KOLBEN

Axial Piston Variable Pump KA10VSO

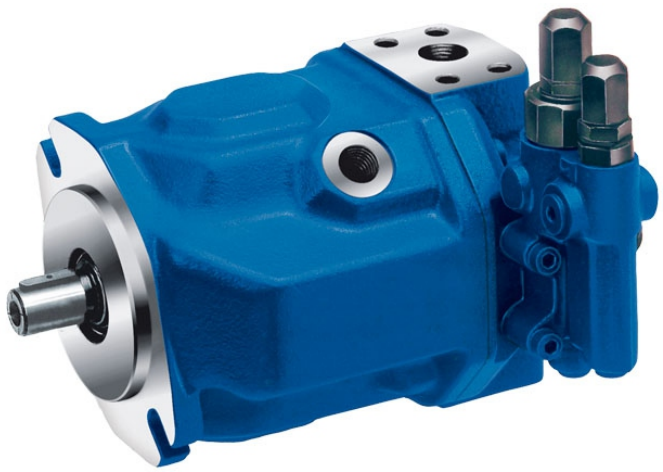
Data sheet

Series 31

- Peak pressure 280 bar
- Open circuit

Features

– Variable axial piston pump of swashplate design for hydrostatic drives in open circuits
– The flow is proportional to the drive speed and displacement.
– The flow is infinitely variable through adjustment of the swashplate angle.
– 2 case drain ports
– Good suction characteristics
– Low noise level
– Long service life
– Axial and radial loading of drive shaft possible
– High power to weight ratio
– Wide range of controls
– Short response times
– The through drive is suitable to mount additional gear or piston pumps of up to the same displacement size, i.e. 100% through drive torque.



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Ordering code :

KA10V(S)	O	28	DR/	31	R	-	P	S	C	62	N00
1	2	3	4	5	6		7	8	9	10	11

1. Model

KA10V(S)	Swash plate Design, Variable, Industrial Version

2. Type

O	Basic Model Pump Open Circuit

3. Displacement

28	18,28,45,71,100,140 CC/rev

4. Controller

DR	Pressure Regulator
DFR	Pressure Regulator and flow control
DFR1	Pressure Regulator and flow control orifice in X-Channel

5. Series

31	31

6. Direction of Rotation

R	clockwise (right)
L	Anti-clockwise (left)

6. Sealing

P	Perbunan
V	Viton

7. Shaft End

P	Metric Parallel with key
S	SAE splined
K	SAE Parallel with key
U	SAE Splined reduced dia.

8. Mounting Flange

C	SAE 2 hole
D	SAE 4 hole
A	ISO 2 hole
B	ISO 4 hole

9. Service line connections

11	SAE flange rear, fixing thread metric
12	SAE flange on opp. side, fixing thread metric
61	SAE flange rear, fixing thread UNC
62	AE flange on opp. side, fixing thread UNC

10. Through drive

N00	Without additional pump, without through shaft
K**	With through drive

Technical data

Hydraulic fluid

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When using HF- or ecologically acceptable fluids possible limitations on the technical data may be applicable, if necessary please consult us (when ordering please state the type of fluid to be used in clear text). For operation on Skydrol fluid please consult us.

Operating viscosity range

In order to obtain optimum efficiency and service life, we recommend that the operating viscosity (at operating temperature) be selected within the range

ν_{opt} = opt. operating viscosity 16 ... 36 mm/s²

referred to the reservoir temperature (open circuit).

Limits of viscosity range

For extreme operating conditions the following limits apply:

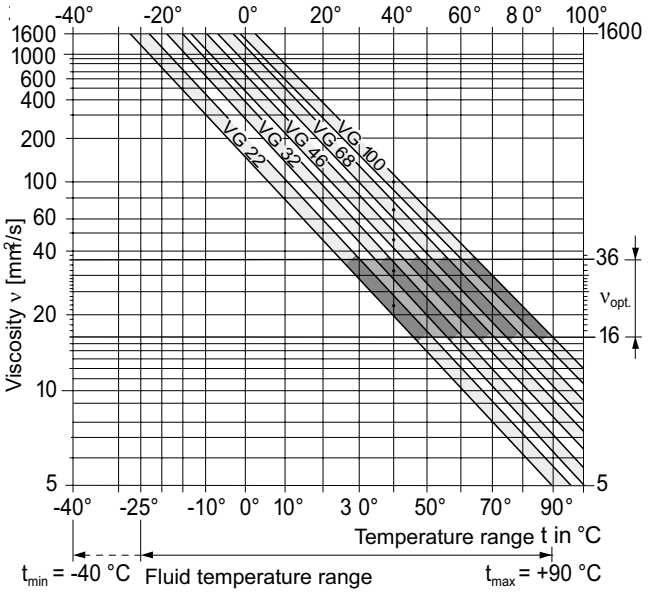
ν_{min} = 10 mm²/s
short term (t ≤1 min)
at max.permissible case drain temperature of 90 °C.

Please note, that the max. case drain temperature of 90 °C is also not exceeded in certain areas (eg. bearing area). The temperature in the bearing area is approx. 5 K higher than the average case drain temperature.

ν_{max} = 1000 mm²/s
short term (t ≤ 1 min)
on cold start
(t_{min} = p ≤30 bar, n ≤ 1000 rpm, -25 °C)

At temperatures between -25 °C and -40 °C special measures may be required for certain installation positions, please contact us for further information.

Selection diagram



Notes on the selction of hydraulic fluid

In order to select the correct fluid, it is necessary to know the operating temperature in the tank (open circuit) in relation to the ambiet temperature.

The hydraulic fluid should be selected so that within the operating temperature range, the operating viscosity lies within the optimum range (ν_{opt}) (see shaded section of the selction diagram). We recommend that the higher viscosity grade should be selected in each case.

Example: At an ambient temperature of X °C the fluid temperature in the tank is 60 °C. In the optimum viscosity range (ν_{opt}; shaded area) this corresponds to viscosity grades VG 46 or VG 68; VG 68 should be selected.

Important
The case drain temperature is influenced by pressure and speed and is typically higher than the tank temperature. However max. temperature at any point in the system may not exceed 90 °C.

If the above mentioned conditions cannot be kept due to extreme operating parameters or high ambient temperatures please consult us.

