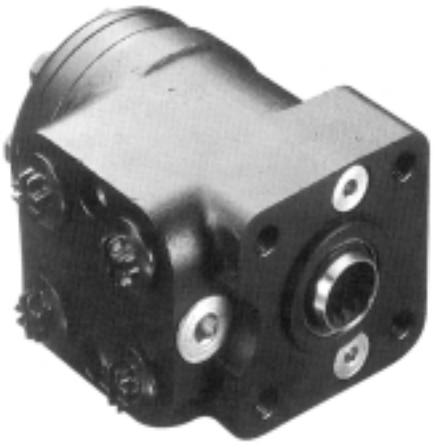
Steering units STX/MSTX - STA - STZ - STH/MSTH



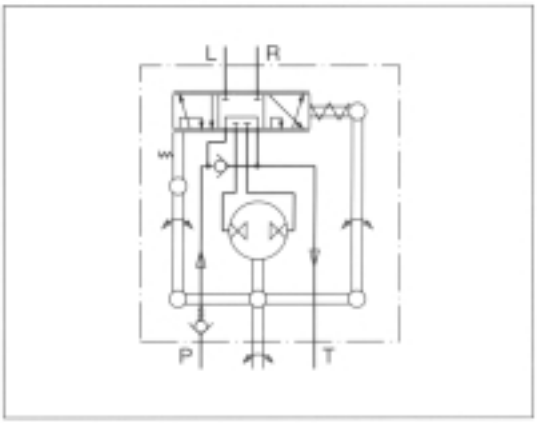
VERSIONS

STX/MSTX
OPEN CENTER
NON REACTION

The **open center** steering unit has, in neutral position, an internal circuit conveying the fluid directly from pump to tank (P>T), with low pressure drop.
The **non reaction** version prevents external shock forces at the vehicle wheels from being transmitted to the steering wheel.

This steering unit is equipped with:

- check valve



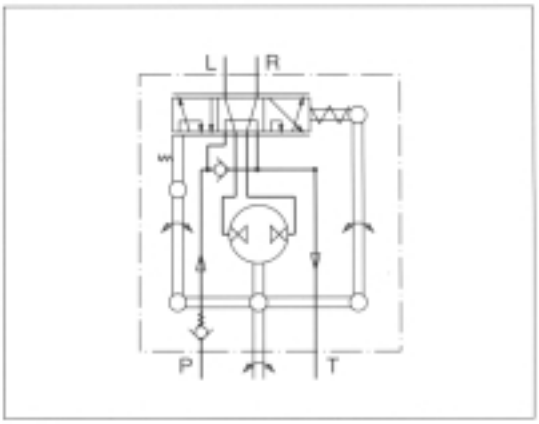
ISO SYMBOL

STX/MSTX
OPEN CENTER
REACTION

The **open center reaction** steering unit, compared with the ON (open non reaction), allows external forces to reach the steering wheel causing a proportional reaction to the steering cylinder movement.
For using this type of steering, the two cylinder chamber volumes must be equal.
In neutral position, an internal circuit conveys the fluid directly from pump to tank (P>T), with low pressure drop.

This steering unit is equipped with:

- check valve



ISO SYMBOL

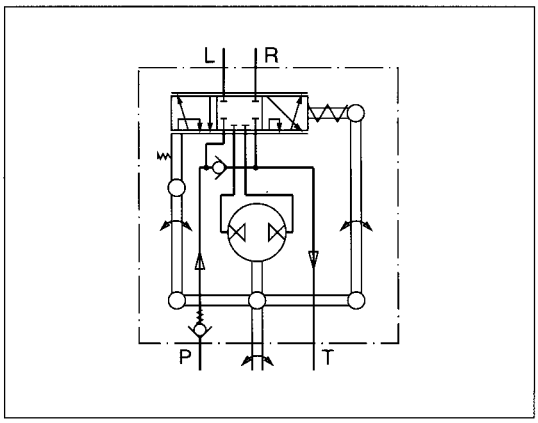
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STX/MSTX
CLOSED CENTER
NON REACTION

The **closed center non reaction** has, in neutral position, no internal circuit connecting the pump P and the tank T.
This version also prevents external forces at the vehicle wheels from reaching the steering wheels.

