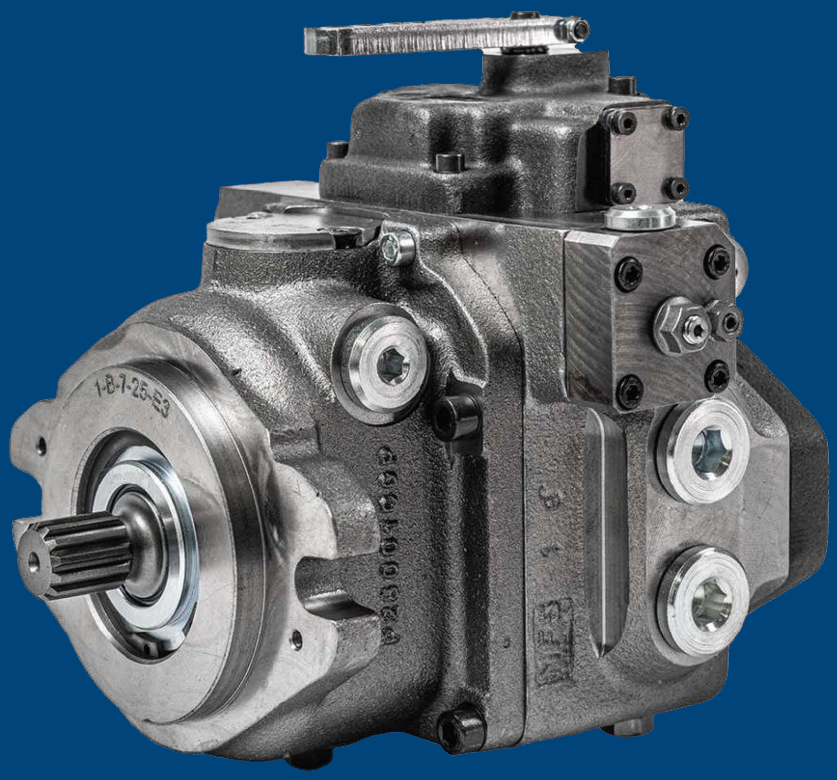
PATRIOT

PHDC2 SERIES
FULL CATALOG



Driven by Innovation

Power Precision Performance

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PATRIOT HYDRAULICS

PHDC2 Description

The PHDC2 Series is a high-performance variable displacement axial piston pump designed for closed-loop hydrostatic transmission systems. Featuring a proven swashplate design, the PHDC2 delivers smooth, precise flow control with output proportional to drive speed.

Built for demanding mobile and industrial applications, the PHDC2 offers high efficiency, low operating noise, excellent durability, and a compact, high power-to-weight design. Available with multiple control options, dual case drain ports, and optional through-drive capability, the PHDC2 provides the flexibility and reliability needed for a wide range of hydraulic systems.

TECHNICAL FEATURES - CONTROLS

C2 21-28-35 series is a family of variable displacement axial piston pumps for use in closed circuits.
The displacement is continuously variable by means of a tilting swash plate, and the oil flow direction is reversible.

The following range of controls is available:

- Manual without zeroing
- Manual with zeroing
- Manual lever with feed-back
- Hydraulic proportional without feed-back
- Hydraulic proportional with feed-back
- Electric impulse
- Electric two position (ON-OFF)
- Automotive
- Automotive with mechanical regulation
- Electric proportional with feed-back
- Electric proportional without feed-back

Options and two through drive options for auxiliary pumps mounting are available:

- By-pass (as standard)
- Power limiter
- Pressure filter
- Filter whit electrical clogging sensor
- Electric Cut-Off Valve
- Exchange valve
- Hydraulic inching
- Mechanical inching
- Through drive - SAE “A” 9T - 16/32-DP
- Through drive - SAE “A-A” 11T - 16/32-DP
- Through drive - SAE “B” 13T - 16/32-DP
- Through drive - Bosch GR2

SERIE		C2	
Displacement [1]	cc/rev	21-28-35	
Connection flange		SAE “B”	
Charge pump displacement	cc/rev	11 (0.671)	
Max speed [2]	rpm	3600	
Min speed	rpm	700	
Rated pressure	bar (psi)	270 (3916)	
Peak pressure	bar (psi)	**21-28** 350 (5076)	**35** 320 (4641)
Charge pressure	bar (psi)	15÷25 (standard 20) (218÷363) (standard 290)	
Max case pressure	bar (psi)	2 (29)	
Suc:on pressure	bar (psi)	≥ 0.8 (≥ 11.6)	
Moment of inertia rotating parts	kg m² (lbf ft²)	0.0018 (0.042)	
Weight (approx) [3]	kg (lb)	22 (48.5)	

Peak operations must not excide 1% of every minute. A simultaneus maximum pressure and maximum speed are not recommended.

Notes: (1) The displacements 21-28-35 use the same external casing.
(2) The values shown are valid for an absolute pressure (pass) of 1 bar (14.5 psi]) at the suction inlet port an when operated on mineral oil.
(3) Approximate values.

C2 21-28-35

ORDERING CODE

C2 21 - 28 - 35	XX	LWX	3	25

Series displacement	
C2 21	21 CC / REV
C2 28	28 CC / REV
C2 35	35 CC / REV

Displacement limitation	
XX	Not Required
00÷34	From 0 cm³/giro To 34 cm³/giro

Controls			
LWX	Manual without zeroing	AM2	Automotive 12V
LNX	Manual with zeroing	AM4	Automotive 24V
LRX	Manual lever with feed-back	AR2	Automotive 12V with mechanical regulation
IND	Hydraulic proportional with feed-back	AR4	Automotive 24V with mechanical regulation
INP	Hydraulic proportional without feed-back WITH ATTACKS ON TOP PLATE	EH2	Electric proportional with feed-back 12V + Hydraulic proportional with feed-back
IRX	Hydraulic proportional with feed-back	EH4	Electric proportional with feed-back 24V + Hydraulic proportional with feed-back
EI2	Electric impulse 12V	ER2	Electric proportional with feed-back 12V
EI4	Electric impulse 24V	ER4	Electric proportional with feed-back 24V
E22	Electric 2 posizioni ON-OFF 12V	EP2	Electric proportional without feed-back 24V
E24	Electric two position ON-OFF 24V	EP4	Electric proportional without feed-back 24V

	Throught Drive	Shaft end
1	Without through drive with charge pump	1 - 4 - 5 - 6
2	Without through drive w/o charge pump	1 - 4 - 5 - 6
3	SAE A = Z9 - 16/32 DP with charge pump	1 - 4 - 5 - 6 - X
4**	SAE B = Z13 - 16/32 DP without charge pump	3 - Y
5	Pump combination (Short version)	2
6	SAE A = Z9 - 16I32 DP without charge pump	1 - 4 - 5 - 6 - X
7**	SAE B = Z13 - 16I32 DP without charge pump	3 - Y
10*	SAE B-B = Z15 - 16I32 DP with charge pump	3 - Y
11*	SAE B-B = Z15 - 16I32 DP without charge pump	3 - Y
12	Bosch GR2 with charge pump	Z
13***	SAE A = Z11 -16/32 DP with charge pump	7 - 8

Note *: With coupling Internal Splined 13T / Internal Splined 15T
Note **: With coupling Internal Splined 13T / Internal Splined 13T
Note ***: With coupling Internal Splined 11T

	Pressure relief valve	10 multiples
14	140 bar [2031 psi]	MIN
27	270 bar [3916 psi]	STD
35	350 bar [5076 psi]	MAX

C2 21-28-35

ORDERING CODE

R	1	G	00	00

Special versions

Option			
00	Without Options	P1	Electric Cut-Off Valve 12v Not available with predisposition "5"
01	Power Limiter	P2	Electric Cut-Off Valve 24v Not available with predisposition "5"
FI	With Filter not available for control AM2/AM4	VS	Exchange Valve
FE	Filter with Electric sensor Not available for control AM2/AM4	II	Hydraulic inching
FR	Remote mounted filter	IM	Mechanical inching
V2	Exchange Valve + Electric Cut-Off Valve 12v	V4	Exchange Valve + Electric Cut-Off Valve 24v

Ports	
G	BSPP Threads
U	SAE (UNF Threads) Upon Request (minimum quantity 50 pieces)

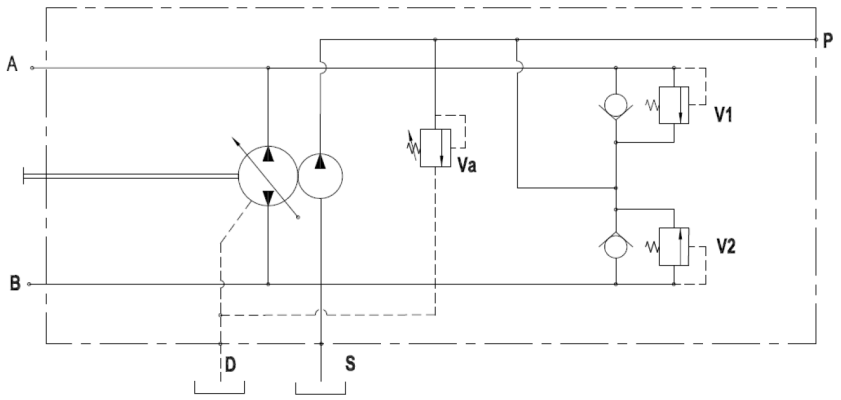
	Shaft end	S	1°T	2°T
1	Splined 13T-16/32-DP - Internal splined 9T-16/32-DP	•		•
2	Splined 15T-16/32-DP - Splined 13T-16/32-DP	•	•	
3	Splined 15T-16/32-DP - Splined 13T-16/32-DP	•	•	•
4	Internal Splined 13T-16/32-DP - Internal splined 9T-16/32-DP TANDEM			•
5	Splined 15T-16/32-DP Internal splined 9T-16/32-DP	•	•	
6	Splined 11T-16/32-DP Internal splined 9T-16/32-DP	•		
X	Splined 15T-16/32-DP Internal splined 9T-16/32-DP + M8	•	•	
Y	Splined 13T-16/32-DP - Splined 13T-16/32-DP (Customized please contact commercial department)	•		
Z	Splined 11T-16/32-DP - GR.2 BOSCH (Customized please contact commercial department)	•		
7*	Internal Splined T13-16/32-DP - Splined T11-16/32-DP (Customized please contact commercial department)			•
8*	Splined 15T-16/32-DP - Splined 11T-16/32-DP	•		
Note **: Available on request				

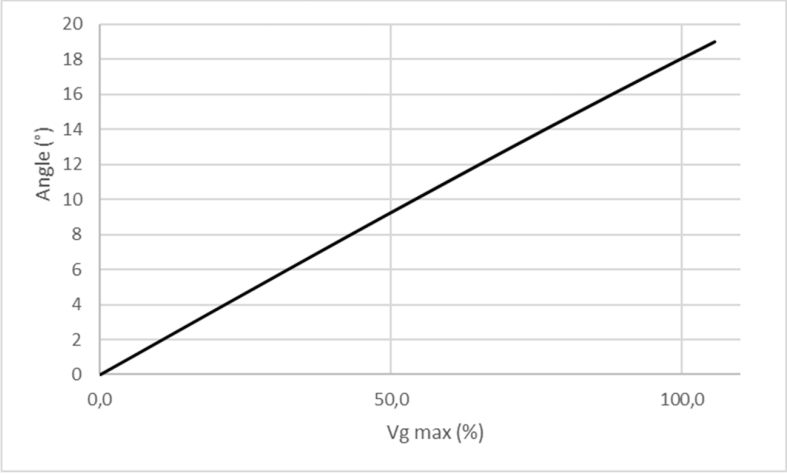
Direction of rotation	
R	- CW
L	- CCW

C2 LWX

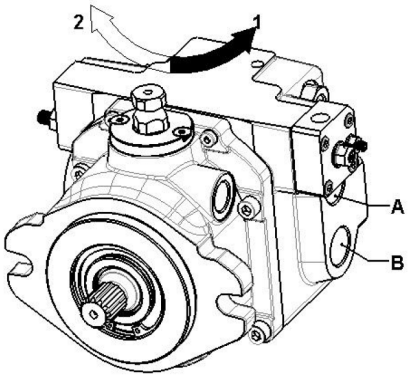
MANUAL WITHOUT ZEROING CONTROL

The pump displacement variation of the pump is achieved rotating the control pivot.
The control pivot is built in the swash plate of the pump.
Control lever not included but supplied as optional.





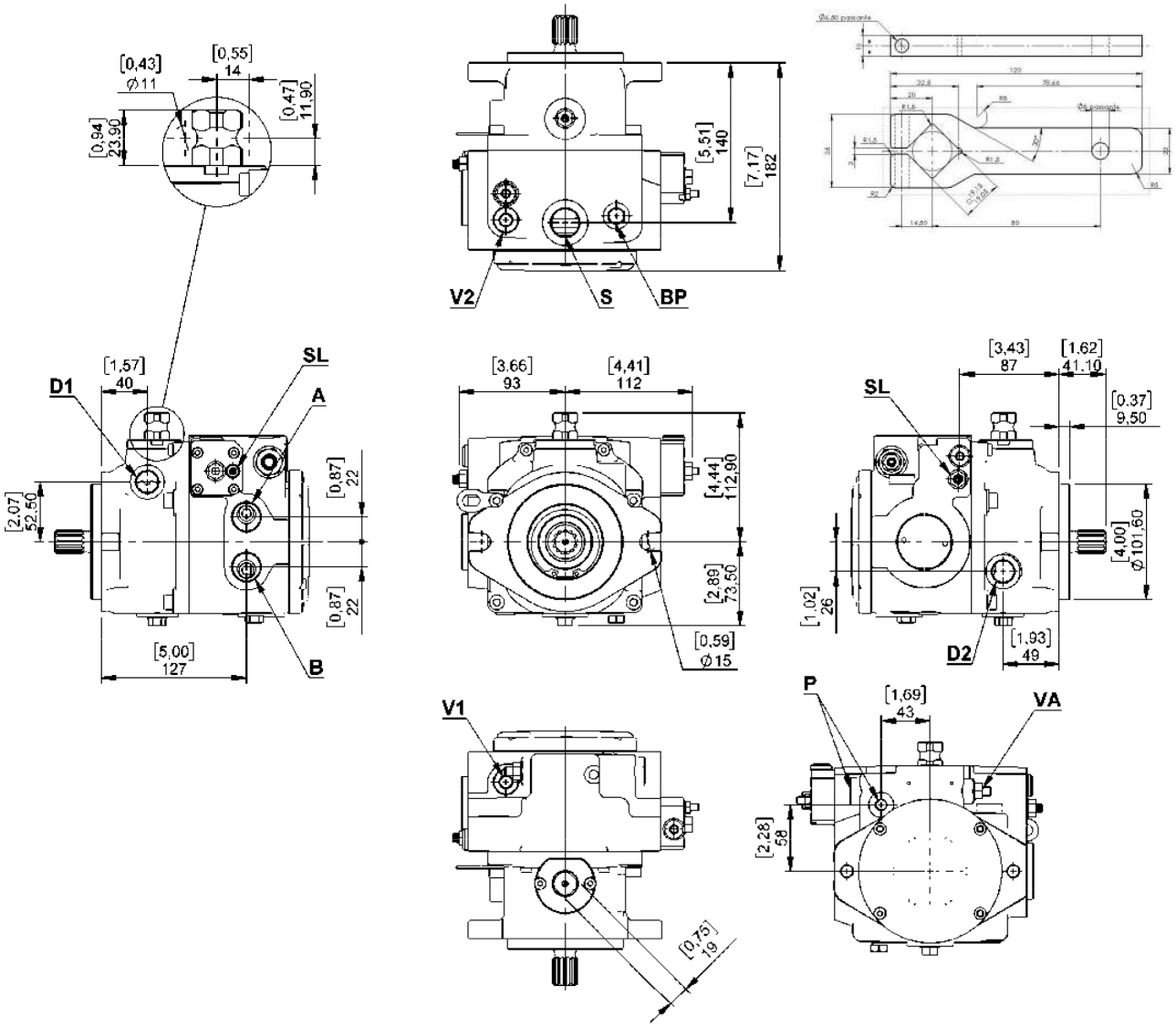
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Control rotation	Pressure port
(L)	1	B
	2	A
(R)	1	A
	2	B

C2 LWX

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

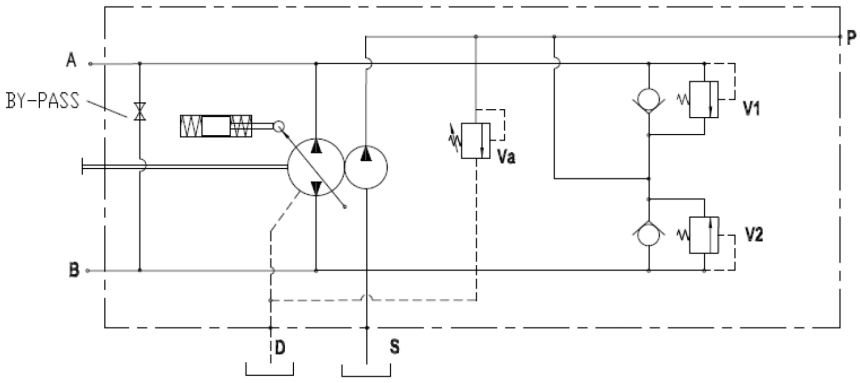
A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

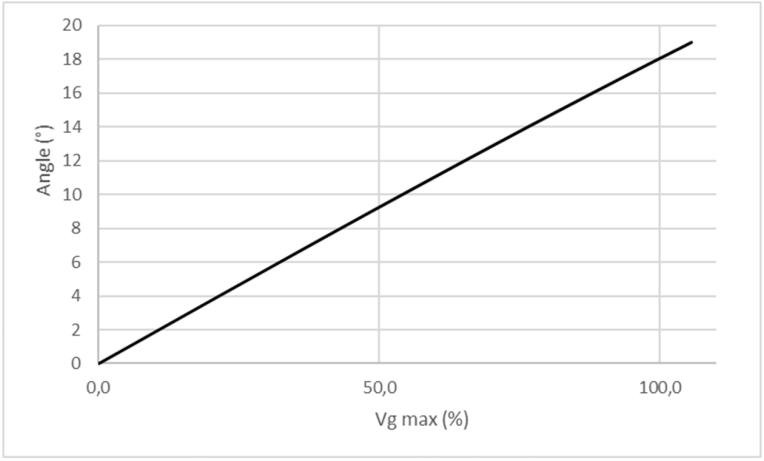
SAE VERSION

A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

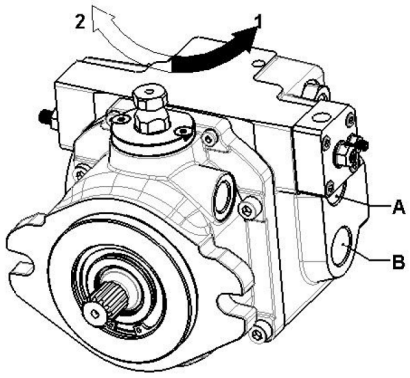
MANUAL WITH ZEROING CONTROL

The pump displacement variation of the pump is achieved rotating the control pivot. The control pivot is buil tin the swash plate of the pump. The return to zero displacement of the pump is guaranteed by an internal spring. Control lever not included but supplied as optional.



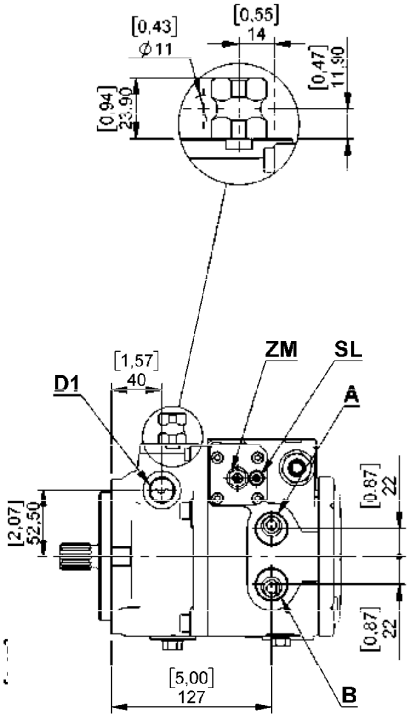


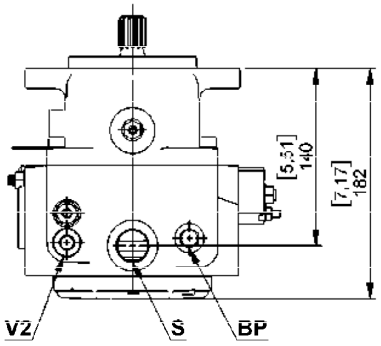
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.

