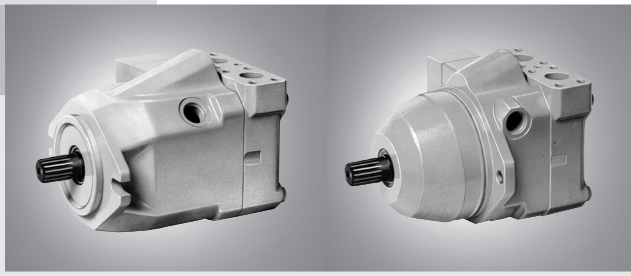
Rexroth
Bosch Group

Dual displacement motor A10VM
Plug-in dual displacement motor A10VE

RE 91 703/09.99 **1**/16
Replaces: 08.98

open and closed circuit



A10VM A10VE

Size 28...85
Series 5
Nominal pressure 280 bar
Peak pressure 350 bar

Contents

– Further information:

Dual displacement motor A10VEC for track and wheel drives Size 45	RE 91 710
Fixed displacement motor A10FSM Size 18	RE 91 180
Fixed displacement motor A10FM Size 23 - 63	RE 91 172

Features

- Dual displacement motor, axial piston in swashplate design for hydrostatic transmissions in open and closed circuit applications
- Output speed directly proportional to the inlet flow and inversely proportional to the motor displacement
- Output torque increases proportional to the pressure difference between high and low-pressure sides and increasing displacement
- Heavy-duty bearings for long service life
- High permissible output speed
- Well proven A10 rotary unit technology
- High power/weight ratio – compact size
- Cost effective
- Low noise
- Control range 1 : 3.75
- External direct control supply possible
- Minimum displacement can be set externally
- SAE 2-bolt mounting flange on A10VM
- Special 2-bolt flange on A10VE

Ordering code / standard range

A10V				/	5	2	W		–	V				

Hydraulic fluid

Mineral oil (without prefix)	

Axial piston motor

Swash plate design, variable, nominal press. 280 bar, peak press. 350 bar	A10V

Operating mode

Motor	M
Plug-in motor	E

> *** Hint for sizes 28 and 45**
> Interchangeability with **pressure range 250/315 bar** and previous flange port patterns on request

Size

	28*	45*	63	85
≙ Motor displacement V_g in cm^3	●	●	●	❍

Control devices

				28	45	63	85		
Two-point direct control, external control supply, without pilot valve	DG			●	●	❍	❍	DG	
Two-point control, hydraulic	HZ			●	●	❍	❍	HZ	
	HZ		6	●	●	❍	❍	HZ6	
Two-point control, electrical with two-position valve	EZ	1		●	●	●	❍	EZ1	} Control voltage 12V
	EZ		6	●	●	●	❍	EZ6	
	EZ	2		●	●	●	❍	EZ2	} Control voltage 24V
	EZ		7	●	●	●	❍	EZ7	

└ with orifice for increase of response time

Series

	5

Design index

	2

Direction of rotation (Viewing onto shaft end)

bi-directional	W

Minimum displacement

	Size	28	45	63	85	
V_{gmin} (in cm^3) infinitely variable	from	8	12	16	22	1
	to	28	25	38	50	
	from	–	26	40	48	2
	to	–	45	62	87	

V_{gmin} – Adjustment, please state in clear text when ordering

Seal

FKM (fluororubber to DIN ISO 1629)	V

Shaft end

	28	45	63	85	
SAE spline shaft (for details see unit dimensions)	●	●	●	❍	R
SAE spline shaft (for details see unit dimensions)	–	●	●	❍	W

Mounting flange

	28	45	63	85	
SAE 2-hole flange for A10VM	●	●	●	❍	C
Special 2-hole flange for A10VE	●	●	●	❍	F

Ports for service lines

		28	45	63	85	
Ports A/B at side - same side;	SAE flange, UNC fixing screws	●	●	●	❍	60N00
Ports A/B at side - same side;	SAE flange, metric fixing screws	❍	❍	❍	❍	10N00
Ports A/B at side - same side;	UNF threaded ports	●	●	❍	–	66N00
Ports A/B at side - same side;	metric threaded ports	❍	❍	❍	–	16N00
Ports A/B at rear;	SAE flange, UNC fixing screws	❍	●	❍	❍	61N00
Ports A/B at rear;	SAE flange, metric fixing screws	❍	❍	❍	❍	11N00
Ports A/B at rear;	UNF threaded ports	❍	●	❍	–	64N00

Valves

	28	45	63	85	
Without valves	●	●	●	❍	0
Integrated flushing valve, only with ports at side (60N00, 10N00, 66N00 und 16N00)	●	●	●	❍	7

Speed monitoring

	28	45	63	85	
Without speed monitoring (no code)	●	●	●	❍	–
Prepared for speed monitoring, A10VM only	❍	❍	❍	❍	D

– = not available ❍ = in preparation ● = available

Technical data

Hydraulic fluid

For extensive information on the selection of fluids and for application conditions,please consult our data sheets RE 90220 (mineral oils) or RE 90221 (environmentally accetable hydraulic fluids).

You might have to consider reduced operating data with environmentally accetable hydraulic fluids. Please contact our technical department (please indicate type of the hydraulic fluid used for your application on the order sheet).

Operating viscosity range

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

ν_{opt} = opt. operating viscosity 16...36 mm^2/s

referred to the circuit temperature (closed circuit) or tank temperature (open circuit).

Viscosity limits

The limiting values for viscosity are as follows:

ν_{min} = 5 mm^2/s

short term at a max. permissible temperature of t_{max} = 115 °C.

