Hydraulic Cylinders by Liebherr

Series-Production Range acc. to 6022

LIEBHERR

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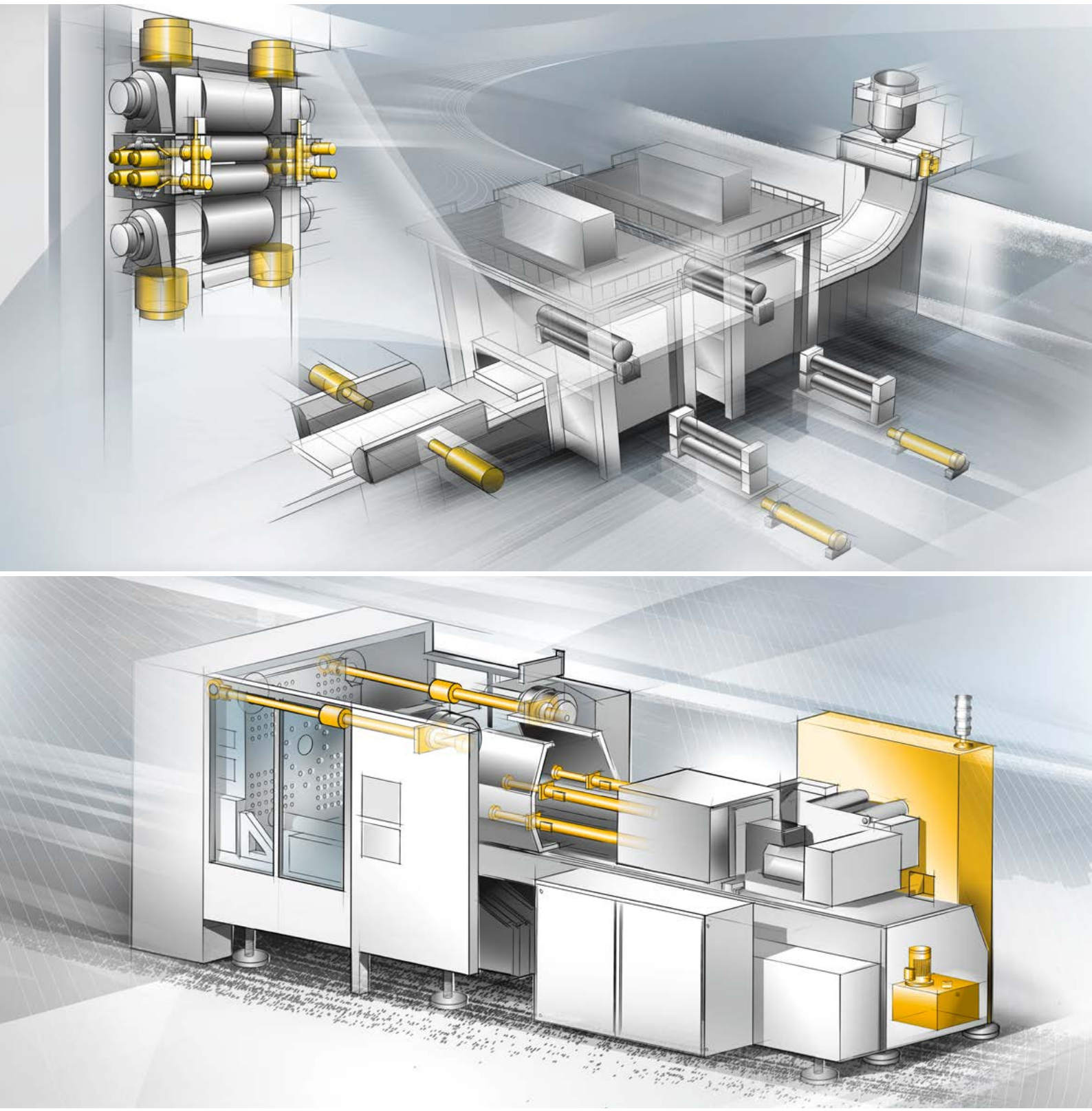


The Industry Specialists

With the series-production range according to ISO 6022 Liebherr has a range of hydraulic cylinders in the product portfolio that are aimed at the diverse needs and requirements of its industry customers.
Installation dimensions and mounting options comply with the standard specifications, but give the customer maximum flexibility and individuality for every application with selected details.

For instance, the series contains 24 basic variants for the rated diameter combination of piston and piston rod, thereby also extending the dimensions defined in the standard. A total of six mounting types and four alternative oil connections are available for each of these basic variants. Depending on the environmental impacts, a single or double chrome coating can be selected. Furthermore, the hydraulic cylinders can be equipped with a large selection of configurable additional optional equipment such as a position transducer, end of stroke cushioning, proximity switch or pressure sensor as required.

Application
The products are used in various stationary applications such as the paper and steel industry as well as in machine tools or automation and manufacturing technology. The hydraulic cylinders may also be exposed to static and dynamic loads.

Also interesting?