Filtration of fluid

The finer the filtration the better the achieved cleanliness of the fluid and the longer the service life of the axial piston unit. In order to ensure a reliable functioning of the axial piston unit it is necessary to determine the fluid cleanliness class through a gravimetric evaluation; a cleanliness level of at least 20/18/15 to ISO 4406 is required.

If the above mentioned cleanliness classes cannot be met please consult us.

Technical data

Operating pressure range

Direction of flow

S to B

Pressure at suction port S (inlet)

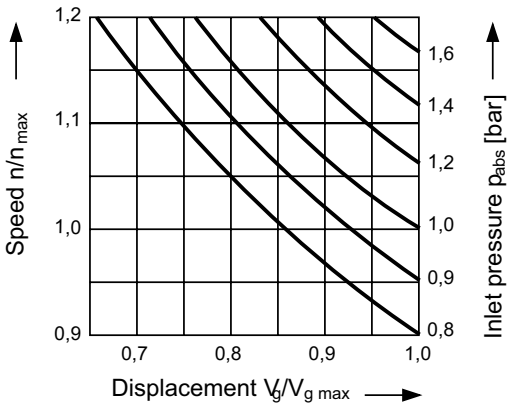
Inlet pressure

$p_{abs\ min}$ 0,8 bar absolute

$p_{abs\ max}$ 10 bar[1] absolute

Minimum permissible inlet pressure at port S at increased drive speed

In order to prevent damage to the pump (through cavitation) it is necesssary to maintain a minimum inlet pressure. This minimum required inlet pressure level depends on the drive speed and the pump displacement. These values do not apply however to the High-Speed version (see table of values on page 7).



Case drain pressure

Maximum case drain pressure
(at ports L, L_1):
Maximum 0,5 bar higher than the inlet pressure at port S, but not higher than 2 bar absolut.

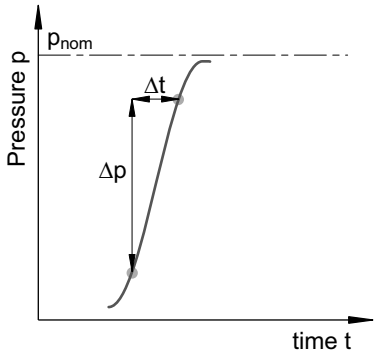
$p_{L\ max_{abs}}$ 2 bar[1]

Pressure at service line port (pressure port) B

Nominal pressure p_{nom} 220 bar absolute

Peak pressure p_{max} 280 bar absolute
Total duration of exertion 300 h
Single duration of exertion 2,5 ms

Minimum outlet pressure 10 bar[1]



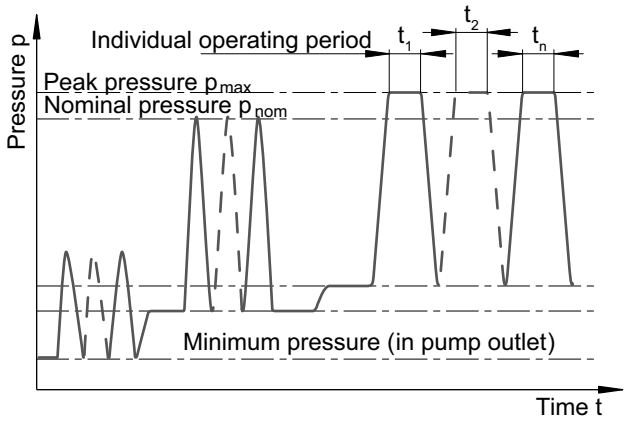
Definition

Nominal pressure p_{nom}
The nominal pressure corresponds to the maximum design pressure.

Peak pressure p_{max}
The peak pressure corresponds to the maximum pressure within the individual operating period. The total of the individual operating periods must not exceed the total operating period.

Minimum pressure (high-pressure side)
Minimum pressure in the pump outlet side (port B) that is required in order to prevent damage to the axial piston unit.

Rate of pressure change R_A
Maximum permissible pressure build-up and pressure reduction speed with a pressure change over the entire pressure range.



Total operating period= $t_1 + t_2 + ... + t_n$

[1] Other datas on request.

Technical data standard units

Table of values (theoretical values, without considering efficiencies and tolerances; values rounded)

Size			NG	18	28	45	71	100	140
Displacement									
variable pump		$V_{g\,max}$	cm^3	18	28	45	71	100	140
Speed[1]									
maximum at $V_{g\,max}$		n_{max}	rpm	3300	3000	2600	2200	2000	1800
maximum at $V_g < V_{g\,max}$[2]		$n_{max\,perm.}$	rpm	3900	3600	3100	2600	2400	2100
Flow									
at n_{max} and $V_{g\,max}$		$q_{v\,max}$	L/min	59	84	117	156	200	252
at n = 1500 rpm		q_v	L/min	27	42	68	107	150	210
Power									
at n_{max}	Δp = 220 bar	P_{max}	kW	30	39	55	73	93	118
at n = 1500 rpm		P	kW	12,6	20	32	50	70	98
Torque									
at $V_{g\,max}$ and	Δp = 280 bar	T_{max}	Nm	80	125	200	316	445	623
	Δp = 100 bar	T	Nm	30	45	72	113	159	223
Torsional stiffness	drive shaft S	c	Nm/rad	11087	22317	37499	71884	121142	169537
	drive shaft R	c	Nm/rad	14850	26360	41025	76545	–	–
	drive shaft P	c	Nm/rad	13158	25656	41232	80627	132335	188406
Moment of inertia rotary unit		J_{TW}	kgm^2	0.00093	0.0017	0.0033	0.0083	0.0167	0.0242
Case volume		V	L	0.4	0.7	1.0	1.6	2.2	3.0
Weight (without through drive) approx.		m	kg	12	15	21	33	45	60

[1] Values shown are valid for an absolute pressure (p) of 1 bar at inlet port S and use with mineral oil (with a specific weight of 0,88kg/L).

[2] Values are valid for $V_g \leq V_{gmax}$ or increase of inlet pressure (p) at inlet port S (see diagram pag 5

Note

Exceeding the maximum or falling below the minimum permissible values can lead to a loss of function, a reduction in operational service life or total destruction of the axial piston unit. The permissible values can be determined through calculation.