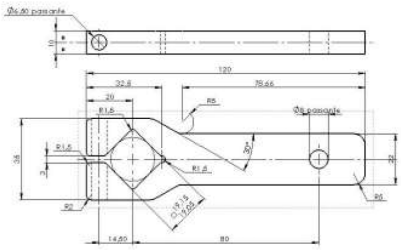


	PUMP FLOW DIRECTION	
SHAFT ROTATION	Control rotation	Pressure port
SINISTRO (L)	1	B
	2	A
DESTRO (R)	1	A
	2	B

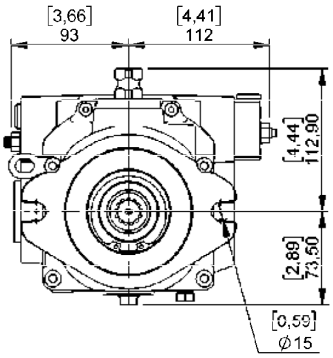
PUMP AND CONTROL DIMENSIONS

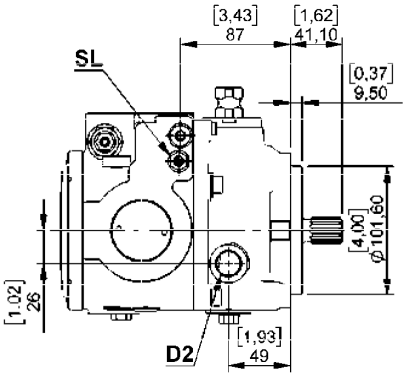


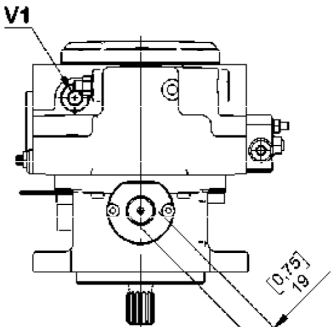


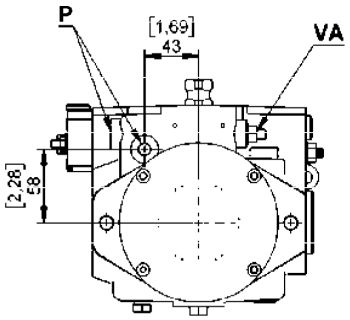


Not included but suppliable









The torque necessary on the control pivot:
40 bar [580 psi] = Min 6 Nm [4.42 lbf ft]
Max 15 Nm [11.05 lbf ft]
200 bar [2900 psi] = Min 12 Nm [8.84 lbf ft]
Max 25 Nm [18.42 lbf ft]

METRIC VERSION

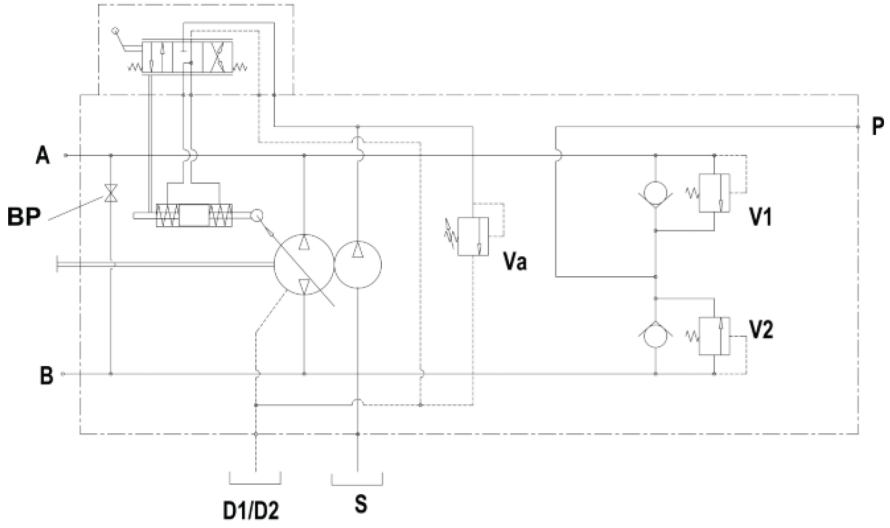
A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

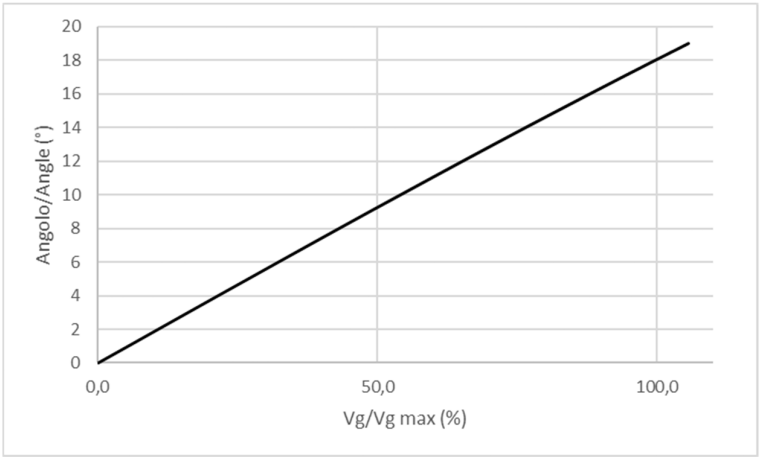
SAE VERSION

A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

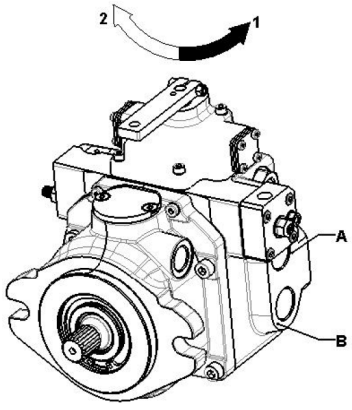
MANUAL LEVER WITH FEED-BACK CONTROL

The displacement of the pump is directly proportional to the angle of the lever.
The diagram below shows the relationship between angle and displacement.





Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



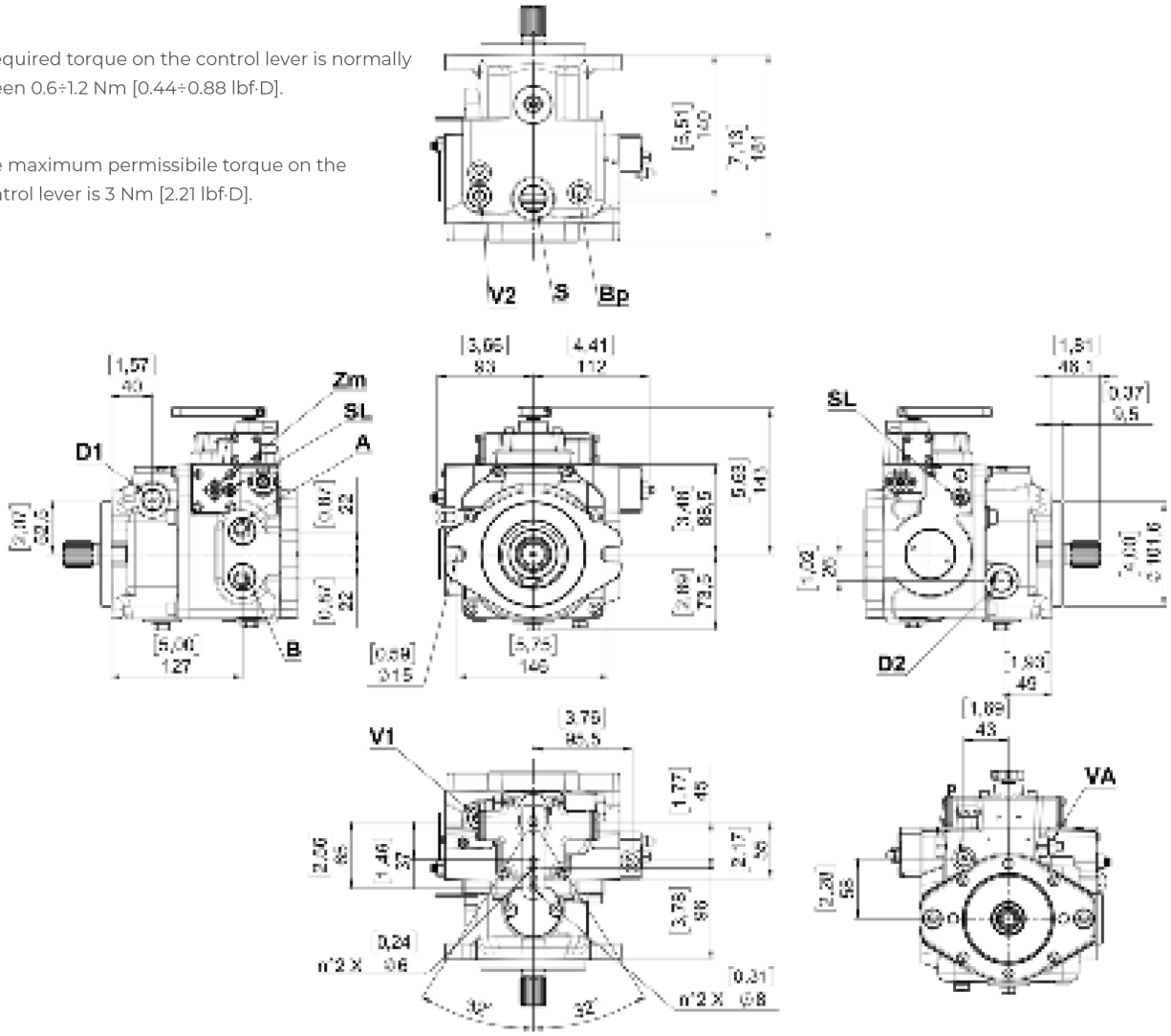
	PUMP FLOW DIRECTION	
SHAFT ROTATION	Control rotation	Pressure port
(L)	1	B
	2	A
(R)	1	A
	2	B

C2 LRX

PUMP AND CONTROL DIMENSIONS

The required torque on the control lever is normally between 0.6÷1.2 Nm [0.44÷0.88 lbf·D].

The maximum permissibile torque on the control lever is 3 Nm [2.21 lbf·D].



METRIC VERSION

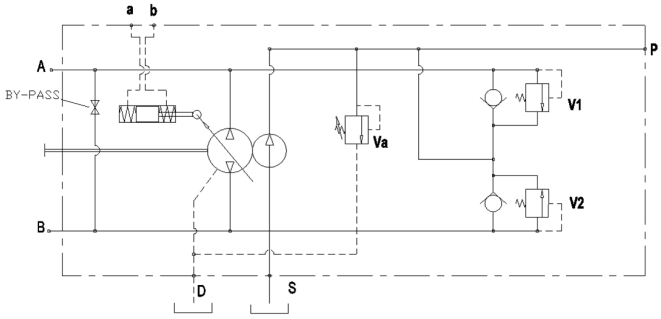
A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

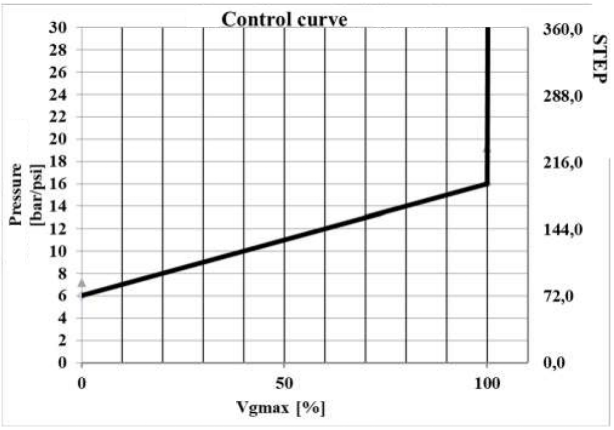
SAE VERSION

A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw

HYDRAULIC PROPORTIONAL WITHOUT FEED-BACK CONTROL

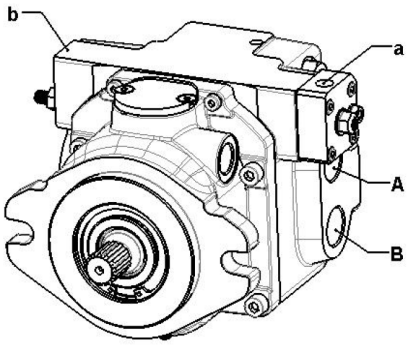
The pump displacement is proportional to the pilot pressure on “a” or “b” piloting ports, which also affect flow direction.
Feeding pressure to the control joystick can be provided by charge pressure from p port. The piloting pressure must then be controlled by said joystick or by a pressure reducing valve (not supplied).





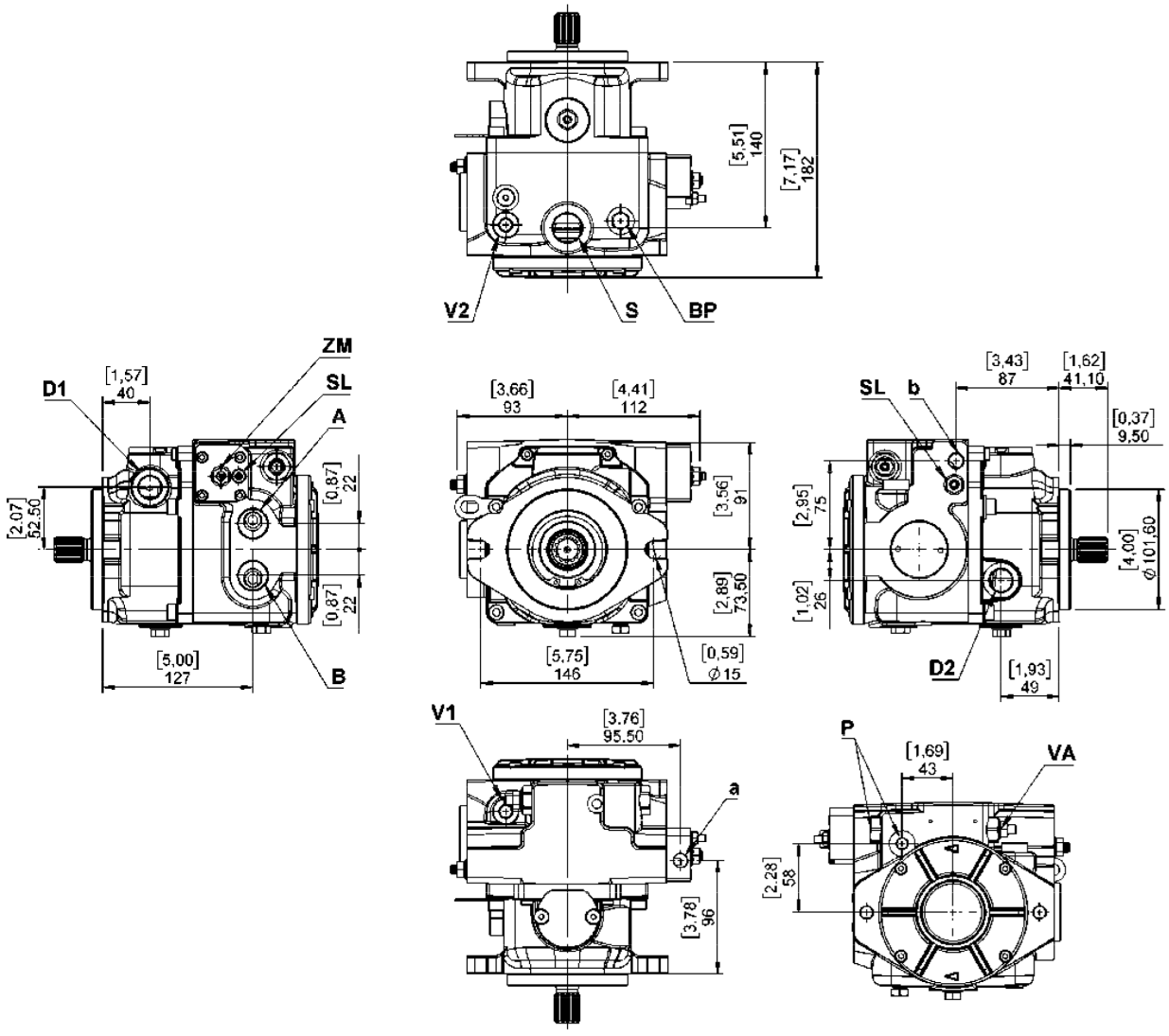
Pilot pressure = 6÷16 bar [87÷232psi](at ports a, b)
Start of control = 6 bar [87 psi]
End of control = 16 bar [232 psi](Max displacement)
Max pressure = 30 bar [435 psi]

Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Piloting pressure	Pressure port
(L)	a	A
	b	B
(R)	a	B
	b	A

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a – b: Control piloting pressure ports
BP: Bypass

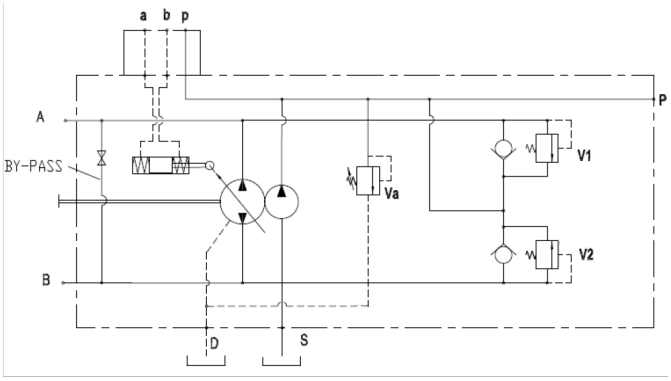
SAE VERSION

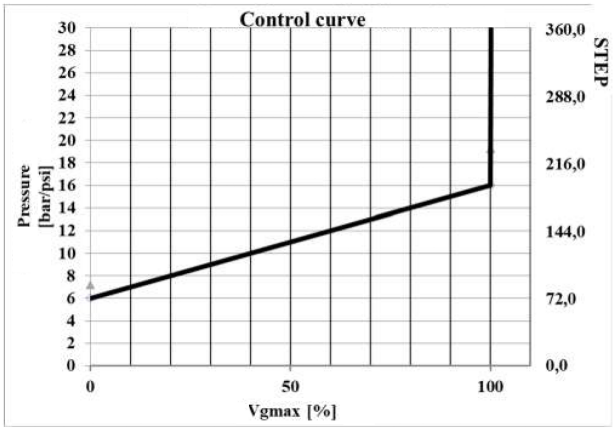
A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a – b: Control piloting pressure ports
7/16-20 UNF-2B
BP: Bypass

C2 INP

HYDRAULIC PROPORTIONAL WITHOUT FEED-BACK CONTROL

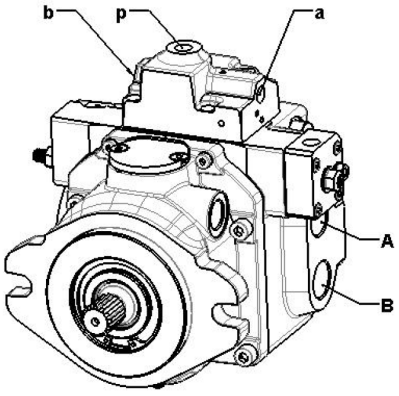
The pump displacement is proportional to the pilot pressure on “a” or “b” piloting ports, which also affect flow direction. Feeding pressure to the control joystick can be provided by charge pressure from p port. The piloting pressure must then be controlled by said joystick or by a pressure reducing valve (not supplied).





Pilot pressure = 6÷16 bar [87÷232psi](at ports a, b)
Start of control = 6 bar [87 psi] End of control = 16 bar [232 psi](Max displacement) Max pressure = 30 bar [435 psi]

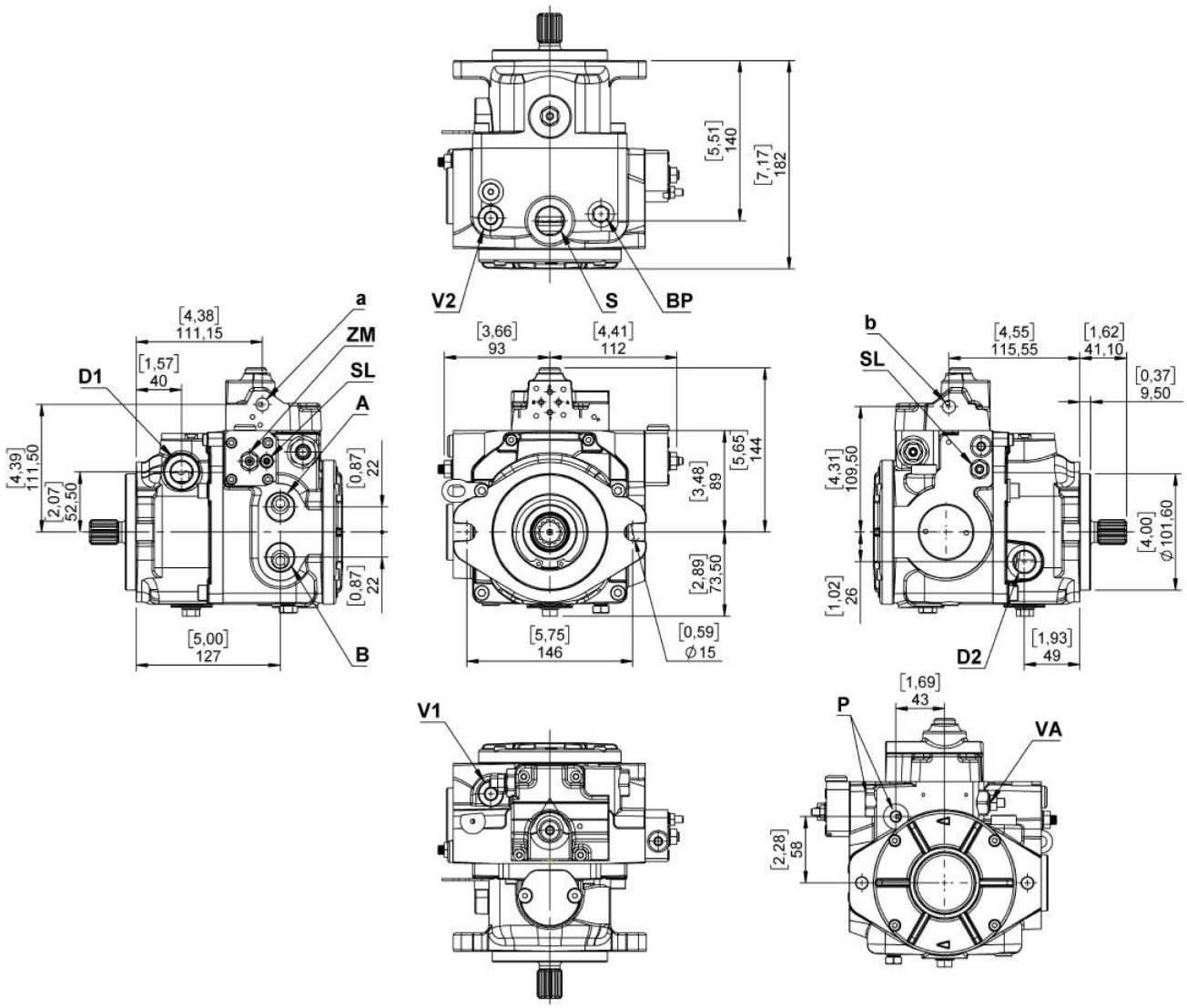
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Piloting pressure	Pressure port
(L)	a	B
	b	A
(R)	a	A
	b	B

C2 INP

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a – b: Control piloting pressure ports – 1/4 G
BP: Bypass

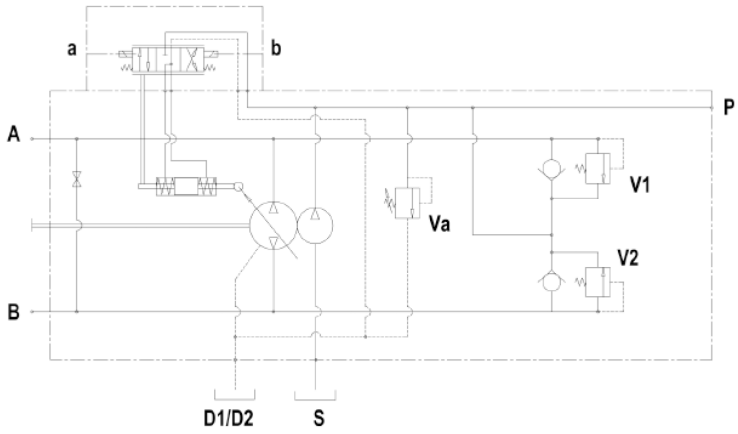
SAE VERSION

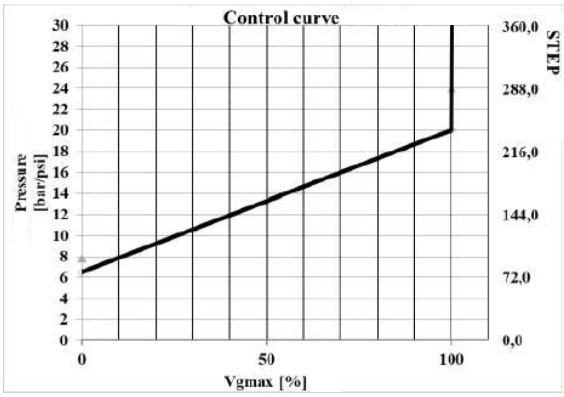
A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a – b: Control piloting pressure ports
7/16-20 UNF-2B
BP: Bypass

C2 IRX

HYDRAULIC PROPORTIONAL WITH FEED-BACK CONTROL

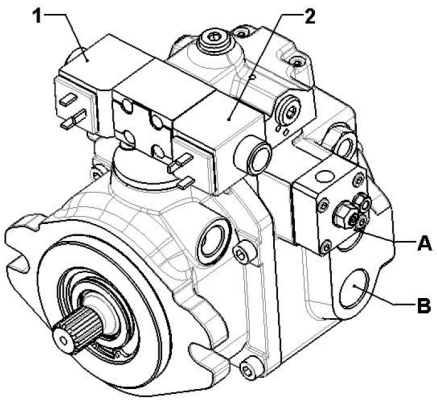
The pump displacement is proportional to the pilot pressure on “a” or “b” ports; which also affect flow direction. Piloting can be provided by charge pressure from P port. The piloting pressure will then have to be controlled by a joystick or by a pressure reducing valve (not supplied).





