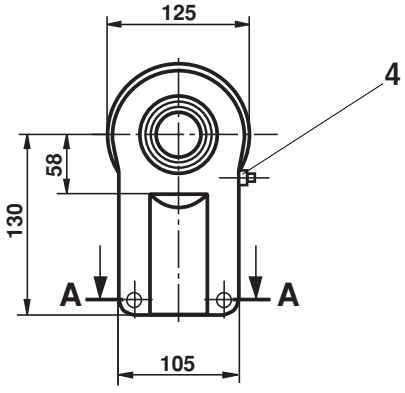
Mounting style F Foot mounting (ISO 6099; Fig. MS 2)

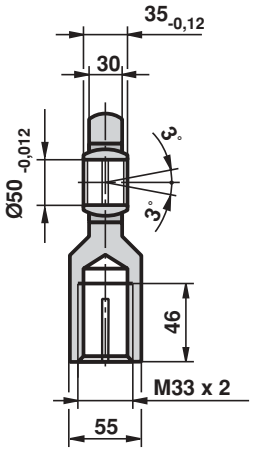


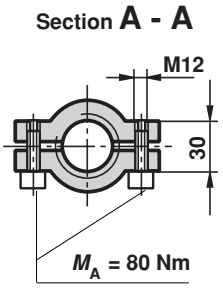
Self-aligning clevis CGKA 50 to DIN 24555

Material No. **R900327368**

Weight: 4.4 kg





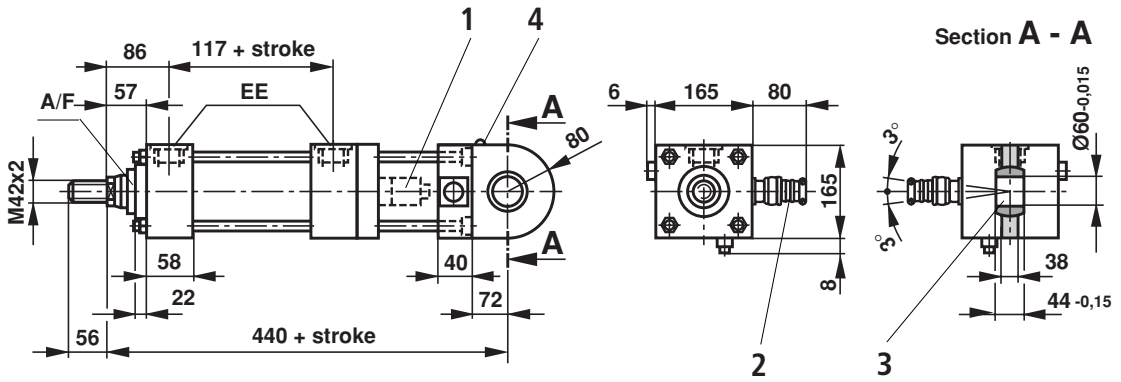


4 Grease nipple; cone head form A to DIN 71412

Piston rod Ø	Cushioning length		Cushioning area in cm²		Weight in kg (single rod cylinder)					
					0-stroke (to mounting styles)					Additional per 100 mm stroke
	Base end	Head end	Base end	Head ends	B	C	D	E	F	
45	26	26	58.85	58.85	25.0	26.7	26.0	30.4	25.4	4.5
70			58.85	34.35	25.6	27.3	26.6	31.0	26.0	6.3

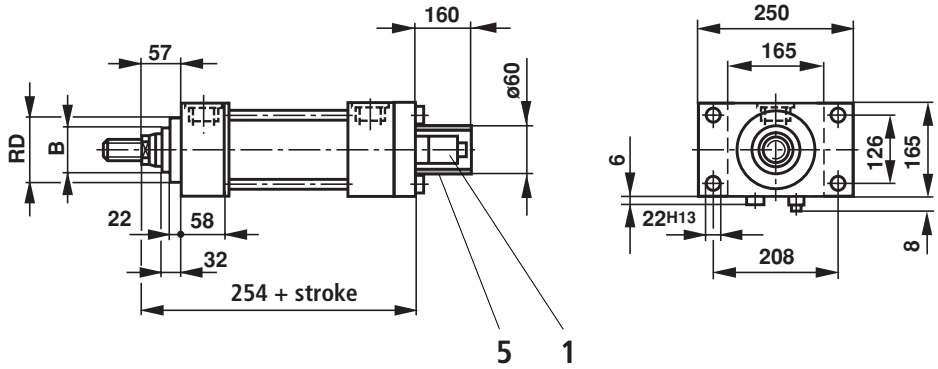
Piston Ø 125/ $\frac{56}{90}$ (dimensions in mm)

Mounting style B self-aligning clevis at cylinder base (ISO 6099; Fig. MP5)



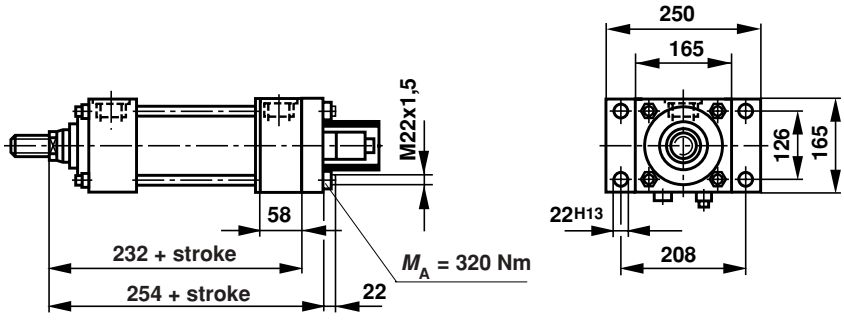
1 Position transducer, for dimensions see page 4 **2** Straight connector **3** Associated pin $Ø_{h6}$ **4** Grease nipple; cone head form A to DIN 71412

Mounting style C Rectangular flange at cylinder head (ISO 6099; Fig. ME5)



1 Position transducer, for dimensions see page 4 **5** Protective tube

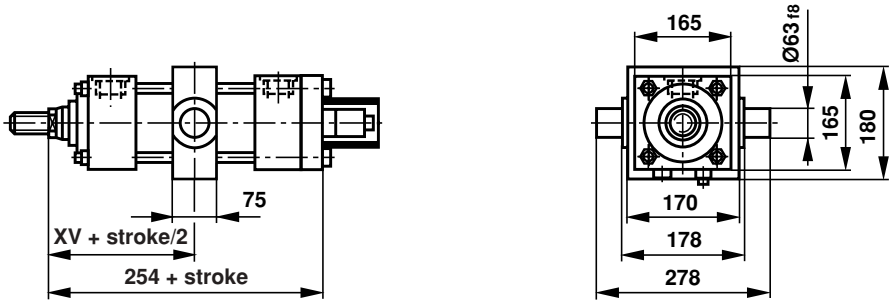
Mounting style D Rectangular flange at cylinder base (ISO 6099; Fig. ME6)



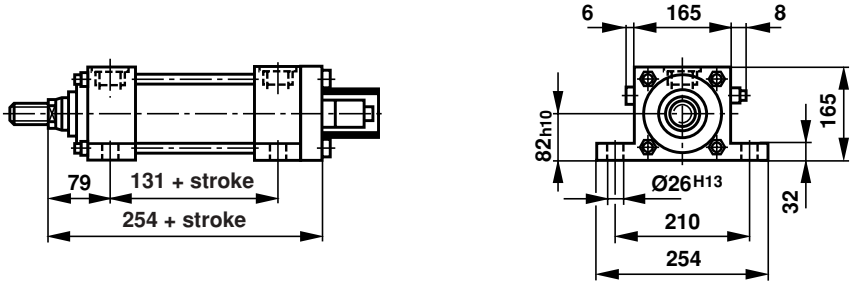
[7]) Only possible with control manifold