This steering unit is equipped with:

- check valve



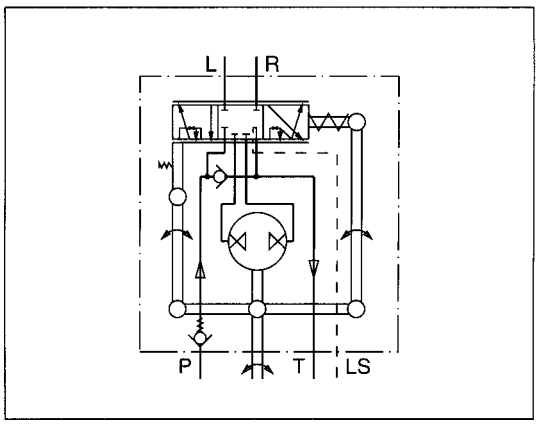
ISO SYMBOL

STX/MSTX
LOAD
SENSING

The **load sensing** steering unit is CN type. This system is connected to a pressure signal (static or dynamic) which can control a flanged priority valve VPF, or in line priority valve VPL (see page 20 and 21).
The system controls the oil flow, allowing the steering unit to work properly.

This steering unit is equipped with:

- check valve



ISO SYMBOL

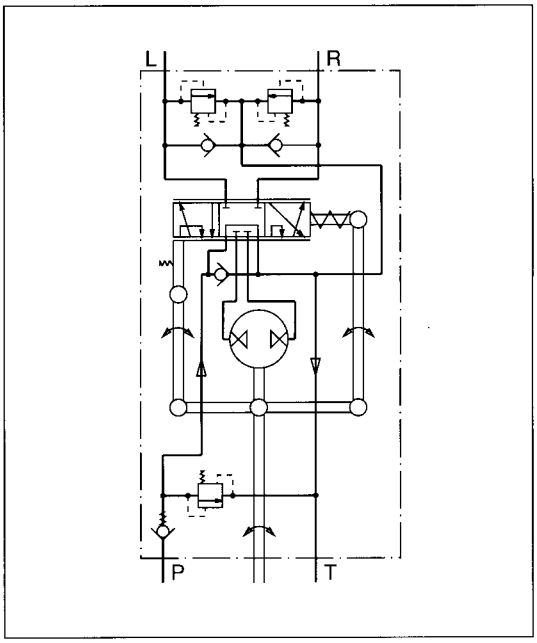
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STA
OPEN CENTER
NON REACTION

The **open center** steering unit has, in neutral position, an internal circuit conveying the fluid directly from pump to tank (P>T), with low pressure drop.
The **non reaction** version prevents external shock forces at the vehicle wheels from being transmitted to the steering wheel.

This steering unit is equipped with:

- check valve
- relief valve
- anti-shock valve
- anti-cavitation valve



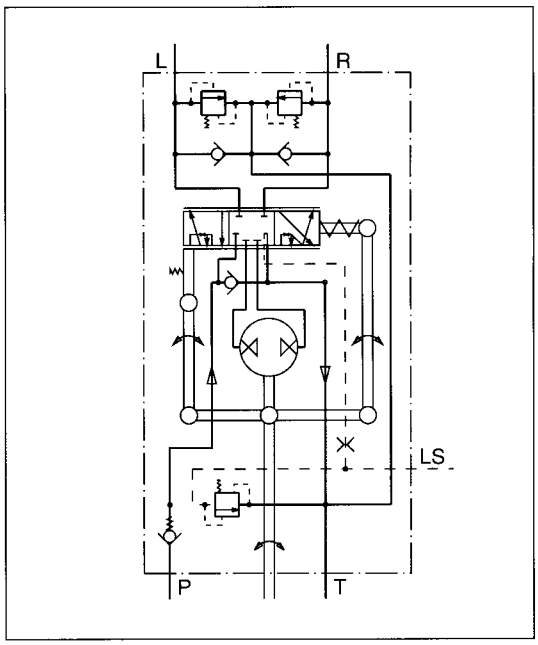
ISO SYMBOL

STA
LOAD
SENSING

The **load sensing** steering unit is CN type. This system is connected to a pressure signal (static or dynamic) which can control a flanged priority valve VPF, or in line priority valve VPL (see page 20 and 21).
The system controls the oil flow, allowing the steering unit to work properly.

This steering unit is equipped with:

- check valve
- relief valve
- anti-shock valve
- anti-cavitation valve



ISO SYMBOL

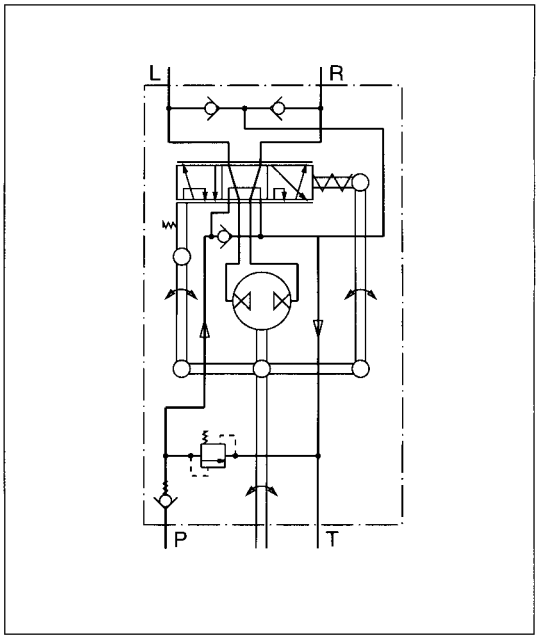
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STZ
OPEN CENTER
REACTION