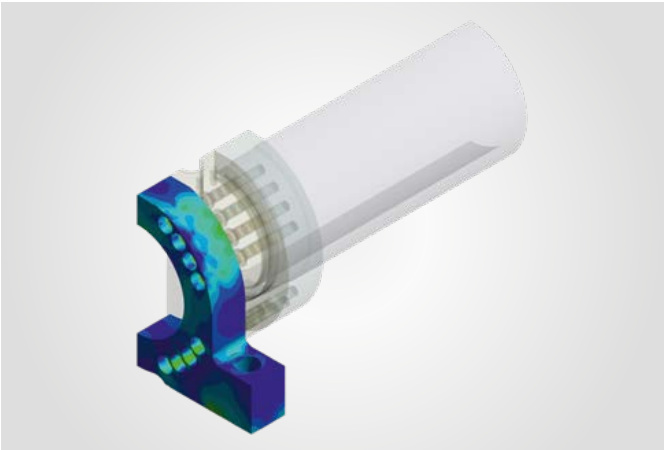
380 bar series-production range
The hydraulic cylinders in the 380 bar series are mainly used in mobile applications. They are used wherever durable and robust products are required in highly dynamic applications. The “eye-eye mounting" designed specially for connection in construction machines guarantees optimal operation.
A highlight is the optional equipment with Liebherr's own position transducer LiView®, which reliably records the linear movement during work.

260 bar series-production range
With the 260 bar series Liebherr offers its customers a range of hydraulic cylinders optimised to what is essential, which can still also be used in demanding conditions – both in the mobile and stationary area. There is a broad range of mounting types as well as two alternative oil connections and piston rod coatings available. In order to be able to realise the most economical solution for the respective target application, no extended functions such as sensor technology or cushioning options are intended for this series.

Product range - overview

Type	Differential cylinder in a cylindrical design
Operating pressure	Max. 250 bar
Stroke lengths	Up to 2,700 mm (depending on application); longer lengths available on request
Piston diameter	63 – 320 mm
Piston rod diameter	40 – 220 mm
Mounting types	Bushing or spherical bearing eye at base, round flange at head / base, trunnion mounting, foot mounting
Piston rod connection	Rod thread; available with appropriate swivel head as option
Media port	Threaded connection in inches; metric or UNF threaded connection or SAE connection at the customer's request
Options	Position transducers, proximity switches, measuring coupling, pressure sensor, adjustable cushioning system
Operating fluid	Hydraulic oils acc. to ISO 4406: 20/18/15
Coating	Chrome coating with 25 µm (±5 µm); double chrome coating AASS with 96 h Rating 10 at the customer's request
Anti-corrosion	Primed; painted at the customer's request
Operating temperature	-20 °C to +80 °C
Piston speed	Up to 1 m/s
Usage	Dynamic, static
Applications	Paper and steel industry, machine tools, automation and manufacturing technology

Technical Design

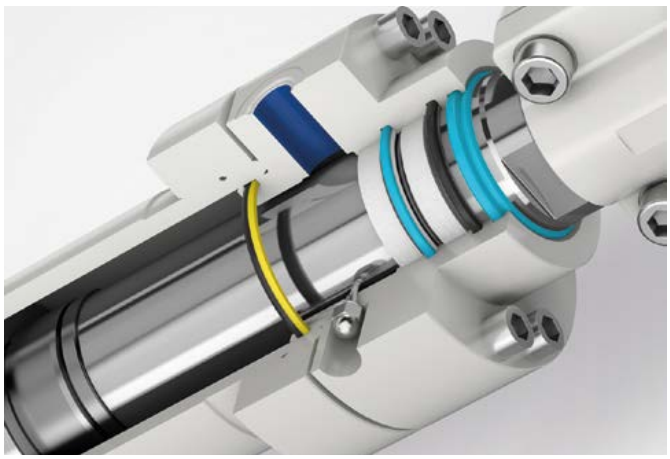


Hydraulic cylinder configuration
The hydraulic cylinders are computed and designed using state-of-the-art technology. Here, for example, the finite element method is used to help configure the designs. Supporting pulse and endurance tests are also carried out to verify the calculation results.
The industry series-production range is designed for dynamic and static applications. With this series Liebherr sets a reliable standard in terms of durability and resistance.

Sensor technology
In order to realise the many different control tasks, the linear movements and the response of the hydraulic cylinders have to be recorded, monitored and controlled exactly. Because of this, the series based on ISO 6022 is designed so that pressure sensors, proximity switches as well as position transducers can be selected as options. Liebherr uses products from well-known manufacturers or according to the customer's specifications.

Piston rod coating
A high-quality single chrome layer with a thickness of 25 µm (±5 µm) is used as standard. A hardened piston rod with a double chrome coating is available for higher corrosion or impact protection requirements. This coating guarantees at least 96 h in acetic acid-salt spray test (AASS) according to DIN EN ISO 9227 Rating 10.

End of stroke cushioning
Controlled and gentle retraction to the end positions is specially important in highly dynamic applications. For this Liebherr offers an adjustable cushioning system as optional equipment. The customer is able to choose between piston-side and/or rod-side cushioning. The system ensures a smooth and stutter-free acting of the hydraulic cylinder.



Seals
Seals are extremely important for the reliability of hydraulic cylinders. Liebherr also uses a compact arrangement of seals and an innovative sealing system in the series-production range to satisfy the most exacting of standards. This means that high-quality and low-friction seals are already used as standard.
A proven tandem sealing system consisting of a primary and a secondary seal is used for the rod seal.