Piston rod	RD centring	B	EE connection			XV trunnion size			A/F	Available stroke lengths in mm	
Ø	$Ø_{f8}$	Ø	1	5 [7]	6 [7]	Average	Min.	Max.		Min.	Max.
56	105	72	G 1 1/4	NS 16	NS 25	$144.5+\frac{\text{stroke}}{2}$	180	109 + stroke	46	100	1700
90	150	108							75	100	1700

Mounting style E Centre trunnion mounting (ISO 6099; Fig. MT 4)



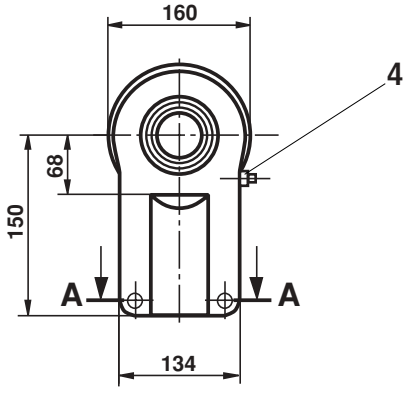
Mounting style F foot mounting (ISO 6099; Fig. MS 2)

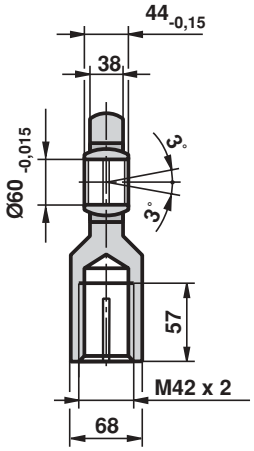


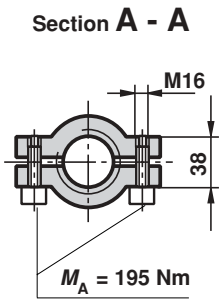
Self-aligning clevis CGKA 40 to DIN 24555

Material No. **R900327369**

Weight: 8.4 kg



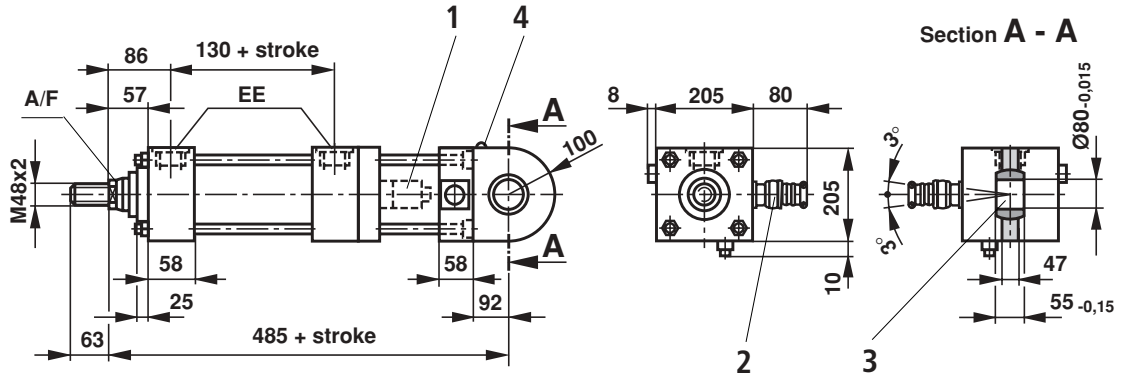




4 Grease nipple; cone head form A to DIN 71412

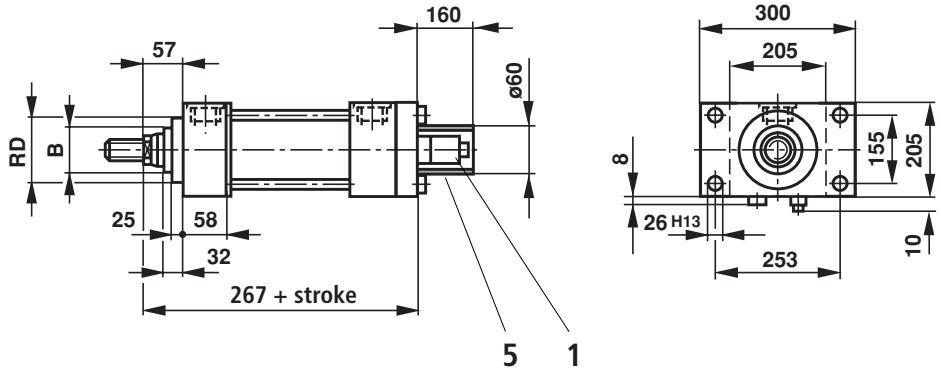
Piston rode Ø	Cushioning length		Cushioning area in cm^2		Weight in kg (single rod cylinder)					
					0-stroke (to mounting styles)					Additional per 100 mm stroke
	Base end	Head end	Base end	Head end	B	C	D	E	F	
56	28	28	92.50	92.50	43.0	46.9	44.1	50.5	43.6	7.2
90			92.50	51.80	44.6	48.5	45.6	52.1	45.2	9.8

Mounting style B self-aligning clevis at cylinder base (ISO 6099; Fig. MP5)



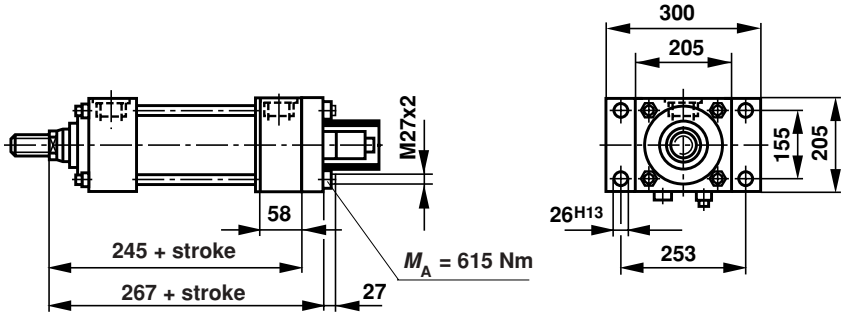
1 Position transducer, for dimensions see page 4 **2** Straight connector **3** Associated pin $Ø_{h6}$ **4** Grease nipple; cone head form A to DIN 71412

Mounting style C Rectangular flange at cylinder head (ISO 6099; Fig. ME5)



1 Position transducer, for dimensions see page 4 **5** Protective tube

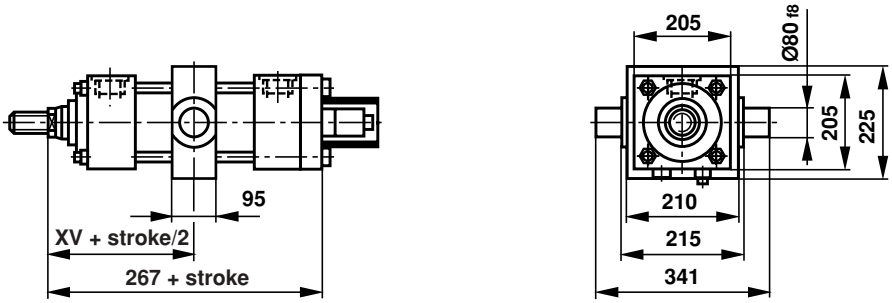
Mounting style D Rectangular flange at cylinder base (ISO 6099; Fig. ME6)