Determination of size

Flow $q_V = \frac{V_g \cdot n \cdot \eta_V}{1000}$ [L/min]

Torque $T = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}}$ [Nm]

Power $P = \frac{2\pi \cdot T \cdot n}{60000} = \frac{q_V \cdot \Delta p}{600 \cdot \eta_t}$ [kW]

V_g = Geometr. displacement per revolution in cm^3

Δp = Pressure differential in bar

n = Speed in rpm

η_V = Volumetric efficiency

η_{mh} = Mechanical-hydraulic efficiency

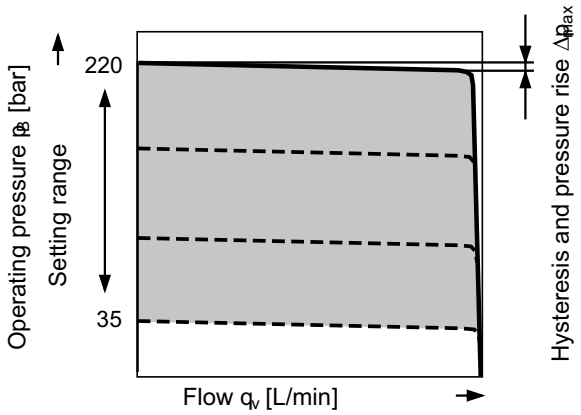
η_t = Overall efficiency ($\eta_t = \eta_V \cdot \eta_{mh}$)

DR – Pressure control

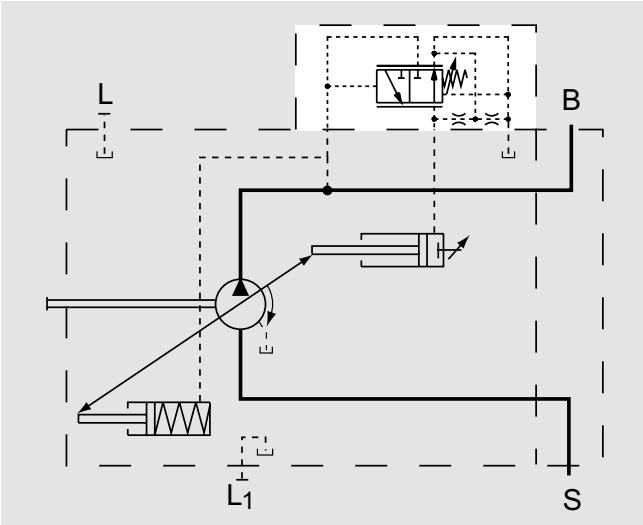
The DR-pressure control limits the maximum pressure at the pump outlet within the pump‘s control range. The pump therefore supplies only the amount of fluid as required by the actuators. This maximum pressure level can be set steplessly at the control valve.

Static characteristic

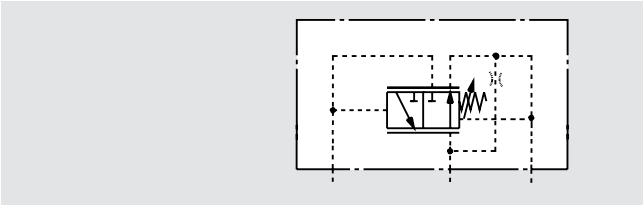
(at n_1 = 1500 rpm; t_{fluid} = 50°C)



Schematic DR size 18 to 100



Size 140



Ports

B	Outlet port
S	Inlet port
L, L_1	Case drain port (L_1 plugged)

Controller data

Hysteresis and repetititive accuracy Δp _____ max. 3 bar

Pressure rise, max

Size		18	28	45	71	100	140
Δp	bar	4	4	6	8	10	12

Pilot fluid consumption _____ max. approx. 3 L/min

DFR/DFR1 – Pressure and flow control

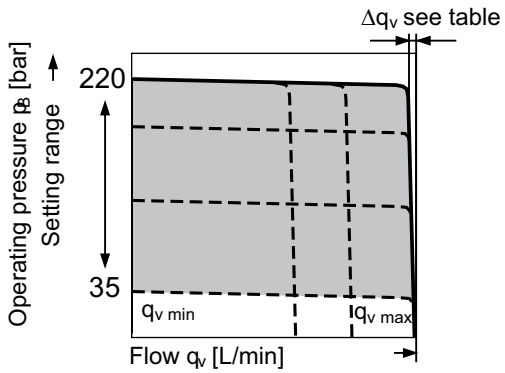
In additon to the pressure control function, the pump flow may be varied by means of a differential pressure over an orifice or valve spool installed in the service line to the actuator. The pump flow is equal to the actual required flow by the actuator, regardless of changing pressure levels.

The pressure control overrides the flow control function.

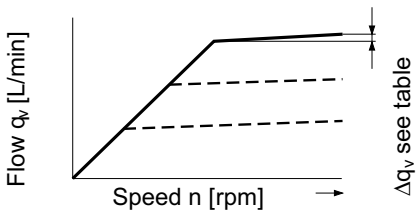
Note
The DFR1-valve version has no connection between X and the tank (pump housing).
Unloading the LS-pilot line must be possible in the valve system.
Because of the flushing function sufficient unloading of the X-line must also be provided.

Static characteristic

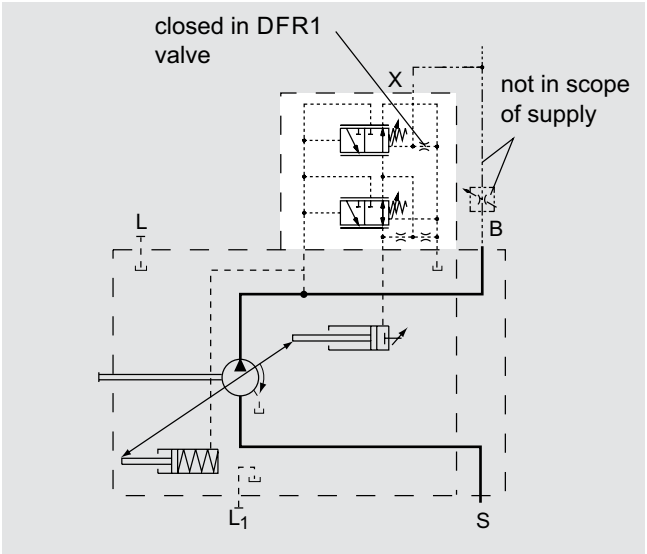
Flow controller at n_1 = 1500 rpm; t_{fluid} = 50°C)