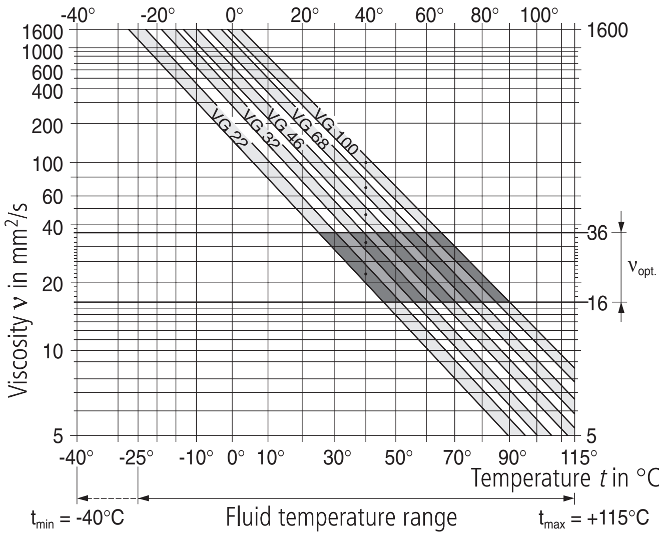
Please note that the maximum fluid temperature must also not exceed 115 °C in certain areas (e.g. bearing area).

ν_{max} = 1600 mm^2/s

short term on cold start (t_{min} = -40 °C).

Special precautions are required at temperatures between -25 °C and -40 °C, depending on the installation conditions. Please consult our technical department.

Selection diagram



Notes on the selecting of the hydraulic fluid

In order to select the correct fluid, it is necessary to know the operating temperature in the loop (closed circuit) or the tank temperature (open circuit) in relation to the the ambient 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 selection diagram). We recommend that the highest possible viscosity range should be choosen in each case.

Example: At an ambient temperature of X °C the operating temperature (closed circuit: loop temperature; open circuit: tank temperature) is 60°C. Within the operating viscosity range (ν_{opt}; shaded area), this corresponds to viscosity ranges VG 46 or VG 68; VG 68 should be selected.

Important: The leakage oil (case drain oil) temperature is influenced by pressure and motor speed and is always higher than the circuit or tank temperature. However, at no point in the circuit may the temperature exceed 115 °C.

If it is not possible to comply with the above conditions because of extreme operating parameters or high ambient temperatures please consult us.

Filtration of fluid

The finer the filtration the better the achieved cleanliness of the pressure fluid and the longer the life of the axial piston unit.

To ensure the functioning of the axial piston unit a minimum cleanliness of: 9 to NAS 1638
18/15 to ISO/DIS 4406.

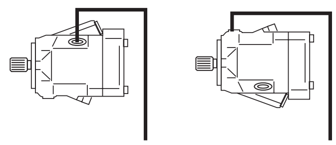
Please consult us, if it is not possible to comply with the above conditions.

Mounting position

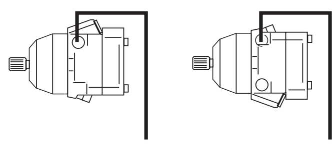
Any. The motor housing must be filled with hydraulic fluid when starting up and during operation. The leakage fluid line must be routed so that the housing is not drained when the motor stops. The end of the line must enter the tank below the minimum oil level.

The highest leakage oil port must be used in all installation positions to fill the housing and to connect the drain line.

A10VM



A10VE



Please consult Brueninghaus Hydromatik if the motor is to be installed vertically.

Technical data

Operating pressure range

Pressure at port A or B
(Pressure data to DIN 24312)

Nominal pressure p_N ____________ 280 bar
Peak pressure p_{max} ____________ 350 bar
Sum of the pressure at ports A and B must not exceed 560 bar.

Case drain pressure

Maximum permissible case pressure at ports L and L_1
$p_{abs\ max}$ ____________ 2 bar abs.

Direction of rotation

Flow B to A = Right-hand rotation
Flow A to B = Left-hand rotation

Displacement

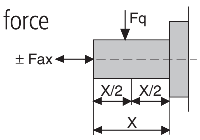
The minimum displacement steplessly adjustable within the range of the screw lengths 1 or 2 (see model code page 2).
Please state min. displacement in clear text when ordering; it will be factory set.

Table of values (theoretical values, ignoring η_{mh} and η_v: values rounded)

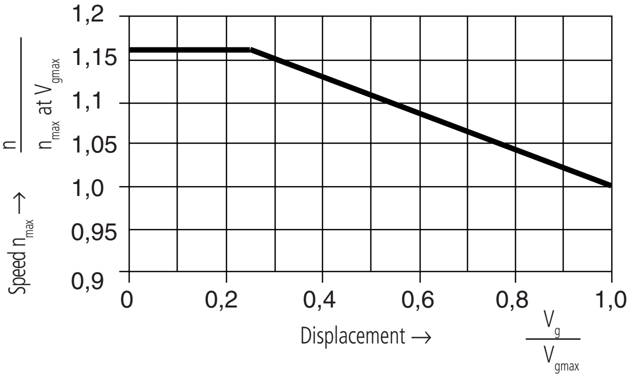
Size					28	45	63	85
Motor displacement			$V_{g\ max}$	cm^3	28	45	62	87
			$V_{g\ min}$	cm^3	8	12	16	22
Max. speed [1])	at $V_{g\ max}$		n_{max}	rpm	4700	4000	3300	3100
	at $V_{g\ min}$		n_{max}	rpm	5300	4600	3800	3500
Max. inlet flow	at n_{max} and $V_{g\ max}$		$q_{v\ max}$	L/min	131.6	180	205	270
Max. output power	at n_{max} and $V_{g\ max}$	Δp = 280 bar	P_{max}	kW	61	84	95	125
Max. torque	at $V_{g\ max}$	Δp = 280 bar	T_{max}	Nm	125	200	276	387
Mass moment of inertia (about the output shaft)			J	kgm^2	0.0017	0.0033	0.0056	0,0167
Filling volume, approx.			L		0.6	0.7	0.8	1
Weight, approx.			m	kg	14	18	26	34
Permissible load on output shaft, max. perm. axial force			$F_{ax\ max}$	N	1000	1500	2000	3000
Max. perm. radial force			$F_{q\ max}$	N	1200	1500	1700	2000
Actual starting toque at n = 0 rpm		Δp = 280 bar		Nm(approx.)	92	149	205	253

