

Steering Units

STEERING UNITS AND ACCESSORIES

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APPLICATION SPECIFICATION AND GENERAL INFORMATION

APPLICATION

(SIZING AND STEERING SYSTEM DESIGN PROCESS)

STEP ONE:

Calculate approximate kingpin torque (M_L).

$$M_L = G \times \mu \sqrt{\frac{B^2}{8} + \ell^2}$$

Note: Double M_L if steered wheels are powered.

M_L = Kingpin torque in [daNm].

G = Vehicle weight on steered axle in [daN] (use maximum estimated overload weight).

μ = Coefficient of friction (use Chart No 1, dimensionless) determined by ℓ / B (see Diagram No 1).

B = Nominal width of tyre print [m] (see Diagram No 1).

ℓ = Kingpin offset. The distance between tyre centerline intersection at ground and kingpins centerline intersection at ground in [m] (see Diagram No 1).

Chart No 1

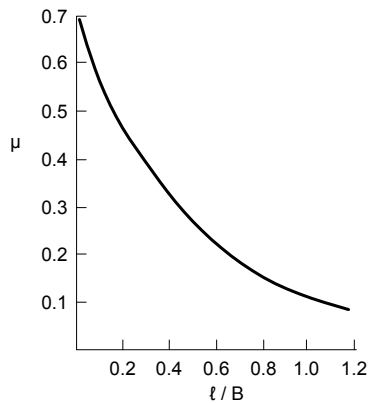


Diagram No 1

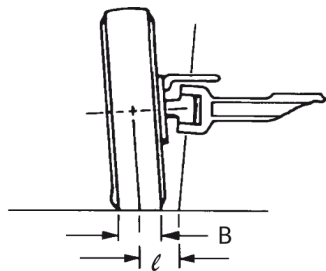
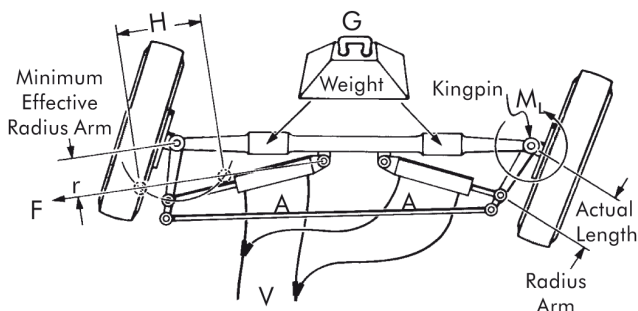


Diagram No 2



STEP TWO:

Calculate approximate cylinder; force-area-stroke-volume.

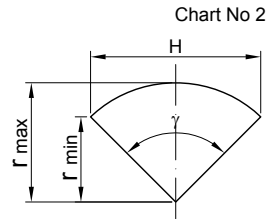
FORCE $F = \frac{M_L}{r}$

F = Force required [daN] to steer axle.

M_L = Kingpin torque in [daNm] from step one. Double M_L if steered wheels are powered.

r = Effective radius Arm [mm] is the minimum distance from the centerline of the cylinders minimum and maximum stroke points parallel to the kingpin center pivot. This is not the physical length of the radius Arm (see Diagram No 2 and Chart No 2).

$$r_{\min} = r_{\max} \times \cos \frac{\gamma}{2}$$



STROKE

H = Stroke [cm].

Calculate stroke of cylinder using Diagram No 2 and Chart No 2 as shavt.

$$H = 2 r_{\max} \times \sin \frac{\gamma}{2}$$

AREA $A = \frac{F}{\Delta P}$

A = Cylinder area for axle cylinder set [cm²].

F = Force required from step two force formula [daN].

ΔP = Hydraulic pressure [bar] use following percentage of relief valve setting by amount of load on steered axle. Severe load 25% - medium load 55% - no load 75%.

DIAMETER

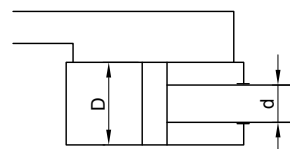
After the cylinder set area is determined, the cylinder diameter can be calculated.

D = Inside diameter of cylinder [cm].

d = Road diameter of cylinder [cm].

Choose type of cylinder arrangement and formula shown for that type.

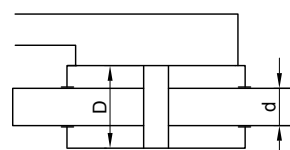
Differential Cylinder



$$D = \sqrt{\frac{4A}{\pi} + d^2}$$

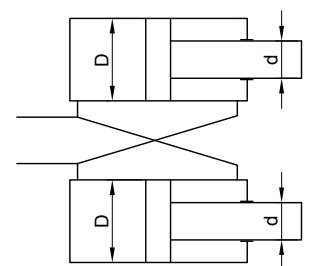
Note: $\left(\frac{d}{D}\right)^2 \leq 0,15$

Balanced Cylinder



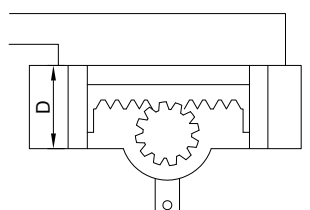
$$D = \sqrt{\frac{4A}{\pi} + d^2}$$

Cross Connected Cylinders



$$D = \sqrt{\frac{2A}{\pi} + \frac{d^2}{2}}$$

Opposed Cylinder



$$D = \sqrt{\frac{4A}{\pi}}$$



VOLUME

$$V = H \times A$$

V = Volume. The total amount of oil required to move the cylinder rod(s) through the entire stroke [cm³].

H = Stroke [cm].

A = Area [cm²].

Note: For differential cylinders it is important to calculate average cylinder volume for step three using below formula.

$$V_{avg} = H \times \frac{\pi}{4} \left(D^2 - \frac{d^2}{2} \right)$$

STEP THREE:

Selecting displacement of hydrostatic steering unit.

At this point determine number of steering wheel revolutions desired for your application to steer the wheels from one side to the other (lock to lock). Depending on the type of vehicle and its use, this will vary from 3 to 5 turns

DISPLACEMENT

$$V_D = \frac{V}{n}$$

V_D = Displacement [cm³] per rev.

V = Volume of oil [cm³].

n = Steering wheel turns lock to lock.

After completing the above displacement calculation, choose the closest standard hydrostatic steering unit in displacement size that incorporates circuitry you require.

Recalculate the number of steering wheel turns using the displacement of selected standard hydrostatic steering unit outlined above. Use the formula shown below.

$$n = \frac{V}{V_D}$$

V = Volume of oil [cm³].

n = Steering wheel turns lock to lock.

Note: For differential cylinders applications the cylinder volume will be different for left and right turns - this means the value n (steering wheel turns lock to lock) will vary when turning to the left or right.

STEP FOUR:

Calculate approximate minimum and maximum steering circuit flow requirements.

$$Q = \frac{V_D \times N}{\text{Unit Conversion for Imperial or [1000] Metric}}$$

Q = Steering circuit flow [l/min].

V_D = Unit displacement [cm³] per rev.

N = Steering wheel input speed [rpm] (min⁻¹).

Recommended steering speed is 50 to 100 rpm.

Many variables are involved in sizing the pump. We suggest that the manufacturer test and evaluate for desired performance.

GENERAL INFORMATION

FLUID DATA:

To insure maximum performance and life of the Hydrostatic steering units, use premium quality hydraulic oils. Fluids with effective quantities of anti-wear agents or additives are highly recommended. If using synthetic fluids consult the factory for alternative seal materials.

Viscosity

Viscosity at normal operating temperature should be approx. 20 mm²/s.

Viscosity range 10 - 300 mm²/s.

Temperature

Normal operating temperature range from +30°C to +60°C.

Minimum operating temperature -40°C.

Maximum operating temperature +80°C.

Note: Extended periods of operation at temperature of 60 C and above will greatly reduce life of oil due to oxidation and shorten life of product.

Filtration

The maximum degree of contamination per ISO 4406 or CETOP RP is:

20/17 open center units

19/16 closed center and load sensing

16/12 priority valves

Return line filtration of 25 µm nominal (40 - 50 µm absolute) or finer is recommended.

In extremely dusty conditions filtration of 10 µm absolute should be used.

START UP

All air must be purged from system before operating unit. It is extremely important that any external lines or units with load sensing or priority feature be completely bled. Lines going to and from cylinders as well as lines to and from pump be purged of all air. It is recommended that a 10 - 15 mm filter be used between pump and steering unit before start up.

MOUNTING UNITS

All hydrostatic steering units should be installed for ease of access. It is recommended that the steering unit be located outside the vehicle cabin. It is important that no radial axial load be applied to the hydrostatic steering unit input shaft. Any or all radial and axial loads must be absorbed by the steering column or other operating device supplied by the vehicle manufacture.

Ports on the steering cylinder(s) should face upward to prevent damage.

During installation of the hydrostatic steering unit, cleanliness is of the utmost importance. Pipe plugs should be left in place during mounting and only removed when hydraulic lines are to be connected.

TORQUE TIGHTENING VALUES

FLUID CONNECTIONS

Fluid connection	metal edge	Max. tightening torque daNm		
		copper washer	aluminum washer	O - ring
7/16 - 20 UNF				2
9/16 - 18 UNF				5
3/4 - 16 UNF				6
7/8 - 14 UNF				7
G 1/4	4	2	3	
G 3/8	6	2	5	
G 1/2	10	3	8	
G 3/4	16	5	13	
M 10 x 1	4	2	3	
M 18 x 1,5	7	2	5	
M 22 x 1,5	10	3	8	

MOUNTING BOLTS

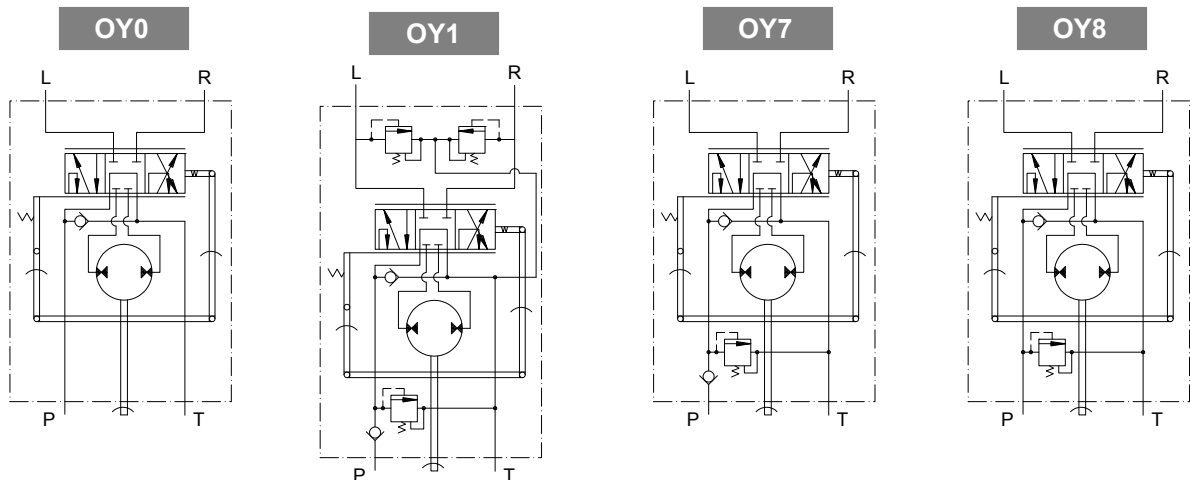
Mounting bolts	Tightening torque daNm
3/8 - 16 UNC	3,0 ± 0,5
M 10 x 1	6,5 ± 0,5
M 10	3,0 ± 0,5

HYDRAULIC STEERING UNITS TYPE OY



Series OY hydraulic steering unit is the integrated orbital steering unit with 4/5 tooth structure. This kind of steering can have check valve, relief valve and shock valve, the structure is small and exquisite, mounting data corresponds to international standard. This kind of steering unit is widely used in mini vehicles, such as mini forklift, mini tractor (and other agricultural machinery), mini earthmoving machinery, mini municipal vehicle, etc. It can obtain more steering output torque through input of less power, with features of easy, flexible and reliable operation.

