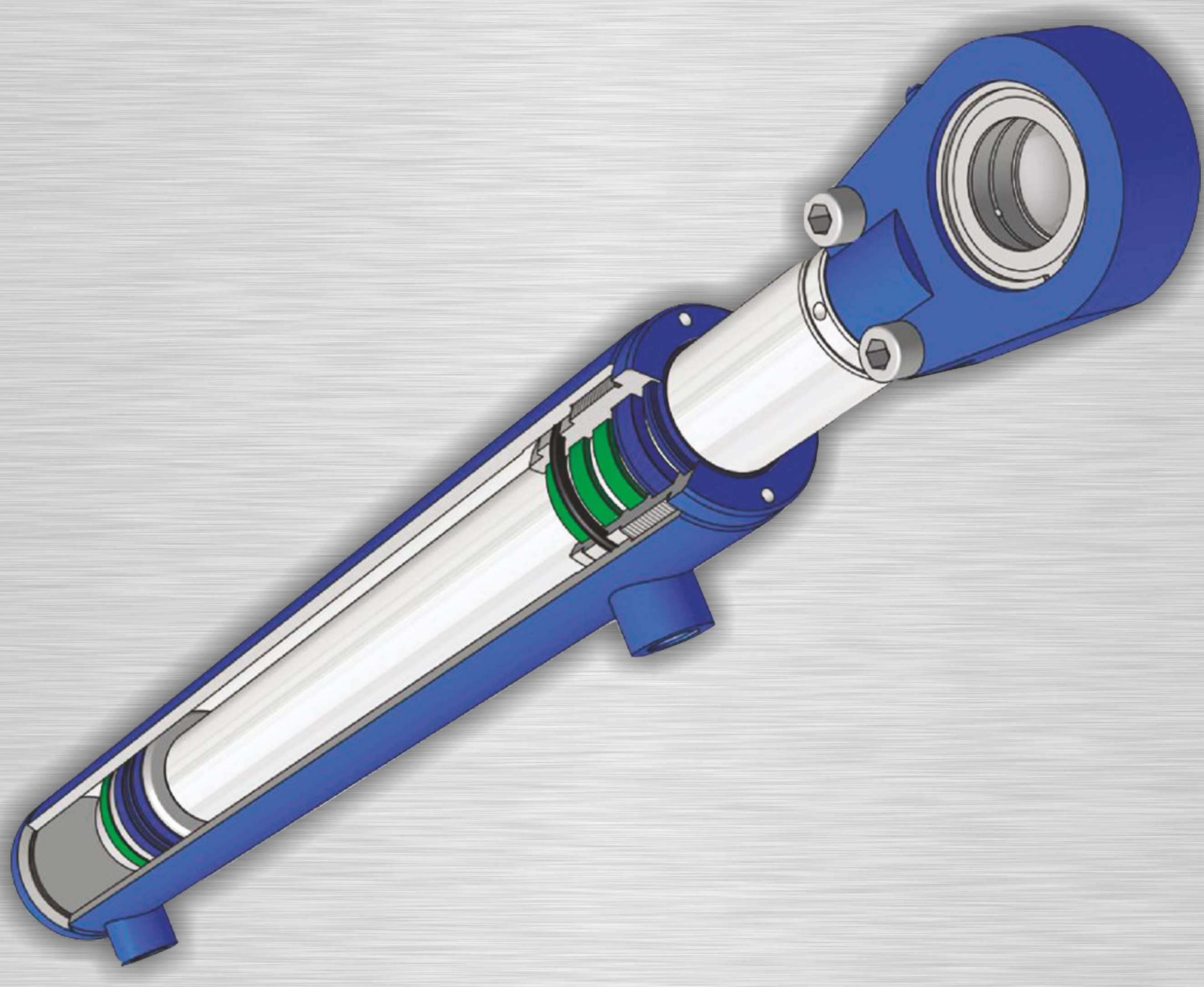
microtact hydraulic

Excellence In Fluid Control



Hydraulic Cylinders

- Standard Cylinders
- Tie Rod Cylinders
- Custom Built Cylinders

Design Manual 1.1/09-2013

microtact hydraulic

ISO 9001

Company Profile

Microtact a leading name in Hydraulic Valves and Systems worldwide, has deliveries across the globe. Microtact has good knowledge of the needs of the customers, with a tradition of quality and service that spans many decades.

We are a ISO 9001 Company, ensuring the quality standards as per International Standards and Specifications.

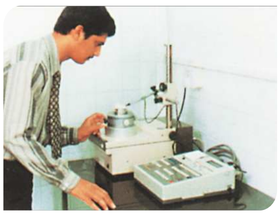
We at Microtact, guarantee our customers the international experience, reliability and back-up in providing solutions which are both most effective and cost-effective.

Microtact products means more than Three Decades of experience, innovative product development, high quality standards, application know-how and prompt service back-up to all customers.

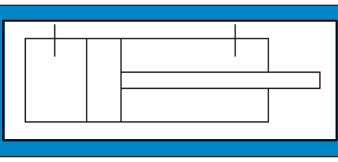
Infrastructure

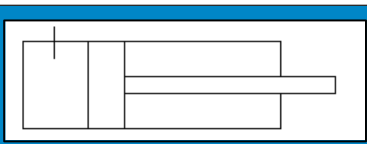












SERIES – HC/HCT/CHC

Standard Hydraulic cylinders :-
Single Acting, Double Acting &
Plunger Cylinders

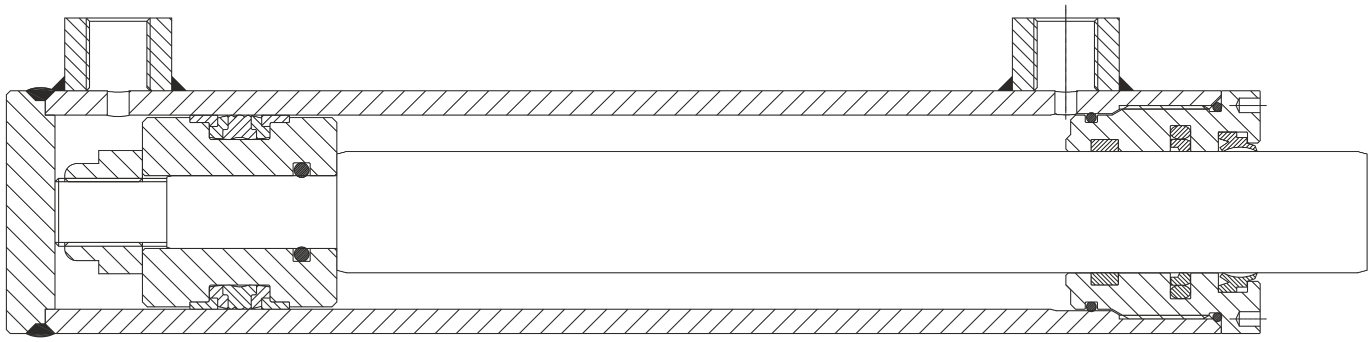
- Tie Rod Cylinders :- Double Acting
- Custom built Cylinders

KEY FEATURES
1. **ISO 6020-1, ISO 6020-2**
2. **Superior high quality chrome plated Rod**
3. **Honed & finished steel tube**
4. **State of the art manufacturing**
5. **Extremely robust design**
6. **Minimum wear & tear.**
7. **Top quality seals**
8. **High tensile strength tie rods**

Basic Characteristics

Continuous speed = Max 0.2 m/s
Top speed = Max 0.5 m/s
Operating pressure = 160 bar

Peak Pressure
Standard Cylinders = Max. 200 bar
Tie Rod Standard Cylinders = Max. 250 bar
Temperature range = -20 ºC to +80ºC
Available strokes = 50 – 300 mm



ORDERING INFORMATION

* HC * - SA / DA / PC - * - * - * - * - *

(1) * HC * · (2) SA / DA / PC · (3) * · (4) * · (5) * · (6) * · (7) *

1.	*- C = Custom Built Cylinder (omit if not required) HC = Standard Cylinder *- T = Tie Rod cylinder (omit if not required)
2.	SA = Single Acting Type DA = Double Acting Type PC = Plunger Type
3.	* = Cylinder Bore
4.	* = Piston Rod Diameter
5.	* = Stroke Length
6.	* = Type of Mounting (Mounting Options are not applicable for Single Acting Cylinders) - Standard Without Mounting = S
	- End Plug Mounting = P – with cross hole (P applicable only for plunger cylinders)
	-Bush Mounting = B1 – One end bush mounted. B2 – Both end bush mounted. (Not applicable for Tie rod cylinder)

-Clevis Mounting =	C1 – Female Clevis Mounted C2 – Male Clevis Mounting (C1 & C2 only for Tie rod cylinders)
-Rod Eye Mounting =	E – Both end Rod Eye Mounted. (Not applicable for Tie rod cylinders)
-Fork Mounting =	F – Both end Fork Mounted. (Not applicable for Tie rod cylinders)
-Flange Mounting =	L1 – Front Flange Mounted L2 – Rear Flange Mounted (L1 applicable for Tie rod & std. DA Cylinders) (L2 applicable only for Tie rod cylinders)
-Threaded Mounting =	T1 – Front & Back Tie Rod mounting T2 – Back Tie Rod Mounting T3 – Front Tie Rod Mounting T4 – Front Threaded Holes Mounting T5 – Back Threaded Holes Mounting (applicable only for Tie rod cylinders)
Feet Mounting =	FT – Side Feet Mounting (Tie rod cylinder)
7. * = Port Thread -	B- BSP, N – NPT

Typical Model Code		
Standard Cylinder	:-	**HC – DA – 40 – 25 – 150 – S – B**
		HC – PC – 50 – 30 – 200 – S – B
Tie Rod Cylinder	:-	**HCT – DA – 40 – 20 – 100 – C1 – B**
Custom built Cylinder	:-	**CHC – DA – 40 – 20 – 100 – B1 – B**

Microtact Hydraulic cylinders are designed and manufactured according to the standards: **ISO 6020-1, ISO 6020-2** All cylinders manufactured according to these standards have a unified installation measurement as per the stroke to ease replacement. Cylinders are primarily intended for the automization of work processes (processing machines and other servo-hydraulic drives), and they are also the best solution for systems where a simple exchangeability of components is required since the cylinders are designed modularly. When designing them special attention is paid to simple servicing without special tools that makes servicing faster and more economical.