[1]) At max. speed the low pressure must see at least 18 bar.

Applied force



Determination of n_{max}



Calculating size

Inlet flow $q_v = \frac{V_g \bullet n}{1000 \bullet \eta_v}$ [L/min]

Torque $T = \frac{1.59 \bullet V_g \bullet \Delta p \bullet \eta_{mh}}{100}$ [Nm]

Output power $P = \frac{T \bullet n}{9549} = \frac{q_v \bullet \Delta p \bullet \eta_t}{600}$ [kW]

Output speed $n = \frac{q_v \bullet 1000 \bullet \eta_v}{V_g}$ [rpm]

V_g = geometric motor displacement per revolution [cm^3]
Δp = pressure differential [bar]
n = speed [rpm]
η_v = volumetric efficiency
η_{mh} = mechanical-hydraulic efficiency
η_t = total efficiency ($\eta_t = \eta_v \bullet \eta_{mh}$)

Direct control pressure DG

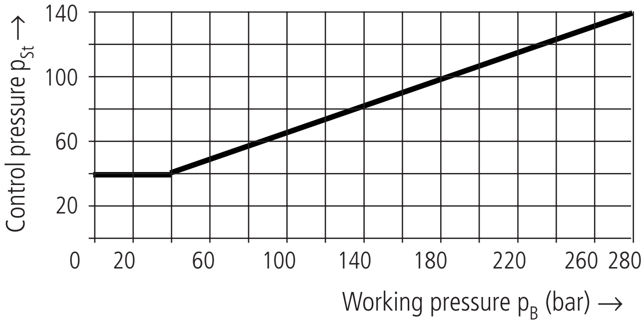
Normally, the motor is at max. displacement. By applying an external pressure to port G, the destroking piston is directly pressurized and the motor switches to minimum displacement.

The minimum required control pressure is $p_{St} \geq 40$ bar.

This control pressure depends directly on the working pressure p_B in port A or B.

See control pressure diagram below. With a control pressure above this minimum required pressure level the motor will destroke properly.

Control pressure diagram



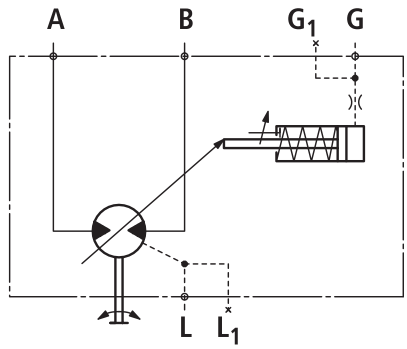
Control pressure = 0 bar $\triangleq V_{g\,max}$

Control pressure ≥ 40 bar $\triangleq V_{g\,min}$ (see control pressure diagram)

The maximum permissible control pressure p_{St} = 280 bar.

$V_{g\,min}$ - setting, please state in clear text when ordering.

Circuit diagram



Ports

A,B	Pressure ports
L, L_1	Drain ports
G, G_1	External control pressure ports

Hydraulic two-point control HZ / HZ6

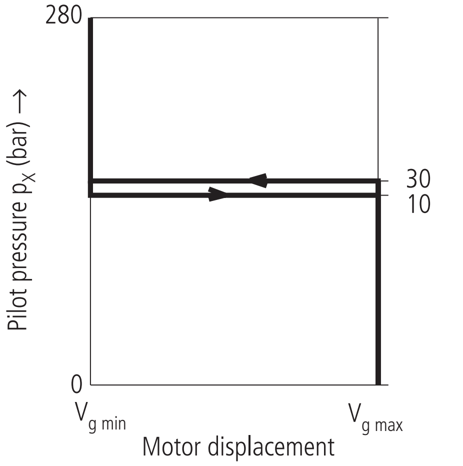
Normally, the motor is at max. displacement. By applying a pilot pressure p_X to port X ($p_X \geq 30$bar), the destroking piston is pressurized and the motor switches to minimum displacement.

The necessary control pressure is via a shuttle valve, taken out of the port A or B.

A minimum operating pressure difference of $\Delta p_{A,B} \geq 20$ bar is required.

Only max. and min. displacements are possible.

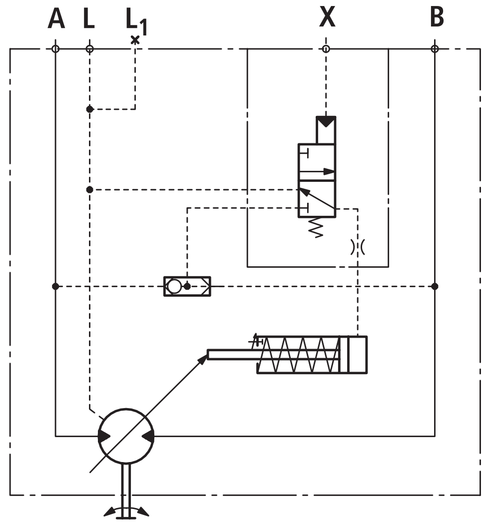
$V_{g\,min}$ - setting, please state in clear text when ordering.