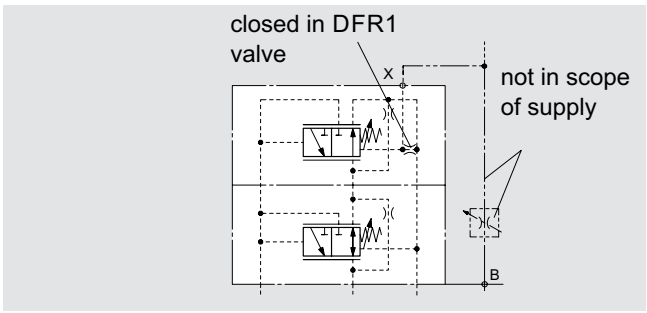
Static characteristic at variable speed



Schematic DFR size 18 to 100



Size 140



Ports

B	Outlet port
S	Inlet port
L, L_1	Case drain port (L_1 plugged)
X	Pilot pressure port

Details of pilot pressure port X

Size 18 to 100	with adapter
Size 140	without adapter

Differential pressure Δp:

Standard setting: 14 bar. If another setting is required, please state in clear text.
Unloading port X to tank (with outlet port B closed) results in a zero stroke (standby) pressure of p = 18 ± 2 bar (dependent on the Δp setting).

Controller data

Data pressure control DR see page 11.
Maximum flow deviation measured with drive speed n = 1500 rpm.

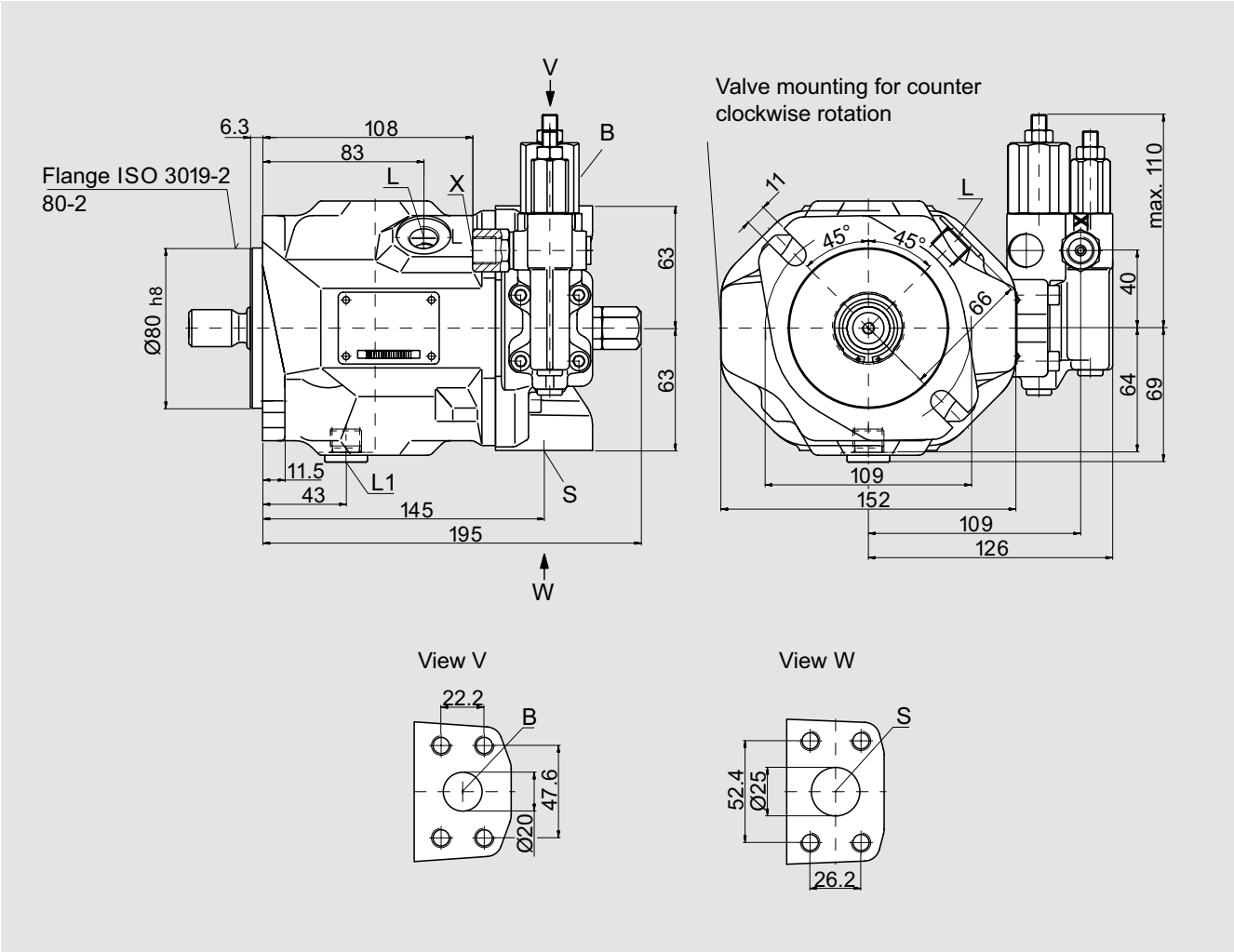
Size		18	28	45	71	100	140
$\Delta q_{v\,max}$	L/min	0,9	1,0	1,8	2,8	4,0	6,0

Pilot flow consumption DFR max. approx. 3...4,5 L/min
Pilot flow consumption DFR1 max. approx. 3 L/min

Dimensions, size 18

Before finalising your design please request a certified installation drawing. Dimensions in mm