A hydraulic cylinder is the actuator or "motor" side of a system. The "generator" side of the system is the hydraulic pump which brings in a fixed or regulated flow of oil to the hydraulic cylinder, to move the piston. The piston pushes the oil in the other chamber back to the reservoir. If we assume that the oil enters from cap end, during extension stroke, and the oil pressure in the rod end / head end is approximately zero, the force *F* on the piston rod equals the pressure *P* in the cylinder times the piston area *A*: F=P*A

During a retraction stroke if oil is pumped into the rod end / head end and the oil from the cap end flows back to the reservoir without pressure.

The fluid pressure in the rod end is (Pull Force) / (piston area - piston rod area):- where P is the fluid pressure, F_p is the pulling force, A_p is the piston face area and A_r is the rod cross-section area.

$$P = \frac{F_p}{A_p - A_r}$$

Hydraulic cylinders are powered from pressurized hydraulic fluid, which is typically oil. The hydraulic cylinder consists of a cylinder barrel, in which a piston connected to a piston rod moves back and front. The barrel is closed on one end by the cylinder bottom (also called the cap) and the other end by the cylinder head (also called the gland) where the piston rod comes out of the cylinder. The piston has sliding rings and seals. The piston divides the inside of the cylinder into two chambers, the bottom chamber (cap end) and the piston rod side chamber (rod end / head end)

Seals on the cylinders are chosen in compliance with the ISO standards, which provides independence from seal manufacturers. seals for operating environments with higher temperatures are also offered. All manufactured cylinders are tested in compliance with ISO standard which provides for repeatable quality.

Standard cylinders have an operating pressure of 160 bars and maximum pressure is 250 bars. It enables the final damping as well. It is also possible to order ISO cylinders that are designed in compliance with your requirements (various dimensions, various speeds etc.)

Flanges, clevises, Bush, Rod eye, fork are common cylinder mounting options. The piston rod also has mounting attachments to connect the cylinder to the object or machine component that it is pushing / pulling.

The majority of our hydraulic cylinders is suitable for use within the temperature range between –25°C to 80°C. Operating pressure varies according to the product. Piston speed is very different depending upon the installation length, treatment, material and desired execution.

Single Acting Hydraulic Cylinders

Single acting cylinders are economical and the simplest design. The working mode of cylinders with single acting operation is very simple. The supply of hydraulic fluid is implemented only on one side, which is why it can be operated only unilaterally. The return movement in this procedure is usually performed by a spring and sometimes also by its own weight if the force is not too great. A cylinder with single acting operation can usually be operated using a diverting valve. Operation using correct and appropriate components is also possible.

The most important advantage of cylinders with a Single Acting operation are:
- Smaller moving force,
- Small installation length,
- Small force of the return movement.

Hydraulic cylinders with the single acting operation do not depend on electricity and are used particularly for simple tasks like operating flaps or doors, ejection devices or drawers.

Plunger Type Cylinders

A hydraulic cylinder without a piston or piston without seals is called a plunger cylinder. A plunger cylinder can only be used as a pushing cylinder. The maximum force is a piston rod area multiplied by the pressure. This means that a plunger cylinder in general has a relatively thick piston rod

Double Acting Hydraulic Cylinders

Hydraulic cylinders with double acting operation have two opposite facing piston surfaces that control the operation of the force of hydraulic liquid, i.e. usually a special hydraulic oil that enables two active moving directions. The hydraulic energy is converted through the hydraulic liquid into the mechanical energy for the movement of the pistons. The pistons usually have separate connections that enable active movement in both directions. The force is thus applied in both directions and the structure of this hydraulic cylinder is very simple.

This type of cylinder with linear movement is especially suitable for use in presses and Chippers, for opening and closing drawers and for all types of raising and lowering devices. The piston rod is attached to the piston in this structure. The piston can move faster if it has a smaller surface and slower if its surface is larger. This hydraulic cylinder is used in many types of construction machinery & equipments.

Tie Rod Double Acting Hydraulic Cylinders

Tie Rod Cylinders are the most common on agricultural application, machine tools, automotive industries, transfer lines and manufacturing devices. The main feature of the tie rod cylinder is:space-saving compact design, which makes it particularly suitable for manufacturing devices., The top & bottom of the tie rod cylinder, as well as the cylinder tube are connected together via rods. Extended tie rods at the head or base of the cylinder may be used to mount the tie rod cylinder. Threaded holes and subplate mounting options are also included in the wide mounting range of the tie rod cylinder. The Tie rod cylinders use 4 long high strength threaded steel rods to hold the two end caps to the cylinder tube and are fitted that run the length of the cylinder. Small bore cylinders usually have 4 tie rods, while large bore cylinders may require many tie rods in order to retain the end caps under tremendous force produced.

The National Fluid Power Association has standardized the dimensions of hydraulic Tie rod cylinders. This enables cylinders from different manufacturers to interchange within the same mounting.

The most important advantage of Tie rod cylinder operation is:
- Compact design,
- Wide mounting range,
- Limited piston diameter,
- Limited stroke length,

Connections

The cylinders are supplied as per standard with cylindrical BSP threads and spot facing for seal rings in compliance with ISO 1179. For further information and for the order identification code, please consult our technical office.

For correct cylinder operation, fluid velocity must not exceed 0.5 m/s.

Tie Rod Tightening Torque

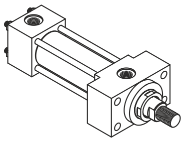
If the cylinder has been disassembled, re-assemble it and tighten the tie rod lock nuts cross-wise applying a gradual torque up to the value indicated in the table below. The values below refer to dry threads.

Bore (mm)	40	50	63	80	100
Tie Rod	M8x1 pitch	M12x1.5 pitch	M12x1.5 pitch	M16x1.5 pitch	M16x1.5 pitch
Torque (Nm)	20	70	70	160	160

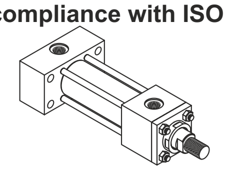
Cushioning

On request, gradual & adjustable cushioning devices can be fitted in the front and / or rear ends of the cylinder without affecting overall dimensions.
The special design of the cushions ensures optimal repeatability also in the event of variations in fluid viscosity.
Cushioning devices are always recommended as they ensure impact free stopping even at high speed thus reducing pressure surges and impact transferred to the mounting supports.
For all the available bores, cushioning is adjustable by means of a needle.
Rapid piston start-up is guaranteed by the bypass valves located inside the front cushioning cone & rear cushioning ring.

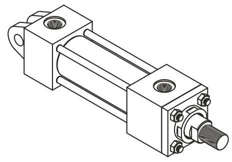
Tie Rod Mounting Style – (in compliance with ISO 6020-1)



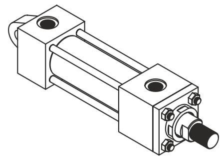
L1 (ISO ME5)
Front Flange Mounting



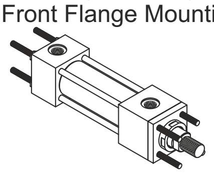
L2 (ISO ME6)
Rear Flange Mounting



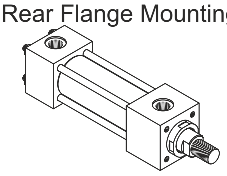
C1 (ISO MP1)
Female Clevis Mounting



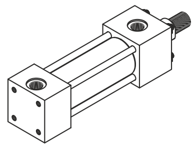
C2 (ISO MP3)
Male Clevis Mounting



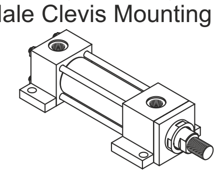
T1 (ISO MX1)
Front & Back
Tie Rod Mounting
T2 (ISO MX2)
Back Tie Rod Mounting
T3 (ISO MX3)
Front Tie Rod Mounting



T4 (ISO MX5)
Front Threaded
Holes Mounting

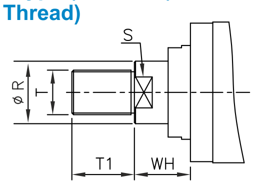


T5 (ISO MX6)
Back Threaded
Holes Mounting



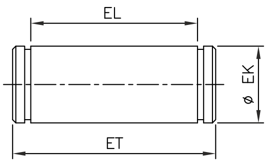
FT (ISO MS2)
Side Feet Mounting

Piston Rod End Type (ISO 4395) (Standard Male Thread)



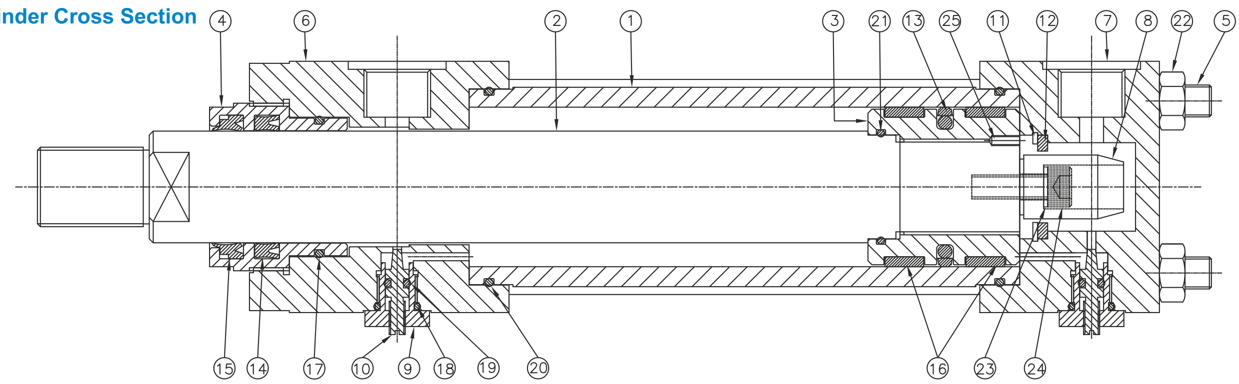
Bore ø	Rod ø	T	T1	WH	S
40	18 22 28	M14x1.5 M16x1.5 M20x1.5	18 22 28	25	14 17 22
50	22 28 36	M16x1.5 M20x1.5 M27x2	22 28 36	26	17 22 30
63	28 36 45	M20x1.5 M27x2 M33x2	28 36 45	33	22 30 36
80	36 45 56	M27x2 M33x2 M42x2	36 45 56	31	30 36 50
100	45 56 70	M33x2 M42x2 M48x2	45 56 63	35	36 50 60