Pilot pressure = 6,5÷20 bar [94÷290psi](at ports a, b)
Start of control = 6,5 bar [94 psi] End of control = 20 bar [290 psi](Max displacement) Max pressure = 30 bar [435 psi]

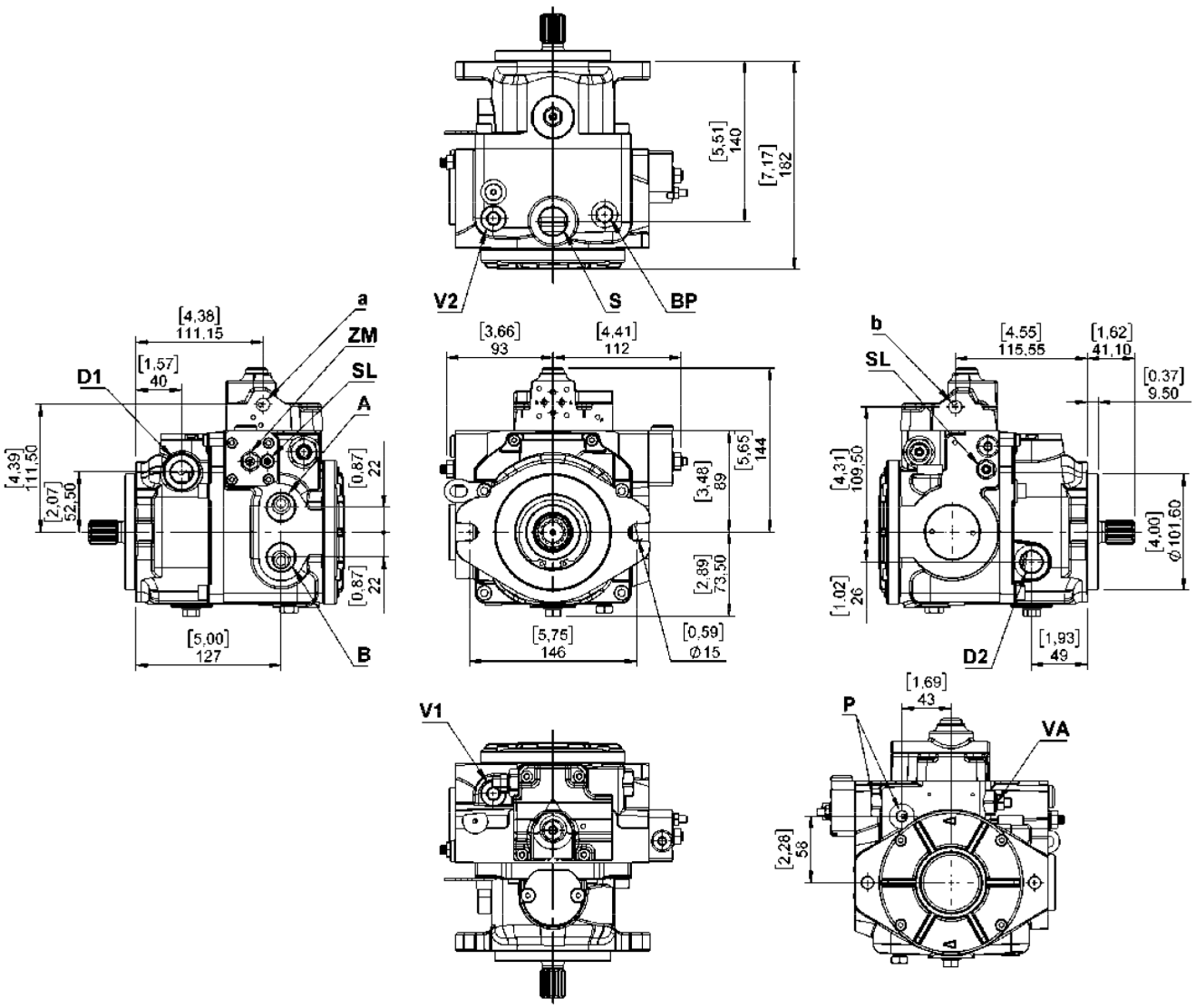
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energized Solenoid	Pressure port
(L)	1	B
	2	A
(R)	1	A
	2	B

C2 IRX

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a – b: Control piloting pressure ports – 1/4 G
BP: Bypass

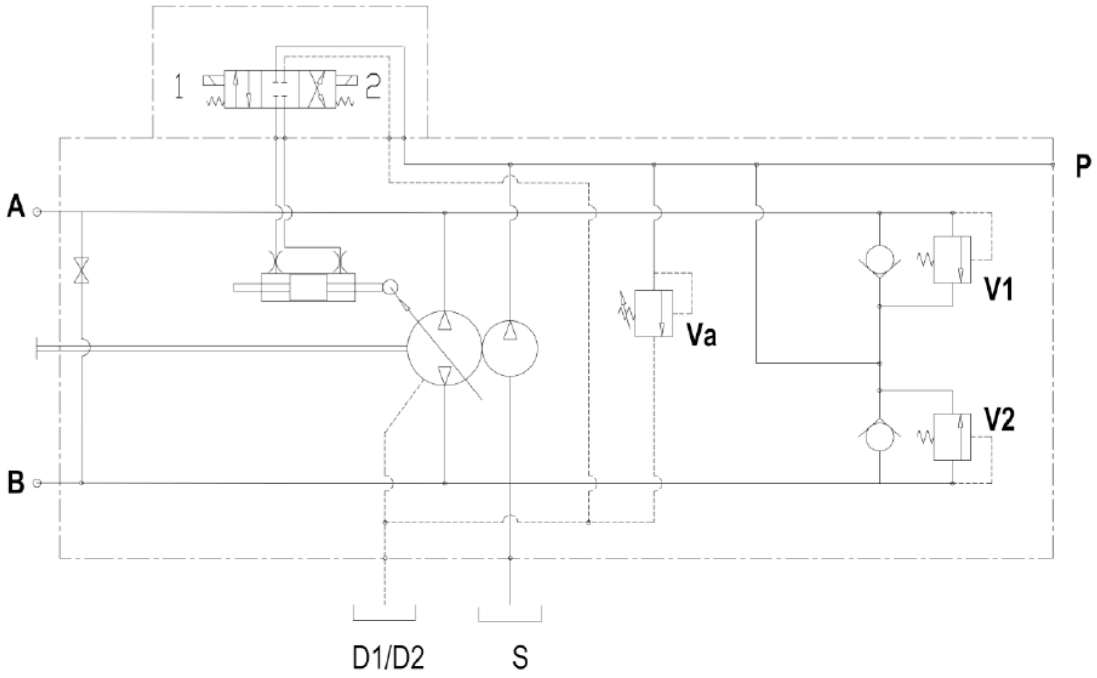
SAE VERSION

A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a – b: Control piloting pressure ports
7/16-20 UNF-2B
BP: Bypass

C2 EI2-EI4

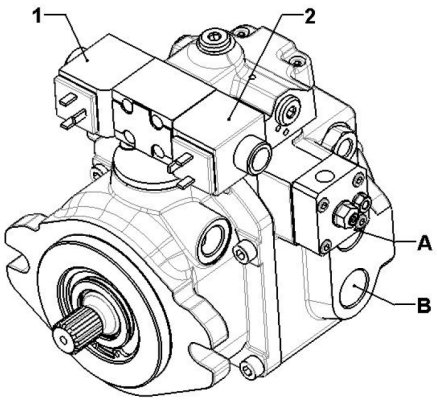
ELECTRIC IMPULSE CONTROL

Impulse control where the displacement of the pump is function of the number of inputs of current to one of the two proportional solenoids. The servocontro is without zeroing spring, therefore the piston of the servocontrol stays in the position until a new input of current is fed to the solenoids. Flow direction depends on which solenoid is energized.



Standard connector DIN: Please contact sales department for Deutsch connectors.

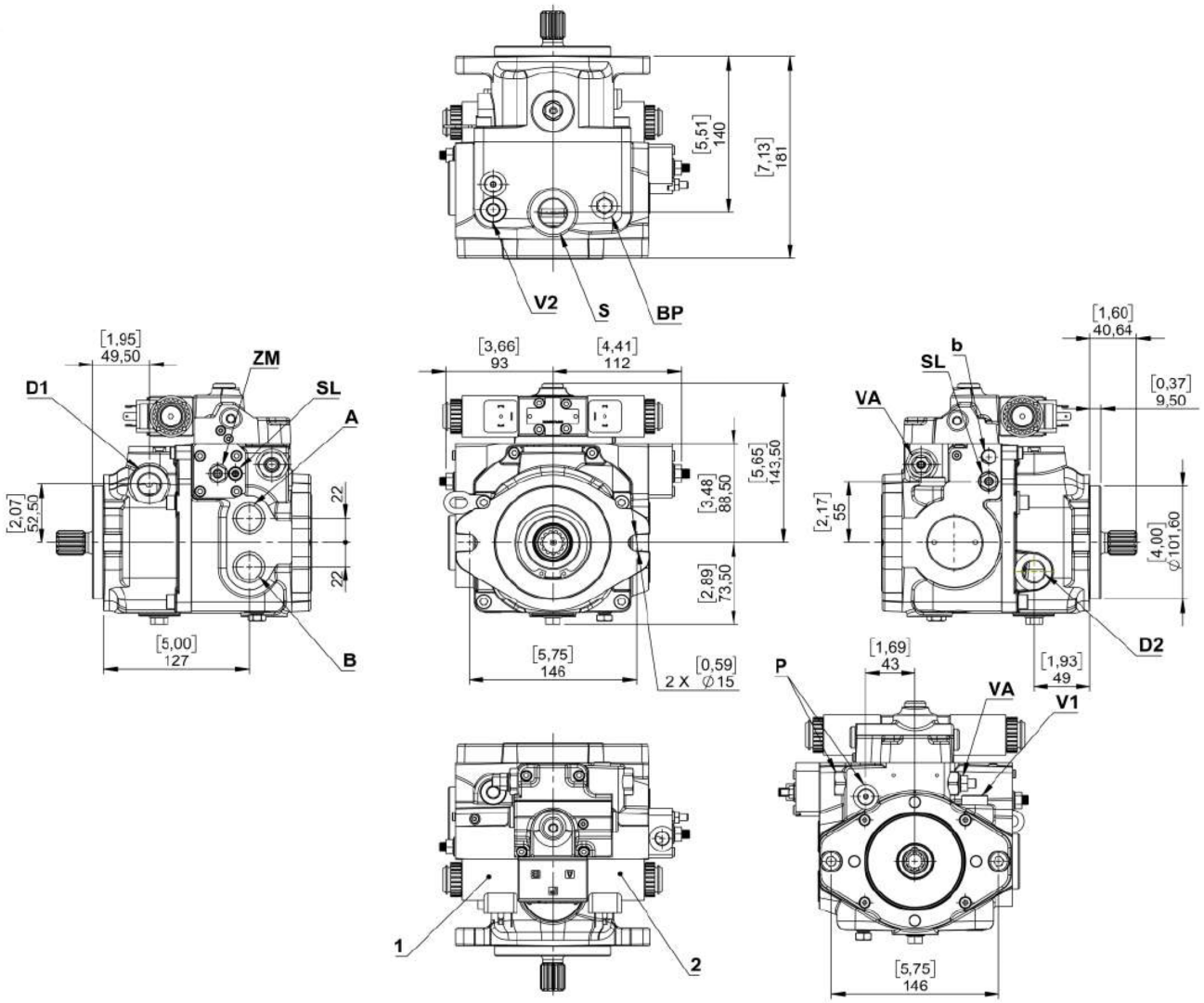
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energized Solenoid	Pressure port
(L)	1	B
	2	A
(R)	1	A
	2	B

C2 EI2-EI4

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

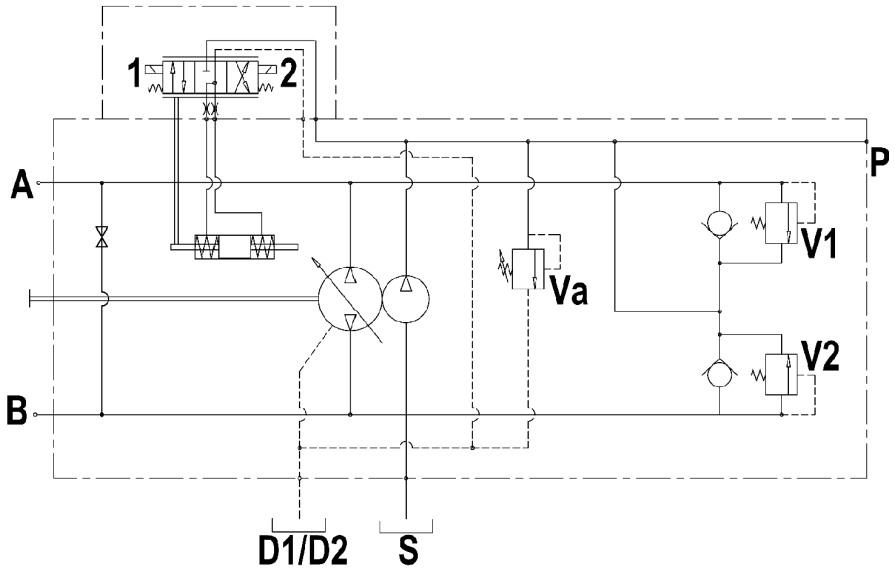
SAE VERSION

A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

C2 E22-E24

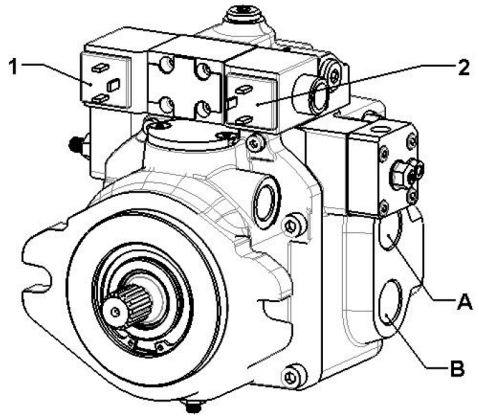
ELECTRIC TWO POSITIONS ON-OFF CONTROL

By switching on one of the ON-OFF solenoids , the pump swivels to maximum displacement in the corresponding output flow direction of the stated solenoid. Switching off charge pressure, the pump return to zero displacement position.



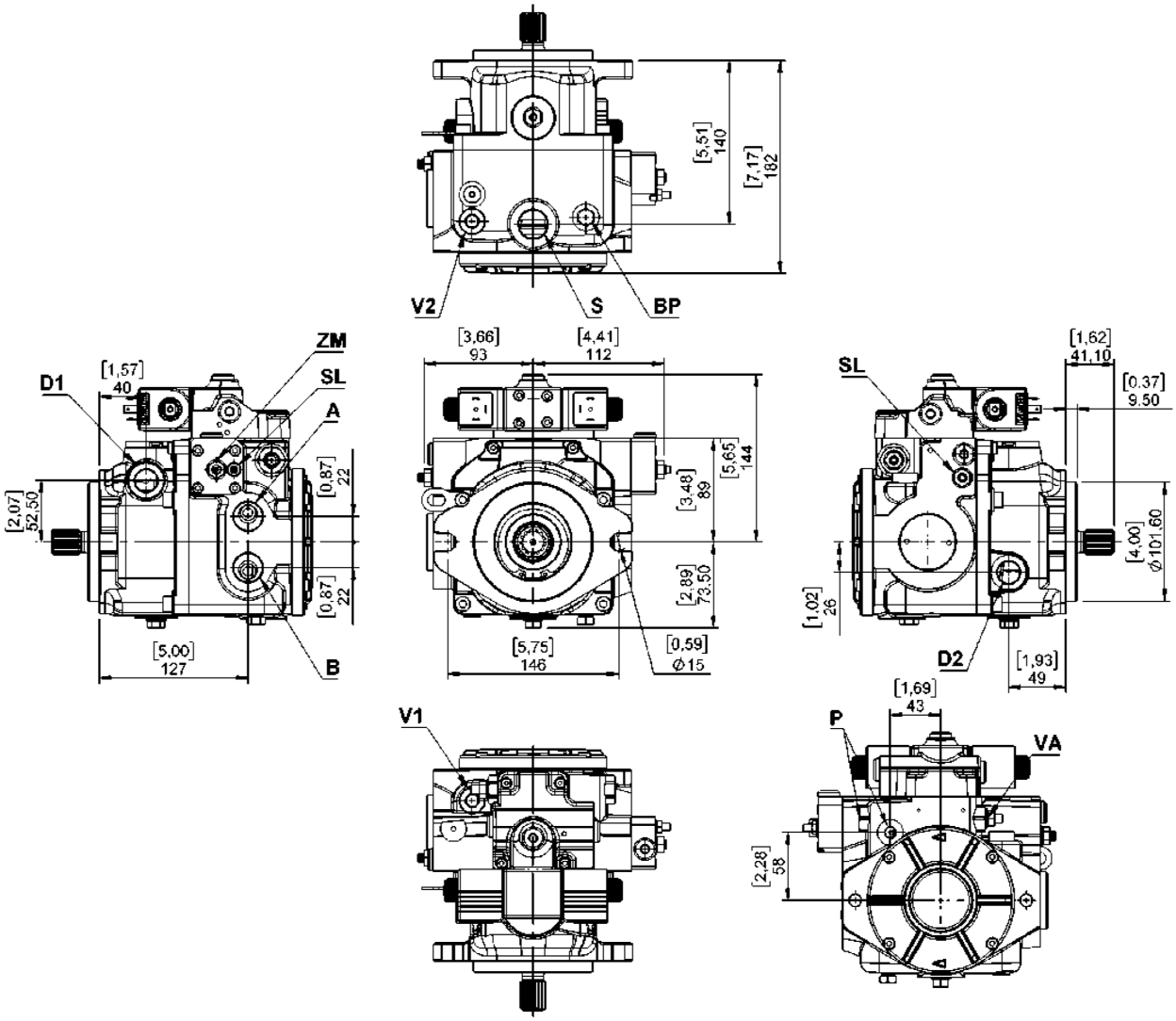
Standard connector DIN: Please contact sales department for Deutsch connectors.

Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energized Solenoid	Pressure port
(L)	1	B
	2	A
(R)	1	A
	2	B

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

SAE VERSION

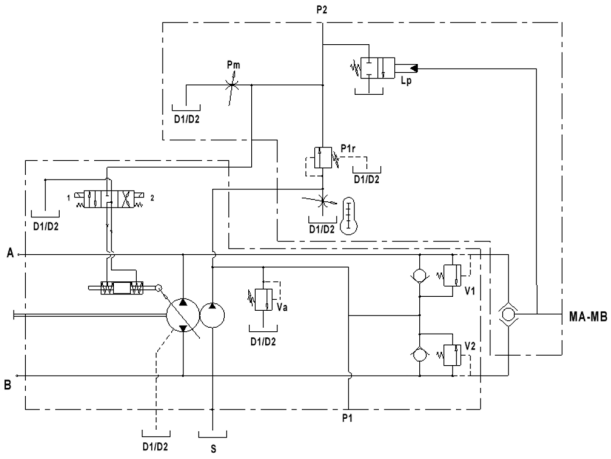
A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

AUTOMOTIVE CONTROL

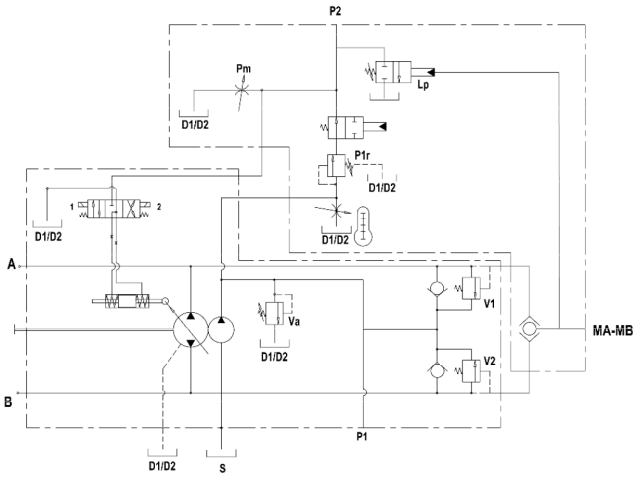
The auto motive control pump has the function of automatically adapt the displacement to the variation in the number of revolutions of the pump (and thus of the diesel engine); set the number of devolution at wicht the machine start up and limit the power absorbed by the transmission to the diesel engine output. The inching valve (variable restrictor) is available as optional, with mechanical or hydraulic control version.

HYDRAULIC INCHING

Automotive Control

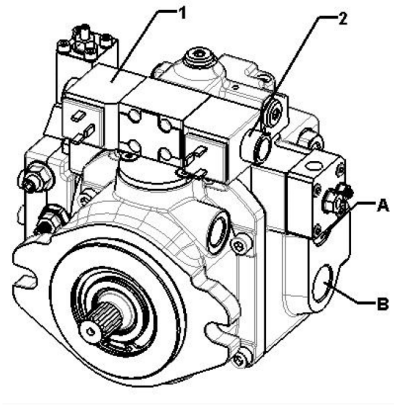


Automotive Control whith Hydraulic Inching



Standard connector DIN: Please contact sales department for Deutsch connectors.

