

VARIABLE  
DISPLACEMENT  
AXIAL PISTON  
PUMPS

**MVP**

## HOW TO ORDER SINGLE PUMPS

MVP60.84	D	-	04	S5	-	L	MF/MC	-	N	-	LSO - Z - G
1	2		3	4		5	6		7		8 ...
<del>MVP30-28</del>	<del>S</del>		<del>04</del>	<del>S5</del>		<del>L</del>	<del>MD/MB</del>		<del>N</del>		<del>...</del>

1	Pump type (max. displacement)	Code
	28 cm <sup>3</sup> /rev (1.74 in <sup>3</sup> /rev)	<b>MVP 30-28</b>
	34,8 cm <sup>3</sup> /rev (2.12 in <sup>3</sup> /rev)	<b>MVP 30-34</b>
	45 cm <sup>3</sup> /rev (2.75 in <sup>3</sup> /rev)	<b>MVP 48-45</b>
	53,7 cm <sup>3</sup> /rev (3.28 in <sup>3</sup> /rev)	<b>MVP 48-53</b>
	60 cm <sup>3</sup> /rev (3.66 in <sup>3</sup> /rev)	<b>MVP 60-60</b>
	72 cm <sup>3</sup> /rev (4.39 in <sup>3</sup> /rev)	<b>MVP 60-72</b>
	<b>84,7 cm<sup>3</sup>/rev (5.17 in<sup>3</sup>/rev)</b>	<b>MVP 60-84</b>

2	Rotation	Code
	Anti-clockwise	<b>S</b>
	<b>Clockwise</b>	<b>D</b>

3	Drive shaft (a)	Code
	<b>SAE "B" spline (13 teeth)</b>	<b>04</b>
	SAE "B" spline (13 teeth)	<b>4R</b>
	SAE "B" straight	<b>32</b>
	SAE "BB" spline (15 teeth)	<b>05</b>
	SAE "BB" spline (15 teeth)	<b>5R</b>
	SAE "C" spline (14 teeth)	<b>06</b>
	SAE "C" spline (14 teeth)	<b>6R</b>
	SAE "C" straight	<b>34</b>

4	Mounting flange (a)	Code
	<b>SAE "B" 2 holes</b>	<b>S5</b>
	SAE "C" 2 holes	<b>S7</b>
	SAE "C" 4 holes	<b>S8</b>

5	Ports position	Code
	<b>Side</b>	<b>L</b>
	Rear	<b>P</b>

Code	Inlet/outlet ports		6
	Nominal size		
	Inlet IN	Outlet OUT	Pump type
	SAE 3000	SAE 3000	
<b>SAE FLANGED PORTS METRIC THREAD (SSM)</b>			
<b>MD/MB</b>	1" 1/4	3/4"	MVP 30
<b>ME/MC</b>	1" 1/2	1"	MVP 48
<b>MF/MC</b>	<b>2"</b>	<b>1"</b>	<b>MVP 60</b>
<b>SAE FLANGED PORTS UNC THREAD (SSS)</b>			
<b>SD/SB</b>	1" 1/4	3/4"	MVP 30
<b>SE/SC</b>	1" 1/2	1"	MVP 48
<b>SF/SC</b>	2"	1"	MVP 60
<b>SAE STRAIGHT THREAD PORTS (ODT)</b>			
	—	—	MVP 30
<b>OH/OF</b>	1" 1/2	1"	MVP 48
<b>MF/OF</b>	2"	1"	MVP 60

Code	Seals	7
<b>N</b>	<b>Buna (standard)</b>	
<b>V</b>	Viton	

Code	Regulators	8
...	See how to order on page 71 ÷ 73	

(a) Drive shafts availability at pages 32 ÷ 35 and mounting flanges availability at pages 36 ÷ 37