The **open center reaction** steering unit, compared with the ON, allows external forces to reach the steering wheel thereby causing a proportional reaction to the steering cylinder movement.
For using this type of steering, the two cylinder chamber volumes must be equal.
In neutral position, an internal circuit conveys the fluid directly from pump to tank (P>T), with low pressure drop.

This steering unit is equipped with:

- check valve
- relief valve
- anti-cavitation valve



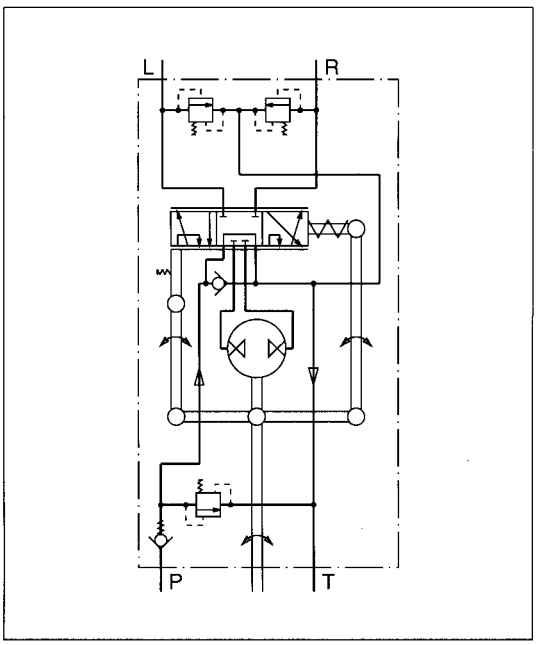
ISO SYMBOL

STH/MSTH
OPEN CENTER
NON REACTION

The **open center** steering unit has, in neutral position, an internal circuit conveying the fluid directly from pump to tank (P>T), with low pressure drop.
The **non reaction** version prevents external shock forces at the vehicle from wheels being transmitted to the steering wheel.

This steering unit is equipped with:

- check valve
- relief valve
- anti-shock valve



ISO SYMBOL

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Emergency manual steering

If the oil flow from the steering system pump fails or is too small, the steering unit will function automatically as a manual steering pump.
In this way, just the emergency steering function of the vehicle is assured.
The table below shows the manual steering pressure value corresponding to each size.
An applied torque of 120 Nm is considered to be the maximum torque applied by an operator.

PRESSURE OBTAINABLE IN MANUAL STEERING

MST displacement		20	32	40	50
Max pressure	bar	150	150	125	100
	psi	*2175*	*2175*	*1813*	*1450*

ST displacement		50	80	100	125	160	200	250	315	400
Max pressure	bar	90	80	60	50	40	30	25	20	15
	psi	*1305*	*1160*	*870*	*725*	*580*	*435*	*363*	*290*	*218*

Load on the steering column

The construction of the steering column must ensure that no axial or radial forces are transferred to the steering unit input shaft.
The mounting of the steering column must be properly aligned so that the steering unit can return to neutral position automatically after a steering action has been completed.

Make sure to lubricate the column spline in assembly with the steering unit (Use calcium - lithium grease)

Technical data

Environment temperature	min.	- 30° C
	max.	+ 60° C
Max temperature during painting process		120° C
Max time resistance to max painting temperature		20 min
Oil temperature	min.	- 30° C
	max.	+ 90° C
Recommended oil temperature	min.	+ 30° C
	max.	+ 60° C
Oil viscosity	min.	10 cst
	max.	1.000 cst
Temperature difference between steering unit and oil circuit		10° C
Torque to steering wheel	normal	3 Nm*
	manual	120 Nm
	max.	240 Nm
Primer painting black RAL 9005	thickness	30 micron

* Max starting torque at max operating speed
Standard torque. Other possibilities: 2,5 Nm and 3,5 Nm