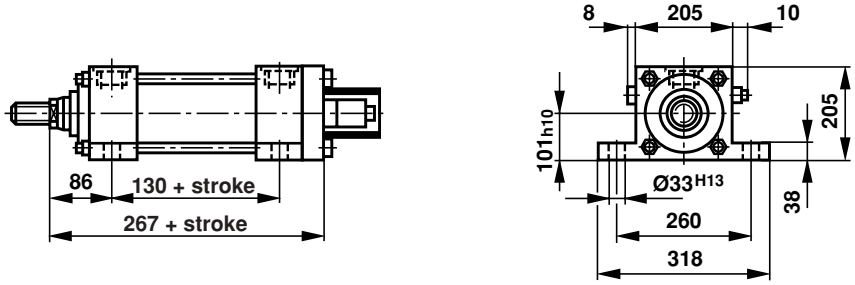
[7]) Only possible with control manifold

Piston rod	RD centring	B	EE connection			XV trunnion size			A/F	Available stroke lengths in mm	
Ø	$Ø_{f8}$	Ø	1	5 [7])	6 [7])	Average	Min.	Max.		Min.	Max.
70	125	88	G 1 1/4	NS 16	NS 25	$151 + \frac{\text{stroke}}{2}$	198	104 + stroke	60	100	1700
110	170	133							95	100	1700

Mounting style E Centre trunnion mounting (ISO 6099; Fig. MT 4)



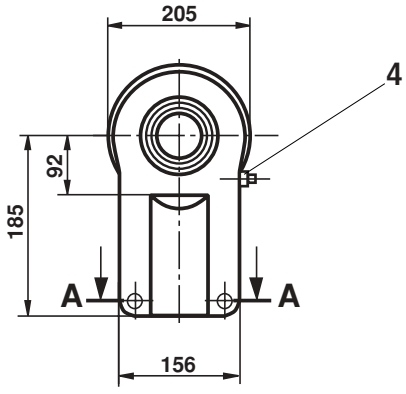
Mounting style F Foot mounting (ISO 6099; Fig. MS 2)

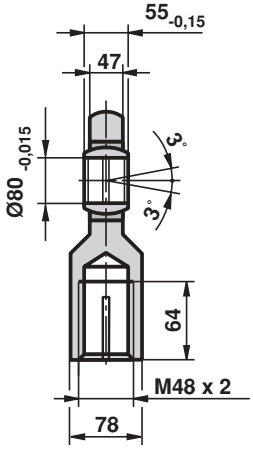


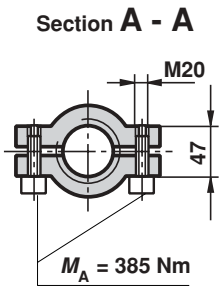
Self-aligning clevis CGKA 40 to DIN 24555

Material No. **R900327370**

Weight: 15.6 kg





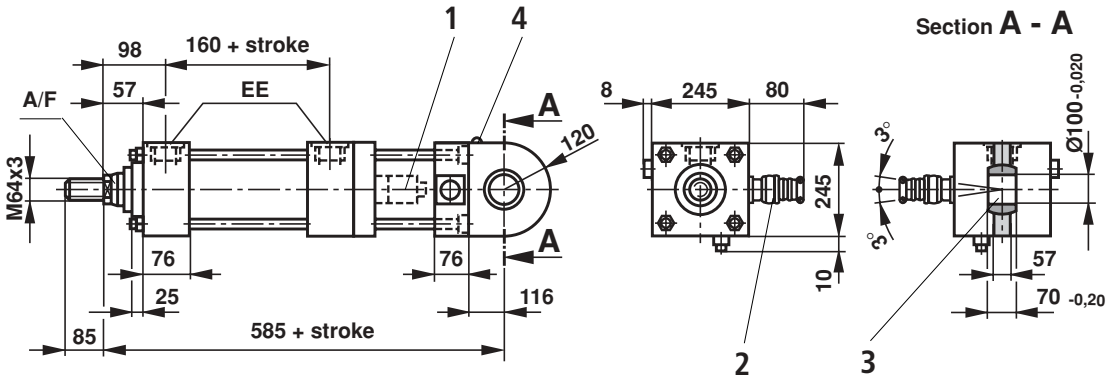


4 Grease nipple; cone head form A to DIN 71412

Piston rod Ø	Cushioning length		Cushioning area in cm²		Weight in kg (signle rod cylinder)					
					0-stroke (to mounting styles)					Additional per 100 mm stroke
	Base end	Head end	Base end	Head end	B	C	D	E	F	
70	30	30	156.8	156.8	70.3	74.8	71.8	85.8	70.6	10.0
110			156.8	91.15	73.5	78.0	74.8	89.0	73.8	14.4

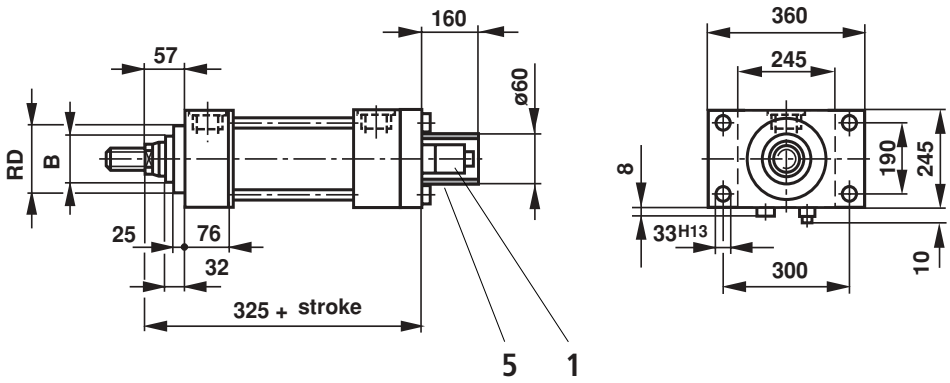
Piston 200/$\frac{90}{140}$ (dimensions in mm)

Mounting style B Self-aligning clevis at cylinder base (ISO 6099; Fig. MP5)



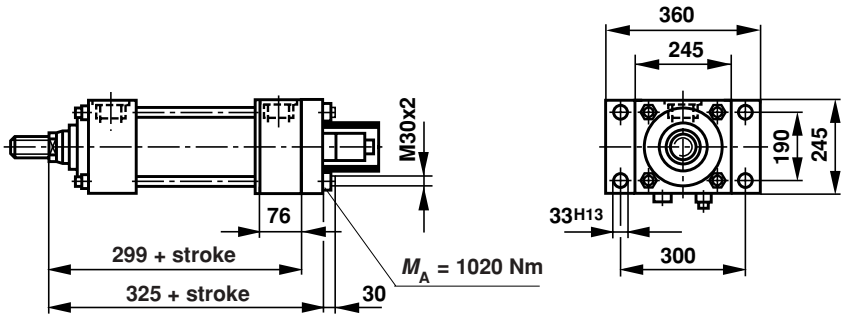
1 Position transducer, for dimensions see page 4 **2** Straight connector **3** Associated pin $Ø_{h6}$ **4** Grease nipple; cone head form A to DIN 71412

Mounting style C Rectangular flange at cylinder head (ISO 6099; Fig. ME5)