Mounting types
In order to satisfy the diverse installation situations for hydraulic cylinders, the series has six possible mounting options according to ISO 6022:

- Bushing (MP3)
- Spherical bearing eye (MP5)
- Round flange at head (MF3)
- Round flange at base (MF4)
- Trunnion mounting (MT4)
- Foot mounting (MS2)

For the connection of the piston rod, its end is provided with a thread. An appropriate swivel head can also be pre-assembled as an option.

Sizes and Dimensions

The following table illustrates all relevant dimensions of the basic design. The tolerances for stroke and installation length comply with ISO 6022. Any additional tolerance specifications are made available individually with the respective acceptance drawing.
Each combination of piston and piston rod diameter defines a basic variant.

The following pages expand this version according to the respective mounting type. Depending on the mounting variant, there are further dimensions. They can be taken from the relevant tables.

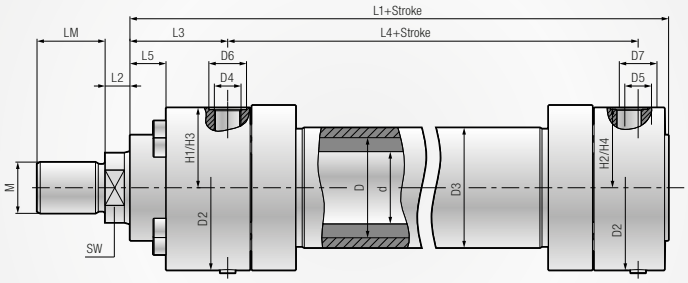
Corresponding 3D models can be supplied for each variant.

Basic dimensions							Oil connection at piston rod end							
D	**d**	**D2**	**D3 max.**	**L1**	**Stroke min.**	**L5**	**L3**	**D4* Standard**	**Option 1**	**Option 2**	**Option 3**	**D6**	**H1**	**H3****
63	40	120	83	253	270	32	91	G3/4"	M27x2	1 1/16-12 UN-2B	1/2"	42	55	54
63	45	120	83	253	270	32	91	G3/4"	M27x2	1 1/16-12 UN-2B	1/2"	42	55	54
80	50	145	105	281	260	36	96	G3/4"	M27x2	1 1/16-12 UN-2B	1/2"	42	68	67
80	56	145	105	281	260	36	96	G3/4"	M27x2	1 1/16-12 UN-2B	1/2"	42	68	67
100	63	170	130	313	240	41	107	G1"	M33x2	1 5/16-12 UN-2B	1/2"	49	80	79
100	70	170	130	313	240	41	107	G1"	M33x2	1 5/16-12 UN-2B	1/2"	49	80	79
125	80	206	160	364	230	45	122	G1"	M33x2	1 5/16-12 UN-2B	3/4"	49	99	97
125	90	206	160	364	230	45	122	G1"	M33x2	1 5/16-12 UN-2B	3/4"	49	99	97
140	90	226	175	399	220	45	135	G1 1/4"	M42x2	1 5/8-12 UN-2B	1"	58	108	106
140	100	226	175	399	220	45	135	G1 1/4"	M42x2	1 5/8-12 UN-2B	1"	58	108	106
160	100	265	200	432	210	50	150	G1 1/4"	M42x2	1 5/8-12 UN-2B	1"	58	128	127
160	110	265	200	432	210	50	150	G1 1/4"	M42x2	1 5/8-12 UN-2B	1"	58	128	127
180	110	292	220	465	190	55	154	G1 1/4"	M42x2	1 5/8-12 UN-2B	1 1/4"	58	142	139
180	125	292	220	465	190	55	154	G1 1/4"	M42x2	1 5/8-12 UN-2B	1 1/4"	58	142	139
200	125	306	245	510	180	61	180	G1 1/4"	M42x2	1 5/8-12 UN-2B	1 1/4"	58	149	146
200	140	306	245	510	180	61	180	G1 1/4"	M42x2	1 5/8-12 UN-2B	1 1/4"	58	149	146
220	140	355	273	595	160	71	202	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	174	170
220	160	355	273	595	160	71	202	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	174	170
250	160	395	313	608	140	71	215	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	194	190
250	180	395	313	608	140	71	215	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	194	190
280	180	445	340	704	130	88	242	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	219	216
280	200	445	340	704	130	88	242	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	219	216
320	200	490	408	712	110	88	234	G1 1/2"	M48x2	1 7/8-12 UN-2B	2"	65	242	237
320	220	490	408	712	110	88	234	G1 1/2"	M48x2	1 7/8-12 UN-2B	2"	65	242	237

* As standard according to ISO 1179-1, Option 1 acc. to ISO 9974-1, Option 2 acc. to ISO 11926-1 / SAE J1926, Option 3 acc. to ISO 6162-2 (SAE 6000 PSI)

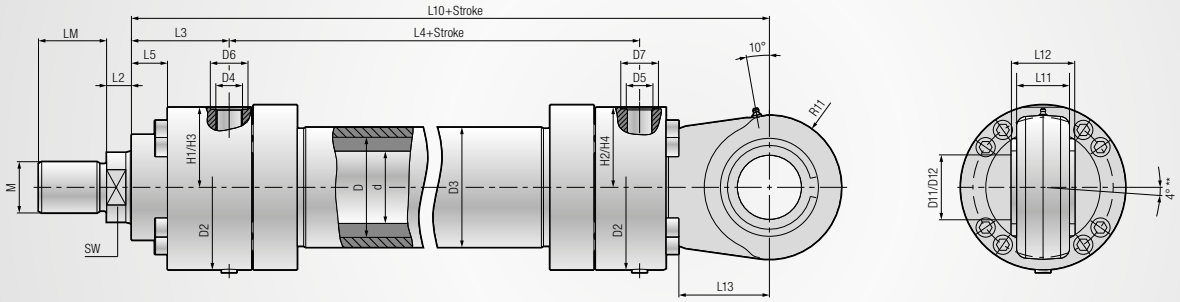
** Height with SAE-connection

Note: If not otherwise indicated, all information are provided in millimetres.



