SAUER DANFOSS

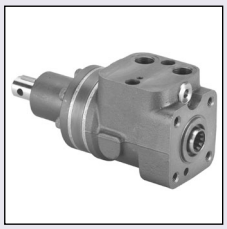
OSPB, OSPC, OSPR, OSPD Open Center Steering units

OSPB Closed Center Steering units

TAD Torque amplifiers

Technical Information






Open and Closed Center Steering units, Torque amplifiers
Technical Information
A wide range of steering components

A WIDE RANGE OF STEERING COMPONENTS

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Sauer-Danfoss is the largest producer in the world of steering components for hydrostatic steering systems on off-road vehicles. Sauer-Danfoss offer steering solutions both at component and system levels. Our product range makes it possible to cover applications of all types - ranging from ordinary 2-wheel steering (also known as Ackermann steering) to articulated steering, complicated 4-wheel steering, automatic steering (e.g. by sensor) and remote controlled steering via satellite.
We can offer more than 1000 different steering units, 150 different priority valves and 300 different steering columns categorised in types, variants and sizes.

For hydrostatic steering systems Sauer-Danfoss offers:

- Mini steering units with displacements from 32 to 100 cm^3/rev [1.95 to 6.10 in^3/rev], flow up to 20 l/min [5.28 US gal/min], steering pressure up to 125 bar [1813 psi]
- Steering units with displacements from 40 to 1000 cm^3/rev [2.44 to 61.0 in^3/rev], flow up to 100 l/min [26.4 US gal/min], steering pressure up to 210 bar [3045 psi]
- Priority valves for rated flows at 40, 80, 120 and 160 l/min [10.6, 21.1, 31.7 and 42.3 US gal/min], pressure up to 350 bar [5076 psi]
- Flow-amplifiers with amplification factors of 4, 5, 8, 10 or 20 for rated oil flows of 240 and 400 l/min [63.4 and 105.7 US gal/min], steering pressure up to 210 bar [3045 psi]
- Pilot operated steering valve with steering flow up to 100 l/min [26.4 US gal/min], steering pressure up to 250 bar [3625 psi] and with integrated priority valve for pump flow up to 150 l/min [39.6 US gal/min].

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A WIDE RANGE OF STEERING COMPONENTS (CONTINUED)

For electro-hydraulic steering systems Sauer-Danfoss offers:

- Pilot operated steering valve (pilot operated by hydrostatic steering unit or by electrical signal) with steering flow up to 100 l/min [26.4 US gal/min] , steering pressure up to 250 bar [3625 psi] and with integrated priority valve for pump flow up to 150 l/min [39.6 US gal/min]

For hydromechanical steering systems Sauer-Danfoss offers:

- Torque amplifiers for output torques of 80 and 120 Nm [708 and 1062 lbf·in]

For steering units and torque amplifiers Sauer-Danfoss offers:

- Steering columns: fixed, tiltable and/or telescopible with or without horn switch and sensor for start/stop of pump, with length, from 45 to 1200 mm [1.77 to 47.2 in]

Characteristic features of steering units:

- Low steering torque: From 0.5 Nm to 3 Nm [4.42 to 26.6 lbf·in] in normal steering situations
- Low noise level
- Low pressure drop
- Many types available: Open center Non reaction, Open center Reaction, Closed center Non reaction, Load Sensing, Load Sensing Reaction, Power Beyond
- One or more built-in valve functions: relief valve, shock and suction valves in L- and R-line, none return valve in P-line and in LS-line
- Optional port connections (according to ISO, SAE or DIN standards)

Characteristic features of electro-hydraulic steering system:

- High steering pressure requiring smaller cylinders and flow
- Low noise emmission in the cab because of low pilot pressure
- The possibility of emergency steering even on very heavy vehicles
- Minimization of side acceleration with articulated steering
- With microcontroller: No steering wheel drift and the possibility of variable steering ratio
- Analogue and CAN-bus interface
- Electro-hydraulic steering valve EHPS can be combined with Sauer-Danfoss PVG 32 proportional valve
- The system is approved by TÜV and have a controller with satisfy critical steering software

CONVERSION FACTORS

1 Nm = 8.851 lbf·in	1 cm^3 = 0.061 in^3
1 N = 0.225 lbf	1 litre = 0.264 US gal
1 bar = 14.50 psi	°F = 1.8 × °C + 32
1 mm = 0.0394 in	

Open and Closed Center Steering units, Torque amplifiers
Technical Information
Contents and technical literature survey

CONTENS AND TECHNICAL LITERATURE SURVEY

Contents and technical literature survey

SURVEY OF LITTERATURE WITH TECHNICAL DATA ON SAUER-DANFOSS STEERING COMPONENETS

Detailed data on all Sauer-Danfoss steering components and accessories can be found in our steering component catalogues, which is divided in 6 individual subcatalogues:

• General information	Steering components DKMH.PK.200.A1.02 **520L0468**
• Technical data on mini steering units and steering columns for mini steering units:	OSPM and OTPM DKMH.PN.210.PC.02 **520L0438**
• Technical data on open center and closed center steering units and on torque amplifiers:	OSPB, OSPC, OSPR, OSPD and TAD DKMH.PK.210.A1.02 **520L0502**
• Technical data on load sensing steering units, priority valves and flow-amplifiers:	OSPB, OSPC, OSPF, OSPD, OSPQ, OSPL, OSPBX, OSPCX, OSPLX, OLS and OSQ DKMH.PN.210.B1.02 **520L0520**
• Technical data on hydraulic and electro-hydraulic pilot operated steering valve, appropriate steering units and electrical actuation module as well as sensors for electro-hydraulic steering systems	EHPS and OSPCX PVE and PVED for EHPS and sensors for steering systems with EHPS DKMH.PN.270.B1.02 **520L0521**
• Technical data on valve blocks and steering columns	OVP, OVPL, OVR and OTPB DKMH.PN.230.A1.02 **520L0522**

The most important data on all Sauer-Danfoss steering components is highlighted in a general survey brochure.
For technical information on individual variants, please contact the Sauer-Danfoss Sales Organisation

NOTES

VERSIONS

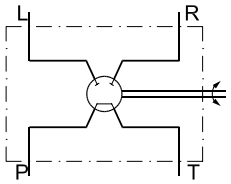
Open center
Open center steering units have open connection between pump and tank in the neutral position. In open center steering systems, pumps with fixed displacement are used.

Reaction
With reaction steering units any external forces acting on the steered wheels result in a corresponding movement of the steering wheel when the driver is not steering the vehicle.

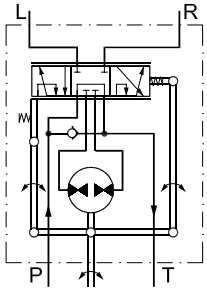
Non-reaction
With non-reaction steering units there is no corresponding movement of the steering wheel when the driver is not steering the vehicle.

