C1 14/18 Series

Axial Piston Pumps Variable Displacement

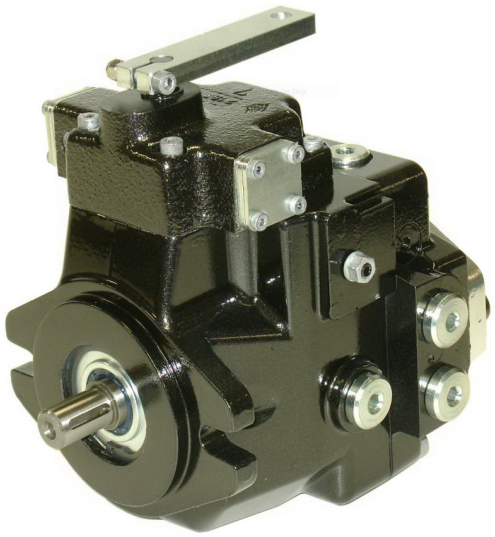
FEATURES

The C1 14/18 Series is a family of variable displacement axial piston pumps for use in closed circuits with housing and distributor cover in aluminium. The displacement is continuously variable by means of a tilting swash plate and the oil flow direction is reversible.

The following range of controls are available:

- Manual without zeroing
- Manual with zeroing
- Manual lever with feed-back
- Hydraulic proportional without feed-back
- Hydraulic proportional with feed-back
- Electric two position (on-OFF)
- Electric impulse
- Electric proportional with feed-back
- Electric proportional without feed-back

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



Two through drive options for auxiliary pump mounting and two options are available:

- Pressure filter
- Through drive - Bosch Gr.1
- Through drive - Bosch Gr. 2
- Through drive - SAE 'A' 9T - 16/32-DP

TECHNICAL DATA

SERIES		C1
Displacement (1)	cc/rev	14 - 18
Connection flange		SAE 'A'
Charge pump displacement	cc/rev	5.4
Maximum speed (2)	rpm	3600
Minimum speed	rpm	700
Rated pressure	bar (psi)	230 (3335)
Peak pressure	bar (psi)	270 (3625)
Charge pressure	bar (psi)	10÷20 (standard 20) (145÷290) (standard 290)
Maximum case pressure	bar (psi)	2 (29)
Suction pressure	bar (psi)	≥ 0.8 (≥ 11.6)
Moment of inertia rotating parts	kg m^2 (lb ft^2)	0.0014 (0.033)
Weight (approx.)	kg (lb)	7 (15.4)

Notes:
(1) The displacements 14/18 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 and when operated on mineral oil.

C1 14/18 Series

Axial Piston Pumps Variable Displacement

MODEL CODE

1	2	2A	3	4	5	6	7	8	9	10

10: Omit if not required

1 - SERIES

C1	Variable displacement axial piston pump for closed circuit “MEDIUM PRESSURE”

2 - DISPLACEMENT

14	Displacement 14 cm^3
18	Displacement 18 cm^3

2A - DISPLACEMENT LIMITATION

3 - CONTROLS

IND	Hydraulic proportional without feed-back
E12	Electric impulse 12V
E14	Electric impulse 24V
IRX	Hydraulic proportional with feed-back
LRX	Manual lever with feed-back
LNX	Manual with zeroing
LWX	Manual without zeroing
E22	Electric two position ON-OFF 12V
E24	Electric two position ON-OFF 24V
ER2	Electric proportional with feed-back 12V
ER4	Electric proportional with feed-back 24V
EP2	Electric proportional without feed-back 12V
EP4	Electric proportional without feed-back 24V
EH2	Electric proportional with feed-back 12V & Hydraulic proportional with feed-back
EH4	Electric proportional with feed-back 24V & Hydraulic proportional with feed-back

C1 14/18 Series

Axial Piston Pumps Variable Displacement

4 - THROUGH DRIVE		SHAFT END 1	2	3	4	5	6
1	Without through drive with charge pump	•			•	•	•
2	Without through drive without charge pump	•					
3	SAE A = Z9 - 16/32 DP with charge pump	•				•	•
4	SAE A = Z9 - 16/32 DP without charge pump	•					
5	Pump combination (Short version)	•					
6	Bosch GR1 with charge pump		•	•			
7	Bosch GR2 with charge pump		•	•			
8	Bosch GR1 without charge pump		•	•			
9	Bosch GR2 without charge pump		•	•			

5 - PRESSURE RELIEF VALVE

14	140 bar - (2030 psi)	
17	170 bar - (2465 psi)	
21	210 bar - (3045 psi)	(Standard)
25	250 bar - (3625 psi)	

6 - DIRECTION OF ROTATION

R	CW
L	CCW

7 - SHAFT END		Single	1a Tandem	2a Tandem
1	Splined T9-16/32-DP / Splined T9-16/32-DP (SAE A)	•	•	•
2	Splined T9-16/32-DP / Bosch	•		•
3	Internal splined T9-16/32-DP / Tandem Bosch			•
4	Internal splined T9-16/32-DP / Tandem			•
5	Round shaft Ø15.88 / Splined T9-16/32-DP	•	•	
6	Round shaft Ø24 / Splined T9-16/32-DP	•	•	

8 - PORTS

G	Metric (BSPP Threads)
U	SAE (UNF Threads)

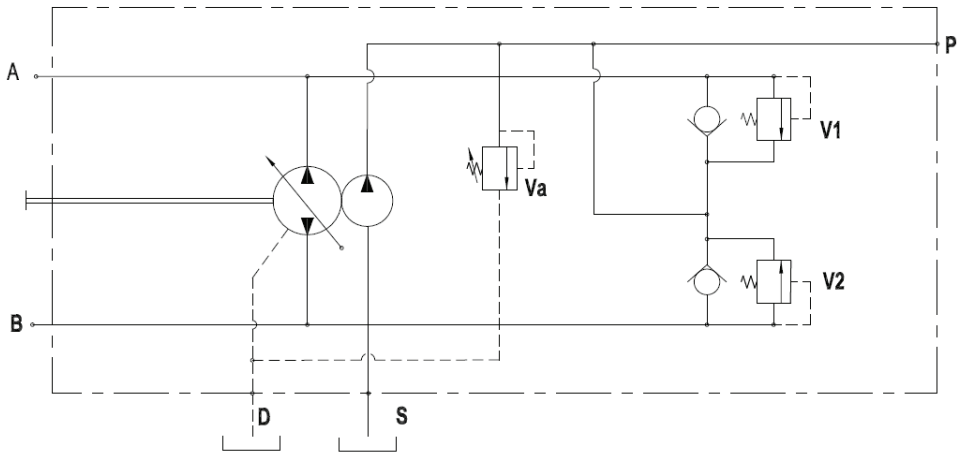
9 - OPTIONS

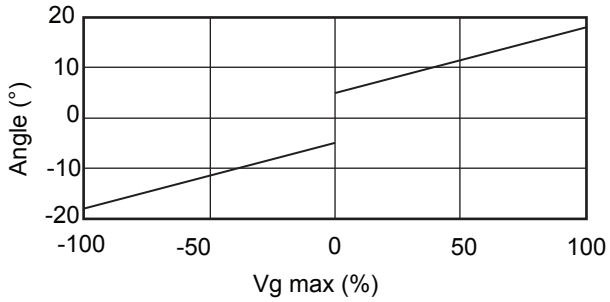
00	Without options
BP	By Pass
FI	With Filter
FE	Filter with electric sensor

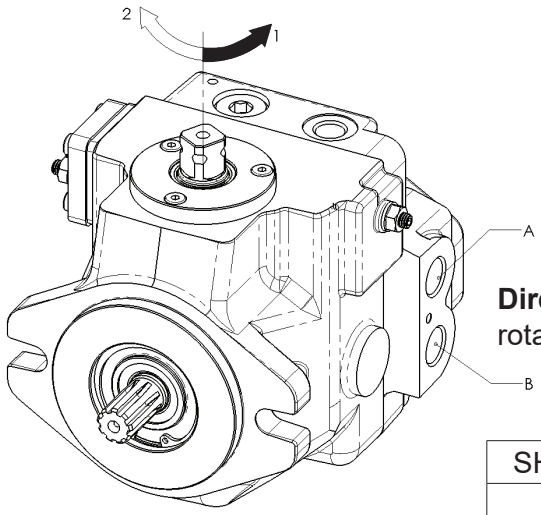
10 - SPECIAL VERSIONS

MANUAL WITHOUT ZEROING CONTROL - LWX

The pump displacement variation of the pump is achieved by rotating the control pivot (i.e. by the means of a lever - not supplied).
The control pivot is built into the swash plate of the pump.



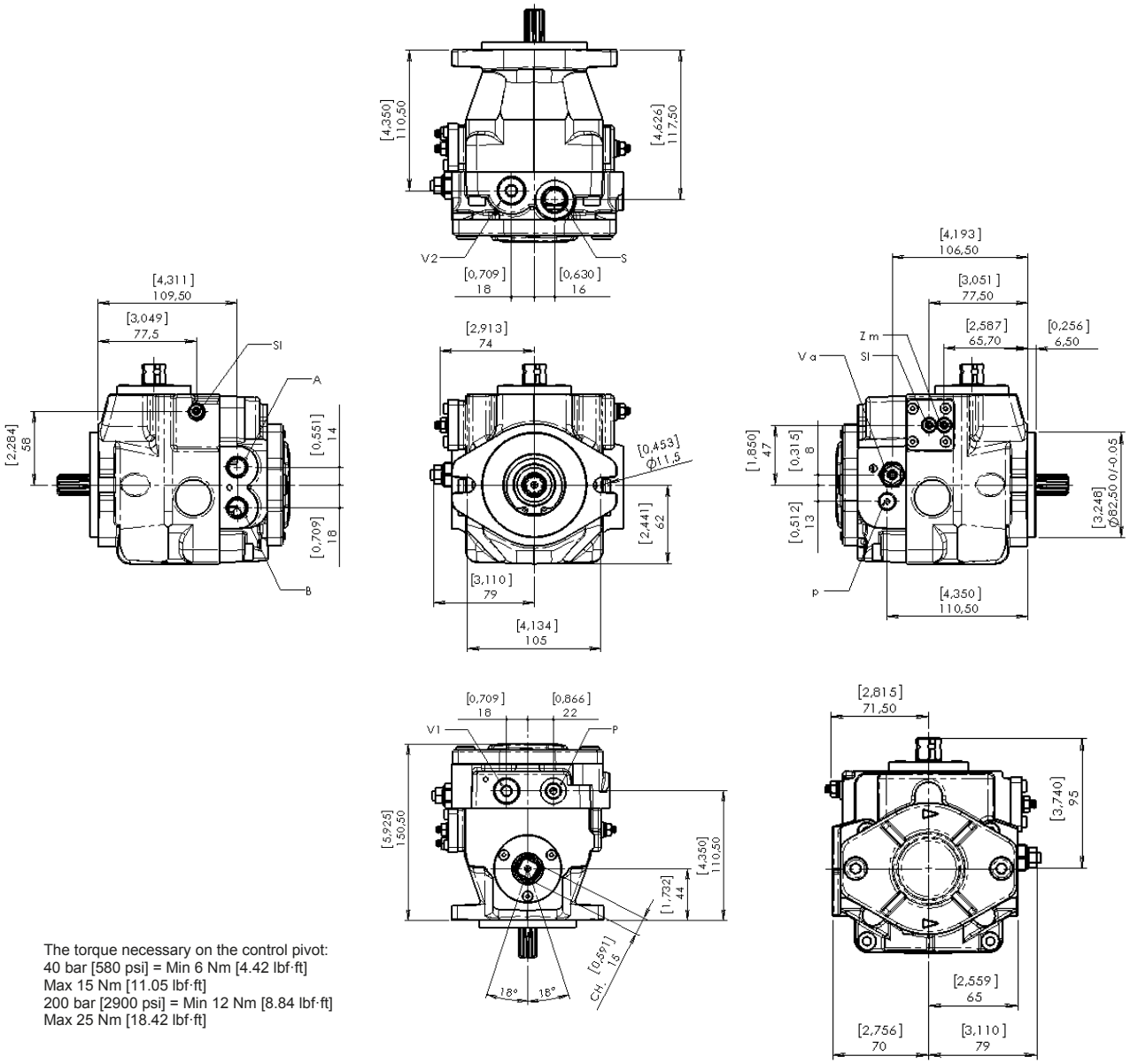




Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.