Pilot pressure p_X = 0 bar ≙ $V_{g\,max}$

Pilot pressure p_X ≥ 30 bar ≙ $V_{g\,min}$

Circuit diagram HZ



Ports

A,B Pressure ports

L, L_1 Drain ports

X Pilot pressure port

Technical data HZ / HZ6

Minimum pilot pressure	30 bar
Max. permissible pilot pressure	280 bar

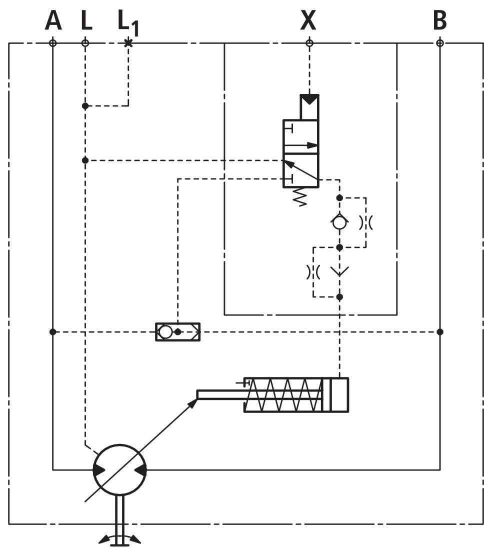
Control HZ6 with shuttle orifice to increase swivel time

Slow down of swivel action by means of shuttle orifice.

This enables a smooth swivel action.

Standard shuttle orifice size = 0,21 mm; other sizes on request.

Circuit diagram HZ6



Ports

A,B Pressure ports

L, L_1 Drain ports

X Pilot pressure port

Electrical two-point control EZ.

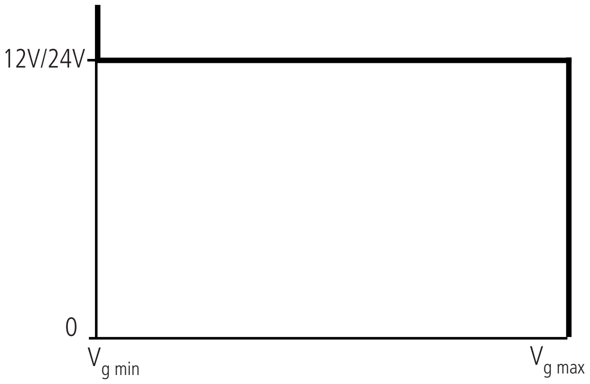
Normally, the motor is at max. displacement. By energizing the solenoid of the control valve, the destroking piston is pressured, and the motor switches to minimum displacement.

The necessary control pressure is via a shuttle valve, taken out of the port A or B.

A minimum operating pressure difference of $\Delta p_{A,B} \geq 20$ bar is required.

Only max. and min. displacements are possible.

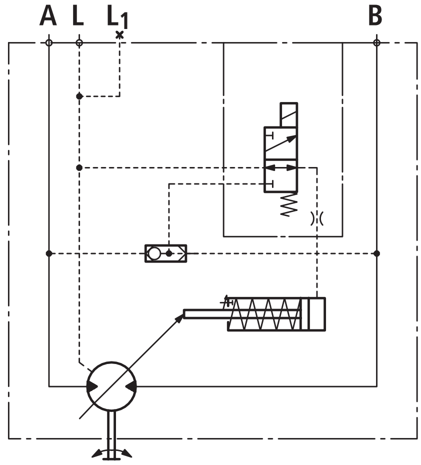
$V_{g\ min}$ - setting, please state in clear text when ordering.



De-energized ≙ $V_{g\ max}$

Energized ≙ $V_{g\ min}$

Circuit diagram EZ1/2



Ports

A,B Pressure ports

L, L_1 Drain ports

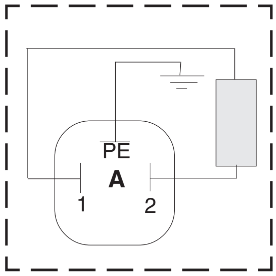
Technical data EZ.

Type	EZ1/6	EZ2/7
Supply voltage (DC)	12 V	24 V
Power consumption	26 W	26 W
Duty cycle	100%	100%
Type of protection	IP 65	IP 65

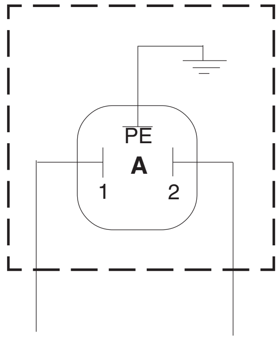
Features:

- With spring return
- Solenoid plug can be turned 4 x 90°

Connection to solenoid



Connection to plug



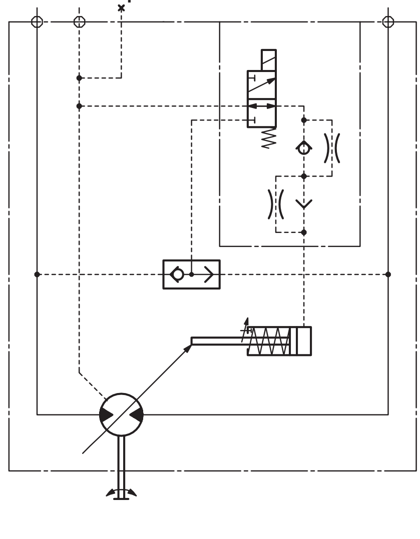
Control EZ6/7 with shuttle orifice to increase swivel time

Slow down of swivel action by means of shuttle orifice.