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Technical data

Steering unit	Displacement Cu (cm^3)	Flow Qi (1) (l/min)	Max. oil ports pressure P bar *psi*	T bar *psi*	L,R bar *psi*
MSTX/MSTH ON 20	20	2.0			
MSTX/MSTH ON 32	32	3.2	90	20	150
MSTX/MSTH ON 40	40	4.0	*1305*	*290*	*2175*
MSTX/MSTH ON 50	50	5.0			
MSTX/MSTH LS 20	20	2.0			
MSTX/MSTH LS 32	32	3.2	90	20	150
MSTX/MSTH LS 40	40	4.0	*1305*	*290*	*2175*
MSTX/MSTH LS 50	50	5.0			
STX / STA ON 50	50	5.0			
STX / STA ON 80	80	8.0			
STX / STA ON 100	100	10.0			
STX / STA ON 125	125	12.5	140	20	200
STX / STA ON 160	160	16.0	*2030*	*290*	*2900*
STX / STA ON 200	200	20.0			
STX / STA ON 250	250	25.0			
STX / STA ON 315	315	32.0			
STX / STA ON 400	400	40.0			
STX CN 50	50	5.0			
STX CN 80	80	8.0	175	20	240
STX CN 100	100	10.0	*2538*	*290*	*3480*
STX CN 125	125	12.5			
STX CN 160	160	16.0			
STA LS 50	50	5.0			
STA LS 80	80	8.0			
STA LS 100	100	10.0			
STA LS 125	125	12.5	175	15	240
STA LS 160	160	16.0	*2538*	*218*	*3480*
STA LS 200	200	20.0			
STX LS 250	250	25.0			
STX LS 315	315	32.0			
STX LS 400	400	40.0			

(1) Necessary flow a steering wheel rotating speed of 100 RPM.

Please contact Ognibene sales organization for:

- Steering units with part numbers not described in this catalogue
- Circuits with pressure values different from those shown in this catalogue
- Reactive versions
- Oil connections for different versions
- Different setting versions

OEM customized versions available.

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Part numbers, pressure settings and weight

STX ON-CN-LS

Steering unit	P/N Oil ports G = G 1/2	P/N Oil ports I = 3/4-16 UNF	Weight Kgs.
STX ON 50	905120010	905120020	5.2
STX ON 80	905120030	905120040	5.3
STX ON 100	905120050	905120060	5.4
STX ON 125	905120070	905120080	5.5
STX ON 160	905120090	905120100	5.6
STX ON 200	905120110	905120120	5.8
STX ON 250	905120170	905120180	6.0
STX ON 315	905120130	905120140	6.2
STX ON 400	905120150	905120160	7.0
STX CN 50	905200010	905200020	5.2
STX CN 80	905200030	905200040	5.3
STX CN 100	905200050	905200060	5.4
STX CN 125	905200070	905200080	5.5
STX CN 160	905200090	905200100	5.6
STX LS 315	905320130	905320140	6.2
STX LS 400	905320150	905320160	7.0

MSTX ON

Steering unit	P/N Oil ports G = G 3/8	Weight Kgs
MSTX ON 20	907120010	2.50
MSTX ON 32	907120030	2.60
MSTX ON 40	907120050	2.65
MSTX ON 50	907120070	2.70

Please contact Ognibene sales organisation for customized versions, different oil ports and other setting values.

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STA ON

Steering unit	P/N Oil ports G = G 1/2	P/N Oil ports I = 3/4-16 UNF	Pressure setting*	Weight Kgs.
STA ON 50	905100010	905100020	1	5.2
STA ON 80	905100030	905100040		5.3
STA ON 100	905100050	905100060		5.4
STA ON 125	905100070	905100080		5.5
STA ON 160	905100090	905100100		5.6
STA ON 200	905100110	905100120		5.8
STA ON 250	905100170	905100180		6.0
STA ON 315	905100130	905100140		6.2
STA ON 400	905100150	905100160		7.0
STA ON 50	905100012	905100022	3	5.2
STA ON 80	905100032	905100042		5.3
STA ON 100	905100052	905100062		5.4
STA ON 125	905100072	905100082		5.5
STA ON 160	905100092	905100102		5.6
STA ON 200	905100112	905100122		5.8
STA ON 250	905100172	905100182		6.0
STA ON 315	905100132	905100142		6.2
STA ON 400	905100152	905100162		7.0

* 1 Relief valve pressure setting to 90 Bar and anti-shock valve pressure setting to 150 Bar
3 Relief valve pressure setting to 140 Bar and anti-shock valve pressure setting to 200 Bar

MSTH ON

Steering unit	P/N Oil ports G = G 3/8	Pressure setting*	Weight Kgs.
MSTH ON 20	907130010	1	2.50
MSTH ON 32	907130030		2.60
MSTH ON 40	907130050		2.65
MSTH ON 50	907130070		2.70

* 1 Relief valve pressure setting to 90 Bar and anti-shock valve pressure setting to 150 Bar

Please contact Ognibene sales organization for customized versions, different oil ports and other setting values.