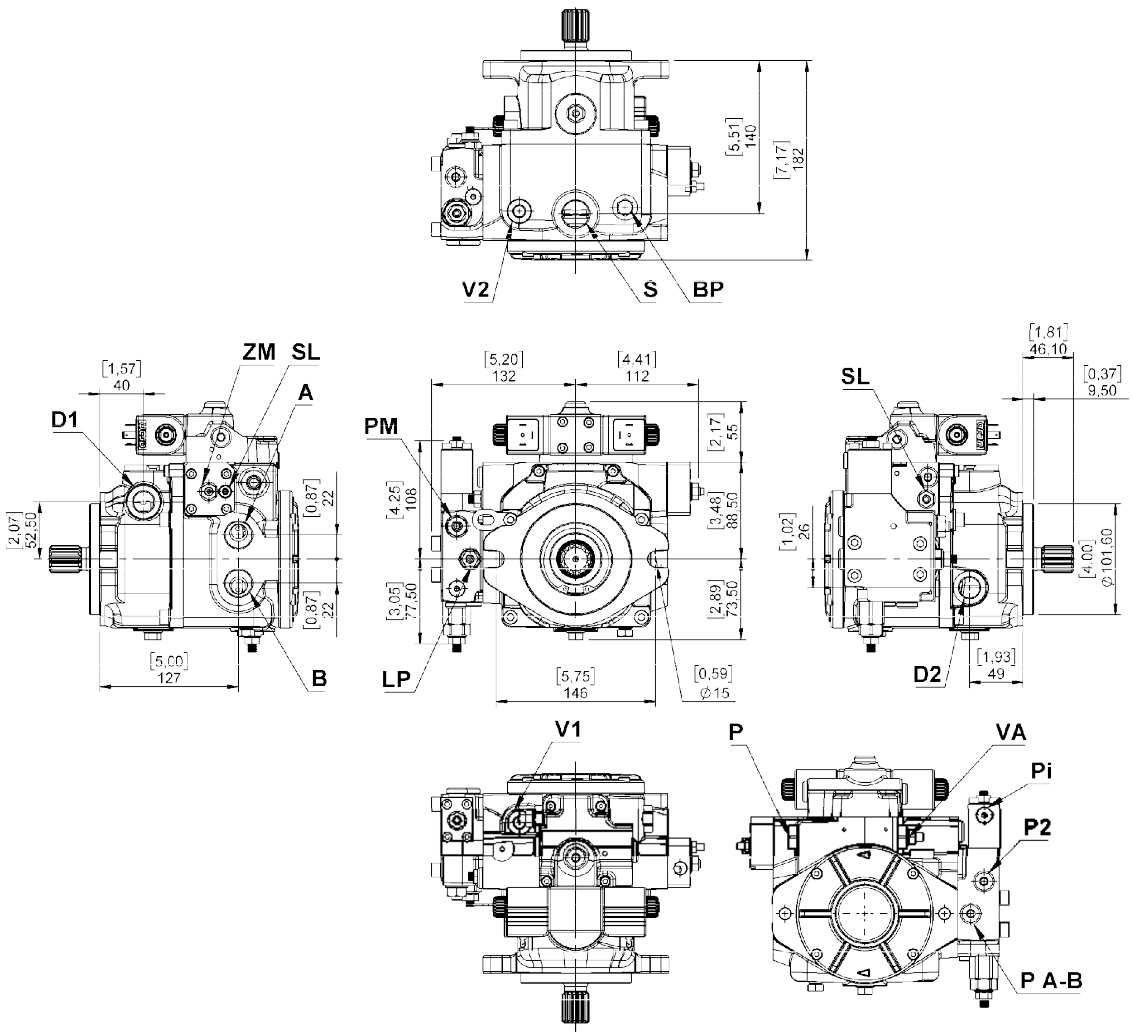
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energized Solenoid	Pressure port
(L)	1	B
	2	A
(R)	1	A
	2	B

C2 AM2-AM4

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass
Pi: Inching In – 1/8 G
LP: Power control adjusting screw
PM: Machine start-up regolation screw
P2: Piloting pressure port – 1/4 G
P A-B: High pressure port (A-B) – 1/4 G

SAE VERSION

A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass
Pi: Inching In – 7/16-20 UNF-2B
LP: Power control adjusting screw
PM: Machine start-up regolation screw
P2: Piloting pressure port - 7/16-20 UNF-2B
P A-B: High pressure port (A-B) - 7/16 UNF-2B

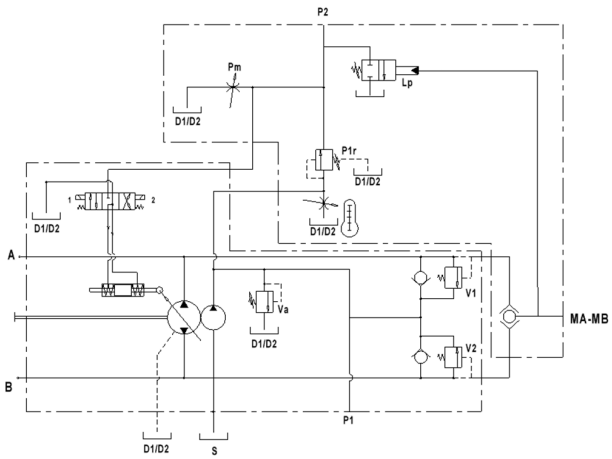
C2 AM2-AM4+IM

AUTOMOTIVE CONTROL

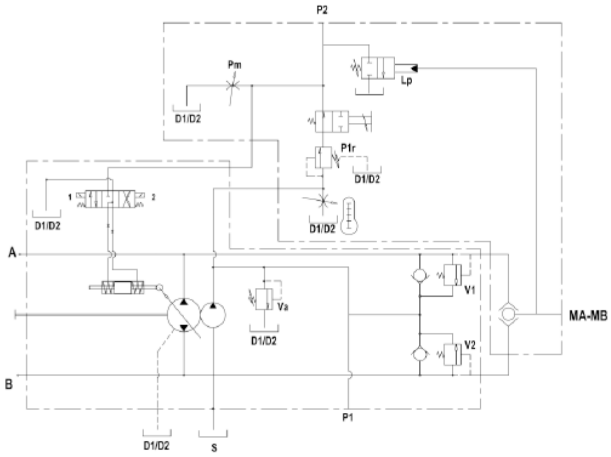
The automotive control pump has the function of automatically adapt the displacement to the variation in the number of revolutions of the pump (and thus of the diesel engine); set the number of devolution at wicht the machine start up and limit the power absorbed by the transmission to the diesel engine output. The inching valve (variable restrictor) is available as optional, whith mechanical for hydraulic control version.

MECHANICAL INCHING

Automotive Control

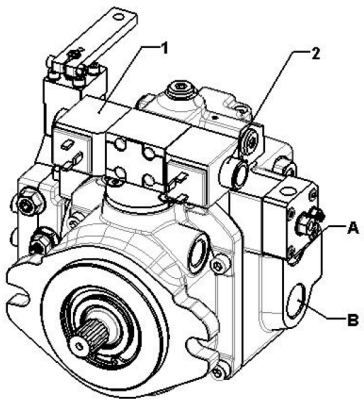


Automotive Control whith Mechanical Inching



Standard connector DIN: Please contact sales department for Deutsch connectors.

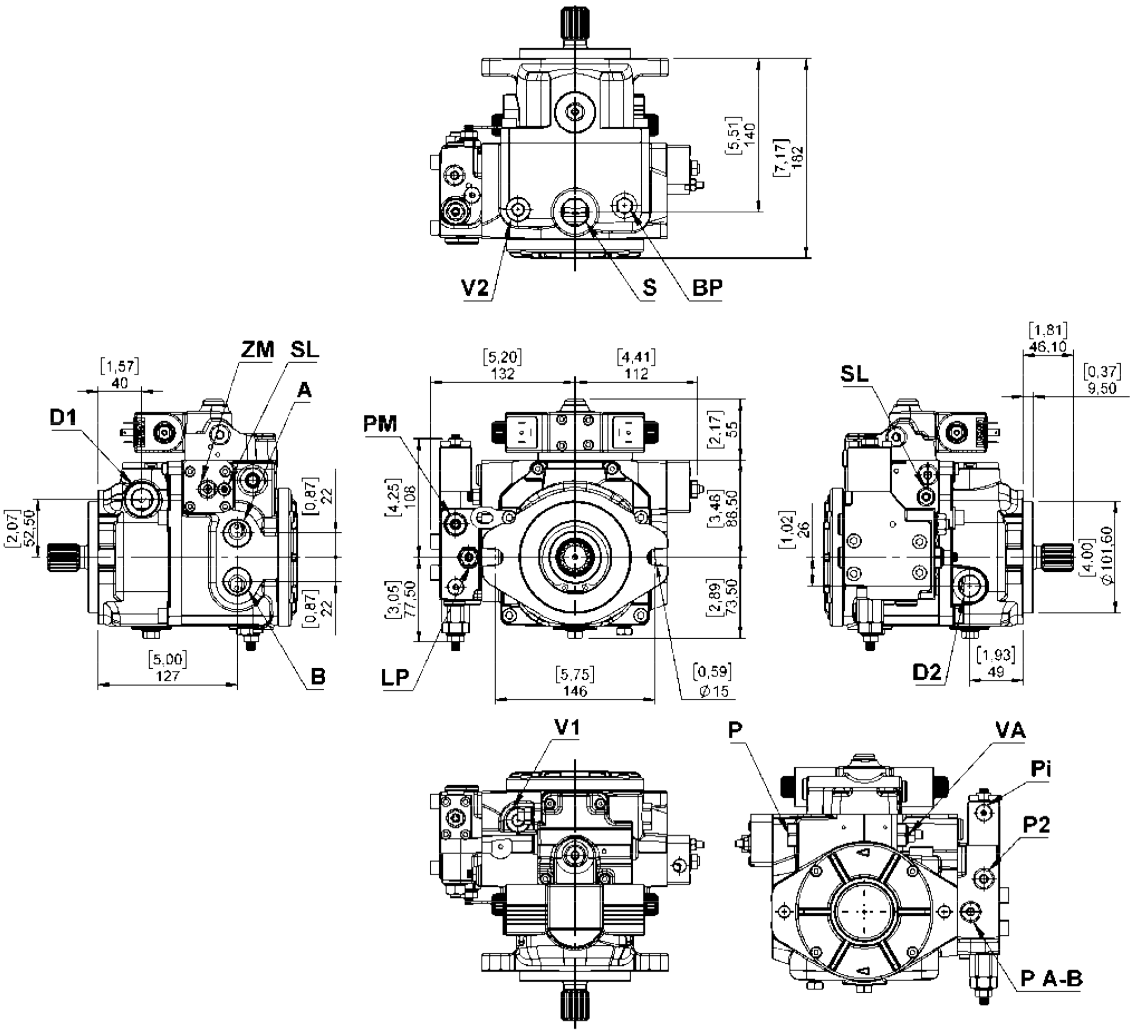
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energized Solenoid	Pressure port
(L)	1	B
	2	A
(R)	1	A
	2	B

C2 AM2-AM4+IM

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass
Pi: Inching In – 1/8 G
LP: Power control adjusting screw
PM: Machine start-up regolation screw
P2: Piloting pressure port – 1/4 G
P A-B: High pressure port (A-B) – 1/4 G

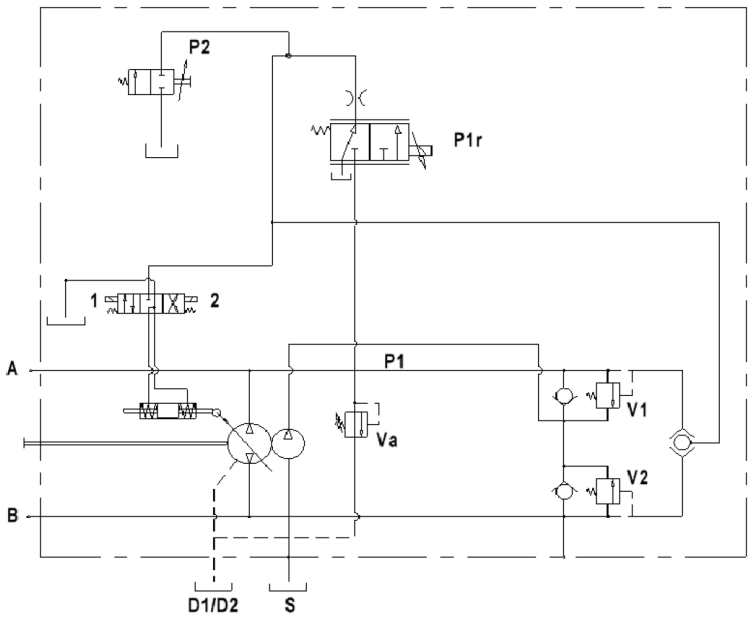
SAE VERSION

A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass
Pi: Inching In – 7/16-20 UNF-2B
LP: Power control adjusting screw
PM: Machine start-up regolation screw
P2: Piloting pressure port - 7/16-20 UNF-2B
P A-B: High pressure port (A-B) - 7/16 UNF-2B

C2 AI2-AI4

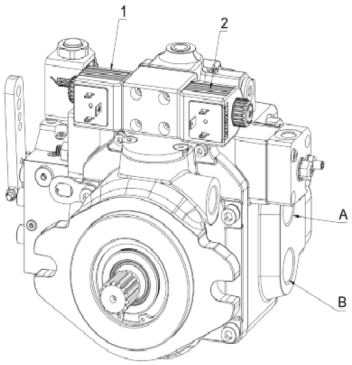
IBRID AUTOMOTIVE 12/24V WITH MECHANICAL REGULATION

The hybrid automotive control is regulated by a proportional electric valve that controls the engine start-up and adjusts the power limiter, making it easier and more intuitive to use. It automatically adjusts the engine displacement based on changes in pump rpm (and therefore the diesel engine rpm), calibrates the rpm at which the engine starts moving forward, and limits the power absorbed by the transmission to that supplied by the diesel engine. The inching valve (variable restrictor) is standard on this version and is mechanically adjustable.



Standard connector DIN: Please contact sales department for Deutsch connectors.

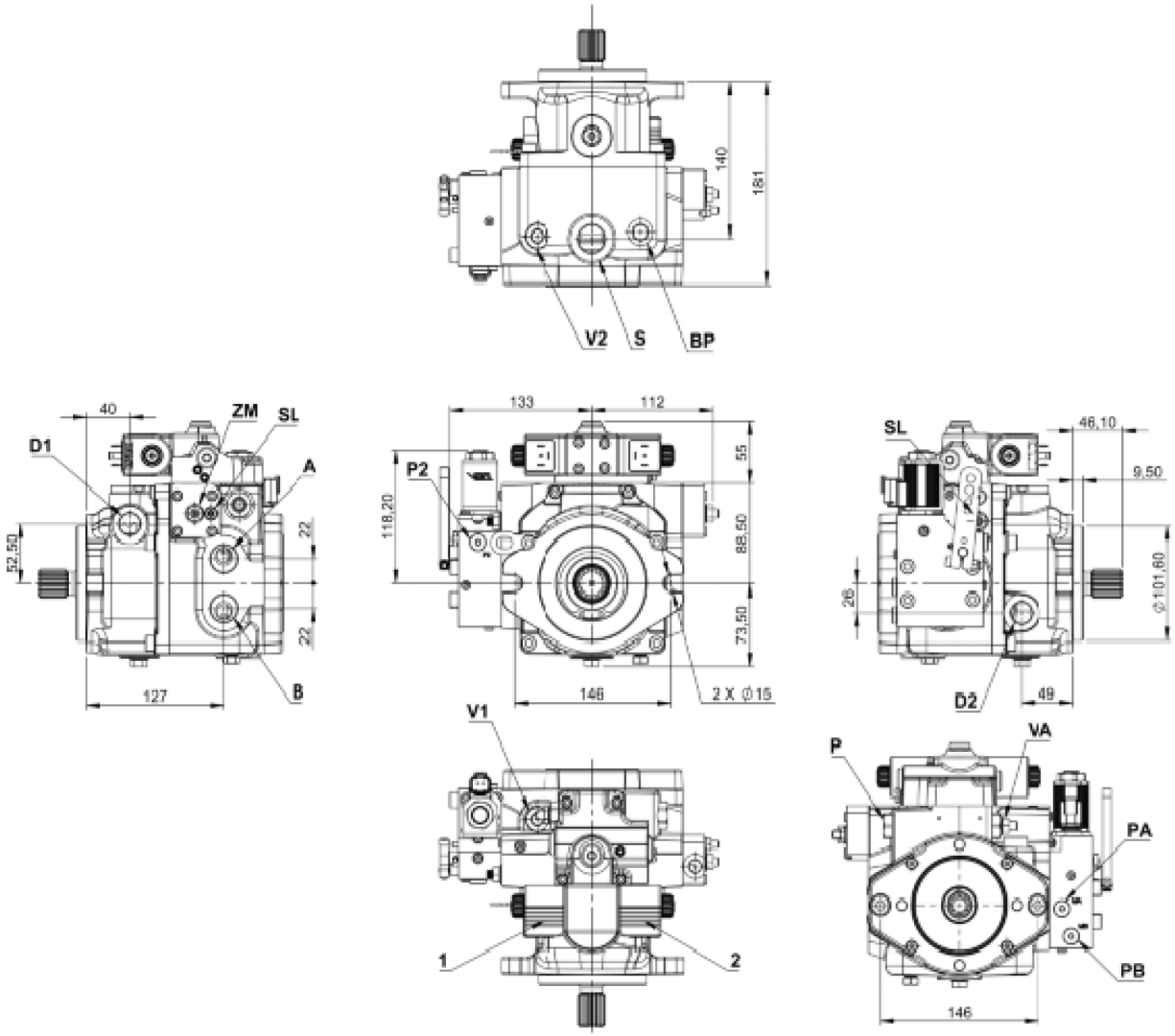
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energized Solenoid	Pressure port
(L)	1	B
	2	A
(R)	1	A
	2	B

C2 AI2-AI4

IBRID AUTOMOTIVE 12/24V WITH MECHANICAL REGULATION



METRIC VERSION

A - B: Pressure ports - 3/4 G
D1 - D2: Drain ports - 1/2 G
S: Suction port - 3/4 G
P: Charge pressure port - 1/4 G
VA: Charge pump valve
V1 - V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass
P2: Piloting pressure port - 1/4 G
P A-B: High pressure port (A-B) - 1/4 G

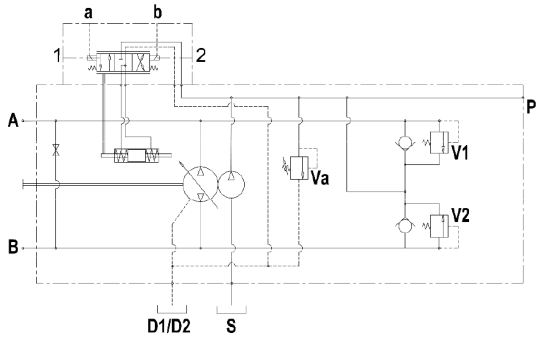
SAE VERSION

A - B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P:Charge pressure port 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass
P2: Piloting pressure port - 3/4-16 UNF-2B
P A-B: High pressure port (A-B) - *3/4-16 UNF-2B*

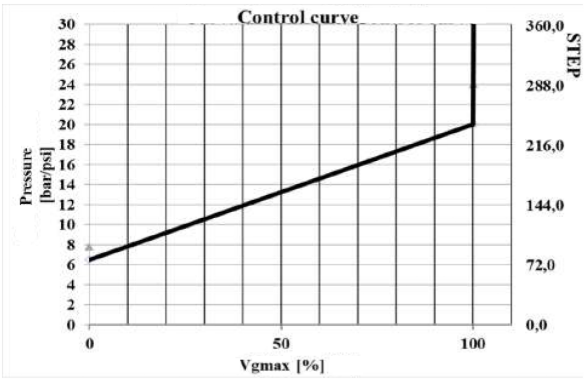
C2 EH2-EH4

HYDRAULIC + ELECTRIC PROPORTIONAL WITH FEED-BACK CONTROL

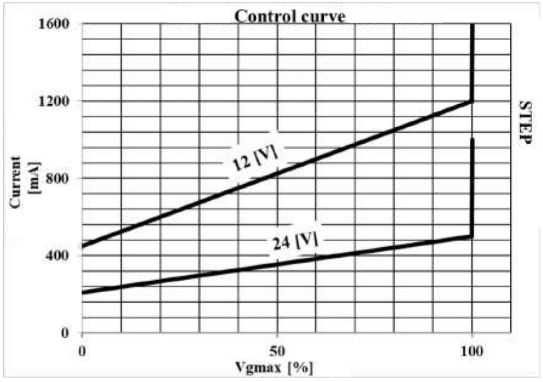
The displacement of the pump is directly proportional to the input current of one of the two proportional solenoids.
Flow direction depends on which solenoid is energized.