	PUMP FLOW DIRECTION	
SHAFT ROTATION	Control Rotation	Pressure Port
(L)	1	B
	2	A
(R)	1	A
	2	B

PUMP AND CONTROL DIMENSIONS - LWX



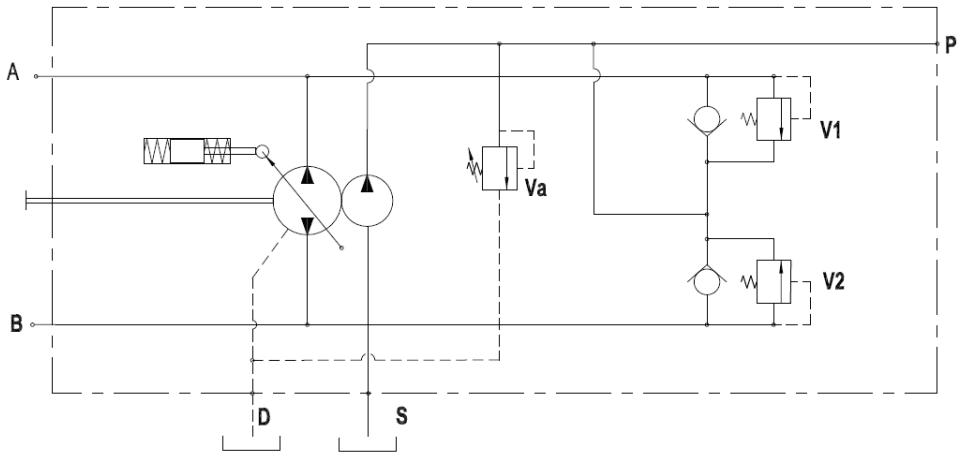
The torque necessary on the control pivot:
40 bar [580 psi] = Min 6 Nm [4.42 lbf·ft]
Max 15 Nm [11.05 lbf·ft]
200 bar [2900 psi] = Min 12 Nm [8.84 lbf·ft]
Max 25 Nm [18.42 lbf·ft]

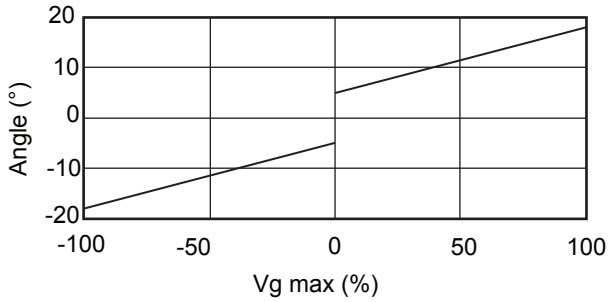
METRIC Version
A – B: Pressure ports – 3/8 G
D1 – D2: Drain port – 3/8 G
S: Suction port – ½ G
P: Charge pressure port – ¼ G
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – ¼ G

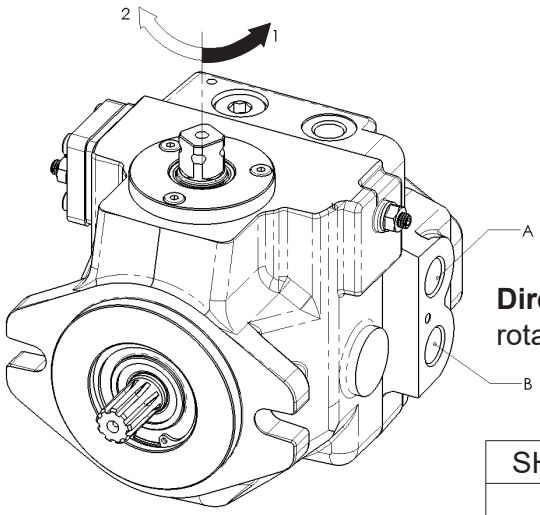
SAE Version
A – B: Pressure ports – 9/16-18 UNF-2B
D1 – D2: Drain port – 9/16-18 UNF-2B
S: Suction port – ¾-16 UNF-2B
P: Charge pressure port – 7/16-20 UNF-2B
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – 7/16-20 UNF-2B

MANUAL WITH ZEROING CONTROL - LNX

The pump displacement variation of the pump is achieved by rotating the control pivot (i.e. by the means of a lever - not supplied). The control pivot is built into the swash plate of the pump.
The return to zero displacement of the pump is guaranteed by an internal spring.



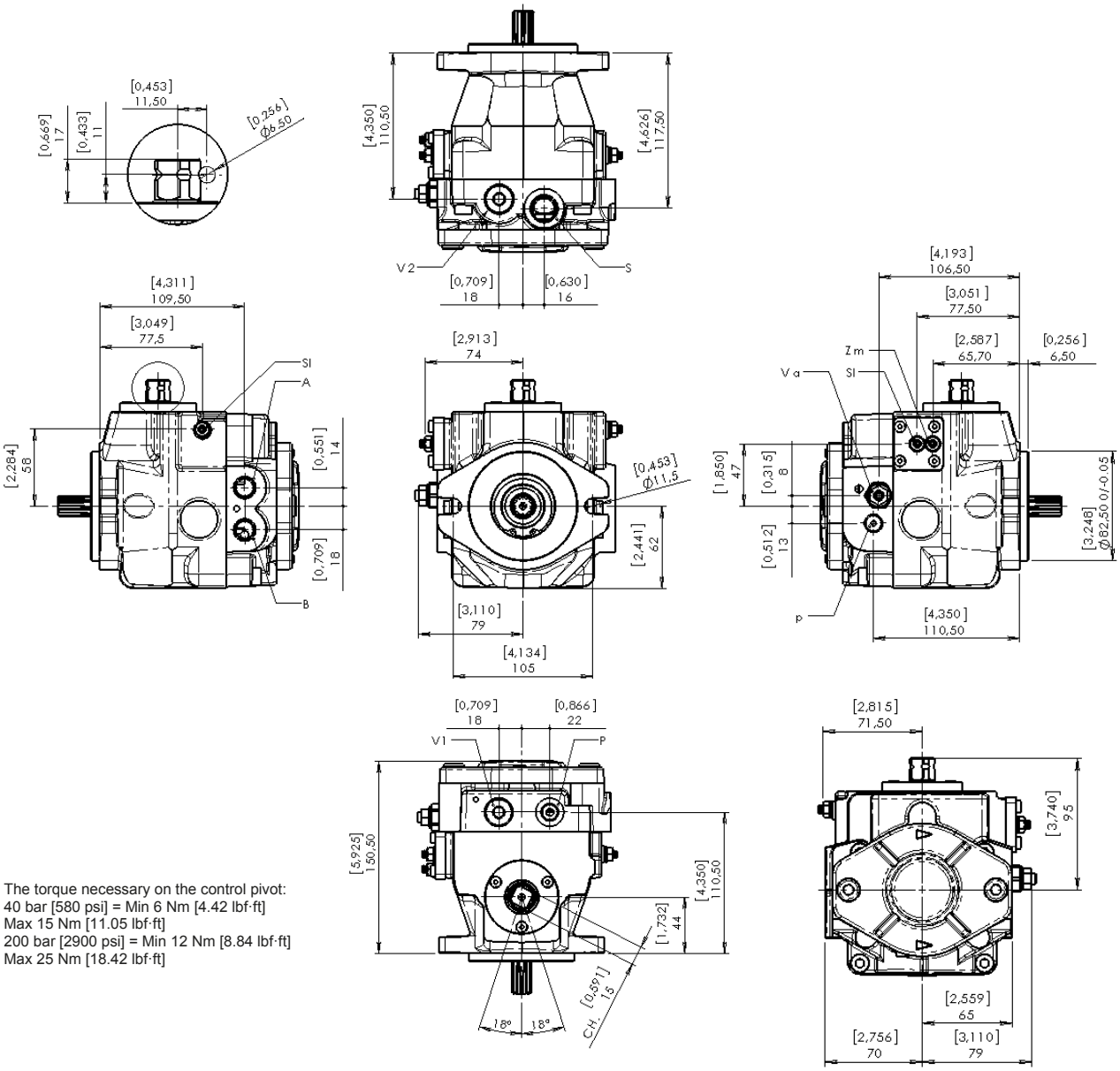




Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.

	PUMP FLOW DIRECTION	
SHAFT ROTATION	Control Rotation	Pressure Port
(L)	1	B
	2	A
(R)	1	A
	2	B

PUMP AND CONTROL DIMENSIONS - LNX



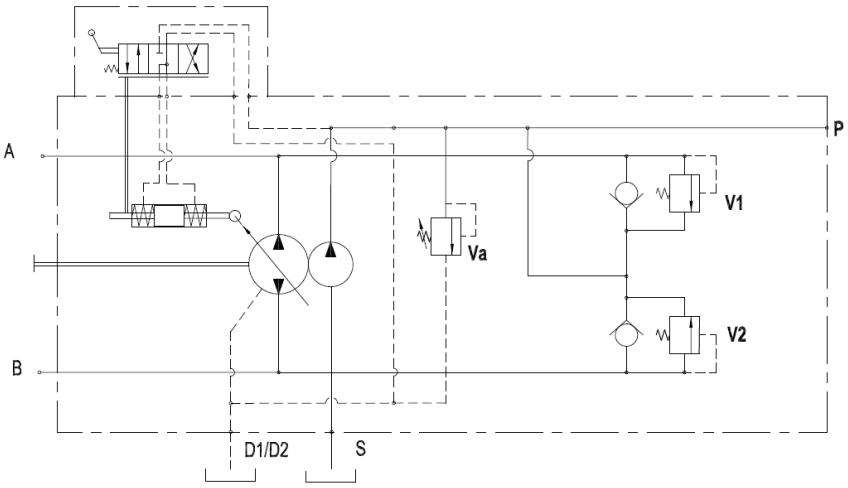
The torque necessary on the control pivot:
40 bar [580 psi] = Min 6 Nm [4.42 lbf·ft]
Max 15 Nm [11.05 lbf·ft]
200 bar [2900 psi] = Min 12 Nm [8.84 lbf·ft]
Max 25 Nm [18.42 lbf·ft]

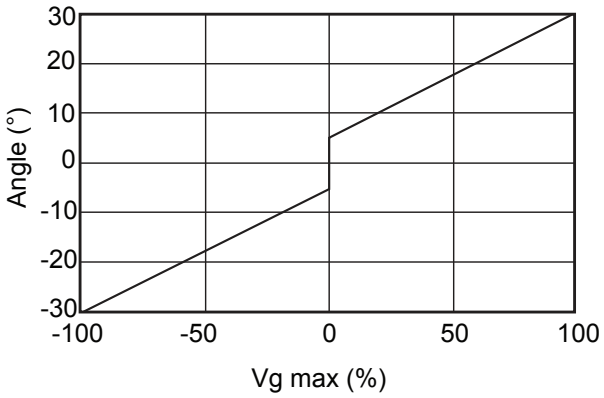
METRIC Version
A – B: Pressure ports – 3/8 G
D1 – D2: Drain port – 3/8 G
S: Suction port – ½ G
P: Charge pressure port – ¼ G
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – ¼ G

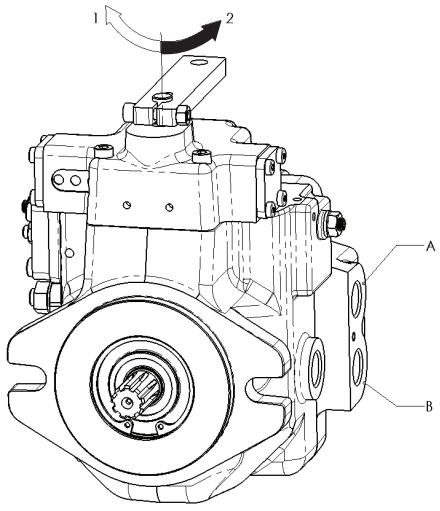
SAE Version
A – B: Pressure ports – 9/16-18 UNF-2B
D1 – D2: Drain port – 9/16-18 UNF-2B
S: Suction port – ¾-16 UNF-2B
P: Charge pressure port – 7/16-20 UNF-2B
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – 7/16-20 UNF-2B

MANUAL LEVER WITH FEED-BACK CONTROL - LRX

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



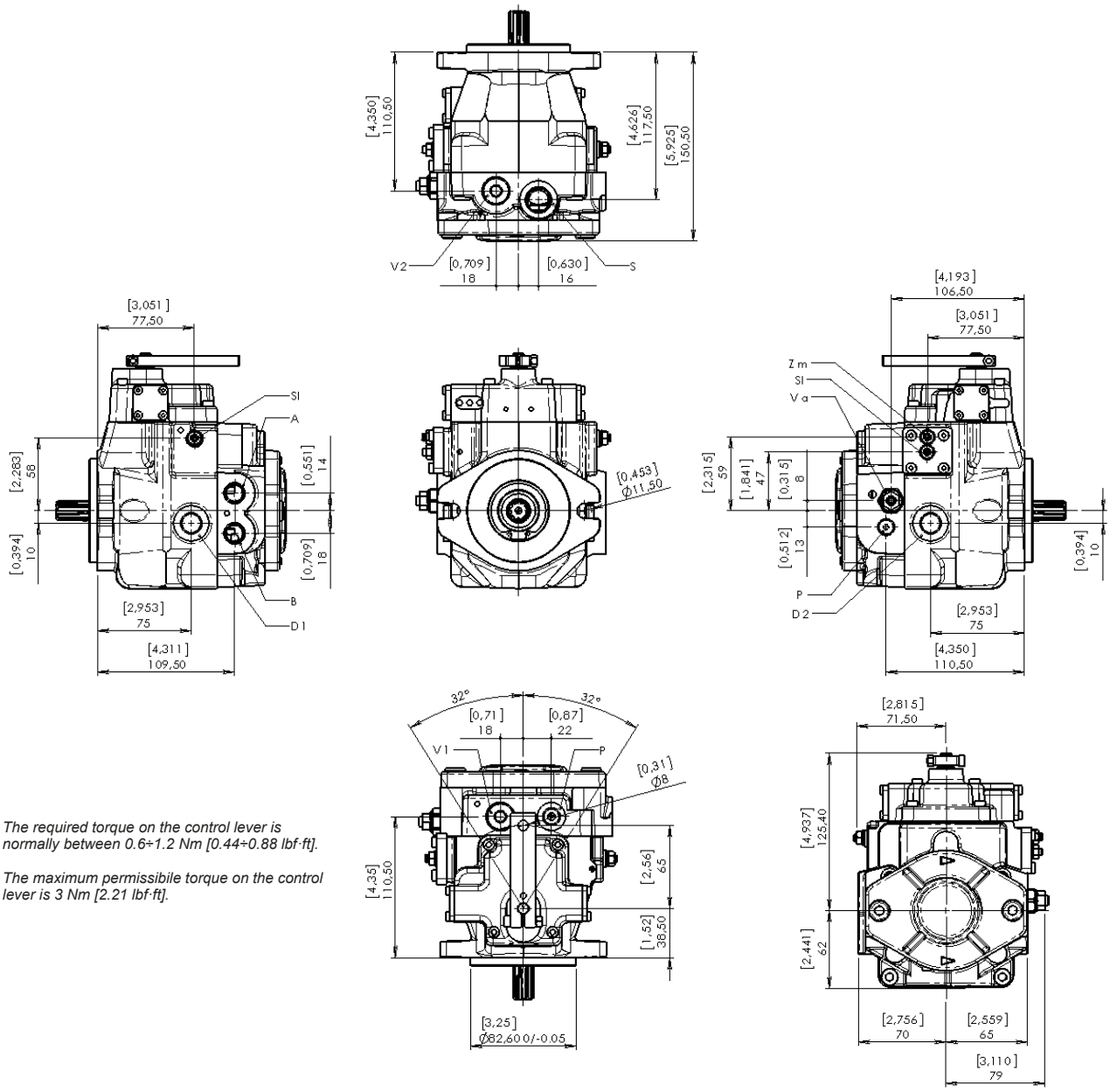




Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.