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STA LS for VPF

Steering unit	P/N Oil ports G	P/N Oil ports I	Pressure setting*	Weight Kgs.
STA LS 80	905250033	905250043	4	5.3
STA LS 100	905250053	905250063		5.4
STA LS 125	905250073	905250083		5.5
STA LS 160	905250093	905250103		5.6
STA LS 200	905250113	905250123		5.8

* 4 Relief valve pressure setting to 175 Bar and anti-shock valve pressure setting to 240 Bar

STA LS for VPL

Steering unit	P/N Oil ports G = G 1/2	P/N Oil ports I = 3/4-16 UNF	Pressure setting*	Weight Kgs.
STA LS 80	905300033	905300043	4	5.3
STA LS 100	905300053	905300063		5.4
STA LS 125	905300073	905300083		5.5
STA LS 160	905300093	905300103		5.6
STA LS 200	905300113	905300123		5.8

* 4 Relief valve pressure setting to 175 Bar and anti-shock valve pressure setting to 240 Bar

MSTH LS for VPL

Steering unit	P/N Oil ports G = G 3/8	Pressure setting*	Weight Kgs.
MSTH LS 20	907330010	1	2.50
MSTH LS 32	907330030		2.60
MSTH LS 40	907330050		2.65
MSTH LS 50	907330070		2.70

* 1 Relief valve pressure setting to 90 Bar and anti-shock valve pressure setting to 150 Bar

Please contact Ognibene sales organization for customized versions, different oil ports and other setting values.

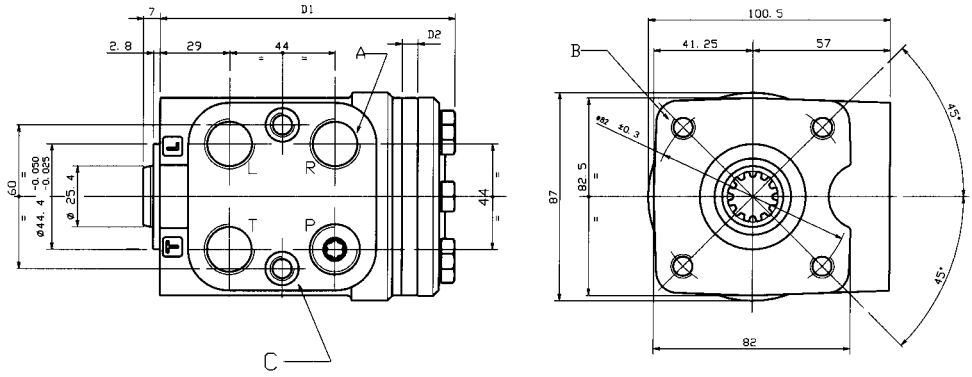
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Dimensions

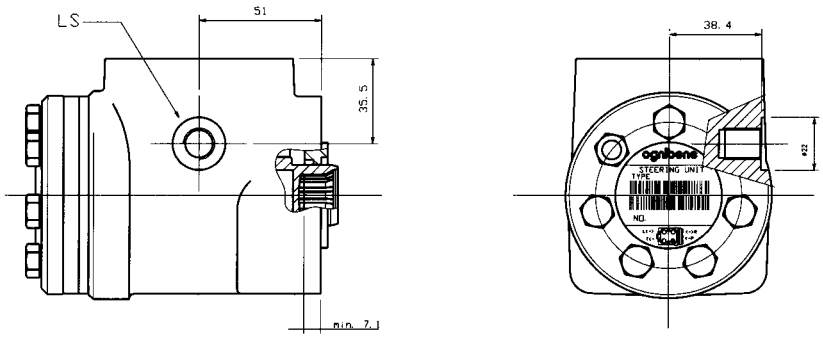
STX

A: 3/4 - 16 UNF o-ring or G 1/2
B: 3/8 - 16 UNC, 16 mm deep
or M10x1,5, 16 mm deep
C: M10x1, 18 mm deep
LS: 7/16-20 UNF o-ring or G 1/4

STX ON and STX CN



STX LS



Other dimensions are same as STX ON

Steering unit	D1 mm	D2 mm
STX 50	123	6.5
STX 80	127	10.6
STX 100	130	13.2
STX 125	133	16.8
STX 160	139	22.0
STX 200	144	25.5
STX 250	151	32.5
STX 315	161	43.1
STX 400	170	50.3