Replaces: 03/06.2011

05/10.2014

## HOW TO ORDER REGULATORS

### PRESSURE COMPENSATORS - FLOW COMPENSATORS (Load-sensing)

Replaces: 03/06.2011

	8	9	10	11	12	13
Pressure compensator	<b>RP0</b> -			<b>Z</b> -		<b>G</b>
Pressure compensator	<b>RP1</b> -			<b>Z</b> -		<b>G</b>
Pressure compensator with flow control	<b>RP1</b> -		<b>LS2</b> -	<b>Z</b> -		<b>G</b>
Dual setting pressure compensator	<b>RP2</b> -	<b>1</b> -		<b>Z</b> -	<b>S</b> -	<b>G</b>
Dual setting pressure compensator with flow control	<b>RP2</b> -	<b>1</b> -	<b>LS2</b> -	<b>Z</b> -	<b>S</b> -	<b>G</b>
<b>Flow compensator</b>	<b>LS0</b> -			<b>Z</b> -		<b>G</b>
Flow compensator for remote control	<b>LS2</b> -			<b>Z</b> -		<b>G</b>
Pressure compensator for remote control	<b>LS3</b> -			<b>Z</b> -		<b>G</b>

05/10.2014

8	Regulators type	Code
	Pressure compensator	<b>RP0</b>
	Pressure compensator	<b>RP1</b>
	Dual setting pressure compensator	<b>RP2</b>
	<b>Flow compensator</b>	<b>LS0</b>
	Flow compensator for remote control	<b>LS2</b>
	Pressure compensator for remote control	<b>LS3</b>

9	Valve type (a)	Code
	Normally closed 12 VDC	<b>1</b>
	Normally closed 24 VDC	<b>2</b>
	Normally closed 24 VAC	<b>3</b>
	Normally open 12 VDC	<b>6</b>
	Normally open 24 VDC	<b>7</b>
	Normally open 24 VAC	<b>8</b>

Code	Flow control option (b)	10
<b>LS2</b>	Flow compensator	

Code	Restrictor option	11
	Without restrictor (standard - no code)	
<b>Z</b>	<b>Damping restrictor (only for critical applications)</b>	

Code	Connector type (a)	12
<b>S</b>	DIN 43 650 / ISO 4400 (standard)	
<b>D</b>	Deutsch DT04-2P	

Code	Displacement limiter	13
<b>G</b>	<b>Min. and Max. displacement limiter</b>	

### ORDER EXAMPLE

MVP60 pump with dual setting pressure compensator:

**MVP60.60S-05S5-LMF/MC-N-RP2-1-S-G**

(a) Only for RP2

(b) Only for RP1 and RP2

## TECHNICAL DATA

### Technical data with mineral oil

HL or HLP mineral oil based hydraulic fluid to DIN 51524

Replaces: 03/06.2011

05/10.2014

Pump type MVP			30-28	30-34	48-45	48-53	60-60	60-72	60-84
Max. displacement (theor.) $V_{max}$	cm <sup>3</sup> /rev (in <sup>3</sup> /rev)		28 (1.71)	34,8 (2.12)	45 (2.75)	53,7 (3.28)	60 (3.66)	72 (4.39)	84,7 (5.17)
	bar abs. (in Hg)	min.				0.8 (24)			
Inlet pressure	bar abs. (psi)	max.				25 (363)			
	bar (psi)	continuous	280 (4060)	250 (3625)	280 (4060)	250 (3625)	280 (4060)	280 (4060)	250 (3625)
intermittent		315 (4568)	280 (4060)	315 (4568)	280 (4060)	315 (4568)	315 (4568)	280 (4060)	
peak		350 (5075)	315 (4568)	350 (5075)	315 (4568)	350 (5075)	350 (5075)	315 (4568)	
Max. drain line pressure	bar abs. (psi)					2 (29)			
Max. speed $n_{max}$	min <sup>-1</sup>	@ $V_{max}$ (1)	3500	2900	3000	2500	3000	2700	2500
		@ $n_{max}$	98 (25.9)	101 (26.7)	135 (35.7)	134 (35.4)	180 (47.6)	194 (51.3)	212 (56.0)
Max. delivery (theor.)	l/min (US gpm)	@ 2000 min <sup>-1</sup>	56 (14.8)	70 (18.5)	90 (23.8)	107 (28.3)	120 (31.7)	144 (38.0)	169 (44.7)
		@ 1500 min <sup>-1</sup>	42 (11.1)	52 (13.7)	68 (18.0)	81 (21.4)	90 (23.8)	108 (28.5)	127 (33.6)
		@ $n_{max}$	45,7 (61.2)	42,1 (56.4)	63 (84.4)	55,9 (74.9)	84 (112.6)	90,7 (121.5)	88,2 (118.2)
Max. power (theor.) ( $\Delta p = p_{max}$ cont.)	kW (HP)	@ 2000 min <sup>-1</sup>	26,1 (35.0)	29 (38.9)	42 (56.3)	44,8 (60.0)	56 (75.0)	67,2 (90.0)	70,6 (94.6)
		@ 1500 min <sup>-1</sup>	19,6 (26.3)	21,8 (29.2)	31,5 (42.2)	33,6 (45.0)	42 (56.3)	50,4 (67.5)	52,9 (70.9)
		@ $p_{max}$ cont.	124,8 (1105)	138,5 (1226)	200,5 (1775)	213,7 (1891)	267,4 (2367)	320,9 (2840)	337 (2983)
Max. torque (theor.)	Nm (lbf in)	@ 100 bar (1450 psi)	44,6 (395)	55,4 (490)	71,6 (634)	85,5 (757)	95,5 (845)	114,6 (1014)	134,8 (1193)
			0,002 (0.05)	0,002 (0.05)	0,003 (0.07)	0,003 (0.07)	0,008 (0.19)	0,008 (0.19)	0,008 (0.19)
Moment of inertia	kgm <sup>2</sup> (ft <sup>2</sup> lbs)		0,002 (0.05)	0,002 (0.05)	0,003 (0.07)	0,003 (0.07)	0,008 (0.19)	0,008 (0.19)	0,008 (0.19)
Fill volume	l (US gallons)		0,85 (0.22)	0,85 (0.22)	1 (0.26)	1 (0.26)	1,3 (0.34)	1,3 (0.34)	1,3 (0.34)
Mass (approx.)	kg (lbs)		15 (33.1)	15 (33.1)	19 (41.9)	19 (41.9)	22 (48.5)	22 (48.5)	22 (48.5)
Seals			N= Buna			V= Viton			
Operating temperature	°C (°F)	min.				-25 (-13)	-15 (5)		
		max. cont.				80 (176)	110 (230)		
		max. peak				100 (212)	125 (257)		

