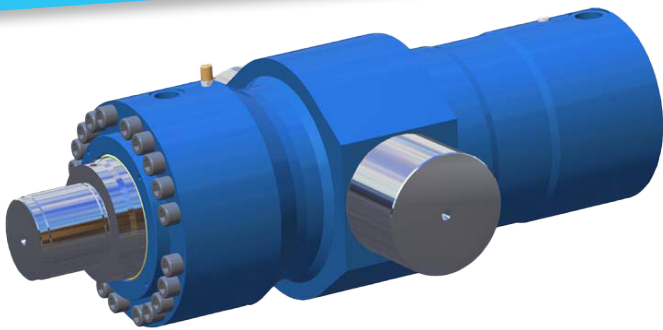


Large hydraulic cylinder for general applications

Series IndyRex 250



- ▶ Component series 1X
- ▶ Nominal pressure 250 bar [25 MPa]

FEATURES

- ▶ Standards: ISO 3320
- ▶ 4 Mounting styles
- ▶ Piston \varnothing (\varnothing AL): 280 ... 560 mm
- ▶ Piston rod \varnothing (\varnothing MM): 180 ... 400 mm
- ▶ Stroke lengths up to 12 m

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TECHNICAL DATA

(For applications outside these parameters, please consult us!)

General		
Weight	kg	See page 26
Installation position		Any
Ambient temperature range	°C	-20 ... +60
Shot blast and Epoxy primer coated	µm	min. 50

Hydraulic		
Nominal pressure	bar [MPa]	250 [25]
Minimum operating pressure (without load)	bar [MPa]	1 [0.1]
Static test pressure	bar [MPa]	375 [37.5]
Allowable hydraulic fluid		See page 7
Hydraulic fluid temperature range	°C	See page 7
Viscosity range	mm ² /s	See page 7
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406		See page 7
Cylinder speed (depending on line connection)	m/s	See table on page 5
Bleeding		By default via Minimes
Drain		By default via G ¼" VSTI plug

Rod Coating

The coating of the piston rod is of eminent importance for the functioning of the cylinder. Bosch Rexroth has developed an array of rod coatings for different environmental conditions. The ones most suitable for industrial applications are available for this cylinder series.

The choice of the rod coating is mainly depending on the chemical activity of the environment and the presence of abrasive particles, please contact us for an advice for the appropriate rod coating.

Comparative tables are shown at page 3 to make the main differences clear. For some items in these tables standardised testing methods exist and are used for items no test existed and Rexroth had to develop their own standard test method. The comparison is always based on exactly the same tests.

TECHNICAL DATA

Hard chromium 30 µm

Properties Hard chromium	Test method	Standard	Criteria/value for thickness 30 µm	Test Report number
Corrosion resistance	Saline droplet corrosion test	DNV-C1 ISO 4536	No corrosion after 700 hours	SDCT284
Wear resistance	Scratch & wear	Bosch Internal standard	Step 2 or better out of 7 steps	S&W test series 2
Toughness	3-Point bending test	Bosch Internal standard	No cracks at rod stress level ≤ 400 [MPa]	Dynamic 3-Point bending test 284
	Impact resistance test at +20°C	Bosch Internal standard	≤ 14 Joules	Val test 284

Enduroq 2x00

Properties Enduroq 2x00	Test method	Standard	Criteria/value 2000	Criteria/value 2200	Test Report number
Corrosion resistance	Saline droplet corrosion test	DNV-C1 ISO 4536	No corrosion after 26688 hours	No corrosion after 67377 hours	SDCT198 / SDCT 184
Wear resistance	Scratch & wear	Bosch Internal standard	Step 7 out of 7 steps		S&W test series 1
Toughness	3-Point bending test	Bosch Internal standard	No cracks at rod stress level		
		Internal Standard	Plain	400 MPa	Dynamic bending test 184
			CIMS	400 MPa	Dynamic bending test (div)
	Impact resistance test at +20°C	Bosch Internal standard	≥ 8 Joules		Val test 184

TECHNICAL DATA

(For applications outside these parameters, please consult us!)

 **Boundaries on application conditions:**

- ▶ The correct mechanical alignment of the movement axis and the mounting points of hydraulic cylinder and piston rod must be ensured. Lateral forces on the guides of piston rod and piston are to be avoided. The dead weight of the hydraulic cylinder (MP3/MP5 or MT4) and the piston rod are taken into account in the buckling tables (see pages 20 ... 23).
- ▶ The buckling length/buckling load of the piston rod and the hydraulic cylinder must be observed (see pages 20 ... 23).
- ▶ The maximum admissible cylinder velocities must be observed. See the table on page 5.
- ▶ The compatibility of the seals with the properties of the hydraulic fluid must be observed.
- ▶ The maximum admissible velocities when moving into the end positions, also considering external loads, must be observed.
- ▶ The maximum admissible operating pressure must be complied with in any operating state of the hydraulic cylinder.
- ▶ Possible pressure intensification resulting from the area ratio of annulus area to piston area and possible throttling points in the system are to be observed.
- ▶ Detrimental environmental influences, like e.g. abrasive particles, vapours, high temperatures, welding etc. as well as contaminations and deterioration of the hydraulic fluid are to be avoided.
- ▶ Minimum stroke:
When using a trunnion mounting a stroke length shorter than indicated is not possible.
- ▶ Number of load cycles:
When the cylinder is intended to be used under shock loads or high cycle dynamic loads Bosch Rexroth should be consulted for its suitability for those circumstances.

Standards:

The bore and rod dimensions comply with the standard ISO 3320.

Acceptance:

Each cylinder is tested according to Bosch Rexroth standard, in line with ISO 10100: 2001.

Safety instructions:

For the assembly, commissioning and maintenance of hydraulic cylinders, the operating instructions 07100-B have to be observed.

Service and repair work has to be performed by Bosch Rexroth BV or by personnel especially trained for this purpose. No warranty is accepted for damage as a consequence of assembly, maintenance or repair work not performed by Bosch Rexroth BV.

Check lists for hydraulic cylinders:

When the application parameters of the cylinder deviate from the values specified in the data sheet, the cylinders can only be offered as a special version upon request.

For offers, the characteristics and application parameters must be described in the check lists for hydraulic cylinders (07200).

This list does not claim to be complete. In case of questions regarding the compatibility with media or use of the cylinder beyond the limits or application conditions described, please contact us.

All graphical representations in the data sheet are examples. The product supplied may therefore differ from the figure.

TECHNICAL DATA

(For applications outside these parameters, please consult us!)

Cylinder velocities

Bore [mm]	Rod [mm]	Oil connection	Oil connection	Oil connection Ø	Oil connection Ø	Max. cylinder speed [mm/s]
		Rod [inch]	Bottom [inch]	Rod [mm]	Bottom [mm]	
280	180	G 1 1/4	G 1 1/2	25	32	130
	200	G 1 1/4	G 1 1/2	25	32	130
320	200	G 1 1/4	G 1 1/2	25	32	100
	220	G 1 1/4	G 1 1/2	25	32	100
SAE code 62/ ISO6162-2 42 MPa						
360	220	SAE 1 1/4	SAE 1 1/2	32	40	120
	250	SAE 1 1/4	SAE 1 1/2	32	40	120
400	250	SAE 1 1/4	SAE 1 1/2	32	40	100
	280	SAE 1 1/4	SAE 1 1/2	32	40	100
450	280	SAE 1 1/2	SAE 2	40	50	120
	320	SAE 1 1/2	SAE 2	40	50	120
500	320	SAE 1 1/2	SAE 2	40	50	100
	360	SAE 1 1/2	SAE 2	40	50	100
560	360	SAE 2	SAE 2 1/2	50	63	120
	400	SAE 2	SAE 2 1/2	50	63	120

- By default, hydraulic cylinders are shot blast and primed with an epoxy coating (colour gentian blue RAL 5010). Other colors upon request.
The following surfaces are not primed or painted:
 - ▶ Sealing surfaces for line connection
 - ▶ Sealing surfaces for flange connection
 The areas that are not painted are protected by means of a solvent-free corrosion protection agent.
- When exposed to extreme conditions like e.g. high cyclic loads, the cylinder must be designed for fatigue. Please contact us to discuss your requests .
- Depending on the application, a certain minimum pressure is required in order to guarantee good functioning of the cylinder.
- The cleanliness classes specified below must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of filters, see www.boschrexroth.com/filter.
- The max. cylinder velocities shown above are based on 10 m/sec oil speed in the oil ports. A flow velocity of 5 m/s in the oil ports is recommended.
- If the extension velocity is considerably higher than the retraction velocity of the piston rod, drag-out losses of the medium may result. If necessary, please consult us.
- All rod sealing systems are equipped with a 1/4" BSP leak oil connection port. This port must kept pressureless: lead the port to a tank. The port can also be used as a seal condition monitoring port.
- For further information on hydraulic fluids refer to data sheet RE 90220, RE 90221, RE 90222, RE 90223.
- The SAE ports indicated are ISO 6162-2 tab. 2 type 1 (42 MPa) (≅ SAE 6000 PSI).
- The maximum speed at which a cylinder is allowed to reach the end positions is limited to 20 mm/sec.