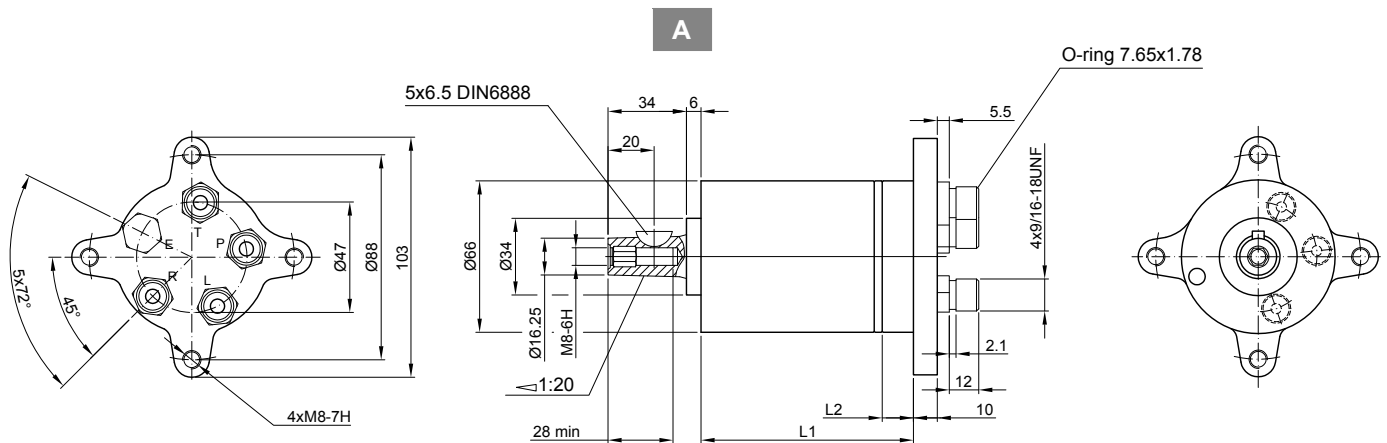
FUNCTION CODE



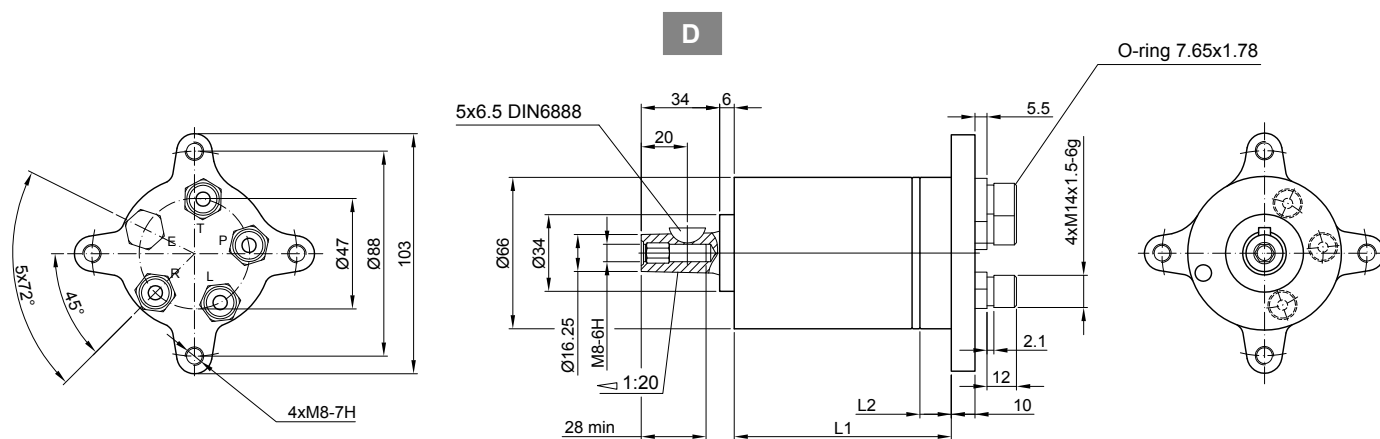
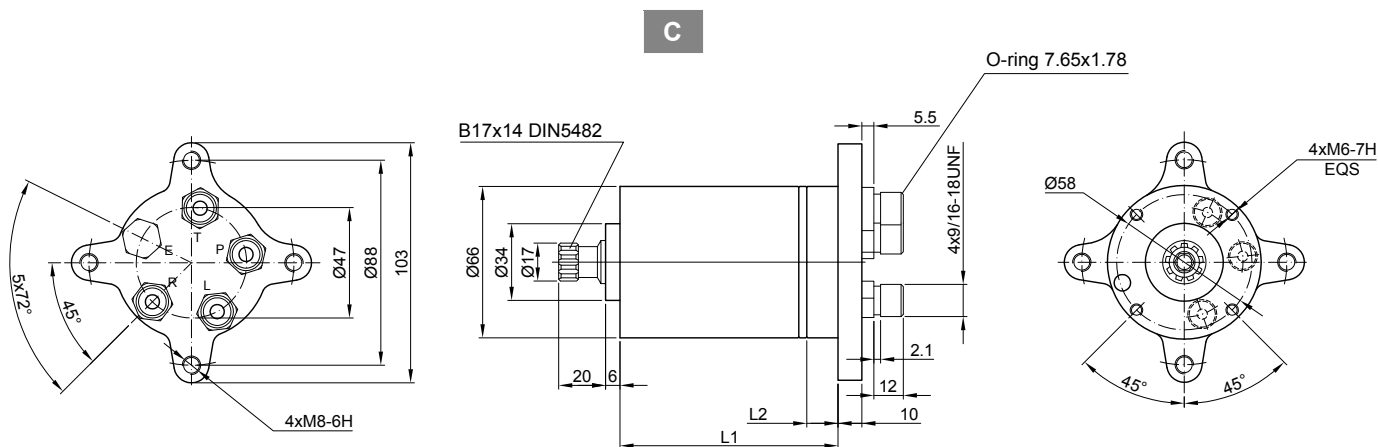
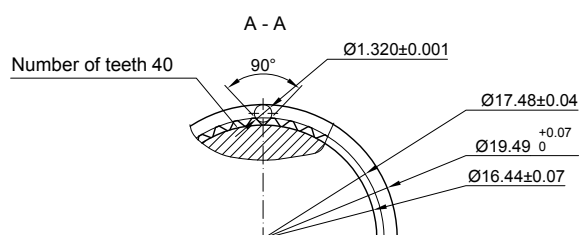
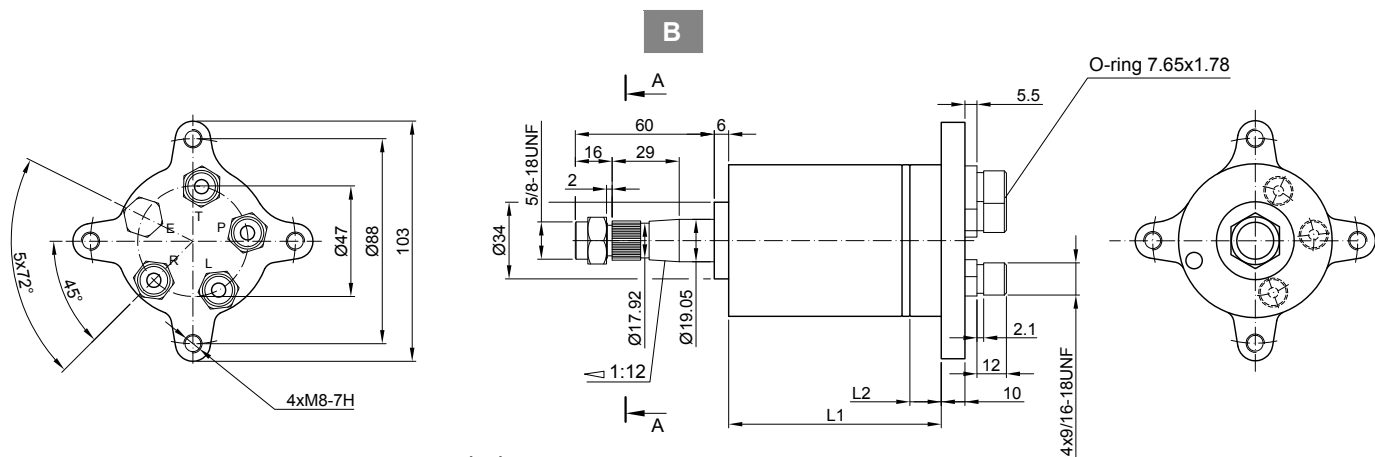
MAIN SPECIFICATION

Parameters	OY Series					
Displacement, (ml/r)	20	32	40	50	63	80
Rated flow, (L/min)	3 ~ 20					
Max. input Pressure, (MPa)	12,5					
Relief Valve Pressure Settings, (MPa)	06,07,08,09,10					
Shock Valve Pressure Settings, (MPa)	12,13,14,15,16					
Steering Torque, (Nm)	≤1.8					
Max. cont. Pressure in Line T-P _T , (MPa)	1					
Dimension L1, (mm)	87	92	96	100	105	113

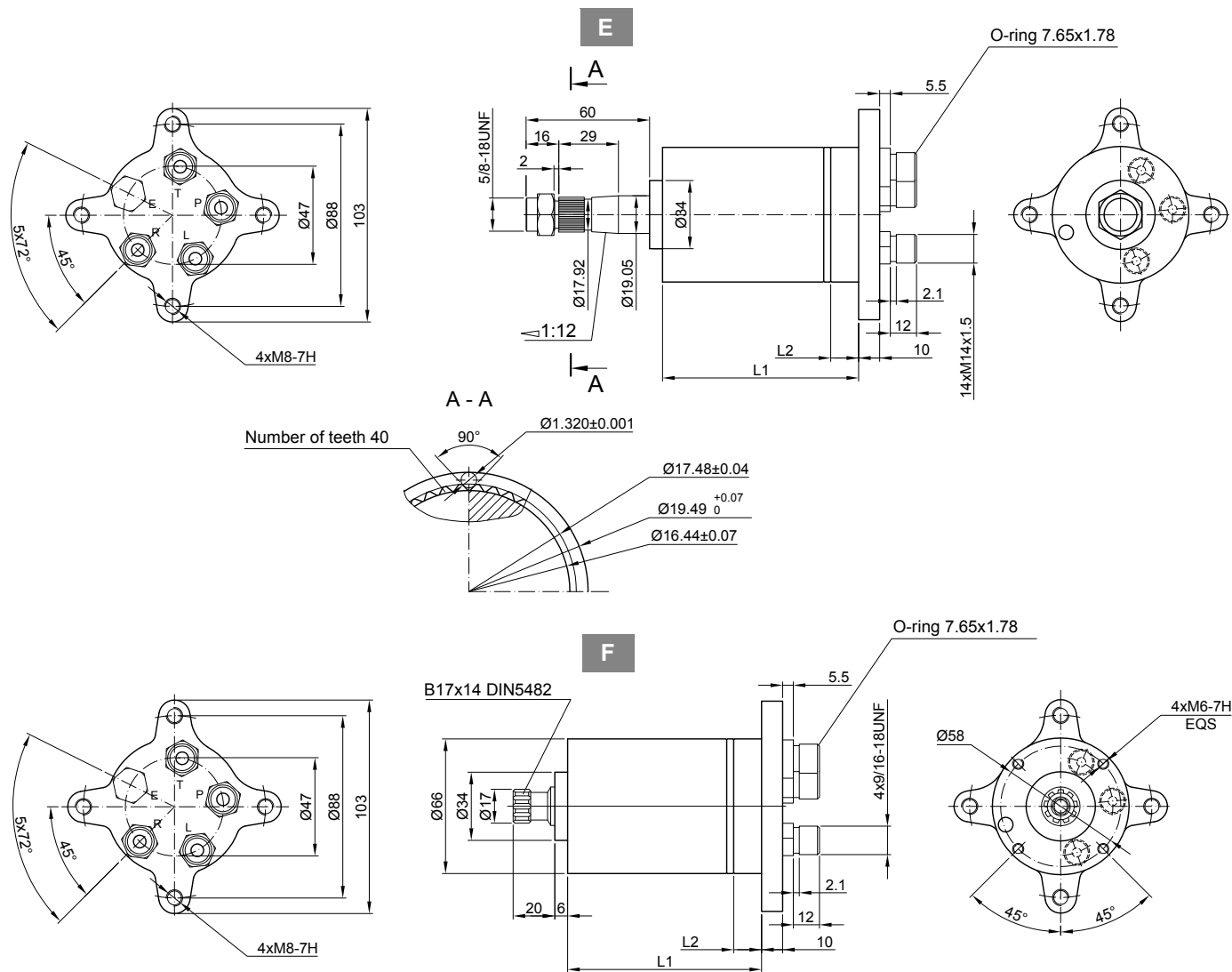
MOUNTING DATA



MOUNTING DATA



MOUNTING DATA



ORDER CODE

OY	1	2	3	4	5

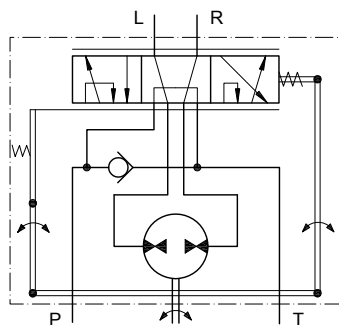
1	Integrated Valve Parameter
0	Without Valve
1	With relief valve, check valve, shock valve
7	With relief valve and check valve
8	With relief valve
2	Displacement [cm³/rev]
20	20,0 [cm³/rev]
32	32,0 [cm³/rev]
40	40,0 [cm³/rev]
50	50,0 [cm³/rev]
63	63,0 [cm³/rev]
80	80,0 [cm³/rev]

3	Relief Valve Pressure [bar]
06	60 bar
07	70 bar
08	80 bar
09	90 bar
10	100 bar

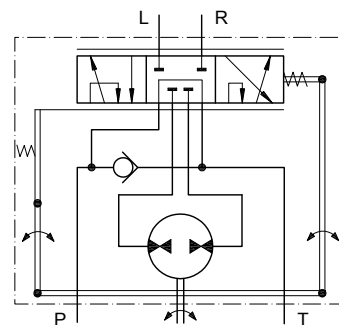
4	Mounting Data
A	Tapered 1:20, key 5x6.5, Ports: 9/16-18UNF
B	Tapered 1:12, With 11/16 In-40 Serrations and 5/8-18UNF, Ports: 9/16-18UNF
C	DIN 5482 Bx17x14, Ports: 9/16-18UNF
D	Tapered 1:20, key 5x6.5, Ports: M14x1.5
E	Tapered 1:12, With 11/16 In-40 Serrations and 5/8-18UNF, Ports: M14x1.5
F	DIN 5482 B17x14, Ports: M14x1.5

5	Version
ON	Open Center Non Load Reaction

HYDROSTATIC STEERING UNITS TYPE OH.../OR - OH...



