ENGINEERING
TOMORROW

Technical Information

Steering
OVPL Valve Block- OVR Angle Block

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Revision history

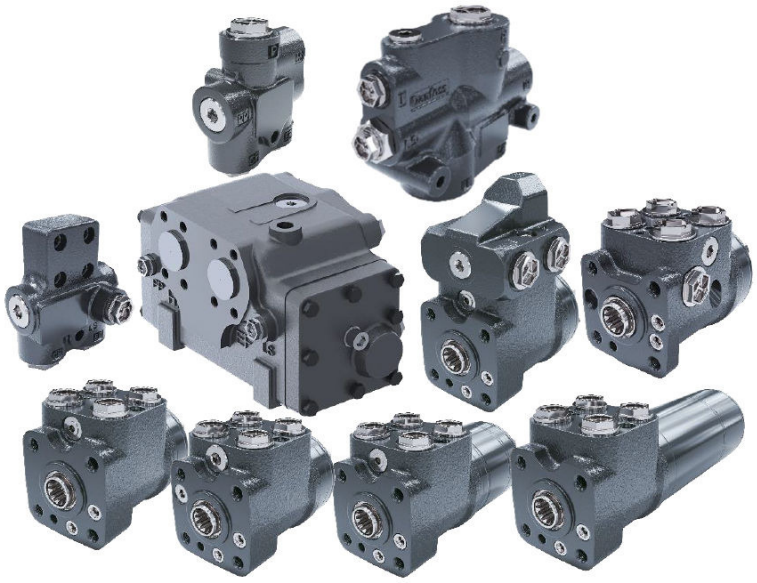
Table of revisions

Date	Changed	Rev
August 2022	Changed booknumber to BC423965203832	0102
August 2022	First edition	0101

Contents

Overview

A Wide Range of Steering Components



Danfoss is one of the largest producers in the world of hydrostatic steering components on off-road vehicles. Danfoss offers steering solutions both at component and system levels. Our product range makes it possible to cover applications of many types, such as ordinary 2 wheel steering (also known as Ackermann steering) and articulated steering. Danfoss offers over 2,200 different steering units and 300 different priority valves categorized in types, variants and sizes.

Danfoss offers:

For hydrostatic steering systems:

Product type	Displacement	Rated Flow	Steering Pressure
Steering units	40 – 1200 cm^3/rev [2.44 to 73.2 in^3/rev]	max. 100 l/min [26.4 US gal/min]	max. 240 bar [3481 psi]
Priority valves	–	40, 80, 120, 160, 320 l/min [10.6, 21.1, 31.7, 42.3, 84.5 US gal/min]	max. 350 bar [5076 psi]
Pilot operated flow-amplifiers (factors: 4, 5, 8, or 10)	–	240 and 400 l/min [63.4 and 105.7 US gal/min]	max. 240 bar [3480 psi]
Pilot operated steering valves	–	max. 100 l/min [26.4 US gal/min]	max. 250 bar [3625 psi]

Characteristic features for steering units:

- Low steering torque: from 0.7 to 4 N•m in normal steering situations
- Low noise level
- Low pressure drop

Overview

- Many types available: Open center Non-reaction, Open center Reaction, Power Beyond, Closed center Non-reaction, Load Sensing, Load Sensing Reaction
- One or more built-in valve functions: relief valve, shock valves, suction valves, non-return valve in P-line and LS-line
- Optional port connections according to ISO, SAE or DIN standards

Characteristics for EH steering systems with OSPE, EHPS, and EHi:

- Possibility of GPS, row sensor, variable steering ratio and joystick steering
- Possibility of manual steering even on very heavy vehicles
- EHPS:
  - High steering pressure requiring smaller cylinders and flow
  - Low pilot pressure and flow giving extremely low noise in the cabin
  - Combined with Danfoss PVG 32 proportional valve

Conversion factors

1 N•m = [8.851 lbf•in]

1 N = [0.2248 lbf]

1 mm = [0.0394 in]