	PUMP FLOW DIRECTION	
SHAFT ROTATION	Control Rotation	Pressure Port
(L)	1	A
	2	B
(R)	1	B
	2	A

PUMP AND CONTROL DIMENSIONS - LRX



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

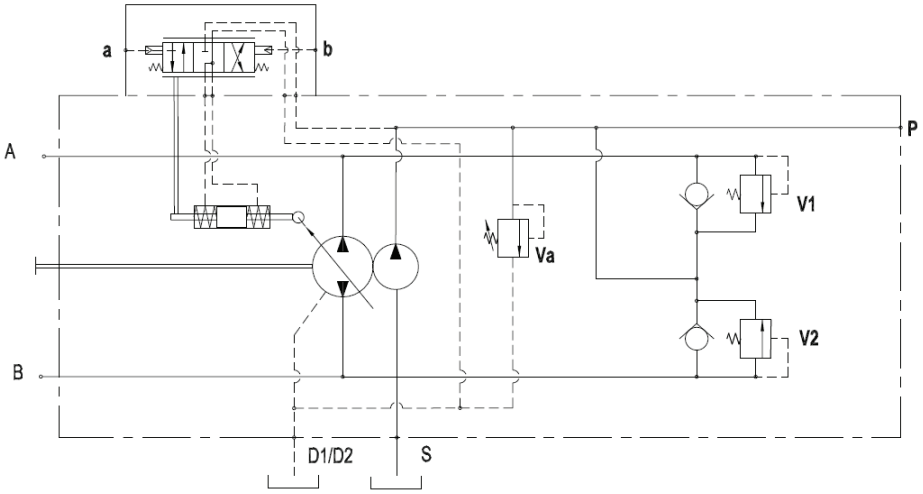
The maximum permissibile torque on the control lever is 3 Nm [2.21 lbf·ft].

METRIC Version
A – B: Pressure ports – 3/8 G
D1 – D2: Drain port – 3/8 G
S: Suction port – ½ G
P: Charge pressure port – ¼ G
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – ¼ G

SAE Version
A – B: Pressure ports – 9/16-18 UNF-2B
D1 – D2: Drain port – 9/16-18 UNF-2B
S: Suction port – ¾-16 UNF-2B
P: Charge pressure port – 7/16-20 UNF-2B
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – 7/16-20 UNF-2B

HYDRAULIC PROPORTIONAL WITH FEED-BACK CONTROL - IRX

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).

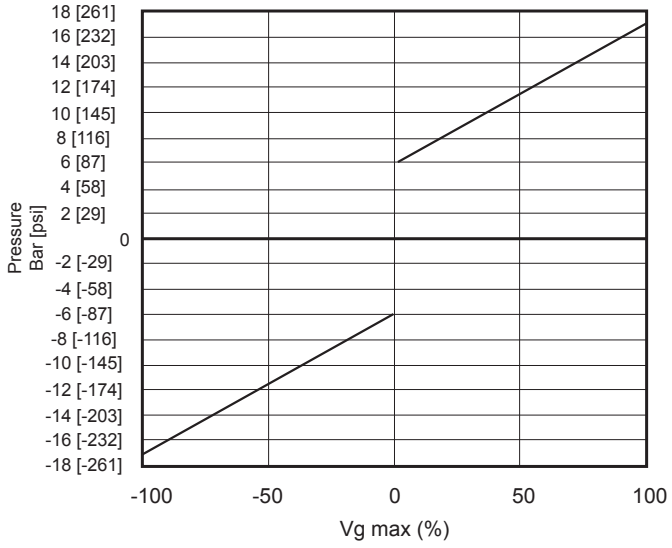


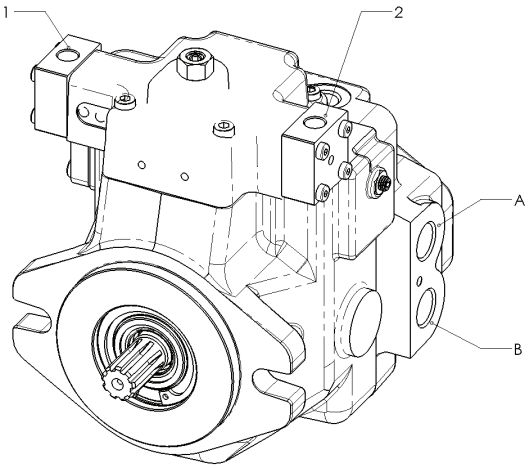
Pilot pressure = 6÷16 bar [87÷232 psi] (at ports a,b)

Start of control = 6 bar [87 psi]

End of control = 16 bar [232 psi] (Maximum displacement)

Max pressure = 30 bar [435 psi]

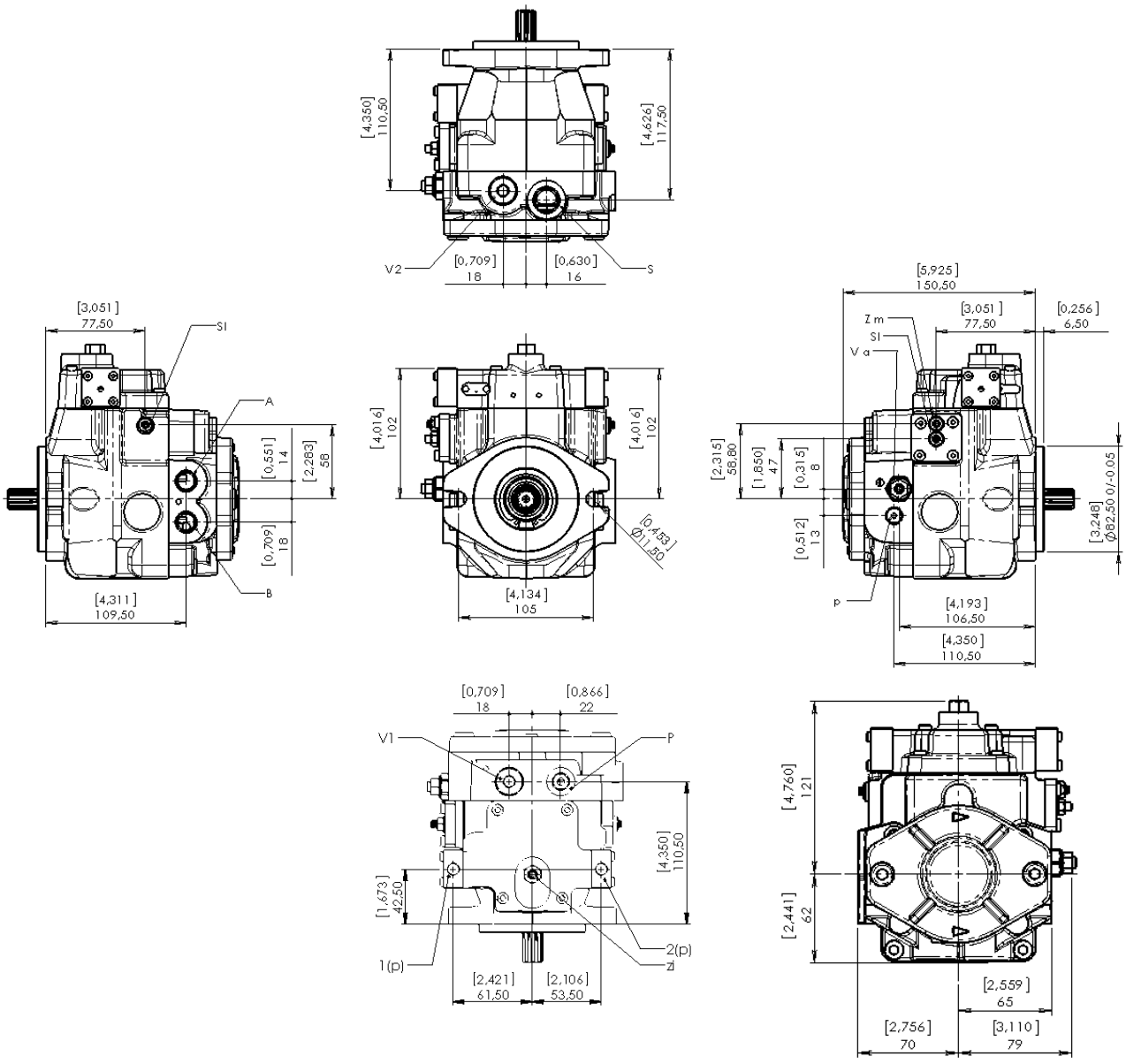




Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.

	PUMP FLOW DIRECTION	
SHAFT ROTATION	Piloting Pressure	Pressure Port
(L)	1	B
	2	A
(R)	1	A
	2	B

PUMP AND CONTROL DIMENSIONS - IRX

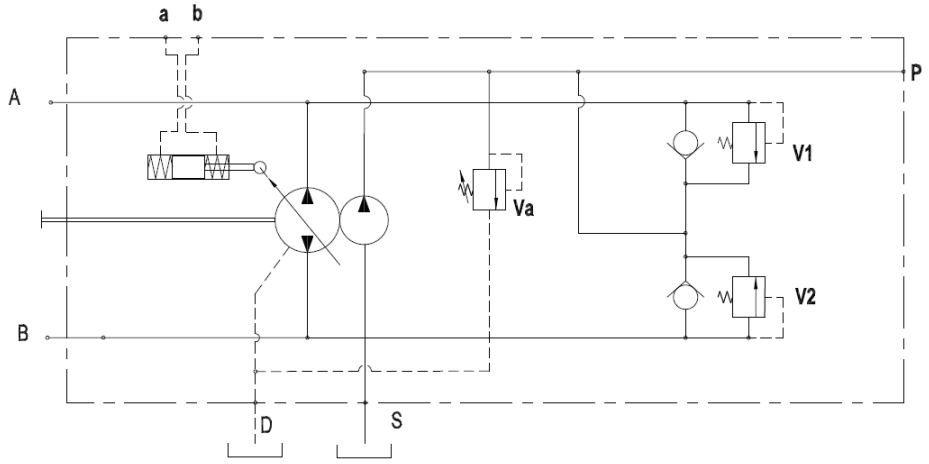


METRIC Version
A – B: Pressure ports – 3/8 G
D1 – D2: Drain port – 3/8 G
S: Suction port – ½ G
P: Charge pressure port – ¼ G
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
zi: Hydraulic zero regulation screw
1 – 2: Control piloting pressure port – 1/8" G

SAE Version
A – B: Pressure ports – 9/16-18 UNF-2B
D1 – D2: Drain port – 9/16-18 UNF-2B
S: Suction port – ¾-16 UNF-2B
P: Charge pressure port – 7/16-20 UNF-2B
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
zi: Hydraulic zero regulation screw
1 – 2: Control piloting pressure port – 3/8-24 UNF-2B

HYDRAULIC PROPORTIONAL WITHOUT FEED-BACK CONTROL - IND

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 a joystick or by a pressure reducing valve (not supplied).