"Open Center - Load Reaction"
Version OR - OH .../OR



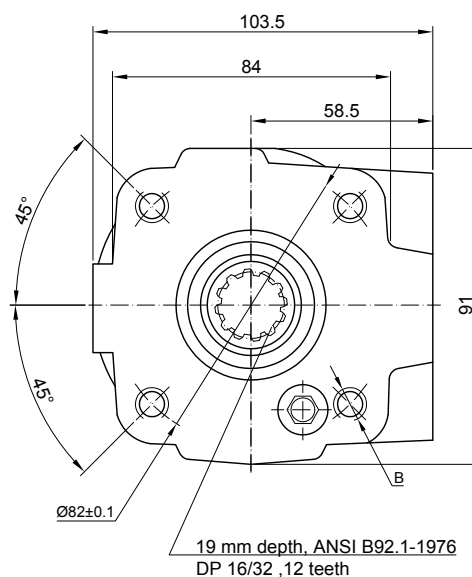
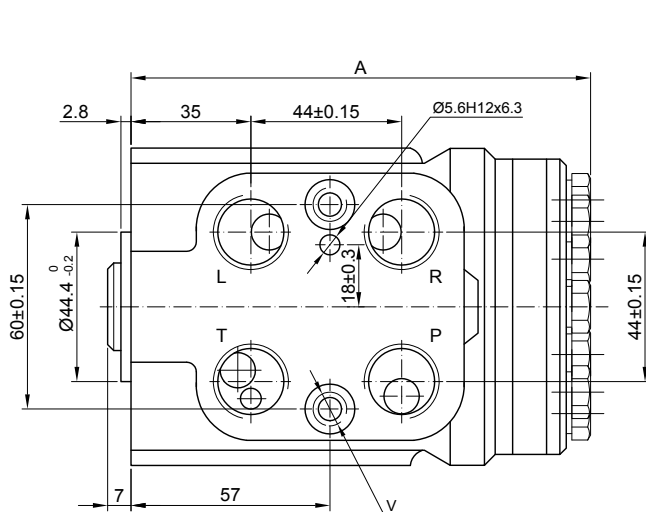
"Open Center - Non Load Reaction"
Version OH ...

The newly designed OH steering units, with radial distribution, incorporate two rotary tracing valves in the housing, which turn on the metering pump.

SPECIFICATION DATA

Parameters	OH Series											
	OH 40/OR	OH 50/OR	OH 63/OR	OH 80/OR	OH 100/OR	OH 125/OR	OH 160/OR	OH 200/OR	OH 250/OR	OH 320/OR	OH 400/OR	
Displacement, (cm ³ /rev)	39,6	49,5	65,6	79,2	99,0	123,8	158,4	198	247,5	316,8	396	
Rated flow, (L/min)		6		9		12		17	24	30	40	
Rated Pressure, (MPa)						160						
Max. cont. Pressure in Line T-P _r , (MPa)						25						
Max. Torque at Servoamplifying, [Nm]						6 (by P _r max)						
Max. Torque w/o Servoamplifying, [Nm]						120						
Weight, avg., [kg]	5,3	5,4	5,5	5,6	5,7	5,8	6,0	6,3	6,5	7,0	7,4	
Dimension A, (mm)	130,8	132,2	133,9	136,2	138,8	142,2	146,8	152,2	158,8	168,2	178,8	

DIMENSIONS AND MOUNTING DATA FROM 40 TO 400



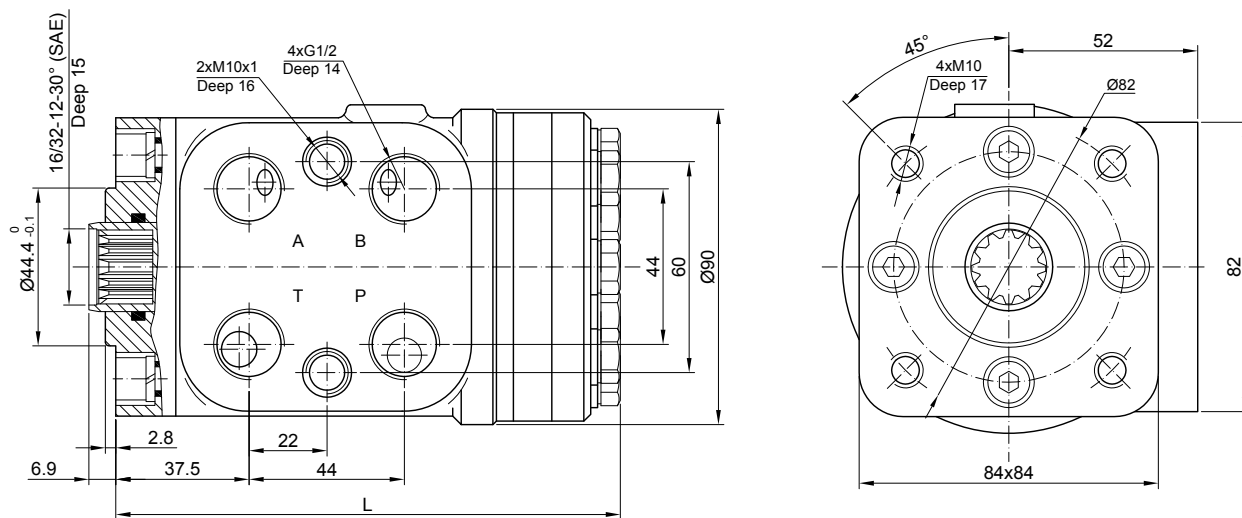
The ports are shown in the Table of page Steering Units OH - 05.

HYDROSTATIC STEERING UNITS TYPE OH.../OR - OH...

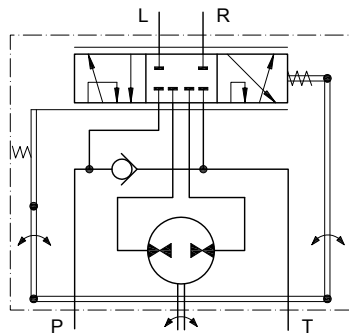
SPECIFICATION DATA

Parameters	OH Series			
	OH 500	OH 630	OH 800	OH 1000
Displacement, (cm ³ /rev)	495	618,7	793	990
Rated flow, (L/min)	38	48	60	75
Rated Pressure, (MPa)	160			
Max. cont. Pressure in Line T-P _T , (MPa)	25			
Max. Torque at Servoamplifying, [Nm]	6 (by P _T max)			
Max. Torque w/o Servoamplifying, [Nm]	120			
Weight, avg., [kg]	8,67	9,72	11,18	12,8
Dimension A, (mm)	197	216	236	262

DIMENSIONS AND MOUNTING DATA FROM 500 TO 1000



HYDROSTATIC STEERING UNITS TYPE OH.../NC



"Closed Center - Non Load Reaction"
Version NC - OH.../NC

The OH.../NC is a "Closed Center - Non Load Reaction".

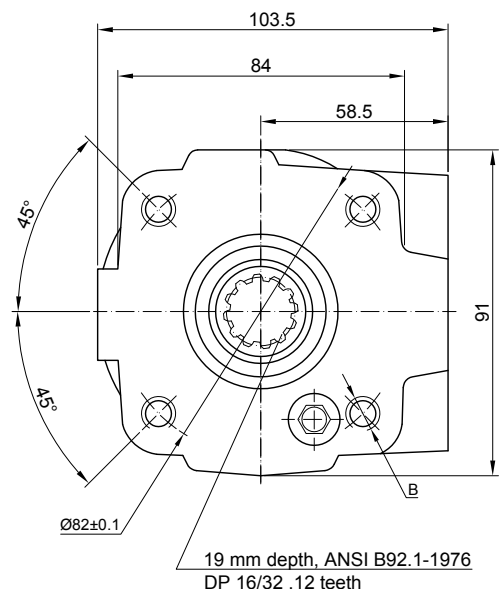
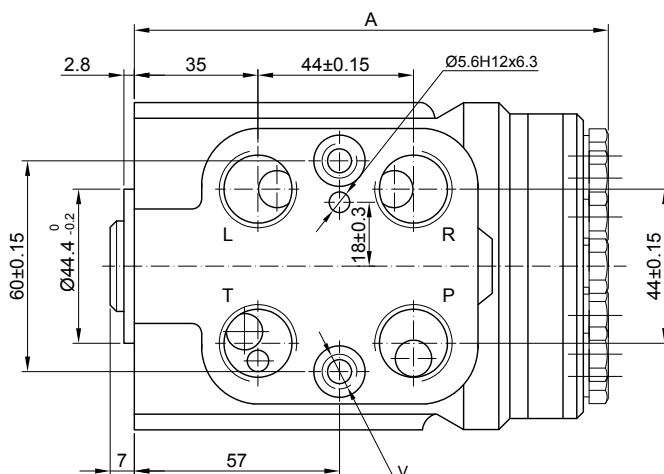
When connecting to a differential cylinder the L and R ports of the steering unit must be connected as follows: L to the greater piston area, and R - to the smaller one.

For the "Closed Center - Non Load Reaction" and "Closed Center - Non Reaction and Load Sensing" steering units is possible to observe Thermal Shock - condition caused when the hydraulic system has operated for some time without turning the steering wheel, causing the fluid in the reservoir and the system to heat up while the steering unit is relatively cool (i.e. there is more than 50°F [10°C] difference in the temperature). If, under the condition of Thermal Shock, the steering wheel is turned very quickly, it is possible to experience temporary seizure and have the internal parts of the steering unit damaged. The temporary seizure may be followed by a total free wheeling.

SPECIFICATION DATA

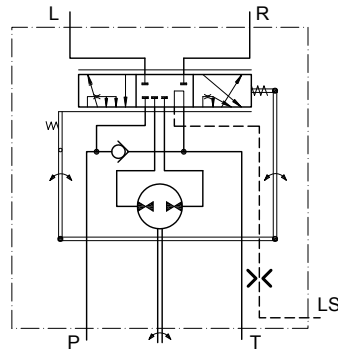
Parameters	Type											Type		
	OH 40/NC	OH 50/NC	OH 63/NC	OH 80/NC	OH 100/NC	OH 125/NC	OH 160/NC	OH 200/NC	OH 250/NC	OH 320/NC	OH 400/NC	OH 500/NC	OH 630/NC	OH 800/NC
Displacement, (cm³/U)	39,6	49,5	65,6	79,2	99,0	123,8	158,4	198	247,5	316,8	396	495	618,7	793
Rated flow, (L/min)	4	5	6	9		12		17	24	30	40	38	48	60
Rated Pressure, (MPa)	175											160		
Max. cont. Pressure in Line T, (MPa)	20											25		
Max. Torque at Servoamplifying, [Nm]	6 (by P _T max)											6 (by P _T max)		
Max. Torque w/o Servoamplifying, [Nm]	120											120		
Weight, [kg]	5,3	5,4	5,5	5,6	5,7	5,8	6,0	6,3	6,5	7,0	7,4	8,67	9,72	11,18
Dimension A, (mm)	130,8	132,2	133,9	136,2	138,8	142,2	146,8	152,2	158,8	168,2	178,8	197	216	236

DIMENSIONS AND MOUNTING DATA



The ports are shown in the Table of page Steering Units OH - 04.