Female Clevis Pin (ISO 8133)



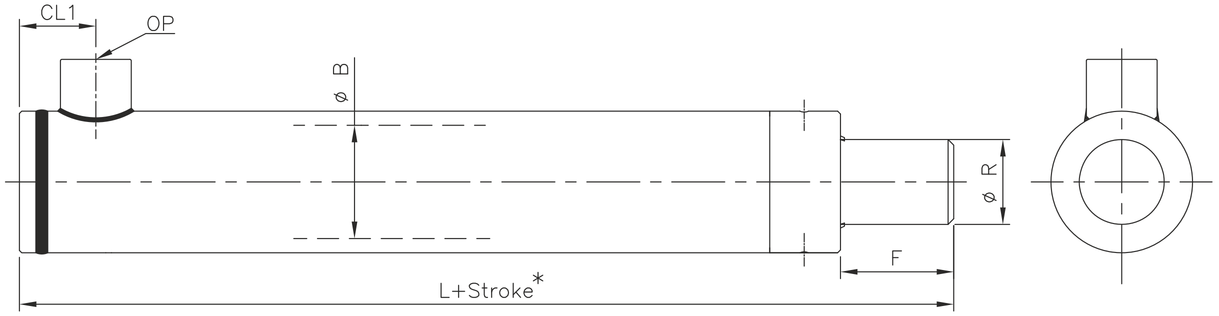
Bore ø	Rod ø	EK f8	EL +0 -0.2	ET
40	18 22 28	14	45	53
50 63	22 28 36	20	66	75
80	36 45 56	28	87	96
100	45 56 70	36	107	120

Cylinder Cross Section



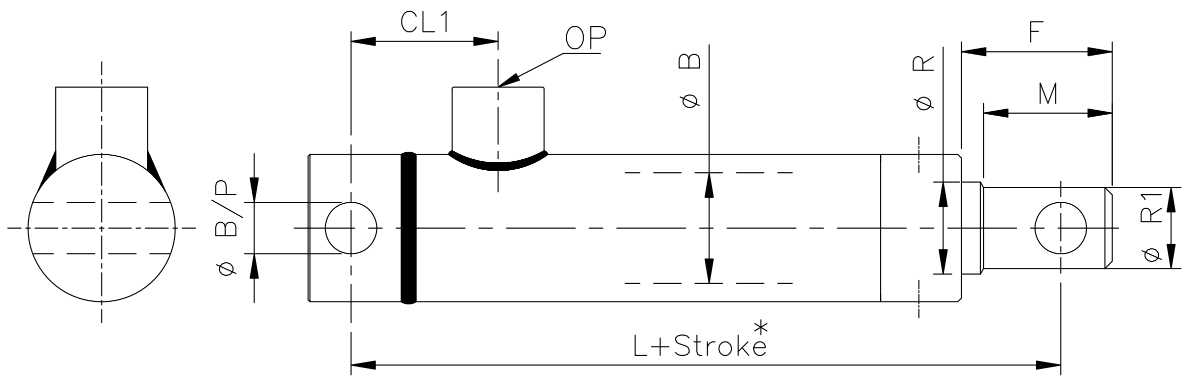
POS.	ITEM DESCRIPTION	MATL.	POS.	ITEM DESCRIPTION	MATL.	POS.	ITEM DESCRIPTION	MATL.
9	ADJUSTING HOLDER	EN–8						
8	REAR CUSHION	EN–8	17	O–RING FOR BUSH	NBR 70	25	GRUB SCREW	ALLOY STEEL
7	REAR FLANGE	DUCTILE IRON	16	GUIDE RING	C–380	24	SOCKET HEAD BOLT	ALLOY STEEL
6	FRONT MOUNTING FLANGE	DUCTILE IRON	15	WIPER SEAL	NBR	23	WASHER	EN 8
5	TIE RODS	STEEL GRADE 8	14	ROD SEAL	Z20	22	NUT	ALLOY STEEL
4	GUIDE BUSH	DUCTILE IRON	13	PISTON SEAL	TURCON T46N	21	O–RING FOR PISTON	NBR 70
3	PISTON	DUCTILE IRON	12	WASHER	EN–8	20	O–RING FOR FLANGE	NBR 70
2	ROD	STEEL CHROME	11	CIRCLIP	SPRING STEEL	19	O–RING FOR SCREW	NBR 70
1	CYLINDER BODY	STEEL St 52.3	10	ADJUSTING SCREW	EN–19	18	O–RING FOR HOLDER	NBR 70

S- SINGLE ACTING STANDARD CYLINDERS (PLUNGER CYLINDER) - BASIC TYPE



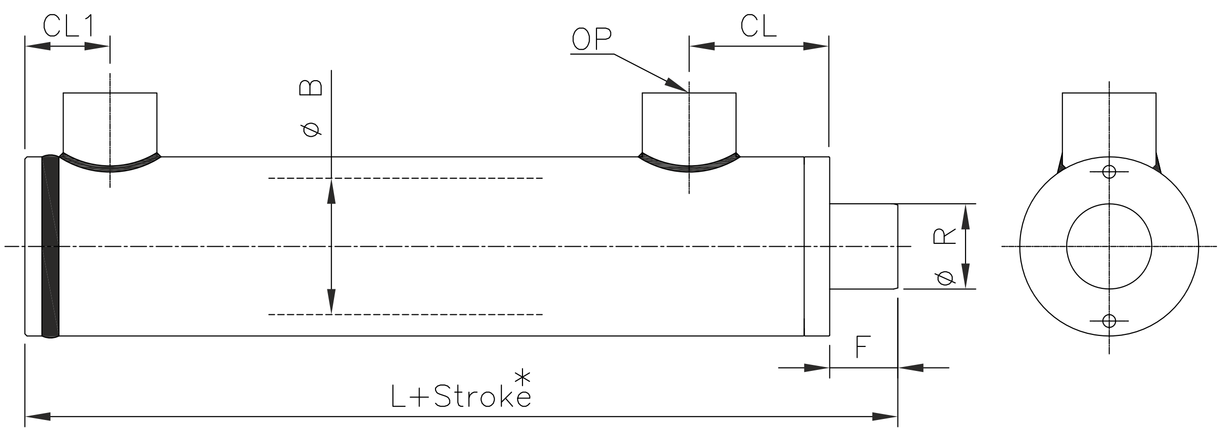
CODE	Ø B	Ø R	L	F	OP (bsp)	CL1
HC-PC-40-30-*-S *Stroke- 200,250,300	40	30	130	40	3/8"	27
HC-PC-50-40-*-S *Stroke- 200, 300	50	40	142	45	3/8"	30
HC-PC-60-50-*-S *Stroke- 300	60	50	156	50	3/8"	36

P - SINGLE ACTING CYLINDERS (PLUNGER TYPE) WITH CROSS HOLE



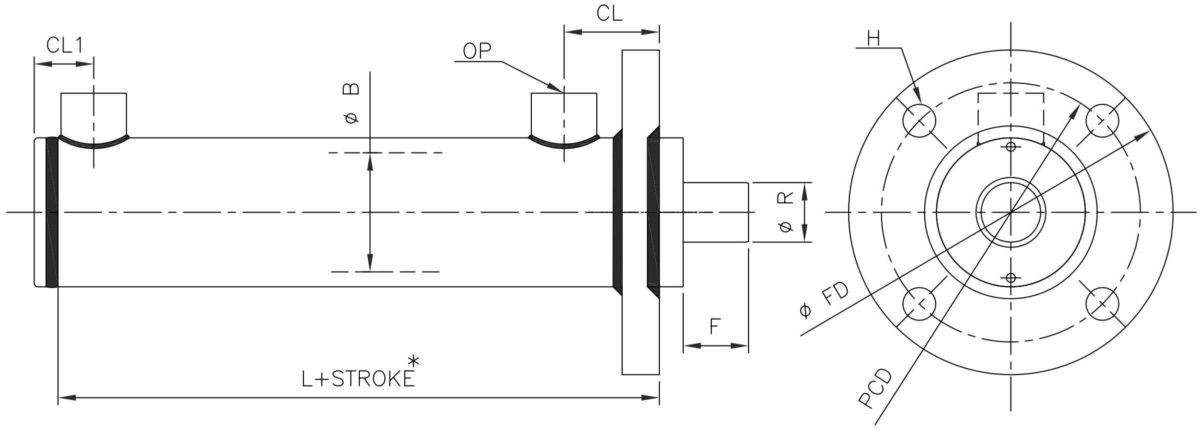
CODE	Ø B	Ø R	L	F	M	OP (bsp)	CL1	Ø B/P	Ø R1
HC-PC-30-25-*-P *Stroke-100,150,200,250,300	30	25	90	38	35	3/8"	40	14	22
HC-PC-40-30-*-P *Stroke- 200,250,300	40	30	100	42	37	3/8"	42	16.2	27
HC-PC-50-40-*-P *Stroke- 200,250,300	50	40	130	54	49	3/8"	47	23	37
HC-PC-60-50-*-P *Stroke- 300	60	50	460	74	65	3/8"	60	25.5	47