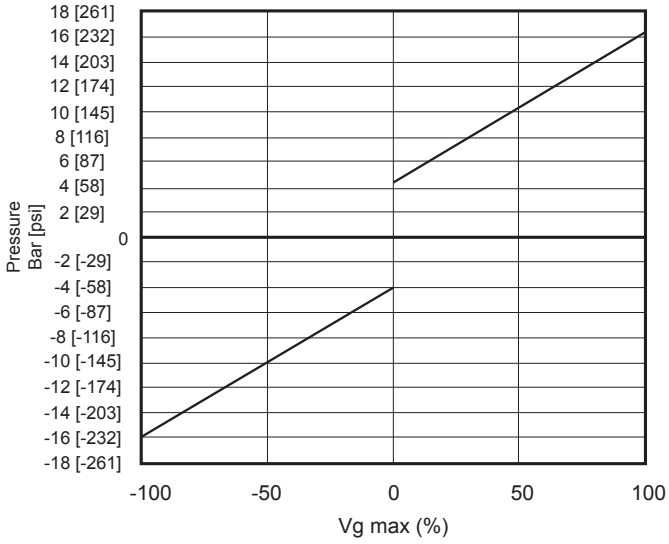


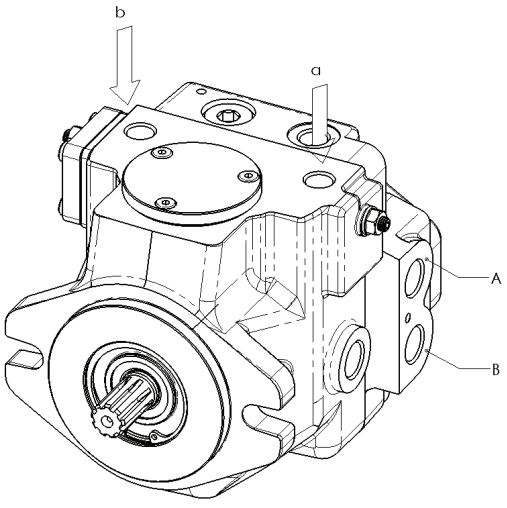
Pilot pressure = 4÷16 bar [58÷232 psi] (at ports a,b)

Start of control = 4 bar [58 psi]

End of control = 16 bar [232 psi] (Maximum displacement)

Max pressure = 30 bar [435 psi]

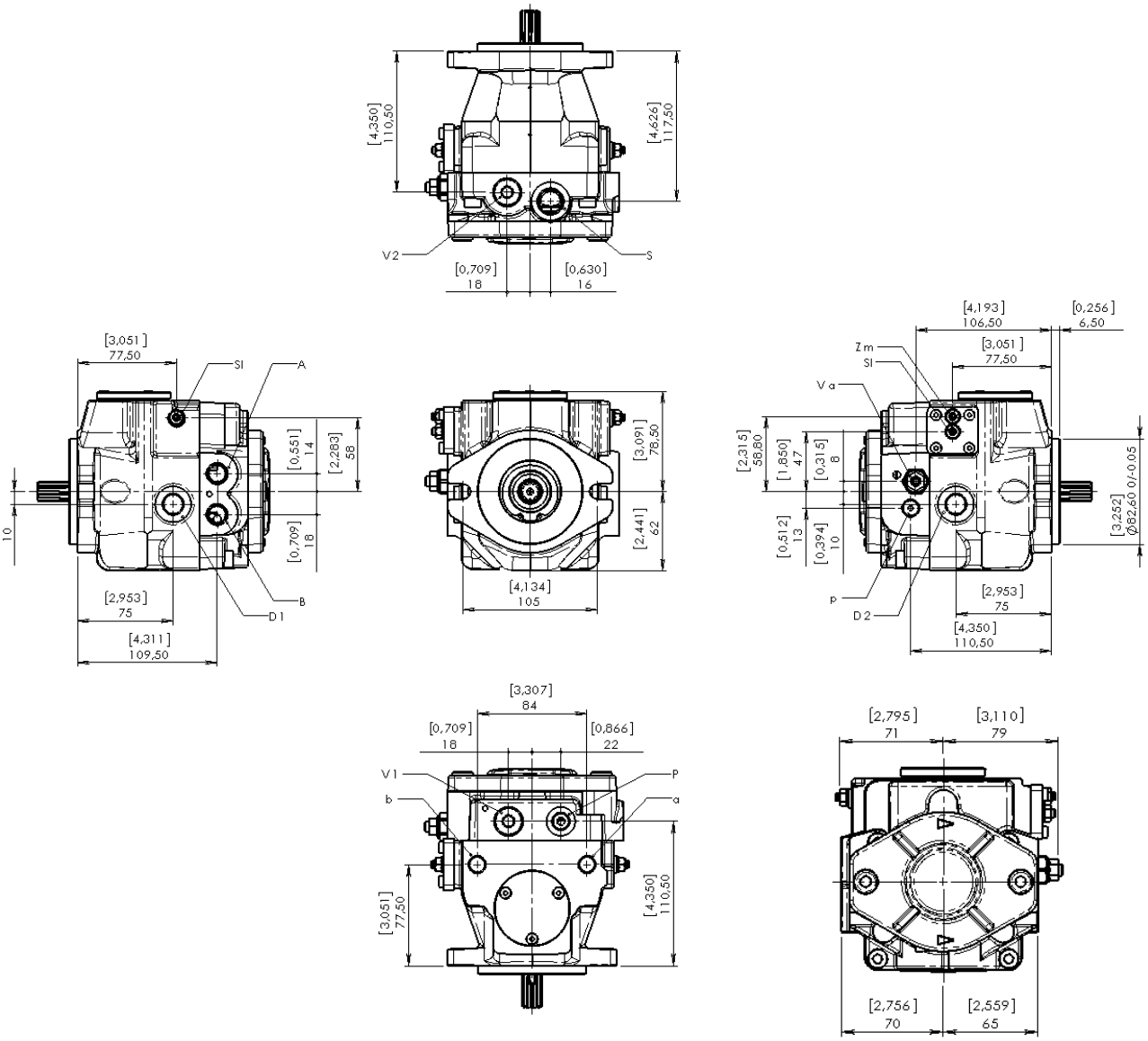




Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.

	PUMP FLOW DIRECTION	
SHAFT ROTATION	Control Rotation	Pressure Port
(L)	a	B
	b	A
(R)	a	A
	b	B

PUMP AND CONTROL DIMENSIONS - IND

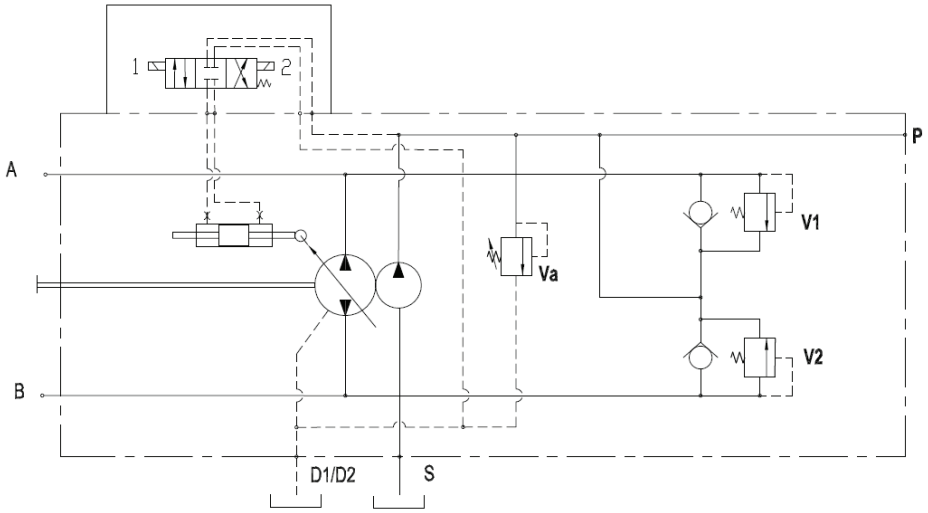


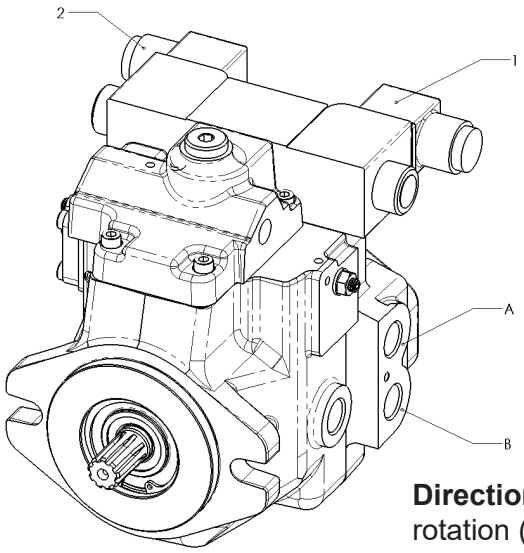
METRIC Version
A – B: Pressure ports – 3/8 G
D1 – D2: Drain port – 3/8 G
S: Suction port – ½ G
P: Charge pressure port – ¼ G
Va: Charge pump valve
V1 – V2: Maximum pressure valves
Sl: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – ¼ G

SAE Version
A – B: Pressure ports – 9/16-18 UNF-2B
D1 – D2: Drain port – 9/16-18 UNF-2B
S: Suction port – ¾-16 UNF-2B
P: Charge pressure port – 7/16-20 UNF-2B
Va: Charge pump valve
V1 – V2: Maximum pressure valves
Sl: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – 7/16-20 UNF-2B

ELECTRIC IMPULSE CONTROL - E12/E14

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 servo control is without zeroing spring, therefore the piston of the servo control stays in the position until a new input of current is fed to the solenoids. Flow direction depends on which solenoid is energised. Standard solenoids are ONOFF at 24V d.c. max. current 1A. (Optional solenoids 12V d.c. max. current 2A).

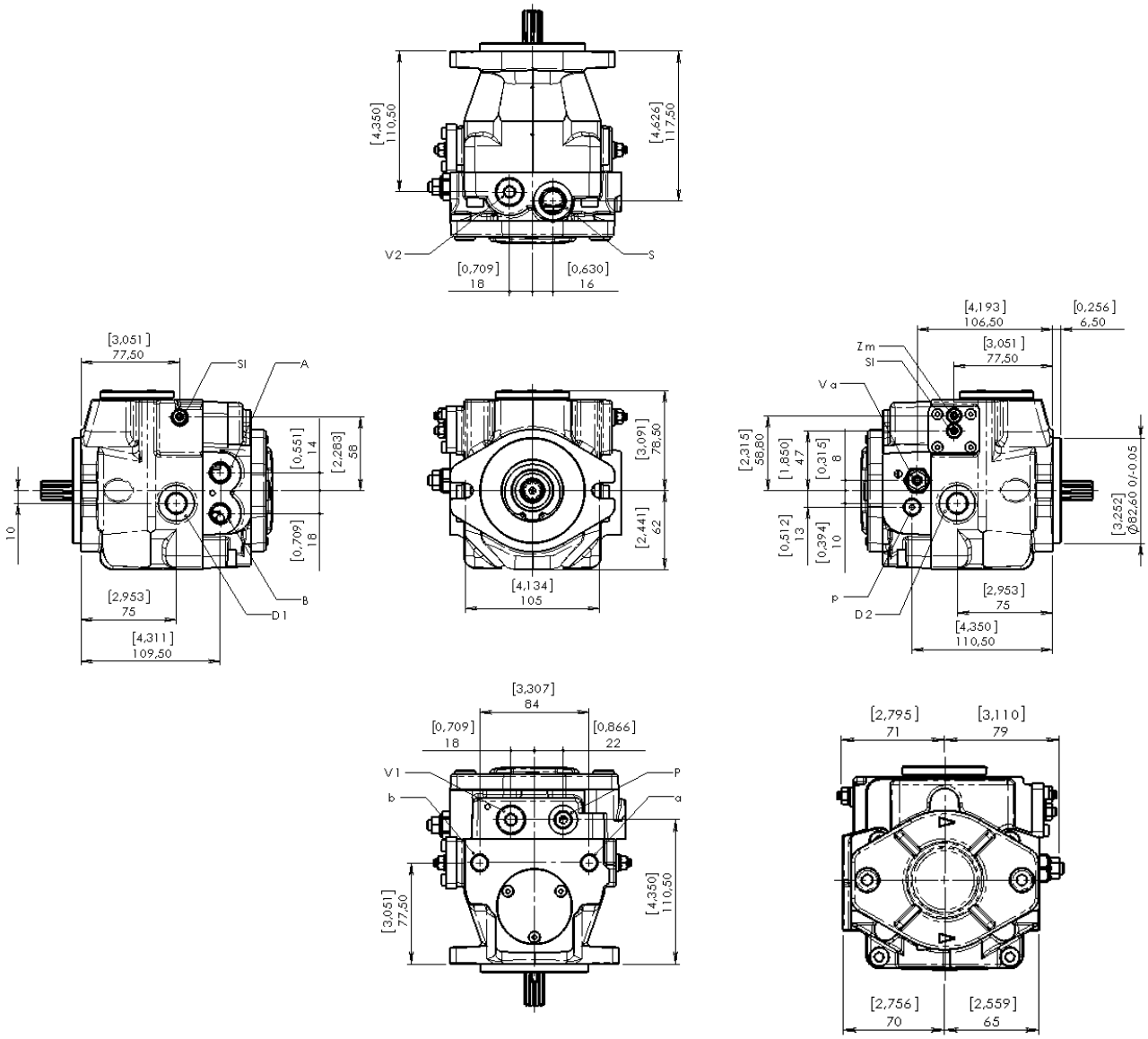




Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.