1 cm^3 = [0.061 in^3]

1 l = [0.264 US gal]

1 bar = [14.5 psi]

°F = [1.8°C + 32]

Survey of Literature with Technical Data on Danfoss Steering Components

Detailed data on all Danfoss steering components and accessories can be found in our steering component catalogs, which is divided into the following individual sub catalogs:

General information	Steering components
Technical data on open center, and closed center steering units	OSPB, OSPC, and OSPD
Technical data on load sensing steering units	OSPB, OSPC, OSPF, OSPD, OSPDF, OSPL, OSPBX, and OSPLX
Technical data on priority valves	OLS
Technical data on priority flow amplifiers	OSQ
Technical data on valve blocks	OVPL and OVR
Technical data on load sensing steering units with amplification	OSPU
Technical data on steering units with zero dead band	OSPS
Technical data on steering units with integrated priority valve	VSPP

For technical information on individual variants, please contact the Danfoss Sales Organization.

Valve block, OVPL type - angle block, OVR type

General

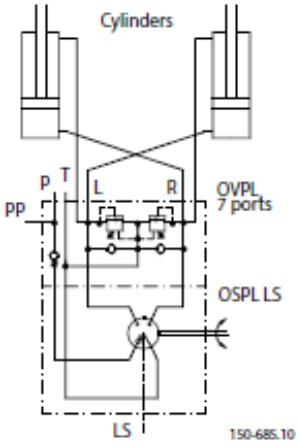
Danfoss offers valve block type OVPL for use on OSPL type steering units, which are designed for high steering flow.

The valves in OVPL have higher flow capacity than those integrated into steering units.

Danfoss offers angle block type OVR to assemble to port face of steering unit type OSPB, OSPC, OSPD, OSPF, OSPU and OSPL.

OVR angle blocks are specially designed for applications in which pipes and/or hoses must run parallel with the steering column axis, and where space is limited. Use of the angle block makes angle and swivel connections and pipe bends unnecessary.

Type OVPL

OVPL	
OVPL valve blocks can be flanged onto Danfoss steering units type OSPL, which are prepared for OVPL mounting.	Main features of OVPL: • For max. pressure on L and R ports: 280 bar • 4, 5, or 7 connections. OVPL with 7 connections have 2 L and 2 R connections • Built in valve functions: check valve, shock and suction valves and optional back-pressure valve
OVPL	
	

Technical Data

For common data: Look in sub catalog "General Steering Components"

Flow and Pressures

Valve block	Max. Oil flow l/min [US gal/min]	Max. pressure on connections		
		P, PP bar [psi]	T bar [psi]	L, R bar [psi]
OVPL 24	100 [26.42]	190 [2756]	15 [218]	240 [3480]
OVPL 28	100 [26.42]	225 [3263]	15 [218]	280 [4061]

Valves

The data below comes from measurements on a representative sample of valve blocks from production. An oil with a viscosity of 21 mm^2/s [SUS] at 50° C [122° F] was used during measurement.

Shock valves

The shock valves protect the valve block and steering unit and limit maximum external forces on the steering cylinder. The shock valves in the valve block limit the maximum pressure drop from L to T and from R to T.

The shock valves are set at 10 l/min. [2.64 US gal/min].

The shock valves are of the direct acting type, so they react very quickly.

Setting tolerance: rated value +/- 10 bar [145 psi] , ex. 240 [3480 psi] +/- 10 bar [145 psi].