Hydraulic control



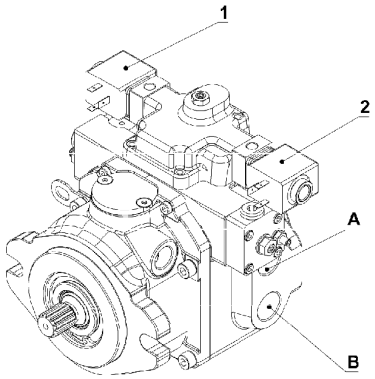
Electric control



Solenoid 12V: Current min. 700 mA max 2000 mA
Coil resistance 5 Ω

Solenoid 24V: Current min. 400 mA max 1600 mA
Coil resistance 19 Ω

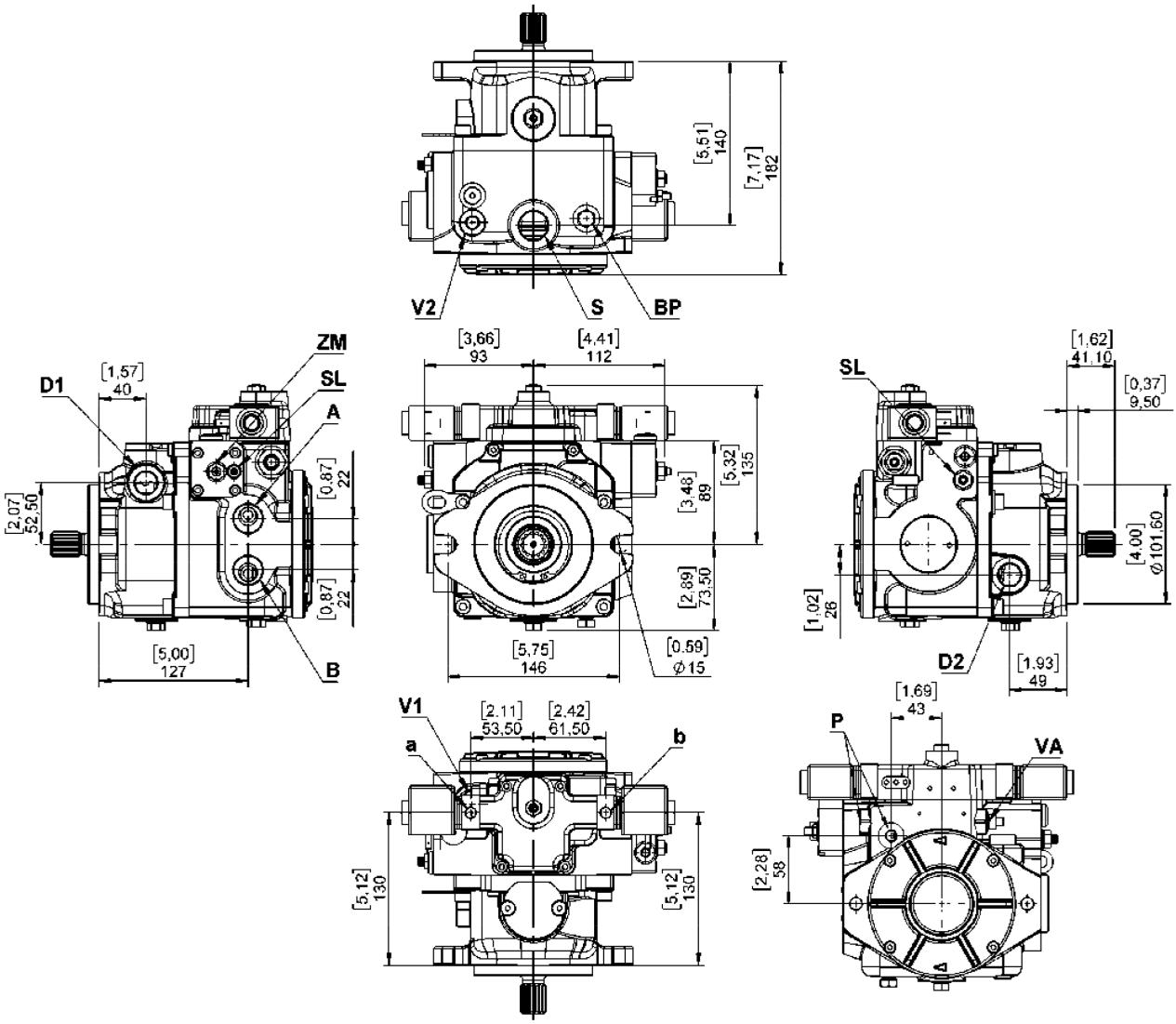
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energized Solenoid	Pressure port
(L)	1	B
	2	A
(R)	1	A
	2	B

C2 EH2-EH4

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a – b: Control piloting pressure ports – 1/8 G
BP: Bypass

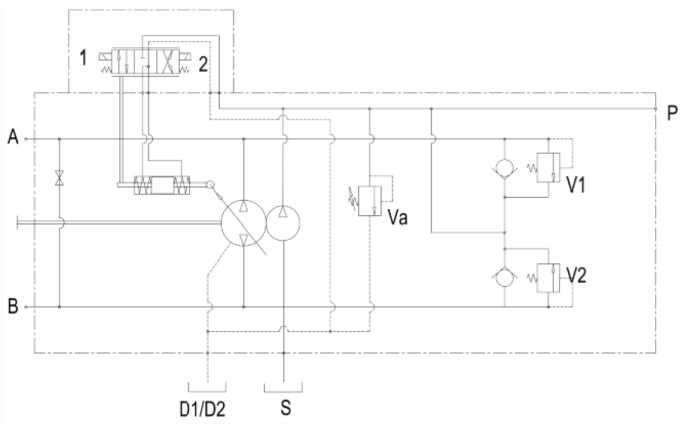
SAE VERSION

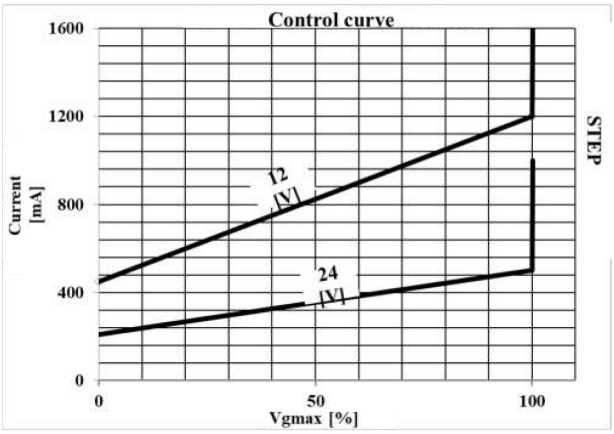
A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a – b: Control piloting pressure ports - 7/16-20 UNF-2B
BP: Bypass

C2 ER2-ER4

ELECTRIC PROPORTIONAL WITH FEED-BACK CONTROL

The displacement of the pump is directly proportional to the input current of one of the two proportional solenoids.
Flow direction depends on which solenoid is energized.

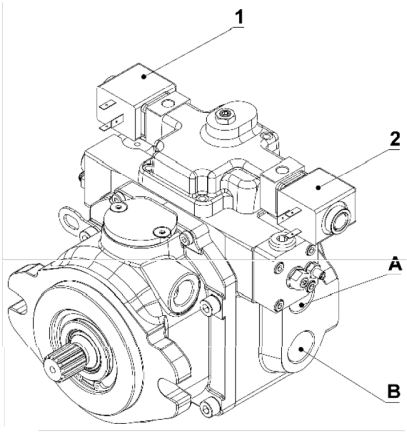




Solenoid 12V: Current min. 450 mA max 1600 mA
Coil resistance 5 Ω

Solenoid 24V: Current min. 210 mA max 1000 mA
Coil resistance 19 Ω

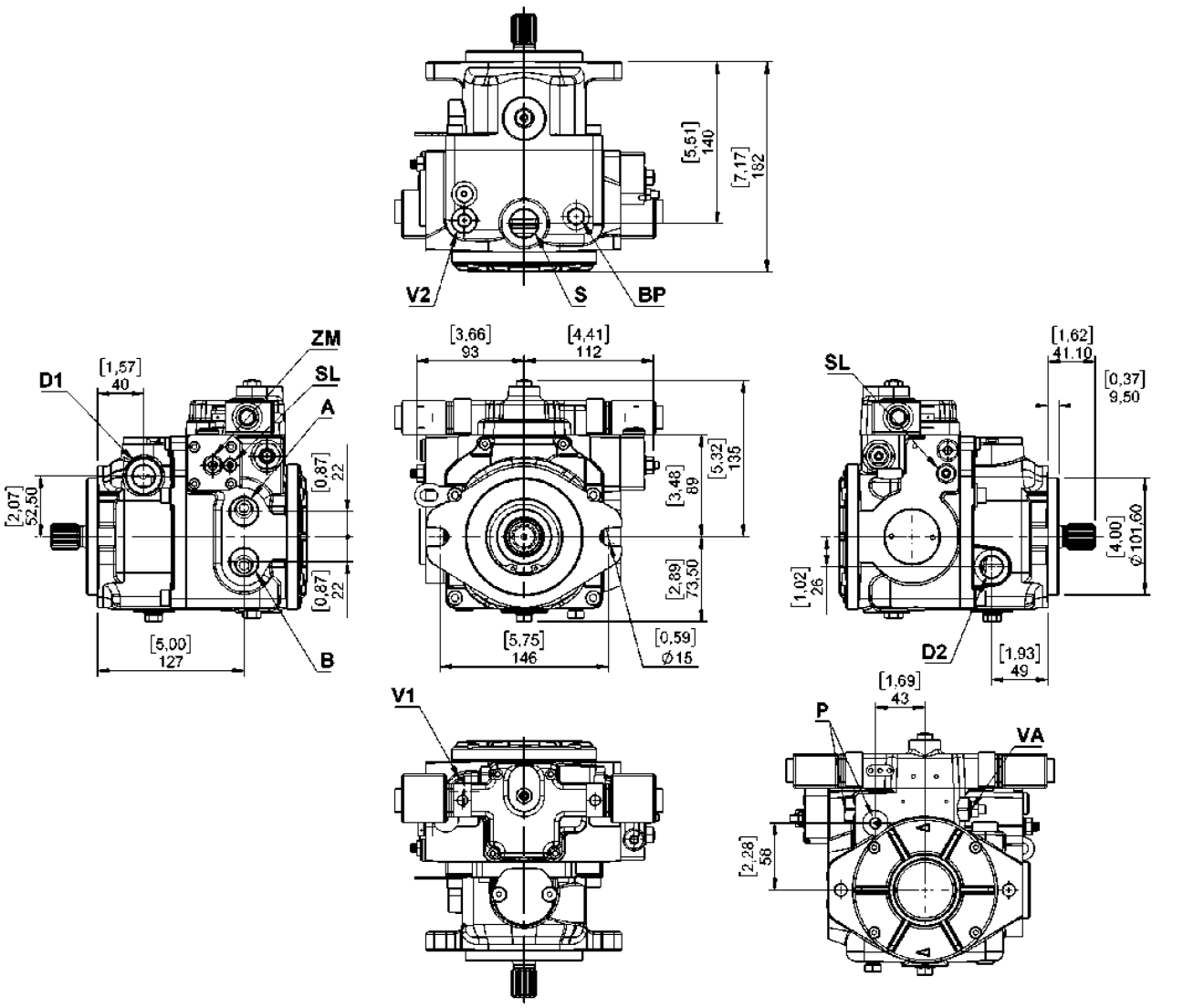
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energized Solenoid	Pressure port
(L)	1	B
	2	A
(R)	1	A
	2	B

C2 ER2-ER4

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

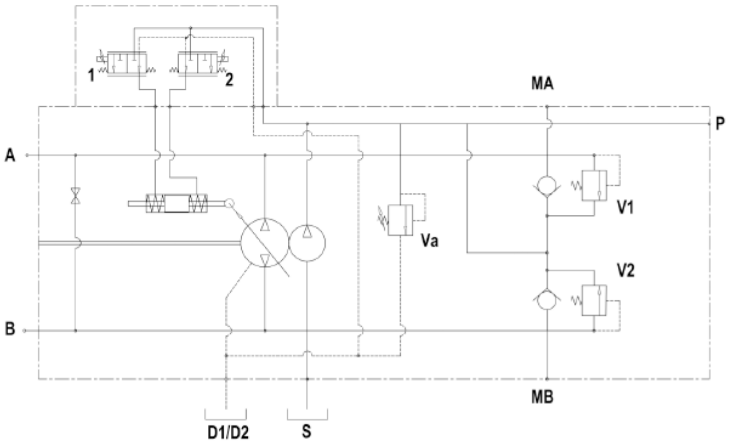
SAE VERSION

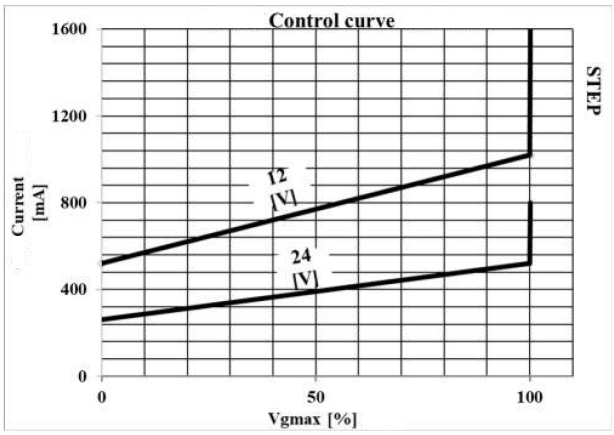
A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

C2 EP2-EP4

ELECTRIC PROPORTIONAL WITHOUT FEED-BACK CONTROL

The displacement of the pump is directly proportional to the input current of one of the two proportional solenoids. Flow is also influenced by the working pressure. With a given input signal (piloting current) the pump can slightly vary the displacement and the flow when working pressure increases. The input current of the two proportional solenoids must be controlled by an external amplifier card. Flow direction depends on which solenoid is energized.



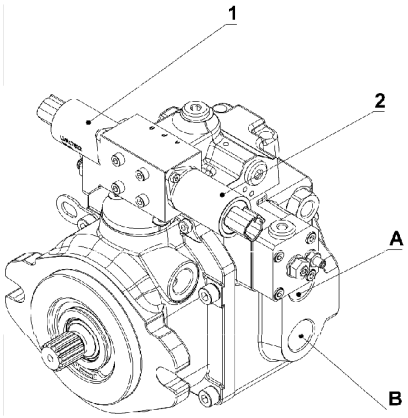


For proportional valve use connector whit this features:
"DEUTSCH CONNECTOR - DT04-2P (not included but can be supplied)

Solenoid 12V: Current min. 500 mA max 1600 mA
Coil resistance 5.4 Ω

Solenoid 24V: Current min. 250 mA max 800 mA
Coil resistance 21 Ω

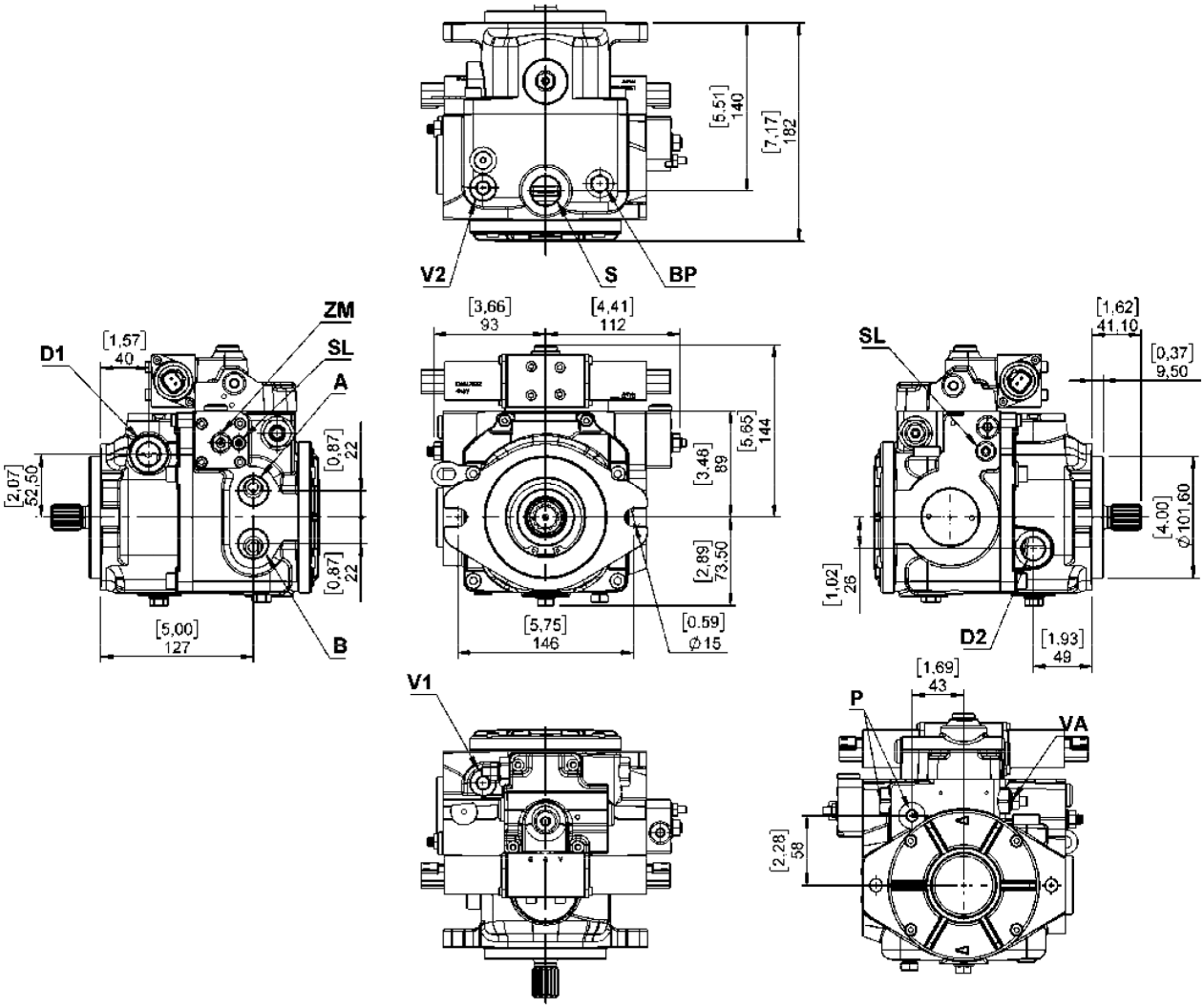
Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.



	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energized Solenoid	Pressure port
(L)	1	A
	2	B
(R)	1	B
	2	A

C2 EP2-EP4

PUMP AND CONTROL DIMENSIONS



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

SAE VERSION

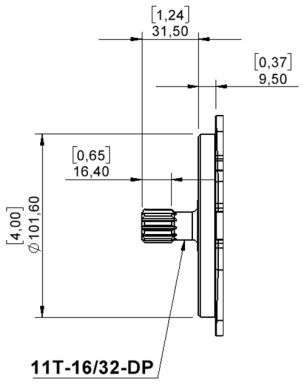
A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port
7/16-20 UNF-2B - 3/4-16 UNF-2B
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass

C2 21-28-35

SHAFTS DIMENSIONS

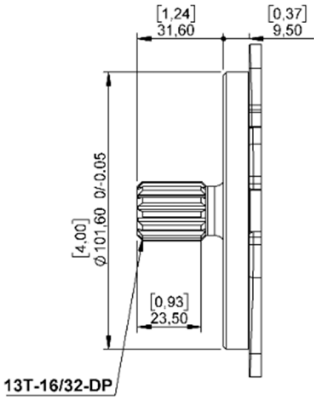
SPLINE SHAFT + ROUND SHAFT

MZ11/T11M



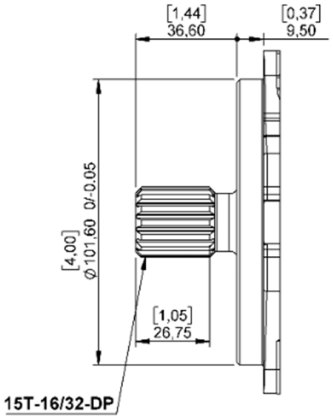
Maximum torque: 175 N m

MZ13 / T13M



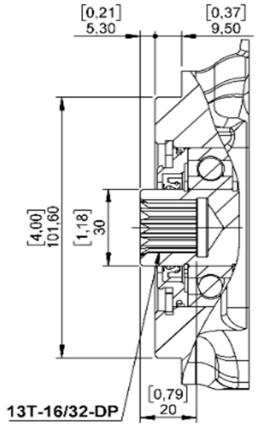
Maximum torque: 270 N m

MZ15 / T15M



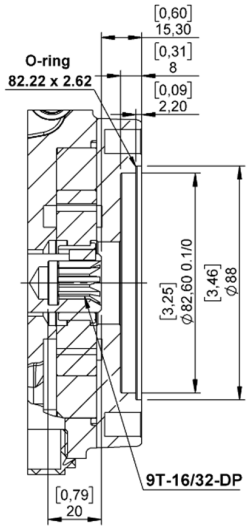
Maximum torque: 400 N m

FZ13 / T13F



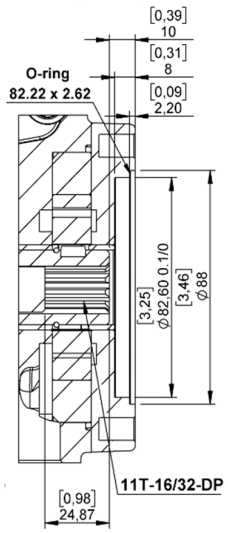
Maximum torque: 255 N m

FZ9 / T9F



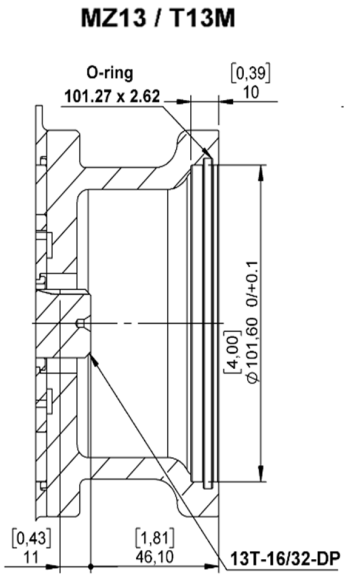
Maximum torque: 193 N m

FZ11 / T11F



Maximum torque: 280 N m

MZ13 / T13M



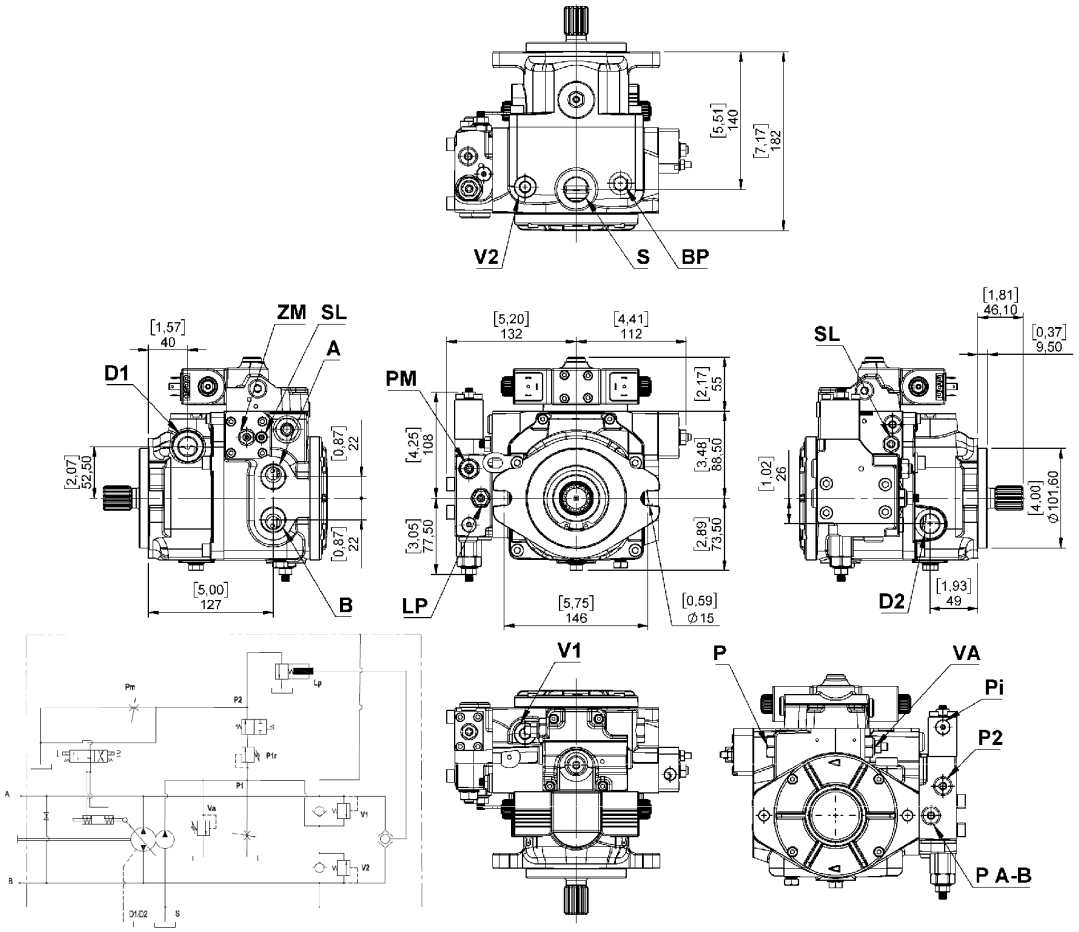
Maximum torque: 230 N m

C2 21-28-35

ACCESSORIES AND FILTER DIMENSIONS

Power Limiter 01

It allows to limit the power absorption of the hydrostatic transmission when the required high pressure value is reached, by acting directly on the pilot pressure of the pump.