OSPB: Steering unit with no valve functions

Sauer-Danfoss diagram



CETOP diagram



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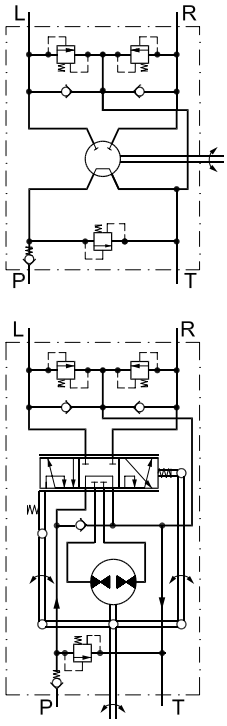
OSPB ON
Open center Non-reaction

VERSIONS

OSPC: Steering unit with integrated valve functions

OSPC ON

F300618



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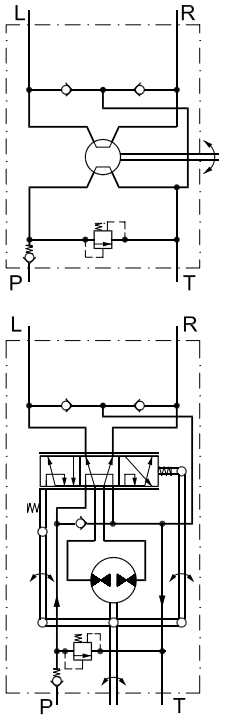
OSPC ON
Open center Non-reaction



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OSPC OR
Open center Reaction

VERSIONS

OSPR: Steering unit with rear ports and with integrated valve functions
The OSPR has end ports with integrated fittings and is designed specially for applications where pipes and/or hoses must run parallel with the steering column, and where space is limited.

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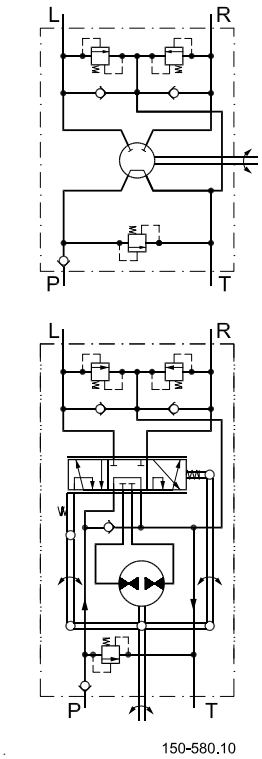

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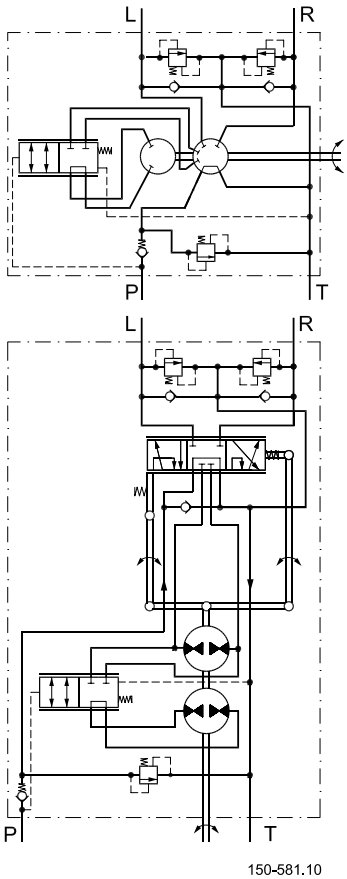
OSPR ON
Open center Non-reaction



150-581.10

OSPD ON
Open center Non-reaction

OSPD: Steering unit with 2 rotary meters and with integrated valve functions
The OSPD has 2 rotary meters (gear wheel sets). In the case of no pump supply only one rotary meter is active for emergency steering. In normal steering situations both rotary meters are active.

CODE NUMBERS AND WEIGHTS

OSPB OPEN CENTER NON-REACTION STEERING UNITS

OSPB has no valve functions.

Steering unit	Code Numbers		Pump flow range	Weight
	Connections			
	European version	US version		
	G 1/2	3/4-16UNF O*	l/min [US gal/min]	kg [lb]
OSPB 50 ON	150N0039	150N0025	5-18 [1.32-4.76]	5.2 [11.46]
OSPB 80 ON	150N0040	150N0026	10-30 [2.64-7.93]	5.3 [11.68]
OSPB 100 ON	150N0041	150N0027		5.4 [11.90]
OSPB 125 ON	150N0042	150N0024	20-50 [5.28-13.21]	5.5 [12.13]
OSPB 160 ON	150N0043	150N0028		5.6 [12.35]
OSPB 200 ON	150N0044	150N0023		5.8 [12.79]
OSPB 250 ON	150N0052	150N0022		6.0 [13.23]
OSPB 315 ON	150N0045	150N0030	20-70 [5.28-18.49]	6.2 [13.67]
OSPB 400 ON	150N0046	150N0031		7.0 [15.43]
OSPB 500 ON	150N0047	150N0032		7.6 [16.76]

O*: O-ring chamfer on port connections
Valve blocks OVP and OVR can be mounted on the all the OSPB steering units from the above table.

CODE NUMBERS AND WEIGHTS

OSPC OPEN CENTER NON-REACTION STEERING UNITS

OSPC ON in the table below have all the following valve functions incorporated:

- check valve in P-port
- relief valve
- shock valves
- suction valves

Steering unit	Code Numbers		Pump flow range	Valve settings		Weight
	Connections			Relief valve	Shock valve	
	European version	US version				
	G 1/2 S**	3/4-16 UNF O*	l/min [US gal/min]	bar [psi]	bar [psi]	kg [lb]
OSPC 40 ON	150N2148	–	5-18 [1.32-4.76]	140 [2030]	200 [2900]	5.2 [11.46]
OSPC 50 ON	150N2149	150N2136				5.2 [11.46]
OSPC 80 ON	150N2150	150N2137	10-30 [2.64-7.93]	170 [2465]	225 [3263]	5.3 [11.68]
OSPC 100 ON	150N2151	150N2138				5.4 [11.90]
OSPC 125 ON	150N2152	150N2139	20-50 [5.28-13.21]			5.5 [12.13]
OSPC 160 ON	150N2153	150N2140				5.6 [12.35]
OSPC 200 ON	150N2154	150N2141				5.8 [12.79]
OSPC 250 ON	150N2155	150N2168				6.0 [13.23]
OSPC 315 ON	150N2156	150N2142	20-70 [5.28-18.49]			6.2 [13.67]
OSPC 400 ON	150N2157	–				7.0 [15.43]
OSPC 500 ON	150N2158	–				7.6 [16.78]

O*: O-ring chamfer on port connections
S**: Spot-face around port connections (can not be used in connection with OVR angular block).

If you wish other port connection displacements, combination of displacement and pump flow range, valve combinations and/or other valve settings, please fill in the order form on page 14 and contact the Sauer-Danfoss Sales Organisation.