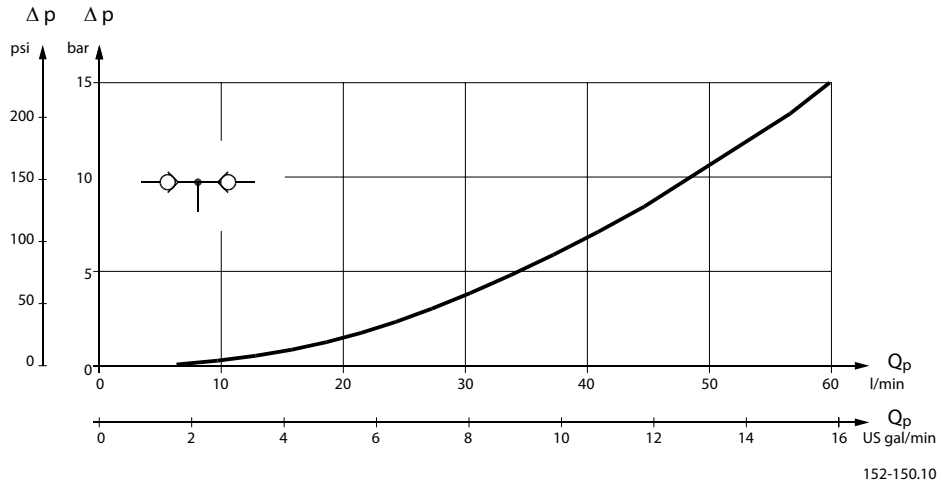
Type OVPL

Suction valves

The suction valves ensure oil suction to avoid cavitations in the steering cylinder. To provide correct suction, a back pressure valve must be fitted in the tank line from the steering unit.

The capacity of the suction valves can be increased by building in a back pressure in the valve block.

The curve below shows pressure drop across a suction valve

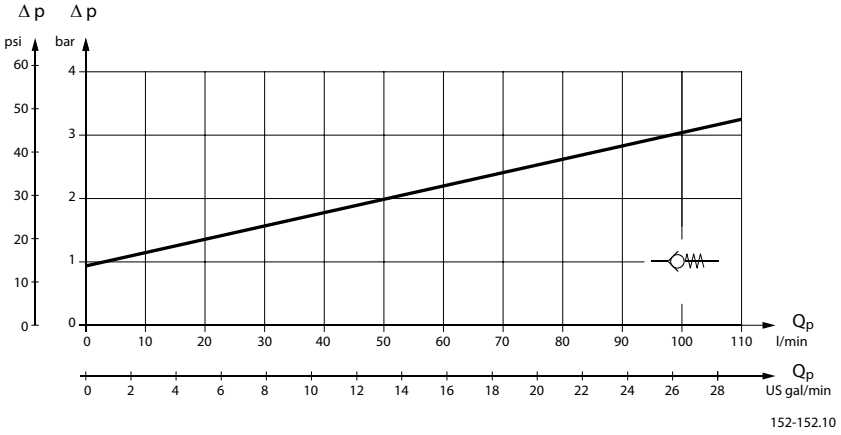


Check valve

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 P connection of the valve block.

The curve below shows pressure drop across the check valve in p-connection

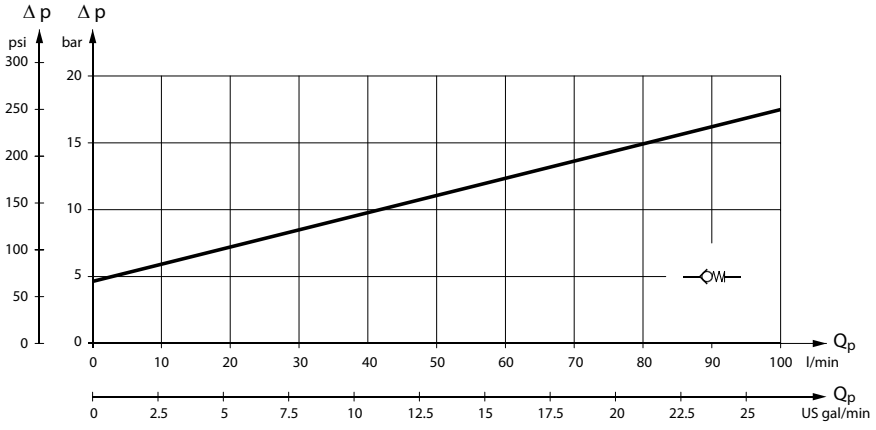


Backpressure valve

A backpressure valve increases the capacity of the suction valves.