1 Position transducer, for dimensions see page 4 **5** Protective tube

Mounting style D Rectangular flange at cylinder base (ISO 6099; Fig. ME6)

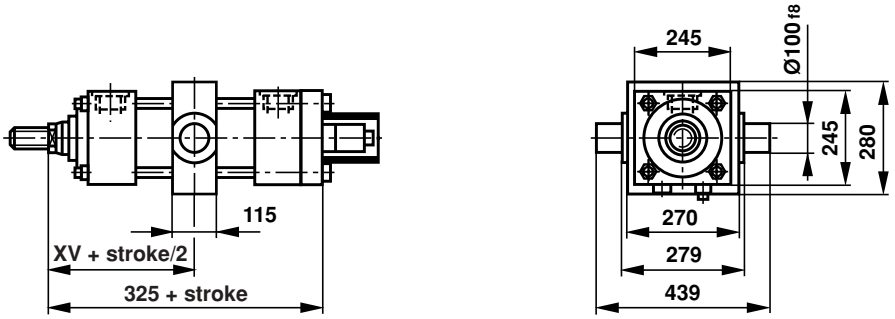


7) Only possible for control manifold

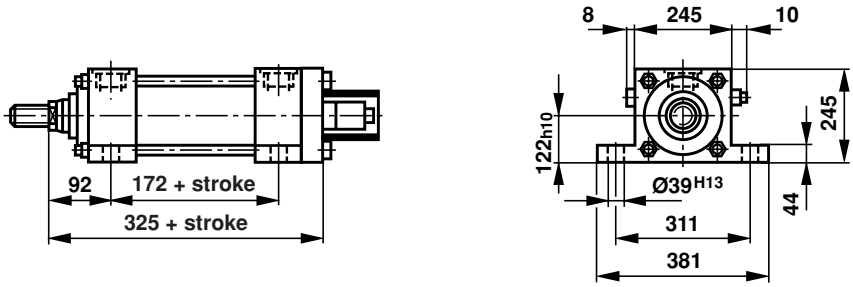
Piston rod	RD centring	B	EE connection			XV trunnion size			A/F	Available stroke lengths in mm	
Ø	$Ø_{f8}$	Ø	1	5 7)	6 7)	Average	Min.	Max.		Min.	Max.
90	150	108	G 1 1/2	NS 16	NS 25	$178 + \frac{\text{stroke}}{2}$	226	130 + stroke	75	100	1700
140	210	163							120	100	1700

Piston Ø 200/$\frac{90}{140}$ (dimensions in mm)

Mounting style E Centre trunnion mounting (ISO 6099; Fig. MT 4)



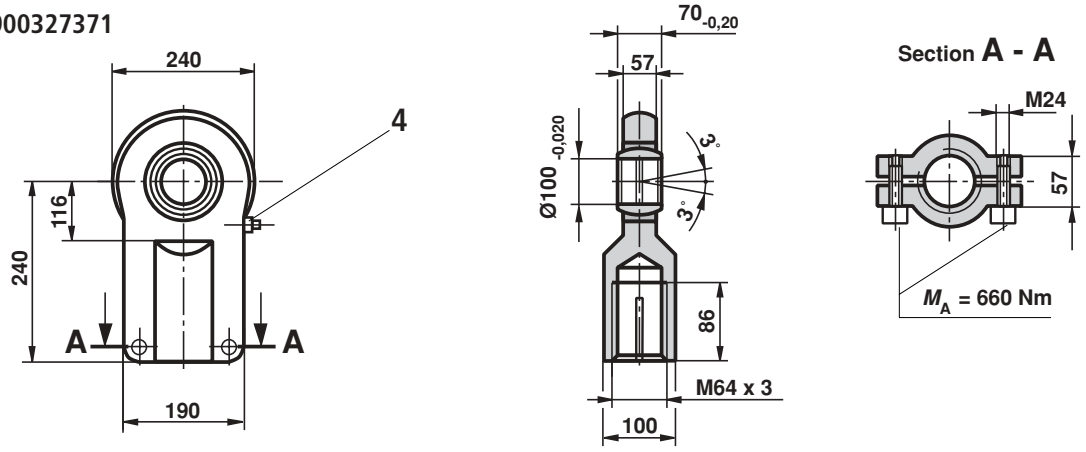
Mounting style F Foot mounting (ISO 6099; fig. MS 2)



Self-aligning clevis CGKA 40 to DIN 24555

Material No. **R900327371**

Weight: 28 kg

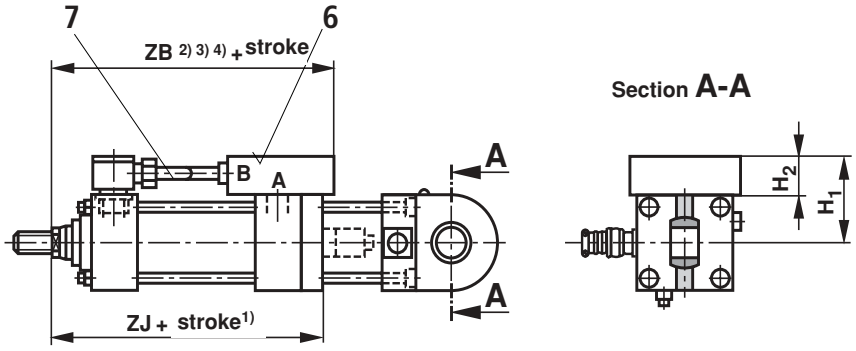


4 Grease nipple; cone head form A to DIN 71412

Piston rod Ø	Cushioning length		Cushioning area in cm²		Weight in kg (single rod cylinder)					
					0-stroke (to mounting styles)					Additional per 100 mm stroke
	Base end	Head end	Base end	Head end	B	C	D	E	F	
90	38	38	243.15	243.15	124	130	127	164	123	14.5
140			243.15	149.00	129	135	132	169	128	22.0

Connection plates for mounting valves (dimensions in mm)

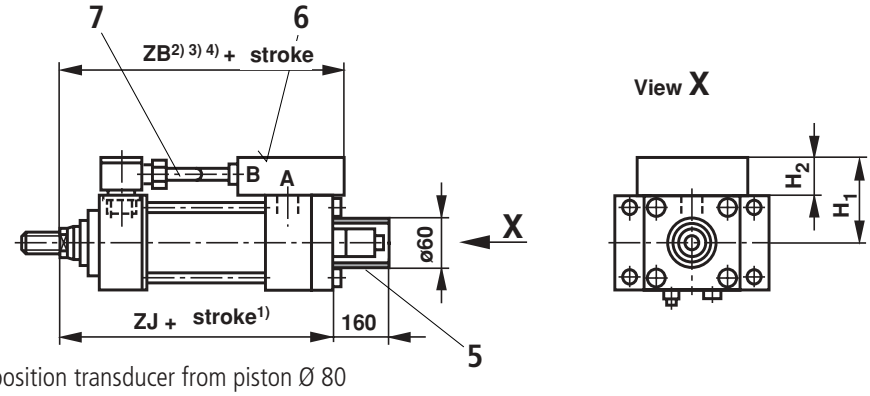
Mounting style B Self-aligning clevis at cylinder base (ISO 6099; Fig. MP5)



6 For valve porting pattern, see pages 24 and 25

7 Port "B" piped to cylinder head

Mounting style C Rectangular flange at cylinder head (ISO 6099; Fig. ME5)