Oil connection at base								Piston rod end			
L4	**D5* Standard**	**Option 1**	**Option 2**	**Option 3**	**D7**	**H2**	**H4****	**L2 min.**	**M**	**LM**	**SW**
133	G3/4"	M27x2	1 1/16-12 UN-2B	1/2"	42	55	54	21	M33x2	45	32
133	G3/4"	M27x2	1 1/16-12 UN-2B	1/2"	42	55	54	21	M33x2	45	36
155	G3/4"	M27x2	1 1/16-12 UN-2B	1/2"	42	68	67	24	M42x2	56	41
155	G3/4"	M27x2	1 1/16-12 UN-2B	1/2"	42	68	67	24	M42x2	56	46
171	G1"	M33x2	1 5/16-12 UN-2B	1/2"	49	80	79	27	M48x2	63	50
171	G1"	M33x2	1 5/16-12 UN-2B	1/2"	49	80	79	27	M48x2	63	60
205	G1"	M33x2	1 5/16-12 UN-2B	3/4"	49	99	97	31	M64x3	85	65
205	G1"	M33x2	1 5/16-12 UN-2B	3/4"	49	99	97	31	M64x3	85	75
219	G1 1/4"	M42x2	1 5/8-12 UN-2B	1"	58	108	106	31	M72x3	90	75
219	G1 1/4"	M42x2	1 5/8-12 UN-2B	1"	58	108	106	31	M72x3	90	85
235	G1 1/4"	M42x2	1 5/8-12 UN-2B	1"	58	128	127	35	M80x3	95	85
235	G1 1/4"	M42x2	1 5/8-12 UN-2B	1"	58	128	127	35	M80x3	95	95
264	G1 1/4"	M42x2	1 5/8-12 UN-2B	1 1/4"	58	142	139	40	M90x3	106	95
264	G1 1/4"	M42x2	1 5/8-12 UN-2B	1 1/4"	58	142	139	40	M90x3	106	110
278	G1 1/4"	M42x2	1 5/8-12 UN-2B	1 1/4"	58	149	146	40	M100x3	112	110
278	G1 1/4"	M42x2	1 5/8-12 UN-2B	1 1/4"	58	149	146	40	M100x3	112	120
326	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	174	170	42	M125x4	125	120
326	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	174	170	42	M125x4	125	140
326	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	194	190	42	M125x4	125	140
326	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	194	190	42	M125x4	125	160
375	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	219	216	48	M160x4	160	160
375	G1 1/2"	M48x2	1 7/8-12 UN-2B	1 1/2"	65	219	216	48	M160x4	160	180
391	G1 1/2"	M48x2	1 7/8-12 UN-2B	2"	65	242	237	48	M160x4	160	180
391	G1 1/2"	M48x2	1 7/8-12 UN-2B	2"	65	242	237	48	M160x4	160	200

Bushing or Spherical Bearing Eye (MP3 / MP5)



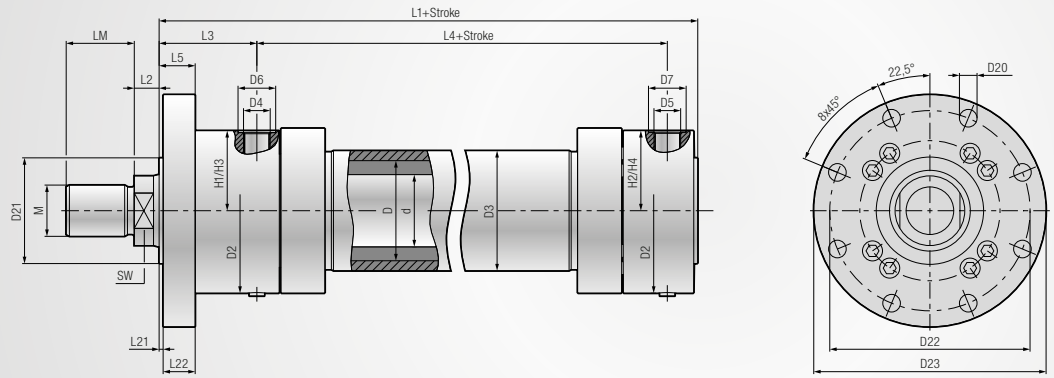
Basic dimensions			Specific dimensions regarding mounting type				
D	**d**	**L10**	**L11**	**L12**	**D11* (H9) / D12** (H7)**	**L13**	**R11**
63	40	327	32	40	40	70	50
63	45	327	32	40	40	70	50
80	50	371	40	50	50	82	63
80	56	371	40	50	50	82	63
100	63	415	52	63	63	96	71
100	70	415	52	63	63	96	71
125	80	489	66	80	80	113	90
125	90	489	66	80	80	113	90
140	90	549	72	90	90	139	100
140	100	549	72	90	90	139	100
160	100	582	84	100	100	141	112
160	110	582	84	100	100	141	112
180	110	650	88	110	110	170	129
180	125	650	88	110	110	170	129
200	125	716	102	125	125	196	140
200	140	716	102	125	125	196	140
220	140	861	130	160	160	261	180
220	160	861	130	160	160	261	180
250	160	861	130	160	160	239	190
250	180	861	130	160	160	239	190
280	180	1,032	138	200	200	300	220
280	200	1,032	138	200	200	300	220
320	200	1,032	162	200	200	310	228
320	220	1,032	162	200	200	310	228