DIMENSIONS: BLEEDING/MEASURING COUPLING

(dimensions in mm)

By default, a measuring coupling with check valve for pressure measurement or contamination-free bleeding is supplied on each side of the cylinder.

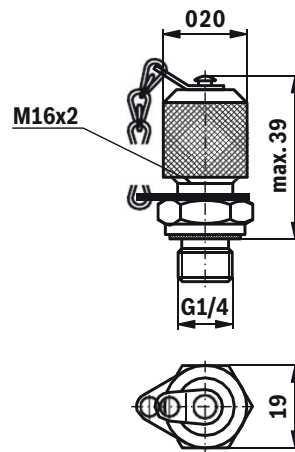
The measuring coupling is equipped with a check valve function, i.e. it can also be connected when the system is pressurized.

Scope of delivery: Measuring coupling G1/4"

MEASURING COUPLING MCS20-SDS-E-G1/4

with seal ring made of NBR

Material No. R900009090



Lifting points

- ☞ Heads and bottoms can be equipped with flat spots with tapped holes for lifting purposes. Per cylinder 2 lift points on the head and 2 on the bottom will be present by default.

HYDRAULIC FLUIDS

The hydraulic fluid is the common element in any hydraulic system and must be selected very carefully. Quality, cleanliness of the hydraulic fluid and chemical compatibility to sealing and bearing materials are decisive factors for the operational reliability, efficiency and service life of a system.

All fluids that comply with HL(P), HFA, HFB and HEES are allowed.

Rexroth can only support the next brands of HFC: Houghton NL1, Houghton RAM 2000, Houghton 273 CTF.

Temperature:

Observe the corresponding medium temperature range. Generally, a medium temperature of approx. 40 °C is recommended. Lower temperature limit -20 °C.

The fluids HFA, HFB and HFC, that contain water, are not allowed to work with a medium temperature above 40 °C. The temperature is limited by the polyurethane that is present in some of the seal components.

Hydraulic fluid viscosity:

The lubricating properties are mainly governed by the viscosity. Minimum viscosity: at 40 °C = 22 mm²/s,

For HEES hydraulic fluids a minimum viscosity at 40 °C = 15 mm²/s is allowed.

Viscosity range 15/22 – 380 cSt.

Hydraulic fluid cleanliness class acc. to ISO:

Hydraulic fluids used in hydraulic cylinders need to have a cleanliness of NAS 7 or ISO 18-16-13 or better.

Hydraulic fluid mixture:

If the fluid contains more than 2 % of another fluid, it is considered to be a mixture. Exceptions apply for water; see RE 90220-01 chapter 4.10 "Water". Mixing with other hydraulic fluids is generally not permitted when the level of 2 % is exceeded. Rexroth will not accept liability for any damage to its components resulting from mixing hydraulic fluids.

The specified values are to be regarded as guidelines; depending on the case of application, it may be necessary to check the suitability of the seal system.

For applications outside these parameters, please consult us.

POSITION MEASUREMENT SYSTEM CIMSmart

All IndyRex 250 cylinders can be equipped with an optional CIMSmart position sensor.

This is an incremental sensor. CIMSmart, when applied works together with Enduroq 2x00. The sensor is located in a pressure free area of the hydraulic cylinder. It requires an additional length compared to the standard length without sensor. The sensor housing is built in a robust way in full stainless steel. The sensor provides, next to the position of the cylinder, data on operating temperatures, stroke distribution and total travelled distance, as well as multiple types of historic data about the usage of the cylinder. Application of CIMSmart increases predictive maintenance opportunities.

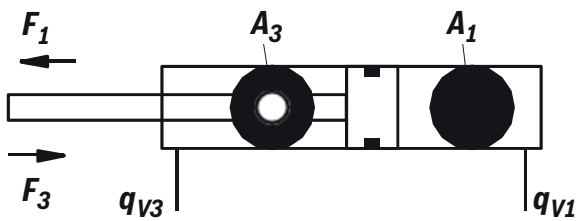
Key technical data for CIMSmart only:

- ▶ High precision: non-linearity < ± 1 mm
- ▶ RS-422 output signal (1,024 pulses/cm)
- ▶ Wide temperature range from -40 ... +70 °C
- ▶ High pressure resistance in (sea)water (IP68, 10 bar)
- ▶ Cable connection via a 9-pin, IP67 industrial connector
- ▶ A connector with cable for submerged conditions is possible
- ▶ Data transfer only via Helukabel Super-Paar-Tronic 340-C-PUR, 4x2x0.25, $\varnothing 7.6$ mm Material No. R987398724
- ▶ Separate data converter RS-422 to analogue available as option
- ▶ Instruction manual with each delivery

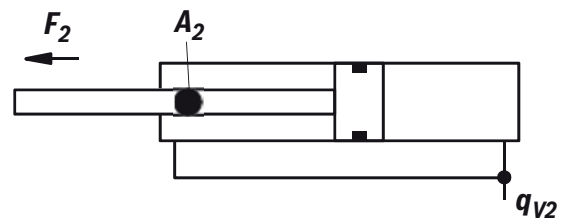


DIAMETERS, AREAS, FORCES, FLOW

Bore [mm]	Rod [mm]	Ratio	Piston	Rod	Annulus	Pushing	Diff.	Pulling	Flow A1 at 0.1 m/s	Flow A2 at 0.1 m/s	Flow A3 at 0.1 m/s
		ϕ [A1/A3]	A1 [mm ²]	A2 [mm ²]	A3 [mm ²]	F1 [kN]	F2 [kN]	F3 [kN]	Qv1 [L/min]	Qv2 [L/min]	Qv3 [L/min]
280	180	1.70	61575	25447	36128	1539	636	903	369.5	152.7	216.8
	200	2.04	61575	31416	30159	1539	785	754	369.5	188.5	181.0
320	200	1.64	80425	31416	49009	2011	785	1225	482.5	188.5	294.1
	220	1.90	80425	38013	42412	2011	950	1060	482.5	228.1	254.5
360	220	1.60	101788	38013	63774	2545	950	1594	610.7	228.1	382.6
	250	1.93	101788	49087	52700	2545	1227	1318	610.7	294.5	316.2
400	250	1.64	125664	49087	76576	3142	1227	1914	754.0	294.5	459.5
	280	1.96	125664	61575	64088	3142	1539	1602	754.0	369.5	384.5
450	280	1.63	159043	61575	97468	3976	1539	2437	954.3	369.5	584.8
	320	2.02	159043	80425	78618	3976	2011	1965	954.3	482.5	471.7
500	320	1.69	196350	80425	115925	4909	2011	2898	1178.1	482.5	695.5
	360	2.08	196350	101788	94562	4909	2545	2364	1178.1	610.7	567.4
560	360	1.70	246301	101788	144513	6158	2545	3613	1477.8	610.7	867.1
	400	2.04	246301	125664	120637	6158	3142	3016	1477.8	754.0	723.8



Theoretical static cylinder forces (without consideration of the efficiency and dead weight of piston rod, clevises etc.). Forces at 250 bar [25MPa]



Flow in litre per minute for the given cylinder velocity

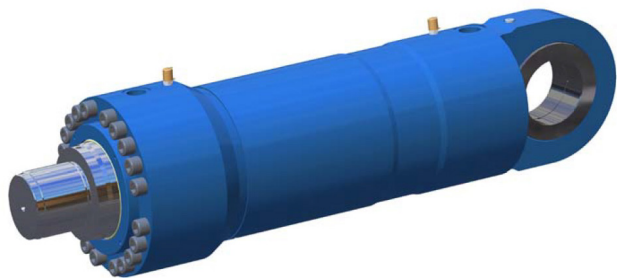
TOLERANCES ACCORDING TO ISO 6020-1

Installation dimensions	WC	XC ¹⁾	XO ¹⁾	XV ¹⁾	Stroke tolerances
Type of mounting	ME7	MP3	MP5	MT4	
Stroke length	Tolerances				
≤ 1250	±2	±1.5	±1.5	±2	+2
> 1250 ... ≤ 3150	±4	±3	±3	±4	+5
> 3150 ... ≤ 12000	±8	±5	±5	±8	+8

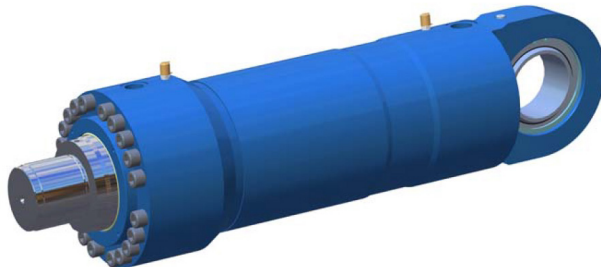
¹⁾ Including stroke length

OVERVIEW TYPES OF MOUNTING: SERIES IndyRex 250

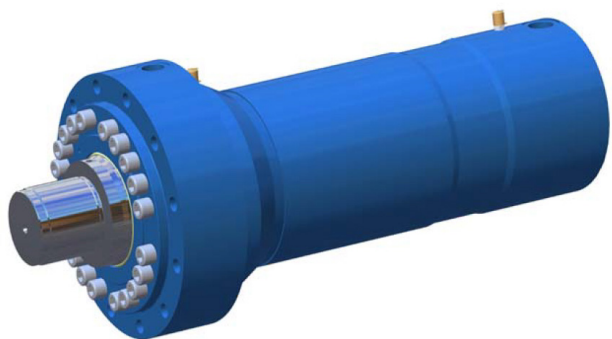
Series IndyRex 250:
MP3: cylindrical clevis
see page 13