DFR/DFR1 Pressure/flow control; clockwise rotation



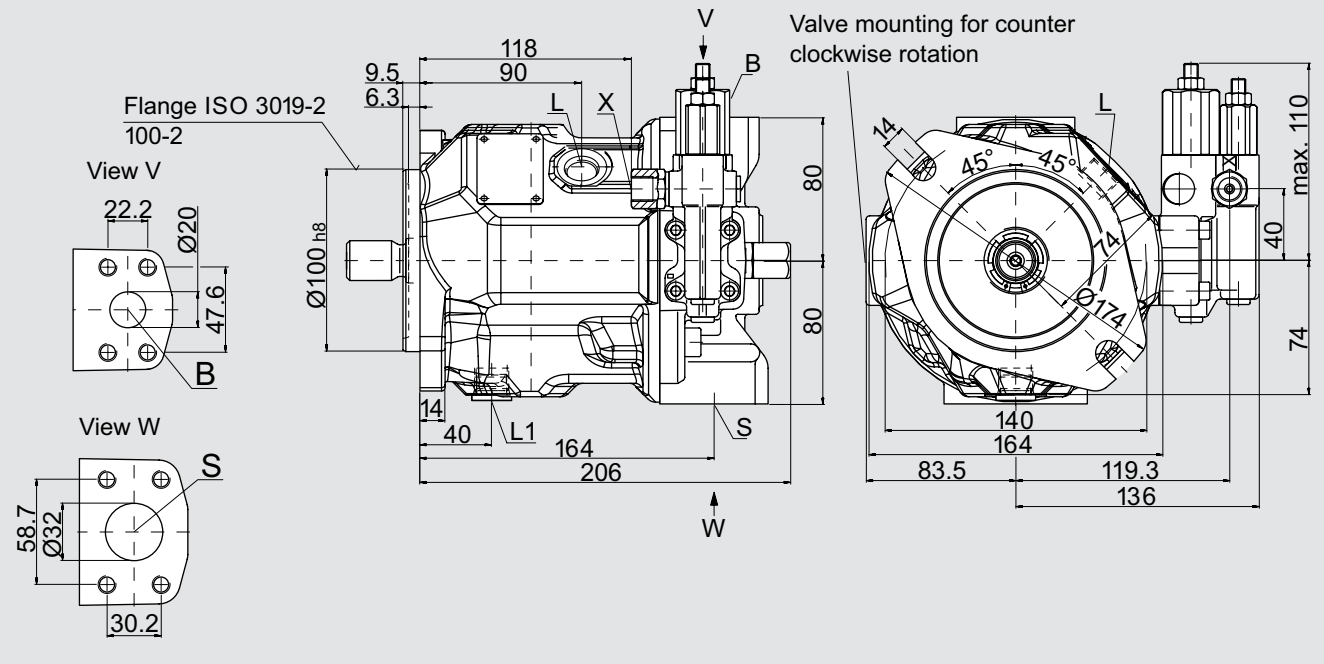
Ports

Designation	Port for	Standard	Size [1]	Peak pressure [bar] [2]	State
B	Service line (standard pressure range) Fixing thread	SAE J518 DIN 13	3/4 in M10; 17 deep	220	O
S	Suction (standard pressure range) Fixing thread	SAE J518 DIN 13	1 in M10; 17 deep	5	O
L	Case drain	DIN 3852	M16x1,5	2	O [3]
L_1	Case drain	DIN 3852	M16x1,5	2	plugged [3]
X	Pilot pressure	DIN 3852	M14x1,5; 12 deep	220	O
X	Control press. for DG control	DIN 3852	G 1/4 in	120	O

Dimensions, size 28

Before finalising your design please request a certified installation drawing. Dimensions in mm

DFR/DFR1 Pressure/flow control; clockwise rotation



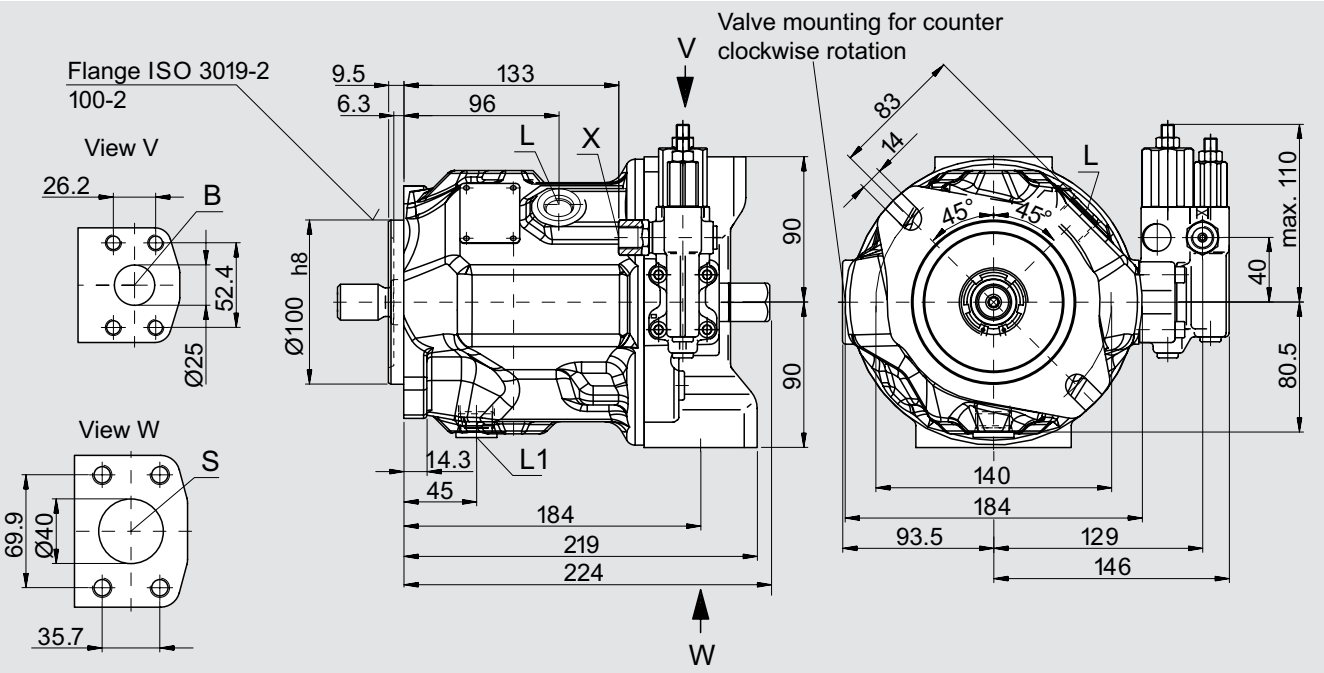
Ports

Designation	Port for	Standard	Size [1]	Peak press. [bar] [2]	State
B	Service line (standard pressure range) Fixing thread	SAE J518 DIN 13	3/4 in M10; 17 deep	 220	O
S	Inlet (standard pressure range Fixing thread	SAE J518 DIN 13	1 1/4 in M10; 17 deep	 5	O
L, L_1	Case drain (L_1 plugged)	DIN 3852	M18x1,5; 12 deep	2	O [3]
X	Pilot pressure	DIN 3852	M14x1,5; 12 deep	220	O
X	Control pressure for DG control	DIN 3852	G 1/4 in	120	O
Y	Pilot support pressure	DIN 3852	M14x1,5; 12 deep	max. 35	O
M_B	Meassuring outlet pressure	SAE 3852	G 1/4 in	220	plugged
M_{st}	Measuring pilot support pressure	DIN 3853/ISO 8434 DIN 3861	Tube dia.8 mm	max 18	closed

