

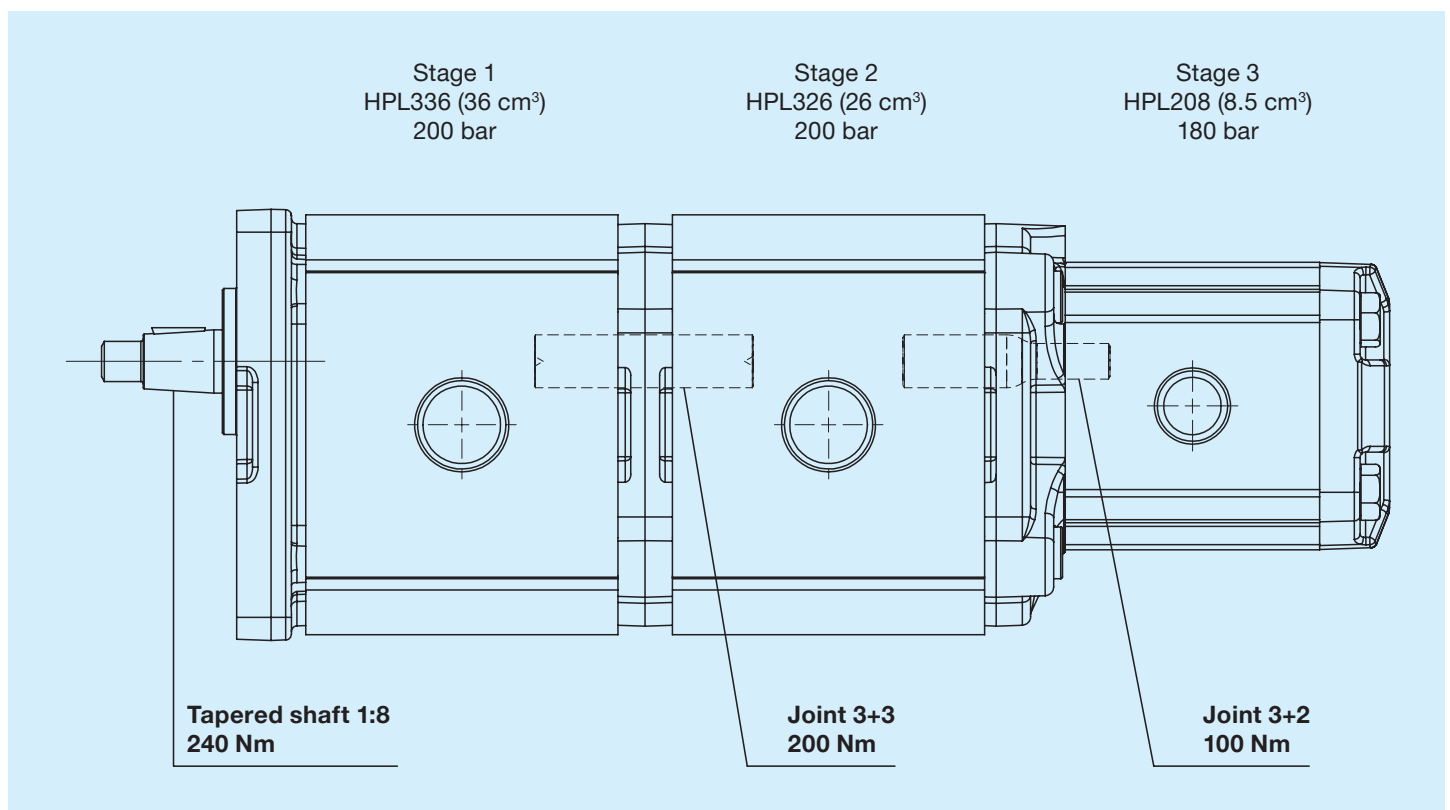
HPL - HPG Series multiple pumps



Introduction HPL + HPL multiple pumps are combinations of two or more sections driven by a single shaft. The sections making up the multiple pump are driven by splined joints. This multiple pump configuration can have inlet and delivery for each stage or, where possible, a single inlet and several deliveries. For individual sections, the values given in the catalogue apply, with some pressure limitations depending on the maximum torque of the drive joint and the shaft profile.

The maximum speed of a multiple pump is the lowest maximum speeds of the individual stages.

A useful example for correctly dimensioning the torque that can be transmitted to the shaft profile and for each individual stage of a group 3 + group 3 + group 2 triple pump at a given operating pressures on each stage is provided below.



Triple pump example HPLPC336D32G7G71326G6G6208G4G4SG

The formula for calculating the torque to be used is:

$$M = \frac{\Delta p \cdot c}{62,83 \cdot \eta_m} \quad [Nm]$$

where:

- M** = Torque (Nm)
- Δp** = Pressure (bar)
- c** = Pump displacement (cm³)
- 62,83** = Conversion factor
- η_m** = Mechanical efficiency = 0.9

The calculation is made out from the last stage of the pump up to the primary shaft. In all stages, the resulting calculated torque must be less than or equal to the maximum permissible torque for each drive joint, including the profile of the pump shaft.

Stage 3:

Group 2, displacement 8.5 cm³, operating pressure 180 bar.

$M_3 = 27.06 \text{ Nm}$.

The joint 2 condition is met (maximum limit 100 Nm).

Stage 2:

Group 3, displacement 26 cm³, operating pressure 200 bar.

$M_2 = 91.96 \text{ Nm}$.

$M_3 + M_2 = 119.02 \text{ Nm}$.

The joint condition 1 is met (maximum limit 200 Nm).

Stage 1:

Group 3, displacement 36 cm³, operating pressure 200 bar.

$M_1 = 127.32 \text{ Nm}$.

$M_3 + M_2 + M_1 = 246.34 \text{ Nm}$.

The drive shaft condition is NOT met (maximum limit 240 Nm).

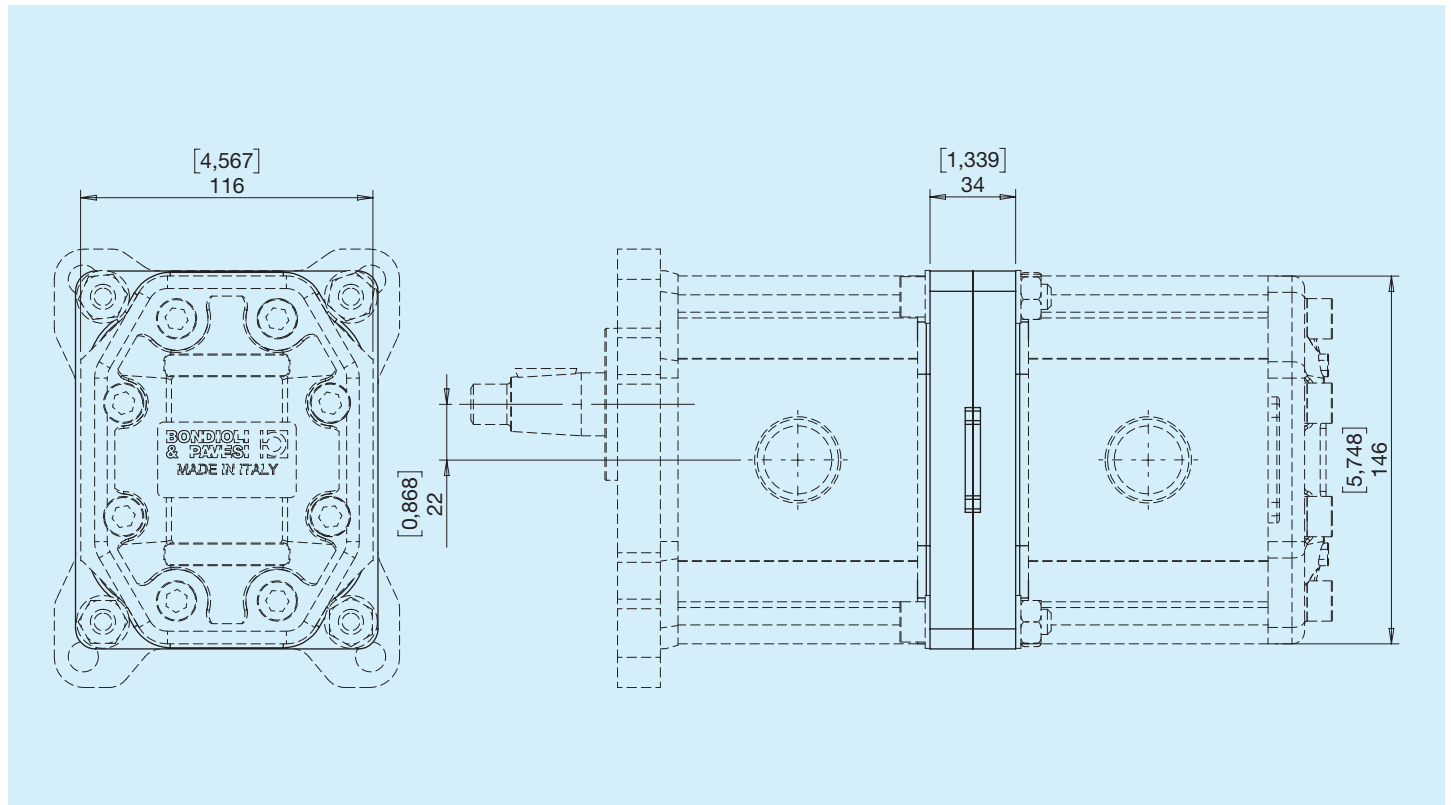
The operating pressure or displacement must be lowered, assuming the operating pressure 180 bar $M_1 = 114.59 \text{ Nm}$.

$M_3 + M_2 + M_1 = 233.61 \text{ Nm}$.