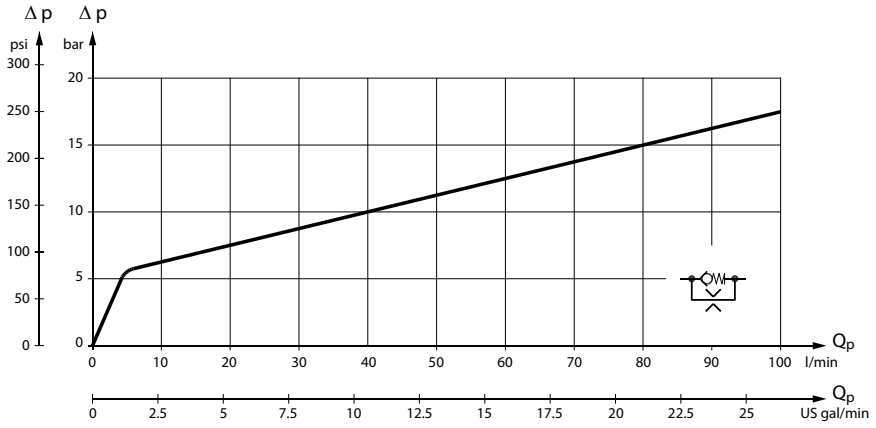
The curve below shows pressure drop for backpressure valve without by-pass.

Type OVPL



152-151.10

The curve below shows pressure drop for backpressure valve with by-pass.