(1) = with an inlet pressure of 1 bar abs (14.5 psi) and viscosity between 15 and 35 cSt (77 and 163 SSU).

Reducing the displacement or increasing the inlet pressure the max. speed changes. See table at page 10.

For different working conditions, please consult our technical sales department.

## TECHNICAL DATA

### Design calculations for pump

<b>Q</b>	l/min (US gpm)	Flow
<b>M</b>	Nm (lbf in)	Torque
<b>P</b>	kW (HP)	Power
<b>V</b>	cm <sup>3</sup> /rev (in <sup>3</sup> /rev)	Displacement
<b>n</b>	min <sup>-1</sup>	Speed
<b>Δp</b>	bar (psi)	Pressure
$\eta_v = \eta_v(V, \Delta p, n)$		Volumetric efficiency
$\eta_{hm} = \eta_{hm}(V, \Delta p, n)$		Hydro-mechanical efficiency
$\eta_t = \eta_v \cdot \eta_{hm}$		Overall efficiency

$$Q = Q_{theor.} \cdot \eta_v$$

$$Q_{theor.} = \frac{V \text{ (cm}^3\text{/rev)} \cdot n \text{ (min}^{-1}\text{)}}{1000} \quad [\text{l/min}]$$

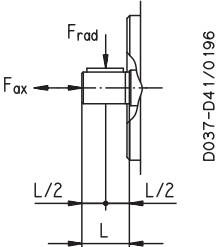
$$M = \frac{M_{theor.}}{\eta_{hm}} \quad [\text{Nm}]$$

$$M_{theor.} = \frac{\Delta p \text{ (bar)} \cdot V \text{ (cm}^3\text{/rev)}}{62,83}$$

$$P_{IN} = \frac{P_{OUT}}{\eta_t} \quad [\text{kW}]$$

$$P_{OUT} = \frac{\Delta p \text{ (bar)} \cdot Q \text{ (l/min)}}{600}$$

### Max. permissible load on drive shaft

Pump type		MVP 30•28	MVP 30•34	MVP 48•45	MVP 48•53	MVP 60•60	MVP 60•72	MVP 60•84	
$F_{ax}$ Axial force		N (lbf)	1000 (225)	1000 (225)	1500 (337)	1500 (337)	2000 (450)	2000 (450)	<b>2000</b> <b>(450)</b>
$F_{rad}$ Radial force	@ L/2	N (lbf)	1500 (337)	1500 (337)	1500 (337)	1500 (337)	3000 (675)	3000 (675)	<b>3000</b> <b>(675)</b>