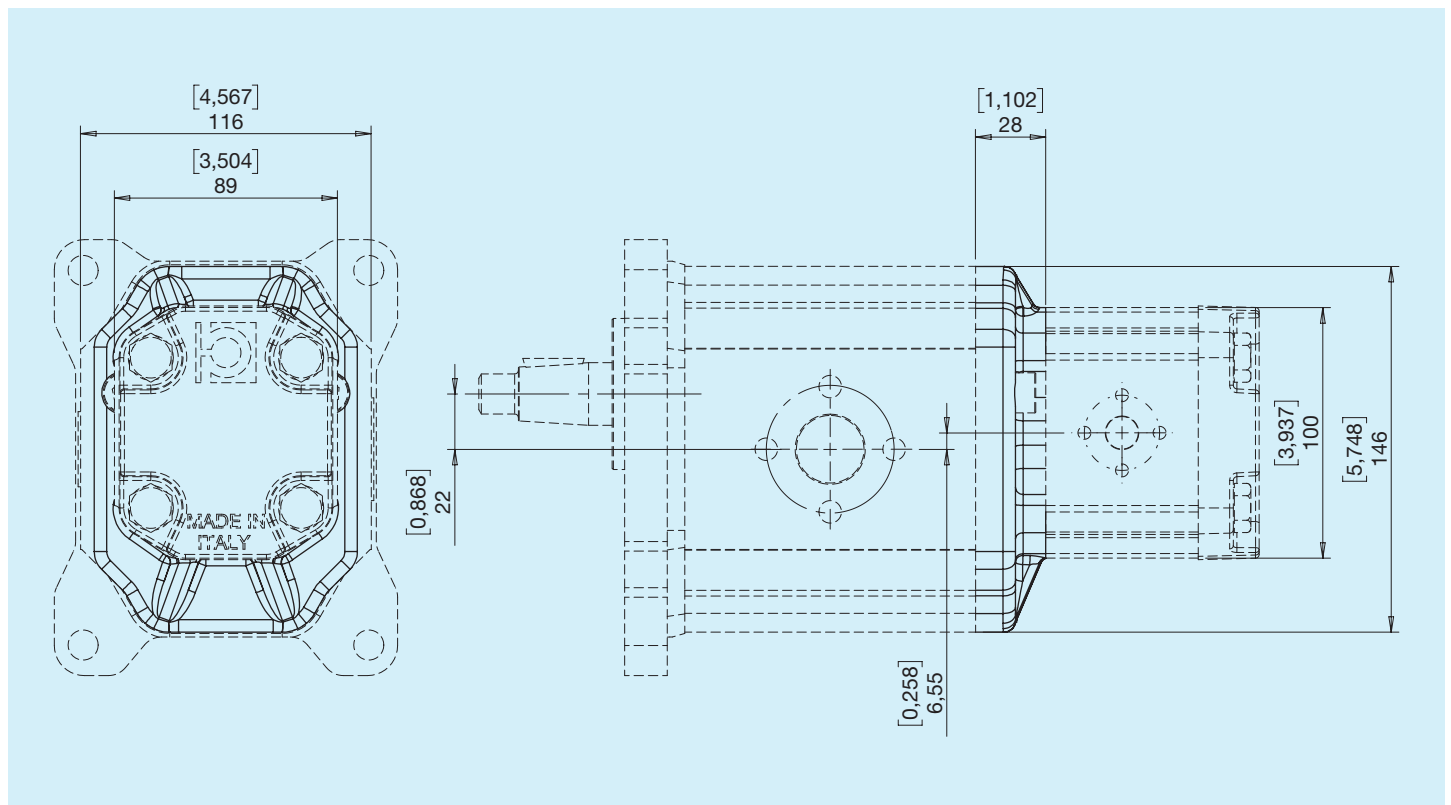
The drive shaft condition is met (maximum limit 240 Nm).

Coupling joint	Maximum transmitted torque
HPLP3 + HPLP3	200 Nm
HPLP3 + HPLP2 HPLP2 + HPLP2	100 Nm
HPLP3 + HPLP1 HPLP2 + HPLP1 HPLP1 + HPLP1	30 Nm