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass
Pi: Inching In – 1/8 G
LP: Power control adjusting screw
PM: Machine start-up regolation screw
P2: Piloting pressure port – 1/4 G **P**
A-B: High pressure port (A-B) – 1/4 G

SAE VERSION

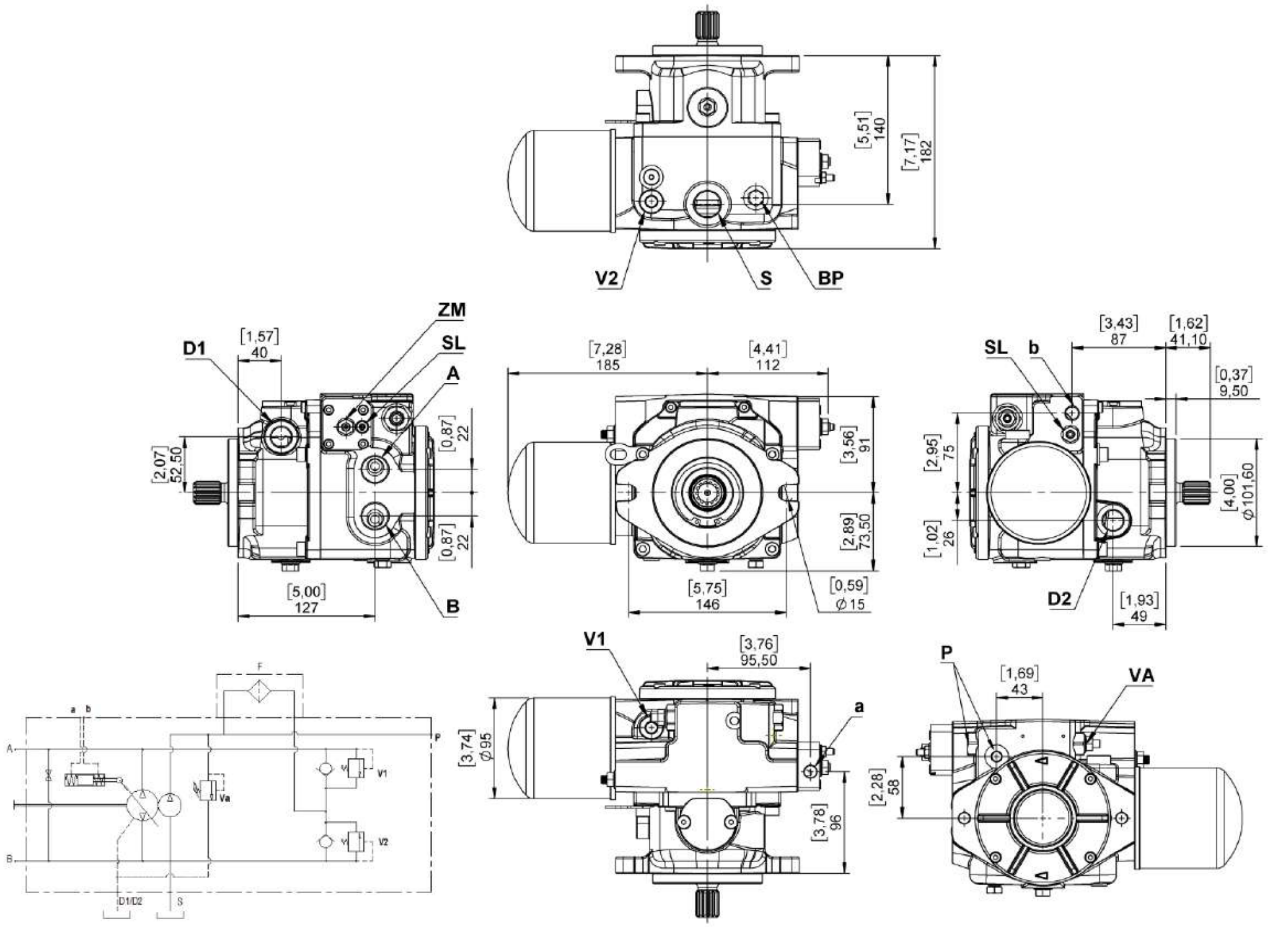
A – B: Pressure ports – 1/1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1/1-16 UNF-2B
P: Charge pressure port - *3/4-16 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
BP: Bypass
Pi: Inching In – 7/16-20 UNF-2B
LP: Power control adjusting screw
PM: Machine start-up regolation screw
P2: Piloting pressure port - 7/16-20 UNF-2B
P A-B: High pressure port (A-B) 7/16-20 UNF-2B

C2 21-28-35

ACCESSORIES AND FILTER DIMENSIONS

Filter FI

This option involves mounting the filter cartridge directly on the pump and ensures that the oil directed to the closed circuit is filtered. The oil intended for the command, on the other hand, is not filtered.



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports – 1/4 G
BP: Bypass

SAE VERSION

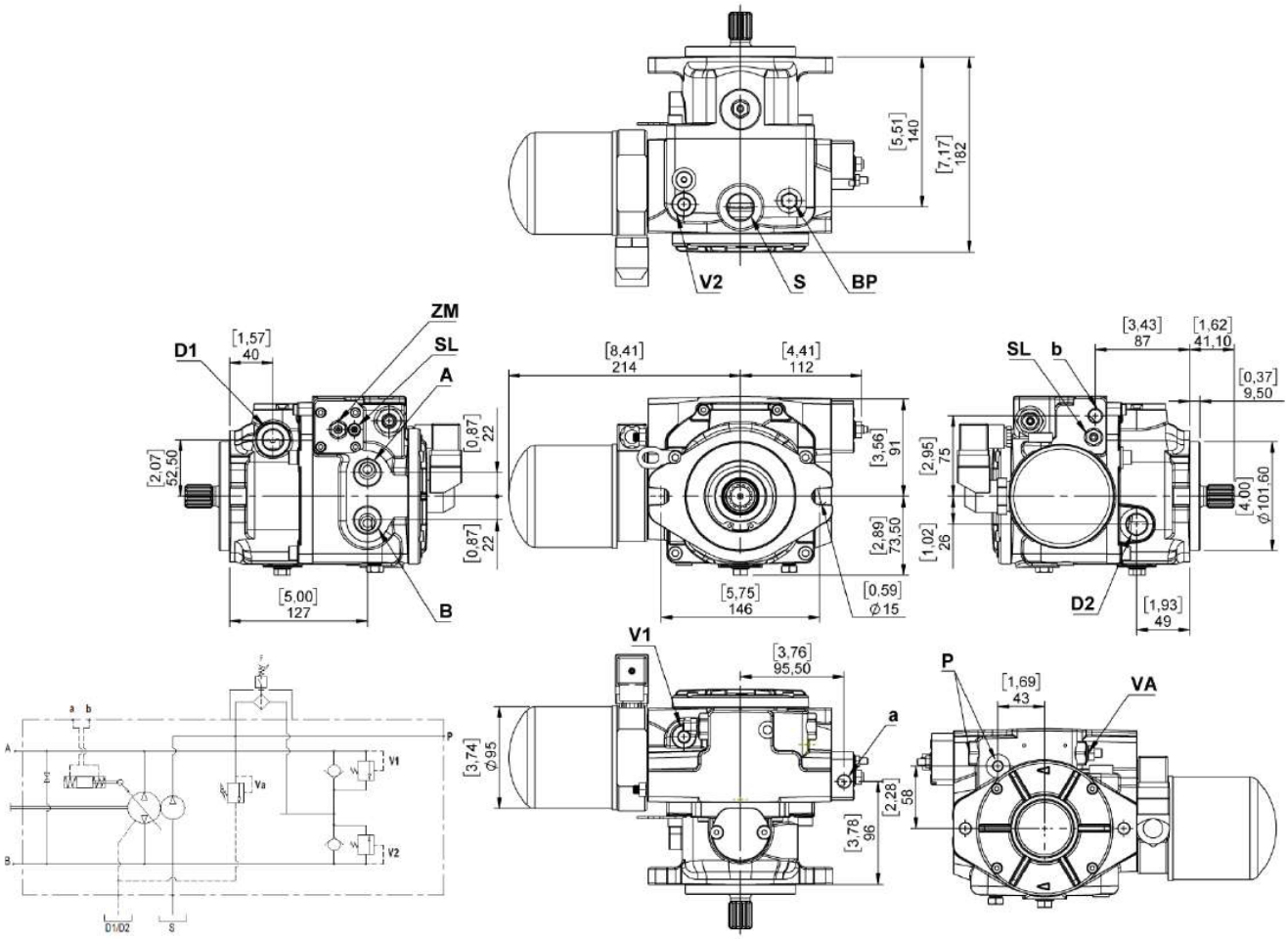
A – B: Pressure ports – 1 1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1 1-16 UNF-2B
P: Charge pressure port *7/16-20 UNF-2B - 3/4-16 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports 7/16-20 UNF-2B
BP: Bypass

C2 21-28-35

ACCESSORIES AND FILTER DIMENSIONS

Filter FE

In addition to mounting the filter cartridge directly on the pump, which ensures that the oil directed to the closed circuit is filtered, this option also includes the insertion of an electrical sensor that is activated when the filter element needs to be replaced. The oil intended for the command, on the other hand, is not filtered.



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports – 1/4 G
BP: Bypass

SAE VERSION

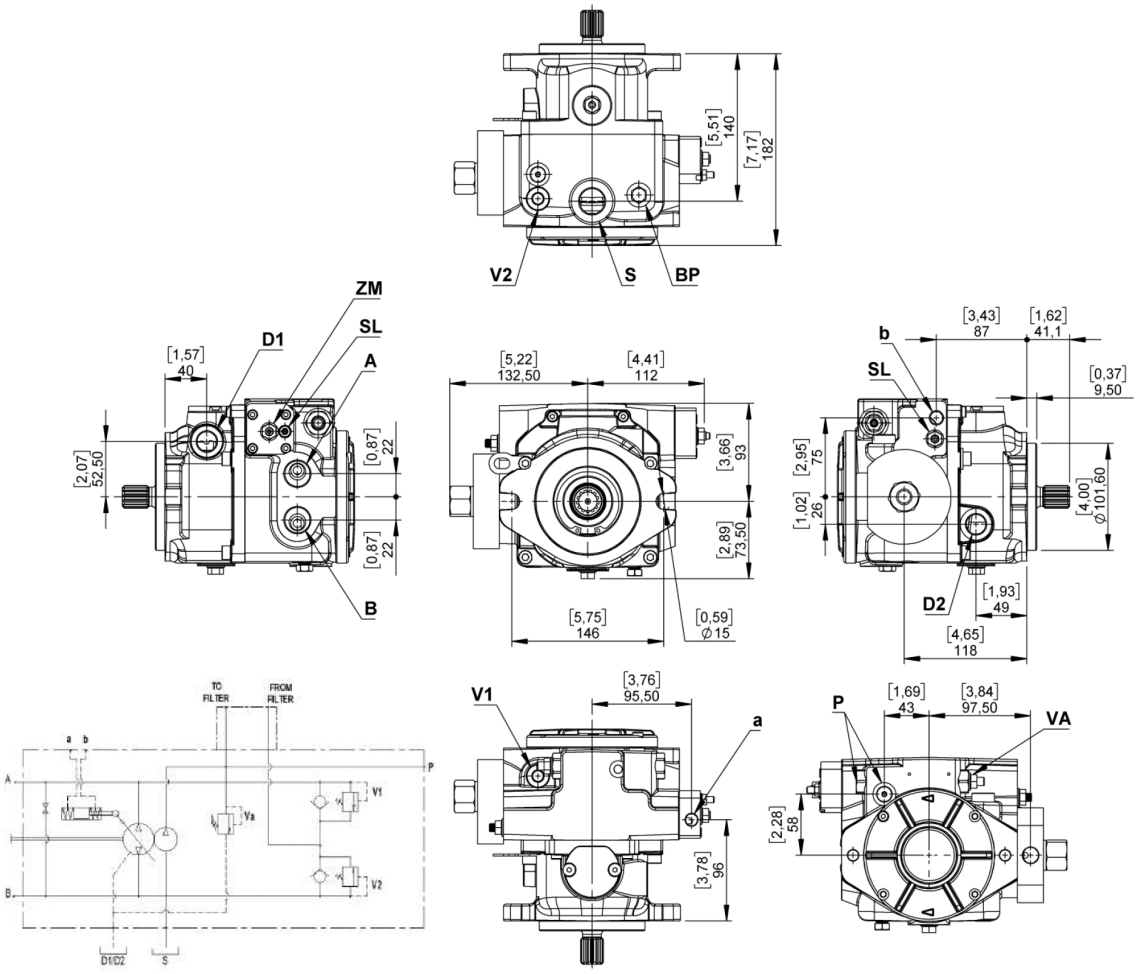
A – B: Pressure ports – 1 1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1 1-16 UNF-2B
P: Charge pressure port *7/16-20 UNF-2B - 3/4-16 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports 7/16-20 UNF-2B
BP: Bypass

C2 21-28-35

ACCESSORIES

Remote mounted filter

Remote filter is an interface that allows you to send the pump's remote feed oil and an external filter to it. It is recommended only for closed pumps or when the overall dimensions do not allow the installation of the filter in line. This option allows to have also filtered the oil that arrives at the command.



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports – 1/4 G
BP: Bypass

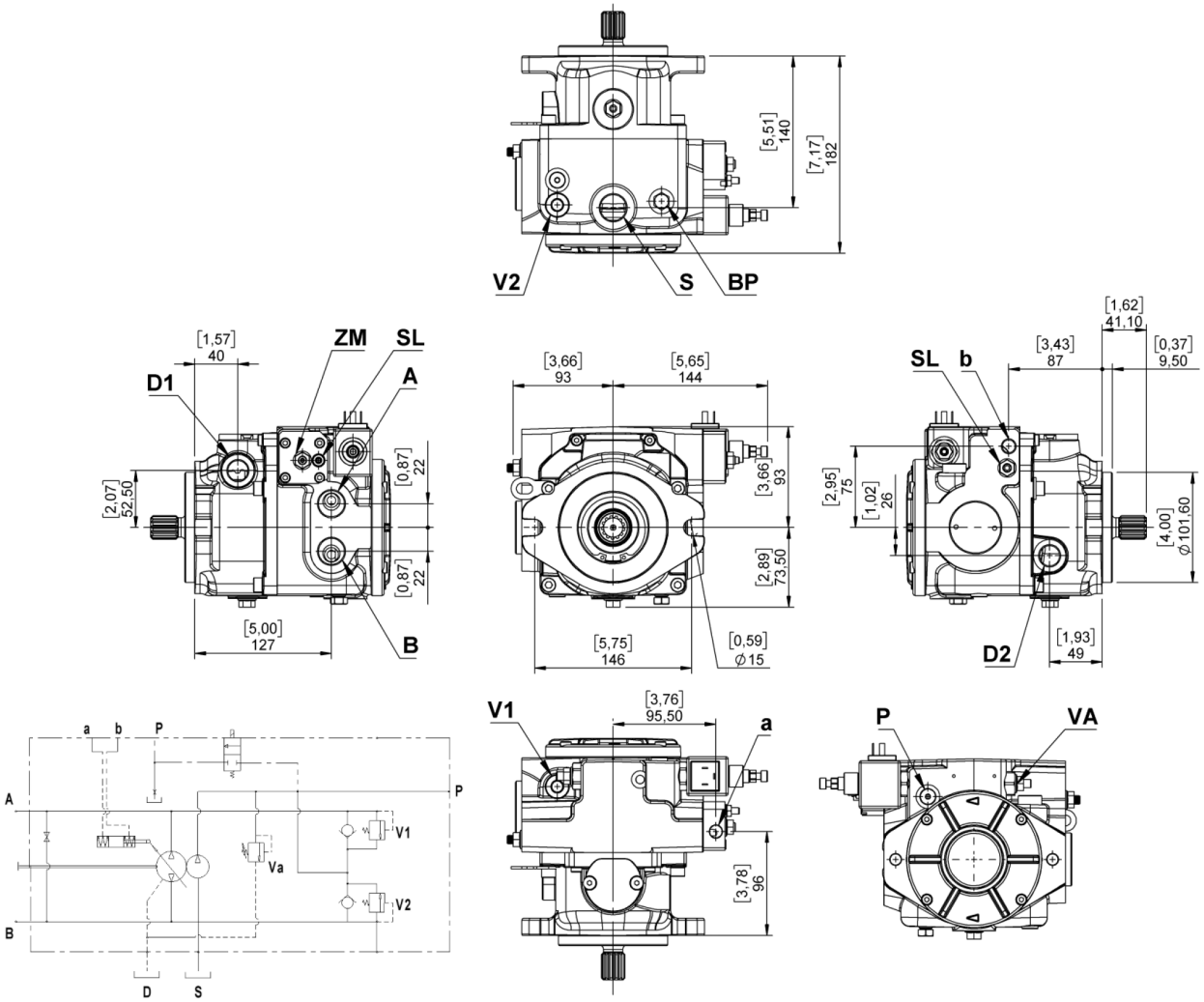
SAE VERSION

A – B: Pressure ports – 1 1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1 1-16 UNF-2B
P: Charge pressure port *7/16-20 UNF-2B - 3/4-16 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports 7/16-20 UNF-2B

ACCESSORIES

Electric Cut-off valve P1/P2

The electric cut-off valve, brings to zero the displacement of the pump when power supply to the ON/OFF solenoid is cut-off.
Feed voltage is 12V d.c or 24V d.c. Is not possible to assembled the cutoff valve in the Tandem pump short version.



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports – 1/4 G
BP: Bypass

SAE VERSION

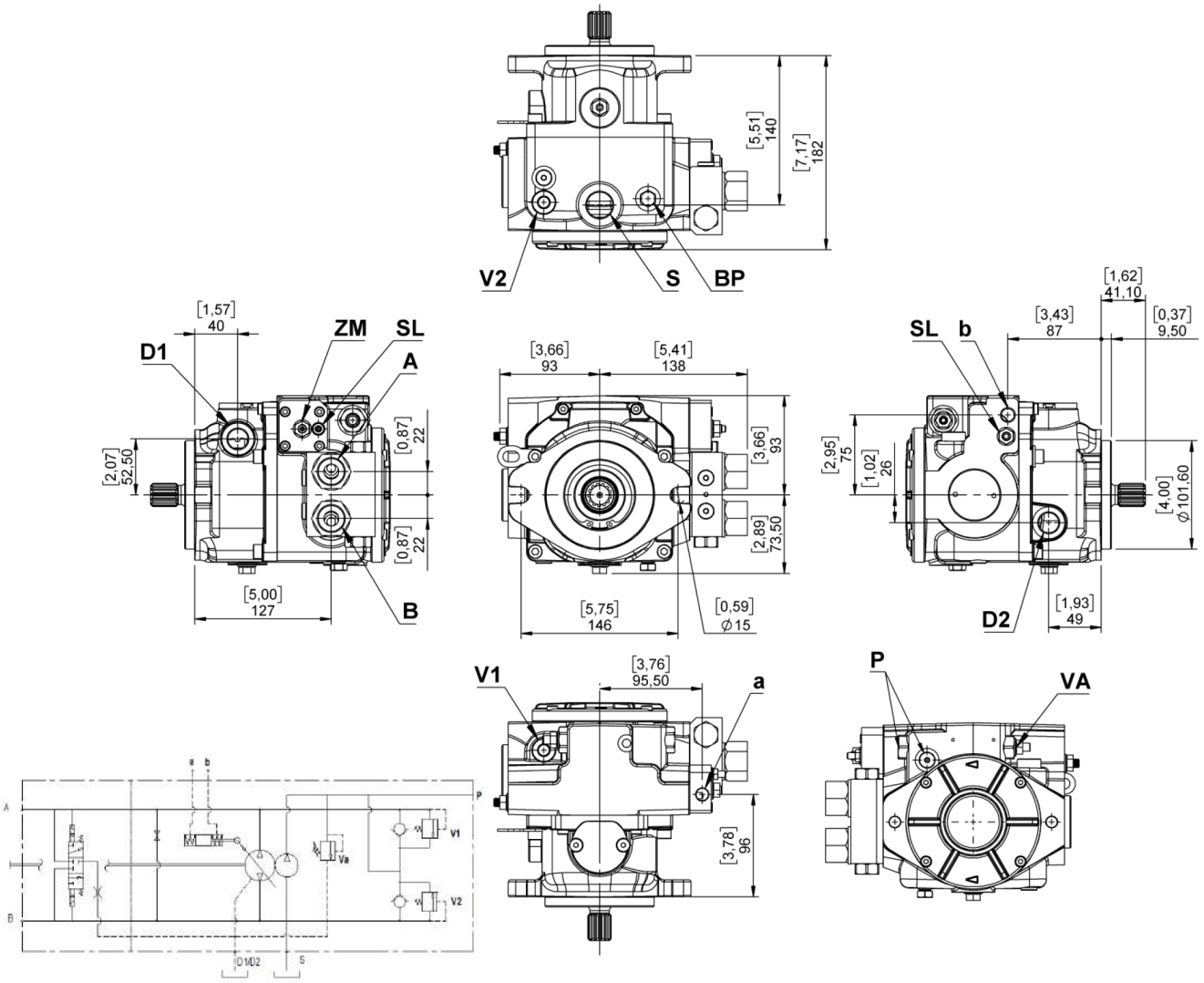
A – B: Pressure ports – 1 1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1 1-16 UNF-2B
P: Charge pressure port *7/16-20 UNF-2B - 3/4-16 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports 7/16-20 UNF-2B
BP: Bypass

C2 21-28-35

ACCESSORIES

Exchange valve VS

The flushing valve allows an oil cooling action, which is recommended when operating at high speed and power.