This enables a smooth swivel action.

Standard shuttle orifice size = 0,21 mm; other sizes on request.

Circuit diagram EZ6/7



Ports

A,B Pressure ports

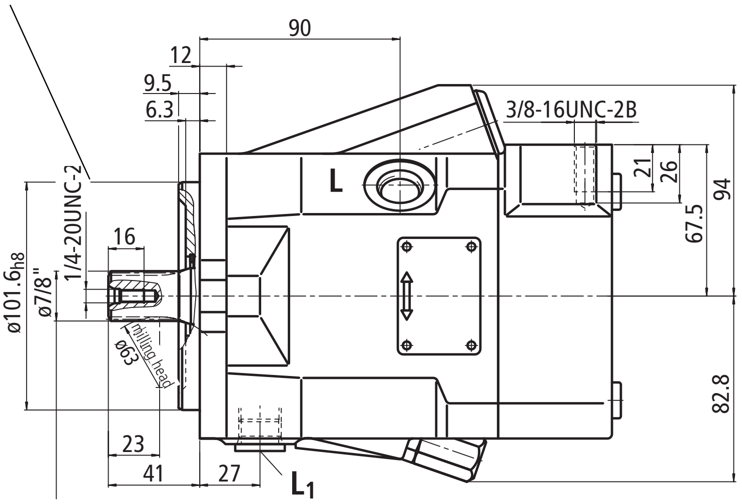
L, L_1 Drain ports

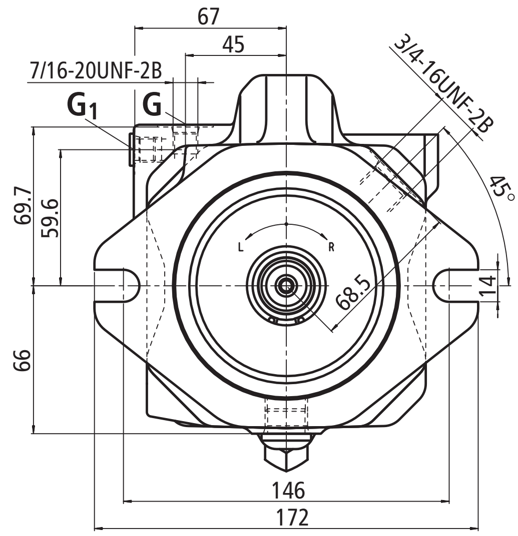
Unit dimensions A10VM; size 28

Before finalising your design, please request certified assembly drawing.

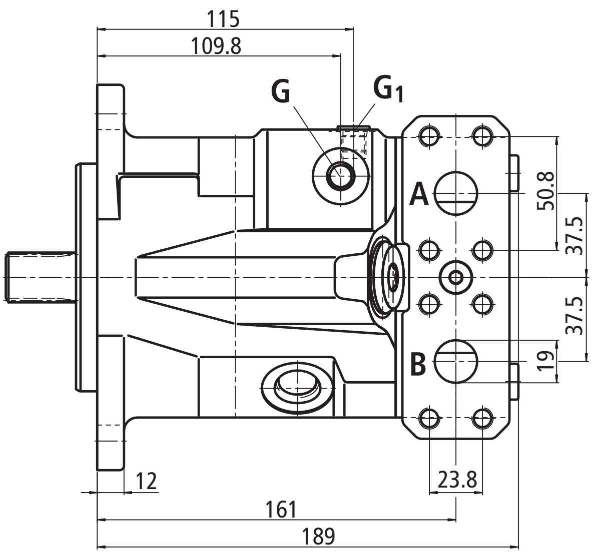
Two-point direct control DG
port plate 60

Flange 101-2
SAE J744 OCT 83





Shaft **R** 22-4; SAE J744 OCT 83
7/8" dia. splined shaft; 30° pressure angle; 13 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976



Ports

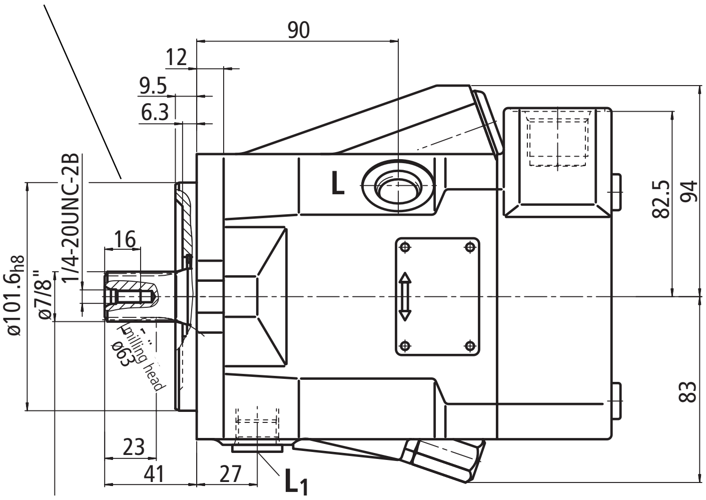
A,B	Pressure ports	SAE flange 3/4 ", high-pressure series (code 62)
L, L_1	Drain ports	3/4 - 16 UNF - 2B (L_1 plugged)
G, G_1	External control pressure ports	7/16 - 20 UNF - 2B (G_1 plugged)