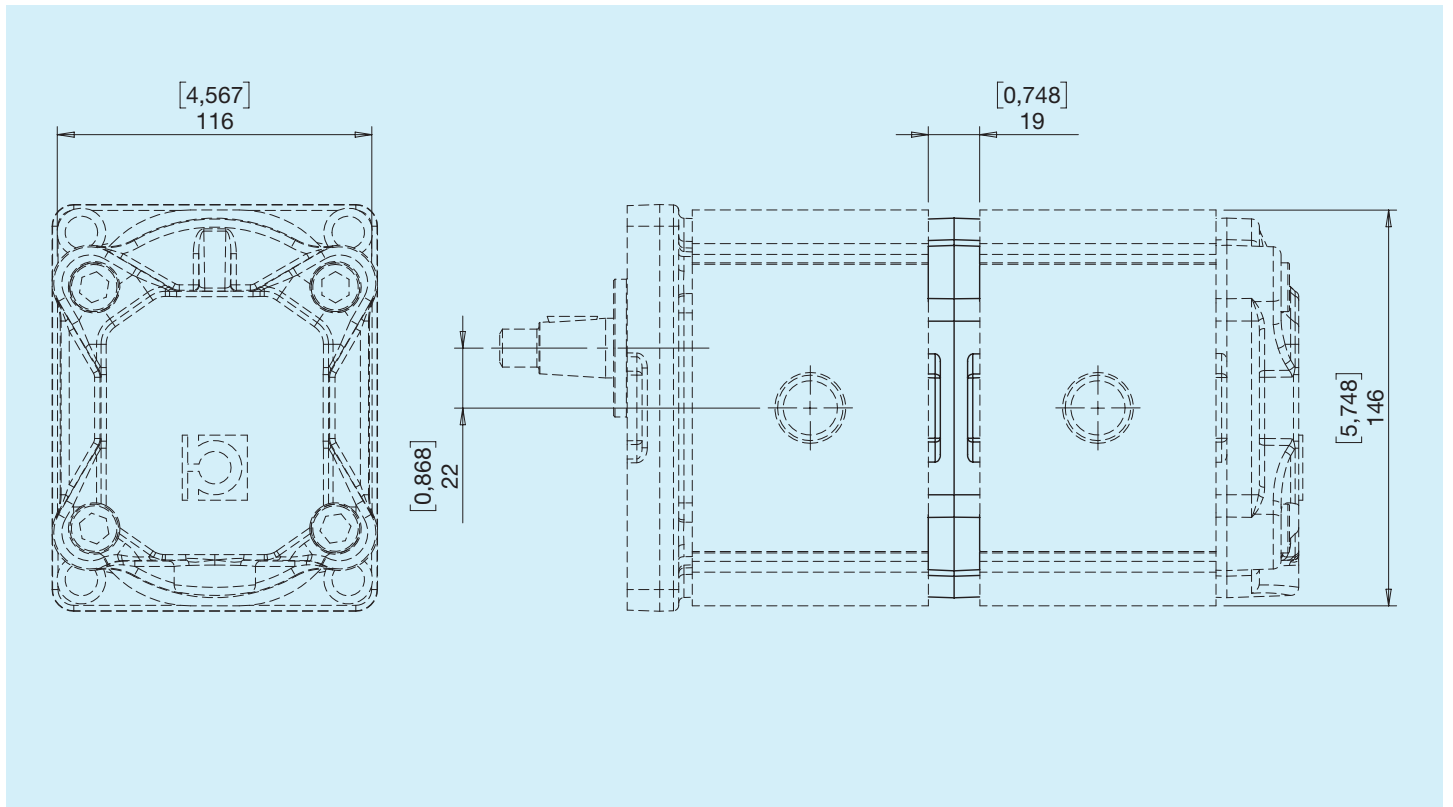
HPLP4 + HPLP4



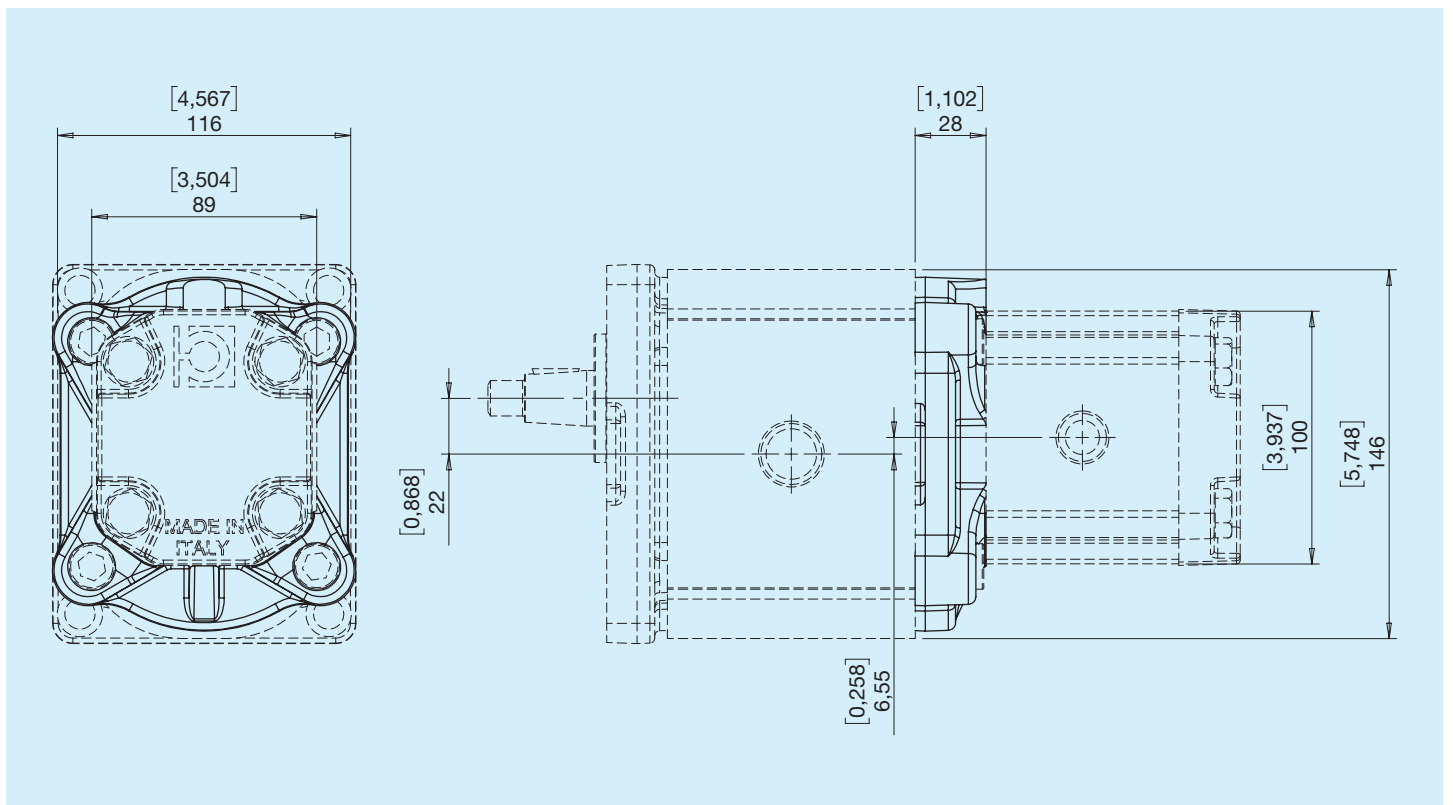
HPLP4 + HPLP2



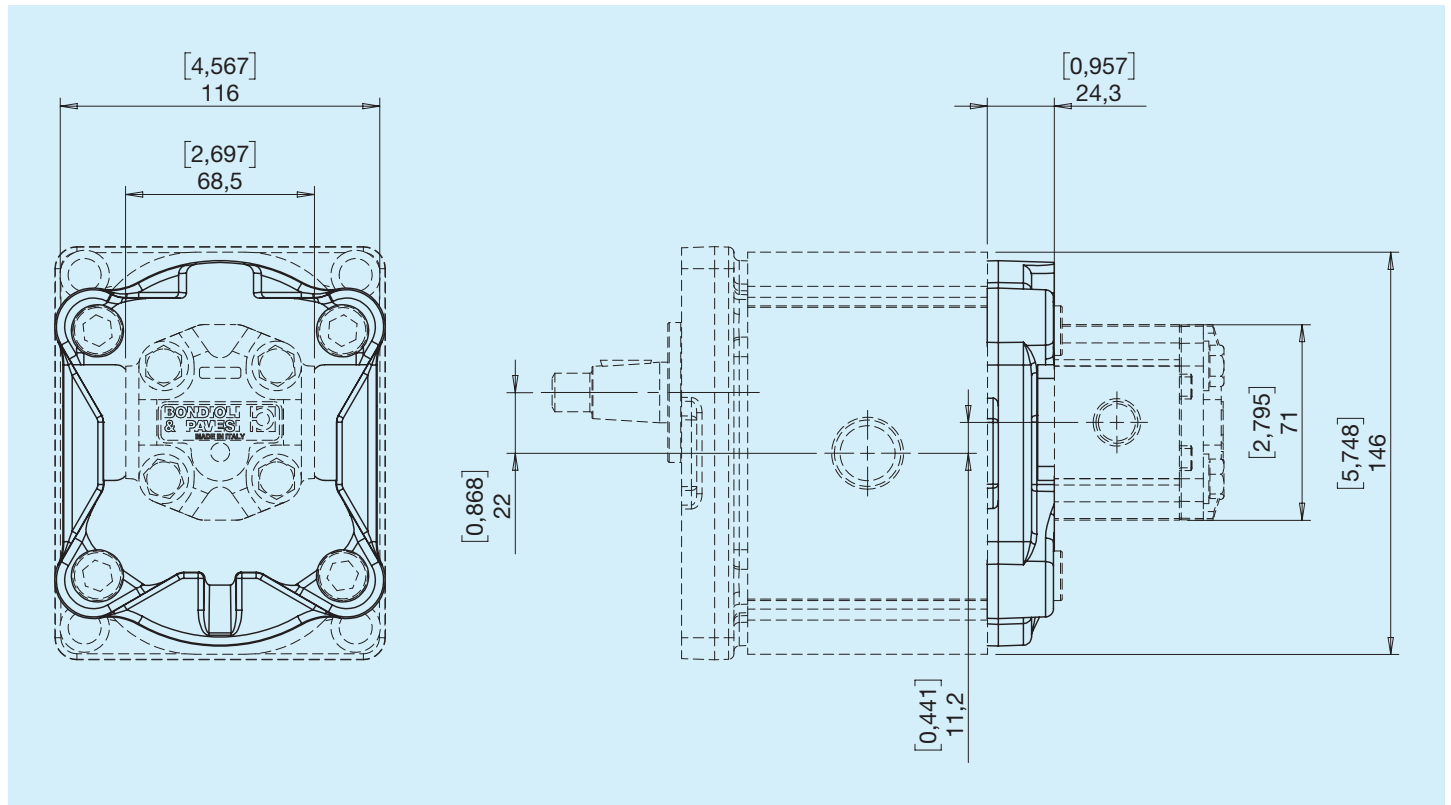
HPLP3 + HPLP3



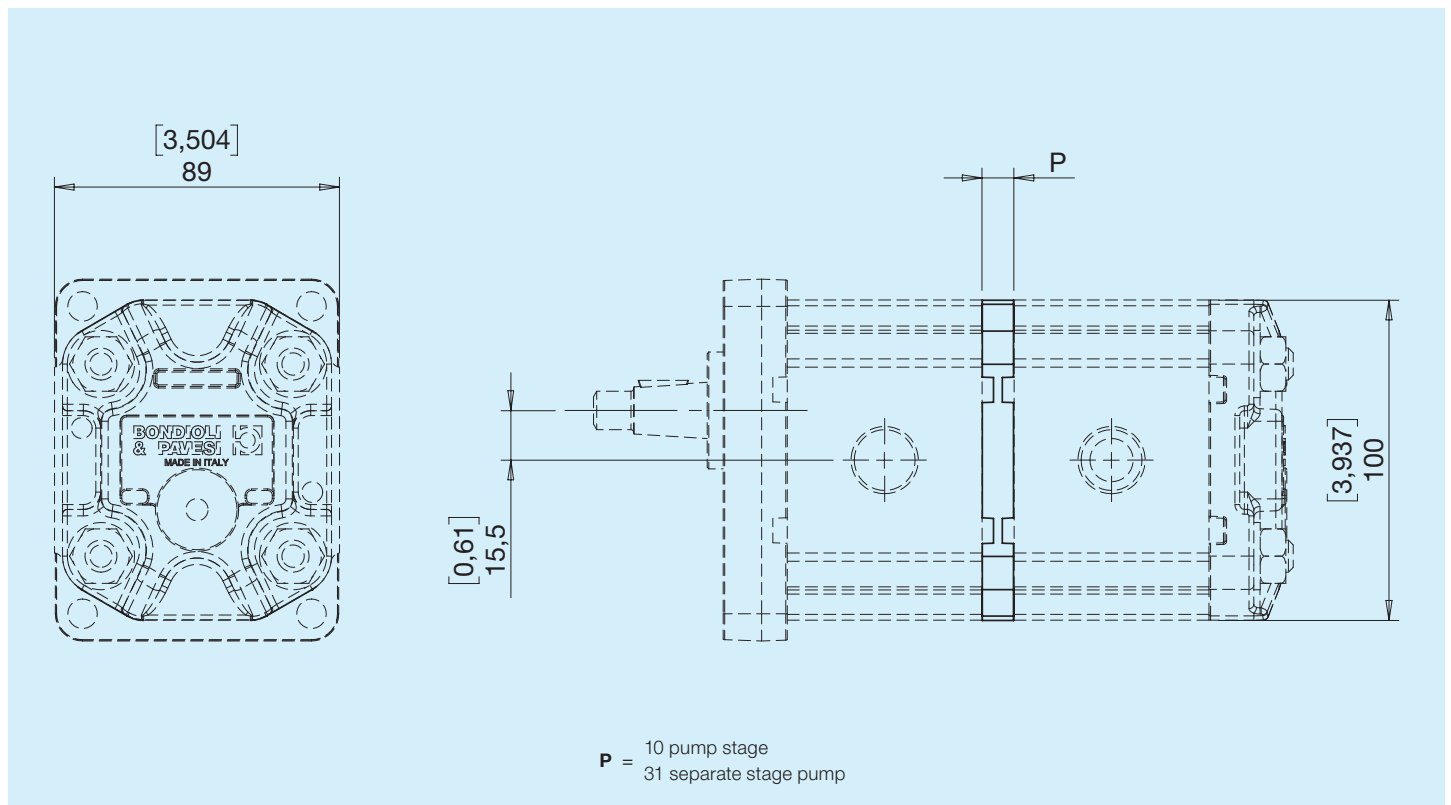
HPLP3 + HPLP2



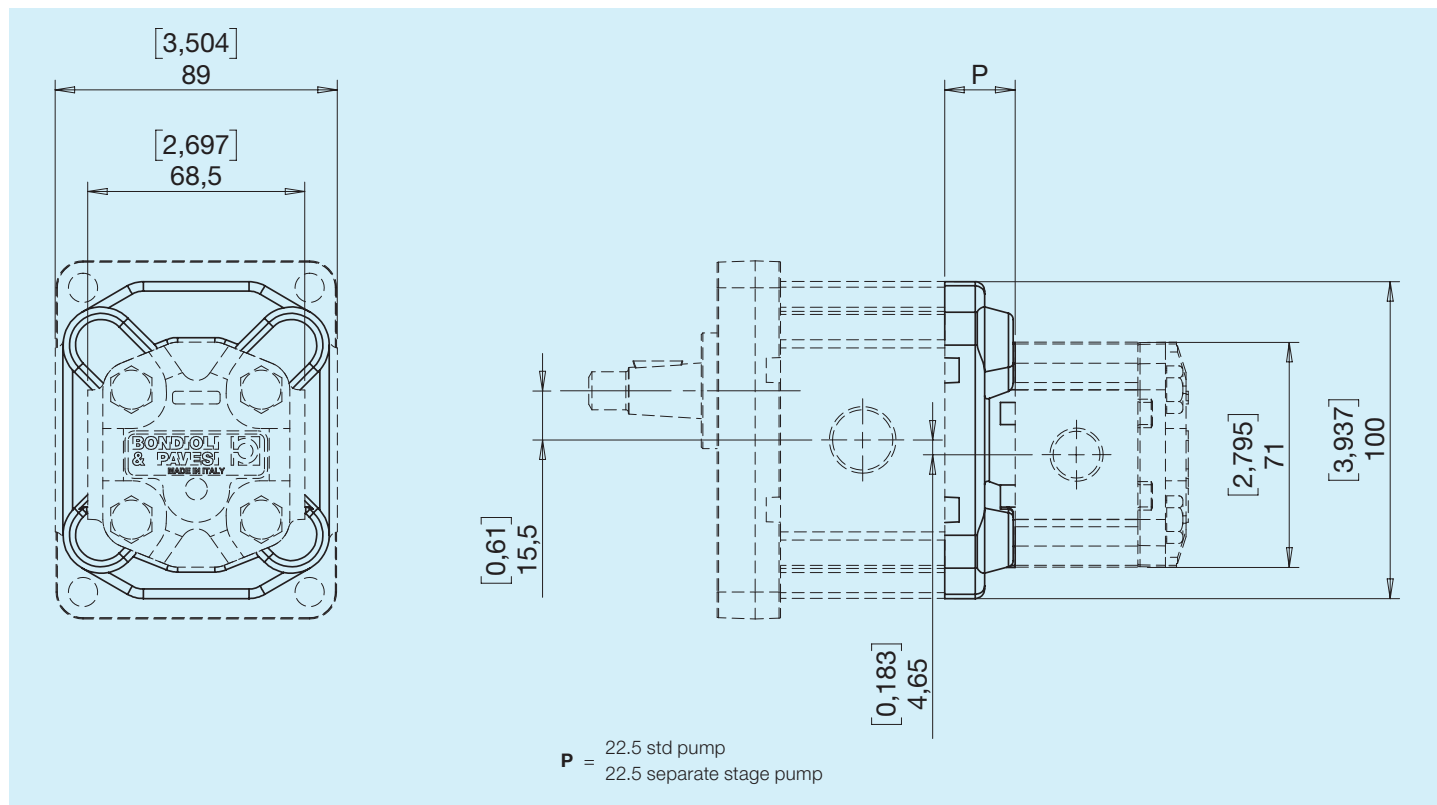
HPLP3 + HPLP1



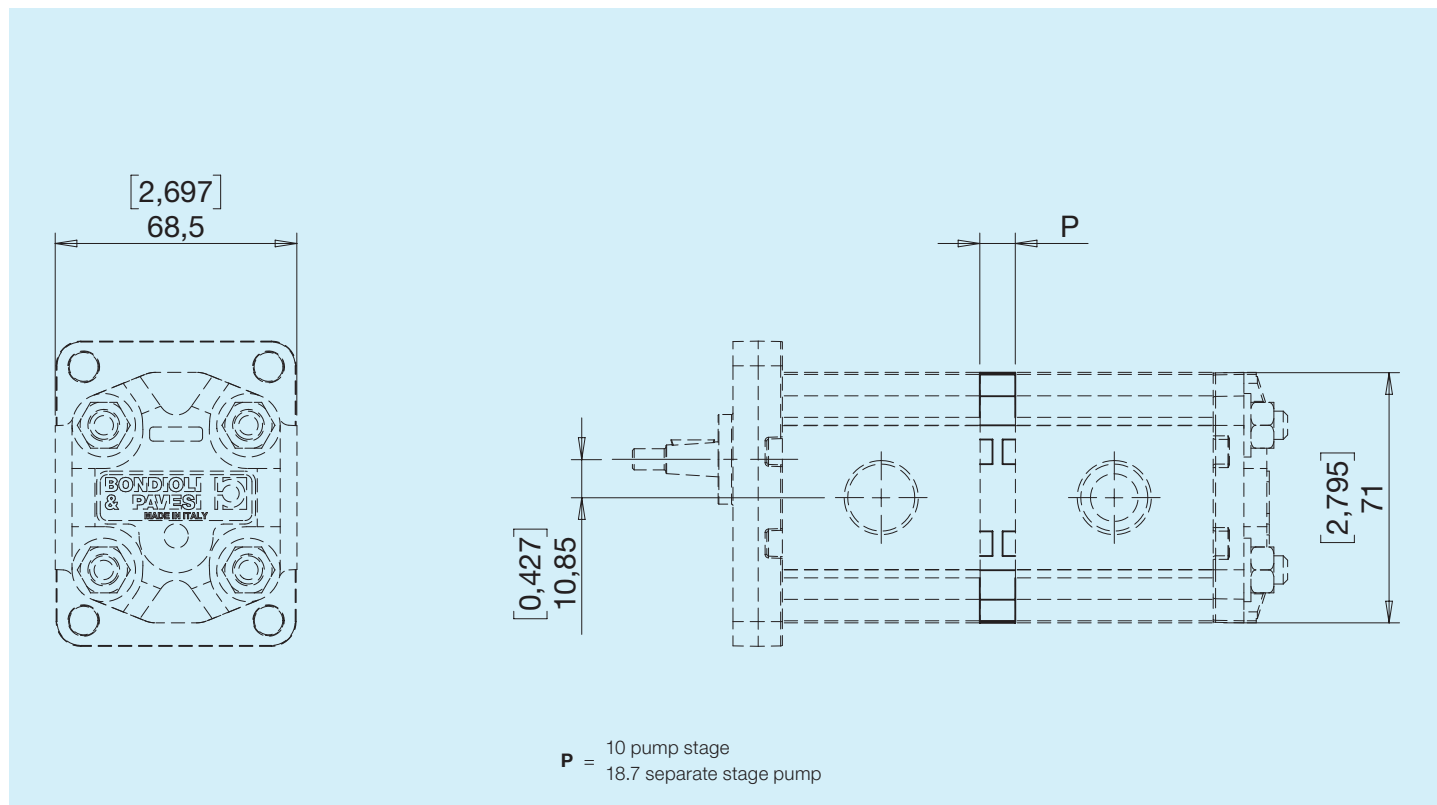
HPLP2 + HPLP2



HPLP2 + HPLP1



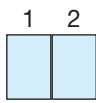
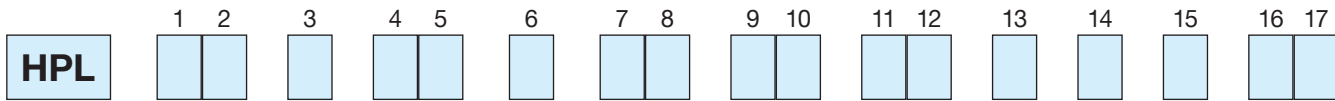
HPLP1 + HPLP1



Pump combinations

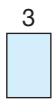
Front stage	Rear stage			
	HPL1	HPL2	HPL3	HPL4
HPL1	•			
HPL2	•	•		
HPL3	•	•	•	
HPL4		•		•

Other combinations are available. For more information, contact our technical sales department.



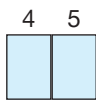
Product

PB Double pump **PC** Triple pump **PD** Quadruple pump



Group 2

1 **2** **3** **4**



Displacement HPL..1

14	31	48	80
19	36	60	
24	44	70	

Displacement HPL..2

05	11	20	40
06	14	26	
08	17	34	

Displacement HPL..3

22	36	51	73
26	41	56	90
31	47	61	

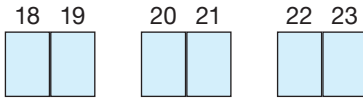
Displacement HPL..4

41	61	90
51	73	



Direction of rotation

S Counter clockwise/left **D** Clockwise/right



Front flanges - Shafts HPL..1

DD	European D25.4 - Tapered (1:8)	DT	European D25.4 - High torque tapered (1:8)	GG	German - Conical (1:5)	JI	SAE AA - Splined SAE AA
DE	European D25.4 - European round	ED	European D30 - Tapered (1:8)	GJ	German - Protruding front tooth without joint		
DH	European D25.4 - Splined DIN 5482	EE	European D30 - European round	GK	German - Front tooth		
DJ	European D25.4 - Protruding front tooth	ET	European D30 - High torque tapered (1:8)	JF	SAE AA - SAE AA round		

Integrated supports HPL..1

I5	European flange - Round D18
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External supports HPL..1

C1	Centring D50.80 - Tapered (1:8)	C2	Centring D50.80 - Round D18
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Front flanges - Shafts HPL..2

LL	European in cast iron - Conical (1:8)	NM	German - Conical (1:5)	QP	SAE A cast iron 2 holes - Round SAE A	SX	SAE A 2 holes - Splined SAE A 11T
LN	European in cast iron - Round D15 European	NU	German - Splined DIN 5482	QV	SAE A cast iron 2 holes - Splined SAE A 9T	TY	SAE B 2 cast iron holes - Splined SAE B 13T
LU	European in cast iron - Splined DIN 5482	OM	German D50 2 holes RH - Tapered (1:5)	QX	SAE A 2 cast iron holes - Splined SAE B 11T	VM	German in cast iron - conical (1:5)