* with bushing

** with spherical bearing

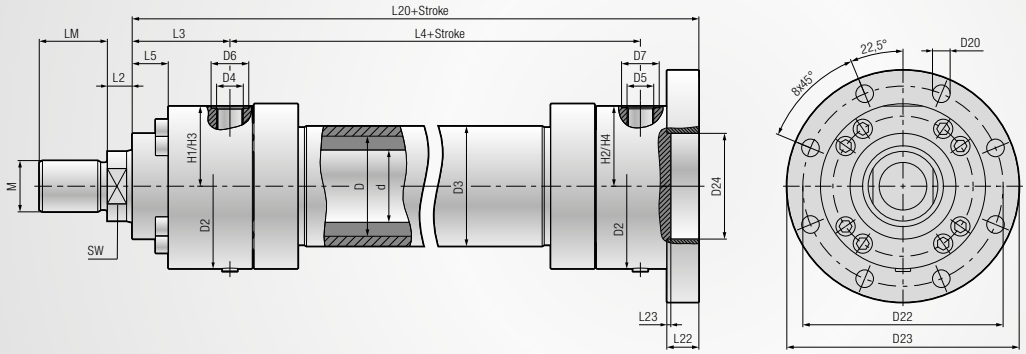
Note: Both bushing and spherical bearing eye are equipped with a screw thread M10x1 as well as a concial grease nipple according to DIN 71412 form A.

Round Flange at Head (MF3)



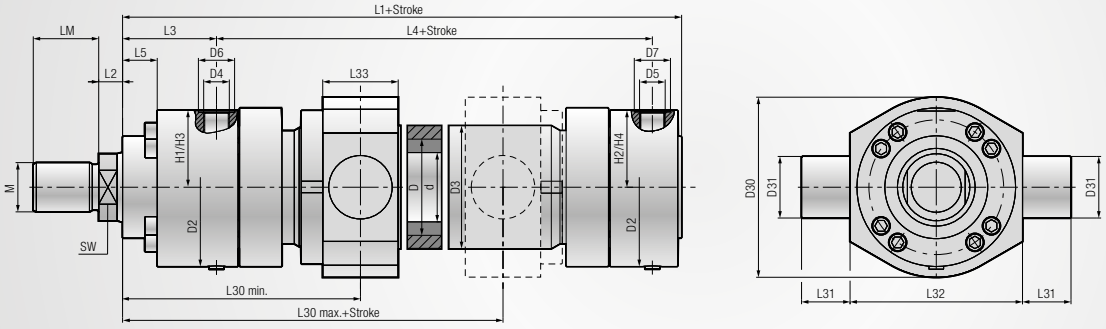
Basic dimensions		Specific dimensions regarding mounting type					
D	**d**	**D20**	**L21**	**D21 (f8)**	**L22**	**D22 (js13)**	**D23**
63	40	14	4	75	28	150	175
63	45	14	4	75	28	150	175
80	50	18	4	90	32	180	210
80	56	18	4	90	32	180	210
100	63	22	5	110	36	212	250
100	70	22	5	110	36	212	250
125	80	22	5	132	40	250	285
125	90	22	5	132	40	250	285
140	90	26	5	145	40	285	330
140	100	26	5	145	40	285	330
160	100	26	5	160	45	315	360
160	110	26	5	160	45	315	360
180	110	33	5	185	50	355	410
180	125	33	5	185	50	355	410
200	125	33	5	200	56	385	440
200	140	33	5	200	56	385	440
220	140	39	8	235	63	435	500
220	160	39	8	235	63	435	500
250	160	39	8	250	63	475	540
250	180	39	8	250	63	475	540
280	180	45	8	295	80	555	630
280	200	45	8	295	80	555	630
320	200	45	8	320	80	600	675
320	220	45	8	320	80	600	675

Round Flange at Base (MF4)



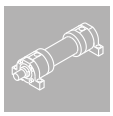
Basic dimensions			Specific dimensions regarding mounting type					
D	**d**	**L20**	**D20**	**L22**	**D22 (js13)**	**D23**	**L23**	**D24 (H8)**
63	40	277	14	28	150	175	4	75
63	45	277	14	28	150	175	4	75
80	50	308	18	32	180	210	5	90
80	56	308	18	32	180	210	5	90
100	63	344	22	36	212	250	5	110
100	70	344	22	36	212	250	5	110
125	80	399	22	40	250	285	5	132
125	90	399	22	40	250	285	5	132
140	90	434	26	40	285	330	5	145
140	100	434	26	40	285	330	5	145
160	100	470	26	45	315	360	7	160
160	110	470	26	45	315	360	7	160
180	110	510	33	50	355	410	5	185
180	125	510	33	50	355	410	5	185
200	125	556	33	56	385	440	10	200
200	140	556	33	56	385	440	10	200
220	140	648	39	63	435	500	10	235
220	160	648	39	63	435	500	10	235
250	160	661	39	63	475	540	10	250
250	180	661	39	63	475	540	10	250
280	180	774	45	80	555	630	10	295
280	200	774	45	80	555	630	10	295
320	200	782	45	80	600	675	10	320
320	220	782	45	80	600	675	10	320