Unit dimensions A10VM; size 28

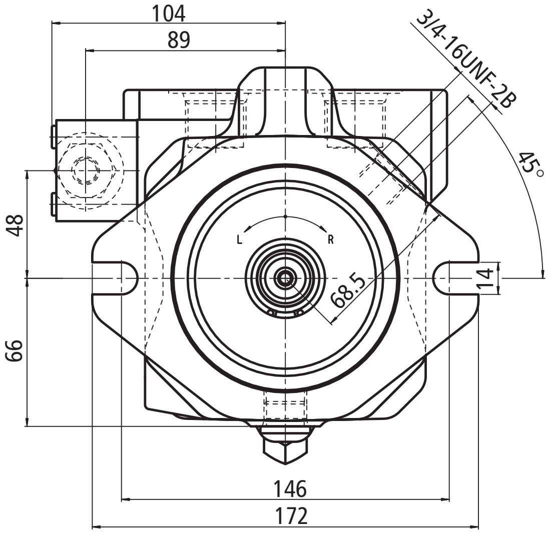
Before finalising your design, please request certified assembly drawing.

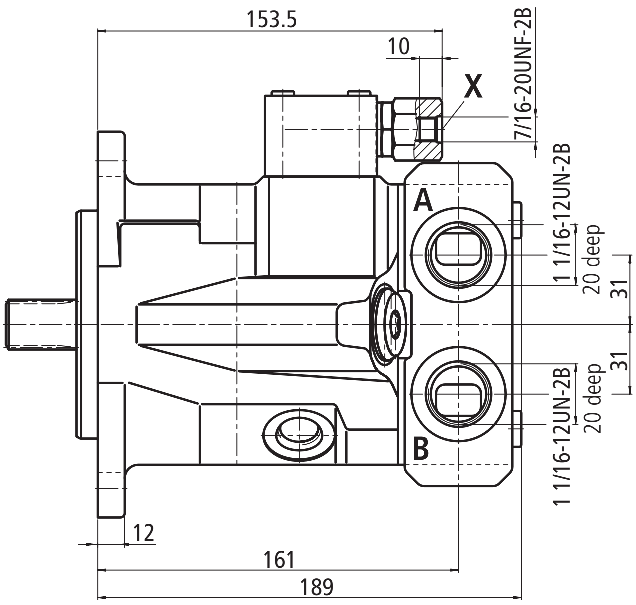
Two-point hydraulic control HZ
port plate 66

Flange 101-2
SAE J744 OCT 83



Shaft **R** 22-4; SAE J744 OCT 83
7/8" dia. splined shaft; 30º pressure angle; 13 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976





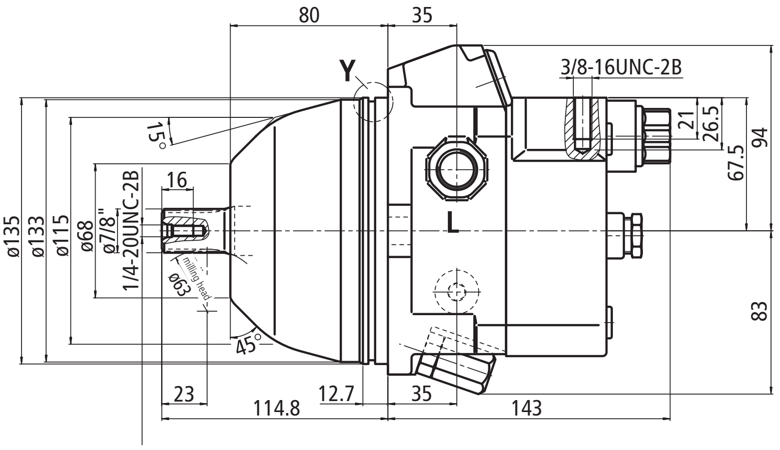
Ports

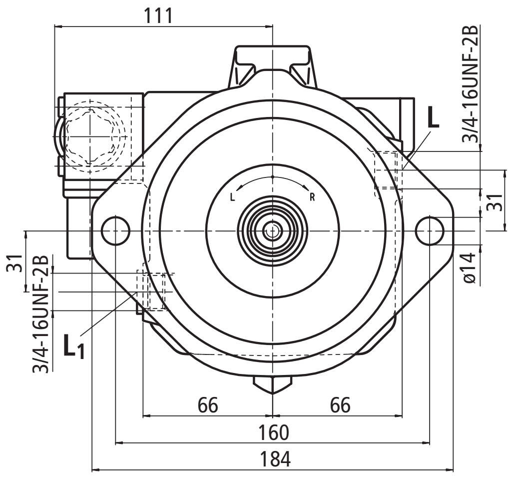
A, B	Pressure ports	Threaded O-ring boss 1 1/16-12UN-2B
L, L_1	Drain ports	3/4 - 16 UNF - 2B (L_1 plugged)
X	Pilot pressure port	7/16 - 20 UNF - 2B

Unit dimensions A10VE; size 28

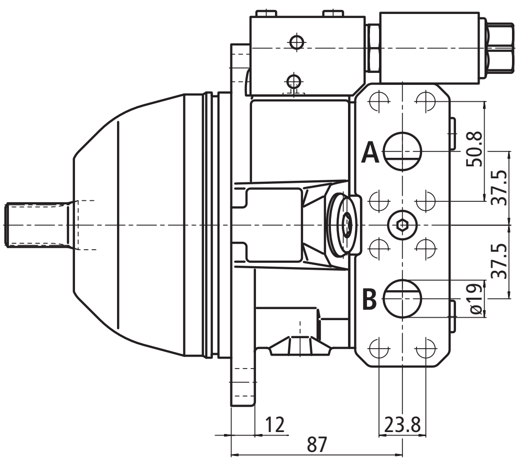
Two-point electrical control EZ. with two-position valve, port plate 60

Before finalising your design, please request certified assembly drawing.