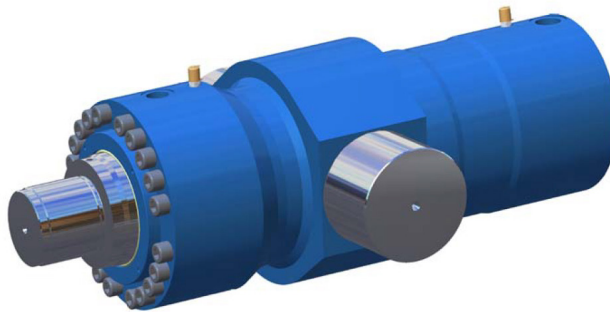
Series IndyRex 250:
MP5: spherical clevis
see page 14



Series IndyRex 250:
ME7: Flange mounting
see page 15



Series IndyRex 250:
MT4: Trunnion
see page 16



ORDERING CODE: SERIES IndyRex 250

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
IR	250	/	/	/	/	/									

01	Double acting cylinder	IR
----	------------------------	-----------

02	Series (250 bar)	250
----	------------------	------------

Types of mounting

03	Swivel eye at base	MP3
	Self-aligning clevis at base	MP5
	Round flange at head	ME7
	Trunnion	MT4 ¹⁾

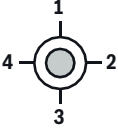
Cylinder dimensions

04	Piston Ø (ØAL) 280 ... 560 mm (in ISO 3320 steps)	...
05	Piston rod Ø (ØMM) 180 ... 400 mm	...
06	Stroke length in mm	... ²⁾
07	Component series 10	1X

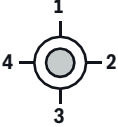
Oil port connection/version

08	According to ISO 1179-1 (pipe thread ISO 228-1)	B ³⁾
	Flange connection according to ISO 6162-2 tab. 2 type 1 (≠ SAE 6000PSI)	D ⁴⁾

Oil port connection/position at head

09	View on piston rod		1
			2
			3
			4

Oil port connection/position at base

10	View on piston rod		1
			2
			3
			4

Piston rod coating

11	Hard chromium-plated	C
	Enduroq 2000	Q
	Enduroq 2200	R

Piston rod end

12	Thread for clevis	G
	With assembled clevis with spherical bearing	L
	With assembled clevis with cylindrical bearing	N

ORDERING CODE: SERIES IndyRex 250

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
IR	250		/		/		/		/						

End position cushioning

13	Without end position cushioning	U
----	---------------------------------	----------

Seal design

14	For mineral oil HLP, oil-in-water emulsion HFA, HFB and water glycol HFC	Low friction	T
----	--	--------------	----------

Option

15	CIMS	C
	Without CIMS	W

Option

16	Additional options, fill fields for additional options	Z
	Without additional options, do not fill fields for additional options	W

Additional options

Fields for additional options

17	18	19
W		

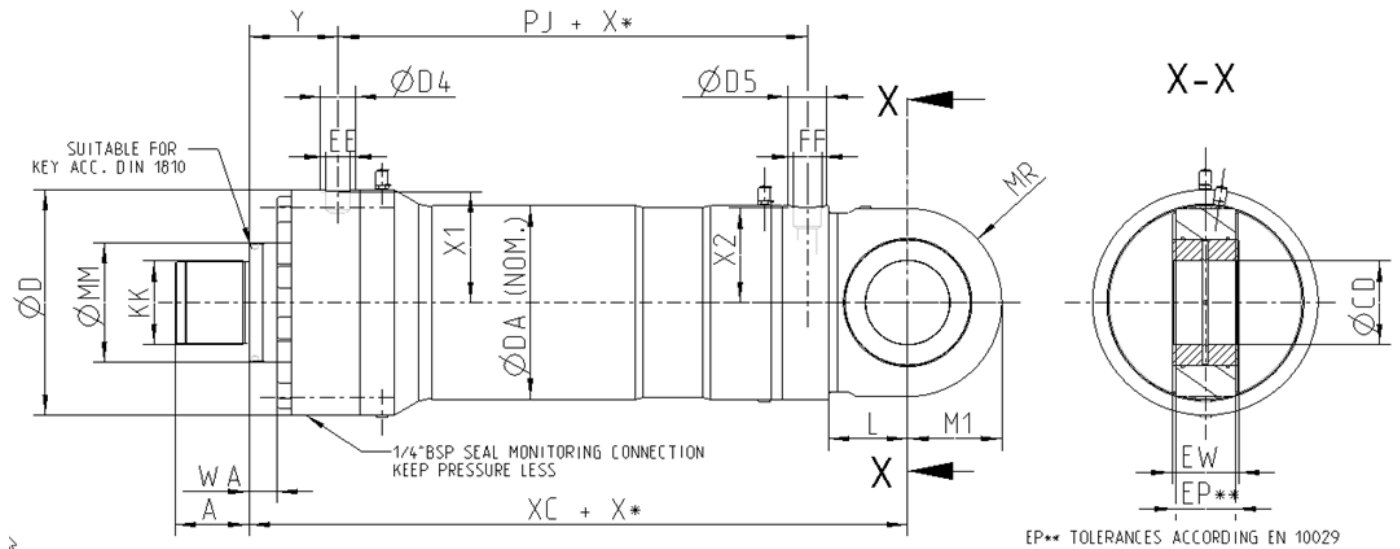
17	Shot blast and primer painted	W
	Three layer Epoxy paint system RAL 5010	P
18	Specify the piston rod extension LY in the plain text in mm	Y
	Without piston rod extension	W
19	With lifting Lug holes	L

Order example:**Without additional options:****IR 250** MT4 /360/220/350 1X/B11 QGUT WW, XV=300 mm

- 1) Trunnion position freely selectable within tube length (with limitations as indicated).
When ordering, always specify the "XV" dimensions in plain text in mm.
- 2) Observe the max. stroke length available and the admissible stroke length (according to buckling calculation) on pages 20, 21, 22.
- 3) Only piston Ø 280 up to 360 mm.
- 4) Only piston Ø 360 to 560 mm.

DIMENSIONS: SWIVEL EYE AT BASE IndyRex 250: MP3

(dimensions in mm)



ØAL [mm]	ØMM [mm]	KK [mm]	A [mm]	ØD [mm]	ØDA [mm]	ØD4 [mm]	ØD5 [mm]	EE	FF	Y ¹ [mm]	PJ [mm]	X1 [mm]	X2 [mm]
280	180/200	M140x3	123	376	323.9	58	65	G 1 1/4	G 1 1/2	139	287	185	158
320	200/220	M160x3	143	416	368	58	65	G 1 1/4	G 1 1/2	140	297	205	181
360	220/250	M180x3	155	504	419	See page 18		SAE 1 1/4	SAE 1 1/2	115	365	247	201
400	250	M200x3	165	544	470	See page 18		SAE 1 1/4	SAE 1 1/2	125	366	267	227
	280									169			
450	280/320	M220x4	187	618	521	See page 18		SAE 1 1/2	SAE 2	146	413	303	251
500	320/360	M260x4	217	622	622	See page 18		SAE 1 1/2	SAE 2	176	429	303	303
560	360/400	M300x4	245	752	660	See page 18		SAE 2	SAE 2 1/2	164	475	369	318

ØAL [mm]	ØMM [mm]	WA ¹ [mm]	XC ¹ [mm]	L [mm]	MR [mm]	M1 [mm]	ØCD [mm]	EP [mm]	EW [mm]
280	180/200	36	593	132	157	157	140	100	140
320	200/220	36	629	157	180	180	160	110	160
360	220/250	36	709	180	210	210	180	120	180
400	250	36	734	194	229	229	200	140	200
	280	43	778						
450	280/320	43	838	220	260	260	220	150	220
500	320/360	43	1038	374	282	282	260	160	260
560	360/400	43	1130	415	328	328	300	180	300