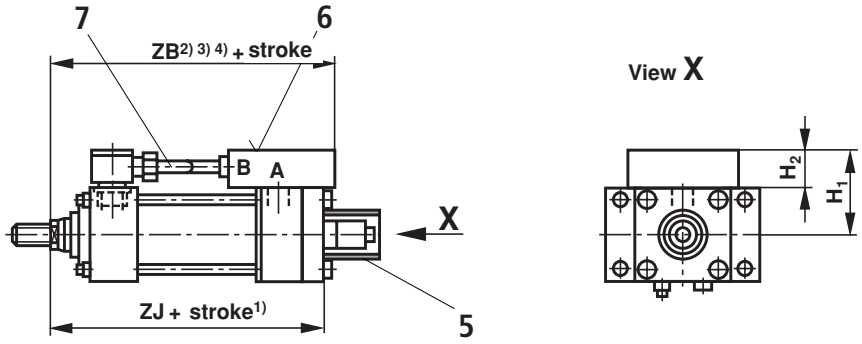


5 Protective for position transducer from piston Ø 80

6 For valve porting pattern, see pages 24 and 25

7 Connection "B" piped to cylinder head

Mounting style D Rectangular flange at cylinder base (ISO 6099; Fig. ME6)



5 Protective tube for position transducer from piston Ø 80

6 For valve porting pattern, see pages 24 and 25

7 Connection "B" piped to cylinder head

Plate nominal size	Connections (plate) P	T	L	X	Y	Porting pattern for valve	Weight (plate) in kg
NS 6	G 3/8	G 3/8	–	–	–	DIN 24 340–A 6	1.8
NS 10	G 1/2	G 1/2	–			DIN 24 340–A10	4.0
Ns 16	G 3/4	G 3/4	G 1/4	G 1/4	G 1/4	DIN 24 340–A16	8.5
NS 25	G 1 1/4	G 1 1/4	G 1/4			DIN 24 340–A25	20.0

1) Min. stroke = 100 mm

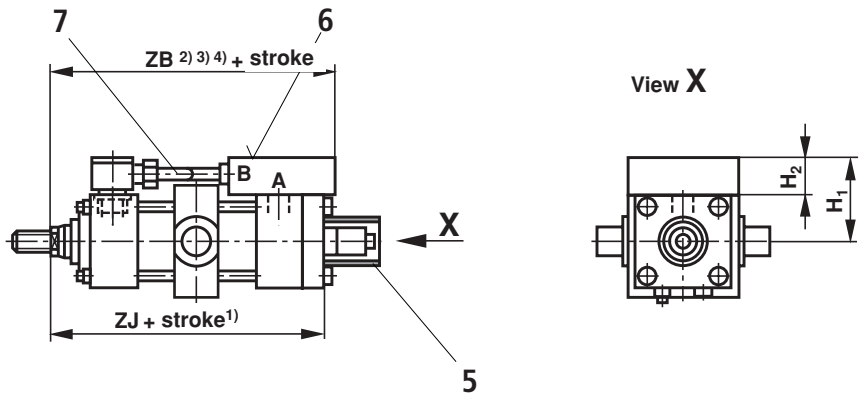
2) Valve spool parallel or rotated by 90° with respect to cylinder axis

3) Valve spool rotated by 90° with respect to cylinder axis

4) Valve spool parallel to cylinder axis

Connection plates for mounting valves (dimensions in mm)

Mounting style E Centre trunnion mounting (ISO 6099; Fig. MT 4)

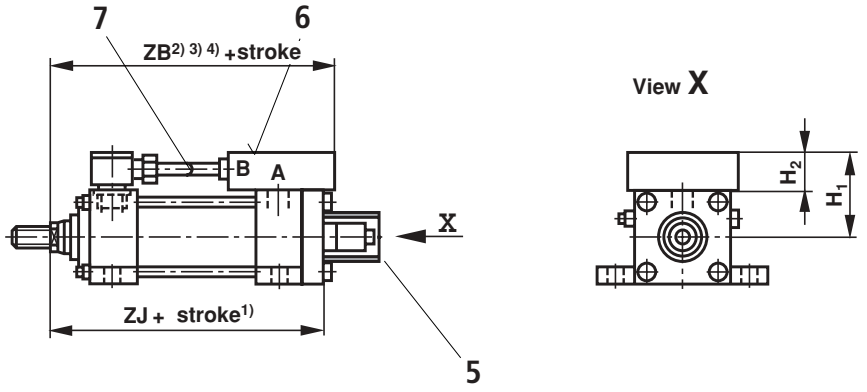


5 Protective tube for position transducer from piston Ø 80

6 For valve porting pattern, see pages 24 and 25

7 Connection "B" piped to cylinder head

Mounting style F Foot mounting (ISO 6099; Fig. MS 2)



5 Protective tube for position transducer from piston Ø 80

6 For valve porting pattern, see pages 24 and 25

7 Connection "B" piped to cylinder head

	Plate sizes																	
	NS 6				NS 10				NS 16					NS 25				
Piston Ø	H_1	H_2	ZJ	ZB[2)]	H_1	H_2	ZJ	ZB[2)]	H_1	H_2	ZJ	ZB[3)]	ZB[4)]	H_1	H_2	ZJ	ZB[3)]	ZB[4)]
40	76.5	45	183	162	76.5	45	183	178										
50	82.5	45	186.5	168	82.5	45	186.5	184										
63	90	45	194	177	90	45	194	193	100	55	194	229	209					
80					102.5	45	215	213	113	55	215	250	230					
100					110	45	231	227	120	55	231	263	243					
125									138	55	254	285	265	153	70	254	319	304
160									158	55	267	298	278	173	70	267	332	317
200									178	55	325	339	319	193	70	325	373	358

[1)] Min. stroke = 100 mm

[2)] Valve spool parallel or rotated by 90° with respect to cylinder axis

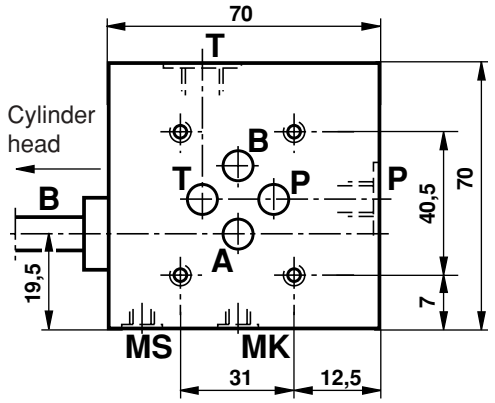
[3)] Valve spool rotated by 90° with respect to cylinder axis

[4)] Valve spool parallel to cylinder axis

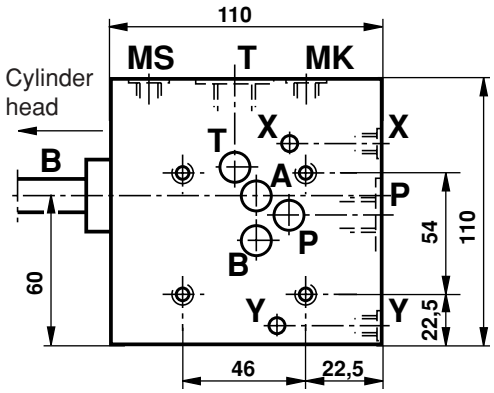
Valve connection plates, dimensions and porting patterns (dimensions in mm)

Valve spool rotated by 90° with respect to the cylinder axis
Porting pattern to DIN 24 340