Trunnion Mounting (MT4)

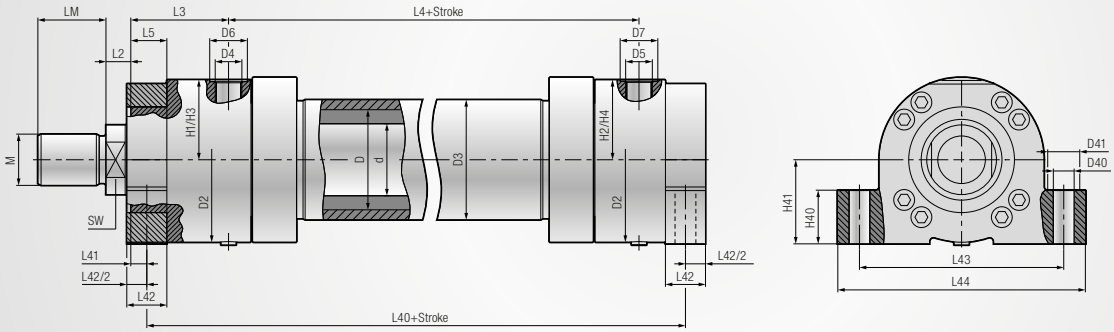


Basic dimensions		Specific dimensions regarding mounting type						
D	**d**	**L30 min.**	**L30 max.***	**D30**	**L31**	**D31 (f8)**	**L32 (h12)**	**L33**
63	40	199	107	125	32	40	125	48
63	45	199	107	125	32	40	125	48
80	50	220	114	155	40	50	150	58
80	56	220	114	155	40	50	150	58
100	63	253	127	185	50	63	180	78
100	70	253	127	185	50	63	180	78
125	80	289	133	230	63	80	224	98
125	90	289	133	230	63	80	224	98
140	90	329	149	255	70	90	265	118
140	100	329	149	255	70	90	265	118
160	100	361	153	285	80	100	280	128
160	110	361	153	285	80	100	280	128
180	110	387	161	325	90	110	320	138
180	125	387	161	325	90	110	320	138
200	125	431	190	340	100	125	335	155
200	140	431	190	340	100	125	335	155
220	140	485	216	390	125	160	385	180
220	160	485	216	390	125	160	385	180
250	160	513	244	430	125	160	425	180
250	180	513	244	430	125	160	425	180
280	180	578	251	485	160	200	480	220
280	200	578	251	485	160	200	480	220
320	200	593	259	535	160	200	530	220
320	220	593	259	535	160	200	530	220

* additional selected stroke



Foot Mounting (MS2)