	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energised Solenoid	Pressure Port
(L)	1	A
	2	B
(R)	1	B
	2	A

PUMP AND CONTROL DIMENSIONS - E12/E14

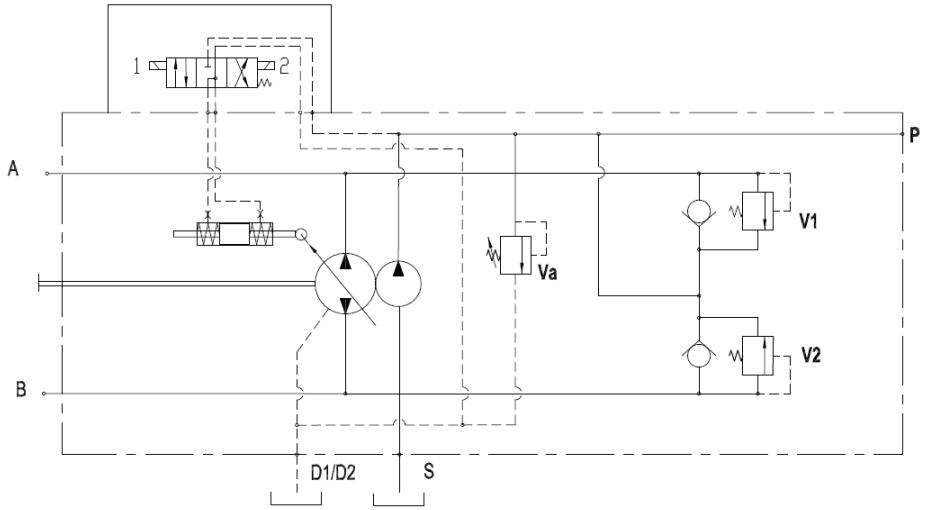


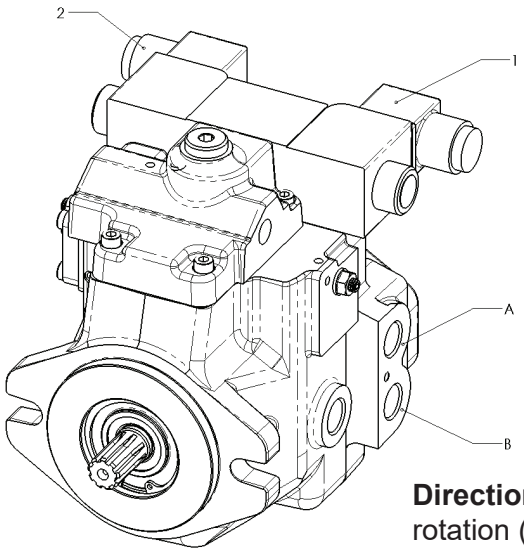
METRIC Version
A – B: Pressure ports – 3/8 G
D1 – D2: Drain port – 3/8 G
S: Suction port – ½ G
P: Charge pressure port – ¼ G
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – ¼ G

SAE Version
A – B: Pressure ports – 9/16-18 UNF-2B
D1 – D2: Drain port – 9/16-18 UNF-2B
S: Suction port – ¾-16 UNF-2B
P: Charge pressure port – 7/16-20 UNF-2B
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – 7/16-20 UNF-2B

ELECTRIC TWO POSITION ON-OFF - E22/E24

By switching on one of the ON-OFF solenoids (standard 24V d.c. optional 12V d.c.), the pump swivels to maximum displacement in the corresponding output flow direction. Switching off the stated solenoid will result in swivelling back the pump to zero displacement position.

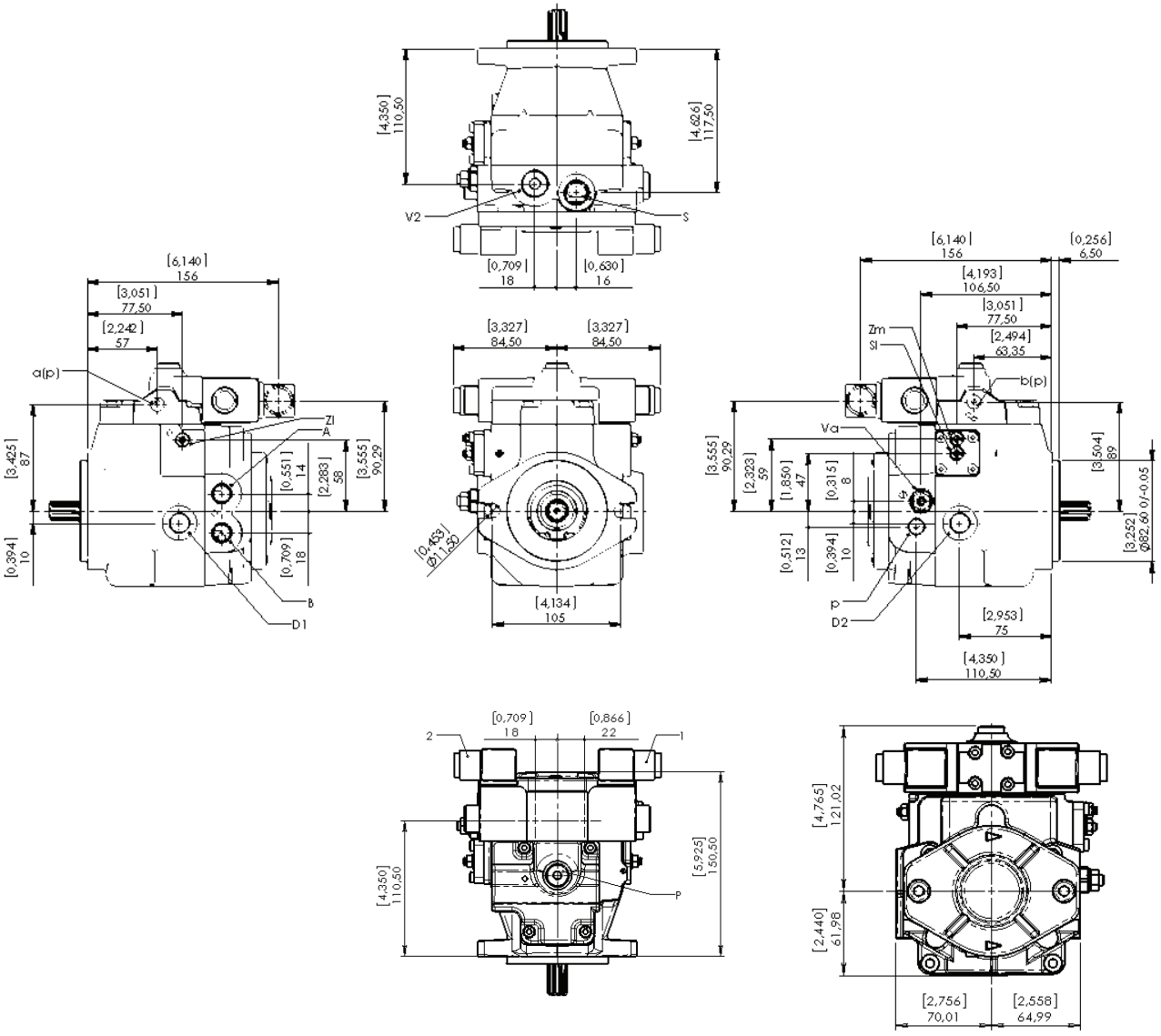




Direction of rotation: Correlation between direction of rotation (shaft view) control and direction of flow.

	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energised Solenoid	Pressure Port
(L)	1	A
	2	B
(R)	1	B
	2	A

PUMP AND CONTROL DIMENSIONS - E22/E24

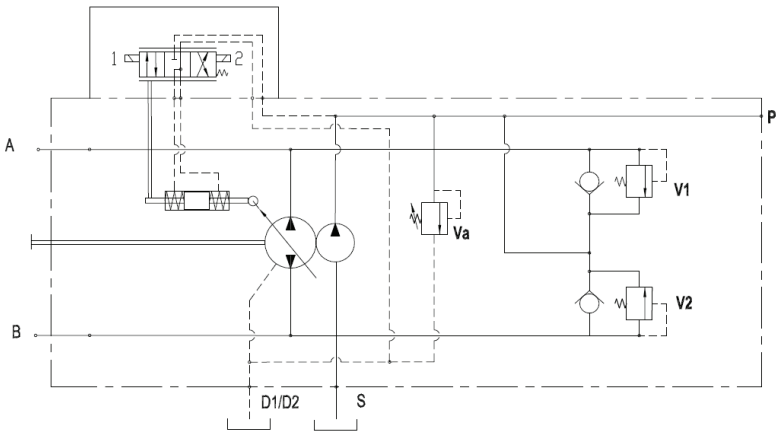


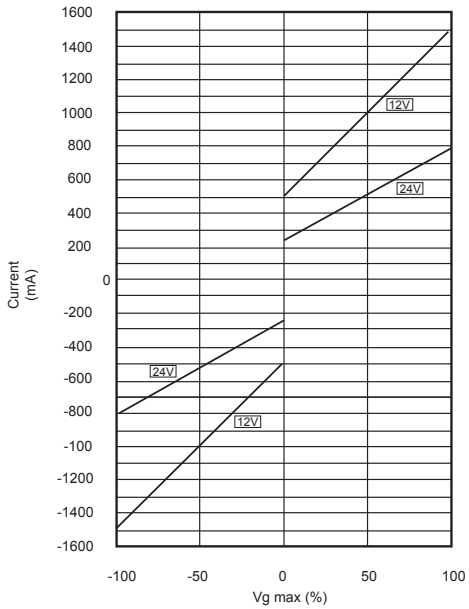
METRIC Version
A – B: Pressure ports – 3/8 G
D1 – D2: / Drain port – 3/8 G
S: Suction port – ½ G
P: Charge pressure port – ¼ G
Va: Charge pump valve
V1 – V2: Maximum pressure valves
Sl: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – ¼ G

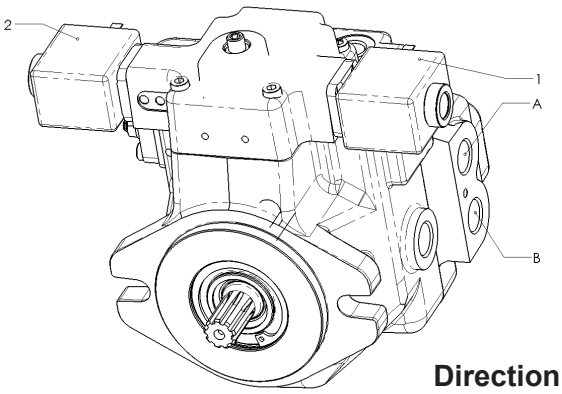
SAE Version
A – B: / Pressure ports – 9/16-18 UNF-2B
D1 – D2: Drain port – 9/16-18 UNF-2B
S: Suction port – ¾-16 UNF-2B
P: Charge pressure port – 7/16-20 UNF-2B
Va: Charge pump valve
V1 – V2: Maximum pressure valves
Sl: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – 7/16-20 UNF-2B

ELECTRIC PROPORTIONAL WITH FEED-BACK CONTROL - ER2/ER4

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 energised. Standard solenoids are proportional at 24V d.c. max. current 1A. (Optional solenoids 12V d.c. max. current 2A).







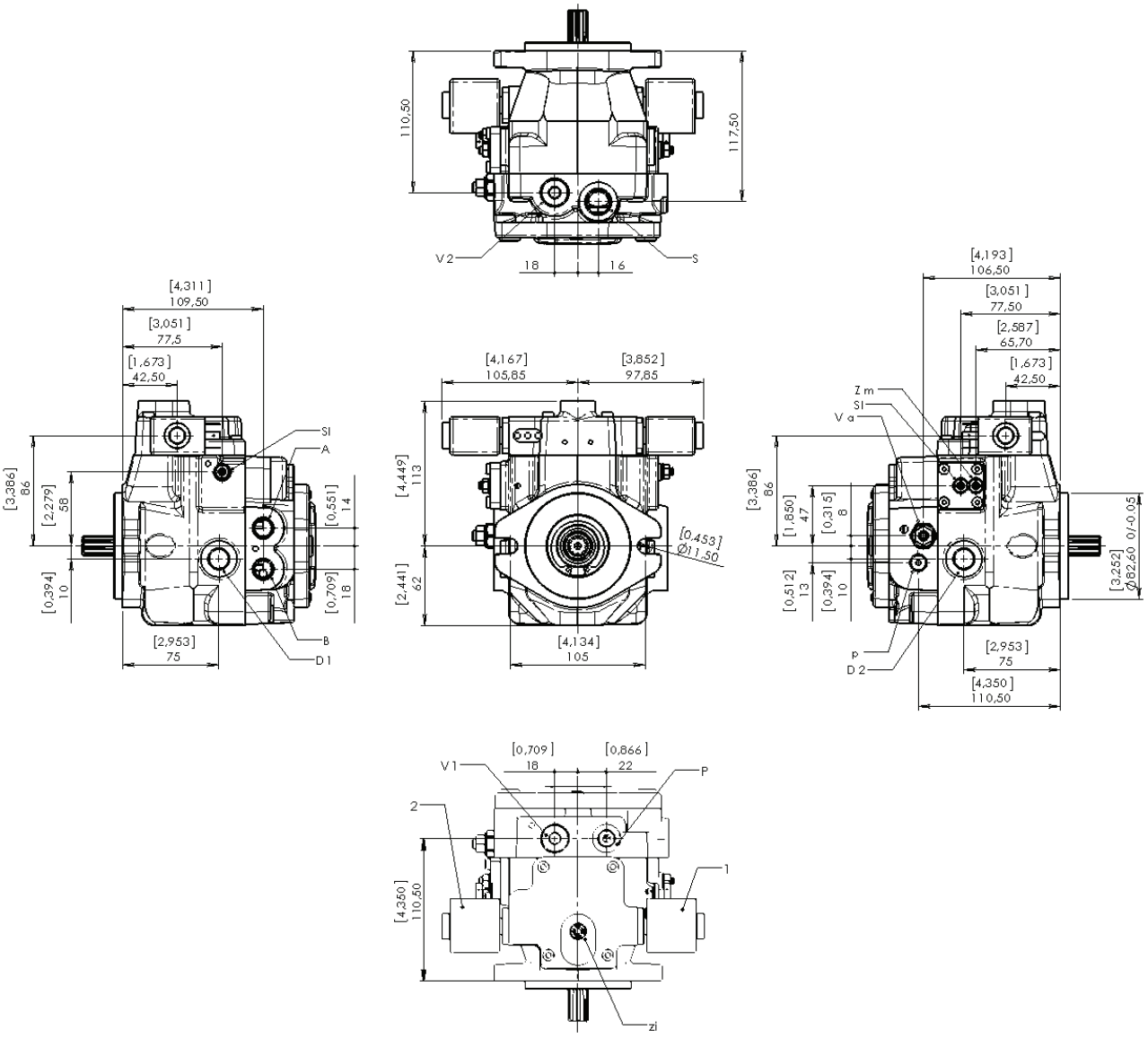
Solenoid 24V:
Current min. 240 mA max. 800 mA