Dimensions, size 45

Before finalising your design please request a certified installation drawing. Dimensions in mm

DFR/DFR1 Pressure/flow control; clockwise rotation



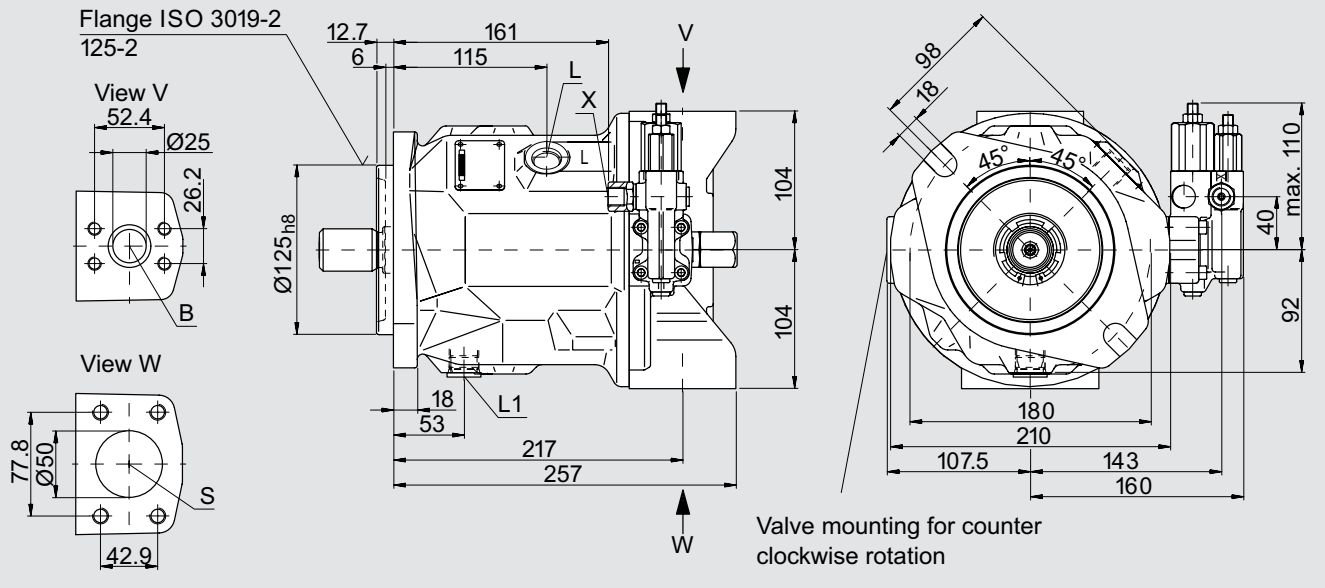
Ports

Designation	Port for	Standard	Size [1]	Peak press. [bar] [2]	State
B	Service line (standard pressure range) Fixing thread	SAE J518 DIN 13	1 in M10; 17 deep	220	O
S	Inlet (standard pressure range) Fixing thread	SAE J518 DIN 13	1 1/2 in M12; 20 deep	5	O
L	Case drain	DIN 3852	M22x1,5	2	O [3]
L_1	Case drain	DIN 3852	M22x1,5	2	plugged [3]
X	Pilot pressure	DIN 3852	M14x1,5; 12 deep	220	O
X	Control pressure for DG control	DIN 3852	G 1/4 in	120	O
Y	Pilot support pressure	DIN 3852	M14x1,5; 12 deep	max. 35	O
M_B	Measuring outlet pressure	SAE 3852	G 1/4 in	220	plugged
M_{st}	Measuring pilot support pressure	DIN 3853/ISO 8434 DIN 3861	Tube dia. 8 mm	max. 18	closed

Dimensions , size 71

Before finalising your design please request a certified installation drawing. Dimensionsin mm