CODE NUMBERS AND WEIGHTS

OSPC OPEN CENTER REACTION STEERING UNITS

OSPC OR in the table below have all the following valve functions incorporated:

- check valve in P-port
- relief valve
- suction valves

Steering unit	Code Numbers Connections European version G 1/2	Pump flow range l/min [US gal/min]	Valve settings Relief valve bar [psi]	Weight kg [lb]
OSPC 80 OR	150N2159	10-30 [2.64-7.93]	170 [2465]	5.3 [11.68]
OSPC 200 OR	150N2160	20-50 [5.28-13.21]		5.8 [12.79]

If you wish other displacements, port connections, pump flow range, valve combinations and/or other valve settings, please fill in the order form on page 14 and contact the Sauer-Danfoss Sales Organisation.

OSPR OPEN CENTER NON-REACTION STEERING UNITS

OSPR ON in the table below has the following valve functions incorporated:

- check valve in P-port
- relief valve
- shock valves
- suction valves

All OSPR steering units are painted black

Steering unit	Code Numbers Connections European version ORFS 11/16-16 UN 9/16-18 UNF	Pump flow range l/min [US gal/min]	Valve settings Relief valve bar [psi]	 Shock valve bar [psi]	Weight kg [lb]
OSPR 125 ON	150N6001	10-30 [2.64-7.93]	170 [2465]	225 [3263]	4.9 [10.80]

If you wish other displacements, reaction type, pump flow range and/or other valve settings, please fill in the order form on page 14 and contact the Sauer-Danfoss Sales Organisation.

CODE NUMBERS AND WEIGHTS

OSPD OPEN CENTER NON-REACTION STEERING UNITS

OSPD ON in the table below has the following valve functions incorporated:

- check valve in P-port
- relief valve
- shock valves
- suction valves

Steering unit	Code Numbers Connections European version G1/2 S**	Pump flow range l/min [US gal/min]	Valve settings Relief valve bar [psi]	 Shock valve bar [psi]	Weight kg [lb]
OSPD 70/195 ON	150G4051	20-50 [5.28-13.21]	170 [2465]	225 [3263]	7.6 [16.76]

S**: Spot-face around port connections (can not be used in connection with OVR angular block)

If you wish other displacements, reaction type, pump flow range and/or other valve settings, please fill in the order form on page 14 and contact the Sauer-Danfoss Sales Organisation.

SPECIFICATION TABLE FOR NON CATALOGUE NUMBERS

Specification table for Sauer-Danfoss open center steering units type OSPC, OSPR and OSPD which are not available in the code number tables.
Fill in your company data and place x's in the table where appropriate then send to your Sauer-Danfoss Sales Organisation.

Your company	Name	Vehicle	Potential pcs/year	Completed by	Date

Steering unit type	OSPC						OSPR						OSPD			
Reaction type	ON (Open center Non-reaction)								OR (Open center Reaction)							
DP, cm^3/rev OSPC ON	40	50	60	70	80	100	125	160	185	200	230	250	315	400	500	
DP, cm^3/rev OSPC OR	40	50	60	70	80	100	125	160	185	200						
DP, cm^3/rev OSPR ON/OR	70		80		125		200									
DP, cm^3/rev OSPD ON	60/185	60/220	60/260	70/195	70/230	70/270	100/260	100/300	125/285	125/325	125/440					
DP, cm^3/rev OSPD OR	60/185		60/220		70/195		70/230									
Pump flow range l/min	5-18		10-30		20-50		20-70									
Port threads OSPC***	$G^1/_2$		$G^1/_2$ - S**		M18 × 1.5 - O* S**		M22 × 1.5/M18 × 1.5 - S**		$^3/_4$-16UNF - O*							
Relief valve**** bar	70	80	90	100	110	120	140	170	190	200	210	no relief valve				
Shock valves bar	150	180	200	225	240	no shock valves										
Suction valves	Yes						No									
Neutral setting springs	Soft: 0.5 - 1.8 Nm in normal steering situations				Standard: 0.8 - 3 Nm in normal steering situations						Strong: 1.5 - 4 Nm in normal steering situations					
Unit black painted	Yes						No									

DP: Displacement
O*: O-ring chamfer on port connections
S**: Spot-face around port connections (can not be used in connection with OVR angular block)
OSPC***: The different port connections are only available for OSPC ON/OR, see also the form on page 13.
Relief valve****: see form on page 16 for limitations in maximum pressure depending on displacement and limitations for OSPR.

All OSPC, OSPR and OSPD steering units specified by code numbers in this catalogue have check valve in P-connection.
All steering units specified by code numbers in this catalogue have standard neutral setting springs.

An alternative way to specify a variant is to state an existing code number and add the modifications, you would like to have implemented in the basic steering unit.
Code number of basic steering unit: _____
Requested modifications: _____
_____

PORT THREAD VERSIONS AND VALVE COMBINATIONS

The following combinations of port threads and valves are available for OSPC ON/OR:

Threads		Valves		
Ports	**For steering column**	**Relief valve**	**Shock valves**	**Suction valves**
DIN 3852-2 G 1/2	M10×1.5	Yes	Yes	Yes
		Yes	Yes	No
		Yes	No	Yes
		Yes	No	No
DIN 3852-2 G 1/2 w. spot-face	M10×1.5	Yes	Yes	Yes
		Yes	Yes	No
		No	Yes	Yes
ISO 6149-1 M18×1.5, w. O-ring chamfer and spot-face	M10×1.5	Yes	Yes	Yes
		Yes	Yes	No
		Yes	No	Yes
		Yes	No	No
DIN 3852-1 P and T: M22×1.5, L and R: M18×1.5 w. spot-face	M10×1.5	Yes	Yes	Yes
		Yes	No	Yes
		Yes	No	No
ISO 11926-1 3/4-16 NF, O-ring boss port	3/8-16 UNC	Yes	Yes	Yes
		Yes	Yes	No
		Yes	No	Yes
		Yes	No	No
		No	Yes	Yes
ISO 11926-1 3/4-16 NF, O-ring boss port	M10×1.5	Yes	Yes	Yes
		Yes	Yes	No
		Yes	No	Yes

Housings with around port connections can not be used in connection with OVR angular block.
Shock valves are not needed for reaction type steering units.
For OSPR ON/OR and OSPD ON/OR only the versions listed in the tables with code numbers are available.

STEERING UNITS, OSPB CLOSED CENTER

VERSION

Closed center
Closed center steering units are blocked on their P port in the neutral position. In closed center steering systems, variable oil flow is required.

Non-reaction
With non-reaction steering units there is no corresponding movement of the steering wheel when the driver is not steering the vehicle

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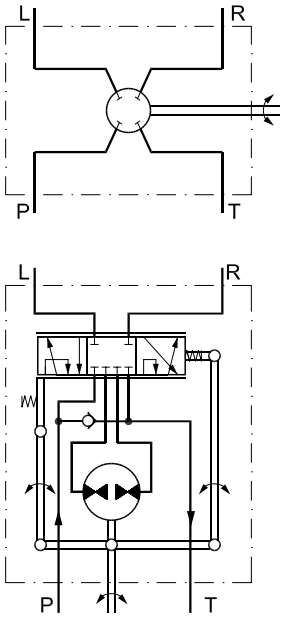

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OSPB CN
Closed center Non-reaction

CODE NUMBERS AND WEIGHTS

OSPB CLOSED CENTER NON-REACTION STEERING UNITS

OSPB has no valve functions.