S - DOUBLE ACTING STANDARD CYLINDERS - BASIC TYPE



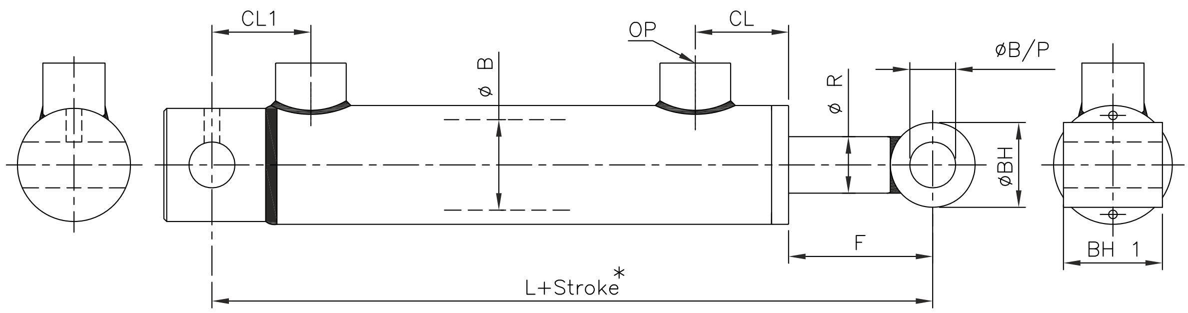
CODE	Ø B	Ø R	L	F	OP (bsp)	CL	CL1
HC-DA-32-20-*-S *Stroke-50,100,150,200,250,300	32	20	105	16	1/4"	33	20
HC-DA-40-20-*-S *Stroke- 100,150,200,250,300	40	20	130	22	1/4"	33	20
HC-DA-40-25-*-S *Stroke- 150,200,250,300	40	25	130	22	1/4"	40	23
HC-DA-50-25-*-S *Stroke-100,150,200,250,300	50	25	140	22	3/8"	43	26
HC-DA-50-30-*-S *Stroke-150,200,250,300	50	30	140	22	3/8"	43	26
HC-DA-60-30-*-S	60	30	160	23	3/8"	50	30
HC-DA-60-35-*-S *Stroke- 100,150,200,250,300		35					
HC-DA-60-40-*-S *Stroke- 200,250,300		40					
HC-DA-63-40-*-S *Stroke- 200,250,300	63	40	160	23	3/8"	50	30
HC-DA-70-35-*-S *Stroke-100,150,200,250,300	70	35 40	160	23	3/8"	50	33
HC-DA-80-40-*-S *Stroke- 200,250,300	80	40 50	180	25	1/2"	60	35
HC-DA-100-50-*-S *Stroke- 200,250,300	100	50 60	210	25	1/2"	82	38

L1 - FLANGE MOUNTED DOUBLE ACTING STANDARD CYLINDERS



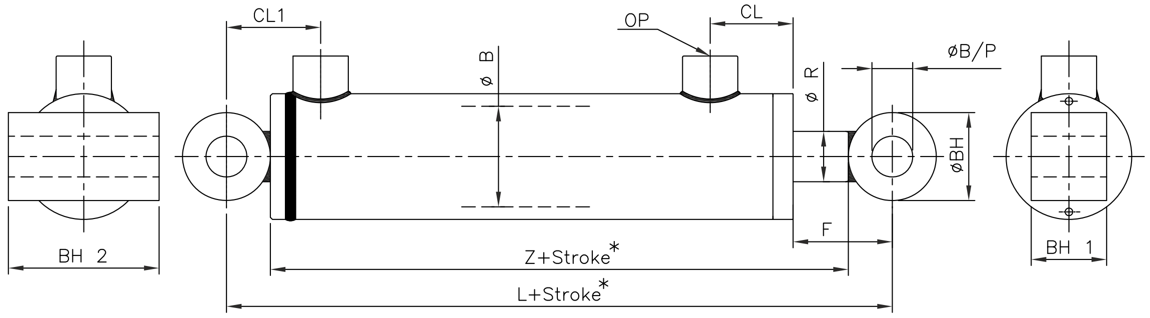
CODE	Ø B	Ø R	L	F	OP (bsp)	CL	CL1	Ø FD	PCD
HC-DA-40-20-*-L1	40	20	101	22	1/4"	32	20	109	87
HC-DA-40-25-*-L1		25							
*Stroke- 100,200,300									
HC-DA-50-25-*-L1	50	25	112	22	3/8"	35	26	128	105
HC-DA-50-30-*-L1		30							
*Stroke- 100,200,300									
HC-DA-60-30-*-L1	60	30	130	23	3/8"	40	30	142	117
HC-DA-60-35-*-L1		35							
*Stroke- 100,200,300									
HC-DA-60-40-*-L1		40							
*Stroke- 200,300									
HC-DA-70-35-*-L1	70	35	130	23	3/8"	40	33	162	127
*Stroke- 100,200,300									
HC-DA-70-40-*-L1		40	260						
*Stroke- 200,300									
HC-DA-80-40-*-L1	80	40	150	25	1/2"	50	35	181	149
HC-DA-80-50-*-L1			250						
*Stroke- 100,200,300									
HC-DA-100-50-*-L1	100	50	178	25	1/2"	70	38	194	162
*Stroke- 100,200,300									
HC-DA-100-60-*-L1		60							
*Stroke- 100,200,300									

B1 - ONE END BUSH MOUNTED DOUBLE ACTING CYLINDERS



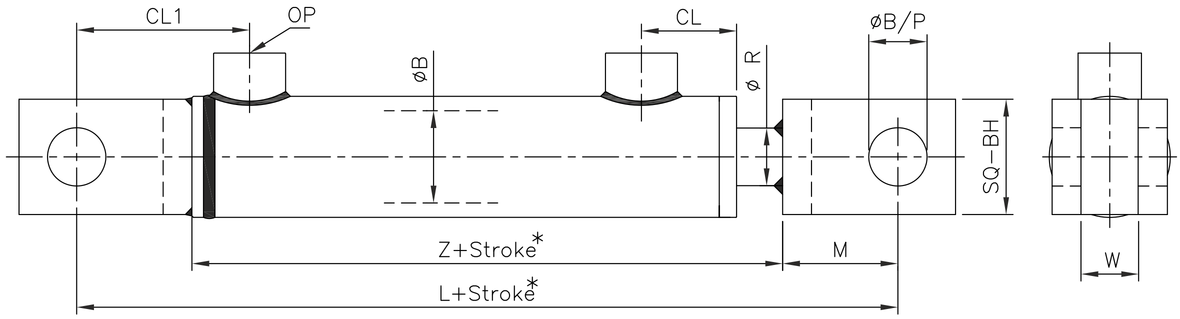
CODE	Ø B	Ø R	L	F	OP (bsp)	CL	CL1	Ø B/P	Ø BH	BH1
HC-DA-32-20-*-B1 *Stroke- 50,100,150,200,250,300	32	20	155	51	1/4"	33	35	16.2	30	35
HC-DA-40-25-*-B1 *Stroke- 100,150,200,250,300	40	25	170	42	3/8"	40	45	20.5	40	40
HC-DA-50-30-*-B1 *Stroke- 100,150,200,250,300	50	30	200	47	3/8"	43	58	25.5	50	45
HC-DA-60-30-*-B1 *Stroke- 100,150,200,250,300	60	30	200	48	3/8"	50	58	25.5	50	45
HC-DA-60-35-*-B1 *Stroke- 200,300		35								
HC-DA-70-40-*-B1 *Stroke- 200,250,300	70	40	210	48	3/8"	50	58	30.5	50	55
HC-DA-80-40-*-B1 *Stroke- 200,250,300	80	40	210	38	3/8"	60	58	30.5	50	55
HC-DA-100-50-*-B1 *Stroke- 200,250,300	100	50	225	46	3/8"	82	50	30.5	60	70

B2 - BOTH END BUSH MOUNTED DOUBLE ACTING CYLINDERS



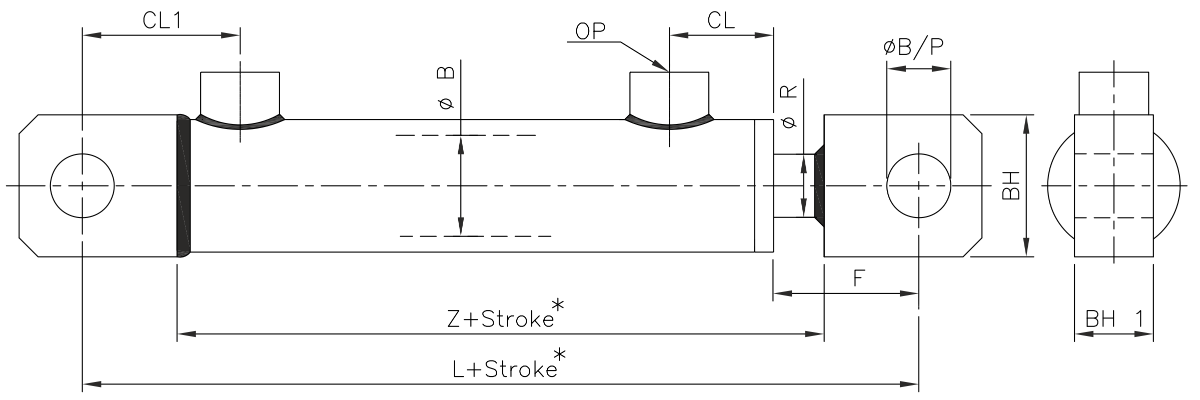
CODE	Ø B	Ø R	L	Z	F	OP(bsp)	CL	CL1	ØB/P	Ø BH	BH1	BH2
HC-DA-40-20-*-B2 *Stroke- 100,150,200,250,300	40	20	165	130	39.5	1/4"	33	40.5	16.25	35	30	60
HC-DA-40-25-*-B2 *Stroke- 150,200,250,300	40	25	165	130	39.5	1/4"	40	40.5	16.25	35	30	60
HC-DA-50-25-*-B2 *Stroke- 100,150,200,250,300	50	25	180	140	43	3/8"	43	46	20.25	40	40	70
HC-DA-50-30-*-B2 *Stroke- 150,200,250,300	50	30	180	140	43	3/8"	43	46	20.25	40	40	70
HC-DA-60-30-*-B2 *Stroke- 100,150,200,250,300		30										
HC-DA-60-35-*-B2 *Stroke- 100,150,200,250,300	60	35	210	160	48	3/8"	50	55	25.25	50	50	80
HC-DA-60-40-*-B2 *Stroke- 200,250,300		40										
HC-DA-63-40-*-B2 *Stroke- 200,250,300	63	40	210	160	48	3/8"	50	55	25.25	50	50	80
HC-DA-70-35-*-B2 *Stroke- 100,150,200,250,300	70	35	210	160	48	3/8"	50	58	25.25	50	50	90
HC-DA-80-40-*-B2		40										
HC-DA-80-50-*-B2	80	50	240	180	55	1/2"	60	65	30.25	60	60	110
*Stroke- 200,250,300												
HC-DA-100-50-*-B2 *Stroke- 200,250,300	100	50	280	210	60	1/2"	82	73	40.25	70	70	130
HC-DA-100-60-*-B2 *Stroke- 300		60										