ML	European - Conical (1:8)	OU	German D50 2 holes RH - Splined DIN 5482, German vers.	RZ	German D52 - Front tooth	VU	German in cast iron - Splined DIN 5482, German vers.
MN	European - Round D15 European	PM	German D50 2 holes LH - Tapered (1:5)	SP	SAE A 2 holes - Round SAE A		
MU	European - Splined DIN 5482	PU	German D50 2 holes LH - Splined DIN 5482 vers. German	SV	SAE A 2 holes - Splined SAE A 9T		

Integrated supports HPL..2

I1	European flange - Round D18	I3	SAE A flange - Round D18	IB	German flange in cast iron - Round D22
I2	European D25.4 - Tapered (1:8)	I7	European D25.4 - Tapered (1:8)	IC	German flange in cast iron - Tapered (1:5)

External supports HPL..2

B1	Centring D80 - Tapered (1:5)	C3	Centring D50.80 - Tapered (1:8)	C5	European D25.4 - Tapered (1:8)
B3	Centring D80 - Round D22	C4	Centring D50.80 - Round D22	C6	Centring D36.50 - Round D18

Front flanges - Shafts HPL..3

21	SAE B 2 holes - Splined SAE BB 15T	29	SAE B 2 holes - Splined SAE B 13T	34	European D50.8 - European round
26	SAE B 2 holes - Round SAE B	32	European D50.8 - Tapered (1:8)	37	European D50.8 - Splined DIN 5482

Integrated supports HPL..3

I6 European cast iron flange
D50.8 - round shaft D24

External supports HPL..3

C7 Centring D50.80 - Tapered
(1:8)

C8 Centring D50.80 - Round
D24

Front flanges - Shafts HPL..4

X3 European D60.3 - Tapered
(1:8)

X5 European D60.3 -
European round

X8 European D60.3 - Splined
DIN 5482

External supports HPL..4

C9 Centring D60.30 - Tapered
(1:8)

C0 Centring D60.30 - Round
D28

IN ports - Inlet *

... See tables HPL..1 - HPL..2
- HPL..3 - HPL..4

OUT port - Outlet *

... See tables HPL..1 - HPL..2
- HPL..3 - HPL..4

Seals HPL..1 - HPL..2

B NBR

R NBR high pressure

X Viton separate stages

S NBR separate stages

V Viton

W Viton high pressure

Seals HPL..3

1 NBR

2 Viton

3 NBR high pressure

4 Viton high pressure

Seals HPL..4

B NBR

R Viton

V NBR high pressure

W Viton high pressure

Series

L Subsequent stages

Group 2

1

2

3

4

9 10



11 12



13







14



15



16 17	Displacement			
	...	See tables HPL..1 - HPL..2 - HPL..3 - HPL..4		
18 19	IN ports - Inlet *			
	...	See tables HPL..1 - HPL..2 - HPL..3 - HPL..4		
20 21	OUT port - Outlet *			
	...	See tables HPL..1 - HPL..2 - HPL..3 - HPL..4		
22 23	Covers			
	ST Standard	EU Single inlet*	SG Cast iron version (not for HPL.. 1)	V... With valve**