DFR/DFR1 Pressure/flow control, port plate 42; clockwise rotation



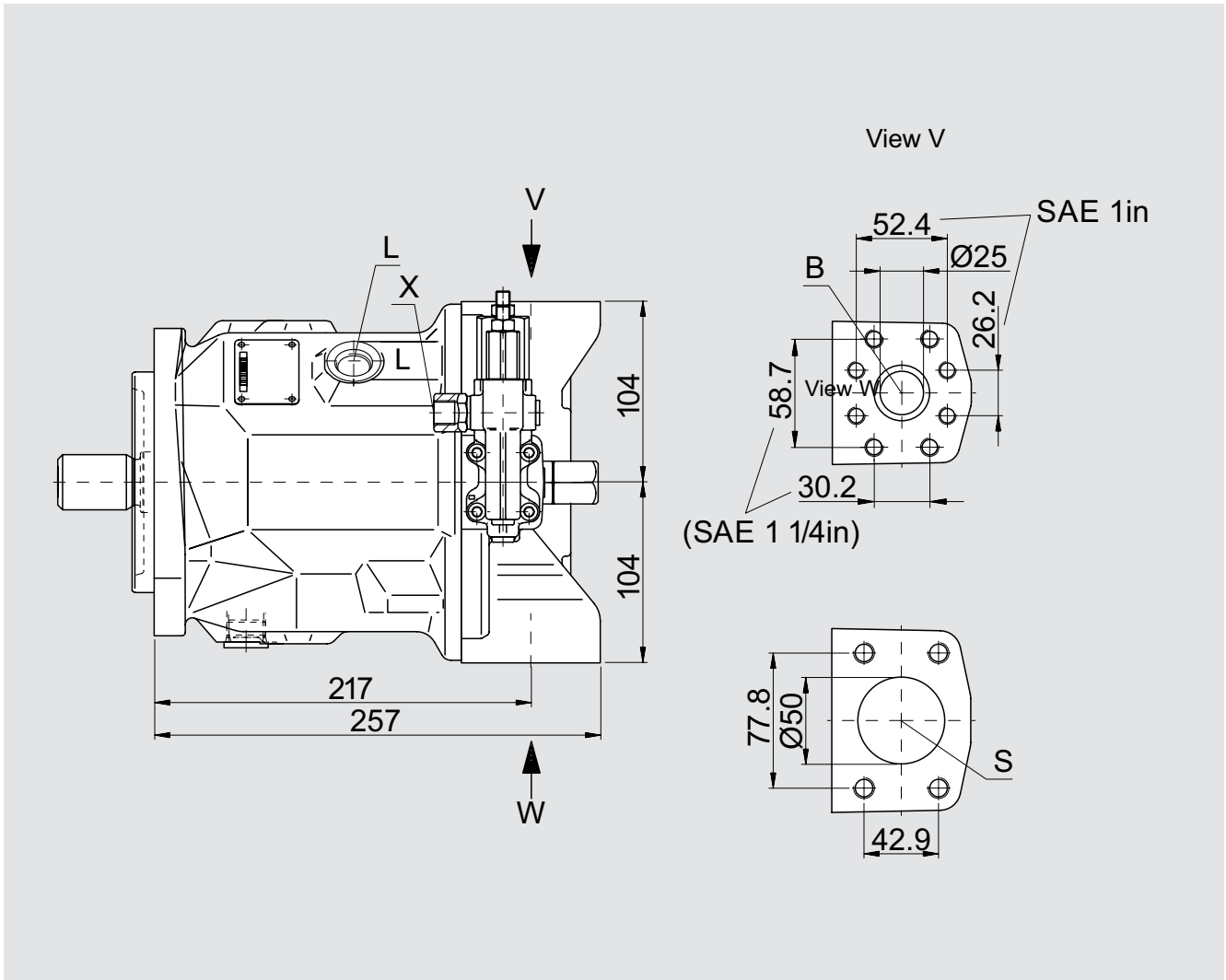
Ports

Designation	Port for	Standard	Size [1]	Peak press. [bar] [2]	State
B	Service line (Standard pressure range) Fixing thread	SAE J518 DIN 13	1 in M10; 17 deep	220	O
S	Inlet (standard pressure range) Fixing thread	SAE J518 DIN 13	2 in M12; 20 deep	5	O
L	Case drain	DIN 3852	M22x1,5	2	O [3]
L_1	Case draint	DIN 3852	M22x1,5	2	plugged [3]
X	Pilot pressure	DIN 3852	M14x1,5; 12deep	220	O
X	Control pressure for DG control	DIN 3852	G 1/4 in	120	O
Y	Pilot support pressure	DIN 3852	M14x1,5; 12 deep	max. 35	O
M_B	Measuring outlet pressure	SAE 3852	G 1/4 in	220	plugged
M_{st}	Measuring pilot support pressure	DIN 3853/ISO 8434 DIN 3861	Tube dia. 8 mm	max. 18	closed

Dimensions, size 71

Before finalising your design please request a certified installation drawing. Dimensions in mm

DFR/DFR1 Pressure/flow control, port plate 12 not for new applications



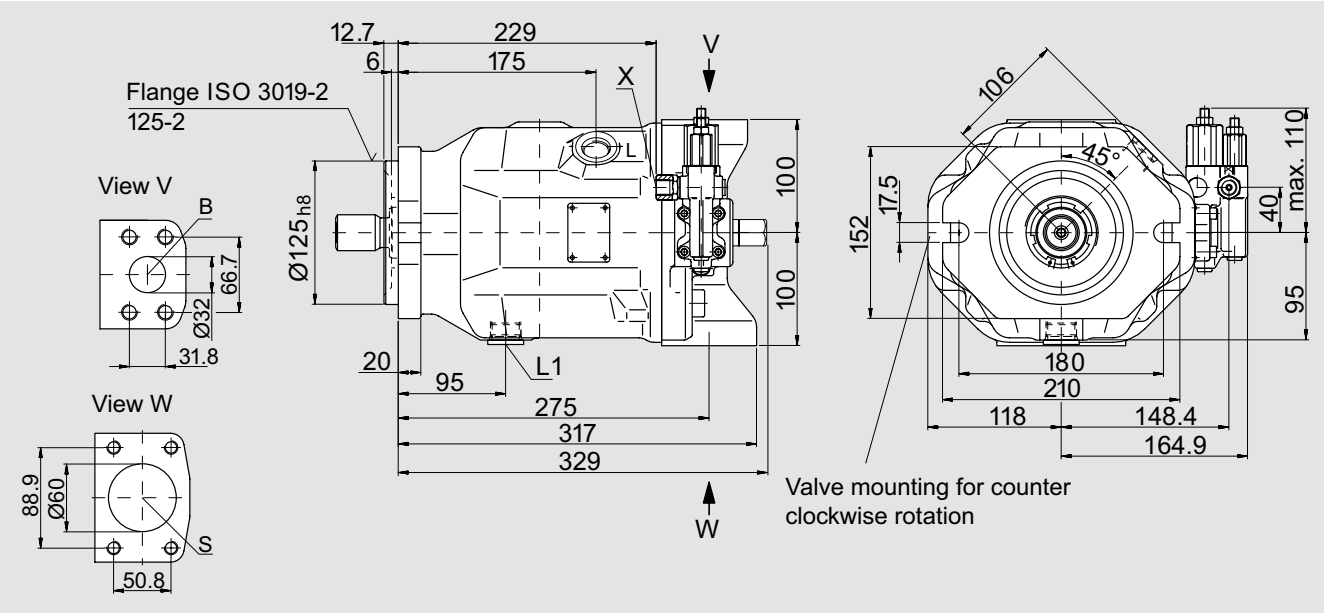
Ports

Designation	Port for	Standard	Size [1]	Peak press. [bar] [2]	State
B	Service line (standard pressure range) Fixing thread	SAE J518 DIN 13	1 in (+ 1 1/4 in) M10; 17 deep	220	O
S	Inlet (standard pressure range Fixing thread	SAE J518 DIN 13	2 in M12; 20 deep	5	O
L	Case drain	DIN 3852	M22x1,5	2	O [3]
L_1	Case drain	DIN 3852	M22x1,5	2	plugged [3]
X	Pilot pressure	DIN 3852	M14x1,5; 12 deep	220	O
X	Control pressure for DG control	DIN 3852	G 1/4 in	120	O
Y	Pilot support pressure	DIN 3852	M14x1,5; 12 deep	max. 35	O
M_B	Measuring outlet pressure	SAE 3852	G 1/4 in	220	plugged
M_{st}	Measuring pilot support pressure	DIN 3853/ISO 8434 DIN 3861	Tube dia. 8 mm	max. 18	closed