ØAL = Piston Ø

ØMM = Piston rod Ø

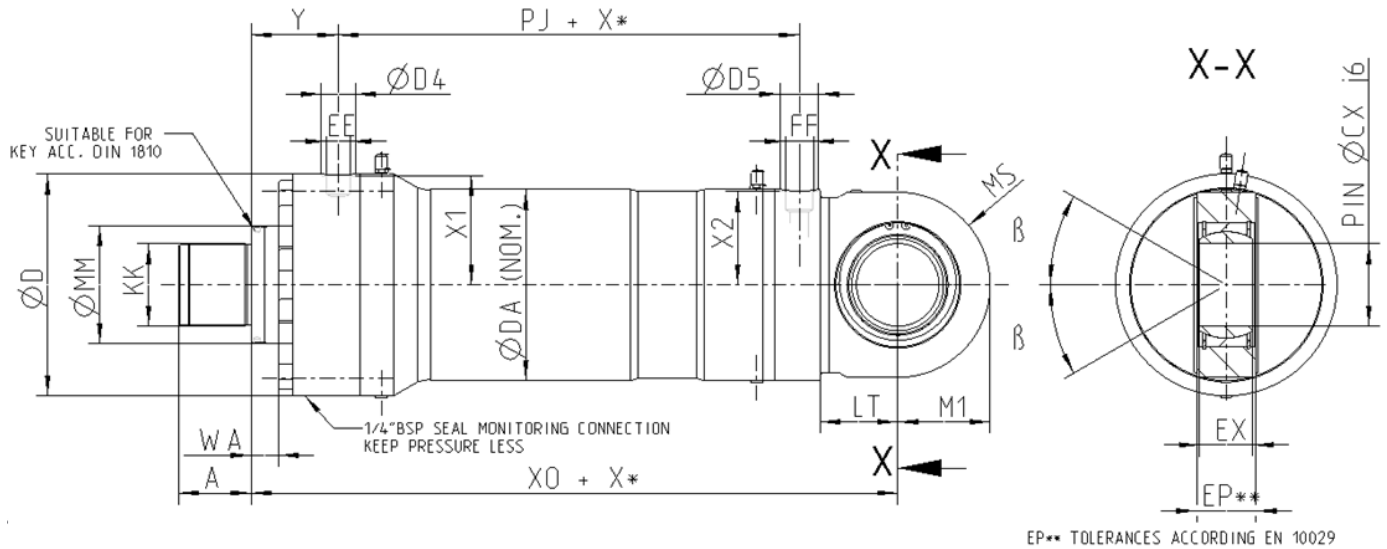
X* = Stroke length

¹ = Length is to be corrected with additional length L from table on page 17 when CIMSmart is chosen

The specified dimensions for M1 and MR are nominal values, tolerance classes 342 according to ISO 9013 Thermal cutting.

DIMENSIONS: SELF-ALIGNING CLEVIS AT BASE IndyRex 250: MP5

(dimensions in mm)



EP** TOLERANCES ACCORDING EN 10029

ØAL [mm]	ØMM [mm]	KK [mm]	A [mm]	ØD [mm]	ØDA [mm]	ØD4 [mm]	ØD5 [mm]	EE	FF	Y ¹ [mm]	PJ [mm]	X1 [mm]	X2 [mm]
280	180/200	M140x3	123	376	323.9	58	65	G 1 1/4	G 1 1/2	139	287	185	158
320	200/220	M160x3	143	416	368	58	65	G 1 1/4	G 1 1/2	140	297	205	181
360	220/250	M180x3	155	504	419	See page 18		SAE 1 1/4	SAE 1 1/2	115	365	247	201
400	250	M200x3	165	544	470	See page 18		SAE 1 1/4	SAE 1 1/2	125	366	267	227
	280									169			
450	280/320	M220x4	187	618	521	See page 18		SAE 1 1/2	SAE 2	146	413	303	251
500	320/360	M260x4	217	622	622	See page 18		SAE 1 1/2	SAE 2	176	429	303	303
560	360/400	M300x4	245	752	660	See page 18		SAE 2	SAE 2 1/2	164	475	369	318

ØAL [mm]	ØMM [mm]	WA ¹ [mm]	X0 ¹ [mm]	LT [mm]	MS [mm]	M1 [mm]	ØCX [mm]	EP [mm]	EX [mm]	β [°]
280	180/200	36	593	132	157	157	140	100	90	7
320	200/220	36	629	157	180	180	160	110	105	8
360	220/250	36	709	180	210	210	180	120	105	6
400	250	36	734	194	229	229	200	140	130	7
	280	43	778							
450	280/320	43	838	220	260	260	220	150	135	8
500	320/360	43	1038	374	282	282	260	160	150	7
560	360/400	43	1130	415	328	328	300	180	165	7

ØAL = Piston Ø

ØMM = Piston rod Ø

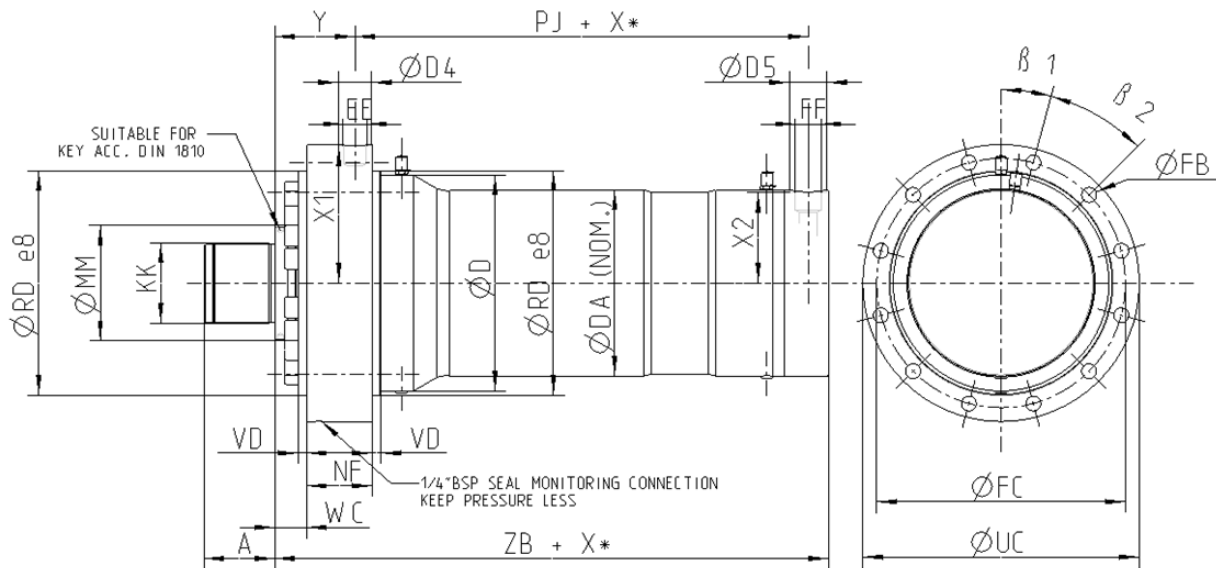
X* = Stroke length

¹ = Length is to be corrected with additional length L from table on page 17 when CIMSmart is chosen

The specified dimensions for M1 and MS are nominal values, tolerance classes 342 according to ISO 9013 Thermal cutting.

DIMENSIONS: ROUND FLANGE AT HEAD IndyRex 250: ME7

(dimensions in mm)



ØAL [mm]	ØMM [mm]	KK [mm]	A [mm]	ØD [mm]	ØDA [mm]	ØD4 [mm]	ØD5 [mm]	EE	FF	Y ¹ [mm]	X1 [mm]	X2 [mm]
280	180/200	M140x3	123	376	323.9	58	65	G 1 1/4	G 1 1/2	139	253	158
320	200/220	M160x3	143	416	368	58	65	G 1 1/4	G 1 1/2	140	270	181
360	220/250	M180x3	155	504	419	See page 18		SAE 1 1/4	SAE 1 1/2	115	341	201
400	250	M200x3	165	544	470	See page 18		SAE 1 1/4	SAE 1 1/2	125	359	227
	280									169		
450	280/320	M220x4	187	618	521	See page 18		SAE 1 1/2	SAE 2	146	395	251
500	320/360	M260x4	217	622	622	See page 18		SAE 1 1/2	SAE 2	176	398	303
560	360/400	M300x4	245	752	660	See page 18		SAE 2	SAE 2 1/2	164	475	318

ØAL [mm]	ØMM [mm]	ØRD [mm]	WC ¹ [mm]	VD [mm]	NF [mm]	PJ [mm]	ZB ¹ [mm]	ØFB [mm]	ØFC [mm]	ØUC [mm]	β 1 [°]	β 2 [°]
280	180/200	390	56	15	114	287	461	33	450	510	11.25	22.5
320	200/220	425	56	15	114	297	472	33	485	545	10	20
360	220/250	520	64	15	116	365	529	45	605	690	15	30
400	250	555	59	20	106	366	540	45	640	725	18	18
	280		63		146		584					
450	280/320	630	77	20	117	413	618	45	715	800	15	15
500	320/360	635	69	20	155	429	664	45	720	805	12.857	12.857
560	360/400	765	74	20	148	475	715	52	860	960	12.857	12.857