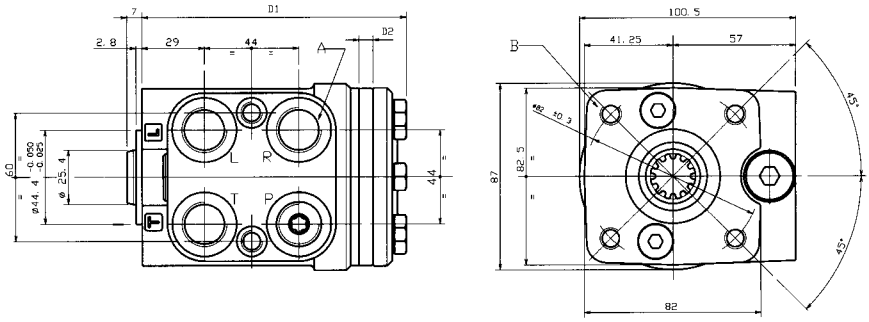
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Dimensions

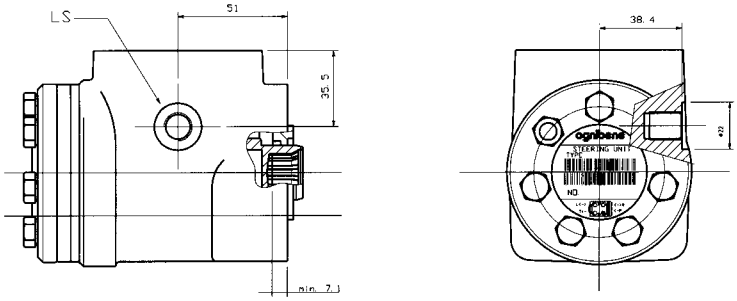
STA, STZ and STH

A: 3/4 - 16 UNF o-ring or G 1/2
B: 3/8 - 16 UNC 16 mm deep or M10x1,5 16 mm deep
C: M10x1 18 mm deep
LS: 7/16-20 UNF o-ring or G 1/4

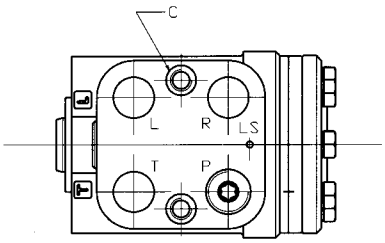
STA ON, STZ OR and STH ON



STA LSX VPL



STA LSX VPF



Other dimensions are same as STA ON

Steering unit	D1 mm	D2 mm
STA 50	123	6.5
STA 80	127	10.6
STA 100	130	13.2
STA 125	133	16.8
STA 160	139	22.0
STA 200	144	25.5
STA 250	151	32.5
STA 315	161	43.1
STA 400	170	50.3

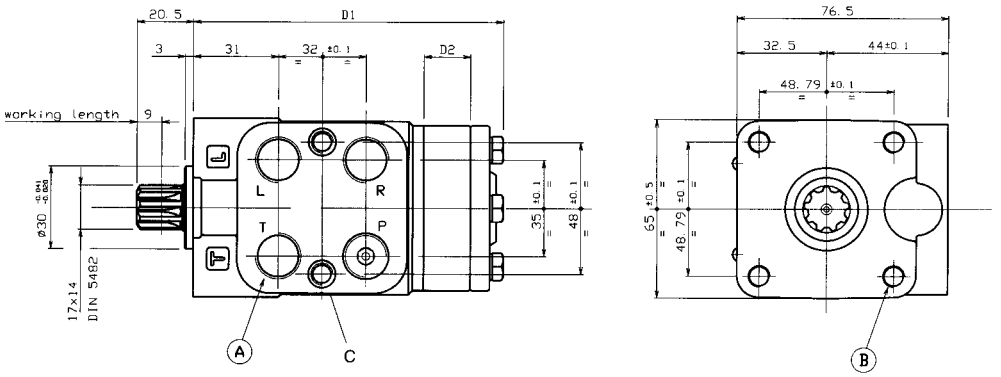
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Dimensions

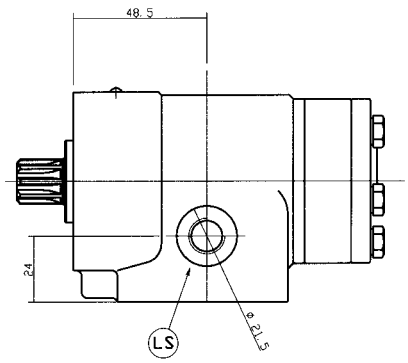
MSTX

A: G 3/8
B: M8 14 mm deep
C: M8x1 mm deep 12
LS: G 1/4

MSTX ON



MSTX LS



Other dimensions are same as MSTX ON

Steering unit	D1 mm	D2 mm
MSTX 20	105	8.5
MSTX 32	110	13.5
MSTX 40	113	17.0
MSTX 50	117	21.0