Solenoid 12V:
Current min. 500 mA max. 1500 mA

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

	PUMP FLOW DIRECTION	
SHAFT ROTATION	Energised Solenoid	Pressure Port
(L)	1	B
	2	A
(R)	1	A
	2	B

PUMP AND CONTROL DIMENSIONS - ER2/ER4



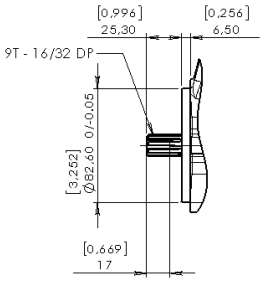
METRIC Version
A – B: Pressure ports – 3/8 G
D1 – D2: Drain port – 3/8 G
S: Suction port – ½ G
P: Charge pressure port – ¼ G
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – ¼ G

SAE Version
A – B: Pressure ports – 9/16-18 UNF-2B
D1 – D2: Drain port – 9/16-18 UNF-2B
S: Suction port – ¾-16 UNF-2B
P: Charge pressure port – 7/16-20 UNF-2B
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – 7/16-20 UNF-2B

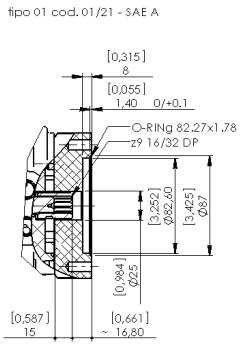
THROUGH DRIVES DIMENSIONS

SPLINE SHAFT

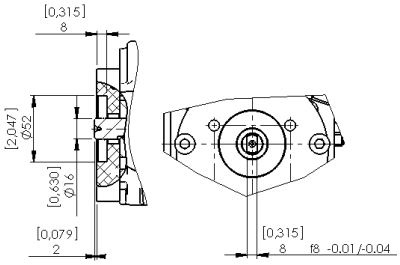
Type 1-2 - S T9



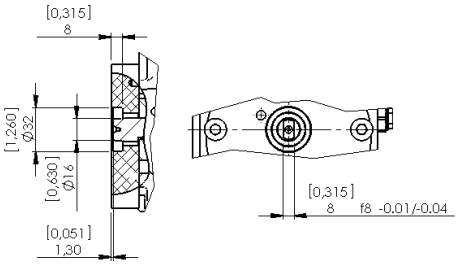
Type 1 - SAE-A



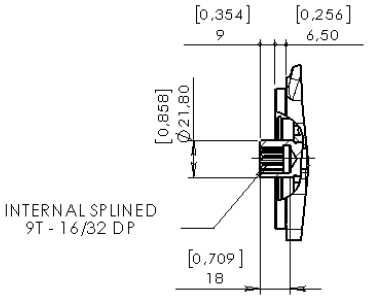
Type 2 - BOSCH GR2



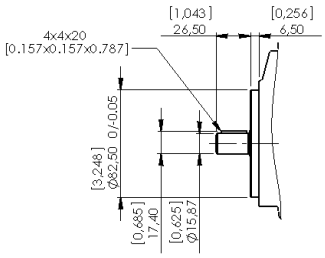
Type 2 - BOSCH GR1



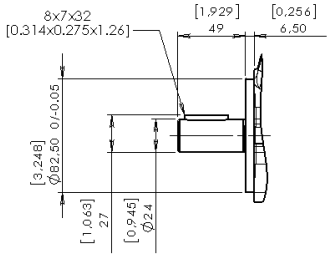
Type 4 - IS T9



Type 5 - ø15.88

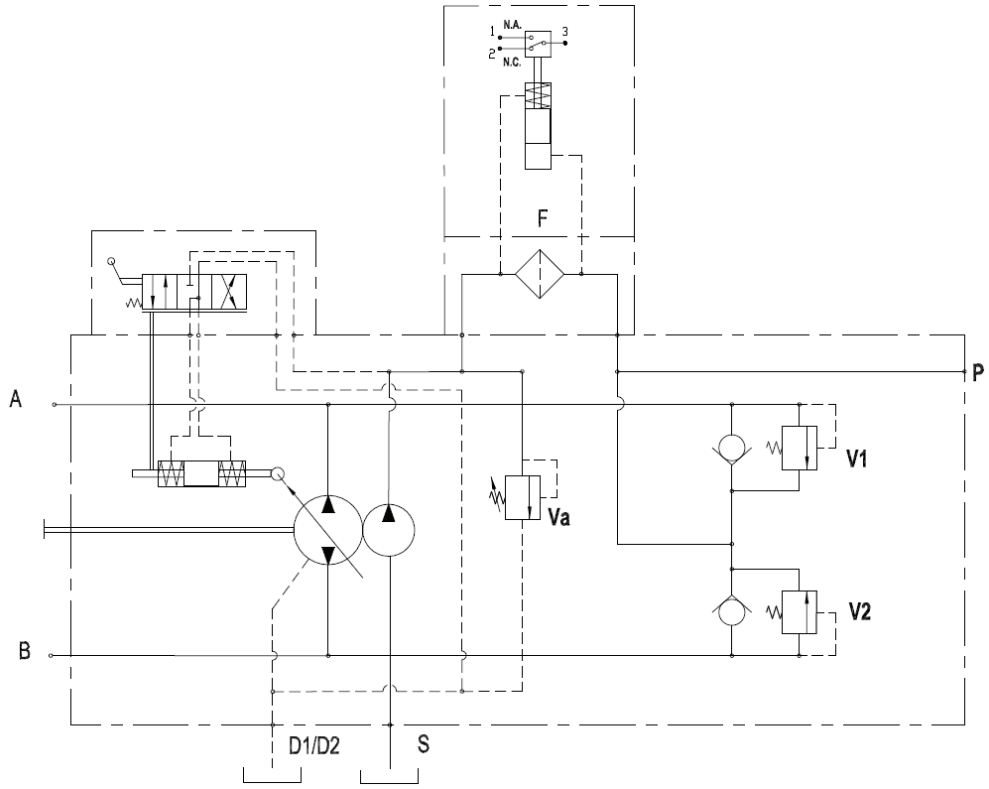


Type 6 - ø24



BOOSTER PUMP FILTER ON DELIVERY SIDE

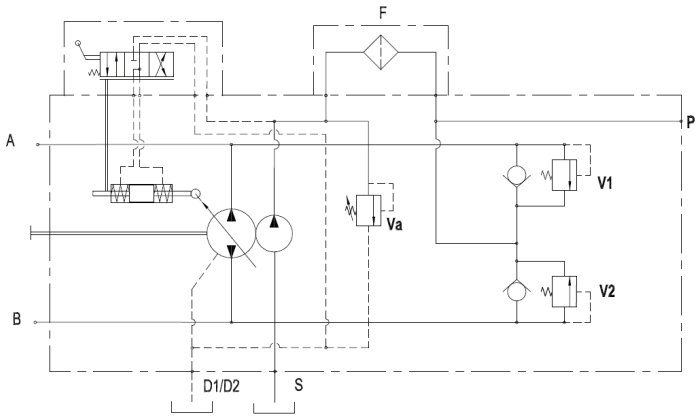
In order to guarantee an optimum stability of the fluid contamination conditions the “C” Series can be equiped with a filter positioned on the delivery outlet of the booster pump. Only the flow necessary to reintegrate the lost oil due to drainage will pass through this filter, all the excess flow, which is drained by the booster pump valve, is therefore not filtered, in this way it will guarantee a longer life of the filter. Upon request it is possible to add an electrical filter clogging sensor. (Connector DIN 43650A).

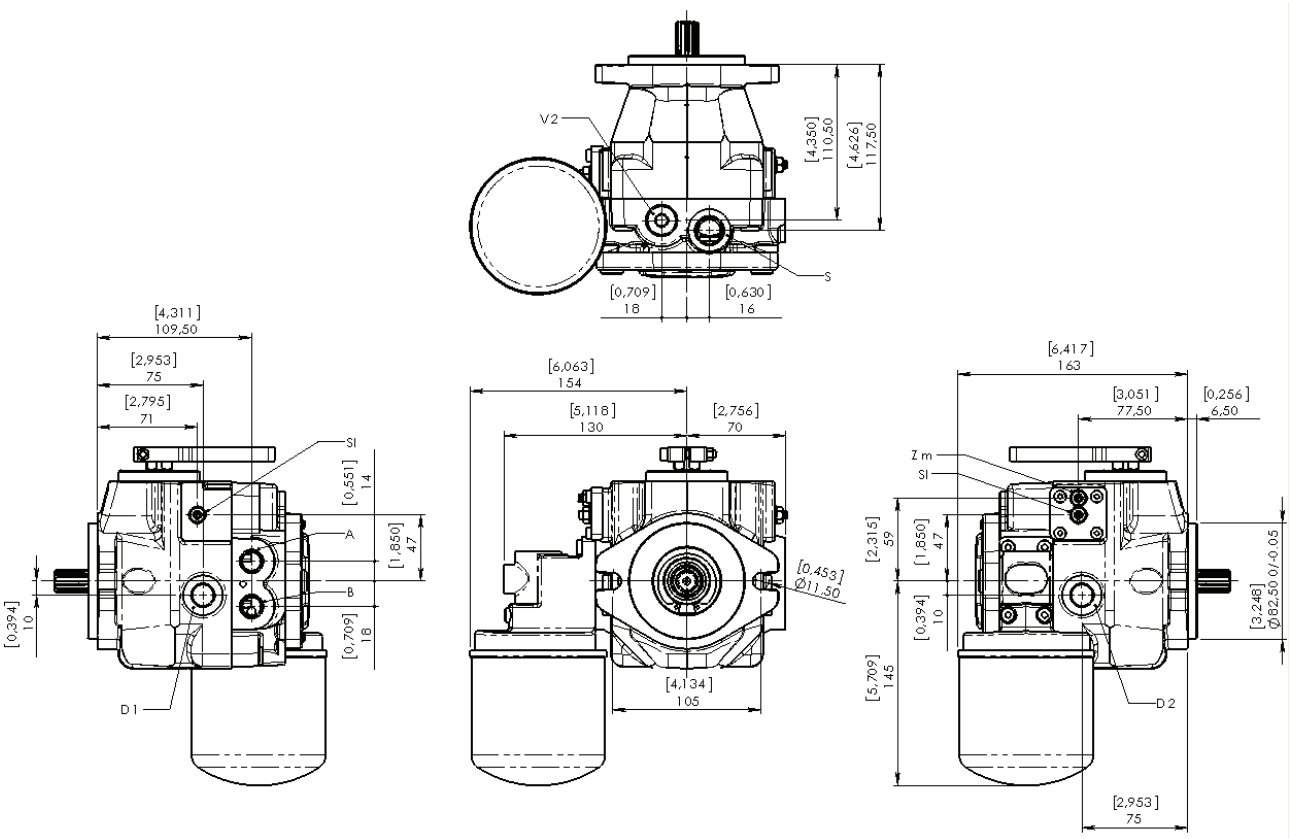


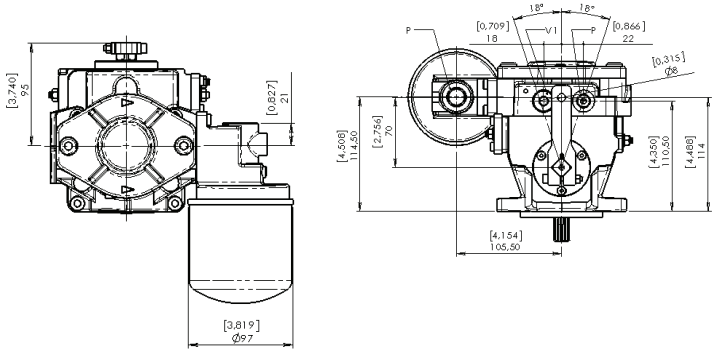
Electrical Sensor

SPDT	Max Resistive Load	Max Inductive Load
C.A.\ A.C. 125-250 V	1 A	1 A
C.C.\ D.C. 30 V	2A	2A
C.C.\ D.C. 50 V	0.5 A	0.5 A
C.C.\ D.C. 75 V	0.25 A	0.25A
C.C.\ D.C. 125 V	0.2 A	0.2 A