HYDROSTATIC STEERING UNITS TYPE OH.../NC - LS



"Closed Center - Non Load Reaction"
Version LS - OH.../NC-...-LS

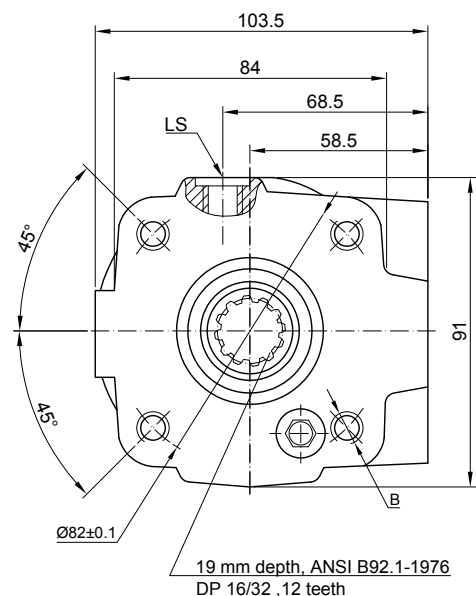
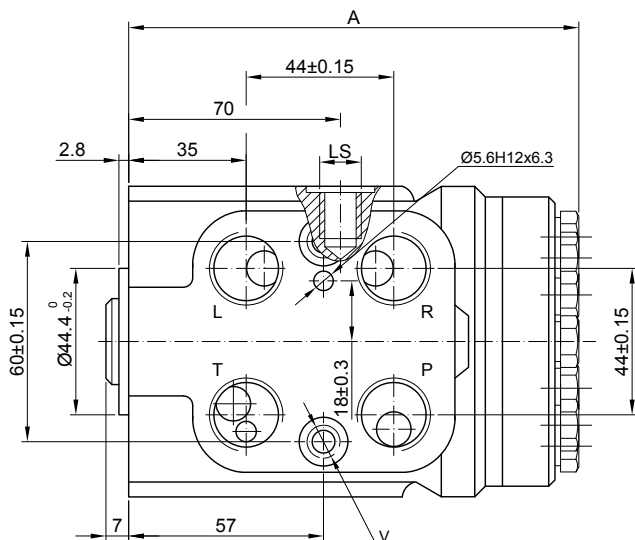
The OH/NC - LS range expands the steering units family of Meta Hydraulic with the "Closed Center - Non Reaction and Load Sensing Outlet" version (static hydraulic connection to the priority valve).
This range is manufactured in pipe mounting version only.

SPECIFICATION DATA

Parameters	Type										Type		
	OH 40 LS	OH 50 LS	OH 63 LS	OH 80 LS	OH 100 LS	OH 125 LS	OH 160 LS	OH 200 LS	OH 250 LS	OH 320 LS	OH 400 LS	OH 500 LS	OH 630 LS
Displacement, (cm ³ /rev)	39,6	49,5	65,6	79,2	99,0	123,8	158,4	198	247,5	316,8	396	495	618,7
Rated flow, (L/min)	4	5	6	9		12		17	24	30	40	50	63
Rated Pressure, (bar)	125	150				175						160	
LS - Valve Pressure Settings, [bar]				80	100	125	150	175				160	
Shock Valves Pressure Settings, [bar]				140	160	180	200	240			140	160	180 200 240
Max. cont. Pressure in Line T-P _T , (MPa)						20						16	
Max. Torque at Servoamplifying, [Nm]					6 (by P _T max)							5 (by P _T max)	
Max. Torque w/o Servoamplifying, [Nm]					120							120	
Weight, avg., [kg]	5,4	5,5	5,6	5,7	5,8	5,9	6,2	6,5	6,6	7,2	7,78	8,67	9,72
Dimension A, (mm)	130,8	132,2	133,9	136,2	138,8	142,2	146,8	152,2	158,8	168,2	184	197	216

Pressure Settings are at flow rate of 6 l/min and viscosity 21 mm²/s (50°C).
Pressure Settings are at flow rate of 2 l/min and viscosity 21 mm²/s (50°C).

DIMENSIONS AND MOUNTING DATA - OH.../NC - LS



THREADED PORTS

Code	Ports - P, T, R, L Thread	Column Mounting Thread - B	Valve Mounting Thread - V	LS - Port	EL - Port
-	G1/2 17 mm depth	4 x M10 18 mm depth	2 x M10x1 16 mm depth	G1/4 14 mm depth	M10x1 10 mm depth
A	3/4 - 16 UNF O-ring 17 mm depth	4 x 3/8 - 16 UNC 15,7 mm depth	2 x 3/8 - 24 UNF 14,2 mm depth	7/16 - 20 UNF O-ring 12,7 mm depth	7/16 - 20 UNF O-ring 12,7 mm depth
M	M22x1,5 17 mm depth	4 x M10 18 mm depth	2 x M10x1 16 mm depth	G1/4 14 mm depth	M10x1 10 mm depth

Threaded Port P min 16 mm.

THREADED PORTS FOR OH.../NC

Code	Ports - P, T, R, L Thread	Column Mounting Thread - B	Valve Mounting Thread - V
-	G1/2 17 mm depth	4 x M10 18 mm depth	2 x M10x1 16 mm depth
A	3/4 - 16 UNF O-ring 17 mm depth	4 x 3/8 - 16 UNC 15,7 mm depth	2 x 3/8 - 24 UNF 14,2 mm depth
M	M22x1,5 17 mm depth	4 x M10 18 mm depth	2 x M10x1 16 mm depth

ORDER CODE

	1	2	3	4	5
OH		/	-		

1	Displacement code (see Specification Data)
40	39,6 [cm³/rev]
50	49,5 [cm³/rev]
63	65,6 [cm³/rev]
80	79,2 [cm³/rev]
100	99,0 [cm³/rev]
125	123,8 [cm³/rev]
160	158,4 [cm³/rev]
200	198,0 [cm³/rev]
250	247,5 [cm³/rev]
320	316,8 [cm³/rev]
400	396,0 [cm³/rev]
500	495,0 [cm³/rev]
630	618,7 [cm³/rev]
800	792,0 [cm³/rev]
1000	990,0 [cm³/rev]

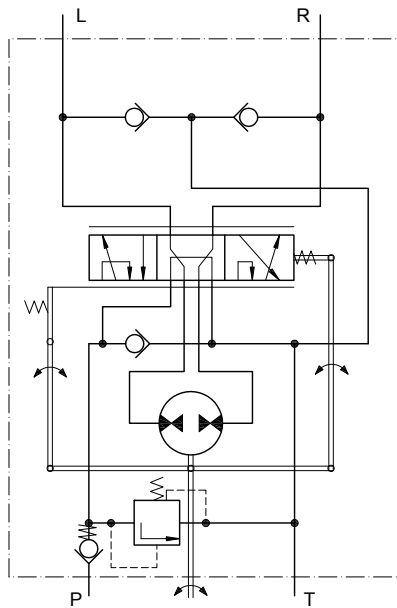
2	Version
OR	Version OR "Open Center - Load Reaction"
omit	Version "Open Center - Non Load Reaction"
NC	Version NC "Closed Center - Non Load Reaction" Up to 800 cc only
3	Ports
omit	BSPP (ISO 228)
A	SAE (ANSI B 1.1 - 1982)
M	Metric (ISO 262)
4	Option (Paint)
omit	No Paint
P	Painted
PC	Corrosion Protected Paint
5	Load Sensing Option (for NC Version only)
LS	"Closed Center - Non Load Reaction Load Sensing Outlet" Up to 630 cc only

Colour at customer's request.
The steering units are mangano-phosphatized as standard.

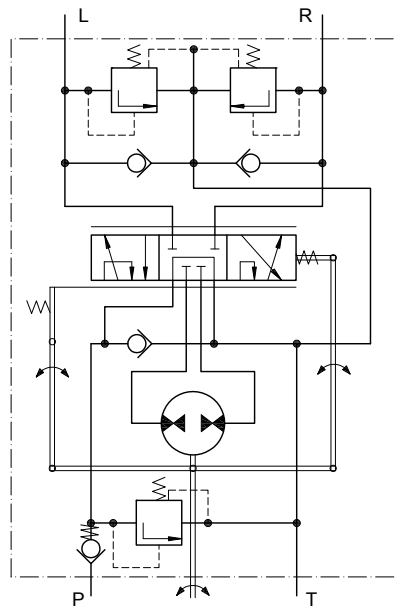
HYDROSTATIC STEERING UNITS TYPE OH/1...OR - OH/1-OH/8



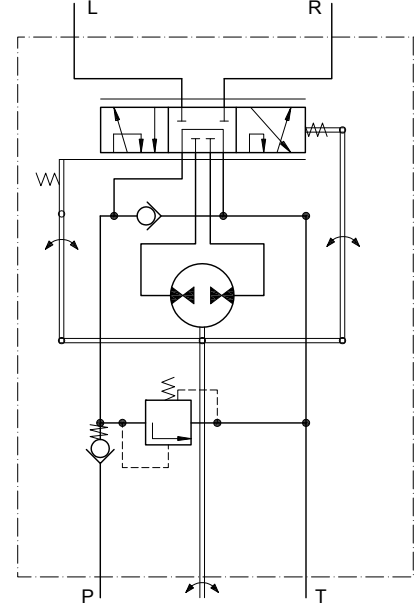
The OH/1 - OH/8 Hydrostatic Steering unit is based on the OH unit but has built-in relief and check valves. Thus Meta Hydraulic achieves one very compact steering unit which reduces the need for additional hydraulic components in the system.



"Open Center - Load Reaction"
With Built-in Valves
Version OH/1...OR



"Open Center - Non Load Reaction"
With Built-in Valves
Version OH/1



"Open Center - Non Load Reaction"
With Built-in Valve
Version OH/8

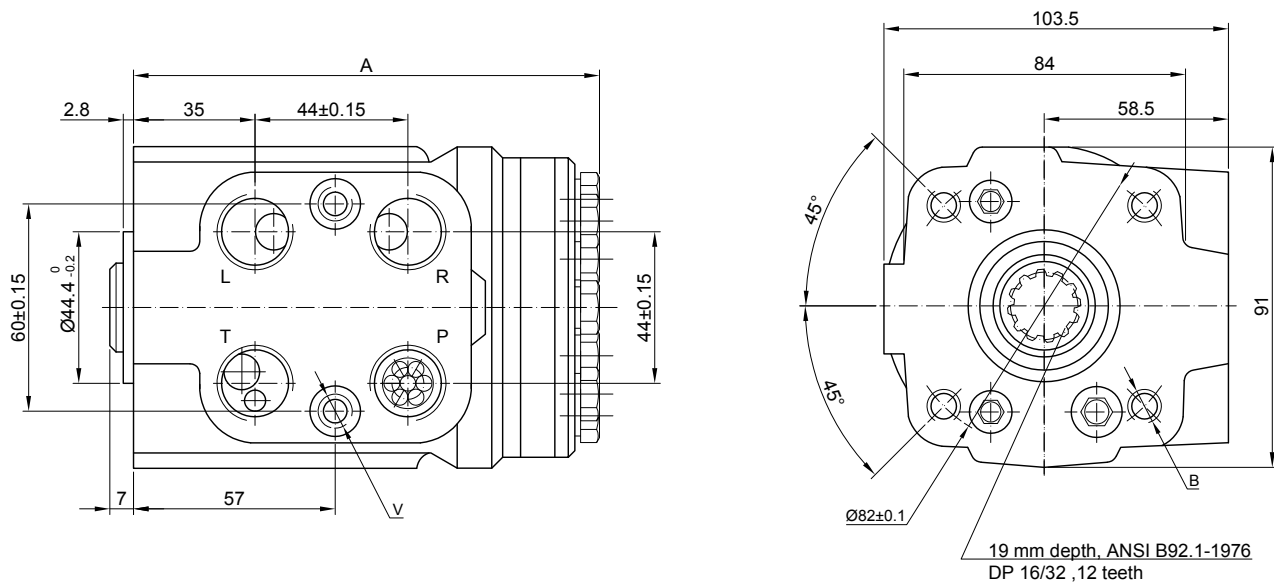
SPECIFICATION DATA

Parameters	Type										
	OH/1,8 40	OH/1,8 50	OH/1,8 63	OH/1,8 80	OH/1,8 100	OH/1,8 125	OH/1,8 160	OH/1,8 200	OH/1,8 250	OH/1,8 320	OH/1,8 400
Displacement, (cm ³ /rev)	39,6	49,5	65,6	79,2	99,0	123,8	158,4	198	247,5	316,8	396
Rated flow, (L/min)	4	5	6	9		12		17	24	30	40
Rated Pressure, (bar)	160										
Relief Valve Pressure Settings, [bar]	80 100 125 150										
Shock Valves Pressure Settings, [bar]	140 160 180 200										
Max. cont. Pressure in Line T-P _T , (MPa)	20 (50 - for OH.../8)										
Max. Torque at Servoamplifying, [Nm]	6 (by P _T max)										
Max. Torque w/o Servoamplifying, [Nm]	120										
Weight, avg., [kg]	5,3	5,5	5,6	5,7	5,8	5,9	6,2	6,5	6,6	7,2	7,8
Dimension A, (mm)	130,8	132,2	133,9	136,2	138,8	142,2	146,8	152,2	158,8	168,2	178,8

Pressure Settings are at Rated Flow (as in the table) and viscosity 21 mm²/s (50° C).