### % Variation of the max. speed in relation of the inlet pressure and/or displacement reduction

Inlet pressure psi (bar abs)	Displacement %					% Variation of the max. speed
	65	70	80	90	100	
12 (0,8)	120	115	105	97	90	03/06.2011
13 (0,9)	120	120	110	103	95	
14.5 (1,0)	120	120	115	107	100	
17 (1,2)	120	120	120	113	106	
20 (1,4)	120	120	120	120	112	
23 (1,6)	120	120	120	120	117	
29 (2,0)	120	120	120	120	120	

#### Example 1

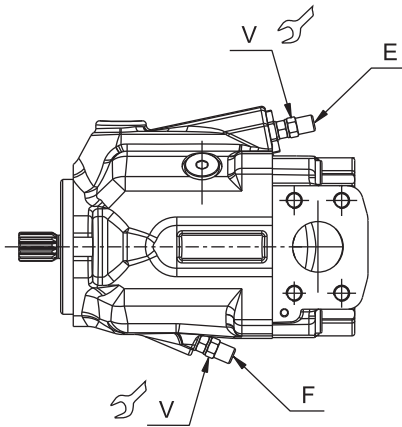
Displacement: 100 %  
Speed: 100 %  
Inlet pressure: 1,0 bar abs. (14.5 psi)

#### Example 2

Displacement: 80 %  
Inlet pressure: 1,0 bar abs. (14.5 psi)  
Speed: 115 %

## DISPLACEMENT SETTING

Replaces: 03/06.2011



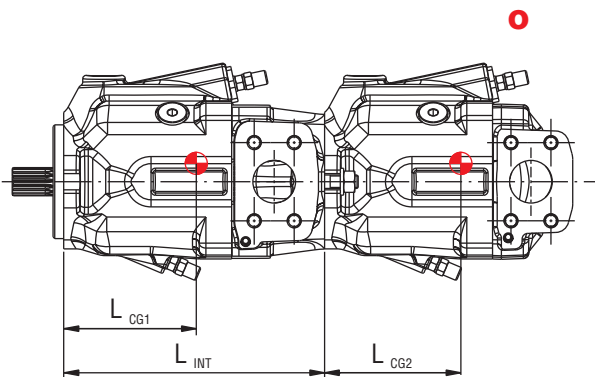
- E:** Max. displacement limiter
- F:** Min. displacement limiter
- G:** Min. and Max. displacement limiter (standard)
- V:** Tightening torque  $10^{\pm 1}$  Nm (80 ÷ 97 lbf in)

			MVP 30	MVP 48	MVP 60
Max. displacement setting range	cm <sup>3</sup> /rev (in <sup>3</sup> /rev)	from	17,4 (1.06)	34,9 (2.13)	55 (3.36)
		to	34,8 (2.12)	53,7 (3.28)	84,7 (5.17)
Min. displacement setting range	cm <sup>3</sup> /rev (in <sup>3</sup> /rev)	from	0	0	0
		to	17,4 (1.06)	10,7 (0.65)	38,1 (2.32)
One turn of screw changes pump displacement by approximately	cm <sup>3</sup> /rev (in <sup>3</sup> /rev)	E	2,8 (0.17)	3,2 (0.20)	5,0 (0.31)
		F	2,3 (0.14)	3,0 (0.18)	4,2 (0.26)

For different setting ranges, please consult our technical sales department.

## CENTER OF GRAVITY

05/10.2014



Center of gravity

$$M_{MF} = \frac{L_{CG1} \cdot m_1 + (L_{INT} + L_{CG2}) \cdot m_2}{102} \quad [\text{Nm}]$$

$M_{MF}$ : Load moment on mounting flange

$L_{CG}$ : Distance from center of gravity to mounting flange [mm]

$m$ : Weight (kg)

		MVP 30	MVP 48	MVP 60
$L_{CG1}$	mm (in)	100 (3.9370)	116 (4.5669)	120 (4.7244)
$L_{CG2}$	mm (in)	90 (3.5433)	99 (3.8976)	107 (4.2126)
$L_{INT}$	mm (in)	208 (8.1890)	233 (9.1732)	253 (9.9606)