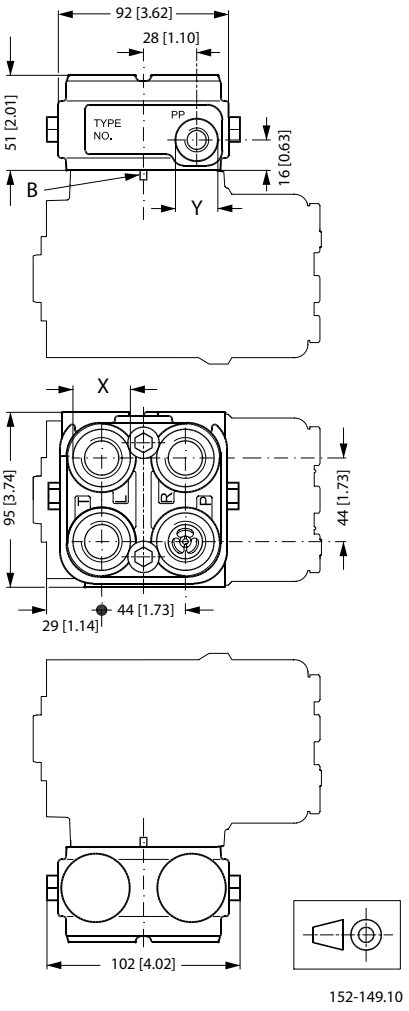


152-178.10

Type OVPL

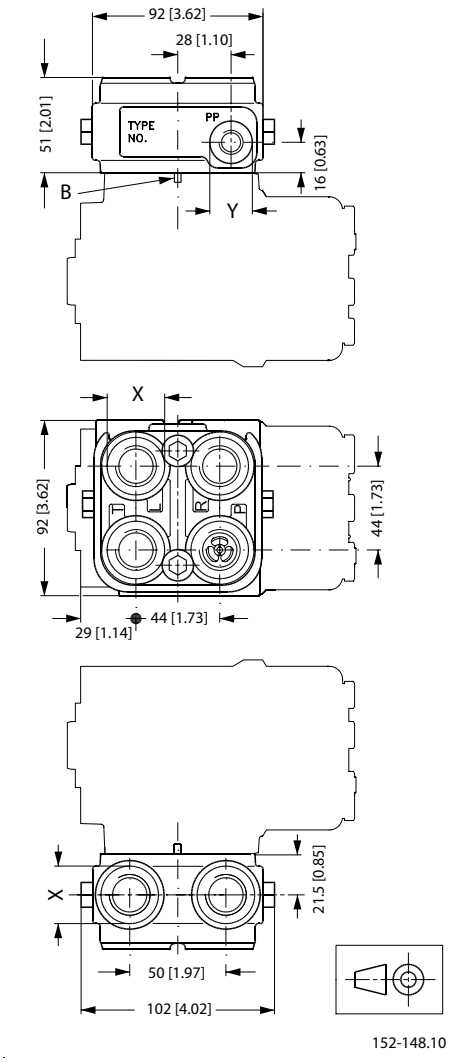
Dimensions

OVPL, 5 ports
European version:
P, T, L and R:
G 1/2 w. spot face,
15 mm [0.59 in] deep
PP: G 1/4, w. spot face,
11,5 mm [0.45 in] deep
X: 30,2 +0,2
Y: 21,3 +/- 0,2
OVPL, 4 ports (no PP)
US version:
P, T, L and R:
3/4-16 UNF O-ring boss
15 mm [0.59 in] deep
X: 30.2 +0.2
B: Positioning pin premounted in OVPL



Type OVPL

OVPL, 7 ports
European version:
P, T, 2xL and 2xR:
G 1/2 w. spot face,
15 mm [0.59 in] deep
PP: G 1/4, w. spot face,
11.5 mm [0.45 in] deep
X: 30.2 +0.2
Y: 21.3 +/- 0.2
B: Positioning pin premounted in OVPL



Type OVPL

Installation

Connection P in the valve block must be placed over the connection P in the steering unit, so OVPL is provided with a positioning pin to fit the positioning hole in the steering unit.

The valve block is supplied inclusive of 2 mounting screws and 4 O-rings for building onto the steering unit.

Tightening torque 65 ±5 N•m [575 ±44 lbf•in]. It is only allowed to mount OVPL blocks on steering units with a flat port flange, no spot face is allowed.

Weight

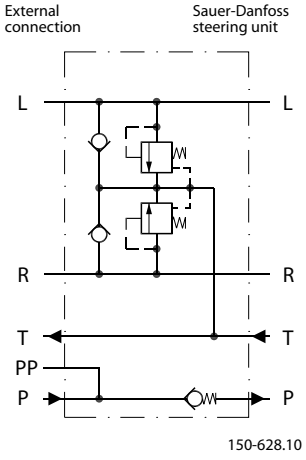
Type	**Weight kg [lb]**
OVPL	2.0 [4.41]

Code Numbers

OVPL in the table below have all the following valve functions incorporated:

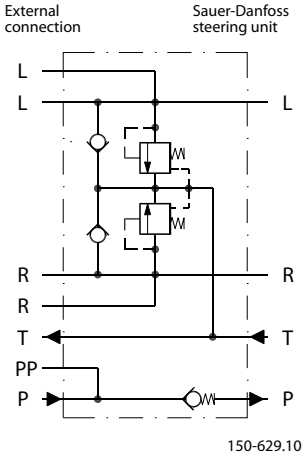
- Check valve in P-port
- Shock valves
- Suction valves

OVPL, 5 ports



150-628.10

OVPL, 7 ports



150-629.10

Type OVPL

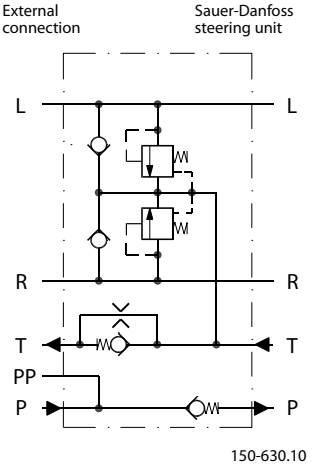
Valve block	Code numbers	Number of ports	Valve settings
	Connections European version P, T, L, R: G 1/2-S PP: G 1/4-S****		**Shock valve bar [psi]**
OVPL 24	152-1117	5	240 [3480]
OVPL 28	152-1114	5	280 [4061]
OVPL 28	152-1116	7	280 [4061]

** Spot face around port connections

OVPL in the table below has the following valve functions incorporated:

- Check valve in P-port
- Shock valves
- Suction valves
- Backpressure valve, with by-pass to reduce stand-by pressure in neutral position.