F - BOTH END FORK MOUNTED DOUBLE ACTING CYLINDERS



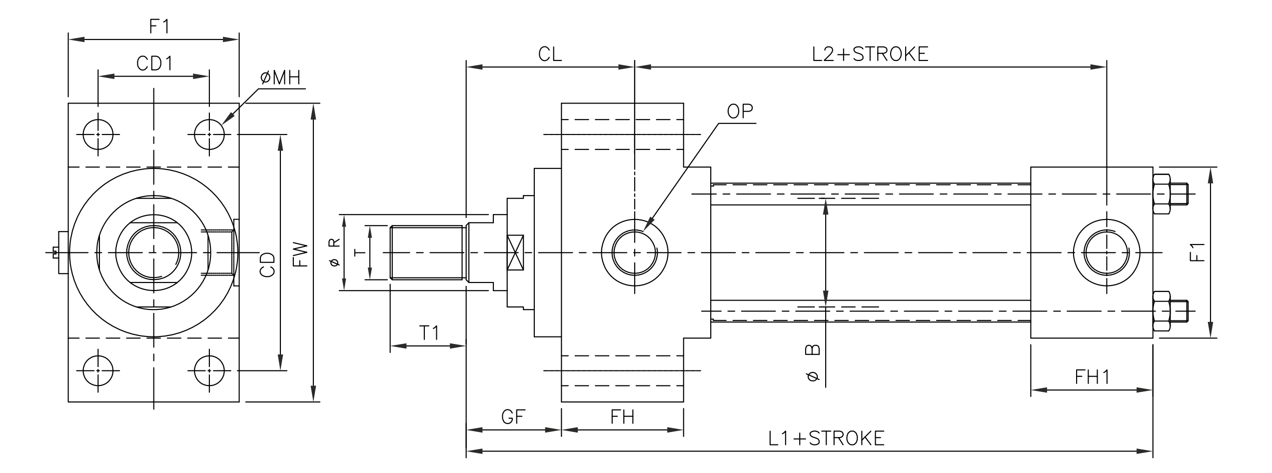
CODE	Ø B	Ø R	L	Z	OP (bsp)	M	CL	CL1	Ø B/P	SQ-BH	W
HC-DA-32-20-*-F *Stroke- 50,100,150,200,250,300	32	20	185	105	1/4"	40	33	60	20.25	40	20
HC-DA-40-20-*-F *Stroke- 100,150,200,250,300	40	20	210	130	1/4"	40	33	60	20.25	40	20
HC-DA-50-25-*-F *Stroke- 100,150,200,250,300	50	25	230	140	3/8"	45	43	71	25.25	50	25
HC-DA-50-30-*-F *Stroke- 150,200,250,300		30									
HC-DA-60-30-*-F *Stroke- 100,150,200,250,300	60	30	260	160	3/8"	50	50	80	30.25	60	30
HC-DA-60-35-*-F *Stroke- 100,150,200,250,300		35									
HC-DA-60-40-*-F *Stroke- 200,250,300		40									
HC-DA-63-40-*-F *Stroke- 200,250,300	63	40	260	160	3/8"	50	50	80	30.25	60	30
HC-DA-70-35-*-F *Stroke- 100,150,200,250,300	70	35	260	160	3/8"	50	50	83	30.25	60	30
HC-DA-70-40-*-F *Stroke- 200,250,300		40									
HC-DA-80-40-*-F *Stroke- 200,250,300	80	40	290	180	1/2"	55	60	90	35.25	70	35
HC-DA-80-50-*-F *Stroke- 200,250,300		50									

E - BOTH END ROD- EYE MOUNTED DOUBLE ACTING CYLINDERS



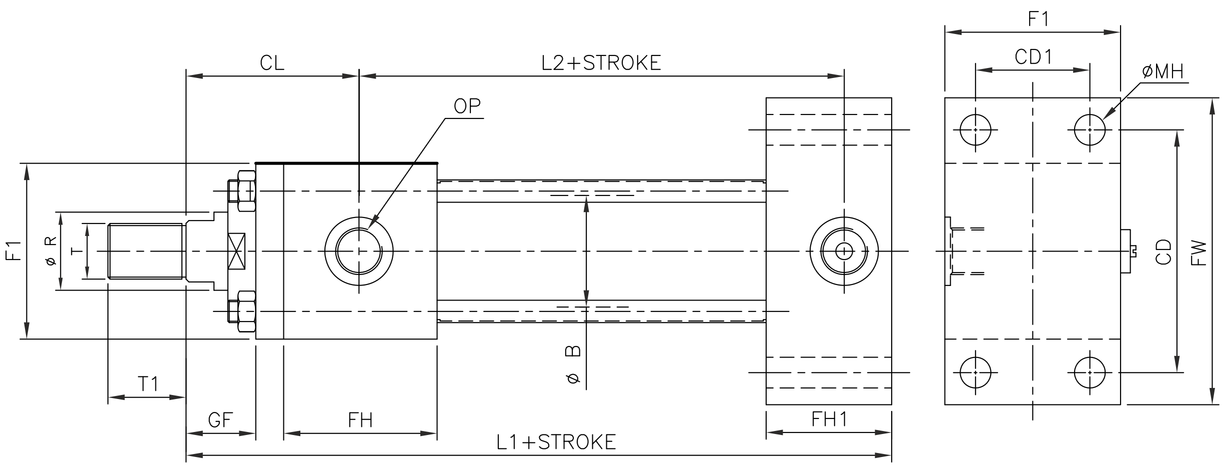
CODE	ØB	Ø R	L	Z	F	OP (bsp)	CL	CL1	Ø B/P	BH	BH1
HC-DA-32-20-*-E *Stroke- 50,100,150,200,250,300	32	20	165	105	46	1/4"	33	50	20.25	45	25
HC-DA-40-20-*-E *Stroke- 100,150,200,250,300	40	20	190	130	52	1/4"	33	50	25.25	50	25
HC-DA-40-25-*-E *Stroke- 150,200,250,300	40	25	190	130	52	1/4"	40	50	25.25	45	25
HC-DA-50-25-*-E *Stroke- 100,150,200,250,300	50	25	210	140	57	3/8"	43	61	25.25	50	30
HC-DA-50-30-*-E *Stroke- 150,200,250,300		30									
HC-DA-60-30-*-E *Stroke- 100,150,200,250,300	60	30	250	160	68	3/8"	50	76	30.25	60	35
HC-DA-60-35-*-E *Stroke- 100,150,200,250,300		35									
HC-DA-60-40-*-E *Stroke- 200,250,300		40									
HC-DA-63-40-*-E *Stroke- 200,250,300	63	40	250	160	68	3/8"	50	76	30.25	60	35
HC-DA-70-35-*-E *Stroke- 100,150,200,250,300	70	35	250	160	68	3/8"	50	78	30.25	60	35
HC-DA-70-40-*-E *Stroke- 200,250,300		40									
HC-DA-80-40-*-E *Stroke- 200,250,300	80	40	290	180	80	1/4"	60	90	30.5	70	40
HC-DA-80-50-*-E *Stroke- 200,250,300		50									

L1 - FRONT FLANGE MOUNTED TIE ROD DOUBLE ACTING CYLINDERS



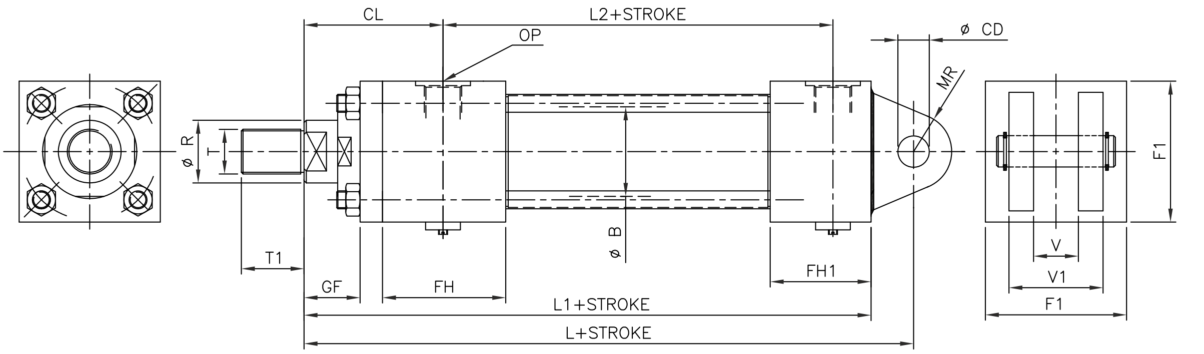
CODE	Ø B	Ø R	L1	L2	FH	FH1	OP (bsp)	CL	GF	T	T1	FW	F1	CD	CD1	ØMH
HCT-DA-40-28-*-L1 *Stroke- 100,150,200,250,300	40	28	153	74	45	45	3/8"	62	35	M20x1.5P	28	110	63	87	41	11
HCT-DA-50-28-*-L1		28														
HCT-DA-50-36-*-L1	50	36	159	76	45	45	1/2"	68	41	M20x1.5P	28	130	75	105	52	14
*Stroke- 100,150,200,250,300										M27x2P	36					
HCT-DA-63-28-*-L1		28								M20x1.5P	28					
HCT-DA-63-36-*-L1	63	36	168	80	45	45	1/2"	71	48	M27x2P	36	145	90	117	65	14
HCT-DA-63-45-*-L1		45								M33x2P	45					
*Stroke 150,200,250,300																
HCT-DA-80-36-*-L1		36								M27x2P	36					
HCT-DA-80-45-*-L1	80	45	190	93	50	52	3/4"	77	51	M33x2P	45	180	115	149	83	18
HCT-DA-80-56-*-L1		56								M42x2P	56					
*Stroke- 150,200,250,300																
HCT-DA-100-45-*-L1		45								M33x2P	45					
HCT-DA-100-56-*-L1	100	56	203	101	50	55	3/4"	82	57	M42x2P	56	200	130	162	97	18
HCT-DA-100-70-*-L1		70								M48x2P	70					
*Stroke- 200,250,300																