ØAL = Piston Ø

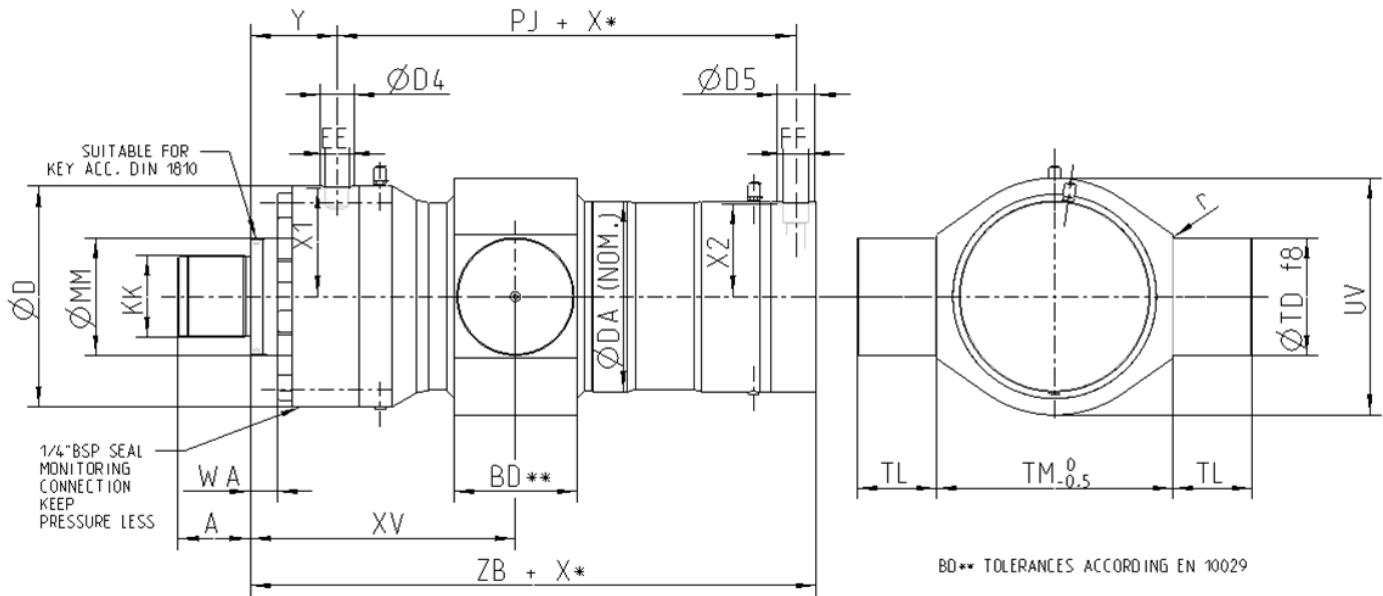
ØMM = Piston rod Ø

X* = Stroke length

¹ = Length is to be corrected with additional length L from table on page 17 when CIMSmart is chosen

DIMENSIONS: TRUNNION IndyRex 250: MT4

(dimensions in mm)



$\varnothing AL$ [mm]	$\varnothing MM$ [mm]	KK [mm]	A [mm]	$\varnothing D$ [mm]	$\varnothing DA$ [mm]	$\varnothing D4$ [mm]	$\varnothing D5$ [mm]	EE	FF	Y^1 [mm]	PJ [mm]	$X1$ [mm]	$X2$ [mm]	WA^1 [mm]
280	180/200	M140x3	123	376	323,9	58	65	G 1 1/4	G 1 1/2	139	287	185	158	36
320	200/220	M160x3	143	416	368	58	65	G 1 1/4	G 1 1/2	140	297	205	181	36
360	220/250	M180x3	155	504	419	See page 18		SAE 1 1/4	SAE 1 1/2	115	365	247	201	36
400	250	M200x3	165	544	470	See page 18		SAE 1 1/4	SAE 1 1/2	125	366	267	227	36
	280									169				43
450	280/320	M220x4	187	618	521	See page 18		SAE 1 1/2	SAE 2	146	413	303	251	43
500	320/360	M260x4	217	622	622	See page 18		SAE 1 1/2	SAE 2	176	429	304	303	43
560	360/400	M300x4	245	752	660	See page 18		SAE 2	SAE 2 1/2	164	475	369	318	43

$\varnothing AL$ [mm]	$\varnothing MM$ [mm]	ZB^1 [mm]	$X^*_{min.}$ [mm]	$XV_{min.}^1$ [mm]	BD [mm]	UV [mm]	$\varnothing TD$ [mm]	TL [mm]	TM [mm]	r [mm]
280	180/200	461	200	420	200	405	180	110	405	4
320	200/220	472	200	420	210	455	200	135	455	4
360	220/250	529	255	495	230	510	220	140	510	4
400	250	540	275	510	250	580	240	145	580	4
	280	584		554						
450	280/320	618	305	575	280	655	260	155	655	4
500	320/360	664	170	470	300	755	280	160	755	4
560	360/400	715	345	648	320	810	300	170	810	4

$\varnothing AL$ = Piston \varnothing

$\varnothing MM$ = Piston rod \varnothing

¹ = Length is to be corrected with additional length L from table on page 17 when CIMSmart is chosen

X^* = Stroke length

$X^*_{min.}$ = Min. stroke length

The specified dimension for UV is a nominal value, tolerance classes 342 according to ISO 9013 Thermal cutting.

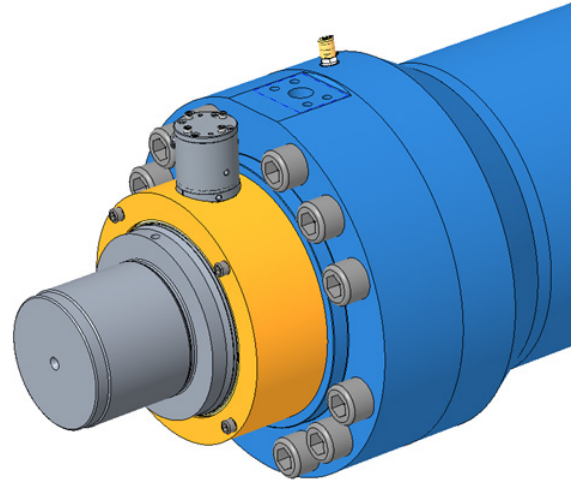
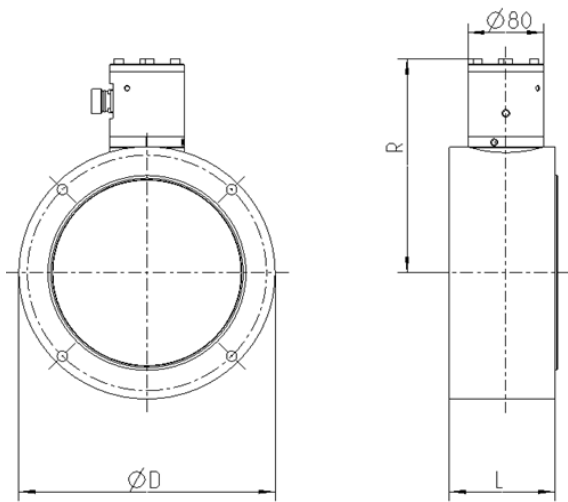
When ordering, always specify the "XV" dimension in the plain text. Preferred XV dimension: Observe trunnion position in cylinder center $XV_{min.}$ and $XV_{max.}$

Important installation information!

During installation, it must be ensured that the trunnion bearings are installed up to the trunnion shoulders. Any non-compliance may reduce the product's service life.

DIMENSIONS: IndyRex 250 WITH CIMSmart: ADDITIONAL LENGTH

(dimensions in mm)



ØAL [mm]	ØMM [mm]	ØD [mm]	L [mm]	R [mm]
280	180	252	112	221
	200	272	112	231
320	200	272	112	231
	220	302	112	241
360	220	302	112	241
	250	332	112	256
400	250	332	112	256
	280	362	122	271
450	280	362	122	271
	320	402	122	291
500	320	402	122	291
	360	442	122	311
560	360	442	122	311
	400	482	122	331