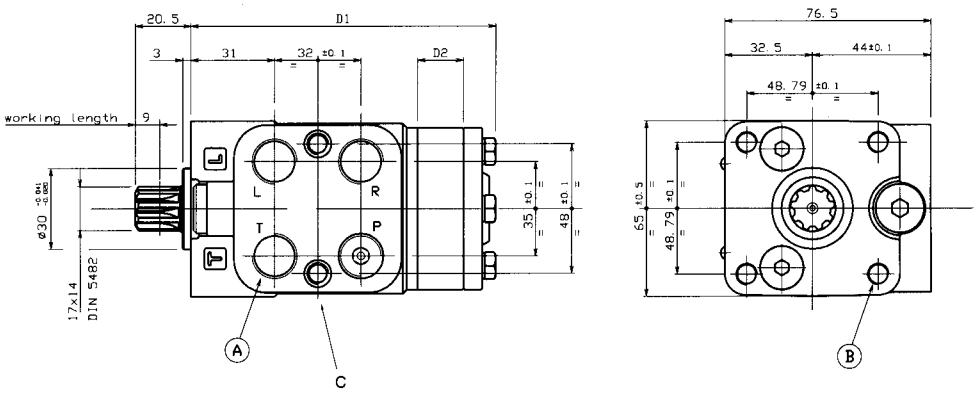
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Dimensions

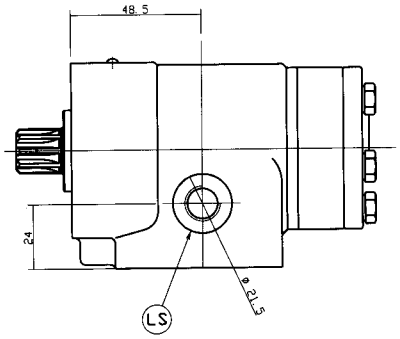
MSTH

A: G 3/8
B: M8 14 mm deep
C: M8 18 mm deep
LS: G 1/4

MSTH ON



MSTH LS



Other dimensions are same as MSTH ON

Steering unit	D1 mm	D2 mm
MSTH 20	105	8.5
MSTH 32	110	13.5
MSTH 40	113	17.0
MSTH 50	117	21.0

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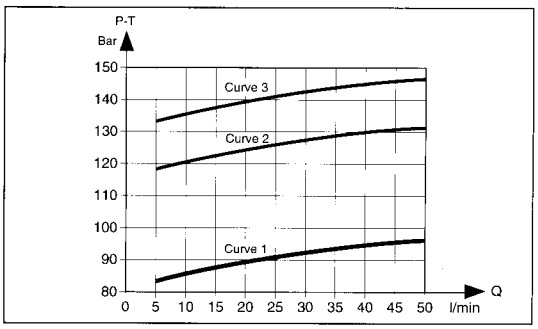
Relief valve

The charts show the characteristic curve of the valve at 50°C using oil viscosity 21 cSt.
This valve limits maximum supply pressure to protect the power steering system. The built-in relief valve also works as a by-pass when the cylinder is at the end of its stroke.

STA Relief valve

The data was taken with the relief valve preset to 25 l/min. flow.

CURVE 1 = 90 Bar
CURVE 2 = 125 Bar
CURVE 3 =140 Bar

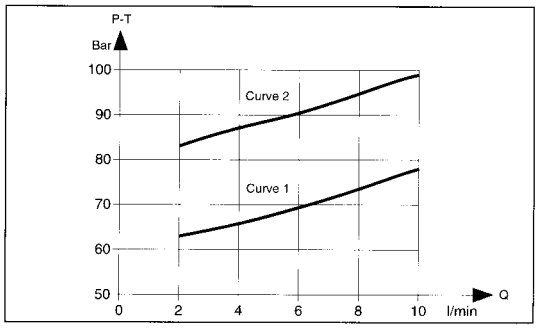


STA CHART

MSTH/Z Relief valve

The data was taken with the relief valve set to 6 l/min. flow.

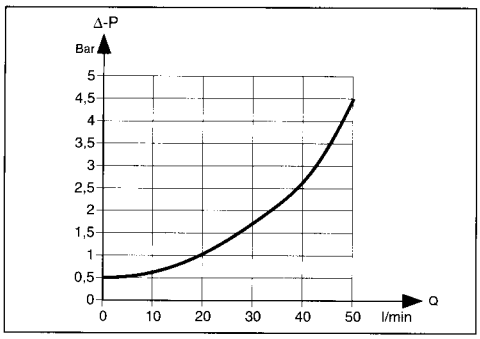
CURVE 1 = 70 Bar
CURVE 2 = 90 Bar



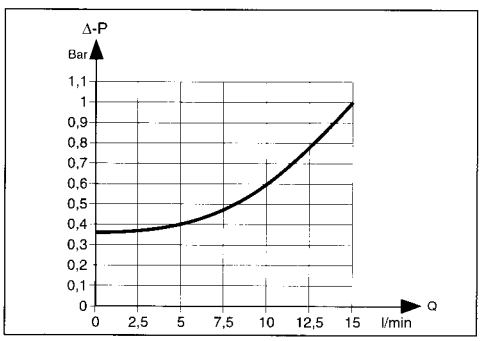
MSTA CHART

Check valve

The charts show the characteristic curve of the valve at 50°C using oil viscosity 21 cSt.
The check valve prevents oil from returning through the P-inlet oil port when pressure on the cylinder side is higher than oil pump pressure. Steering wheel kick back is thus avoided. This valve also prevents air ingress in the event of a tube failure between pump and tank (required by the German Authorities TÜV Vehicle Homologation) to maintain circuit integrity in an **"emergency steering"** condition.