Dimensions, size 100

Before finalising your design please request a certified installation drawing. Dimensions in mm

DFR/DFR1 Pressure/flow control; clockwise rotation



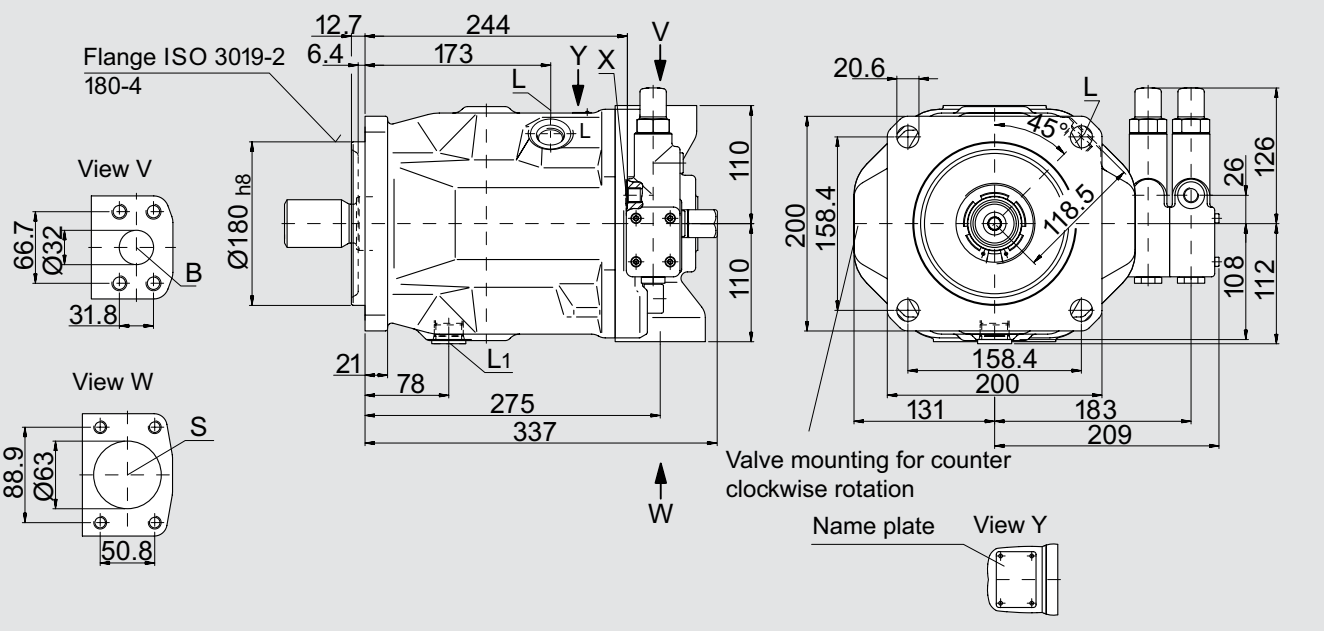
Ports

Designation	Port for	Standard	Size [1]	Peak press. [bar] [2]	State
B	Service line (high pressure range) Fixing thread	SAE J518 DIN 13	1 1/4 in M14; 19 deep	220	O
S	Inlet (standard pressure range Fixing thread	SAE J518 DIN 13	2 1/2 in M12; 17 deep	5	O
L	Case drain	DIN 3852	M27x2	2	O [3]
L_1	Case drain	DIN 3852	M27x2	2	plugged [3]
X	Pilot pressure	DIN 3852	M14x1,5; 12 deep	220	O
X	Control pressure for DG control	DIN 3852	G 1/4 in	120	O
Y	Pilot support pressure	DIN 3852	M14x1,5; 12 deep	max. 35	O
M_B	Measuring outlet pressure	SAE 3852	G 1/4 in	220	plugged
M_{st}	Measuring pilot support pressure	DIN 3853/ISO 8434 DIN 3861	Tube dia. 8 mm	max. 18	closed

Dimensions, size 140

Before finalising your design please request a certified installation drawing. Dimensions in mm

DFR/DFR1 Pressure/flow control; clockwise rotation



Ports

Designation	Port for	Standard	Size [1]	Peak pressure [bar] [2]	State
B	Service line (high pressure range) Fixing thread	SAE J518 DIN 13	1 1/4 in M14; 19 deep	220	O
S	Inlet (standard pressure range) Fixing thread	SAE J518 DIN 13	2 1/2 in M12; 17 deep	5	O
L	Case drain	DIN 3852	M27x2	2	O [3]
L_1	Case drain	DIN 3852	M27x2	2	plugged [3]
X	Pilot pressure	DIN 3852	M14x1,5; 12 deep	220	O
X	Pilot pressure for DG control	DIN 3852	M14x1,5; 12 deep	120	O
M_H	Measuring high pressure	DIN 3852	M14x1,5; 12 deep	220	plugged
Y	Pilot support pressure	DIN 3852	M14x1,5; 12 deep	max. 35	O
M_{st}	Measuring pilot support pressure	DIN 3853/ISO 8434 DIN 3861	Tube dia. 8 mm	max. 18	closed

KOLBEN

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KOLBEN HYDRAULICS LTD.

B-80, 2nd Floor, 2nd Cross Road,
Peenya Industrial Estate, 1st stage,
Bangalore- 560058,India.
Tel: +91-80-41170110
Email: sureshkannan@kolbenhydraulics.com
kolbenhydraulics@gmail.com

www.kolbenhydraulics.com