ACCESSORIES AND FILTER DIMENSIONS

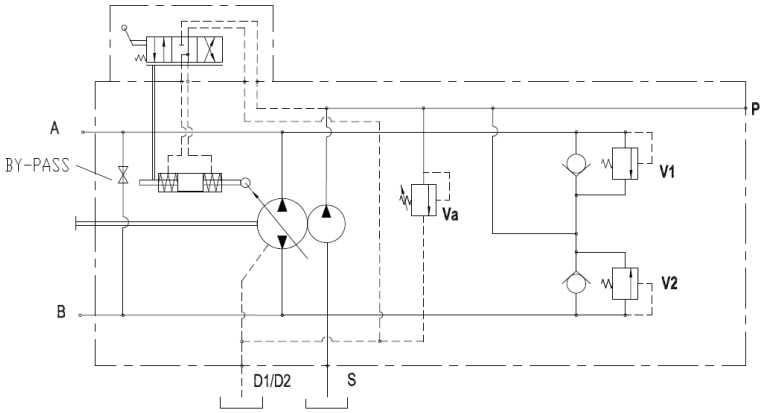


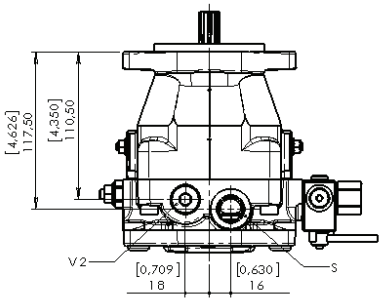


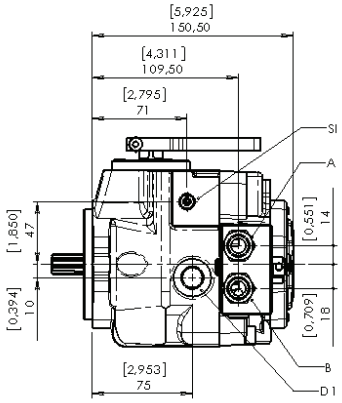


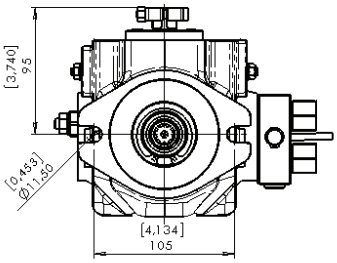
BY-PASS

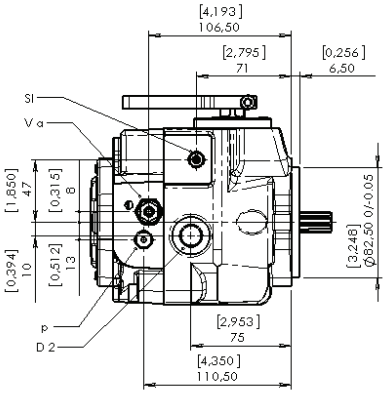
The By-Pass valve is a tap inside the pump that allows, if necessary, to connect the pressure port line A and B.

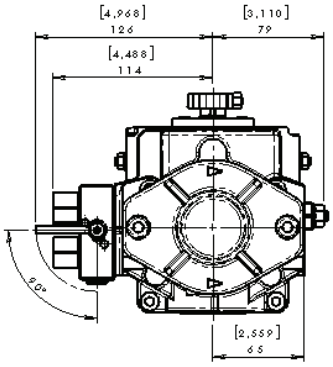


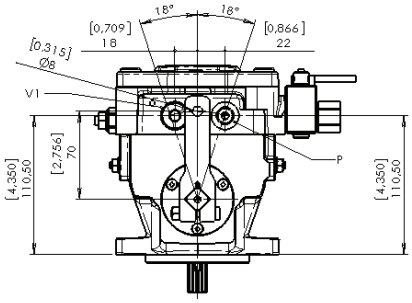






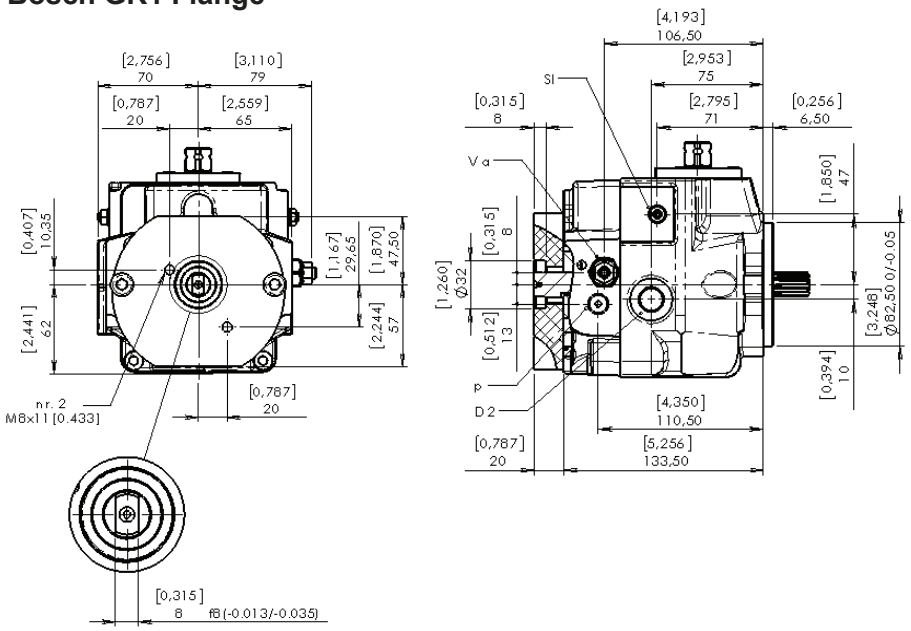




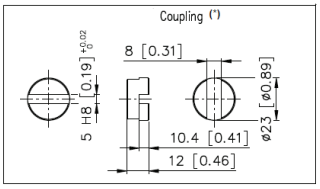


THROUGH DRIVES DIMENSIONS

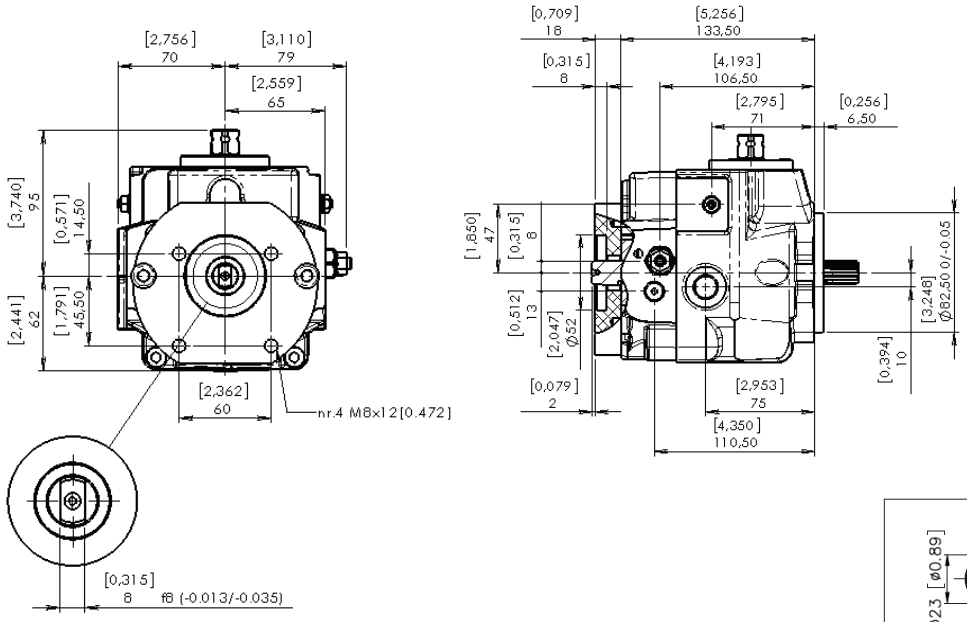
Bosch GR1 Flange



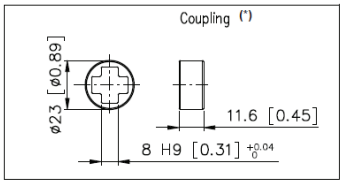
(*)Coupling not supplied



Bosch GR2 Flange

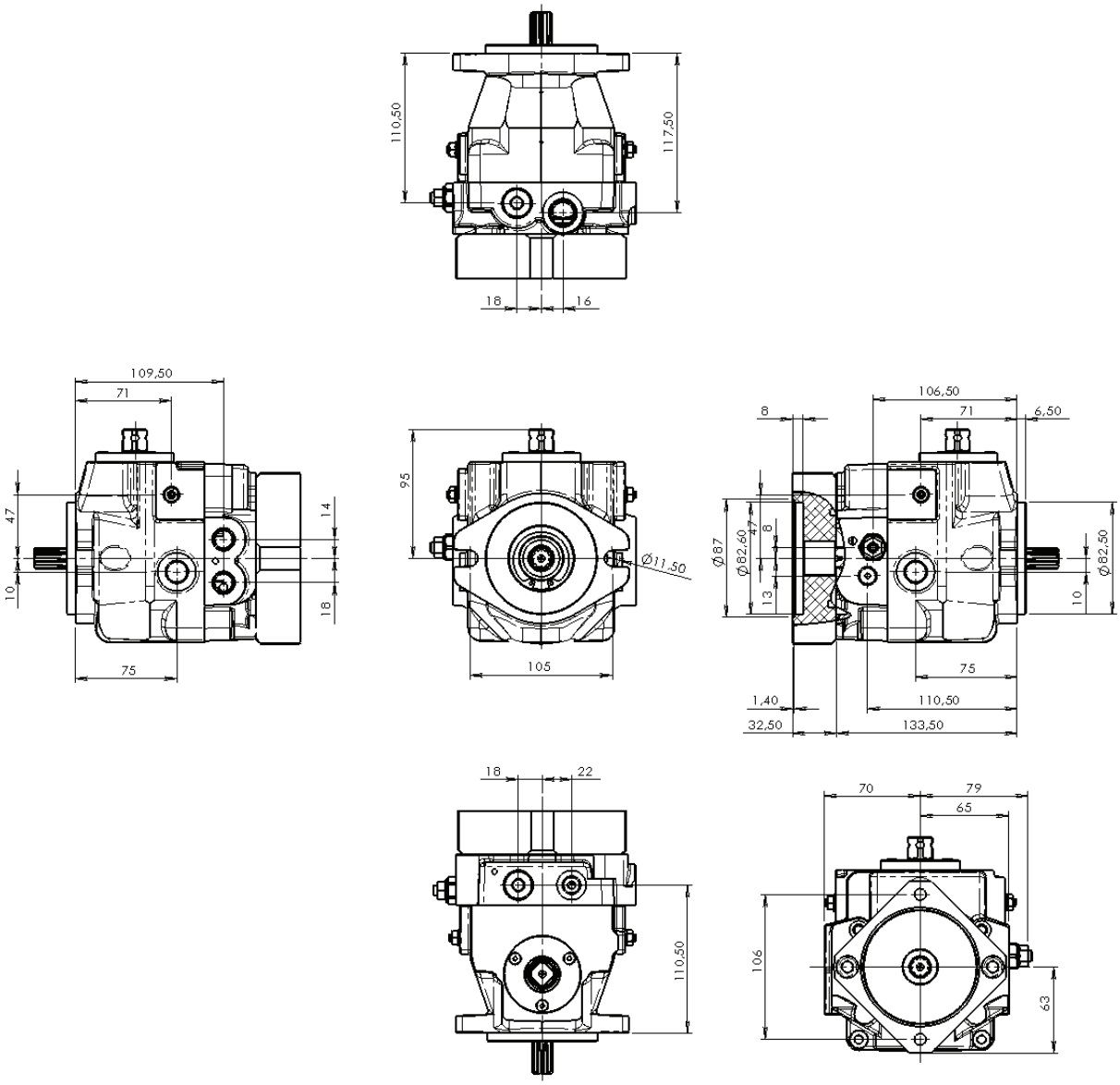


(*)Coupling not supplied



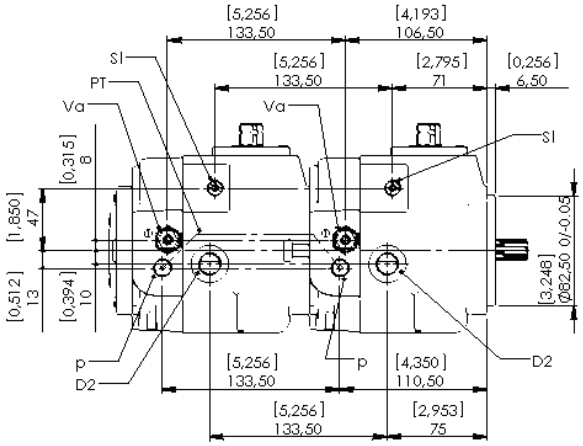
THROUGH DRIVES DIMENSIONS

SAE A Flange



COMBINATION PUMP DIMENSIONS - SHORT VERSION

TANDEM C1 14/18 + C1 14/18
SHORT VERSION



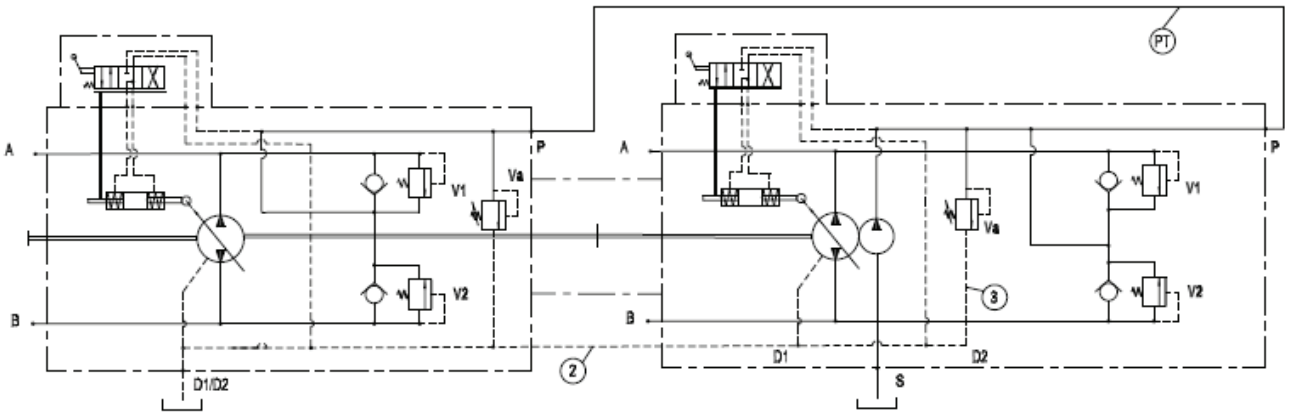
Configuration	C1 14/18 + C1 14/18	
Pump	1st	2nd
Shafts	1	3 or 4(1)

With this configuration, only the second pump mount the boost pump.