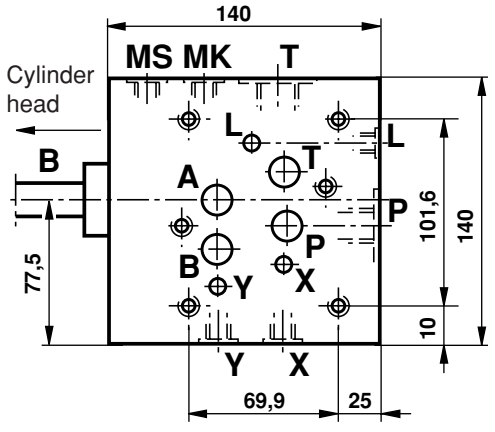
NS 6



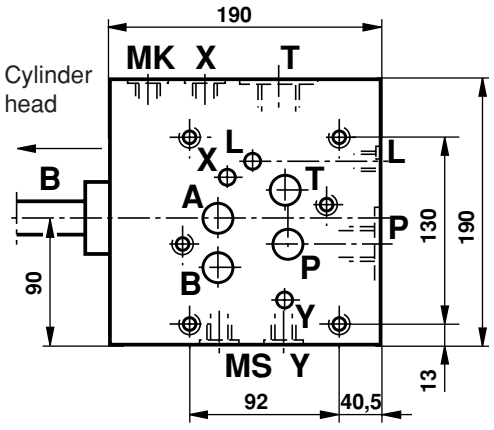
NS 10



NS 16



NS 25

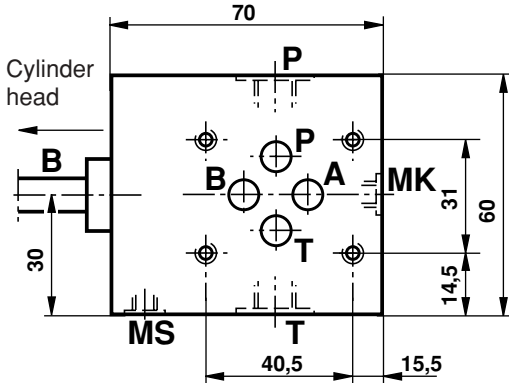


Nominal size	Connection designations						
	P	T	X	Y	L	MK [1]	MS [2]
NS 6	G 3/8	G 3/8	–	–	–	G 1/8	G 1/8
NS 10	G 1/2	G 1/2	G 1/4	G 1/4	–	G 1/4	G 1/4
NS 16	G 3/4	G 3/4	G 1/4	G 1/4	G 1/4	G 1/4	G 1/4
NS 25	G 1 1/4	G 1 1/4	G 1/4	G 1/4	G 1/4	G 1/4	G 1/4

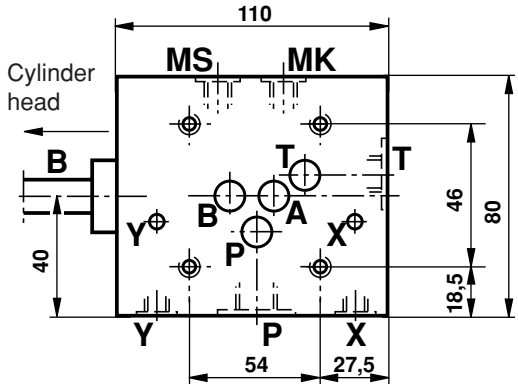
[1] Measuring port on piston end
[2] Measuring port on rod end

Valve spool parallel to the cylinder axis
Porting pattern to DIN 24 340

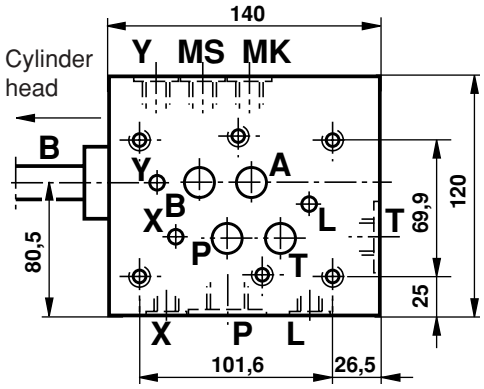
NS 6



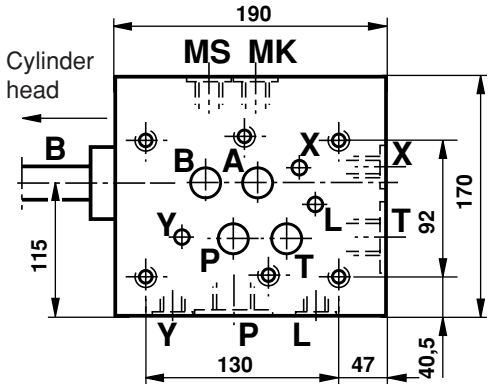
NS 10



NS 16



NS 25



Nominal size	Connection designations						
	P	T	X	Y	L	MK [1]	MS [2]
NS 6	G 3/8	G 3/8	–	–	–	G 1/8	G 1/8
NS 10	G 1/2	G 1/2	G 1/4	G 1/4	–	G 1/4	G 1/4
NS 16	G 3/4	G 3/4	G 1/4	G 1/4	G 1/4	G 1/4	G 1/4
NS 25	G 1 1/4	G 1 1/4	G 1/4	G 1/4	G 1/4	G 1/4	G 1/4

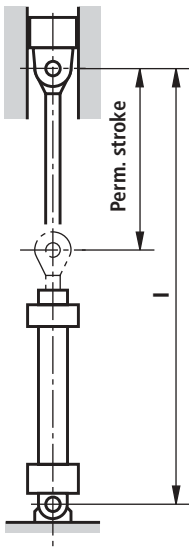
[1] Measuring port on piston end
[2] Measuring port on rod end

Permissible stroke lengths (dimensions in mm)

Piston Ø in mm	Rod Ø in mm	Mounting style **B** Operating pressure in bar 70	100	160 Max. permissible stroke in mm	Mounting styles: **C** and **F** Operating pressure in bar 70	100	160 Max. permissible stroke in mm	Maximum available stroke lengths in mm (standard)
40	–	–	–	–	–	–	–	1000
	28	–	–	–	1000	1000	1000	
50	–	–	–	–	–	–	–	1200
	36	750	595	430	1200	1200	1200	
63	–	–	–	–	–	–	–	1200
	45	960	770	560	1200	1200	1200	
80	36	350	255	150	1500	1260	965	1500
	56	1195	960	710	1500	1500	1500	
100	45	475	355	225	1500	1500	1215	1500
	70	1500	1230	915	1500	1500	1500	
125	56	620	470	310	1700	1700	1530	1700
	90	1700	1685	1470	1700	1700	1700	
160	70	780	600	405	1700	1700	1700	1700
	110	1700	1700	1495	1700	1700	1700	
200	90	1070	825	570	1700	1700	1700	1700
	140	1700	1700	1700	1700	1700	1700	