Steering unit	Code Numbers Connections US version ¾-16UNF O*	Weight kg [lb]
OSPB 50 CN	150-0125	5.2 [11.46]
OSPB 80 CN	150-0126	5.3 [11.68]
OSPB 100 CN	150-0127	5.4 [11.90]
OSPB 125 CN	150-0129	5.5 [12.13]
OSPB 160 CN	150-0128	5.6 [12.35]
OSPB 200 CN	150-0146	5.8 [12.79]
OSPB 315 CN	150G4104	6.2 [13.23]
OSPB 400 CN	150G4105	7.0 [15.43]

O*: O-ring chamfer on port connections

Valve blocks OVP and OVR can be mounted on the all the OSPB steering units from the above table

TECHNICAL DATA

Common data:
Look in sub catalogue:"General, steering components"

DISPLACEMENT, FLOW AND PRESSURE

Steering unit	Displacement cm³/rev [in³/rev]	Recommended* oil flow l/min [US gal/min]	Max. pressure on connections P bar [psi]	T bar [psi]	L, R bar [psi]
OSPC 40 ON	40 [2.44]	4-18 [1.05-4.76]	140 [2030]	40 [580]	280 [4061]
OSPB/OSPC 50 ON	50 [3.05]	5-18 [1.32-4.76]			
OSPC 60 ON	60 [3.66]	6-18 [1.59-4.76]			
OSPC 70 ON	70 [4.27]	7-18 [1.85-4.76]	175 [2538]		
OSPB/OSPC 80 ON	80 [4.88]	8-30 [2.11-7.93]			
OSPB/OSPC 100 ON	100 [6.10]	10-30 [2.64-7.93]			
OSPB/OSPC 125 ON	125 [7.63]	13-50 [3.43-13.21]	210 [3045]		
OSPB/OSPC 160 ON	160 [9.76]	16-50 [4.23-13.21]			
OSPB/OSPC 185 ON	185 [11.29]	19-50 [5.02-13.21]			
OSPB/OSPC 200 ON	200 [12.20]	20-50 [4.23-13.21]			
OSPB/OSPC 230 ON	230 [14.04]	23-50 [6.08-13.21]			
OSPB/OSPC 250 ON	250 [15.26]	25-50 [6.60-13.21]			
OSPB/OSPC 315 ON	315 [19.22]	32-70 [8.45-18.49]			
OSPB/OSPC 400 ON	400 [24.41]	40-70 [10.57-18.49]			
OSPB/OSPC 500 ON	500 [30.51]	50-70 [13.21-18.49]			
OSPC 40 OR	40 [2.44]	4-18 [1.05-4.76]	140 [2030]	40 [580]	280 [4061]
OSPC 50 OR	50 [3.05]	5-18 [1.32-4.76]			
OSPC 60 OR	60 [3.66]	6-18 [1.59-4.76]			
OSPC 70 OR	70 [4.27]	7-18 [1.85-4.76]	175 [2538]		
OSPC 80 OR	80 [4.88]	8-30 [2.11-7.93]			
OSPC 100 OR	100 [6.10]	10-30 [2.64-7.93]			
OSPC 125 OR	125 [7.63]	13-50 [3.43-13.21]	210 [3045]		
OSPC 160 OR	160 [9.76]	16-50 [4.23-13.21]			
OSPC 185 OR	185 [11.29]	19-50 [5.02-13.21]			
OSPC 200 OR	200 [12.20]	20-50 [4.23-13.21]			
OSPR 70 ON	70 [4.27]	7-18 [1.85-4.76]	175 [2538]	20 [5]	240 [3480]
OSPR 80 ON	80 [4.88]	8-30 [2.11-7.93]			
OSPR 125 ON	125 [7.63]	13-30 [3.43-7.93]			
OSPR 200 ON	200 [12.20]	20-30 [4.23-7.93]			
OSPR 70 OR	70 [4.27]	7-18 [1.85-4.76]	175 [2538]	20 [5]	240 [3480]
OSPR 80 OR	80 [4.88]	8-30 [2.11-7.93]			
OSPR 125 OR	125 [7.63]	13-30 [3.43-7.93]			
OSPR 200 OR	200 [12.20]	20-30 [4.23-7.93]			
OSPB 50 CN	50 [3.05]	5 [1.32]	140 [2030]	40 [580]	280 [4061]
OSPB 80 CN	80 [4.88]	8 [2.11]	175 [2538]		
OSPB 100 CN	100 [6.10]	10 [2.64]			
OSPB 125 CN	125 [7.63]	13 [3.43]			
OSPB 160 CN	160 [9.76]	16 [4.23]			
OSPB 200 CN	200 [12.20]	20 [5.28]			
OSPB 315 CN	315 [19.22]	32 [8.45]			
OSPB 400 CN	400 [24.41]	40 [10.57]			

* Criteria for determining the recommended oil flow:
- As a minimum the oil flow it takes to ensure sufficient steering speed at engine idle speed
- Ensures the least possible pressure loss at full speed

TECHNICAL DATA

Common data:
Look in sub catalogue: "General, steering components"

DISPLACEMENT, FLOW AND PRESSURE

Steering unit	Displacement manual steer mode cm³/rev [in³/rev]	Displacement normal steer mode cm³/rev [in³/rev]	Recommended* oil flow l/min [US gal/min]	Max. pressure on connections P bar [psi]	T bar [psi]	L, R bar [psi]
OSPD 60/185 ON	60 [3.66]	185 [11.29]	20-50 [5.28-13.21]			
OSPD 60/220 ON	60 [3.66	220 [13.43]	22-50 [5.81-13.21]			
OSPD 60/260 ON	60 [3.66]	260 [15.87]	26-50 [6.87-13.21]			
OSPD 70/195 ON	70 [4.27]	195 [11.90]	20-50 [5.28-13.21]			
OSPD 70/230 ON	70 [4.27]	230 [14.04]	23-50 [6.08-13.21]	210 [3045]	40 [580]	280 [4060]
OSPD 100/260 ON	100 [6.10]	260 [15.87]	26-50 [6.87-13.21]			
OSPD 100/300 ON	100 [6.10]	300 [18.31]	30-50 [7.93-13.21]			
OSPD 125/285 ON	125 [7.63]	285 [17.39]	30-50 [7.93-13.21]			
OSPD 125/325 ON	125 [7.63]	325 [19.83]	33-70 [8.72-18.49]			
OSPD 125/440 ON	125 [7.63]	440 [26.85]	44-70 [11.62-18.49]			
OSPD 60/185 OR	60 [3.66]	185 [11.29]	20-50 [5.28-13.21]			
OSPD 60/220 OR	60 [3.66]	220 [13.43]	22-50 [5.81-13.21]			
OSPD 70/195 OR	70 [4.27]	195 [11.90]	20-50 [5.28-13.21]	210 [3045]	40 [580]	280 [4060]
OSPD 70/230 ON	70 [4.27]	230 [14.04]	23-50 [6.08-13-21]			

* Criteria for determining the recommended oil flow:
- As a minimum the oil flow it takes to ensure sufficient steering speed at idle engine speed
- Ensures the least possible pressure loss at full speed

Please contact the Sauer-Danfoss Sales Organisation regarding steering units with code numbers not mentioned in this catalogue. They may have different technical data.