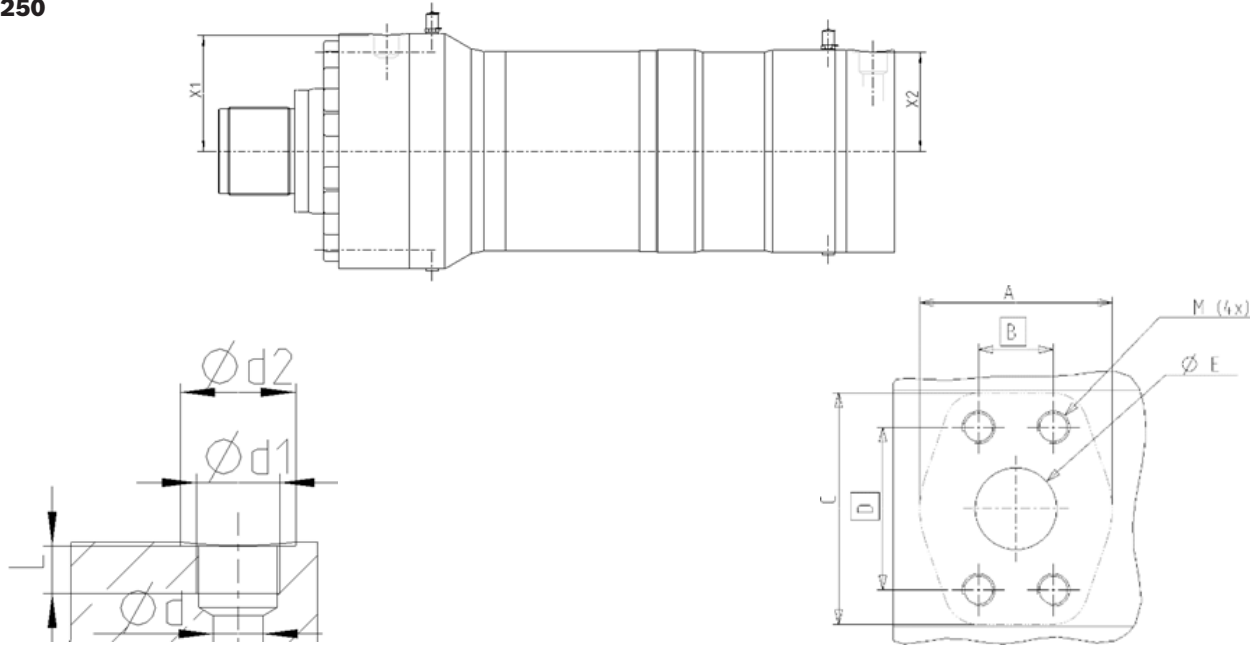
ØAL = Piston Ø

ØMM = Piston rod Ø

L = additional length when CIMSmart is chosen

DIMENSIONS: FLANGE PORTS

(dimensions in mm)

IndyRex 250**Thread connections**

Bore	Rod	Oil port Rod [inch]	d [mm]	d1 [mm]	d2 [mm]	L [mm]	X1 [mm]	Oil port Bottom [inch]	d [mm]	d1 [mm]	d2 [mm]	L [mm]	X2 [mm]
280	180	G 1 1/4	25	G 1 1/4	58	24	185	G 1 1/2	32	G 1 1/2	65	24	158
	200	G 1 1/4	25	G 1 1/4	58	24	185	G 1 1/2	32	G 1 1/2	65	24	158
320	200	G 1 1/4	25	G 1 1/4	58	24	205	G 1 1/2	32	G 1 1/2	65	24	181
	220	G 1 1/4	25	G 1 1/4	58	24	205	G 1 1/2	32	G 1 1/2	65	24	181

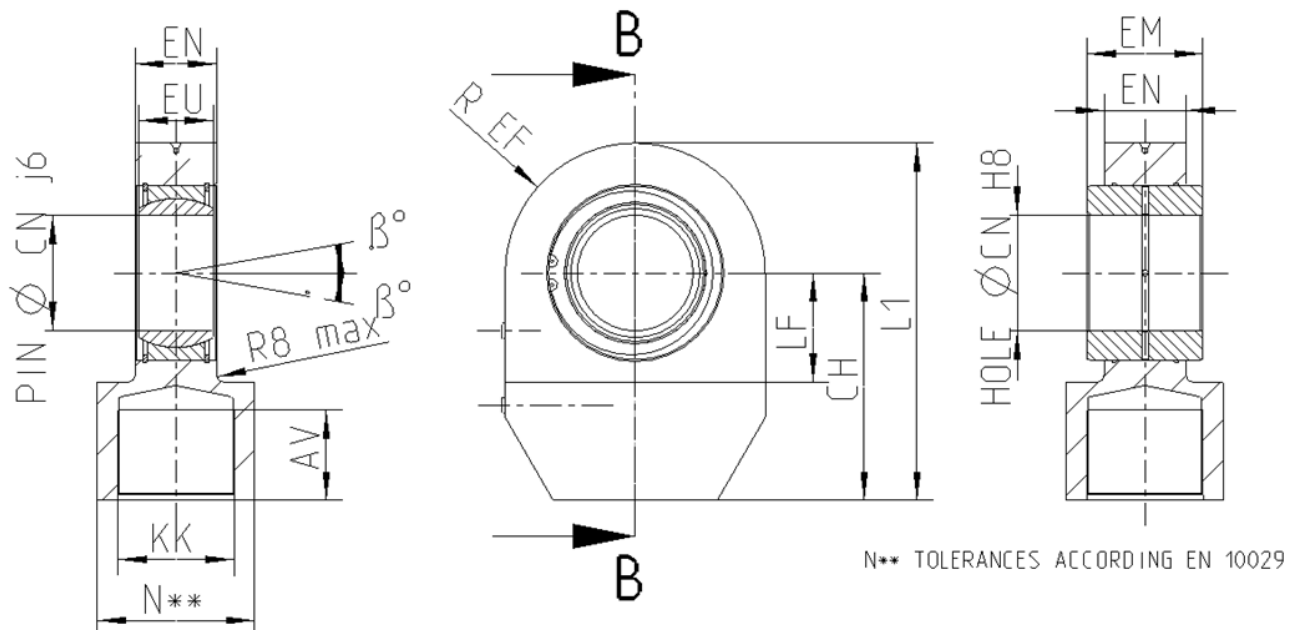
SAE code 62/ ISO6162-2 42 MPa flange connections

Bore	Rod	Oil port Rod [inch]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	M [mm]	X1 [mm]	Oil port Bottom [inch]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	M [mm]	X2 [mm]
360	220	SAE 1 1/4	78	31.8	95	66.7	32	M14	247	SAE 1 1/2	94	36.6	113	79.4	40	M16	201
	250	SAE 1 1/4	78	31.8	95	66.7	32	M14	247	SAE 1 1/2	94	36.6	113	79.4	40	M16	201
400	250	SAE 1 1/4	78	31.8	95	66.7	32	M14	267	SAE 1 1/2	94	36.6	113	79.4	40	M16	227
	280	SAE 1 1/4	78	31.8	95	66.7	32	M14	267	SAE 1 1/2	94	36.6	113	79.4	40	M16	227
450	280	SAE 1 1/2	94	36.6	113	79.4	40	M16	303	SAE 2	114	44.4	133	96.8	50	M20	251
	320	SAE 1 1/2	94	36.6	113	79.4	40	M16	303	SAE 2	114	44.4	133	96.8	50	M20	251
500	320	SAE 1 1/2	94	36.6	113	79.4	40	M16	304	SAE 2	114	44.4	133	96.8	50	M20	303
	360	SAE 1 1/2	94	36.6	113	79.4	40	M16	304	SAE 2	114	44.4	133	96.8	50	M20	303
560	360	SAE 2	114	44.4	133	96.8	50	M20	369	SAE 2 1/2	148	58.7	174	123.8	63	M24	318
	400	SAE 2	114	44.4	133	96.8	50	M20	369	SAE 2 1/2	148	58.7	174	123.8	63	M24	318

X1 in combination with front flange ME7 see page 15.

DIMENSIONS: CLEVIS ON PISTON ROD

(dimensions in mm)



Bore ØAL [mm]	Material No. SPH BEARING	KK [mm]	AV _{min.} [mm]	N [mm]	CH [mm]	R EF [mm]	pin ØCN j6 [mm]	EN [mm]	EM [mm]	LF _{min.} [mm]	β [°]	m [kg]	C _{stat} [kN]	F _{adm} [kN]
280	R905030707	M140x3	100	190	275	157	140	99	90	132	7	90	3780	1394.8
320	R905030708	M160x3	120	220	320	180	160	109	105	157	8	135	4800	1771.2
360	R905030709	M180x3	130	250	355	210	180	115	105	180	6	196	5400	1992.6
400	R905030710	M200x3	140	280	379	229	200	135	130	194	7	259	7500	2767.5
450	R905030711	M220x4	160	300	427	260	220	143	135	220	8	357	8240	3040.6
500	R905030712	M260x4	190	351	654	282	260	160	150	374	7	427	10720	3955.7
560	R905030713	M300x4	210	405	729	328	300	180	165	415	7	618	13500	4981.5

Bore ØAL [mm]	Material No. CYL BEARING	KK [mm]	AV _{min.} [mm]	N _{max.} [mm]	CH [mm]	R EF [mm]	L1 [mm]	pin ØCN j6 [mm]	EN [mm]	EM [mm]	LF _{min.} [mm]	m [kg]	C _{stat} [kN]	F _{adm} [kN]
280	R905030714	M140x3	100	190	275	157	432	140	99	140	132	90	3780	1394.8
320	R905030715	M160x3	120	220	320	180	500	160	109	160	157	135	4800	1771.2
360	R905030716	M180x3	130	250	355	210	565	180	115	180	180	196	5400	1992.6
400	R905030717	M200x3	140	280	379	229	608	200	135	200	194	259	7500	2767.5
450	R905030718	M220x4	160	300	427	260	687	220	143	220	220	357	8240	3040.6
500	R905030719	M260x4	190	351	654	282	936	260	160	260	374	427	10720	3955.7
560	R905030720	M300x4	210	405	729	328	1057	300	180	300	415	618	13500	4981.5

ØAL = Piston Ø

m = Weight swivel head in kg

C_{stat} = Static load rating of the swivelhead

F_{adm} = Max. admissible load of the swivel head with oscillatory or alternating loads

The specified dimensions for L1, R EF are nominal values, tolerance classes 342 according to ISO 9013 Thermal cutting from plate. For bores Ø500 and Ø560 dimension EN has a tolerance according EN 10029.