OVPL, 5 ports and backpressure valve with by-pass



Valve block	Code numbers	Number of ports	Valve settings
	Connections European version P, T, L, R: G 1/2-S PP: G 1/4-S****		**Shock valve bar [psi]**
OVPL 24	152-1120	5	240 [3480]
OVPL 28	152-1130	5	280 [4061]

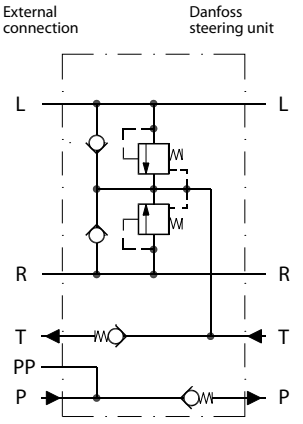
** Spot face around port connections

OVPL in the table below have all the following valve functions incorporated:

- Check valve in P-port
- Shock valves
- Suction valves
- Backpressure valve, without by-pass.

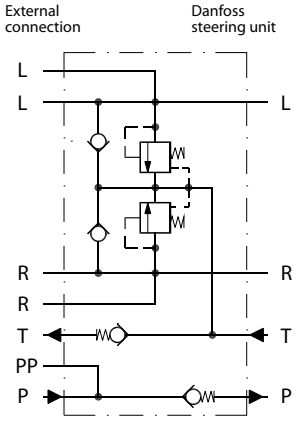
Type OVPL

OVPL, 5 ports and backpressure valve



150-631.10

OVPL, 7 ports and backpressure valve



150-632.10

Valve block	**Code numbers**	**Number of ports**	**Valve settings**
	Connections European version P, T, L, R: G 1/2 - S PP: G 1/4 - S****		**Shock valve bar [psi]**
OVPL 24	152-1132	5	240 [3480]
OVPL 28	152-1115	7	280 [4061]

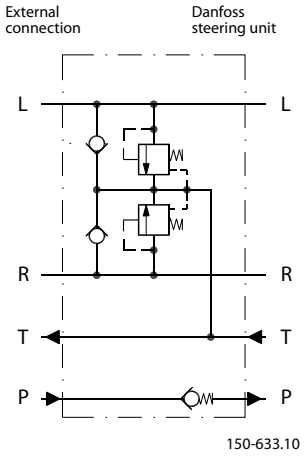
** Spot face around port connections

OVPL in the table below has following valve functions incorporated:

- Check valve in P-port
- Shock valves
- Suction valves

Type OVPL

OVPL, 4 ports



Valve block	Code numbers	Number of ports	Valve settings
	Connections US version 3/4 - 16 UNF O* + S**		**Shock valve bar [psi]**
OVPL 28	152-1133	4	280 [4061]

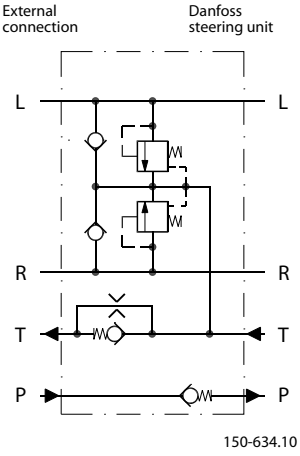
* O-ring chamfer on port connections

** Spot face around port connections

OVPL in the table below has the following valve functions incorporated:

- Check valve in P-port
- Shock valves
- Suction valves
- Backpressure valve with by-pass to reduce stand-by pressure in neutral position.