TECHNICAL DATA

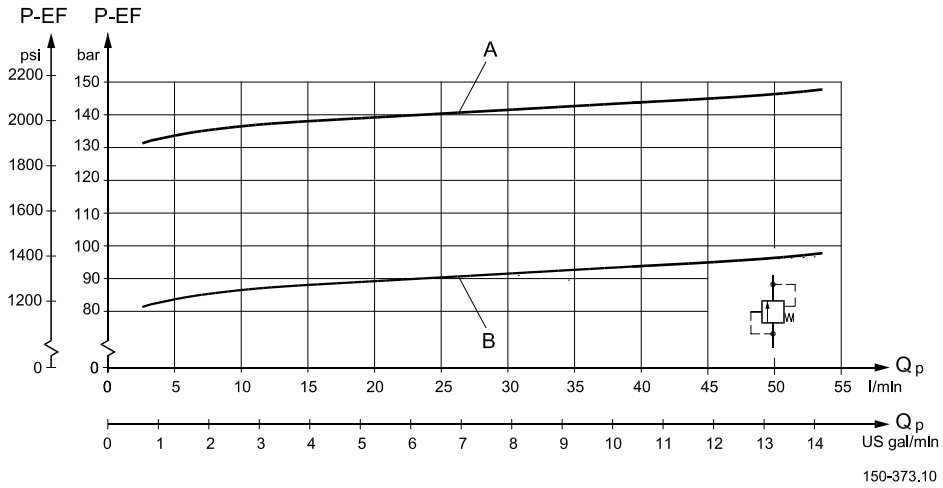
VALVE FUNCTIONS IN OSPC, OSPR AND OSPD STEERING UNITS

The data below comes from measurements on a representative sample of steering units from production. Oil with a viscosity of 21 mm²/s [100 SUS] at 50°C [122°F] was used during measuring.

PRESSURE RELIEF VALVE

The pressure relief valve protects pump and steering unit against excessive pressure and limits the system pressure while steering. The pressure relief valve is set at 25 l/min [6.60 US gal/min] flow.

Setting tolerances:
170 bar [2466 psi]: rated value +5 bar [+73 psi]
> 170 bar [2466 psi]: rated value +10 bar [+145 psi]



A = 140 $^{+5}$ bar [2030 $^{+73}$ psi]
B = 90 $^{+5}$ bar [1305 $^{+73}$ psi]
Q = 25 l/min [6.60 US gal/min]

SHOCK VALVES

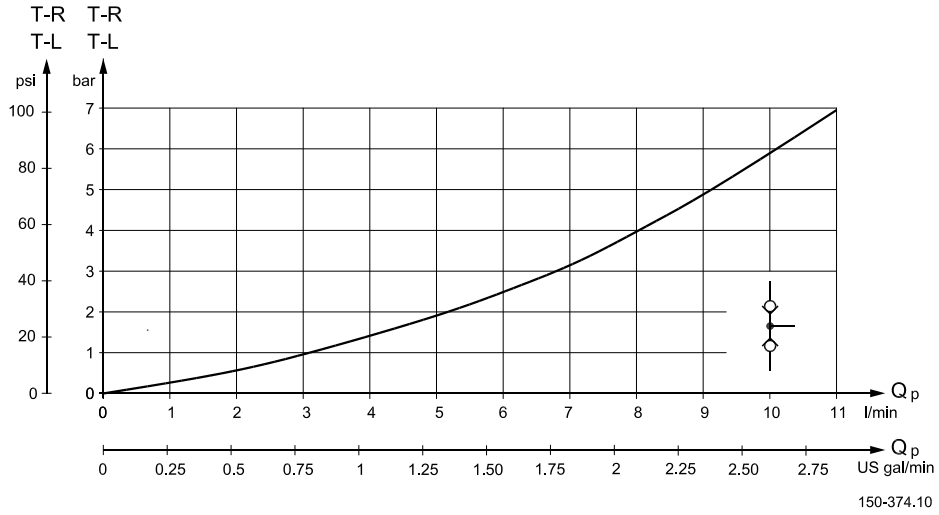
The shock valves protect the steering unit and limit maximum external forces on the steering cylinder. The shock valves in the steering unit limit the maximum pressure drop from L to T and from R to T. The shock valves are set at 1 l/min [0.26 US gal/min].
The shock valves are of the direct acting type, so they react very quickly.
Settings: rated value +20 bar [290 psi], ex: 200 +20 bar [2900 +290 psi].

TECHNICAL DATA

VALVE FUNCTIONS IN OSPC, OSPR AND OSPD STEERING UNITS

SUCTION VALVES

The suction valves ensure oil suction to avoid cavitation in the steering cylinder. To provide correct suction, a back pressure valve must be fitted in the tank line from the steering unit.
Generally we recommended a back pressure of 2 bar [29 psi], but on vehicles with strong selfstraightening tendencies, we recommend 5-10 bar [72-145 psi].
For further advice, please contact the Sauer-Danfoss Sales Organisation.
Note: A connection which incorporates a check valve must be established to allow oil flow to by-pass the back pressure valve (and filter) from the tank to steering unit.



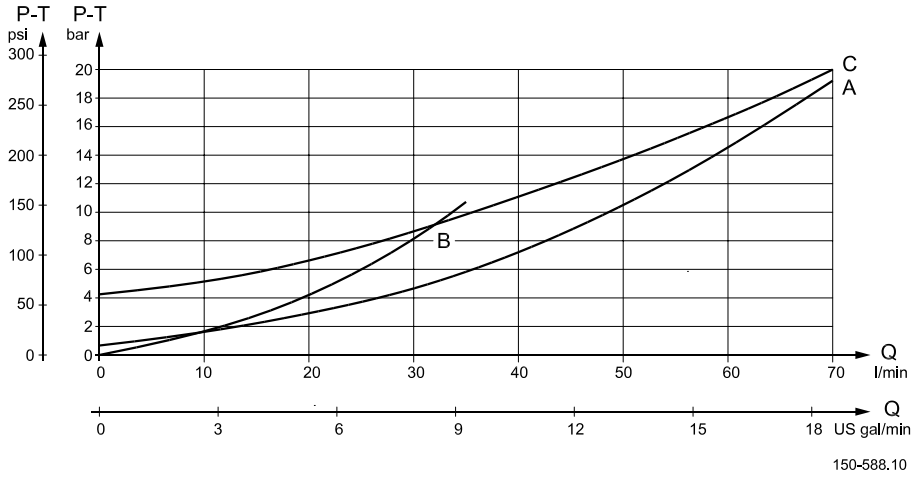
CHECK VALVE

The check valve protects the driver against steering wheel jerks. The check valve prevents oil from flowing backwards into the pump line when steering against a high pressure on the cylinder side. The check valve is built into the steering unit P connection. The pressure drop across the check valve depends on the use of port adoptors with 11 mm [0.43 in] minimum bore and is indicated on the graph.