L2 - REAR FLANGE MOUNTED TIE ROD DOUBLE ACTING CYLINDERS



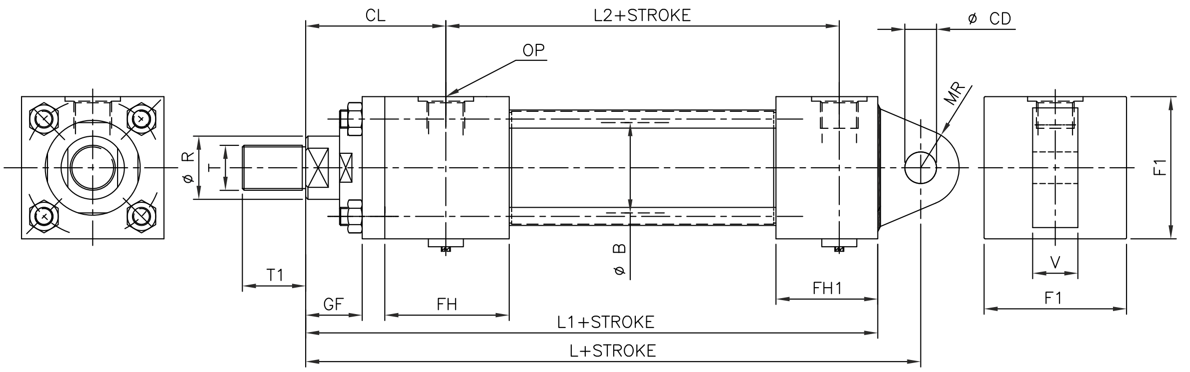
CODE	Ø B	Ø R	L1	L2	FH	FH1	OP (bsp)	CL	GF	T	T1	FW	F1	CD	CD1	ØMH
HCT-DA-40-28-*-L2 *Stroke- 100,150,200,250,300	40	28	153	74	55	45	3/8"	62	25	M20x1.5P	28	110	63	87	41	11
HCT-DA-50-28-*-L2 HCT-DA-50-36-*-L2 *Stroke- 100,150,200,250,300	50	28 36	159	76	55	45	1/2"	68	26	M20x1.5P M27x2P	28 36	130	75	105	52	14
HCT-DA-63-28-*-L2 HCT-DA-63-36-*-L2 HCT-DA-63-45-*-L2 *Stroke- 150,200,250,300	63	28 36 45	168	80	55	45	1/2"	71	33	M20x1.5P M27x2P M33x2P	28 36 45	145	90	117	65	14
HCT-DA-80-36-*-L2 HCT-DA-80-45-*-L2 HCT-DA-80-56-*-L2 *Stroke- 150,200,250,300	80	36 45 56	190	93	65	52	3/4"	77	31	M27x2P M33x2P M42x2P	36 45 56	180	115	149	83	18
HCT-DA-100-45-*-L2 HCT-DA-100-56-*-L2 HCT-DA-100-70-*-L2 *Stroke- 200,250,300	100	45 56 70	203	101	65	55	3/4"	82	35	M33x2P M42x2P M48x2P	45 56 70	200	130	162	97	18

C1 - FEMALE CLEVIS MOUNTED TIE ROD DOUBLE ACTING CYLINDERS



CODE	Ø B	Ø R	L	L1	L2	FH	FH1	OP (bsp)	CL	GF	T	T1	F1	Ø CD H9	V	V1	MR
HCT-DA-40-28-*-C1 *Stroke- 100,150,200,250,300	40	28	172	153	74	55	45	3/8"	62	25	M20x1.5P	28	63	14	20	42	17
HCT-DA-50-28-*-C1	50	28	191	159	76	55	45	1/2"	68	26	M20x1.5P	28	75	20	30	62	29
HCT-DA-50-36-*-C1		36									M27x2P	36					
*Stroke- 100,150,200,250,300																	
HCT-DA-63-28-*-C1	63	28	200	168	80	55	45	1/2"	71	33	M20x1.5P	28	90	20	30	62	29
HCT-DA-63-36-*-C1		36									M27x2P	36					
HCT-DA-63-45-*-C1		45									M33x2P	45					
*Stroke- 150,200,250,300																	
HCT-DA-80-36-*-C1	80	36	229	190	93	65	52	3/4"	77	31	M27x2P	36	115	28	40	83	34
HCT-DA-80-45-*-C1		45									M33x2P	45					
HCT-DA-80-56-*-C1		56									M42x2P	56					
*Stroke- 150,200,250,300																	
HCT-DA-100-45-*-C1	100	45	257	203	101	65	55	3/4"	82	35	M33x2P	45	130	36	50	103	50
HCT-DA-100-56-*-C1		56									M42x2P	56					
HCT-DA-100-70-*-C1		70									M48x2P	70					
*Stroke- 200,250,300																	

C2 - MALE CLEVIS MOUNTED TIE ROD DOUBLE ACTING CYLINDERS



CODE	Ø B	Ø R	L	L1	L2	FH	FH1	OP (b)	CL	GF	T	T1	F1	Ø CD H9	V	MR
HCT-DA-40-28-*-C2 *Stroke- 100,150,200,250,300	40	28	172	153	74	55	45	3/8"	62	25	M20x1.5P	28	63	14	20	17
HCT-DA-50-28-*-C2 HCT-DA-50-36-*-C2 *Stroke- 100,150,200,250,300	50	28 36	191	159	76	55	45	1/2"	68	26	M20x1.5P M27x2P	28 36	75	20	30	29
HCT-DA-63-28-*-C2 HCT-DA-63-36-*-C2 HCT-DA-63-45-*-C2 *Stroke- 150,200,250,300	63	28 36 45	200	168	80	55	45	1/2"	71	33	M20x1.5P M27x2P M33x2P	28 36 45	90	20	30	29
HCT-DA-80-36-*-C2 HCT-DA-80-45-*-C2 HCT DA 80 56 * C2 *Stroke- 150,200,250,300	80	36 45 56	229	190	93	65	52	3/4"	77	31	M27x2P M33x2P M42 2P	36 45 56	115	28	40	34
HCT-DA-100-45-*-C2 HCT-DA-100-56-*-C2 HCT-DA-100-70-*-C2 *Stroke- 200,250,300	100	45 56 70	257	203	101	65	55	3/4"	82	35	M33x2P M42x2P M48x2P	45 56 70	130	36	50	50

PUSH & PULL FORCE

CYLINDER BORE / ROD	PUSH & PULL FORCE IN VARIOUS BAR PRESSURE									
	50 bar	75 bar	100 bar	125 bar	160 bar	50 bar	75 bar	100 bar	125 bar	160 bar
	PUSH FORCE IN kN					PULL FORCE IN kN				
30/25	3.5	5.3	7.0	8.8	11.3	1.0	1.6	2.1	2.6	3.4
32/20	4.0	6.0	8.0	10.0	12.8	2.4	3.6	4.9	6.1	7.8
40/20	6.3	9.5	12.6	15.8	20.1	4.7	7.0	9.4	11.7	15
40/25	6.3	9.5	12.6	15.8	20.1	3.8	5.7	7.7	9.6	12.2
40/30	6.3	9.5	12.6	15.8	20.1	2.7	8.4	5.4	6.8	8.7
50/25	9.8	14.7	19.6	24.5	31.4	7.3	11	14.7	18.3	23.5
50/30	9.8	14.7	19.6	24.5	31.4	6.3	9.4	12.6	15.7	20.1
50/40	9.8	14.7	19.6	24.5	31.4	3.5	5.3	7.0	8.8	11.3
60/30	14.2	21.2	28.3	35.4	45.2	10.6	15.9	21.2	26.5	33.9
60/35	14.2	21.2	28.3	35.4	45.2	9.3	14	18.7	23.3	29.8
60/40	14.2	21.2	28.3	35.4	45.2	7.8	11.7	15.7	19.6	25.1
60/50	14.2	21.2	28.3	35.4	45.2	4.3	6.4	8.6	10.7	13.8
63/40	15.5	23.3	31.1	38.9	49.8	9.3	13.9	18.6	23.2	29.7
70/35	19.2	28.8	38.5	48.1	61.5	14.4	21.6	28.9	36.1	46.1
70/40	19.2	28.8	38.5	18.1	61.5	12.9	19.4	25.9	32.3	41.4
80/40	25.1	37.7	50.3	62.8	80.4	18.8	28.2	37.7	47.1	60.3
80/50	25.1	37.7	50.3	62.8	80.4	15.3	22.9	306	38.2	49
100/50	39.2	58.8	78.5	98.1	125.6	29.4	44.1	58.9	73.6	94.2
100/60	39.2	58.8	78.5	98.1	125.6	25.1	37.6	50.2	62.8	80.4

MAINTENANCE & TROUBLE SHOOTING

a. **External Leakage.** If a cylinder's end caps are leaking, tighten them. If the leaks still do not stop, replace the gasket. If a cylinder leaks around a piston rod, replace the packing. Make sure that a seal lip faces toward the pressure oil. If a seal continues to leak, check points e through I.

b. **Internal Leakage.** Leakage past the piston seals inside a cylinder can cause sluggish movement or settling under load. Piston leakage can be caused by worn piston seals or rings or scored cylinder walls. The latter may be caused by dirt and grit in the oil.

c. **Creeping Cylinder.** If a cylinder creeps when stopped in midstroke, check for internal leakage (point b). Another cause could be a worn control valve.

d. **Sluggish Operation.** Air in a cylinder is the most common cause of sluggish action. Internal leakage in a cylinder is another cause. If an action is sluggish when starting up a system, but speeds up when a system is warm, check for oil of too high a viscosity. If a cylinder is still sluggish after these checks, test the whole circuit for worn components.

e. **Loose Mounting.** Pivot points and mounts may be loose. The bolts or pins may need to be tightened, or they may be worn out. Too much slop or float in a cylinder's mountings damages the piston-rod seals. Periodically check all the cylinders for loose mountings.

f. **Misalignment.** Piston rods must work in-line at all times. If they are side-loaded, the piston rods will be galled and the packings will be damaged causing leaks. Eventually, the piston rods may be bent or the welds broken.

g. **Lack of Lubrication.** If a piston rod has no lubrication, a rod packing could seize, which would result in an erratic stroke, especially on single-acting cylinders.

h. **Abrasives on a Piston Rod.** When a piston rod extends, it can pick up dirt and other material. When it retracts, it carries the grit into a cylinder, damaging a rod seal. For this reason, rod wipers are often used at the rod end of a cylinder to clean the rod as it retracts. Rubber boots are also used over the end of a cylinder in some cases. Piston rods rusting is another problem. When storing cylinders, always retract the piston rods to protect them. If you cannot retract them, coat them with grease.