OVPL, 4 ports and backpressure valve with by-pass



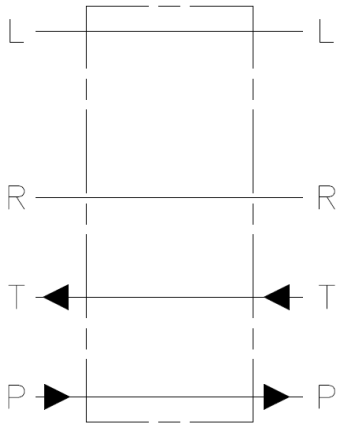
Type OVPL

Valve block	Code numbers	Number of ports	Valve settings
	Connections US version 3/4 - 16 UNF O* + S**		Shock valve bar [psi]
OVPL 28	152-1136	4	280 [4061]

* O-ring chamfer on port connections

** Spot face around port connections

Type OVR

OVR	
The OVR angle block can be flanged onto Danfoss steering unit OSPB, OSPC, OSPD, OSPF, OSPU and OSPL, which have no spot face around the ports.	Main feature of OVR: • Use of the angle block makes angle and swivel connections and pipe bends unnecessary
OVR	
	

Technical Data

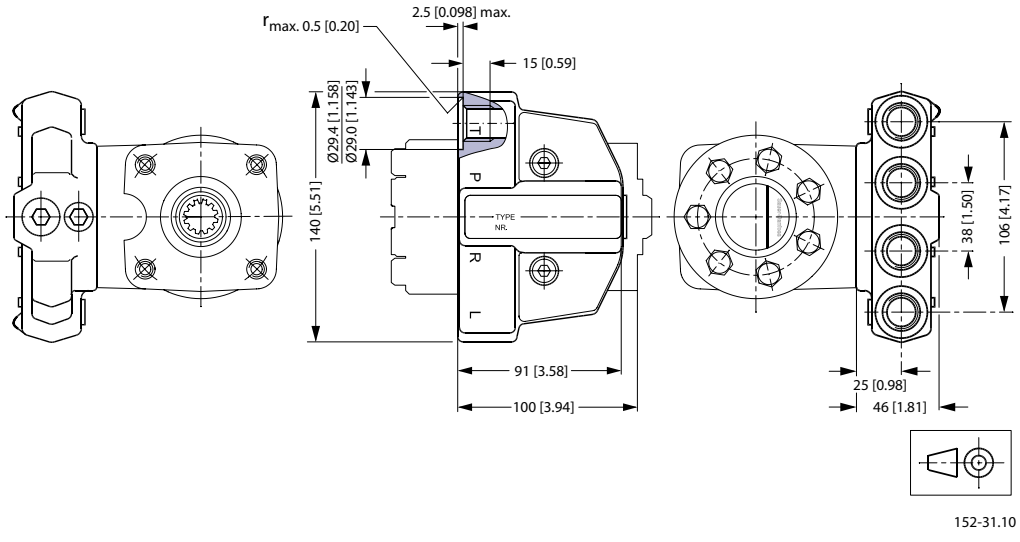
For common data: Look in sub catalog: "General Steering Components"

Flow and pressure

Valve Block	**Max. Oil Flow 1/min [US gal/min]**	**Max. Pressure on Connections**		
		P bar [psi]	**T bar [psi]**	**L, R bar [psi]**
OVR	**80 [21.1]**	**175 [2538]**	**40 [580]**	**240 [3480]**

Dimensions

OVR



Type OVR

European version: G 1/2, 15 mm [0.59 in] deep

P, T, L and R:

Installation

The valve block is supplied inclusive of 2 mounting screws and 4 O-rings for building onto the steering unit.

Tightening torque 65 ±5 N•m [575 ±44.3 lbf•in]. OVR blocks may only be mounted on steering units with a flat port flange, (no spot facing).

Weight

Type	Weight kg [lb]
OVR	2.0 [4.41]

Code numbers

OVR in the table below has no valve functions incorporated.

Angle	Code numbers
	Connections European version P, T, L, R: G ½ S**
OVR	152-0201

** Spot face around port connections

For OVR blocks with other thread or kind of valves mounted, please contact the Danfoss Sales organization.

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