TECHNICAL DATA

PRESSURE DROP IN NEUTRAL

The pressure drop is measured on Open Center steering units, and with the steering unit in neutral position.
The pressure drop is measured from P to T.
The values are valid at an oil temperature of 50°C (122°F) and a viscosity of 21 mm^2/s (100 SUS).

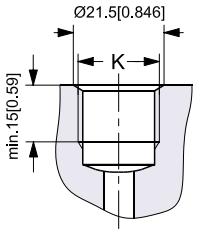


A: OSPB ON and OSPC ON/OR
B: OSPR ON/OR
C: OSPD ON/OR

The pressure drop curves are solely valid for selected spool sets within the recommended flow range.
E.g. OSPC 50 ON with a spool set for 5-18 l/min [1.32-4.76 US gal/min], pressure drop curve A solely applies within the interval from 0-18 l/min [0-4.76 US gal/min]. A higher flow supply to the steering unit (e.g. 30 l/min [7.93 US gal/min]) will make the pressure drop exceed the value, which curve A shows at 30 l/min [7.93 US gal/min].

PORT THREAD VERSIONS

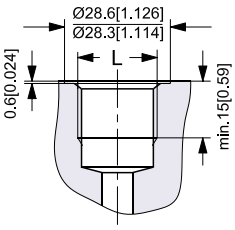
A



A: G main ports

K: DIN 3852-2 - G½

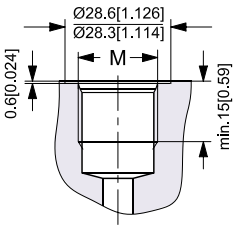
B



B: G main ports w.spot-face

L: DIN 3852-2 - G½

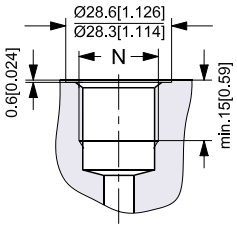
C



C: Metric main ports w.spot-face and O-ring chamfer

M: ISO 6149-1 – M18×1.5

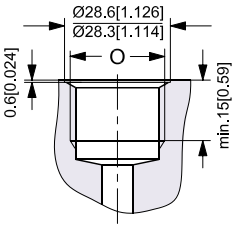
D



D: Metric main ports w. spot-face

N: DIN 3852-1 – M18×1.5

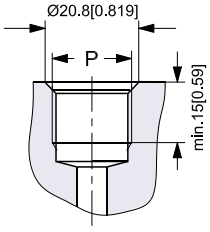
E



E: Metric main ports w. spot-face

O: DIN 3852-1 – M22×1.5

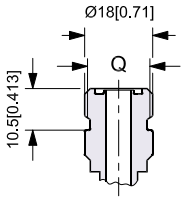
F



F: UNF main ports w. O-ring chamfer

P: ISO 11926-1 – ¾-16UNF O-ring boss port

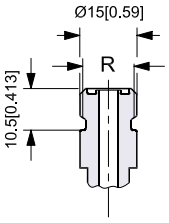
G



G: ORFS main ports: O-ring face seal

Q: ISO 8434-3 - $^{11}/_{16}$-16 UN

H



H: ORFS main ports: O-ring face seal

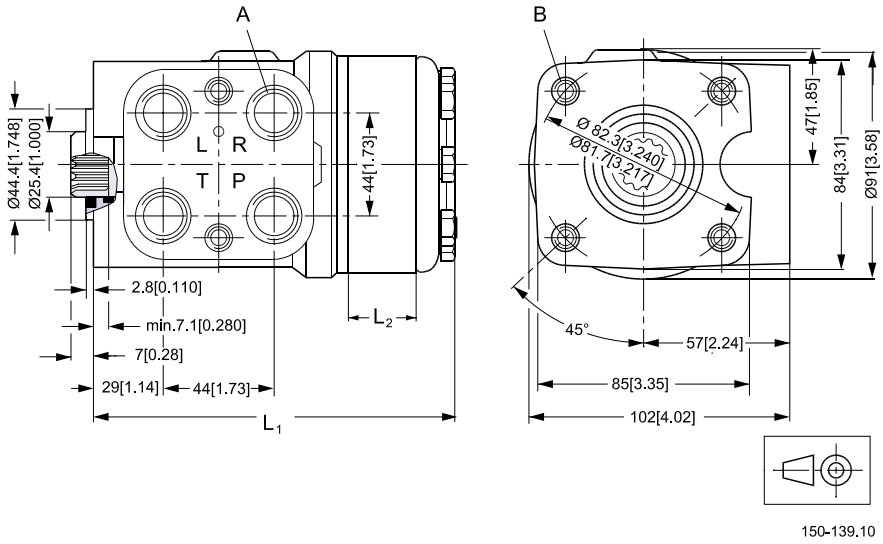
R: ISO 8434-3 – $^{9}/_{16}$-18 UNF

150-582.10

DIMENSIONS

OSPB ON and OSPB CN

Type	L_1 mm [in]	L_2 mm [in]
OSPB 50	126 [4.96]	6.5 [0.26]
OSPB 80	129 [5.08]	10.4 [0.41]
OSPB 100	132 [5.20]	13.0 [0.51]
OSPB 125	135 [5.31]	16.2 [0.64]
OSPB 160	140 [5.51]	20.8 [0.82]
OSPB 200	145 [5.71]	26.0 [1.02]
OSPB 250	151 [5.94]	32.5 [1.28]
OSPB 315	160 [6.30]	40.9 [1.61]
OSPB 400	171 [6.73]	52.0 [2.05]
OSPB 500	184 [7.24]	65.0 [2.56]



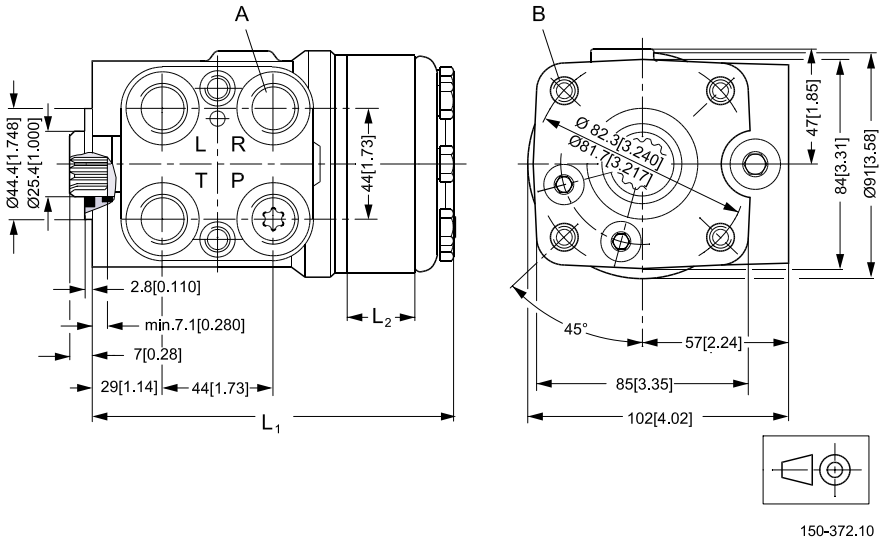
European version:
A: G ½; 15 mm [0.59 in] deep
B: M10 × 1.5,
16 mm [0.63 in] deep