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports – 1/4 G
BP: Bypass

SAE VERSION

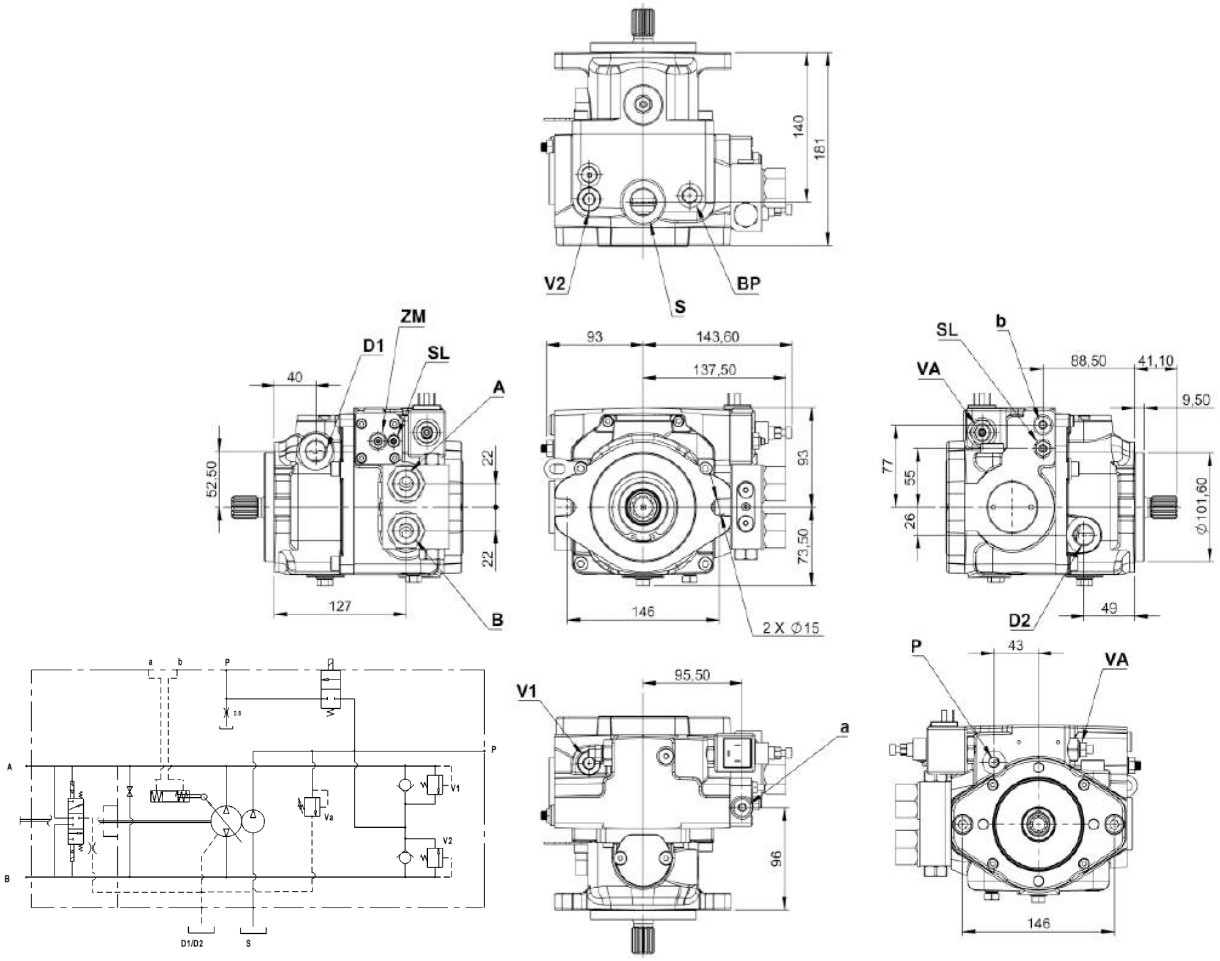
A – B: Pressure ports – 1 1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1 1-16 UNF-2B
P: Charge pressure port *7/16-20 UNF-2B - 3/4-16 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports 7/16-20 UNF-2B
BP: Bypass

C2 21-28-35

ACCESSORIES

V2/V4: Exchange Valve VS + Electric Cut-off valve P1/P2

The flushing valve allows an oil cooling action, which is recommended when operating at high speed and power. The electric cut-off valve brings to zero the displacement of the pump when power supply to the ON/OFF solenoid is cut-off. Feed voltage is 12V d.c or 24V d.c. Is not possible to assembled the cutoff valve in the Tandem pump short version.



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports – 1/4 G
BP: Bypass

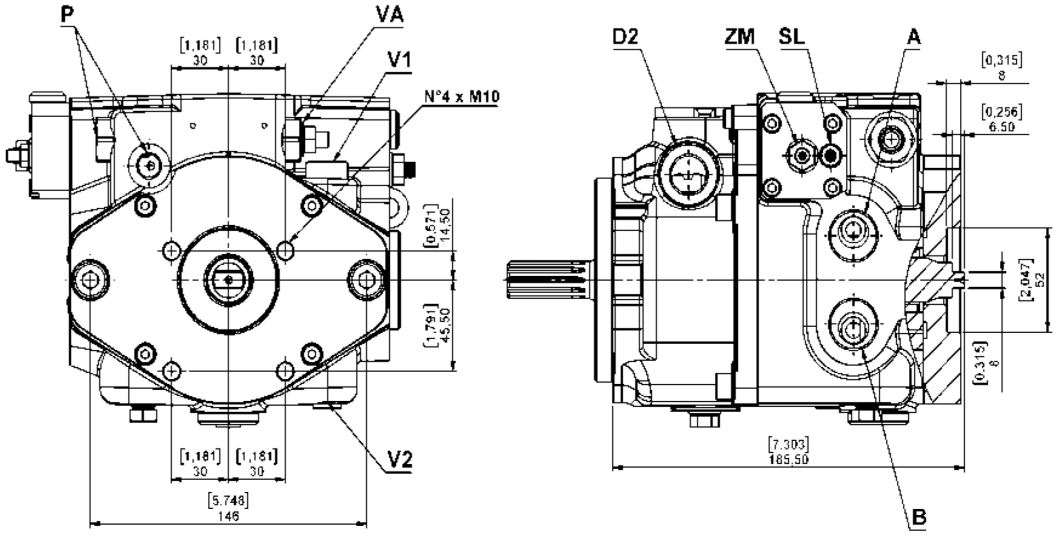
SAE VERSION

A – B: Pressure ports – 1 1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1 1-16 UNF-2B
P: Charge pressure port *7/16-20 UNF-2B - 3/4-16 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports 7/16-20 UNF-2B
BP: Bypass

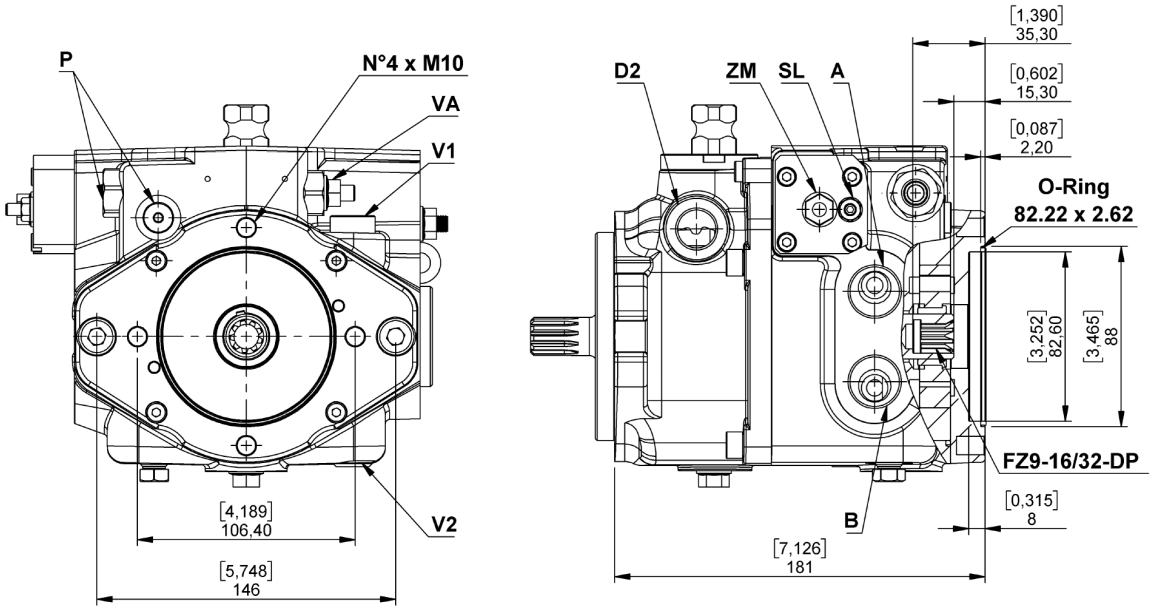
C2 21-28-35

THROUGH DRIVES DIMENSIONS

GR.2 BOSCH flange



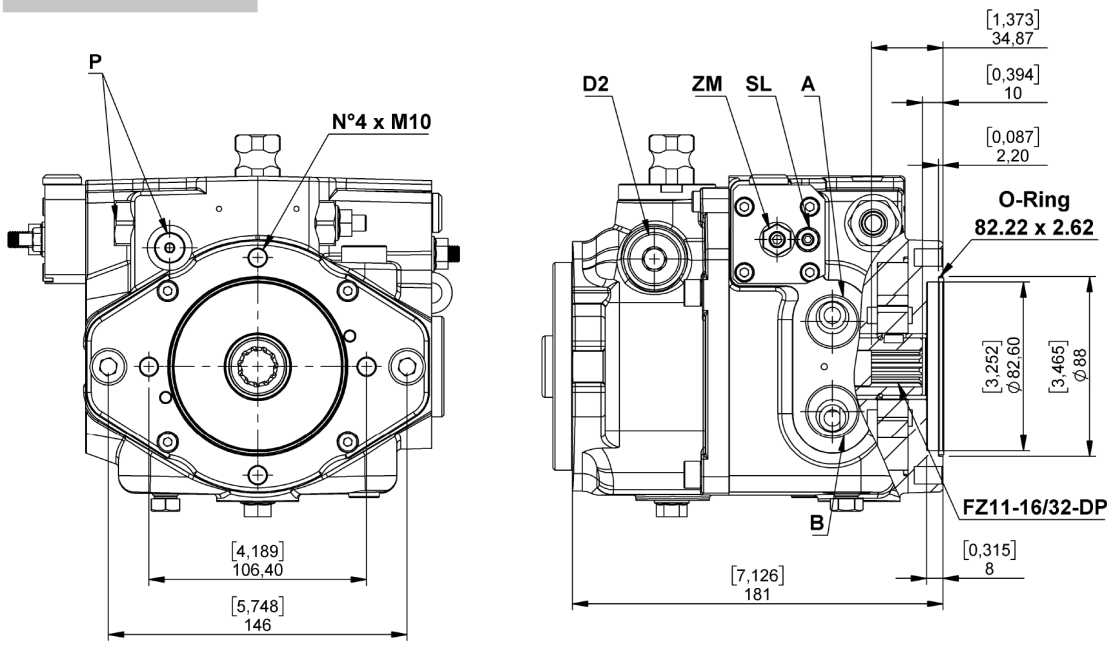
SAE-A = Z9 flange



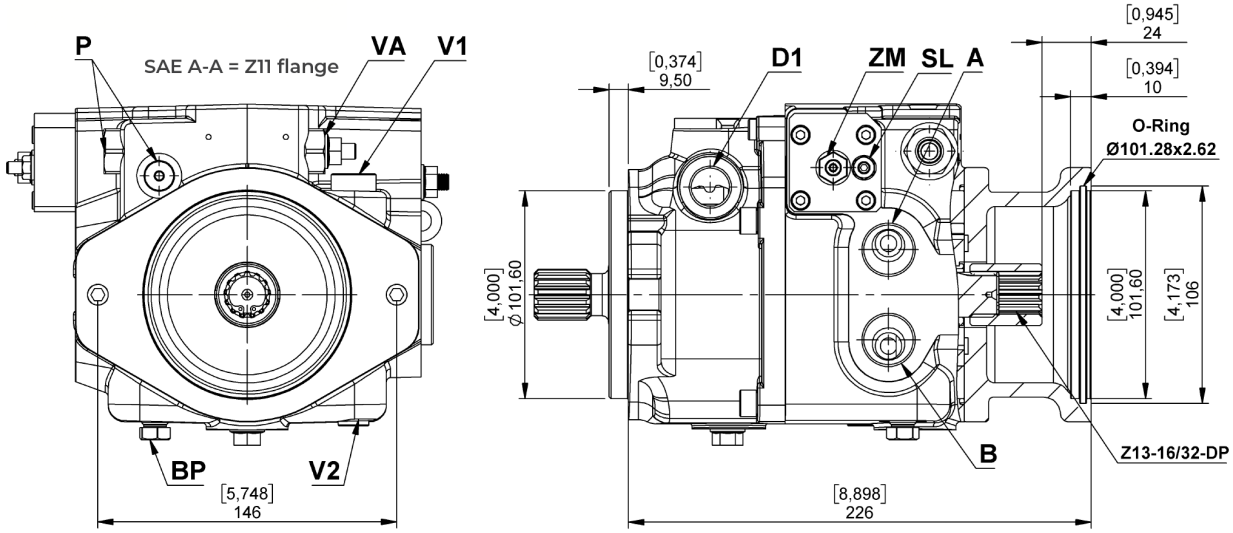
C2 21-28-35

THROUGH DRIVES DIMENSIONS

SAE A-A = Z11 flange

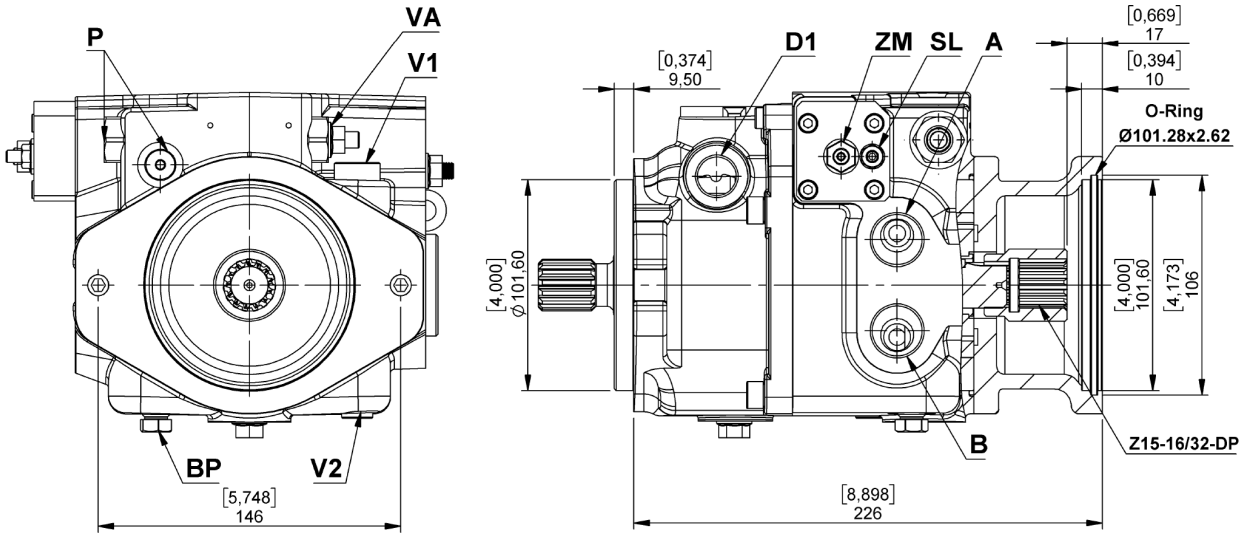


SAE-B Flange = 13T -16/32-DP



THROUGH DRIVES DIMENSIONS

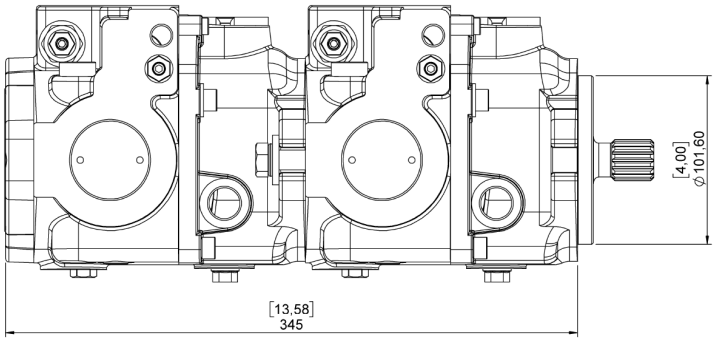
SAE-BB Flange = 15T-16/32-DP



COMBINATION PUMP DIMENSIONS - SHORT VERSION

Tandem C2 21-28-35 + C2 21-28-35

Short version



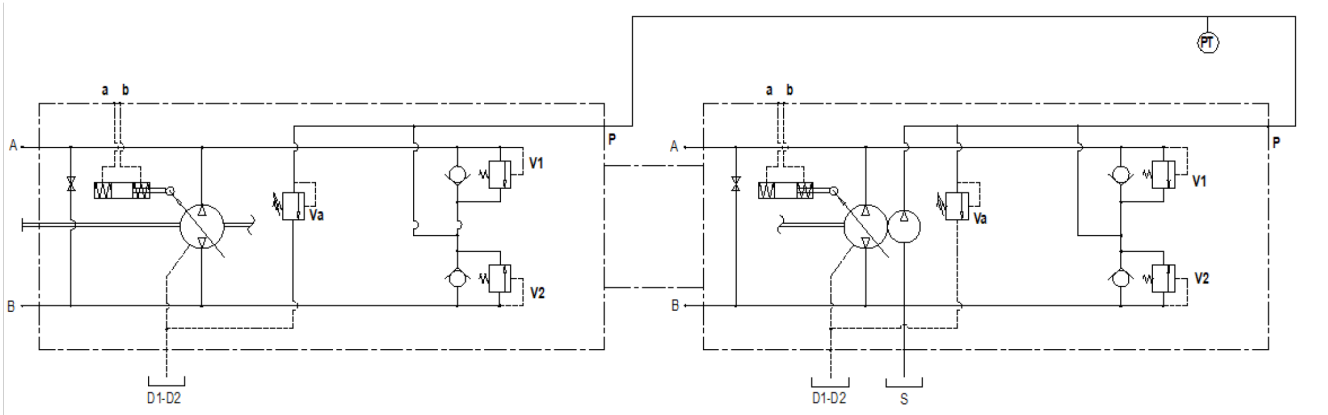
Shaft for combination pumps

Configuration	C2 21-28-35 + C2 21-28-35 Short version	
Pump	1st.	2nd.
Shafts	2	4 - 7

With this configuration, both the pumps mount the boost pumps.

Warning: Ordering a tandem pump it is necessary to indicate for each pump the kind of shaft and the through drive option needed.

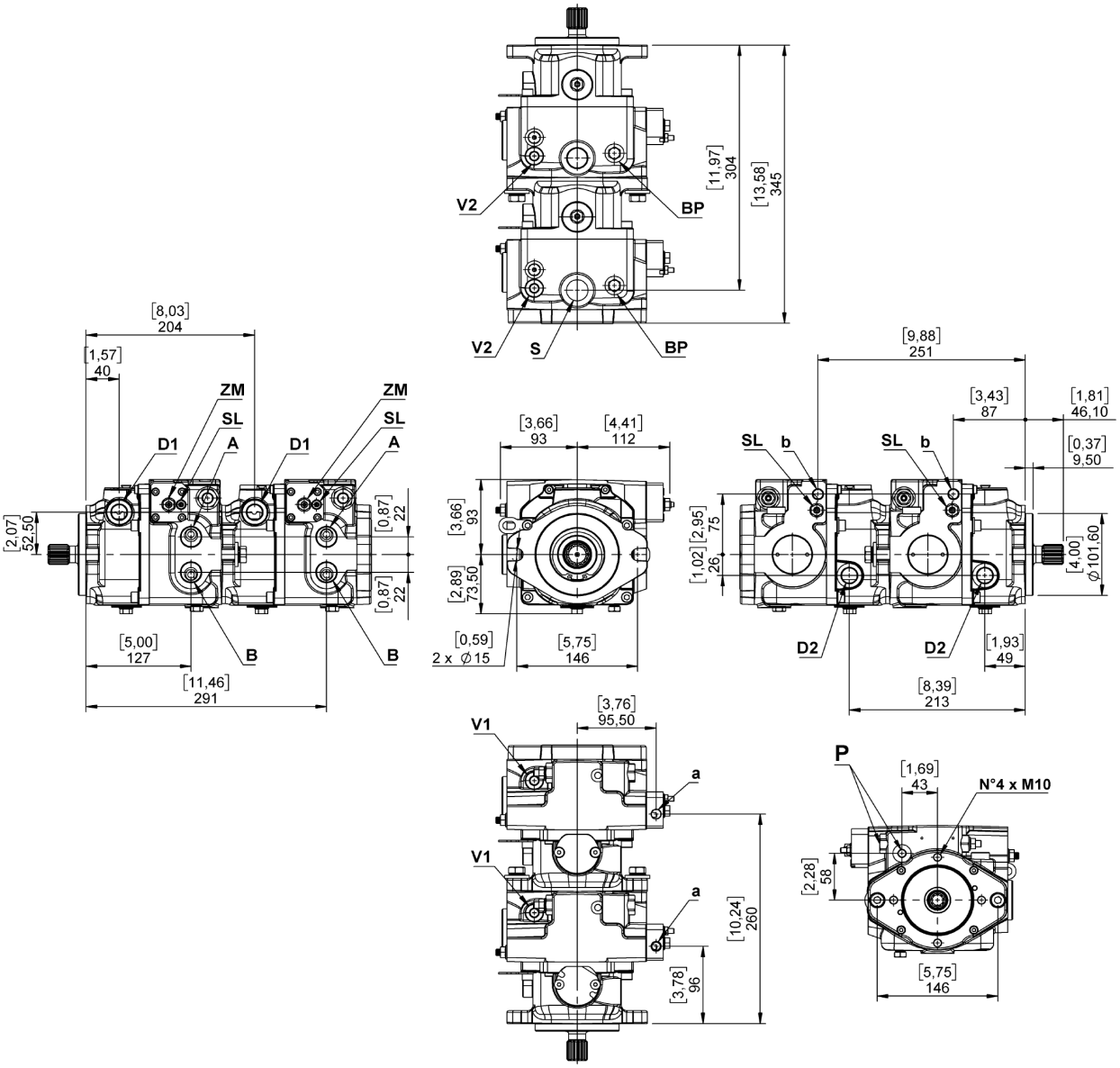
SHORT VERSION TANDEM (TS) HYDRAULIC LAYOUT



The hose (1) used to connect the charge pressure ports (P) is supplied with the units. The hoses connec:ng the drain ports must be relized and mounted by the customer.