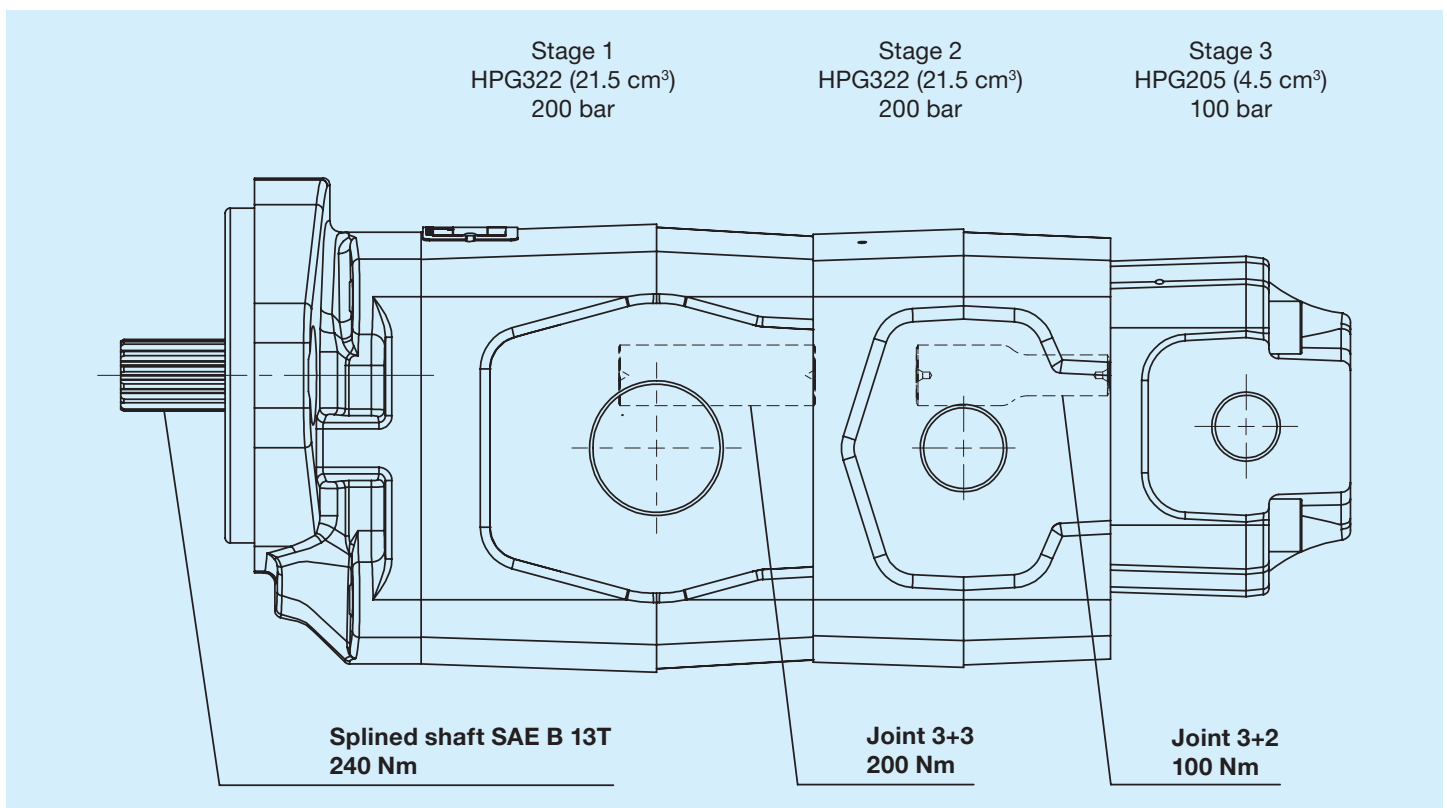
* For EU versions, contact the technical sales department

** See sections on Covers with valves HPL..1 - HPL..2 - HPL..3 - HPL..4

Introduction HPG + HPG multiple pumps are combinations of two or more sections driven by a single shaft. The sections making up the multiple pump are driven by splined joints. This multiple pump configuration can have inlet and delivery for each stage or, where possible, a single inlet and several deliveries. For individual sections, the values given in the catalogue apply, with some pressure limitations depending on the maximum torque of the drive joint and the shaft profile.

The maximum speed of a multiple pump is the lowest maximum speeds of the individual stages.

A useful example for correctly dimensioning the torque that can be transmitted to the shaft profile and for each individual stage of a group 3 + group 3 + group 2 triple pump at a given operating pressures on each stage is provided below.



Triple pump example HPGPC322D29E7E5B322E5E5G205E3E3ST

The formula for calculating the torque to be used is:

$$M = \frac{\Delta p \cdot c}{62,83 \cdot \eta_m} \quad [Nm]$$

where:

M = Torque (Nm)

Δp = Pressure (bar)

c = Pump displacement (cm³)

62,83 = Conversion factor

η_m = Mechanical efficiency = 0.9

The calculation is made out from the last stage of the pump up to the primary shaft. In all stages, the resulting calculated torque must be less than or equal to the maximum permissible torque for each drive joint, including the profile of the pump shaft.

Stage 3:

Group 2, displacement 4.5 cm³, operating pressure 210 bar.
 $M_3 = 16.7 \text{ Nm}$.
 The joint 2 condition is met (maximum limit 100 Nm).

Stage 2:

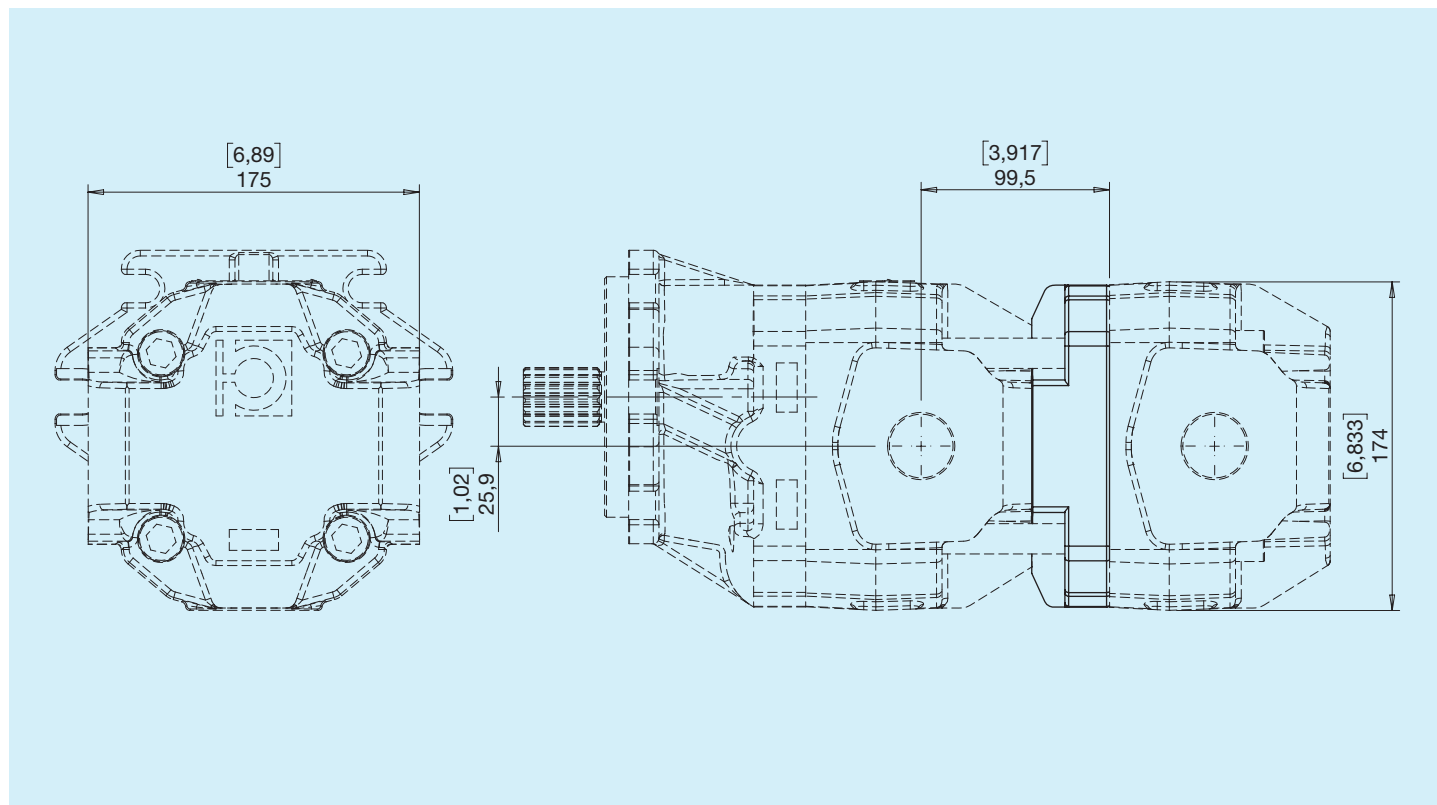
Group 3, displacement 26 cm³, operating pressure 200 bar.
 $M_2 = 91.96 \text{ Nm}$.
 $M_3 + M_2 = 119.02 \text{ Nm}$.
 The joint condition 1 is met (maximum limit 200 Nm).

Stage 1:

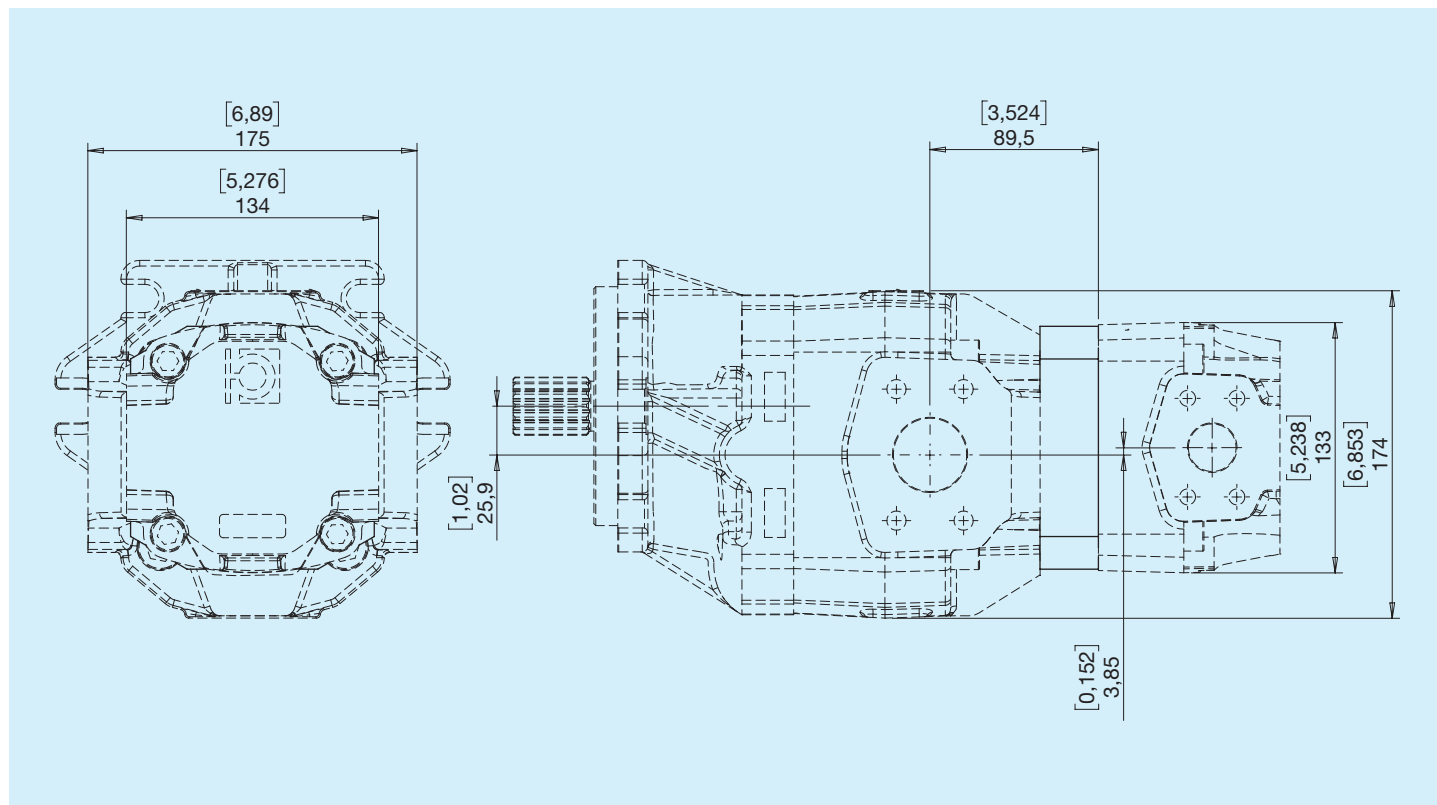
Group 3, displacement 21.5 cm³, operating pressure 200 bar.
 $M_1 = 76 \text{ Nm}$.
 $M_3 + M_2 + M_1 = 160.7 \text{ Nm}$.
 The drive shaft condition is met (maximum limit 160 Nm).

Coupling joint	Maximum transmitted torque
HPGP4 + HPGP4	450 Nm
HPGP4 + HPGP3 HPGP3 + HPGP3	200 Nm
HPGP4 + HPLP2 HPGP3 + HPGP2 HPGP3 + HPLP2 HPGP2 + HPGP2	100 Nm
HPGP3 + HPLP1 HPGP2 + HPLP1	30 Nm