US version:
A: ¾ - 16 UNF O-ring boss;
15 mm [0.59 in] deep
B: ⅜ - 16 UNC,
16 mm [0.63 in] deep

DIMENSIONS

OSPC ON and OSPC OR

Type	L_1 mm [in]	L_2 mm [in]
OSPC 40	126 [4.96]	6.5 [0.26]
OSPC 50	126 [4.96]	6.5 [0.26]
OSPC 60	128 [5.04]	9.1 [0.36]
OSPC 70	128 [5.04]	9.1 [0.36]
OSPC 80	129 [5.08]	10.4 [0.41]
OSPC 100	132 [5.20]	13.0 [0.51]
OSPC 125	135 [5.31]	16.2 [0.64]
OSPC 160	140 [5.51]	20.8 [0.82]
OSPC 185	143 [5.63]	24.0 [0.94]
OSPC 200	145 [5.71]	26.0 [1.02]
OSPC 230	149 [5.87]	29.9 [1.18]
OSPC 250	151 [5.94]	32.5 [1.28]
OSPC 315	160 [6.30]	40.9 [1.61]
OSPC 400	171 [6.73]	52.0 [2.05]
OSPC 500	184 [7.24]	65.0 [2.56]

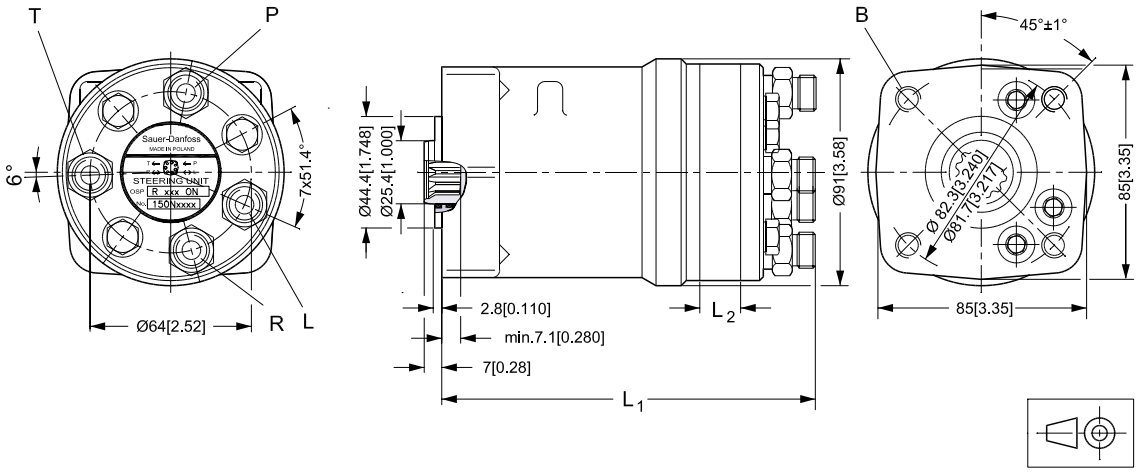


European version:
A: G ½ w. spot-face
or M18 × 1.5 ISO 6149
or M22 × 1.5 (P and T) +
M18 × 1.5 (L and R) DIN 3852;
15 mm [0.59 in] deep
B: M10 × 1.5,
16 mm [0.63 in] deep

US version:
A: ¾ - 16 UNF O-ring boss;
15 mm [0.59 in] deep
B: ⅜ - 16 UNC,
16 mm [0.63 in] deep

DIMENSIONS

OSPR ON and OSPR OR



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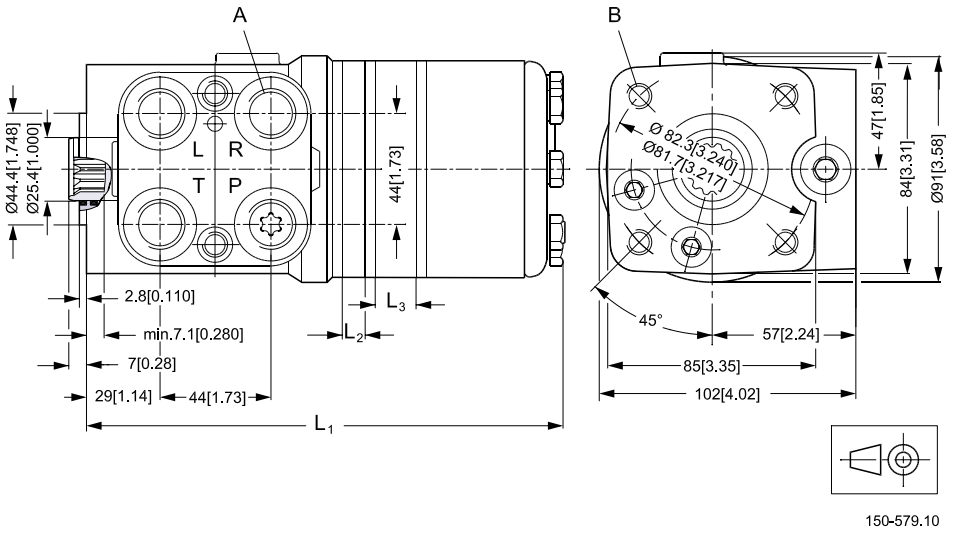
Type	L_1 mm [in]	L_2 mm [in]
OSPR 70	141 [5.55]	9.1 [0.36]
OSPR 80	142 [5.59]	10.4 [0.41]
OSPR 100	145 [5.71]	13.0 [0.51]
OSPR 125	148 [5.83]	16.2 [0.64]
OSPR 160	153 [6.02]	20.8 [0.82]
OSPR 200	158 [6.22]	26.0 [1.02]

P and T: 11/16-16 UN ORFS
L and R: 9/16-18 UNF ORFS
ISO 8434-3
B: M10 × 1.5,
16 mm [0.63 in] deep

DIMENSIONS

OSPD ON and OSPD OR

Type	L_1 mm [in]	L_2 mm [in]	L_3 mm [in]
OSPD 60/185	195 [7.68]	9.1 [0.36]	20.8 [0.82]
OSPD 60/220	200 [7.87]	9.1 [0.36]	26.0 [1.92]
OSPD 70/195	190 [7.48]	9.1 [0.36]	16.2 [0.64]
OSPD 70/230	195 [7.68]	9.1 [0.36]	20.8 [0.82]
OSPD 100/260	199 [7.83]	13.0 [0.51]	20.8 [0.82]
OSPD 100/300	204 [8.03]	13.0 [0.51]	26.0 [1.02]
OSPD 125/285	202 [7.95]	16.2 [0.64]	20.8 [0.82]
OSPD 125/325	207 [8.15]	16.2 [0.64]	26.0 [1.02]
OSPD 125/440	222 [8.74]	16.2 [0.64]	40.9 [1.61]



European version:
A: G ½; 15 mm [0.59 in] deep w. spot-face;
B: M10 × 1.5, 16 mm [0.63 in] deep

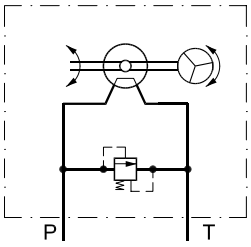
Torque amplifier, TAD

VERSION

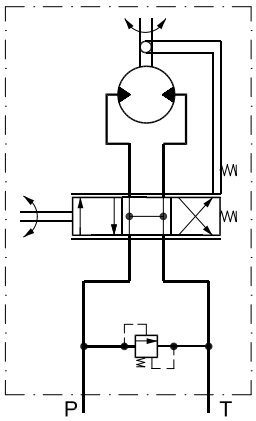
Open center

TAD is an open center torque amplifier, which has open connection between pump and tank in the neutral position. In open center steering systems, pumps with fixed displacement are used.