C2 21-28-35

COMBINATION PUMP DIMENSIONS - SHORT VERSION



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports – 1/4 G
BP: Bypass

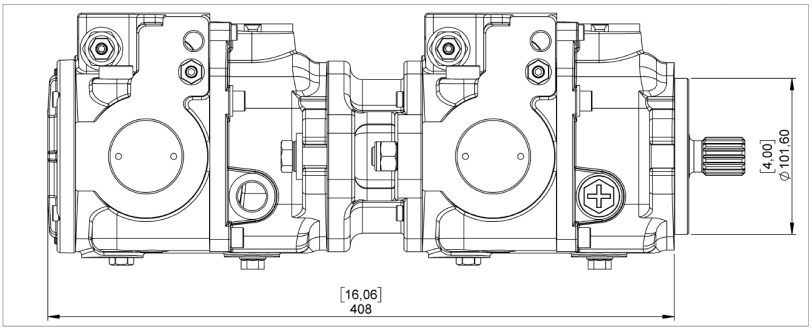
SAE VERSION

A – B: Pressure ports – 1 1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1 1-16 UNF-2B
P: Charge pressure port *7/16-20 UNF-2B - 3/4-16 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports 7/16-20 UNF-2B
BP: Bypass

COMBINATION PUMP DIMENSIONS - LONG VERSION

Tandem C2 21-28-35 + C2 21-28-35

Through drive SAE-B \ Closed



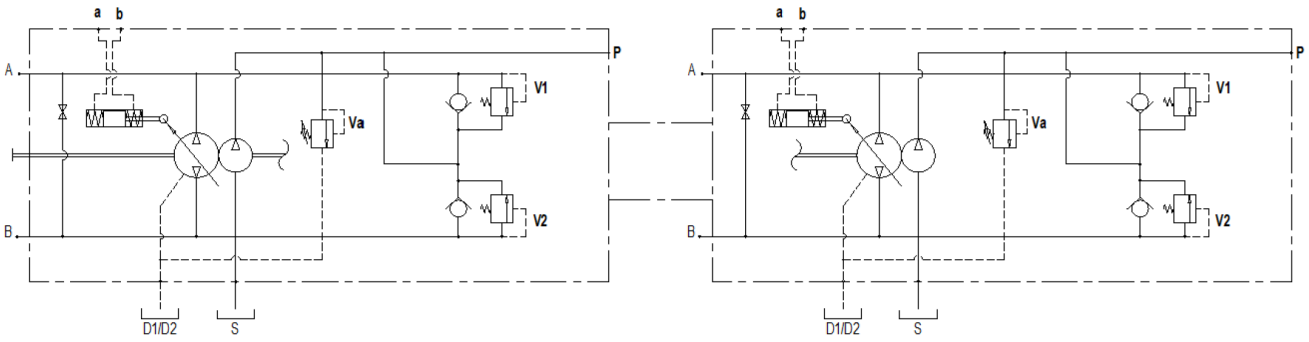
Shaft for combination pumps

Configuration	C2 21-28-35 + C2 21-28-35 Long version SAE-B	
Pump	1st.	2nd.
Shafts	3	1

With this configuration, both the pumps mount the boost pumps.

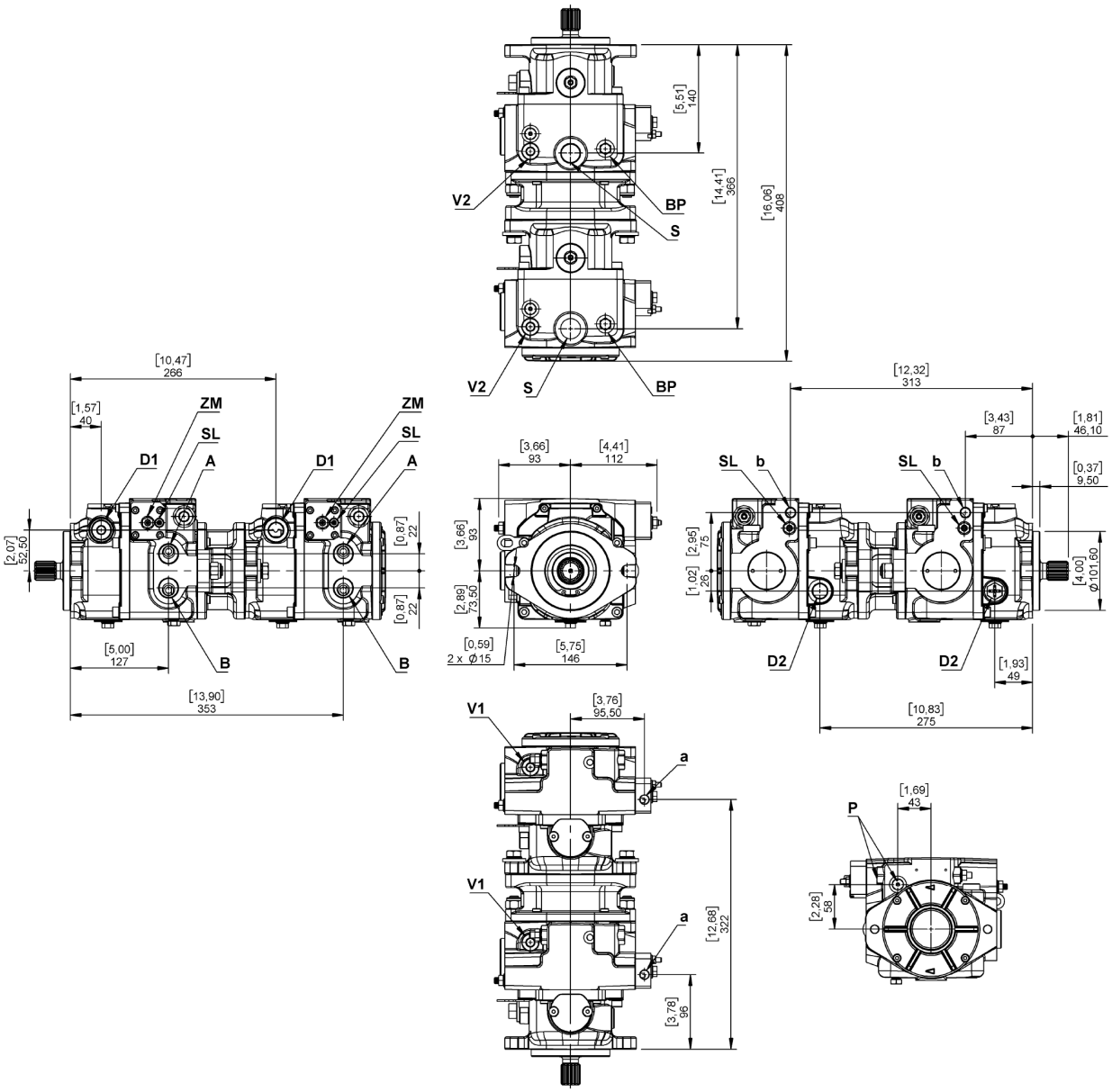
(1) It is necessary to mount on the first pump the through drive-SAE B

(2) 1 - Splined ShaFT 13T - 16/32 - DP (C2 21/28)



C2 21-28-35

COMBINATION PUMP DIMENSIONS - LONG VERSION



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports – 1/4 G
BP: Bypass

SAE VERSION

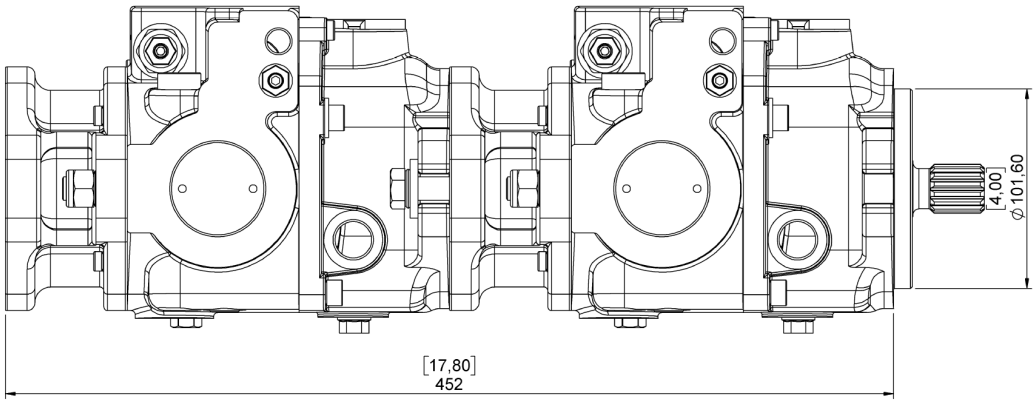
A – B: Pressure ports – 1 1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
S: Suction port – 1 1-16 UNF-2B
P: Charge pressure port *7/16-20 UNF-2B - 3/4-16 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports 7/16-20 UNF-2B
BP: Bypass

C2 21-28-35

COMBINATION PUMP DIMENSIONS - LONG VERSION

Tandem C2 21-28-35 + C2 21-28-35

Through drive SAE-B/B-B



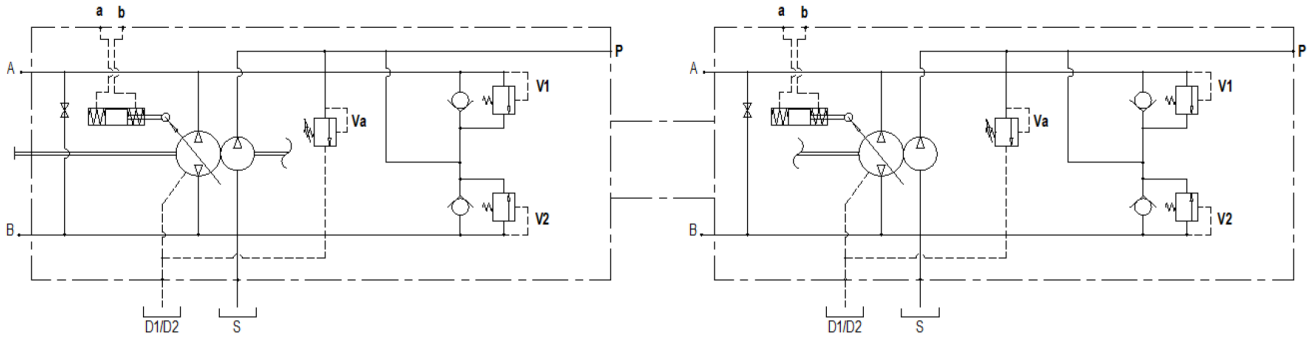
Shaft for combination pumps

Configuration	C2 21-28-35 + C2 21-28-35 Long version SAE-B	
Pump	1st.	2nd.
Shafts	3	1

With this configuration, both the pumps mount the boost pumps.

(1) It is necessary to mount on the first pump the through drive-SAE B

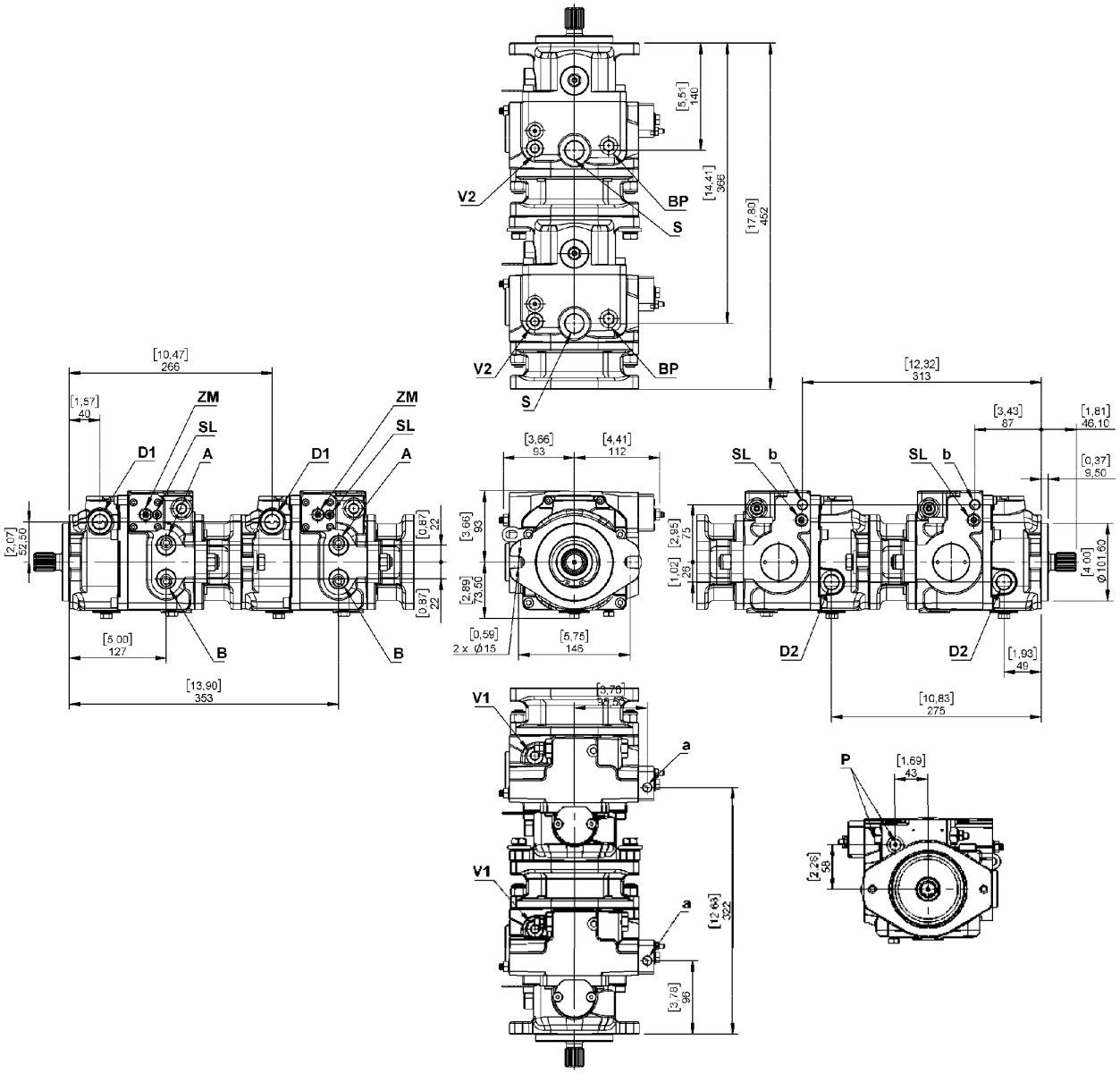
(2) 1 - Splined Shaft 13T - 16/32 - DP (C2 21/28)



C2 21-28-35

COMBINATION PUMP DIMENSIONS - LONG VERSION

First pump with through drive SAE B-B



METRIC VERSION

A – B: Pressure ports – 3/4 G
D1-D2: Drain port – 1/2 G
S: Suction port – 3/4 G
P: Charge pressure port – 1/8 G - 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports – 1/4 G
BP: Bypass

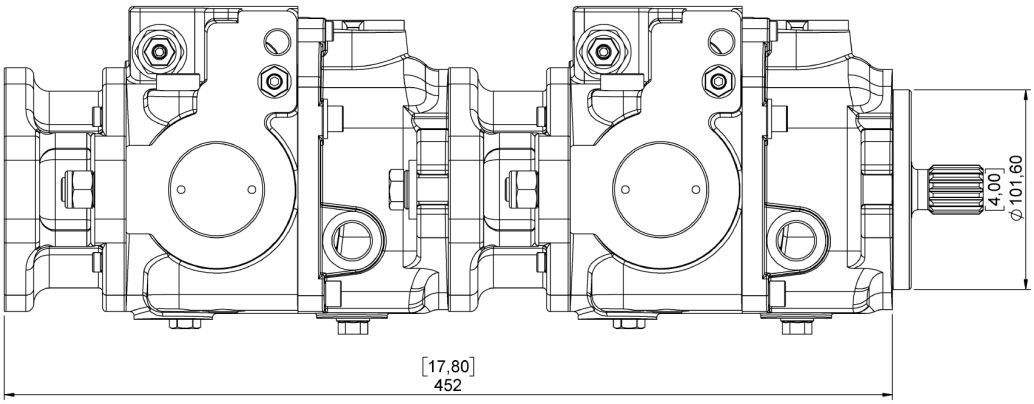
SAE VERSION

A – B: Pressure ports – 1 1-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B **S:** Suction port – 1 1-16 UNF-2B **P:** Charge pressure port *7/16-20 UNF-2B - 3/4-16 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a-b: Control piloting pressure ports 7/16-20 UNF-2B
BP: Bypass

C2 21-28-35

COMBINATION PUMP DIMENSIONS - LONG VERSION

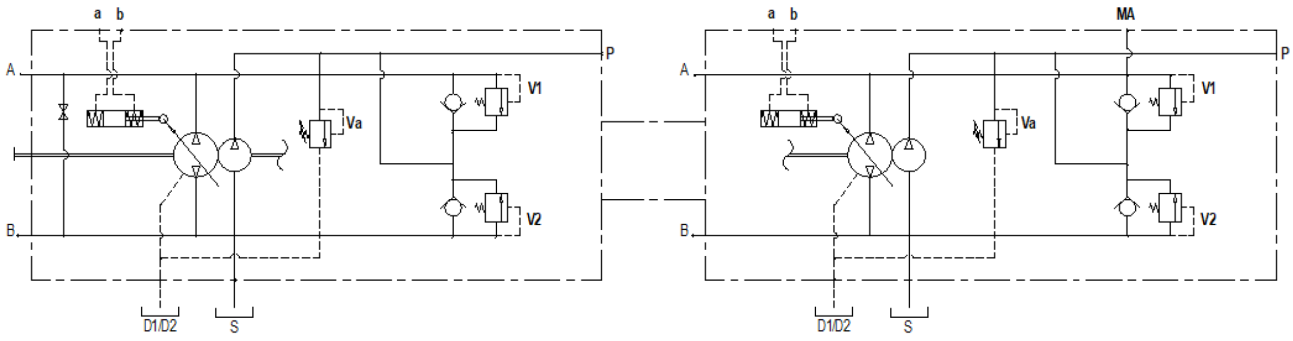
Tandem C2 21-28-35 + C1 14-18



Shafts for combination pumps

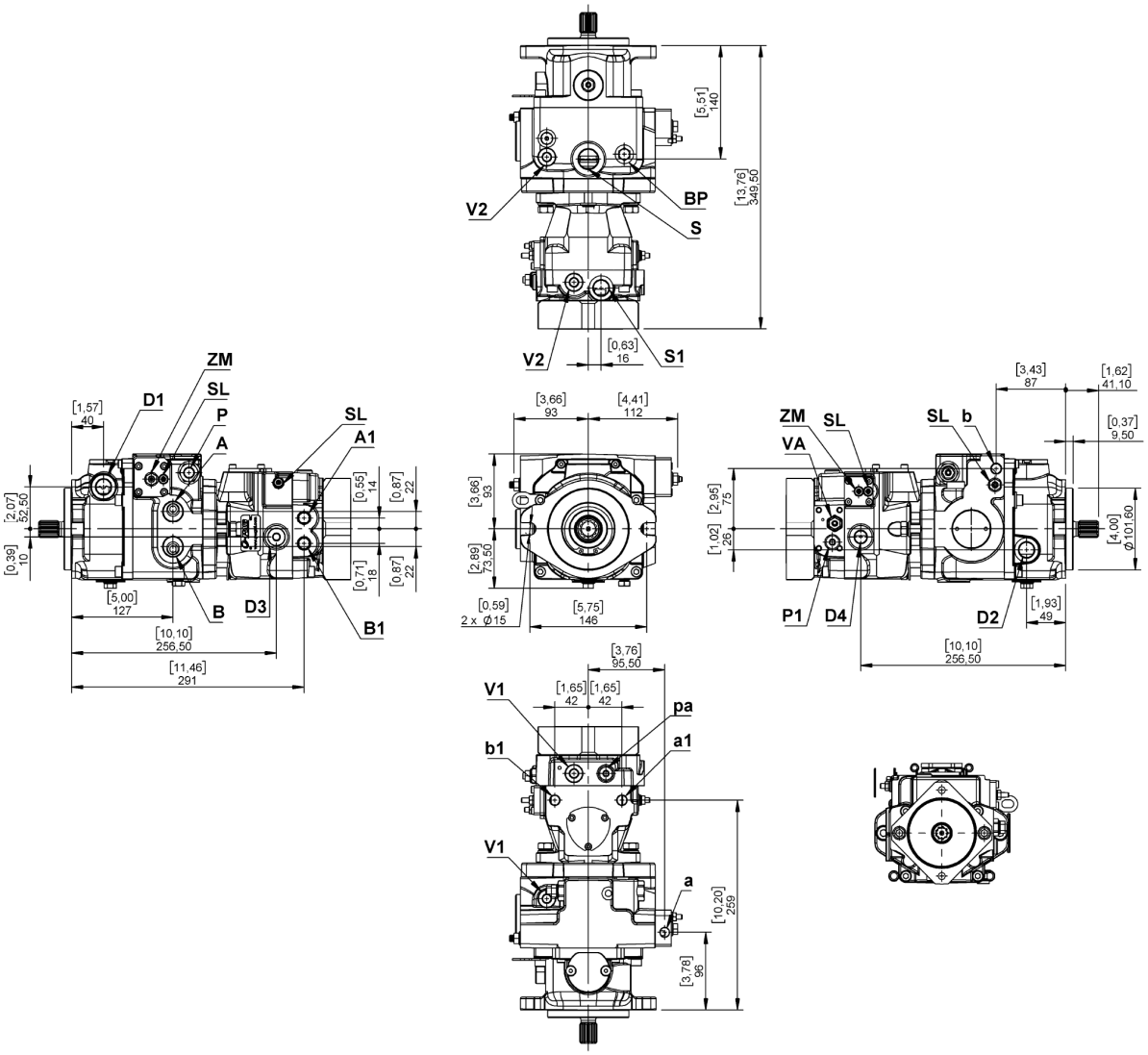
Configuration	C2 21-28-35 + C1 14-18 SAE-B	
Pump	1st.	2nd.
Shafts	1 - 5 - 6 - X	1 - 2

SHORT VERSION TANDEM (TS) HYDRAULIC LAYOUT



C2 21-28-35

COMBINATION PUMP DIMENSIONS - SHORT VERSION



METRIC VERSION

A – B: Pressure ports – 3/4 G
A1 – B1: Pressure ports – 3/8 G
D1-D2: Drain port – 1/2 G
D3-D4: Drain port – 3/8 G
S: Suction port – 3/4 G
S1: Suction port – 1/2 G
P-P1: Charge pressure port – 1/4 G
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a - b - a1 - b1: Control piloting pressure ports – 1/4 G
pa: High pressure - 1/4 G
BP: Bypass

SAE VERSION

A – B: Pressure ports – 1 1-16 UNF-2B
A – B: Pressure ports – 3/4-16 UNF-2B
D1-D2 : Drain port – 3/4-16 UNF-2B
D3-D4 : Drain port – 9/16-18 UNF-2B
S: Suction port – 1 1-12 UNF-2B
S1: Suction port – 3/4-16 UNF-2B
P - P1: Charge pressure port *7/16-20 UNF-2B*
VA: Charge pump valve
V1 – V2: Pressure relief valves
SL: Stroke limiter
ZM: Mechanical zero adjustment screw
a - b - a1 - b1: Control piloting pressure ports 7/16-20 UNF-2B
pa: High pressure - 7/16-20 UNF-2B
BP: Bypass