ST CHECK VALVE CHART



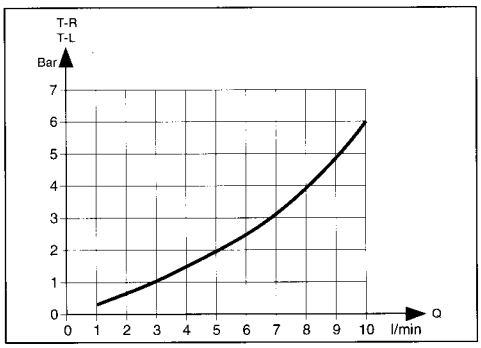
MST CHECK VALVE CHART

N.B.: IN ORDER TO HAVE THE SAME WORKING CONDITIONS AS SHOWN ON THE ABOVE CHARTS, THE MINIMUM INTERNAL DIAMETER OF CONNECTION MUST BE AT LEAST 11 mm. FOR ST AND MUST BE 8.5 mm. FOR MST.

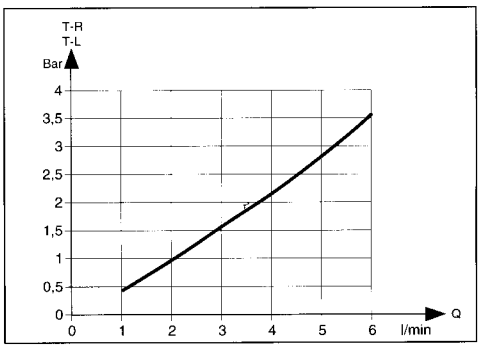
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Anti-cavitation valve

The charts show the characteristic curve of the valve at 50°C using oil viscosity 21 cSt.
These valves are designed specifically to prevent cavitation in the steering cylinders ports. A back pressure in the return line "T" of approximately 2 bar enhances valve performance.



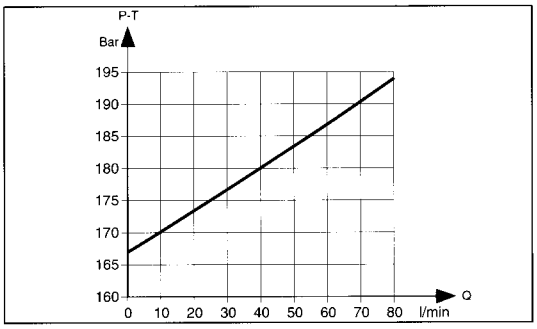
ST ANTICAVITATION VALVE CHART



MST ANTICAVITATION VALVE CHART

ST A LS + VPF/VPL 80

The pilot pressure relief valve protects the steering unit against excess pressure.
The pilot pressure relief valve in ST A LS toghether with the priority valve limits the maximum steering pressure P-T.
The pilot pressure relief valve is set at an oil flow of 5 l/min (25 l/min at "P" port of priority valve).
Setting: 175 bar.



LS RELIEF VALVE CHART

Anti-shock valve

These fast-response anti-shock valves protect the system from dangerous pressure peaks which can occur in extreme conditions.
These valves are set at 1 l/min. flow and 60 Bar higher than relief valve setting.

IMPORTANT

All valves described (with the exception of VPF and VPL) are integral to the steering unit. The benefit of this is very compact overall dimensions as well as simple mounting.
The above mentioned data was taken from a production sample.

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Standard setting

ST Setting

Setting pressure code	Relief valve		Anti-shock valve	
	bar	*psi*	bar	*psi*
1 (*)	90	*1305*	150	*2175*
2	125	*1813*	185	*2683*
3	140	*2030*	200	*2900*
4	175	*2538*	240	*3480*

MST Setting

Setting pressure code	Relief valve		Anti-shock valve	
	bar	*psi*	bar	*psi*
0	70	*1015*	130	*1885*
1 (*)	90	*1305*	150	*2175*
2	125	*1813*	185	*2683*
3	140	*2030*	200	*2900*

* If not otherwise specified, the unit will be supplied with the setting valves indicated in code 1.

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