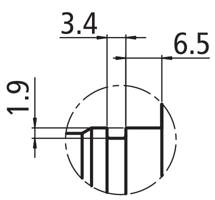




Shaft **R** 22-4; SAE J744 OCT 83
7/8" dia. splined shaft; 30° pressure angle; 13 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976



Detail Y



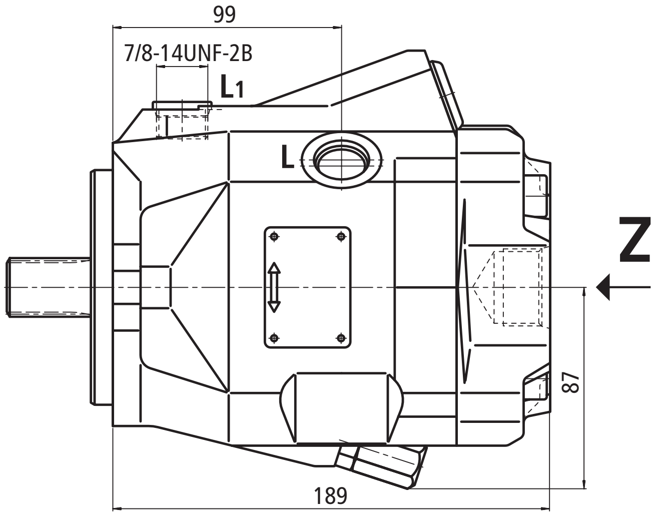
Ports

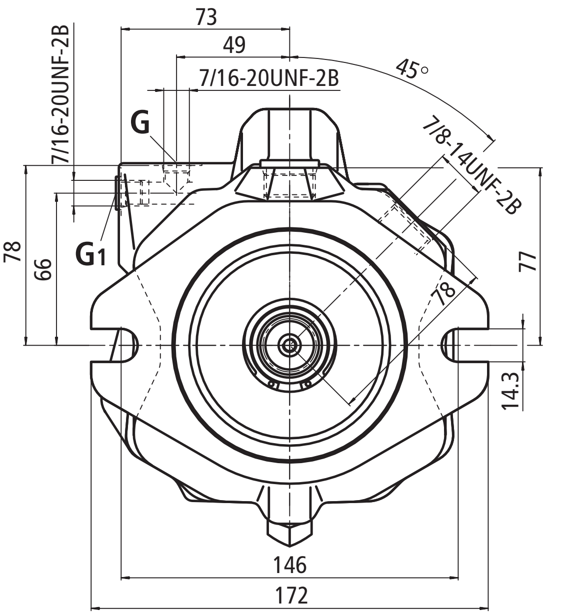
A,B	Pressure ports	SAE flange 3/4 ", high-pressure series (code 62)
L, L_1	Drain ports	3/4 - 16 UNF - 2B (L_1 plugged)

Unit dimensions A10VM; size 45

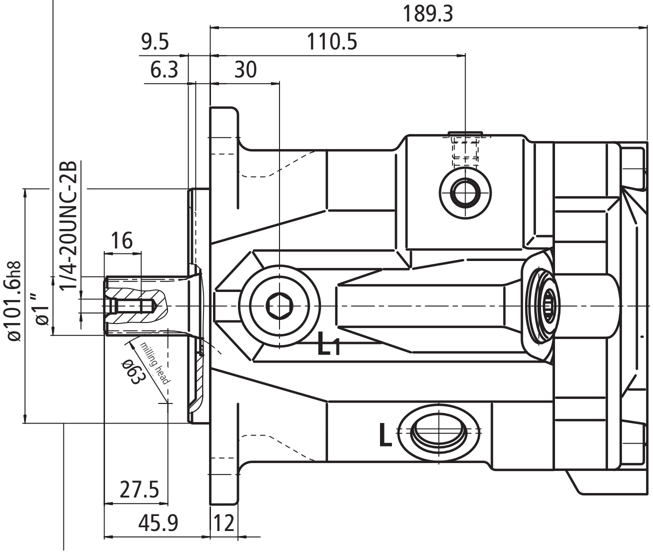
Two-point control, direct control pressure DG, port plate 64

Before finalising your design, please request certified assembly drawing.



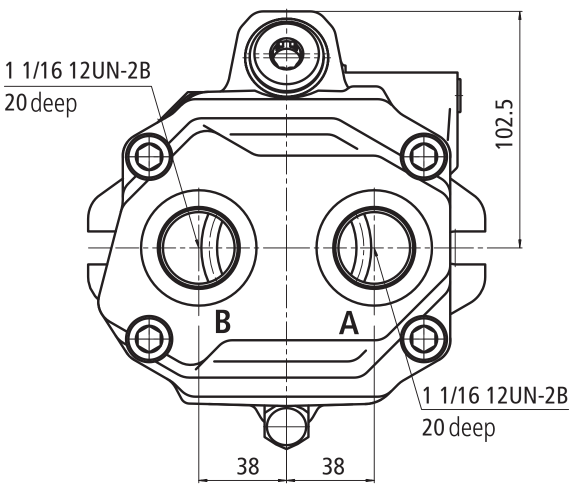


Shaft **R** 25-4; SAE J744 OCT 83
1" dia. splined shaft; 30° pressure angle; 15 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976



Flange 101-2
SAE J744 OCT 83

View Z



Shaft **W** see page 12.