F300616



150B36.10



150B25.10

CODE NUMBERS AND WEIGHTS

Type	Code number		Weight kg [lb]
	European version	US version	
	G ½	¾-16 UNF	
TAD 100	150B0032	150B0012	6.2 [13.67]
TAD 160	150B0034	150B0014	6.5 [14.33]

TECHNICAL DATA

Torque amplifier			TAD 100	TAD 160
Displacement		cm^3/rev	100	160
		in^3/rev	[6.10]	[9.76]
Input torque *		Nm	approx. 3	approx. 3
		lbf·in	[26.55]	[26.55]
Max. input torque	cont.	Nm	20	20
		lbf·in	[177.02]	[177.02]
	peak	Nm	200	200
		lbf·in	[1770.15]	[1770.15]
Hydraulic output torque at 70 bar [1015 psi]		Nm	80	120
		lbf·in	[708.06]	[1062.09]
Max. operating pressure		bar	70	70
		psi	[1015]	[1015]
Max. return pressure		bar	2	2
		psi	[29]	[29]
Recommended oil flow Q		l/min	10	16
		US gal/min	[2.64]	[4.23]
Max. speed at Q		r/min	100	100
Pressure drop in neutral position at Q and viscosity 21 mm^2/s [100 SUS]		bar	0.9	1.4
		psi	[13]	[20]
Pressure relief valve setting		bar	70	70
		psi	[1015]	[1015]

* This torque is of course considerably higher if the oil flow is insufficient or fails completely.

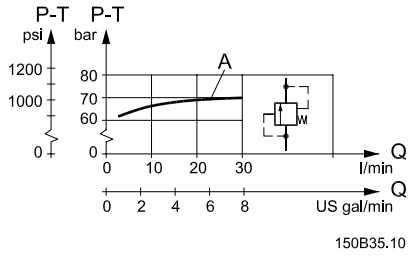
The output shaft must be capable of handling the torque (manual input torque + hydraulic output torque).

VALVE FUNCTION IN TAD TORQUE AMPLIFIERS

The data given here comes from measurements on a representative sample of torque amplifiers from production. Oil with a viscosity of 21 mm^2/s [100 SUS] at 50°C [122°F] was used.

PRESSURE RELIEF VALVE

The pressure relief valve protects the pump and the torque amplifier against excessive pressure. The pressure relief valve in the torque amplifier limits the maximum pressure drop from P to T. The pressure relief valve is set at 25 l/min [6.60 US gal/min].
A: 70 $^{+5}$ bar [1015 $^{+73}$ psi].



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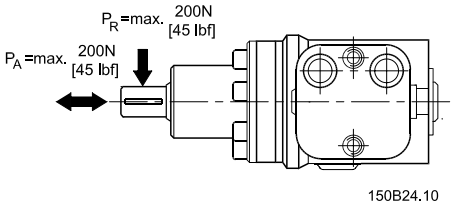
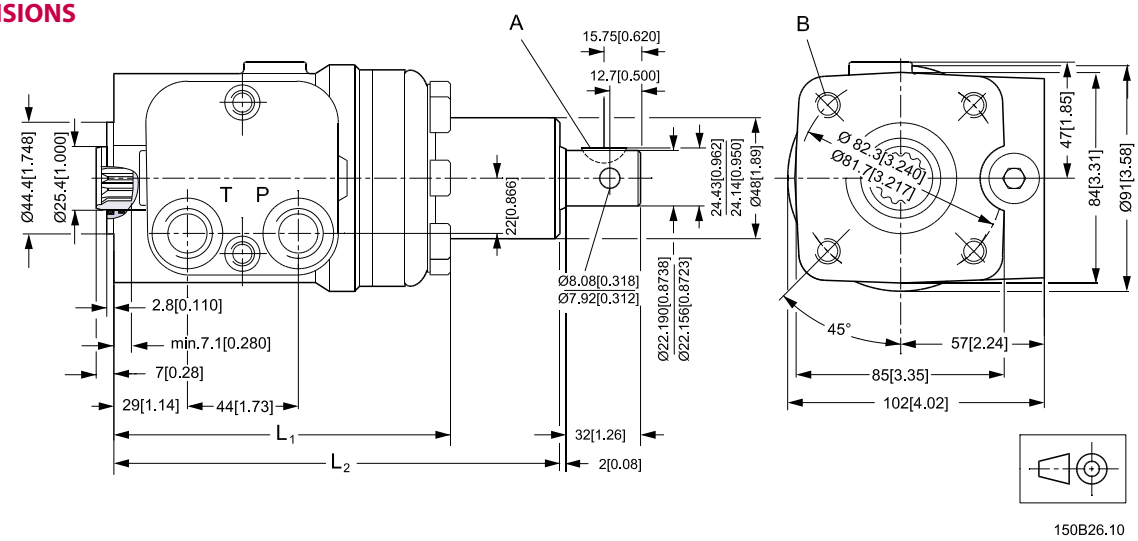
INSTALLATION

The output shaft of the torque amplifier is only meant to absorb small radial and axial forces



150B24.10

DIMENSIONS



150B26.10

Type	L_1 mm [in]	L_2 mm [in]
TAD 100	137 [5.39]	181 [7.13]
TAD 160	145 [5.71]	189 [7.44]

European version:
P,T: G 1/2; 15 mm [0.59 in] deep, w. spot-face
A: 3/16 in × 3/4 in SAE J502
B: M10 × 1.5, 16 mm [0.63 in] deep

US version:
P,T: 3/4 - 16 UNF O-ring boss; 15 mm [0.59 in] deep
A: 3/16 in × 3/4 in SAE J502
B: 3/8 - 16 UNC, 16 mm [0.63 in] deep

NOTES

NOTES

SAUER DANFOSS

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DKMH.PN.210.A1.02 **520L0502** 02/2002

Sauer-Danfoss Hydraulic Power Systems – Market Leaders Worldwide

Sauer-Danfoss is a comprehensive supplier providing complete systems to the global mobile market.

Sauer-Danfoss serves markets such as agriculture, construction, road building, material handling, municipal, forestry, turf care, and many others.

We offer our customers optimum solutions for their needs and develop new products and systems in close cooperation and partnership with them.

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Sauer-Danfoss provides comprehensive worldwide service for its products through an extensive network of Authorized Service Centers strategically located in all parts of the world.

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