I. **Burrs on a Piston Rod.** Exposed piston rods can be damaged by impact with hard objects. If a smooth surface of a rod is marred, a rod seal may be damaged. Clean the burrs on a rod immediately, using crocus cloth. Some rods are chrome-plated to resist wear. Replace the seals after restoring a rod surface.

j. **Air Vents.** Single-acting cylinders (except ram types) must have an air vent in the dry side of a cylinder. To prevent dirt from getting in, use different filter devices. Most are self-cleaning, but inspect them periodically to ensure that they operate properly.

NOTE: When repairing a cylinder, replace all the seals and packings before reassembly.

Trouble Shooting Guidelines

Cylinder failure can occur for many reasons. This cylinder Trouble Shooting Guideline can be used to analyze the potential reasons for cylinder failure and establish corrective actions

Symptom	Possible Causes	Remedies
Piston rod scored	Contamination of the oil Contamination of the gland bearing	Flush entire hydraulic system Change all filters
Cylinder bore scored	Contamination of the oil Piston bearing failure Damage cylinder barrel	Flush entire hydraulic system Change all filters Check piston head bearing Replace cylinder barrel
Bent piston rod	Operation problem: possible overload Outside impact Under specification of piston rod	Check operation parameters Increase rod specification
Split weld on base and ports	Shock loading Poor original weld	Check operation parameters Machine off & re-weld correctly
Rod worn on one side	Lack of bearing support Too much side load Rod too small	Increase bearing area Change operation Increase rod size Incorporate external guides
Gland blown out	Possible intensification of internal pressure Threads worn Deformation of cylinder tube	Check hydraulic valve operation Check threads Check tube for ovality & thread wear
Leaking from around the gland O.D.	o-ring failure cracked gland	Check clearances Fit back-up ring to o-ring Crack test gland
Piston rod pitting	Corrosion Piston rod damage	Upgrade to anti-corrosive material Specification. Protect rod from weather. Check rod for nicks or scratches that could cause seal damage or allow oil leakage.
Barrel internally corroded	Water in the oil	Change oil Protect from water ingress

TROUBLE SHOOTING

Symptom	Possible Causes	Remedies
Piston rod will not retract	Internal leakage Port blockage	Strip and inspect piston head & tube Check ports and pipes for blockages Check valve operation
Regular seal leakage	Incorrect seals fitted Seal grooves corroded or marked Air trapped in the oil Incorrect metalwork clearances Contamination of the oil Seals fitted incorrectly Seal housing sizes incorrect Rod seal leaking	Check seal compatibility with conditions Check all seal grooves for marking & corrosion Make sure the cylinder is bled correctly Check oil for contamination Check condition of all running surfaces Replace the seal, If contamination caused seal to wear may be caused by external as well internal contaminants.
Cylinder is getting hot	Internal leakage	Test for internal pressure bypass Strip cylinder and inspect piston head & bore of the tube Remove the piston and check the internal seal
Rod kick up at end of stroke	Internal bearing wear Incorrect alignment of piston to gland	Strip and inspect piston head & gland bearings Check alignment of piston to the gland
Loss of power	Internal leakage Hydraulic pump failure Valve settings incorrect	Strip and inspect piston head & tube Check pump & valves
Slip stick or juddering	Lack of lubricant for the gland bearing & seals	Rough surface finishes on rod or tube Lack of hydraulic pressure Vacuum or air entrapment Bearing tolerances too tight Seals too tight
Erratic Action	Pilot control pressure low Air in system	Control line may be too small or melting choke valve not working properly. Bleed air and check for leaks. Check to see that oil intake is well below the surface of the oil in the reservoir. Check pump packing and line connections on the intake side by pouring hydraulic oil over suspected leak. If the noise stops, the leak has been located. Tighten joints or change packing or gaskets packing or gaskets where necessary.

General Notes

Maximum pressure – Microtact Hydraulic Cylinders are designed in accordance with standards for a dynamic continuous pressure of 160 bar for all mounting types. Under certain conditions, a higher pressure may be permitted. To confirm this , we require a detailed application, description on the basis of a technical data of a regenerative circuit or a meter-out throttle, pressure intensification must be taken into account.

Minimum pressure – Depending on the application, a certain minimum pressure is required to ensure correct operation of the cylinder. Under no -load condition, a minimum pressure of 10 bar is recommended for single rod cylinders. In the case of lower pressure, please consult us.

Installation of cylinder –The cylinder may only be installed or the piston rod end screwed into the machine part or into a self-aligning clevis while the cylinder is depressurized.

Hydraulic Cylinder Formula

Calculate	Formula	Symbolic
Cylinder area (In Sq. Inch)	Area= π Radius^2 (Inches)	Area= πr^2
	Area= (P/4) x Diameter^2 (Inches)	A = $(\pi D^2)/4$ or A= $0.785D^2$
Cylinder Force (In Pounds, Push or Pull)	Area=Pressure (psi) x Net Area (sq. inch)	F = psi x A or F = PA
Cylinder Velocity or Speed (In Feet/Second)	Velocity = 231xFlow Rate (GPM) ÷ 12 x 60 x Net Area (sq. in.)	V = 231 Q÷720A or V = 0.3208 Q ÷ A
Cylinder Volume Capacity (In Gallons of Fluid)	Volume = π x Radius^2 (in) x Stroke (in) ÷ 231	V = $(\pi r^2 L)$ ÷ 231
	Volume = Net Area (sq. in) x stroke (in.) ÷ 231	V = (AL) ÷ 231
Cylinder Flow Rate (In Gallons / Minute)	Flow Rate = 12 x 60 x Velocity (Ft / Sec.) x Net Area (sq. in.) / 231	Q = (270vA) 231 or Q = 3.117vA

Hydraulic Formulas

Horsepower :

Horsepower = $\frac{GPM \times psi}{1714}$

Torque:

Torque (lb. in.)= $\frac{CU\ IN./REV. \times psi}{2}$

Torque (lb. in.) = $\frac{HP \times 63025}{RPM}$

Flow :

Flow (gpm) = $\frac{CU\ IN./REV. \times RPM}{231}$

CONVERSION FACTORS:

1 hp = 33,000 ft. lbs. per minute
1 hp = 42.4 btu per minute
1 hp = 0.746 kwhr (kilowatt hours)
1 U. S. gallon = 231 cubic inches.

Pipe volume varies as the square of the diameter; volume in gallons = $0.0034\ D^2L$

where: D = inside diameter of pipe in inches
L = length in inches.
Velocity in feet per second = $\frac{0.408 \times flow\ (gpm)}{D2}$

where: D = inside diameter of pipe in inches.

Atmospheric pressure at sea level = 14.7 psi
Atmospheric pressure decreases approximately 0.41 psi for each one thousand feet of elevation up to 23,000 feet.

Pressure (psi) = feet head x 0.433 x specific gravity.
Specific gravity of oil is approximately 0.85.
Thermal expansion of oil is approximately 1 cu. in. per 1 gal. per 10°F rise in temperature.

Overall Efficiency :

Overall efficiency = $\frac{OUTPUT\ HP}{INPUT\ HP} \times 100$

Volumetric Efficiency:

Volumetric efficiency (pump) = $\frac{OUTPUT\ GPM}{THEORETICAL\ GPM} \times 100$

Volumetric efficiency (motor) = $\frac{THEORETICAL\ GPM}{INPUT\ GPM} \times 100$

Practical hydraulic formulae

Geometric flow rate (l/min) (pumps and motors) = $\frac{\text{Geometric displacement } (cm^3/r) \times \text{shaft speed } (r/min)}{1000}$

Theoretical shaft torque (Nm) (pumps and motors) = $\frac{\text{Geometric displacement } (cm^3/r) \times \text{pressure (bar)}}{20\pi}$

Shaft power (kW) = $\frac{\text{Torque at shaft (Nm)} \times \text{shaft speed } (r/min)}{9550}$

Hydraulic power (kW) = $\frac{\text{Flow rate } (l/min) \times \text{pressure (bar)}}{600}$

Heat equivalent of hydraulic power (kJ/min) = $\frac{\text{Flow rate } (l/min) \times \text{pressure (bar)}}{10}$

Geometric flow rate (l/min) (cylinders) = $\frac{\text{Effective area } (cm^2) \times \text{piston speed } (m/min)}{10}$

Theoretical force (N) (cylinders) = Effective area (cm^2) x pressure (bar) x 10

Velocity of fluid in pipe (m/s) = $\frac{\text{Flow rate } (l/min) \times 21{,}22}{D^2}$

where D = inside diameter of pipe in millimeters.

Conversion Factors

To convert → Into → Multiply by

Into ← To convert → Divide by

Unit	Symbol	Unit	Symbol	Factor
Atmospheres	Atm	bar	bar	1.013250
BTU / hour	Btu/h	kilowatts	kW	0.293071 x 10^{-3}
Cubic centimeters	cm^3	liters	L	0.001
Cubic centimeters	cm^3	milliliters	ml	1.0
Cubic feet	ft^3	cubic meters	m^3	0.0283168
Cubic feet	ft^3	litres	L	28.3161
Cubic inches	in^3	cubic centimeters	cm^3	16.3871
Cubic inches	in^3	liters	L	0.0163866
Degrees (angle)	^{0}	radians	rad	0.0174533
Fahrenheit	^0F	Celsius	^0C	$^0C = 5(^0F - 32)/9$
Feet	ft	meters	m	0.3048
Feet of water	ftH_20	bar	bar	0.0298907
Fluid ounces. UK	Uk fl oz	cubic centimeters	cm^3	28.413
Fluid ounces. US	Us fl oz	cubic centimeters	cm^3	29.5735
Foot pounds f.	ft lbf	joules	J	1.35582
Foot pounds / minute	ft lbf/min	watts	W	81.3492
Gallons. UK	UK gal	liters	L	4.54596
Gallons. US	US gal	liters	L	3.78531
Horsepower	hp	kilowatts	kW	0.7457
Inches of mercury	in Hg	millibar	mbar	33.8639
Inches of water	in H_2O	millibar	mbar	2.49089
Inches	in	centimeters	cm	2.54
Inches	in	millimeters	mm	25.4
Kilogramm force	kgf	newtons	N	9.80665
Kilogramm f. meter	kgf m	newton meters	Nm	9.80665
Kilogramm f./sq centimeter	kgf/cm^2	bar	bar	0.980665
Kilopascals	kPa	bar	bar	0.01
Kilopound	kp	newtons	N	9.80665
Kilopound meters	kp m	newton meters	Nm	9.80665
Kilopound/square centimeter	kp/cm^2	bar	bar	0.980665
Microinches	in	microns	*μm*	0.0254
Millimetres of mercury	mm hg	millibar	mbar	1.33322
Millimeters of water	mm H_2O	millibar	mbar	0.09806
Newtons/square centimeter	N/cm^2	bar	bar	0.1
Newtons/square meter	N/m^2	bar	bar	10^{-5}
Pascals (newtons/sq meter)	Pa	bar	bar	10^{-5}
Pounds (mass)	lb	kilograms	kg	0.4536
Pounds / cubic foot	lb/ft^3	kilograms/ cubic meter	kg/m^3	16.0185
Pounds / cubic inch	lb/in^3	kilograms/ cubic centimeter	kg/cm^3	0.0276799
Pounds force	lbf	newtons	N	4.4822
Pounds f. feet	lbf ft	newton meters	Nm	1.35582
Pounds f. inches	lbf in	newton meters	Nm	0.112985
Pounds f. / square inch	lbf/in^2	bar	bar	0.06894
Revolutions/minute	r/min	radians/second	rad/s	0.104720
Square feet	ft^2	square meters	m^2	0.092903
Square inches	in^2	square meters	m^2	6.4516 x 10^{-4}
Square inches	in^2	square centimeters	cm^2	6.4516