(1) 3 - Internal splined shaft 9T - 16/32 - DP (Through drive Bosch)
4 - Internal splined shaft 9T - 16/32 - DP

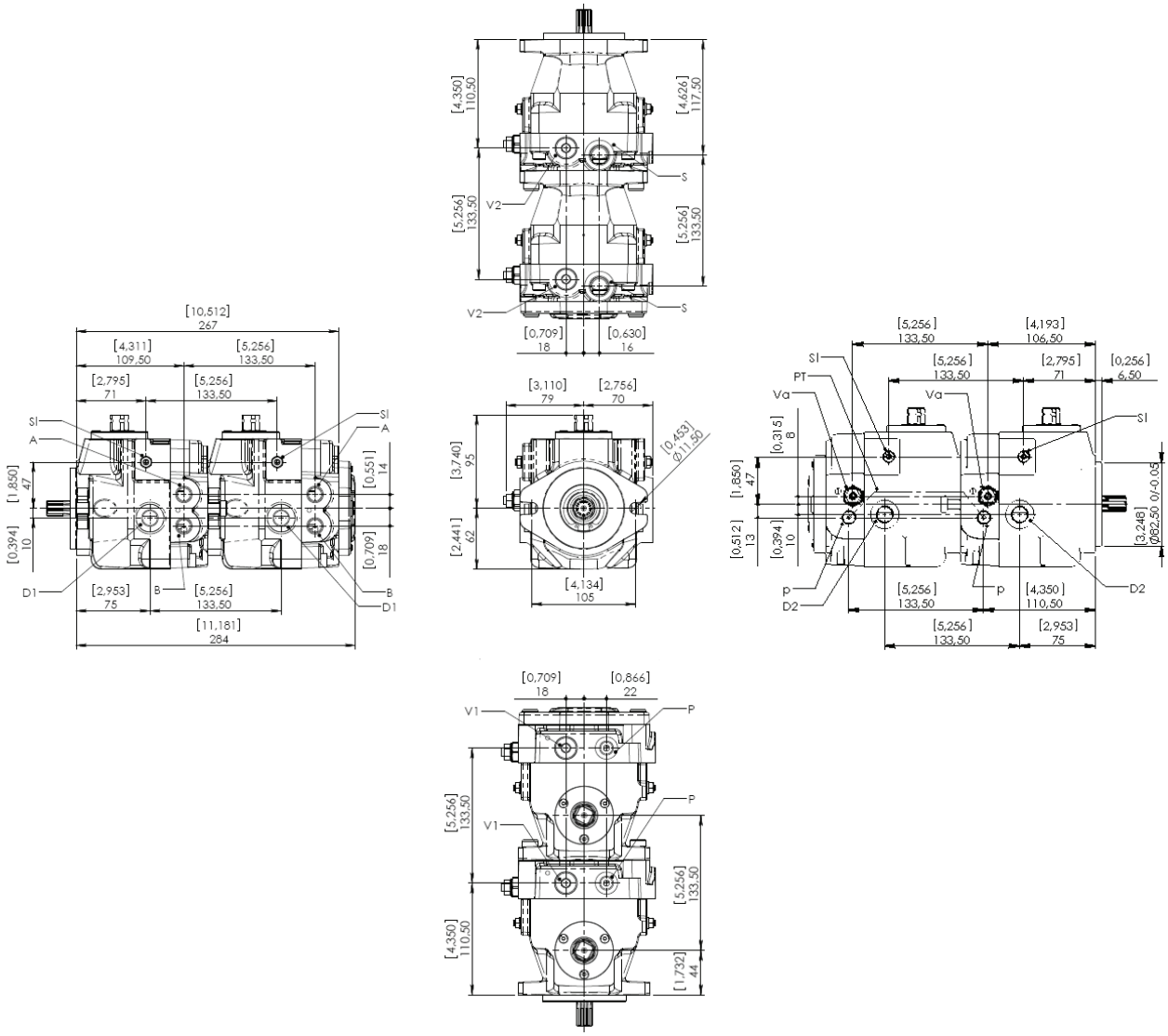
Warning: When ordering a tandem pump it is necessary to indicate for each pump the kind of shaft and the through drive option required.

SHORT VERSION TANDEM (TS) HYDRAULIC LAYOUT



The hose (PT) used to connect the charge pressure ports (P) is supplied with the units. The hoses (2) and (3) connecting the drain ports must be supplied and mounted by the customer.

COMBINATION PUMP DIMENSIONS - SHORT VERSION

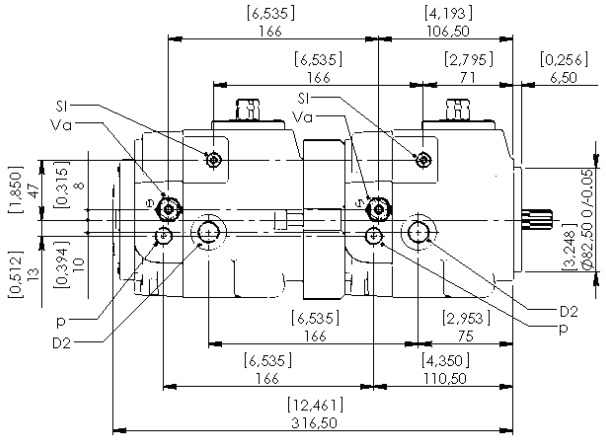


METRIC Version
A – B: Pressure ports – 3/8 G
D1 – D2: Drain port – 3/8 G
S: Suction port – ½ G
P: Charge pressure port – ¼ G
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – ¼ G

SAE Version
A – B: Pressure ports – 9/16-18 UNF-2B
D1 – D2: Drain port – 9/16-18 UNF-2B
S: Suction port – ¾-16 UNF-2B
P: Charge pressure port – 7/16-20 UNF-2B
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – 7/16-20 UNF-2B

COMBINATION PUMP DIMENSIONS - LONG VERSION

TANDEM C1 14/18 + C1 14/18

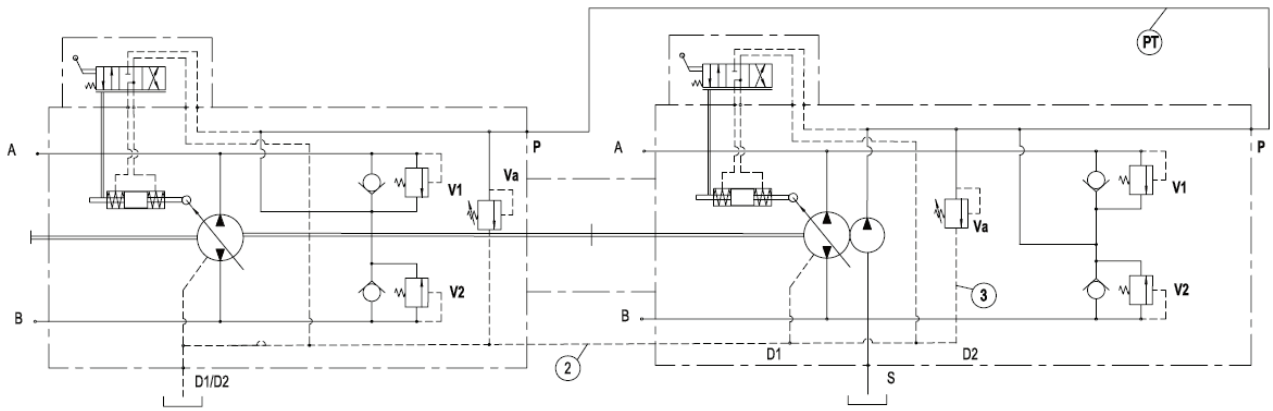


Shafts for combination pumps

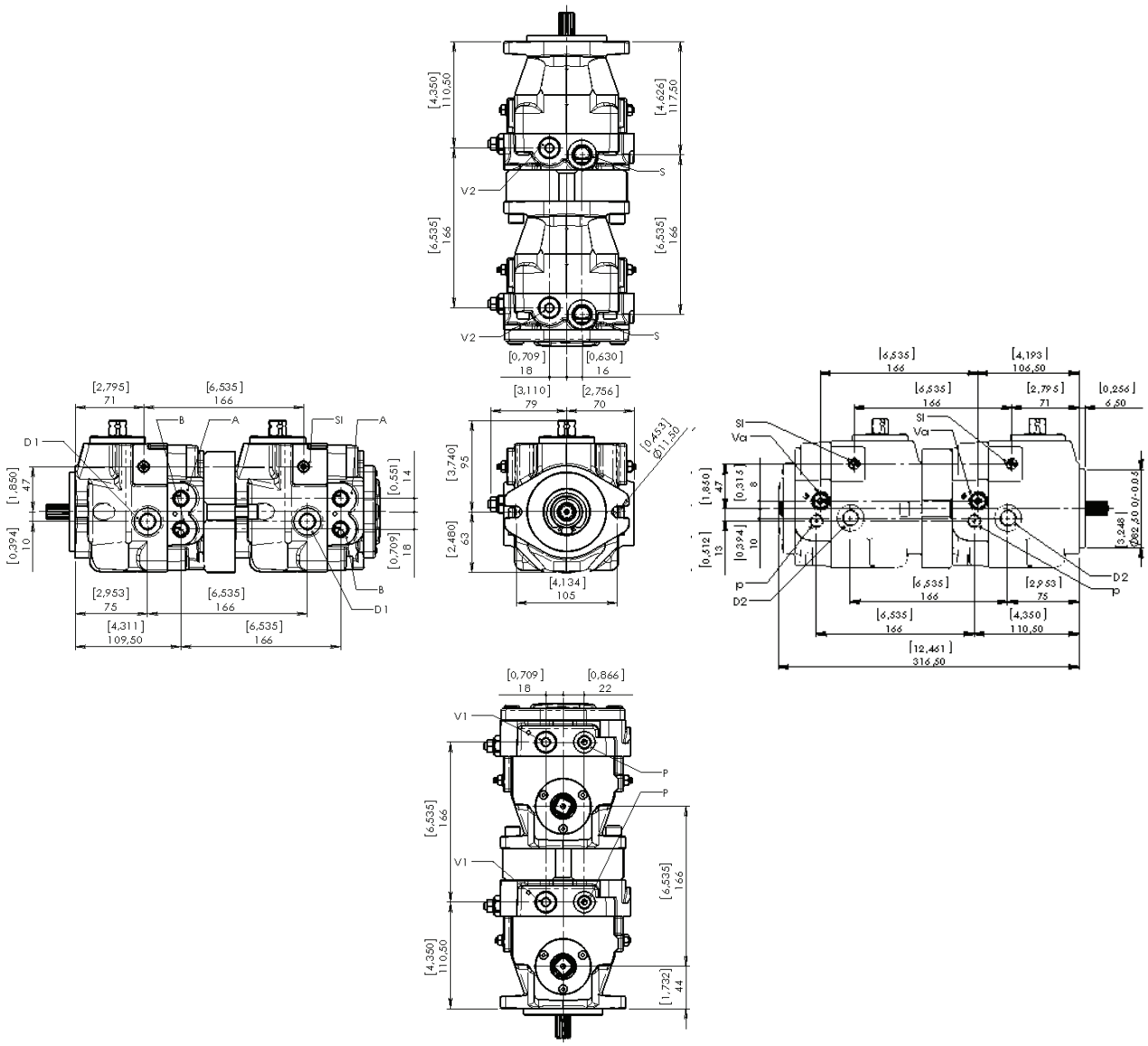
Configuration	C1 14/18 + C1 14/18	
Pump	1st	2nd
Shafts	1	1 or 2(1)

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

(1) 1 - Splined shaft 9T - 16/32 - DP (Through drive SAE A)
2 - Splined shaft 9T - 16/32 - DP (Through drive Bosch)



COMBINATION PUMP DIMENSIONS - LONG VERSION



METRIC Version
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D1 – D2: Drain port – 3/8 G
S: Suction port – ½ G
P: Charge pressure port – ¼ G
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – ¼ G

SAE Version
A – B: Pressure ports – 9/16-18 UNF-2B
D1 – D2: Drain port – 9/16-18 UNF-2B
S: Suction port – ¾-16 UNF-2B
P: Charge pressure port – 7/16-20 UNF-2B
Va: Charge pump valve
V1 – V2: Maximum pressure valves
SI: Stroke limiter
Zm: Mechanical zero adjustment screw
a – b: Control piloting pressure port – 7/16-20 UNF-2B