Pressure Settings are at flow rate of 2 l/min and viscosity 21 mm²/s (50° C).

DIMENSIONS AND MOUNTING DATA



THREADED PORTS

Code	Ports - P, T, R, L Thread	Column Mounting Thread - B	Valve Mounting Thread- V
-	G1/2 17 mm depth	4 x M10 18 mm depth	2 x M10x1 16 mm depth
A	3/4 - 16 UNF O-ring 17 mm depth	4 x 3/8 - 16 UNC 15,7 mm depth	2 x 3/8 - 24 UNF 14,2 mm depth
M	M22x1,5 17 mm depth	4 x M10 18 mm depth	2 x M10x1 16 mm depth

Threaded Port P min 16 mm depth.

ORDER CODE for OH/1 - OH/8

	1		2		3		4		5		6
OH		/		-		-					

1 Versions

1	Version OR "Open Center - Load Reaction"
1	Version 1 "Open Center - Non Load Reaction"
8	Version 8 "Open Center - Non Load Reaction"

2 Displacement code (see Specification Data)

40	39,6 [cm³/rev]
50	49,5 [cm³/rev]
63	65,6 [cm³/rev]
80	79,2 [cm³/rev]
100	99,0 [cm³/rev]
125	123,8 [cm³/rev]
160	158,4 [cm³/rev]
200	198,0 [cm³/rev]
250	247,5 [cm³/rev]
320	316,8 [cm³/rev]
400	396,0 [cm³/rev]

3 Relief Valve Pressure Settings, bar

80
100
125
150
175

4 Ports

omit	BSPP (ISO 228)
A	SAE (ANSI B 1.1 - 1982)
M	Metric (ISO 262)

5 Option (Paint)

omit	No Paint
P	Painted
PC	Corrosion Protected Paint

6 Version

OR	Version OR "Open Center - Load Reaction"
omit	"Open Center - Non Load Reaction"

Colour at customer's request.
The steering units are mangano-phosphatized as standard.

Version	Manual Steering Check Valve	Relief Valve	Inlet Check Valve	Cylinder Relief Valve	Anti-Cavitation Valve
1-...OR	•	•	•		•
1	•	•	•	•	•
8	•	•	•		

HYDROSTATIC STEERING UNITS TYPE OH/4-OH/3-OH/4E-OH/3E



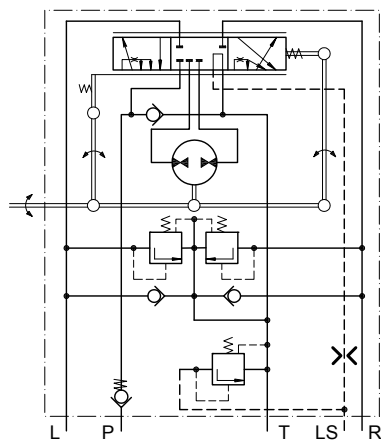
OH/4-OH/3-OH/4E-OH/3E range expands the steering units family of Meta Hydraulic with the "Closed Center - Non Reaction and Load Sensing Outlet" version (static hydraulic connection to the priority valve). This range is manufactured in two versions: for modularly and pipe mounting and therefore the two versions of priority (tracing) valves: LSA... and LS... were developed.

OH/4 is designed to be connected with priority valves with built-in relief valves for rated flow up to 160 l/min.

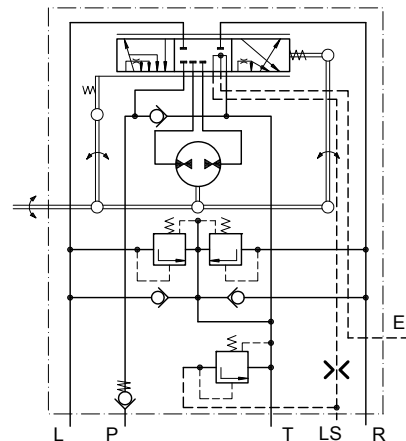
The control hydraulic circuits of the OH/4-OH/3-OH/4E-OH/3E steering units were designed to ensure minimal energy consumption (energy losses) in various hydraulic systems such as those of: fork-lift trucks, agricultural and construction machines and others.

The OH/4E and OH/3E are equipped with an electrohydraulic relay, mounted in the EL port, which supplies signal to the electric - control system. The relay can be pre-set to normally - open (N.O) or normally - closed (N.C) contacts, with control range from 0,1 to 50 bars. Upon customer's request the relay could be supplied with another type of fixing thread.

MODULARLY MOUNTING

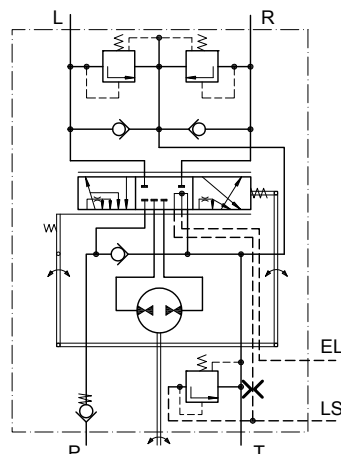


OH/4

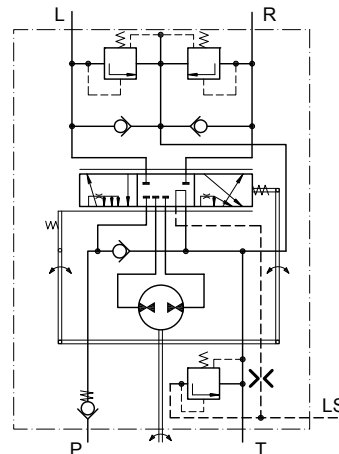


OH/4E

PIPE MOUNTING



OH/3E



OH/3

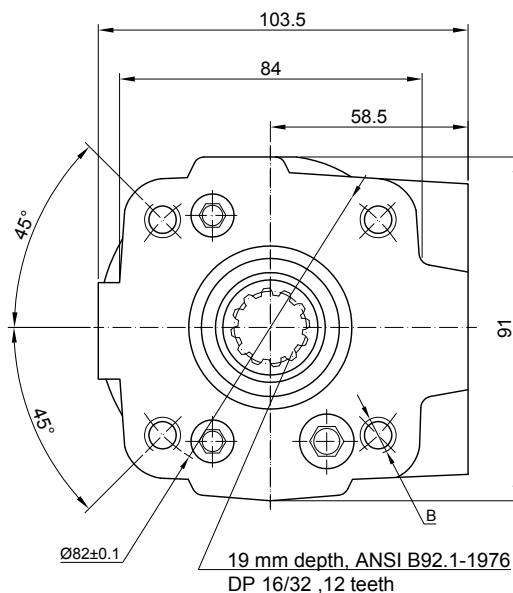
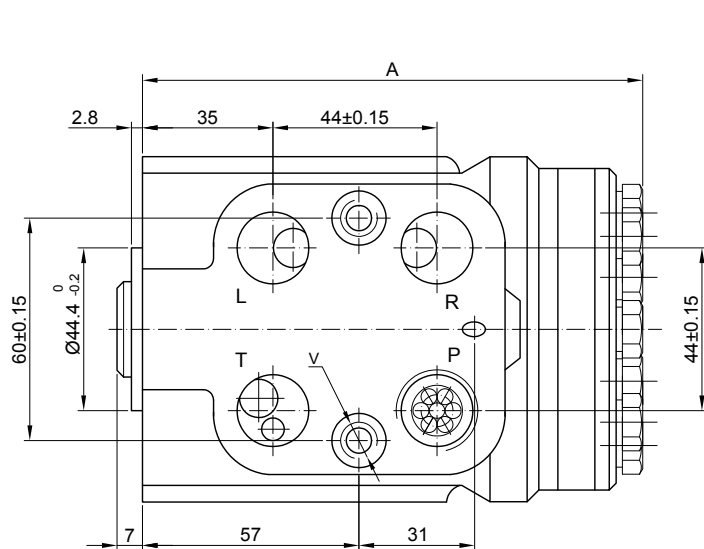
SPECIFICATION DATA

Parameters	Type									
	OH 40	OH 50	OH 63	OH 80	OH 100	OH 125	OH 160	OH 200	OH 250	OH 320
Displacement, (cm ³ /rev)	39,6	49,5	65,6	79,2	99,0	123,8	158,4	198	247,5	316,8
Rated flow, (L/min)	4	5	6	9		12		17	24	30
Rated Pressure, (bar)	125	150				175				
LS - Valve Pressure Settings, [bar]				80	100	125	150	175		
Shock Valves Pressure Settings, [bar]				140	160	180	200	240		
Max. cont. Pressure in Line T-P _T , (MPa)						20				
Max. Torque at Servoamplifying, [Nm]					6 (by P _T max)					
Max. Torque w/o Servoamplifying, [Nm]					120					
Weight, avg., [kg]	5,4	5,5	5,6	5,7	5,8	5,9	6,2	6,5	6,6	7,2
Dimension A, (mm)	130,8	132,2	133,9	136,2	138,8	142,2	146,8	152,2	158,8	168,2

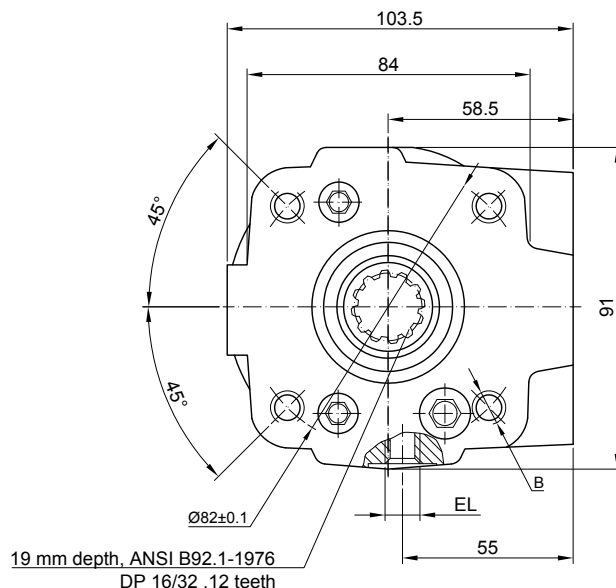
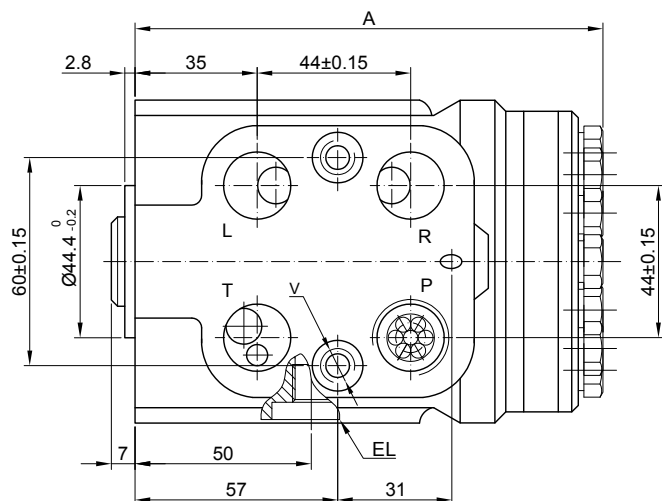
Pressure Settings are at flow rate of 6 l/min and viscosity 21 mm²/s (50°C).

Pressure Settings are at flow rate of 2 l/min and viscosity 21 mm²/s (50°C).