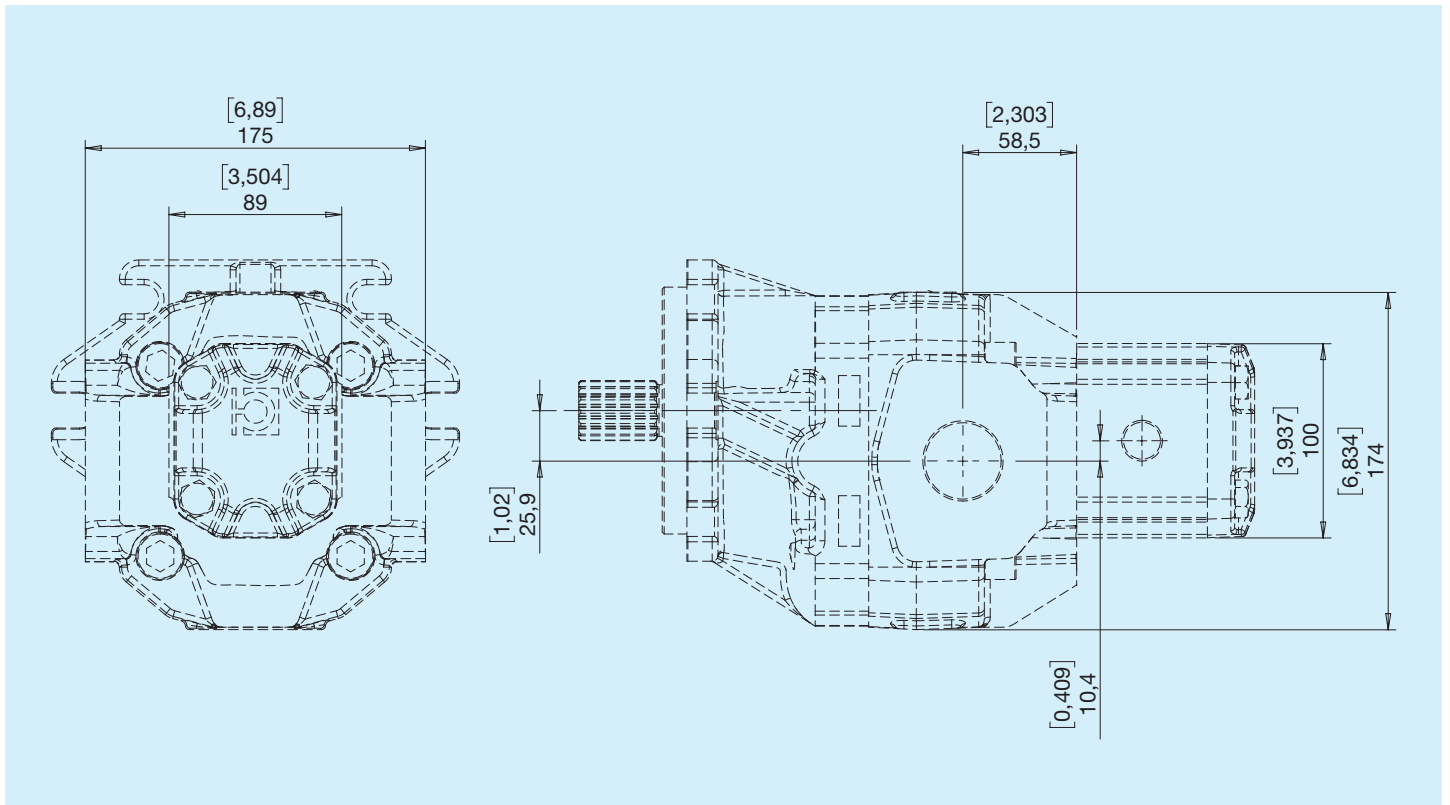
HPGP4 + HPGP4



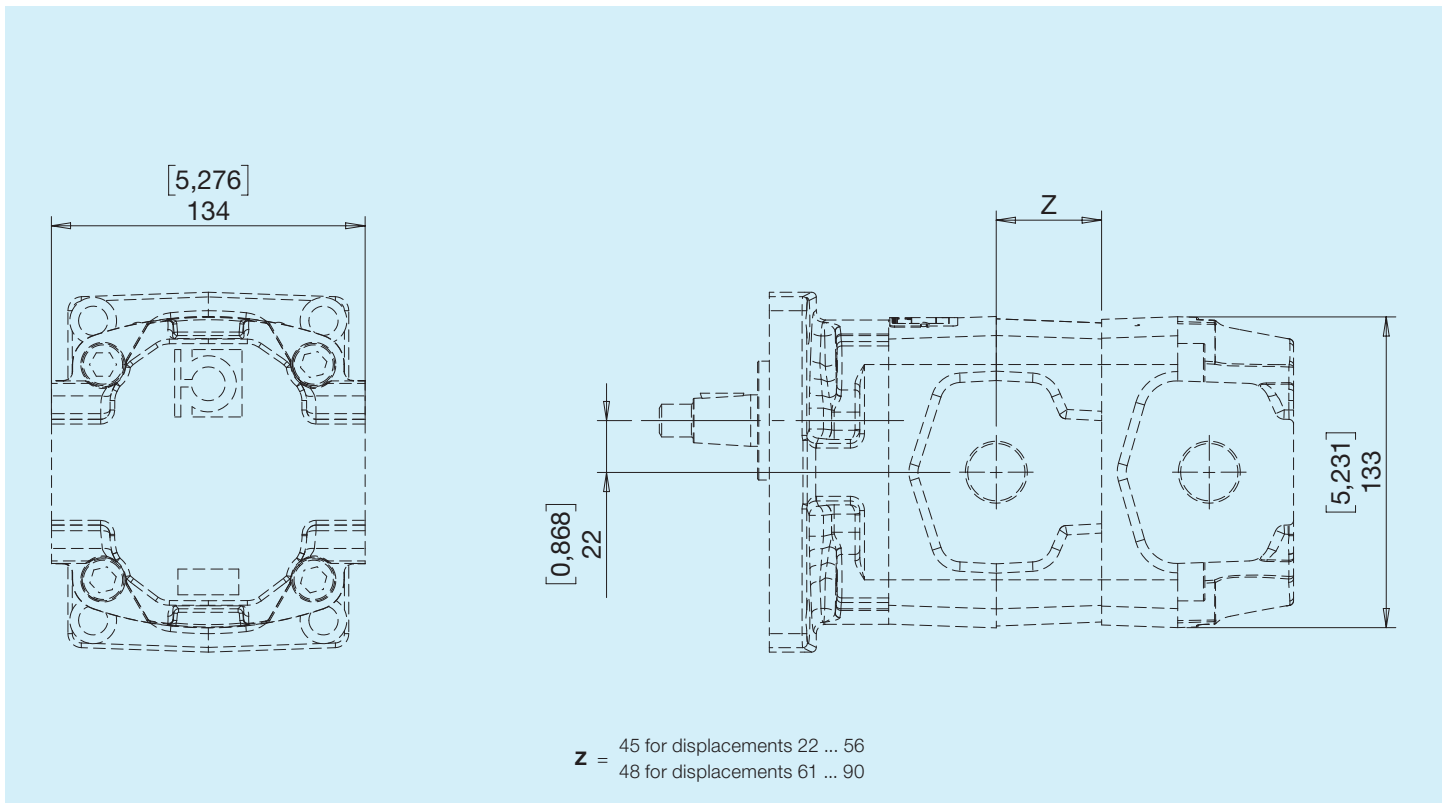
HPGP4 + HPGP3



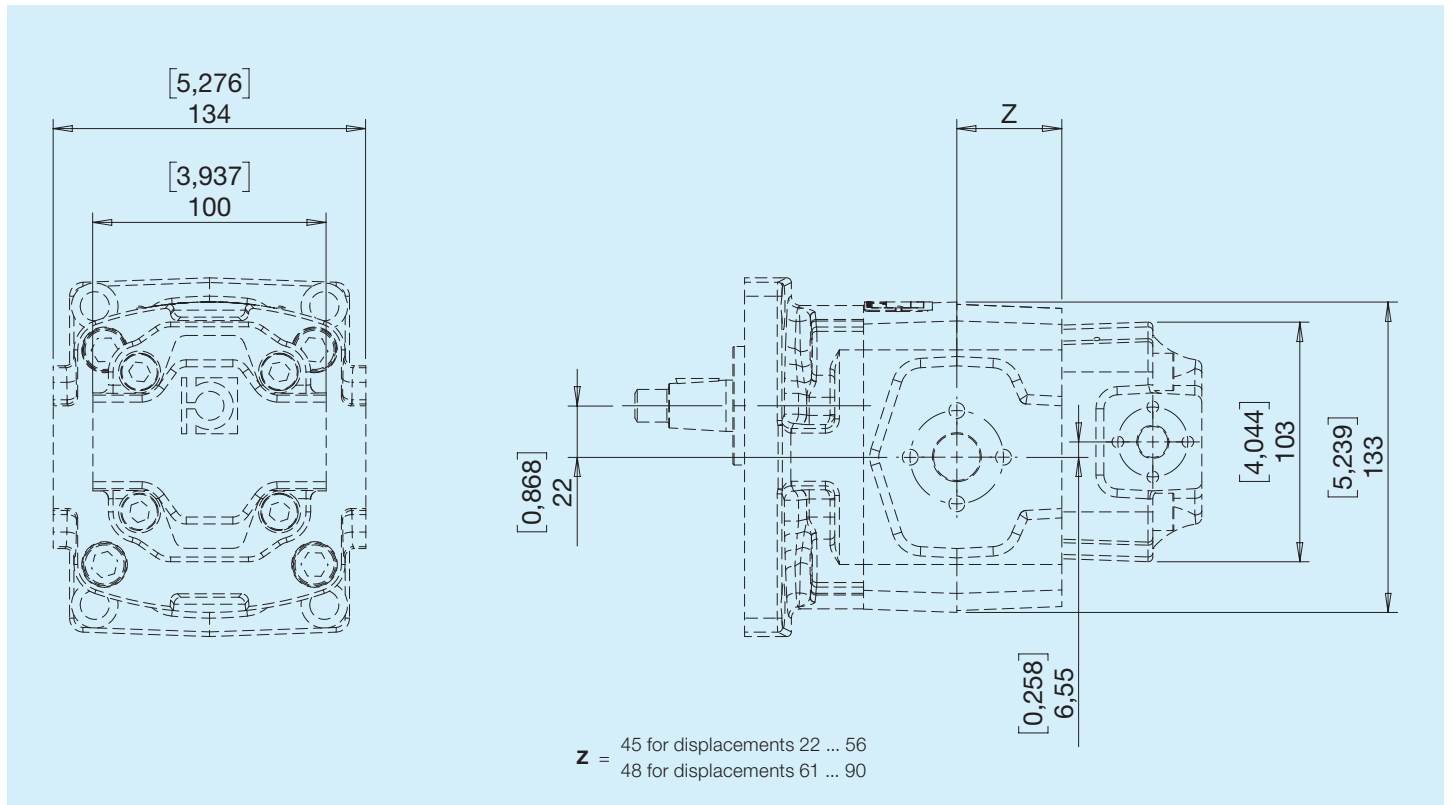
HPGP4 + HPLP2



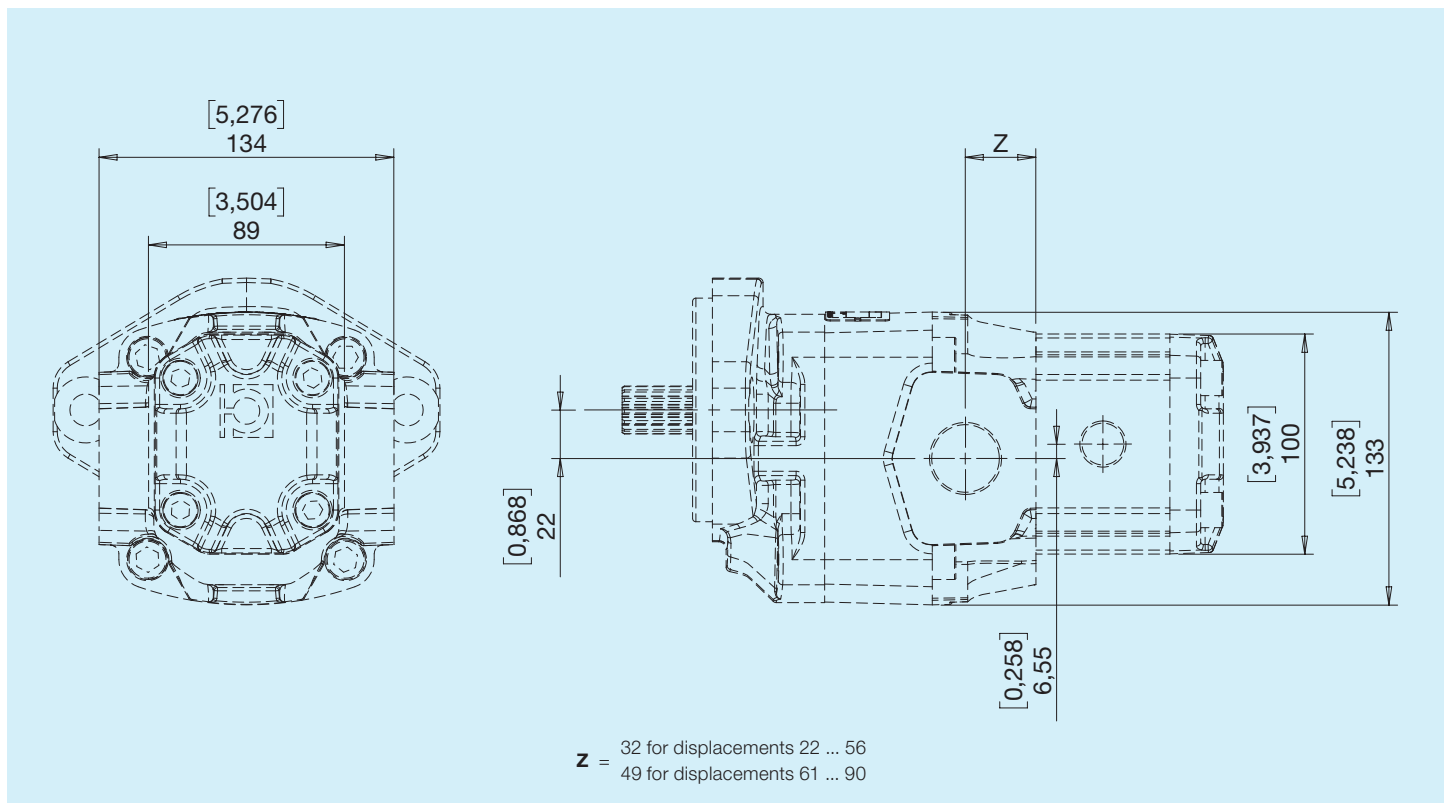
HPGP3 + HPGP3



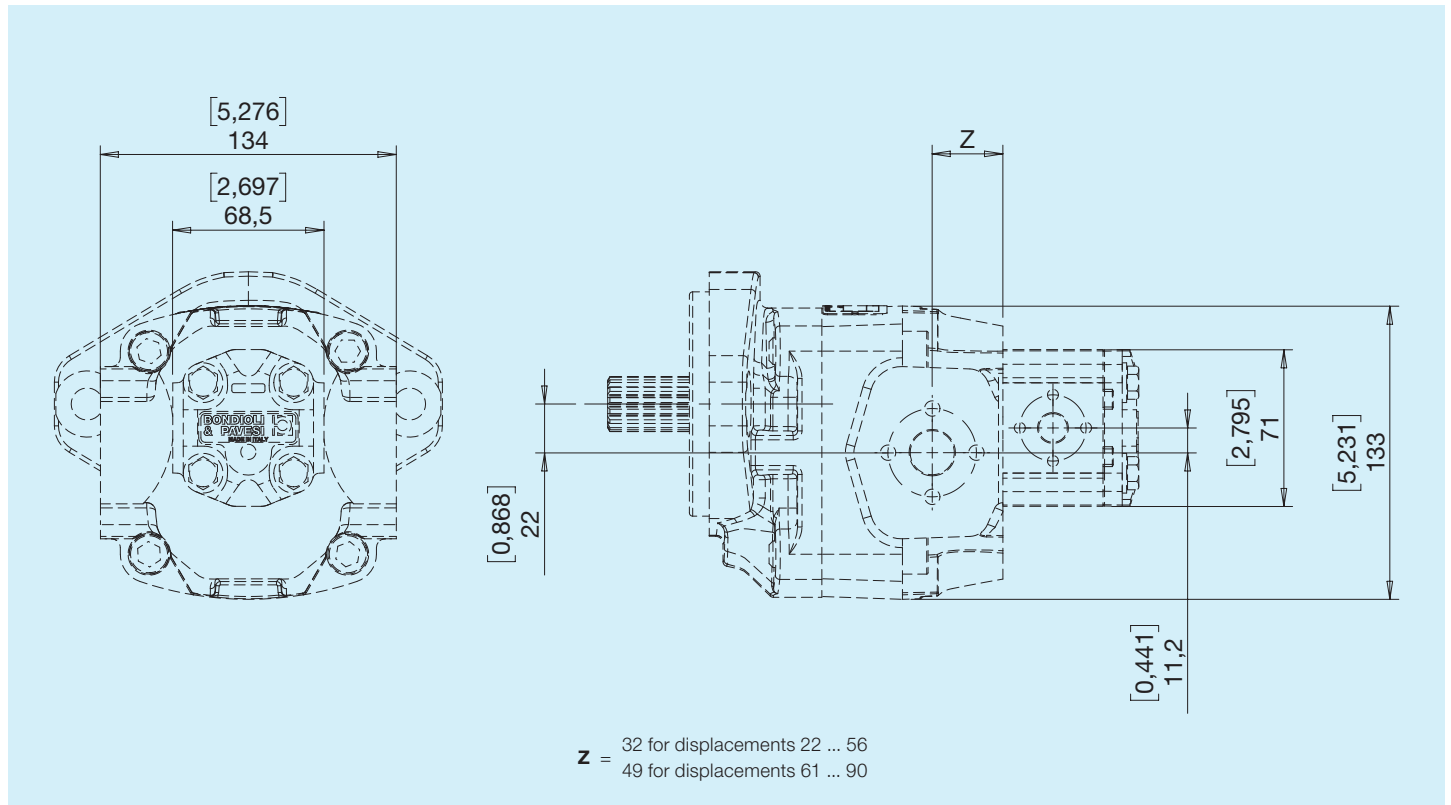
HPGP3 + HPGP2



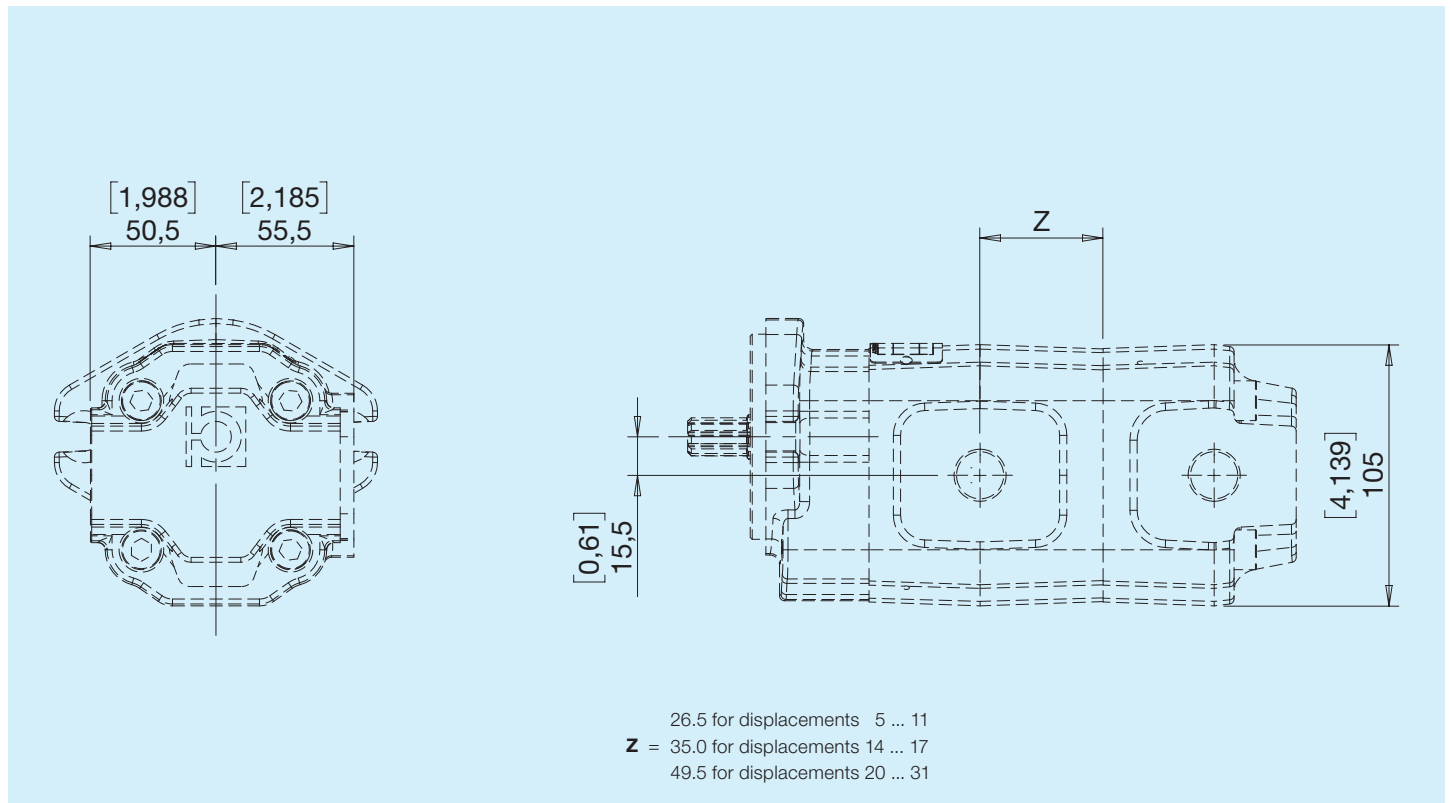
HPGP3 + HPLP2



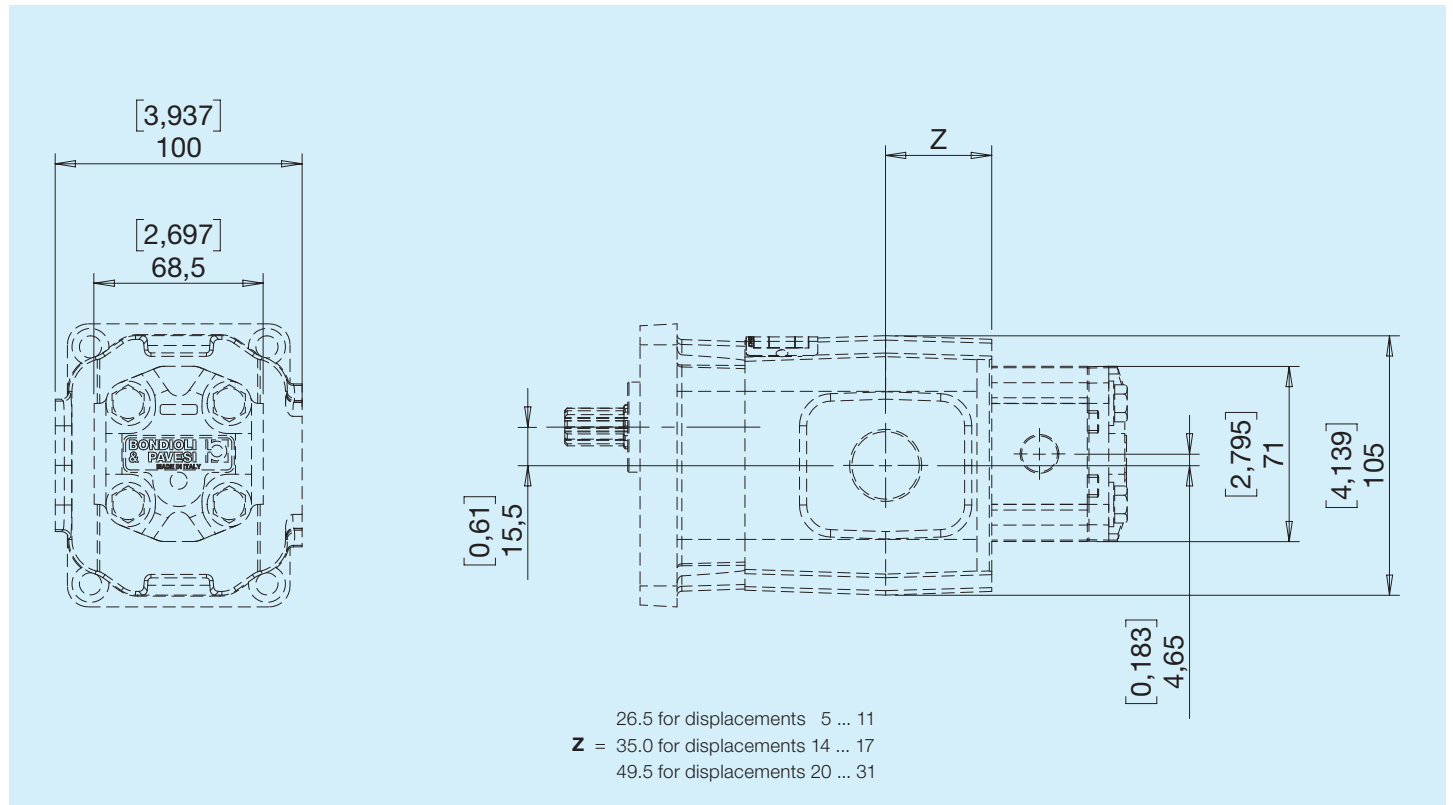
HPGP3 + HPLP1



HPGP2 + HPGP2



HPGP2 + HPLP1

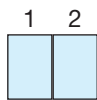
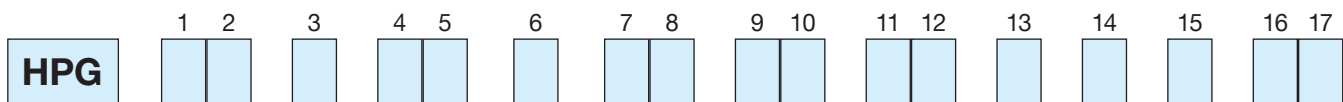


Pump combinations

Front stage	Rear stage				
	HPG2	HPG3	HPG4	HPL1	HPL2
HPG2	•			•*	
HPG3	•	•		•	•
HPG4		•	•		•

* The multiple pump HPG..2 + HPL..1 is only available with the L flange (European).

Other combinations are available. For more information, contact our technical sales department.



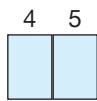
Product

PB Double pump **PC** Triple pump **PD** Quadruple pump



Group 2

2 **3** **4**



Displacement HPG..2

05	11	20
06	14	26
08	17	31

Displacement HPG..3

22	36	51	73
26	41	56	90
31	47	61	

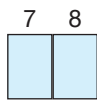
Displacement HPG..4

41	61	90
51	73	



Direction of rotation

S Counter clockwise/left **D** Clockwise/right

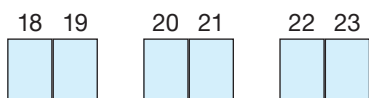


Front flanges - Shafts HPG..2