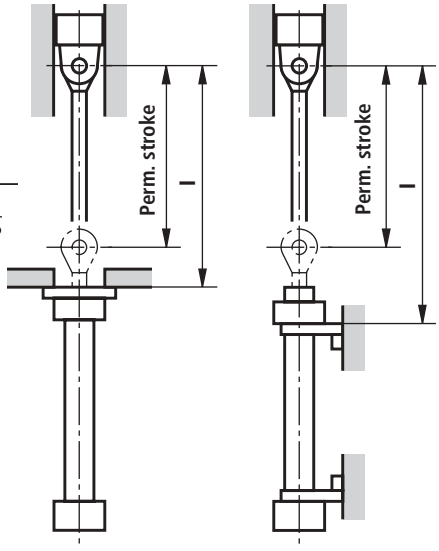
Loading case 2

$s_K = l$



Loading case 3

$s_K = l \cdot \sqrt{\frac{1}{2}}$

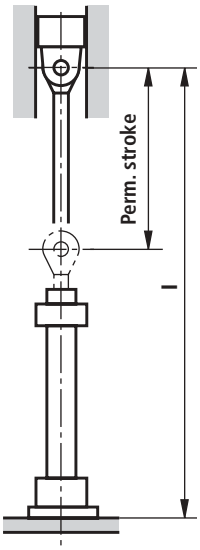


Permissible stroke lengths (dimensions in mm)

Piston Ø in mm	Rod Ø in mm	Mounting style **D** Operating pressure in bar 70	100	160	Mounting style **E** Operating pressure in bar 70	100	160	Maximum available stroke lengths in mm (standard)
		Max. permissible stroke in mm			Max. permissible stroke in mm			
40	–	–	–	–	–	–	–	1000
	28	920	750	575	850	695	525	
50	–	–	–	–	–	–	–	1200
	36	1200	1020	780	1145	940	720	
63	–	–	–	–	–	–	–	1200
	45	1200	1200	985	1200	1180	905	
80	36	700	560	410	640	510	370	1500
	56	1500	1500	1210	1500	1450	1110	
100	45	890	720	535	810	650	480	1500
	70	1500	1500	1500	1500	1500	1400	
125	56	1120	905	675	1030	830	615	1700
	90	1700	1700	1700	1700	1700	1700	
160	70	1380	1120	840	1265	1020	760	1700
	110	1700	1700	1700	1700	1700	1700	
200	90	1700	1500	1130	1700	1375	1030	1700
	140	1700	1700	1700	1700	1700	1700	

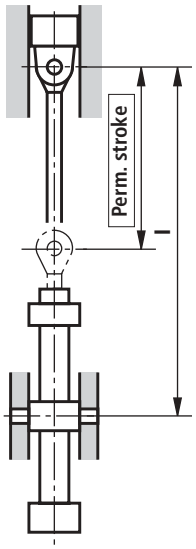
Loading case 2

$s_K = l \bullet \sqrt{\frac{1}{2}}$



Loading case 3

$s_K = l$



(centre trunnion mounting)

Buckling calculation

The calculations for buckling are normally carried out according to Euler, as the piston rod may be normally considered to be a slender column.

Buckling load $K = \frac{\pi^2 \bullet E \bullet J}{s_K^2}$ in N

At this load, the rod will buckle!

Max. operating load $F = \frac{K}{S}$ in N

s_K = Free buckling length in mm

E = Module of elasiticity in N/mm^2
= $2{,}1 \bullet 10^5$ for steel

J = Moment of inertia in mm^4
for circular cross-sectional area
= $\frac{d^4 \bullet \pi}{64} = 0.0491 \bullet d^4$

S = Safety (3.5)

Forces; areas (dimensions in mm)

Operating pressure in bar	Piston Ø / Piston rod Ø	mm	40		50		63		80	
	Piston Ø	mm	40		50		63		80	
	Piston rod Ø	mm	–	28	–	36	–	45	36	56
70	Force; piston end	kN	8.80		13.75		21.82		35.19	
	Force; rod end	kN	–	4.49	–	6.62	–	10.69	28.06	17.95
100	Force; piston end	kN	12.57		19.64		31.17		50.27	
	Force; rod end	kN	–	6.41	–	9.46	–	15.27	40.09	25.64
160	Force; piston end	kN	20.11		31.42		49.87		80.43	
	Force; rod end	kN	–	10.26	–	15.14	–	24.43	64.14	41.02
Piston area		cm^2	12.57		19.64		31.17		50.27	
Annulus area		cm^2	–	6.41	–	9.46	–	15.27	40.09	25.64

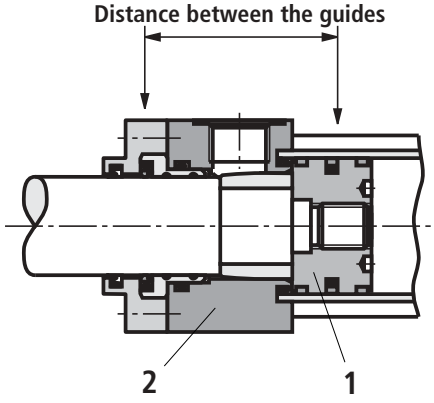
Operating pressure in bar	Piston Ø / Piston rod Ø	mm	100		125		160		200	
	Piston Ø	mm	100		125		160		200	
	Piston rod Ø	mm	45	70	56	90	70	110	90	140
70	Force; piston end	kN	54.89		85.90		140.74		219.91	
	Force; rod end	kN	43.85	28.04	68.66	41.37	113.80	74.22	175.38	112.15
100	Force; piston end	kN	78.54		122.72		201.06		314.16	
	Force; rod end	kN	62.64	40.05	98.09	59.10	162.57	106.03	250.54	160.22
160	Force; piston end	kN	125.66		196.35		321.70		502.66	
	Force; rod end	kN	100.22	64.08	156.94	94.56	260.11	169.65	400.86	256.35
Piston area		cm^2	78.54		122.72		201.06		314.16	
Annulus area		cm^2	62.64	40.05	98.09	59.10	162.57	106.03	250.54	160.22

Stop tube extention

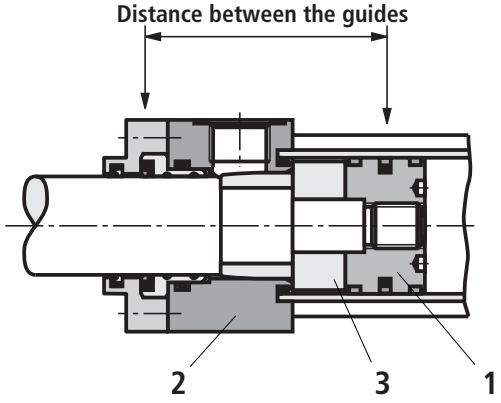
With long strokes and compressive loads, a stop tube is recommended in order to reduce the bearing loads with the rod is extended. A spacer bush (3) is inserted between piston (1) and cylinder head (2).

This spacer bush extends the lever arm and thus reduces the bearing loads.