DIMENSIONS AND MOUNTING DATA - OH/4



DIMENSIONS AND MOUNTING DATA - OH/4E



ORDER CODE for OH/3 - OH/4

	1		2		3		4		5		6		7
OH		/			-		-						

1	Versions and Priority Valve Connection
3	Version 3 "Closed Center - Non Reaction and Load Sensing Outlet" - Pipe Mounting
4	Version 4 "Closed Center - Non Reaction and Load Sensing Outlet" - Modularly Mounting
2	Displacement code (see Specification Data)
40	39,6 [cm³/rev]
50	49,5 [cm³/rev]
63	65,6 [cm³/rev]
80	79,2 [cm³/rev]
100	99,0 [cm³/rev]
125	123,8 [cm³/rev]
160	158,4 [cm³/rev]
200	198,0 [cm³/rev]
250	247,5 [cm³/rev]
320	316,8 [cm³/rev]
400	396,0 [cm³/rev]

3	Electric Signal Connection
omit	without electric signal connection
E	with electric signal connection
4	Relief Valve Pressure Settings, bar
80	
100	
125	
150	
175	
5	Ports
omit	BSPP (ISO 228)
A	SAE (ANSI B 1.1 - 1982)
M	Metric (ISO 262)
6	Option (Paint)
omit	No Paint
P	Painted
PC	Corrosion Protected Paint
7	Design Series
omit	Factory specified

Colour at customer's request.
The steering units are mangano-phosphatized as standard.

VALVE BLOCKS FOR OH TYPE BH...



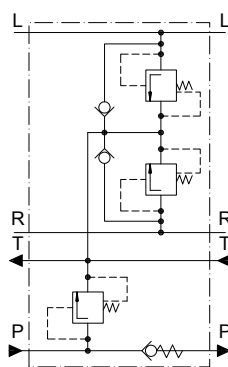
BH1

Meta Hydraulic BH valves are developed to protect the components of the hydraulic circuit - pumps, steering units and cylinders - from overloads, impacts and cavitation. Some of their advantages are: easy integration into any hydraulic circuit, easy mounting to the steering unit, and quick and easy hose connections.

Depending on the design and the built in valves the BH valves can be divided into 2 types: BH1 and BHR. The maximum flow rate is in compliance with the whole range of OH steering units but no more than 80l/min. The pressure settings for the entry relief valves and the shock valves are given in the table.



BHR



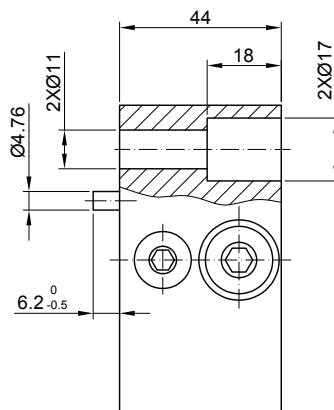
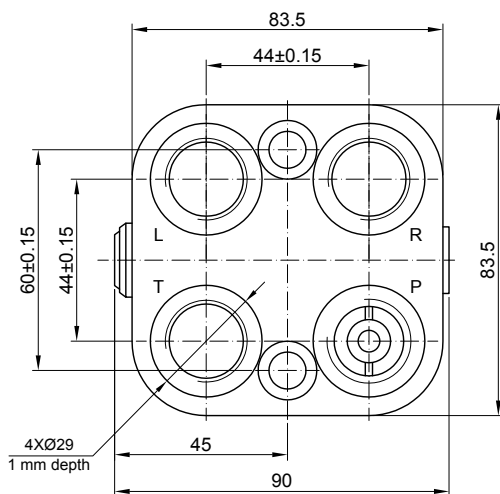
BH1, BHR

SPECIFICATION DATA

Parameters	Type			
	BH1, BHR			
Rated flow, (L/min)	80			
Rated Pressure, (bar)	160			
Relief Valve Pressure Settings, [bar]	80	100	125	150
Shock Valves Pressure Settings, [bar]	140	160	180	200
Weight, avg., [kg]	1,8; 2,3			

Pressure Settings are at flow rate of 30 l/min and viscosity 21 mm²/s (50° C).
Pressure Settings are at flow rate of 2 l/min and viscosity 21 mm²/s (50° C).

DIMENSIONS AND MOUNTING DATA - BH1

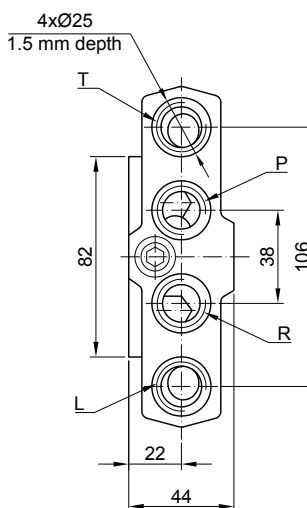
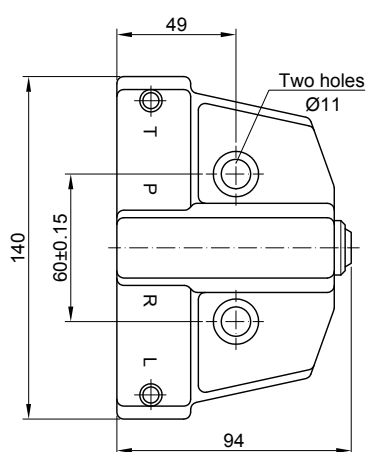


Code	Ports - P, T, R, L Thread
-	G1/2 17 mm depth
A	3/4 - 16 UNF O-ring 20 mm depth
M	M22x1,5 20 mm depth

Connection to the OH is done with 2 screws M10x1x40-8.8 DIN 912
or with 2 screws 3/8-24 ANSI B18.3-76; UNF 37,5 mm long.
Tightening torque: 2,5±0,5 daNm

DIMENSIONS AND MOUNTING DATA - BHR

Connection to the OH is done with 2 screws M10x1x40-8.8 DIN 912 or with 2 screws 3/8-24 UNF ANSI B18.3-76; 37,5 mm long.
Tightening torque: 2,5±0,5 daNm



Code	Ports - P, T, R, L Thread
------	------------------------------

A	3/4 - 16 UNF O-ring 22 mm depth
----------	------------------------------------

M	M18x1,5 22 mm depth
----------	------------------------

ORDER CODE

	1		2		3		4		5
BH		-		-					

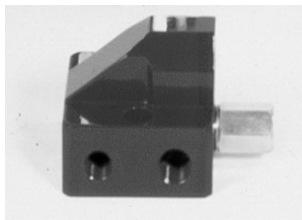
1	Versions
R	with built-in valves:
1	Input relief valve on line "P".
	Input check (non-return) valve on line "P".
	Shock valves on lines "R" and "L".
	Anti-cavitation valves on lines "R" and "L".
2	Relief Valve Pressure Settings, bar
80	
100	
125	
150	

3	Ports
omit	BSPP (ISO 228)
A	SAE (ANSI B 1.1 - 1982)
M	Metric (ISO 262)
4	Option (Paint)
omit	No Paint
P	Painted
PC	Corrosion Protected Paint
5	Design Series
omit	Factory specified

Versions R,1- for OH.
The colour is by customer's request.

The valve blocks are mangano-phosphatized as standard.

PRIORITY VALVES FOR OH/4 AND OH/3 TYPE LS...

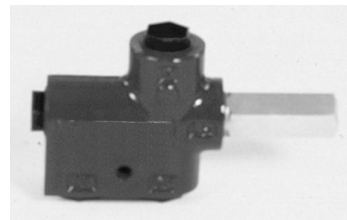


LSA

The Priority Valves distribute and trace the hydraulic flow from the supply pump of the hydraulic system to the hydraulic components which control and run the vehicle.

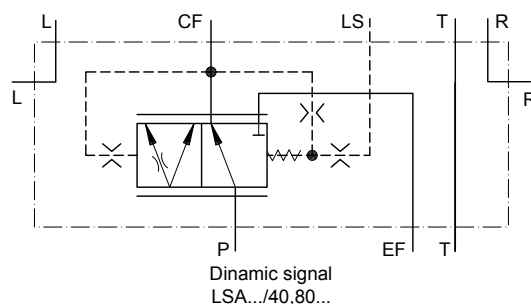
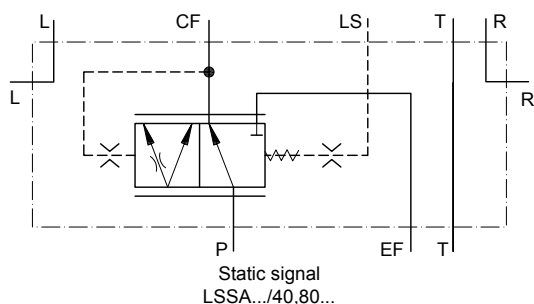
The Priority Valves are used only with the OH/4-OH/4E-OH/3-OH/3E hydrostatic steering units. When connected, the steering unit and the priority valve represent sophisticated hydraulic tracing system that controls the flow in both main pipelines of the hydraulic system (the working and control one) at any time of its operation.

As a static signal, the "LS" signal must be used in systems with circuit stability. The connection between the LS priority valves and the OH/3-OH/3E steering units has to be as short as possible, but should not exceed 1,5m (for iron pipe with Ø4 internal diameter). When a rubber hose is used this length has to be even shorter.

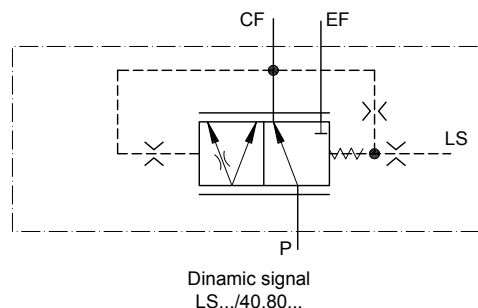
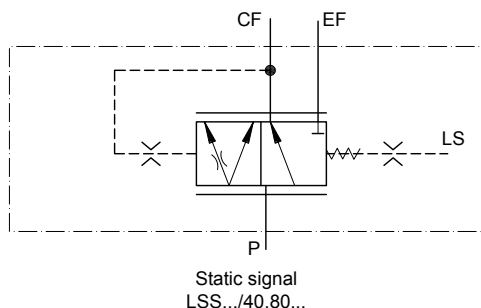