Fluid power equipvalents
1 bar = 10^5 N/m^2
1 bar = 10 N/cm^2 = 1 dN/mm^2
1 pascal = 1 N/m
1 litre = 1000 Cm^3
1 centistoke (cSt) = 1 mm^2/S
1 joule = 1 wattsecond (Ws)
Hertz (Hz) = cycles/second

Prefixes denoting decimal multiples or sub-multiples

For multiples

x10^{12}	tera	T
x10^9	giga	G
x10^6	mega	M
x10^3	kilo	k
x10^2	hecto	h
x10	deca	da

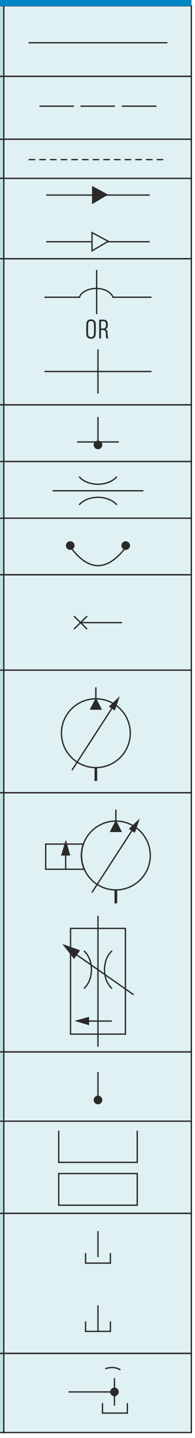
For submultiples

x10^{-1}	deci	d
x10^{-2}	centi	c
x10^{-3}	milli	m
x10^{-6}	micro	**μ**
x10^{-9}	nano	n
x10^{-12}	pico	p
x10^{-15}	femto	f
x10^{-18}	atto	a

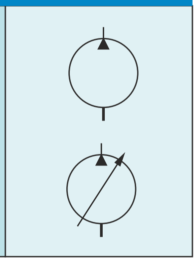
microtact hydraulic

ISO/ANSI BASIC SYMBOLS

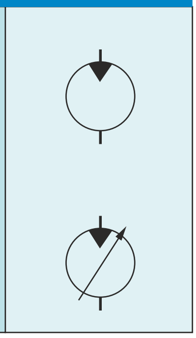
For Fluid Power Equipments And Systems



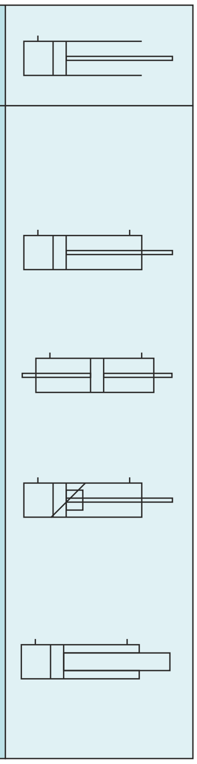
Lines	
Line, Working (Main)	
Line, Pilot (For Control)	
Line, Liquid Drain	
Hydraulic Flow, Direction of Pneumatic	
Lines Crossing	
Lines Joining	
Lines With Fixed Restriction	
Line, Flexible	
Station, Testing, Measurement or Power Take-Off	
Variable Component (run arrow through symbol at 45°)	
Pressure Compensated Units (arrow parallel to short side of symbol)	
Temperature cause or Effect	
Vented Reservoir Pressurized	
Line, To Reservoir Above Fluid Level Below Fluid Level	
Vented Manifold	



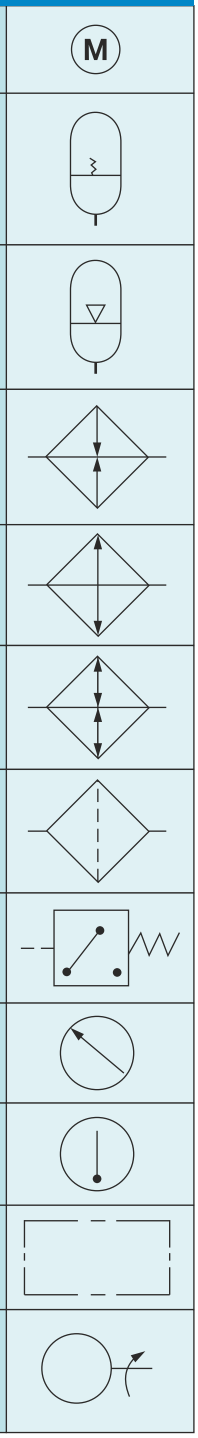
Pumps	
Hydraulic Pump Fixed Displacement	
Variable Displacement	



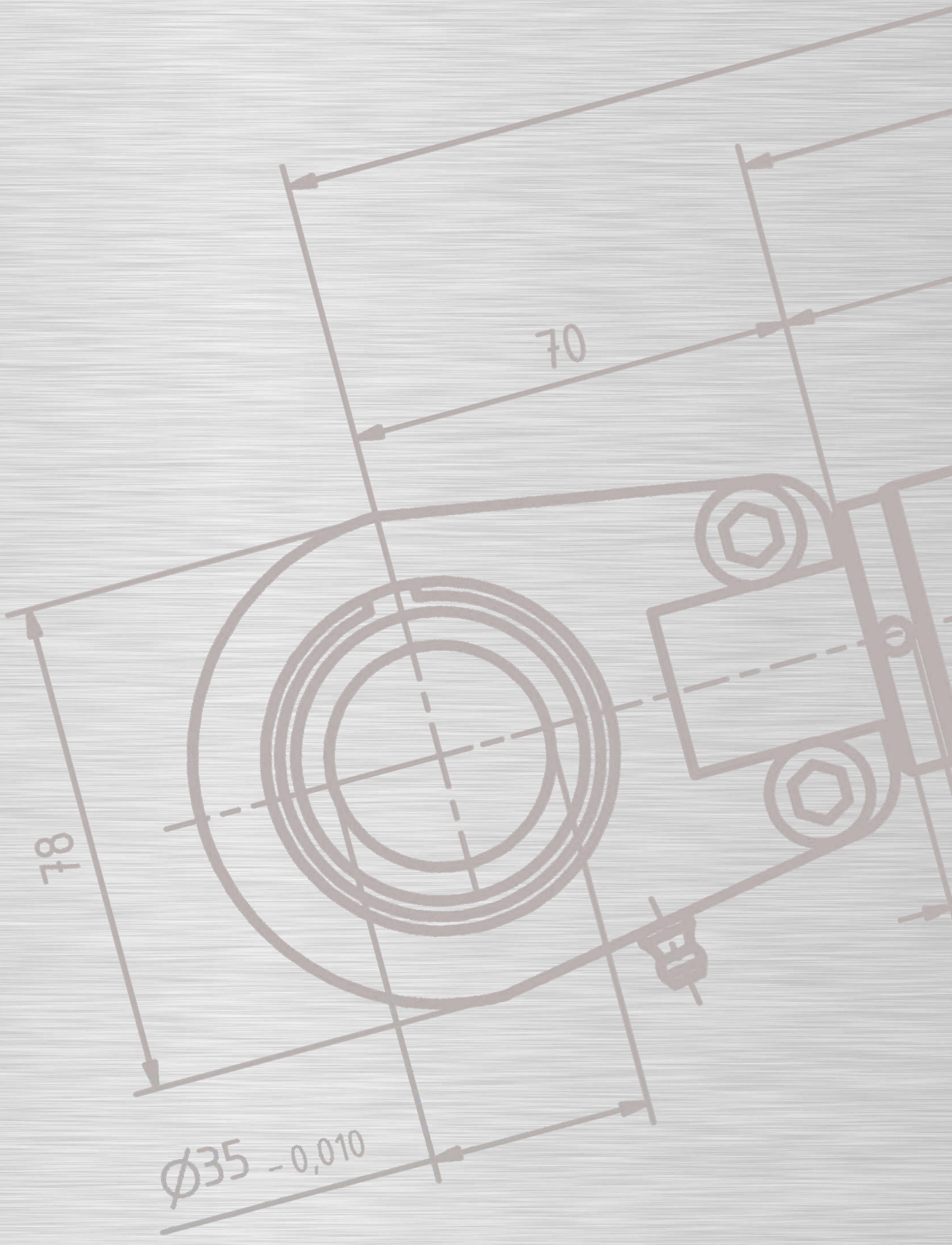
Motors and Cylinders	
Hydraulic Motor Fixed Displacement	
Variable Displacement	



Cylinder, Single Acting	
Cylinder, Double Acting	
Single End Rod	
Double End Rod	
Adjustable Cushion advance Only	
Differential Piston	



Miscellaneous Units	
Electric Motor	
Accumulator, Spring Loaded	
Accumulator, Gas Charged	
Heater	
Cooler	
Temperature Controller	
Filter, Strainer	
Pressure Switch	
Pressure Indicator	
Temperature Indicator	
Component Enclosure	
Direction of Shaft Rotation (assume arrow on near side of shaft)	



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