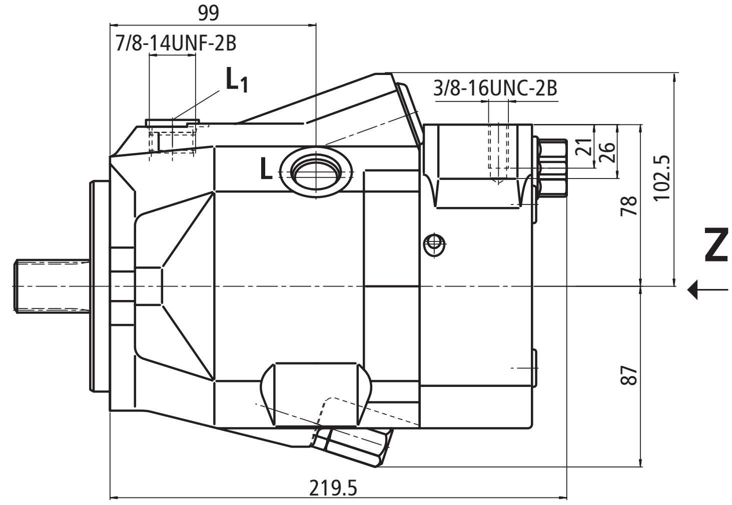
Ports

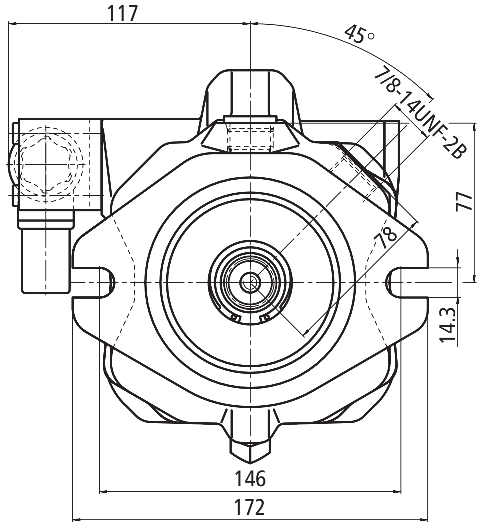
A,B	Pressure ports	Threaded O-ring boss 1 1/16 12UN-2B
L, L_1	Drain ports	7/8-14UNF-2B (L_1 plugged)
G, G1	External control pressure ports	7/16-20UNF-2B (G_1 plugged)

Unit dimensions A10VM; size 45

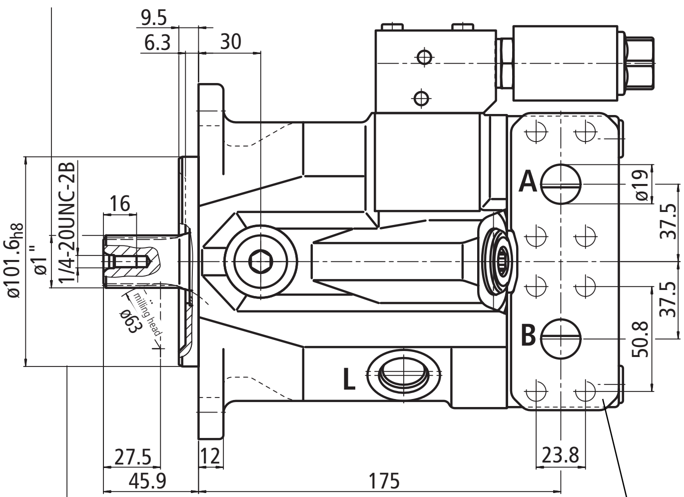
Two-point electrical control EZ. with two-position valve, port plate 60 and 61

Before finalising your design, please request certified assembly drawing.





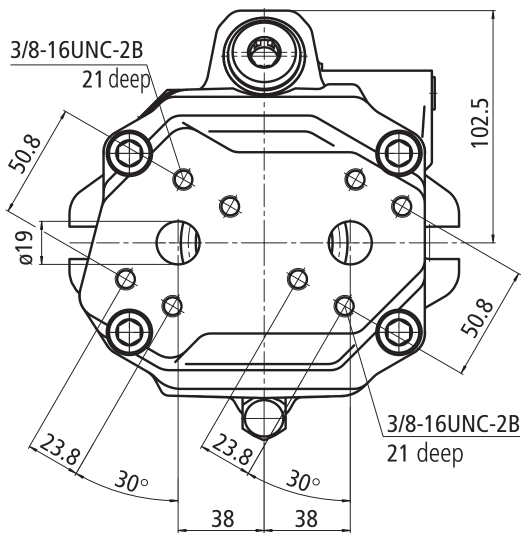
Shaft **R** 25-4; SAE J744 OCT 83
1" dia. splined shaft; 30° pressure angle; 15 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976



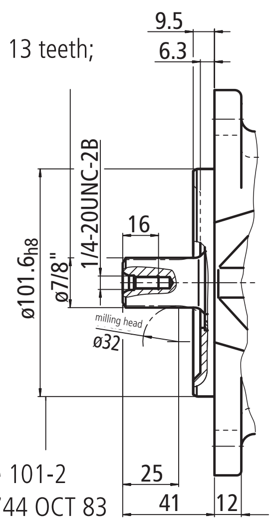
Flange 101-2
SAE J744 OCT 83

Port plate 60

Port plate 61, View Z



Shaft **W** 22-4; SAE J744 OCT 83
7/8" dia. splined shaft; 30º pressure angle; 13 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976



Flange 101-2
SAE J744 OCT 83

Ports

A,B	Pressure ports	SAE flange 3/4 ", high-pressure series (code 62)
L, L_1	Drain ports	7/8-14UNF-2B (L_1 plugged)