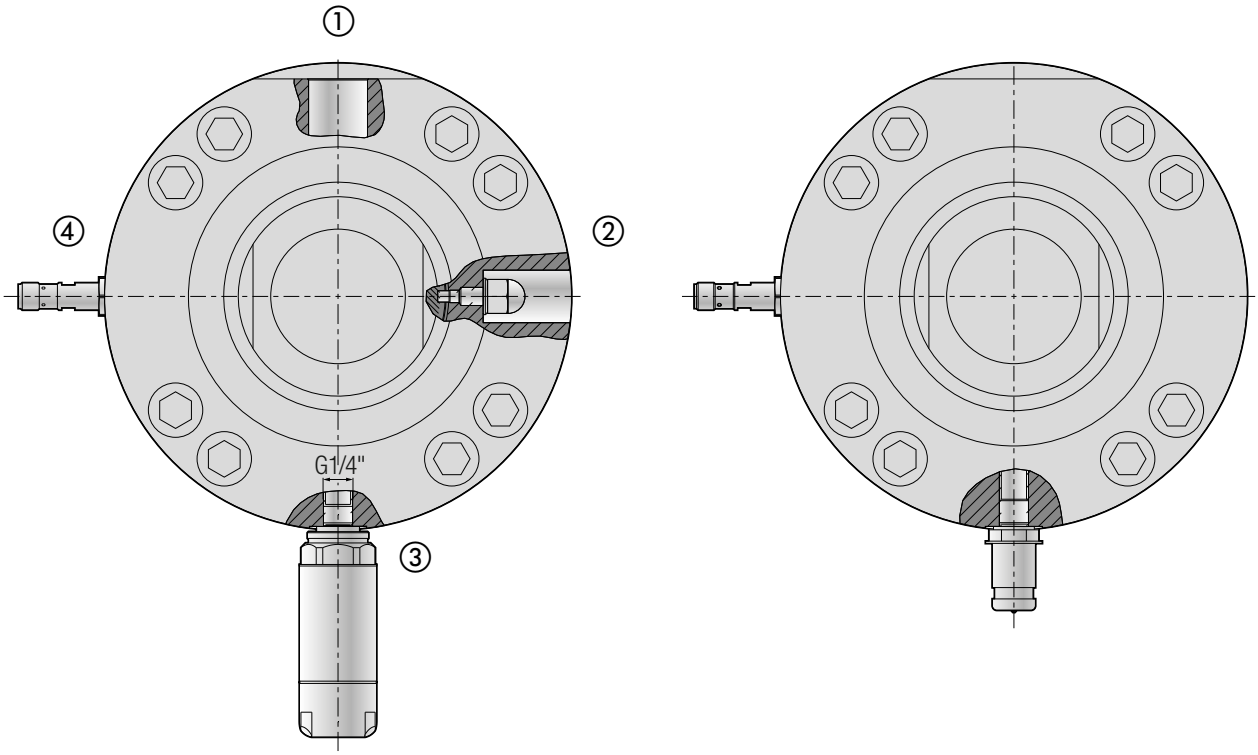


Basic dimensions		Specific dimensions regarding mounting type								
D	**d**	**L40**	**L41**	**L42**	**L43**	**L44**	**D40***	**D41**	**H40**	**H41**
63	40	252	15	35	150	180	14	20	42	65
63	45	252	15	35	150	180	14	20	42	65
80	50	280	16	40	180	220	18	26	47	75
80	56	280	16	40	180	220	18	26	47	75
100	63	312	19	45	210	260	22	33	57	90
100	70	312	19	45	210	260	22	33	57	90
125	80	364	20	50	255	310	26	40	67	105
125	90	364	20	50	255	310	26	40	67	105
140	90	399	20	50	290	355	30	46	72	115
140	100	399	20	50	290	355	30	46	72	115
160	100	435	20	60	330	400	33	50	77	135
160	110	435	20	60	330	400	33	50	77	135
180	110	475	20	70	360	440	40	58	92	150
180	125	475	20	70	360	440	40	58	92	150
200	125	509	26	70	385	470	40	58	97	160
200	140	509	26	70	385	470	40	58	97	160
220	140	594	31	80	445	540	45	69	102	185
220	160	594	31	80	445	540	45	69	102	185
250	160	617	26	90	500	605	52	78	112	205
250	180	617	26	90	500	605	52	78	112	205
280	180	701	41	95	550	660	52	78	142	235
280	200	701	41	95	550	660	52	78	142	235
320	200	714	38	100	610	730	62	93	142	255
320	220	714	38	100	610	730	62	93	142	255

* Shear stress within the screws is not allowed. Therefore the force application need to be realised by an additional positive connection.

Equipment Options

All cylinders in the series-production range can be individually extended with different equipment configurations as standard. The position of the respective variant is specified as standard. The top view with a view of the piston rod end shows the possible options and their respective 90° position. They are possible both on the piston and rod side.



① Apart from a threaded connection in inches, a metric thread, a UNF-thread or a 6000 PSI-SAE connection can also be selected. A threaded connection in inches is provided as standard.

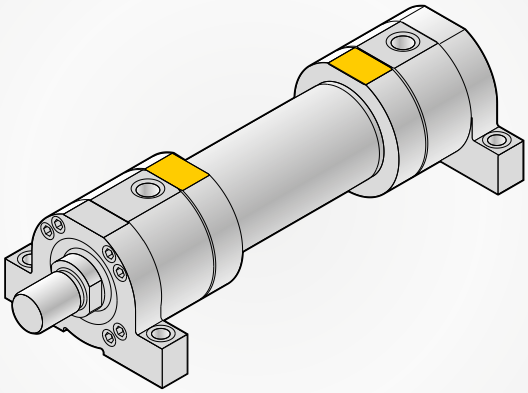
② The adjustment option for the integrated cushioning system is located at an offset of 90° in clockwise direction to the oil connection.

③ On the opposite side to the oil connection is a standard vent hole that is locked with a screw. A measuring coupling or an appropriate pressure sensor can be installed here as an option.

④ A proximity switch can be fitted at an offset of 90° in clockwise direction to the vent hole.

In addition, the hydraulic cylinders in the series can be equipped with an integrated rod measuring system (Except cylinders that are selected with bushing or spherical bearing eye mountings).