LS

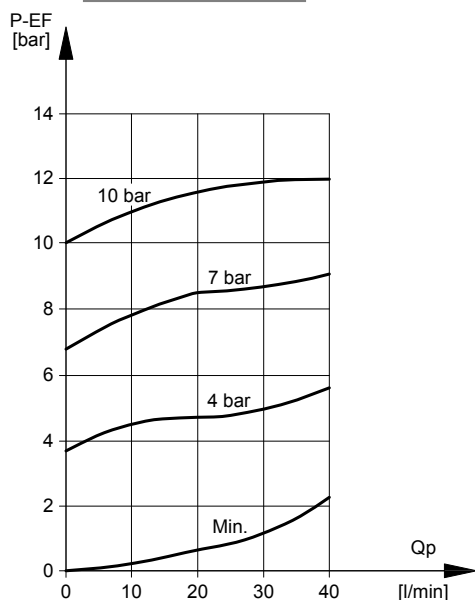
MODULARLY MOUNTING



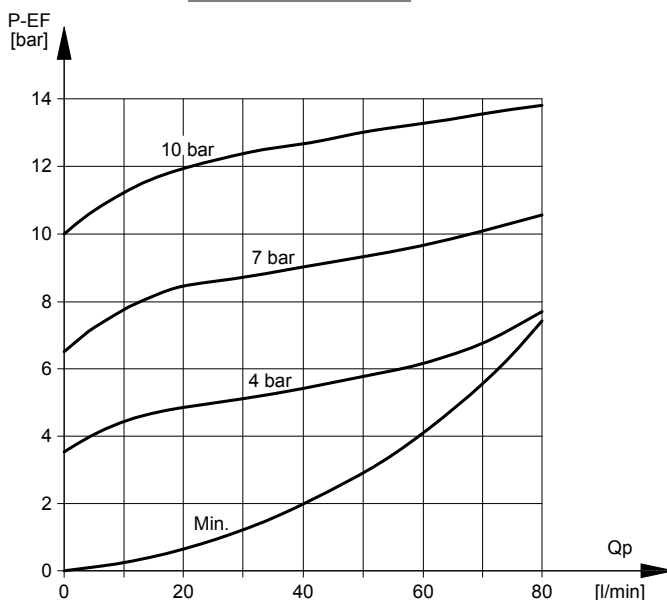
PIPE MOUNTING



LS...40



LS...80

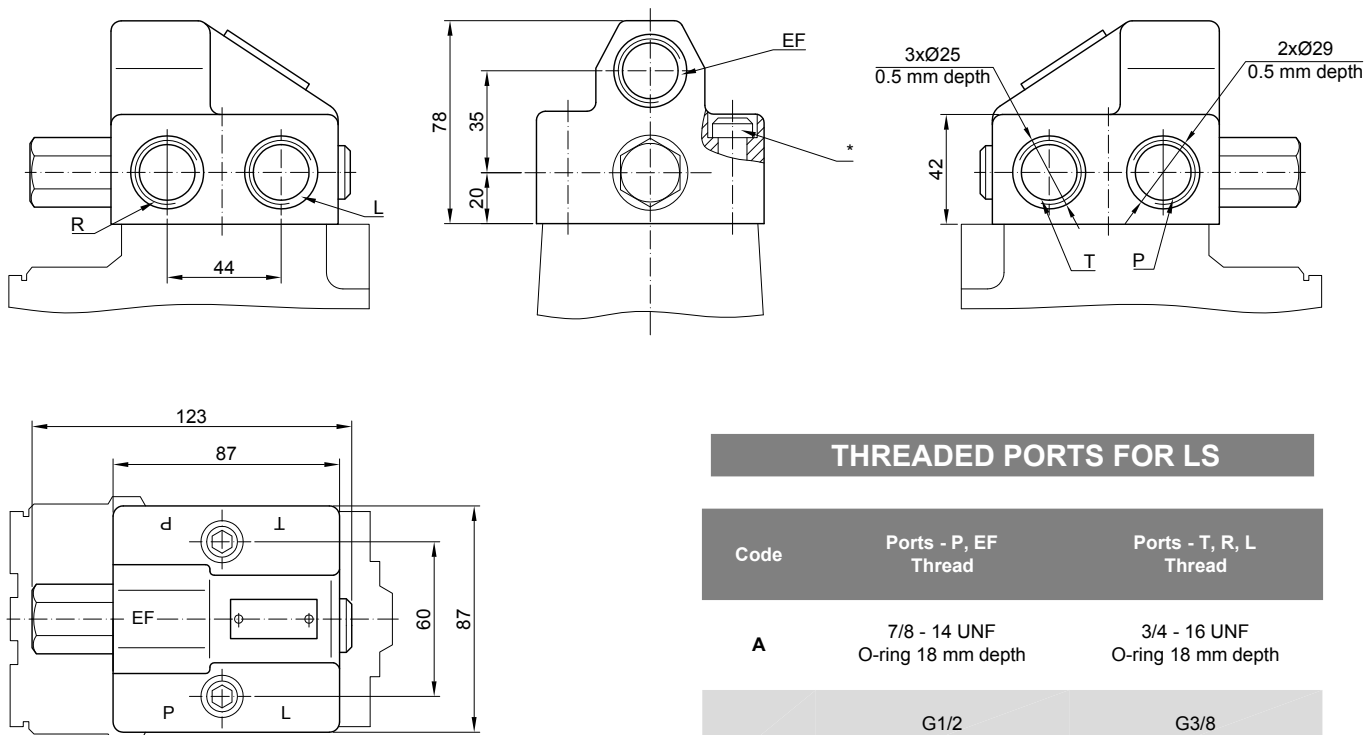


SPECIFICATION DATA

Parameters			Type					
			LS(S)A		LS(S)			
Rated flow, (L/min)			40; 80					
Control Spring Pressure, (bar)			4	7	10	4	7	10
Max. Pressures in Oil Ports: (bar)	P, EF, R, L		250					
	CF		175					
	T		15					
Weight, avg., [kg]			2,7		1,2			

P - pump, EF - excess flow, CF - control flow (first priority oil flow),
L - left, R - right, LS - load sensing, T - tank

DIMENSIONS AND MOUNTING DATA - LS(S)A/40,80

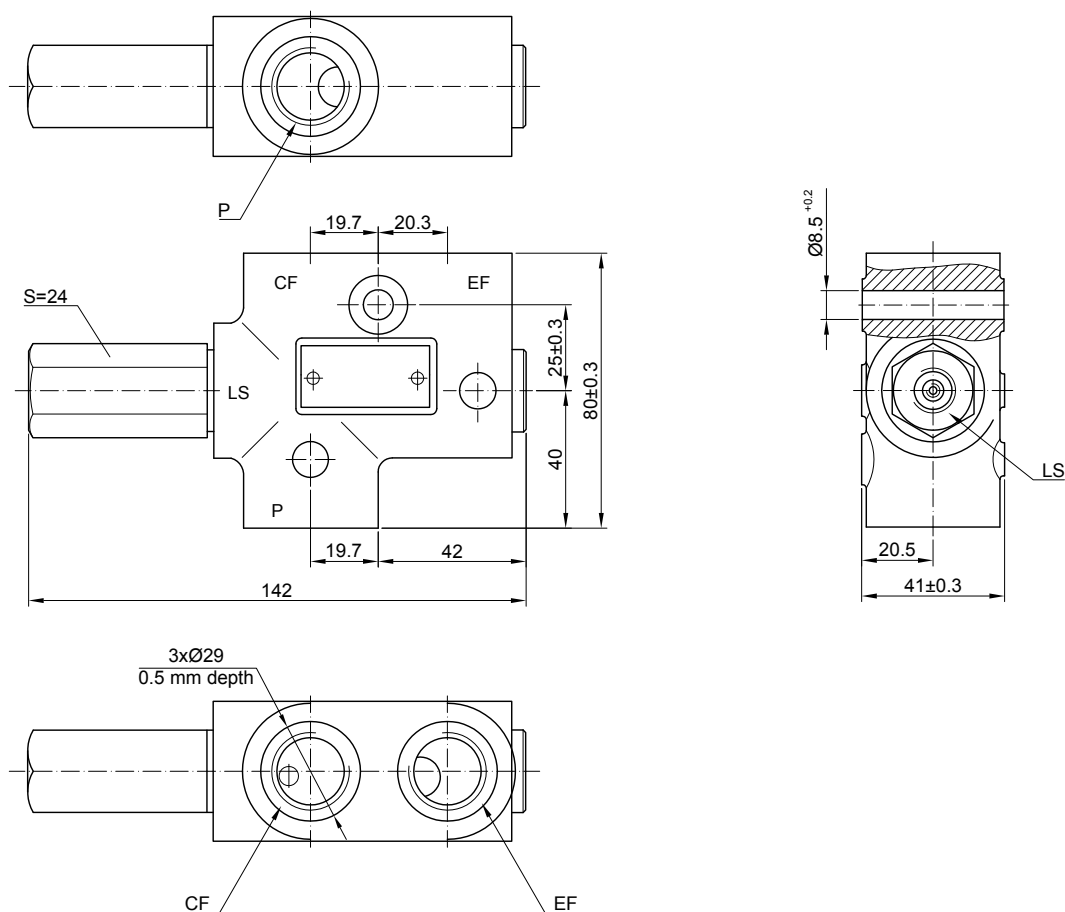


THREADED PORTS FOR LS

Code	Ports - P, EF Thread	Ports - T, R, L Thread
A	7/8 - 14 UNF O-ring 18 mm depth	3/4 - 16 UNF O-ring 18 mm depth
-	G1/2 18 mm depth	G3/8 18 mm depth
M	M22x1,5 18 mm depth	M18x1,5 18 mm depth

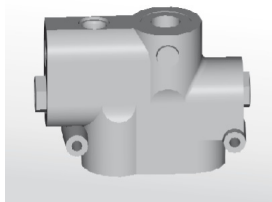
Connection to the OH/4... is done with 2 screws M10x1x45-10.9 DIN 912 or
with 2 screws 3/8-24 UNF ANSI B18.3-76; 44,5 mm long.
Tightening torque: 4,5±0,5 daNm.

DIMENSIONS AND MOUNTING DATA - LS(S)/40,80

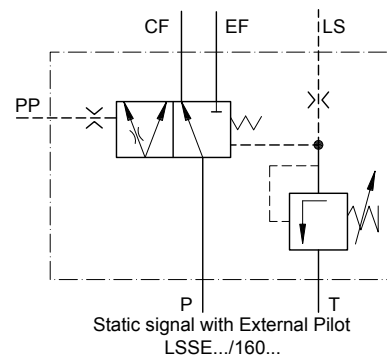
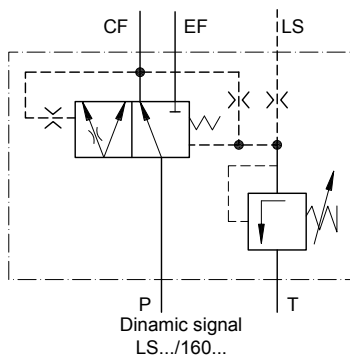
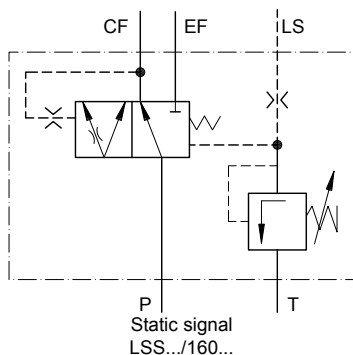


Code	Ports - P, EF Thread	Port - CF Thread	LS - Port
-	G1/2 18 mm depth	G1/2 18 mm depth	G1/4 14 mm depth
A	7/8 - 14 UNF O-ring 18 mm depth	3/4 - 16 UNF O-ring 18 mm depth	7/16 - 20 UNF O-ring 12,7 mm depth
M	M22x1,5 18 mm depth	M22x1,5 18 mm depth	G1/4 14 mm depth

PRIORITY VALVES FOR OH/3... TYPE LS.../160



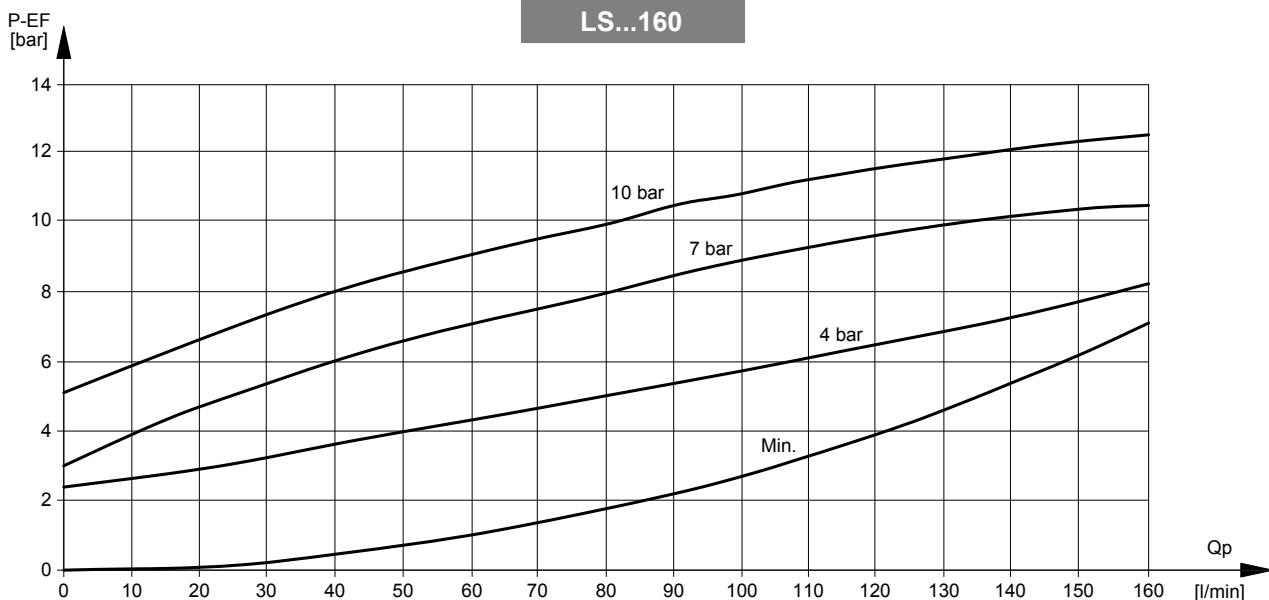
The Priority Valves LS.../160 have a built-in pilot pressure relief valve, which protects the steering unit against excess pressure. The pilot pressure relief valve operates with the Shuttle of the Priority valve to limit the maximum steering pressure P-T measured across the steering units ports.