LL European in cast iron - Conical (1:8)	LU European in cast iron - Splined DIN 5482	QV SAE A cast iron 2 holes - Splined SAE A 9T
LN European in cast iron - Round D15 European	QP SAE A cast iron 2 holes - Round SAE A	QX SAE A 2 cast iron holes - Splined SAE B 11T

Front flanges - Shafts HPG..3

21 SAE B 2 holes - Splined SAE BB 15T	32 European D50.8 - Tapered (1:8)	41 SAE B 2+4 holes - Splined SAE BB 15T
26 SAE B 2 holes - Round SAE B	34 European D50.8 - European round	46 SAE B 2+4 holes - Round SAE B
29 SAE B 2 holes - Splined SAE B 13T	37 European D50.8 - Splined DIN 5482	49 SAE B 2+4 holes - Splined SAE B 13T



Front flanges - Shafts HPG..4

5S SAE C 2+4 holes - Splined
SAE C 14T



IN ports - Inlet *

... See tables HPG..2 - HPG..3 - HPG..4



OUT port - Outlet *

... See tables HPG..2 - HPG..3 - HPG..4



Seals

B NBR

R NBR high pressure

V Viton

W Viton high pressure



Series

G Subsequent stages HPG

L Subsequent stages HPL



Group 2

1

2

3

4



Displacement

... See tables HPL..1 - HPL..2 - HPG..2 - HPG..3 - HPG..4



IN ports - Inlet *

... See tables HPL..1 - HPL..2 - HPG..2 - HPG..3 - HPG..4



OUT port - Outlet *

... See tables HPL..1 - HPL..2 - HPG..2 - HPG..3 - HPG..4



Covers

ST Standard

EU Single inlet*

V... With valve**

* For EU versions, contact the technical sales department

** See sections on Covers with valves HPL..1 - HPL..2 - HPG..2 - HPG..3 - HPG..4