BUCKLING

In the tables at page 21, 22, 23 the admissible stroke length for the cylinders is given based on mounting style and position to the horizontal. The factor of safety for buckling is 2 at the longest allowable length or higher for shorter lengths. For the trunnion mounting, the trunnion is assumed to be at 1/3 of the stroke length distance from the bottom.

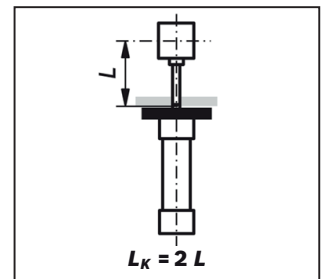
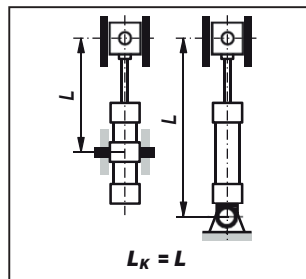
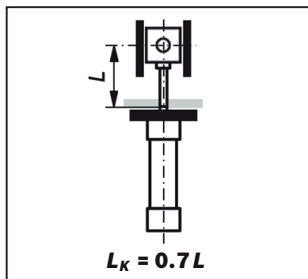
Besides the calculation of buckling also the loads in the bearings on the piston and in the head are taken into account as is the possibility for mechanical contact between the moving parts.

The combined stress in the rod and cylinder shell as a result of pressure, bending and compression load is checked. Also the deflection of the cylinder from the straight centre line is calculated.

This way of calculating is much more advanced than the traditional check for buckling only and the mentioned factor of safety has successfully been used in recent years.

The pictures below show the influence of the mounting style on the buckling length.

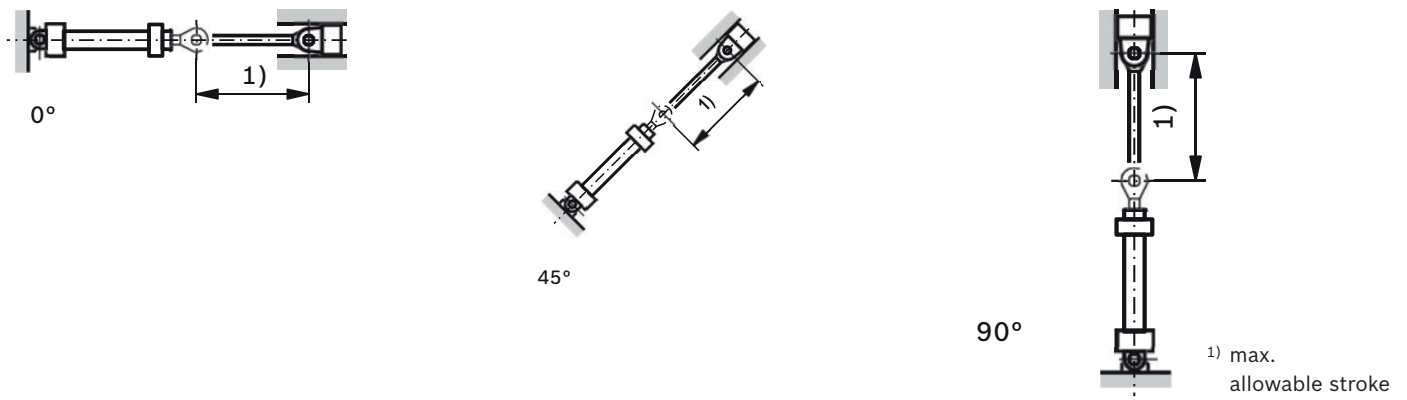
In case of heavy manifolds mounted on the cylinder, side loads, eccentric loads or when the cylinder is (partly) subjected to a medium like wind or water, that is flowing around it, please contact us.



ADMISSIBLE STROKE LENGTH (WITHOUT ROD EXTENSION)

(dimensions in mm)

Type of mounting Series IndyRex 250: MP3/L, MP5/L



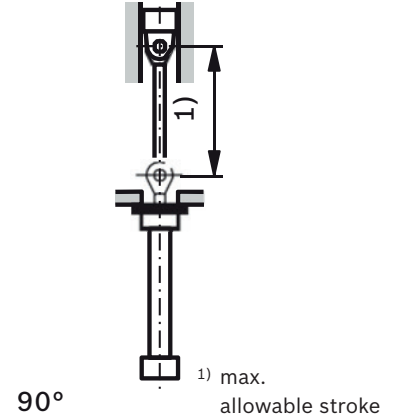
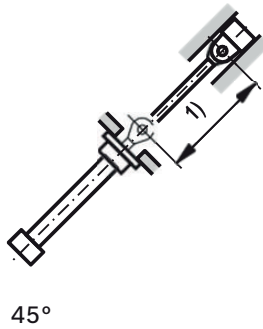
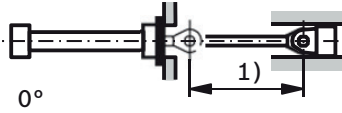
Bore	Rod	MP5/L 0 bar						MP5/L 100 bar						MP5/L 160 bar						MP5/L 250 bar					
		0°		45°		90°		0°		45°		90°		0°		45°		90°		0°		45°		90°	
		F_{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F_{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F_{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F_{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F_{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F_{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]
280	180	0	6700	8300	12000	615	4200	4600	4700	985	3300	3600	3600	1539	2400	2600	2700								
	200	0	6800	8400	12000	615	4700	5300	5800	985	3800	4200	4400	1539	2900	3100	3400								
320	200	0	7100	8800	12000	804	4500	5000	5100	1286	3500	3900	3900	2011	2500	2700	3000								
	220	0	7200	8900	12000	804	4900	5600	6200	1286	4000	4400	4700	2011	3000	3200	3700								
360	220	0	6500	8100	12000	1017	4300	4900	5600	1628	3400	3800	4300	2545	2400	2600	3300								
	250	0	6700	8300	12000	1017	4800	5600	7200	1628	4000	4600	5500	2545	3000	3300	4300								
400	250	0	7200	8900	12000	1256	4900	5700	6500	2010	4000	4500	5000	3142	2900	3200	3800								
	280	0	7400	9100	12000	1256	5500	6300	8200	2010	4600	5200	6300	3142	3500	3900	4900								
450	280	0	7000	8700	12000	1590	4800	5600	7300	2544	3800	4400	5600	3976	2600	2900	4100								
	320	0	7200	8900	12000	1590	5400	6300	9500	2544	4500	5200	7300	3976	3300	3700	5700								
500	320	0	6300	7800	12000	1963	4600	5400	8600	3141	3600	4200	6600	4909	2300	2700	4200								
	360	0	6500	7900	12000	1963	5000	5900	11000	3141	4100	4800	8500	4909	2900	3400	5900								
560	360	0	6800	8400	12000	2463	4800	5700	9700	3940	3700	4400	7400	6158	2100	2500	4400								
	400	0	6900	8600	12000	2463	5200	6200	12000	3940	4200	5000	9200	6158	2700	3200	5900								

Intermediate values can be interpolated.

ADMISSIBLE STROKE LENGTH (WITHOUT ROD EXTENSION)

(dimensions in mm)