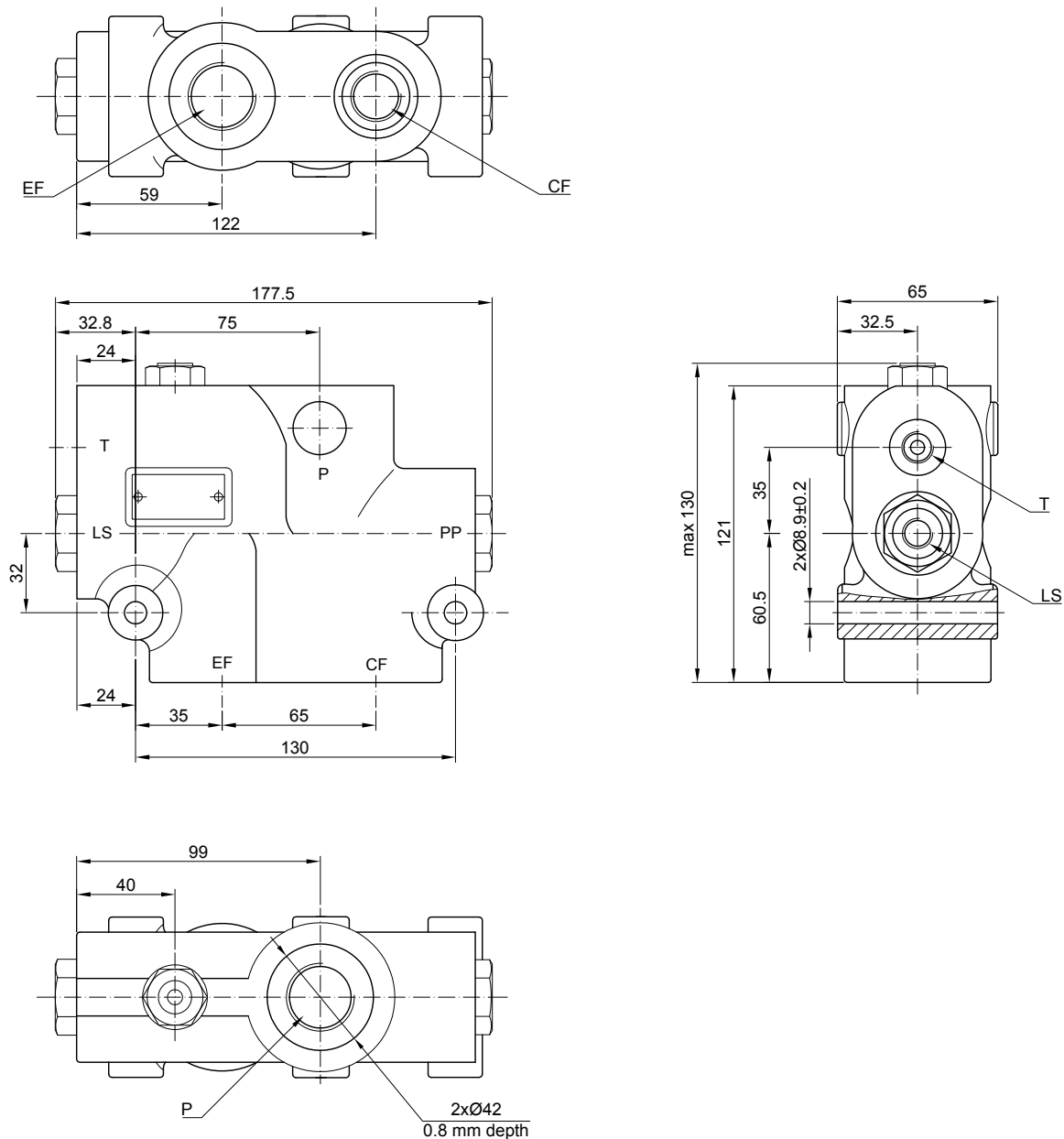
SPECIFICATION DATA

Parameters		Type		
		LS(S),(E)		
Rated flow, (L/min)		160		
Control Spring Pressure, (bar)		4	7	10
Max. Pressures in Oil Ports: (bar)	P, EF, R, L	250		
	CF	210		
	T	15		
	PP	210		
Standart Relief Valve Pressure Settings, (bar)		175		
Weight, avg., [kg]		4,4		

Adjusted valve pressure from 80 till 210 bar upon customer request.
P - pump, EF - excess flow, CF - control flow (first priority oil flow),
L - left, R - right, LS - load sensing, T - tank, PP - pilot pressure.



DIMENSIONS AND MOUNTING DATA - LS(S)(E)/160



Code	Ports - P, EF Thread	Port - CF Thread	LS, PP, T - Ports
-	G3/4 20,5 mm depth	G1/2 18,5 mm depth	G1/4 12,5 mm depth
A	1 1/16 - 12 UNF O-ring 20,5 mm depth	3/4 - 16 UNF O-ring 18,5 mm depth	7/16 - 20 UNF O-ring 12,5 mm depth
M	M27x2 20,5 mm depth	M18x1,5 18,5 mm depth	M12x1,5 12,5 mm depth

ORDER CODE

	1	2	3	4	5	6	7
LS				/		-	

1	Signal Type
S	with Static signal
omit	with Dinamic signal
2	Mounting
omit	Pipe Mounting for OH/3
A	Modularly Mounting for OH/4
3	Rated Flow, l/min
40	
80	
4	Control Spring Pressure , bar
4	
7	
10	

5	Ports
omit	BSPP (ISO 228)
A	SAE (ANSI B 1.1 - 1982)
M	Metric (ISO 262)
6	Option (Paint)
omit	No Paint
P	Painted
PC	Corrosion Protected Paint
5	Design Series
omit	Factory specified

Colour at customer's request.
The priority valves are mangano-phosphatized as standard.

ORDER CODE

	1	2	3	4	5	6
LS		/		-		

1	Signal Type
omit	with Dinamic signal
S	with Static signal
E	with Static signal with External Pilot
2	Rated Flow, l/min
160	
3	Control Spring Pressure , bar
4	
7	
10	

4	Ports
omit	BSPP (ISO 228)
A	SAE (ANSI B 1.1 - 1982)
M	Metric (ISO 262)
5	Option (Paint)
omit	No Paint
P	Painted
PC	Corrosion Protected Paint
6	Design Series
omit	Factory specified

Colour at customer's request.
The priority valves are mangano-phosphatized as standard.

TORQUE AMPLIFIERS TYPE UVM... - Series 2



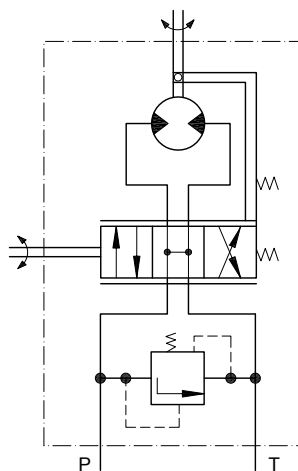
Meta Hydraulic UVM Torque Amplifiers amplify the applied torque to the control shaft and thus ease the running of various transport vehicles such as:

- agricultural and wood working machines;
- road rollers and road cleaning machines;
- fork-lift trucks and construction machinery;

The totally transferred power in terms of output torque is up to 1,1 kW.

UVM torque amplifiers with their simple design, consisted of a pump and an amplifier, ensure 40 times higher output torque than the applied one. The amplifying is achieved as follows: by rotating the input shaft to the left or right the spool and the bushing are displaced, and the hydraulic flow enters the system turning the gerotor set, which transfers the already amplified torque to the output shaft.

One advantage of the UVM torque amplifier is that it allows manual steering in cases of engine (pump) failure.



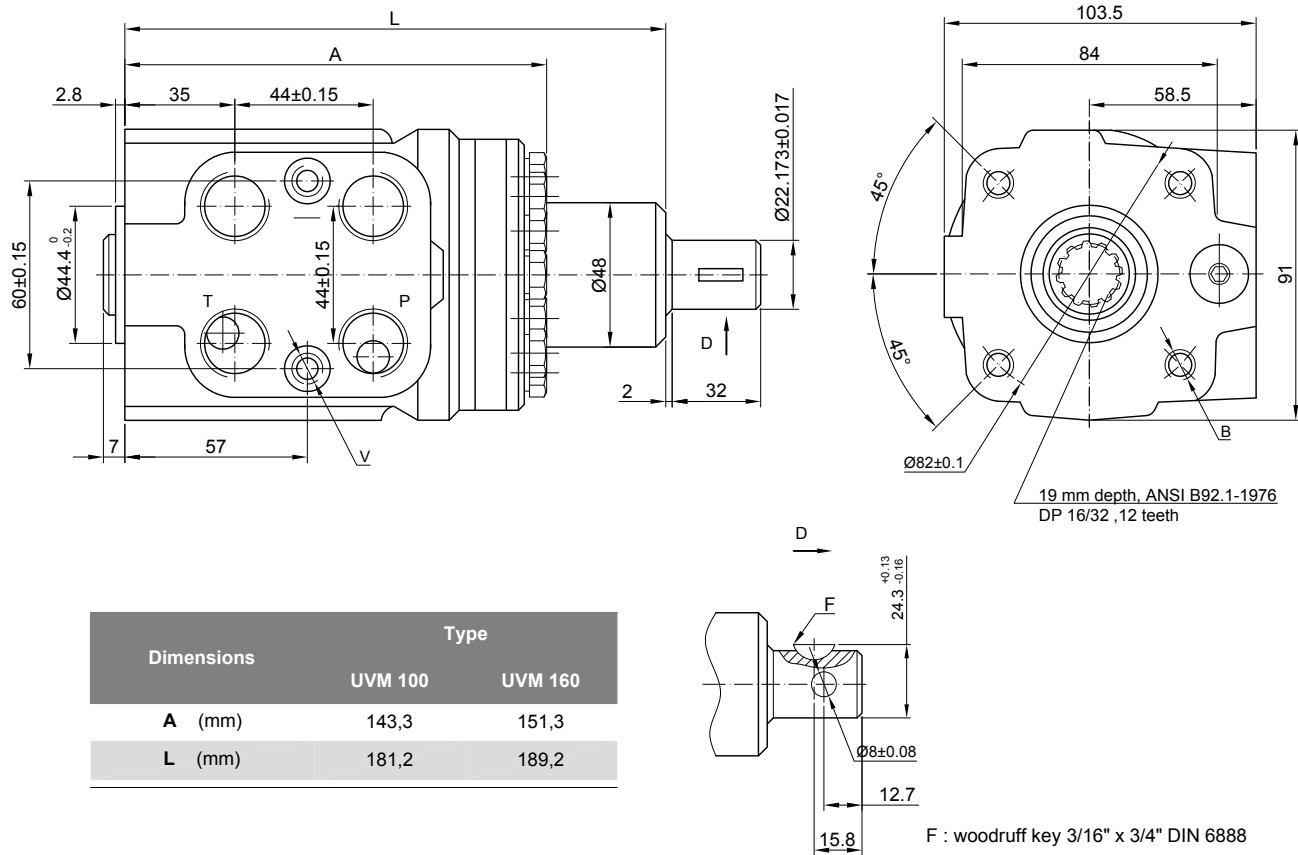
UVM...

SPECIFICATION DATA

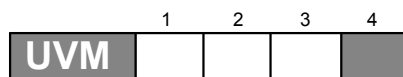
Parameters	Type	
	UVM 100	UVM 160
Displacement, (cm ³ /rev)	99,0	158,4
Rated flow, (L/min)	10	16
Rated Pressure, (bar)	70	70
Input Torque, (Nm)	3,5 ... 5	3,5 ... 5
Max. Input Torque, (Nm)	20	20
Torque Output at 70 bar., (Nm)	80	120
Pressure Drop between P and T at Rated Flow, (bar)	1 ... 2	1,6 ... 2,5
Max. Speed of Rotation at Rated Flow and Pressure, (r/min)	100	100
Max. Continuous Pressure in Line T, (bar)	20	20
Weight, avg., (kg)	5,8	6,2

Pressure Settings are at Rated Flow (as in the table) and viscosity 21 mm² /s (50°C).

DIMENSIONS AND MOUNTING DATA



Code	Ports - P, T Thread	Column Mounting Thread - B	Port Mounting Thread - V
-	G1/2 17 mm depth	4 x M10 18 mm depth	2 x M10x1 16 mm depth
A	3/4 - 16 UNF O-ring 17 mm depth	4 x 3/8 - 16 UNC 15,7 mm depth	2 x 3/8 - 24 UNF 14,2 mm depth
M	M22x1,5 17 mm depth	4 x M10 18 mm depth	2 x M10x1 16 mm depth

ORDER CODE

1	Displacement code
100	99,0 (cm³/rev)
160	158,4 (cm³/rev)
2	Ports
omit	BSPP (ISO 228)
A	SAE (ANSI B 1.1 - 1982)
M	Metric (ISO 262)

3	Option (Paint)
omit	No Paint
P	Painted
PC	Corrosion Protected Paint
4	Design Series
omit	Factory specified

Colour at customer's request.
The steering units are mangano-phosphatized as standard.