Option Control Block Assembly



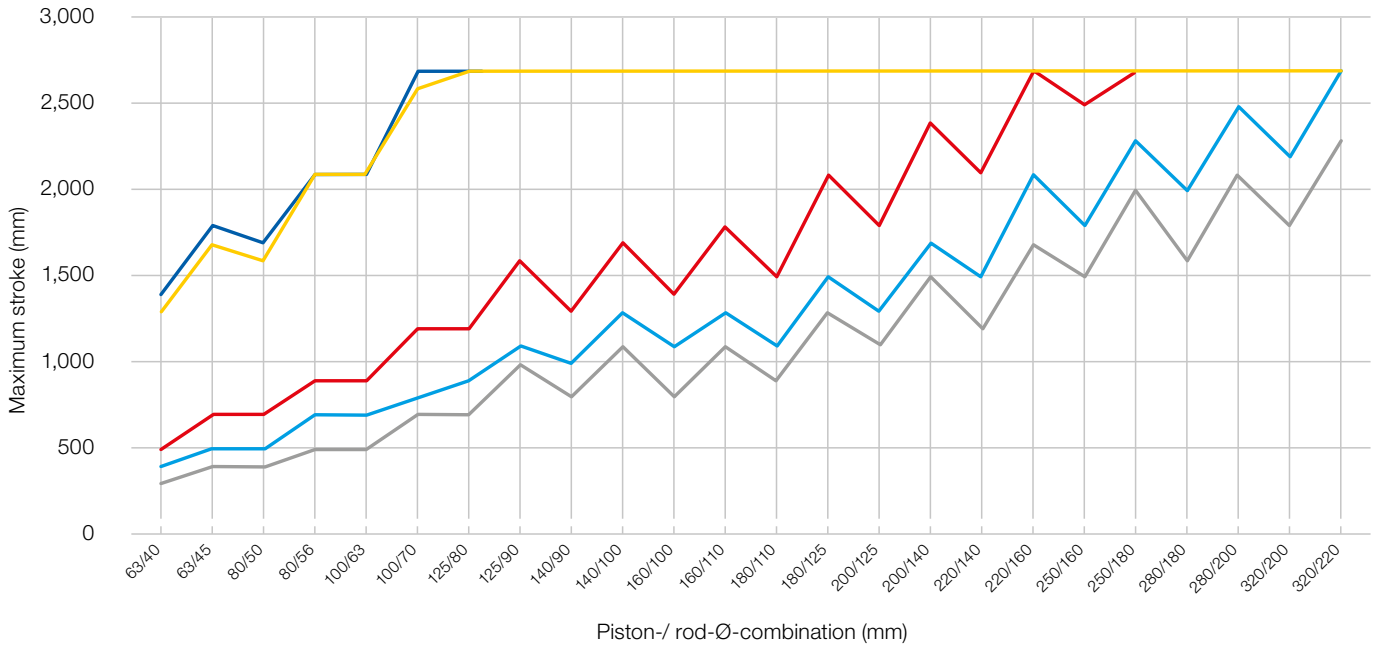
Sample display at foot mounting with threaded connection. The option is possible with all mounting types as well as oil connection options.

In order to be able to fit a control block on the rod and/or piston side at the oil connection, all hydraulic cylinders in the series can be intended for this.
Therefore all relevant areas at the mounting ring are face-milled according to the above diagram.

Buckling Resistance and General Information

In order to ensure safe operation of a hydraulic cylinder, the buckling resistance must be checked with the respective configuration. The following graphic shows the maximum possible stroke in relation to the respective piston/rod diameter basic variant with an assumed buckling resistance of 3.0. Depending on the selected mounting type, with a swivel head assembled at the piston rod there is the respective Euler case and the resulting maximum stroke.

Depending on the application, selected mounting variant and buckling resistance required, an individual determination of the possible stroke is required.



- Round flange at head (MF3) – Case 3
- Round flange at base (MF4) – Case 3
- Foot mounting (MS2) – Fall 3
- Bushing or spherical bearing eye (MP3/MP5) – Case 2
- Trunnion Mounting (MT4) – Fall 2

Buckling according Euler cases with buckling resistance of 3.0 and swivel head at an operation pressure of 250 bar

General information

The maximum operating pressures must be less than or equal to the rated pressure of 250 bar. With increased loads such as pressure peaks or a high running frequency, the hydraulic cylinder design needs to be checked.

For the installation, commissioning, safe use, as well as the maintenance of the hydraulic cylinders in the series-production range according to ISO 6022, the relevant instruction and maintenance manual in its most up-to-date version must be observed.

Service and repair work on Liebherr products must only be carried out by specially trained personnel.

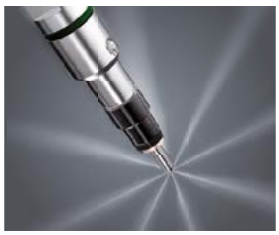
The selected seals of the hydraulic cylinders are suitable for the operation with mineral oils. The usability of the requested oil need to be verified by Liebherr in detail.

All graphic representations serve as an example and do not necessarily correspond to the configured product.

Liebherr Components


Gas engines


Diesel engines

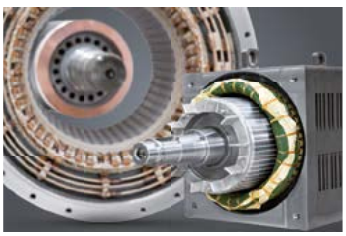

Fuel injection systems


Axial piston hydraulics


Hydraulic cylinders

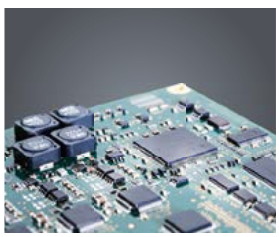

Slewing bearings


Gearboxes and winches

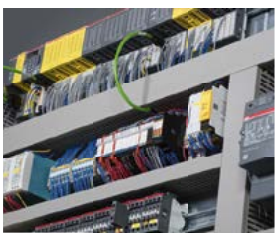

Electric machines


Remanufacturing


Human-machine interfaces and gateways


Control electronics and sensor technology


Power electronics


Control cabinets


Software

From A to Z – the components division of the Liebherr Group offers a broad range of solutions in the area of mechanical, hydraulic, electric and electronic drive system and control technology. The efficient components and systems are produced at a total of ten production sites around the world to the highest standards of quality. Central contact persons for all product lines are available to our customers at Liebherr-Components AG and the regional sales and distribution branches.

Liebherr is your partner for joint success: from the product idea to development, manufacture and commissioning right through to customer service solutions like remanufacturing.

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