Type of mounting Series IndyRex 250 ME7/L



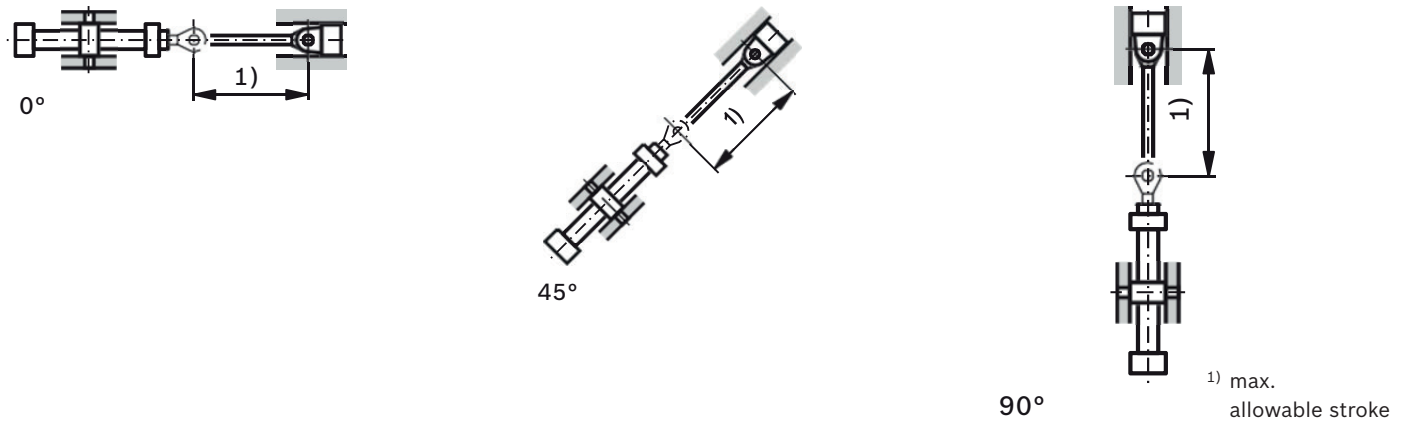
Bore	Rod	ME7/L 0 bar				ME7/L 100 bar				ME7/L 160 bar				ME7/L 250 bar			
			0°	45°	90°		0°	45°	90°		0°	45°	90°		0°	45°	90°
		F _{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F _{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F _{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F _{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]
280	180	0	12000	12000	12000	615	11800	11800	12000	985	9200	9200	9300	1539	7200	7300	7300
	200	0	12000	12000	12000	615	12000	12000	12000	985	11200	11500	11600	1539	9000	9100	9200
320	200	0	12000	12000	12000	804	12000	12000	12000	1286	9900	10000	10100	2011	7800	7900	7900
	220	0	12000	12000	12000	804	12000	12000	12000	1286	11200	12000	12000	2011	9500	9600	9700
360	220	0	12000	12000	12000	1017	12000	12000	12000	1628	10600	10700	10800	2545	8400	8500	8500
	250	0	12000	12000	12000	1017	12000	12000	12000	1628	11800	12000	12000	2545	10100	11000	11200
400	250	0	12000	12000	12000	1256	12000	12000	12000	2010	11500	12000	12000	3142	9600	10000	10100
	280	0	12000	12000	12000	1256	12000	12000	12000	2010	12000	12000	12000	3142	10800	11900	12000
450	280	0	12000	12000	12000	1590	12000	12000	12000	2544	12000	12000	12000	3976	10400	11100	11200
	320	0	12000	12000	12000	1590	12000	12000	12000	2544	12000	12000	12000	3976	11900	12000	12000
500	320	0	12000	12000	12000	1963	12000	12000	12000	3141	12000	12000	12000	4909	11500	12000	12000
	360	0	12000	12000	12000	1963	12000	12000	12000	3141	12000	12000	12000	4909	12000	12000	12000
560	360	0	12000	12000	12000	2463	12000	12000	12000	3940	12000	12000	12000	6158	10800	11900	12000
	400	0	12000	12000	12000	2463	12000	12000	12000	3940	12000	12000	12000	6158	11900	12000	12000

Intermediate values can be interpolated.

ADMISSIBLE STROKE LENGTH (WITHOUT ROD EXTENSION)

(dimensions in mm)

Type of mounting Series IndyRex 250: MT4/L



Bore	Rod	MT4/L 0 bar				MT4/L 100 bar				MT4/L 160 bar				MT4/L 250 bar					
		0°		45°		0°		45°		0°		45°		0°		45°		90°	
		F _{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F _{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F _{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	F _{max} Push [kN]	Stroke [mm]	Stroke [mm]	Stroke [mm]	Stroke [mm]	Stroke [mm]
280	180	0	9000	11100	12000	615	5200	5200	5300	985	4000	4000	4000	1539	2900	3100	3100		
	200	0	9000	11000	12000	615	5800	6400	6500	985	4700	5000	5000	1539	3500	3800	3900		
320	200	0	9500	11800	12000	804	5600	5600	5700	1286	4300	4300	4400	2011	3100	3300	3400		
	220	0	9500	11700	12000	804	6200	6800	7000	1286	5000	5300	5400	2011	3700	4000	4200		
360	220	0	9000	11100	12000	1017	5500	6100	6200	1628	4300	4700	4700	2545	3000	3300	3600		
	250	0	9000	11100	12000	1017	6200	7100	8100	1628	5100	5700	6200	2545	3800	4200	4800		
400	250	0	9900	12000	12000	1256	6400	7200	7400	2010	5100	5600	5700	3142	3700	4000	4400		
	280	0	10000	12000	12000	1256	7100	8100	9300	2010	5900	6600	7200	3142	4500	4900	5700		
450	280	0	9700	12000	12000	1590	6400	7200	8100	2544	5000	5600	6200	3976	3400	3700	4800		
	320	0	9700	11900	12000	1590	7100	8200	10700	2544	5800	6600	8200	3976	4300	4800	6400		
500	320	0	9200	11200	12000	1963	6400	7300	9500	3141	5100	5700	7300	4909	3300	3700	5000		
	360	0	9100	11100	12000	1963	6800	8000	12000	3141	5700	6500	9400	4909	4100	4600	7000		
560	360	0	9600	11800	12000	2463	6600	7700	10800	3940	5200	5900	8300	6158	3200	3600	5300		
	400	0	9600	11700	12000	2463	7100	8300	12000	3940	5800	6700	10400	6158	3900	4500	7200		

Intermediate values can be interpolated.

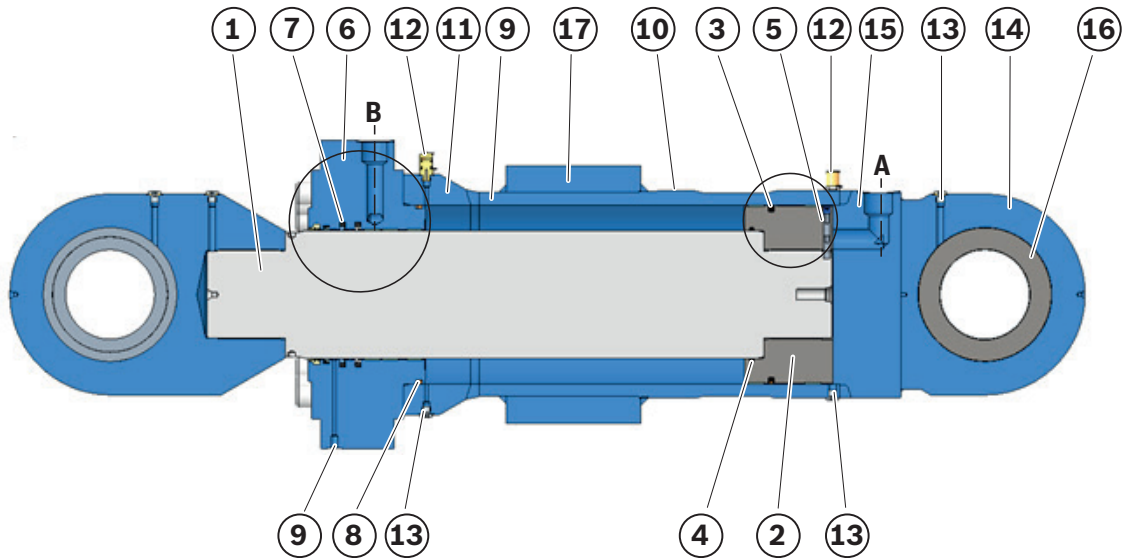
SEAL KITS

Series IndyRex 250 – standard

Seal kits can be ordered by referring to the material numbers in the table below.

Bore	Rod	Seal kit
		Material No.
280	180	R905030693
	200	R905030694
320	200	R905030695
	220	R905030696
360	220	R905030697
	250	R905030698
400	250	R905030699
	280	R905030700
450	280	R905030701
	320	R905030702
500	320	R905030703
	360	R905030704
560	360	R905030705
	400	R905030706

SPARE PARTS: SERIES IndyRex 250:



Piston Rod



Piston Rod



- | | | | |
|----------------------------------|--------------------------------|---------------------------|--------------------|
| 1 Rod | 5 Piston locking | 8 Static seal | 14 Clevis |
| 2 Piston | 6 Head (with flange) | 9 Drain line | 15 Bottom |
| 3 Piston seal and bearing | 7 Rod seals and bearing | 10 Cylinder tube | 16 Bearing |
| ▶ Piston seal | ▶ Wiper | 11 Weld flange | 17 Trunnion |
| ▶ Guide ring | ▶ Excluder | 12 Air vent ¼" BSP | |
| 4 Static seal | ▶ Secondary Rod seal | 13 Plug ¼" BSP | |
| | ▶ Primary Rod seal | | |
| | ▶ Guide ring | | |

CYLINDER WEIGHT

Bore	Rod	Cylinder with 0 mm stroke length			per 100 mm stroke length	Optional clevis [kg]	Optional flange with CIMS [kg]
		MP5/MP3 [kg]	ME7 [kg]	MT4 [kg]	[kg]		
280	180	361	389	457	40	90	23
	200	355	383	451	44	90	25
320	200	476	486	586	49	135	25
	220	466	476	576	54	135	30
360	220	749	784	975	64	196	30
	250	738	773	975	72	196	33
400	250	949	940	1117	83	259	33
	280	934	925	1102	92	259	39
450	280	1373	1334	1592	100	357	39
	320	1356	1317	1575	113	357	43
500	320	1841	1697	2033	158	427	43
	360	1821	1677	2013	173	427	48
560	360	2615	2390	2802	170	618	48
	400	2596	2371	2783	185	618	52

Weights above are including oil in the retracted position.

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