Without stop tube extension

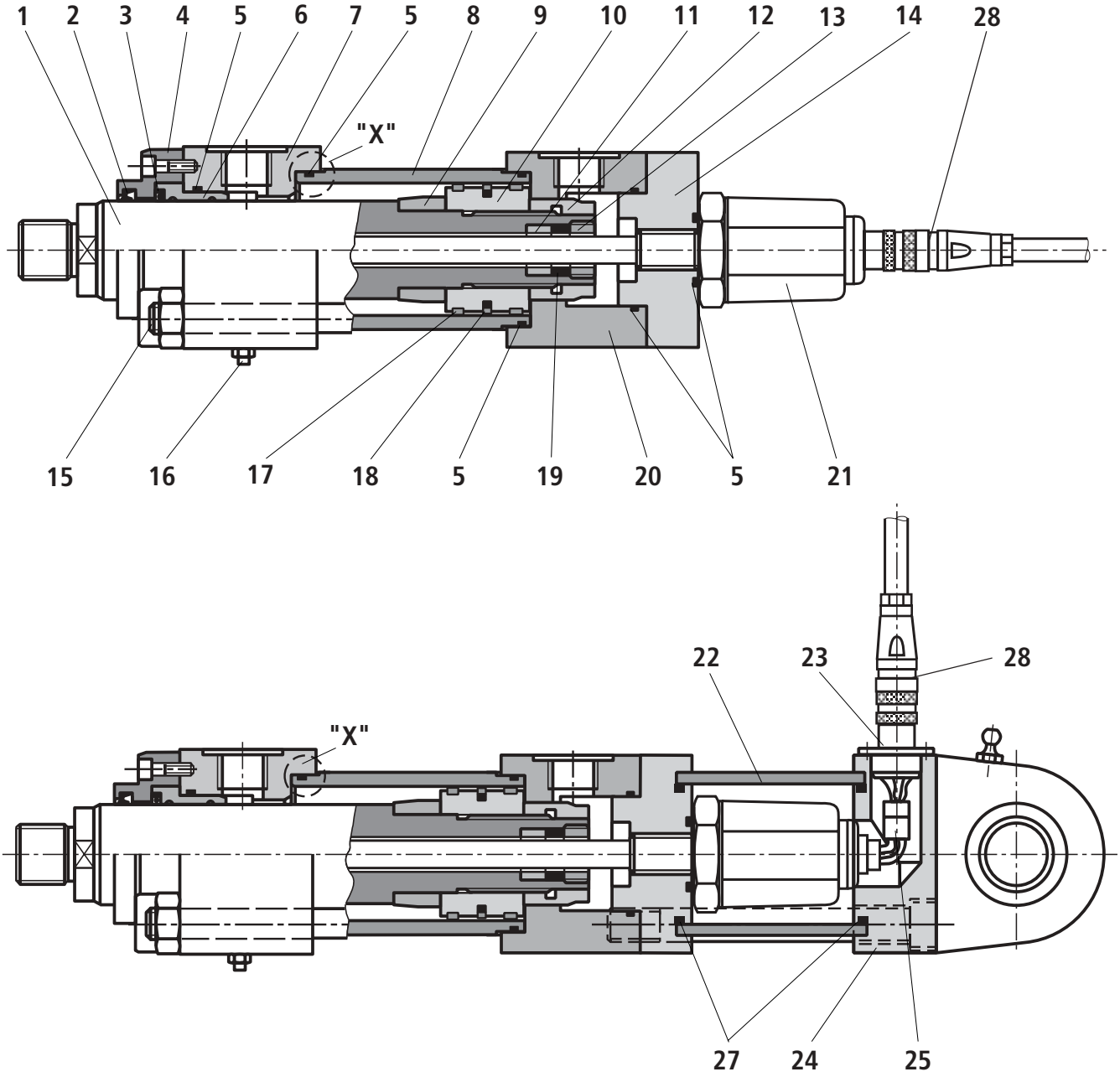


With stop tube extension



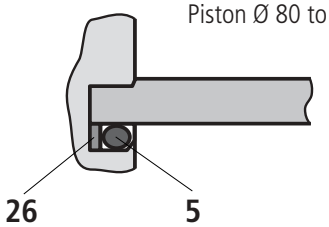
Ordering details	No details	1	2	3	4	5	6	7
	Stop tube extension in mm for all pistons Ø							
	–	25	50	75	100	125	150	175
Mounting style	Stroke length in mm							
B	...500	501...625	626...750	751...875	876...1000	1001...1125	1126...1250	1251...1700
C	...1425	1426...1700	–	–	–	–	–	–
D	...665	666...835	836...1000	1001...1165	1166...1335	1336...1500	1501...1665	1666...1700
E	...665	666...835	836...1000	1001...1165	1166...1335	1336...1500	1501...1665	1666...1700
F	...1425	1426...1700	–	–	–	–	–	–

Installation length of cylinder with stop tube extensions: Installation length of standard cylinders + stop tube extension



1 Piston rod
2 Double wiper seal
3 Rod seal
4 Cover
5 O-ring
6 Guide bush
7 Cylinder head
8 Cylinder tube
9 Cushioning bush
10 Piston
11 Bush
12 Cushioning bush
13 Ring
14 Cover
15 Tie rod
16 Throttle valve (check valve)
17 Guide sstrip
18 Piston seal
19 Solenoid
20 Head
21 Position transducer
22 Tube
23 Component plug rotated by 90°
24 Cylinder base
25 Plug-in connection
26 Back-up ring
27 O-ring
28 Plug-in connector

"X"
Piston Ø 80 to 200



Notes

The data specified above only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information.
The details stated do not release you from the responsibility for carrying out your own assessment and verification. It must be remembered that our products are subject to a natural process of wear and ageing.

Bosch Rexroth AG
Industrial Hydraulics
D-97813 Lohr am Main
Zum Eisengießer 1 • D-97816 Lohr am Main
Telefon 0 93 52 / 18-0
Telefax 0 93 52 / 18-23 58 • Telex 6 89 418-0
eMail documentation@boschrexroth.de
Internet www.boschrexroth.de

Bosch Rexroth SA
BP 37 – Z.I. Les Fourmis
F-74131 Bonneville Cedex
Tel. +33(0)4 50 25 35 45
Fax +33(0)4 50 25 35 19
Internet www.boschrexroth.fr

Bosch Rexroth Teknik AB
Varuvägen 7, Älvsjö
S-125 81 Stockholm
Tel. +46(08) 72 79 20 0
Fax +46(08) 86 87 21
eMail cyl.hyd@boschrexroth.se
Internet www.boschrexroth.se

Notes

Bosch Rexroth AG
Industrial Hydraulics
D-97813 Lohr am Main
Zum Eisengießer 1 • D-97816 Lohr am Main
Telefon 0 93 52 / 18-0
Telefax 0 93 52 / 18-23 58 • Telex 6 89 418-0
eMail documentation@boschrexroth.de
Internet www.boschrexroth.de

Bosch Rexroth SA
BP 37 – Z.I. Les Fourmis
F-74131 Bonneville Cedex
Tel. +33(0)4 50 25 35 45
Fax +33(0)4 50 25 35 19
Internet www.boschrexroth.fr

Bosch Rexroth Teknik AB
Varuvägen 7, Älvsjö
S-125 81 Stockholm
Tel. +46(08) 72 79 20 0
Fax +46(08) 86 87 21
eMail cyl.hyd@boschrexroth.se
Internet www.boschrexroth.se

Notes

The data specified above only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information.
The details stated do not release you from the responsibility for carrying out your own assessment and verification. It must be remembered that our products are subject to a natural process of wear and ageing.

Bosch Rexroth AG
Industrial Hydraulics
D-97813 Lohr am Main
Zum Eisengießer 1 • D-97816 Lohr am Main
Telefon 0 93 52 / 18-0
Telefax 0 93 52 / 18-23 58 • Telex 6 89 418-0
eMail documentation@boschrexroth.de
Internet www.boschrexroth.de

Bosch Rexroth SA
BP 37 – Z.I. Les Fourmis
F-74131 Bonneville Cedex
Tel. +33(0)4 50 25 35 45
Fax +33(0)4 50 25 35 19
Internet www.boschrexroth.fr

Bosch Rexroth Teknik AB
Varuvägen 7, Älvsjö
S-125 81 Stockholm
Tel. +46(08) 72 79 20 0
Fax +46(08) 86 87 21
eMail cyl.hyd@boschrexroth.se
Internet www.boschrexroth.se