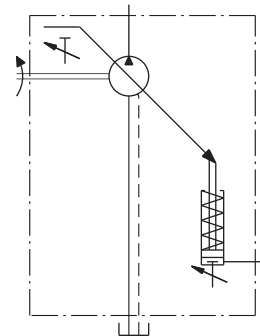
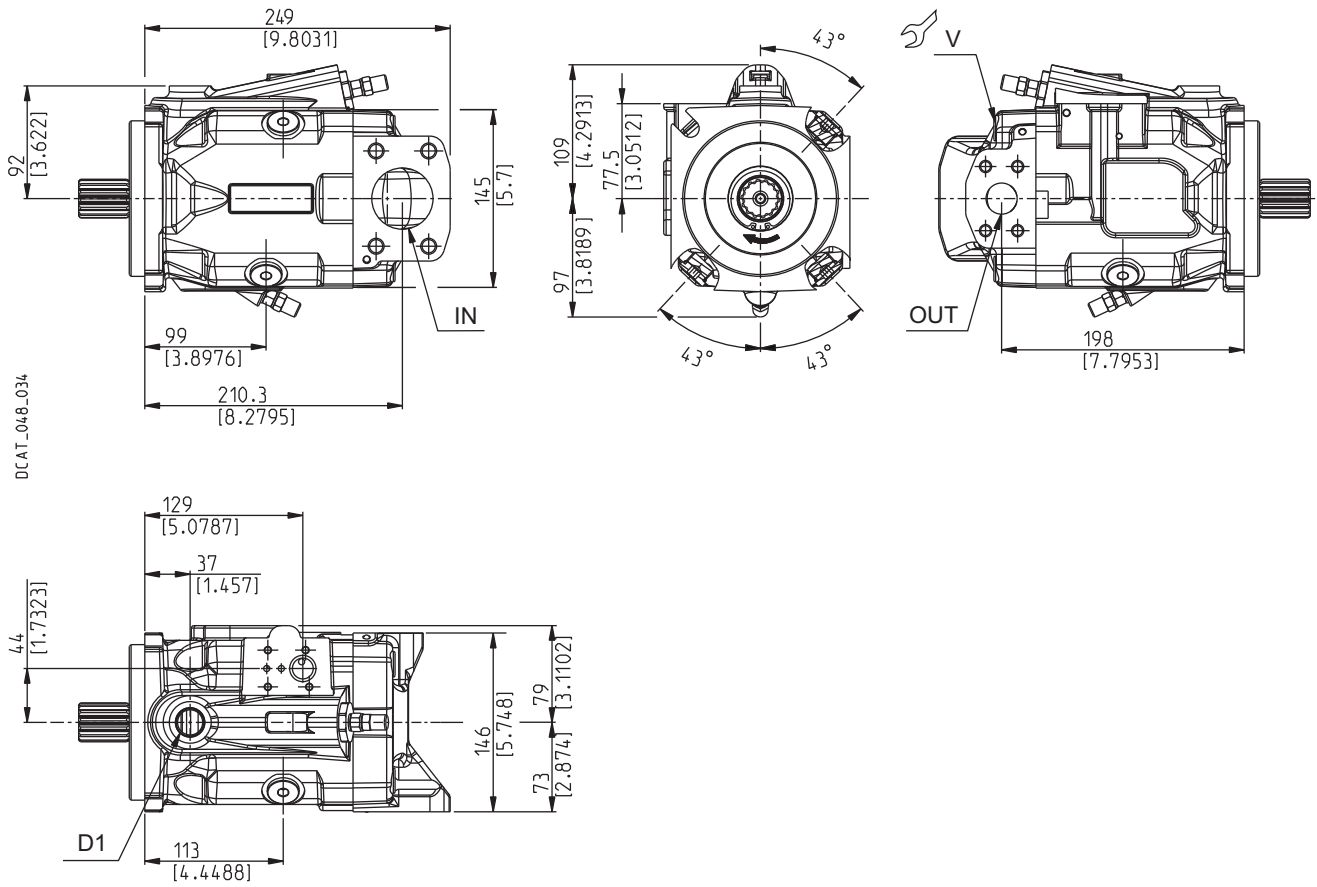
For single pumps refer to  $L_{CG2}$  values

**MVP60**

**SIDE PORTS - DIMENSIONS**



Drive shafts: page 34 ÷ 35  
Mounting flanges: page 36 ÷ 37



Screws tightening torque Nm (lbf in)

V
130 ±13 (1036 ÷ 1266)

Ports (Nominal size)

IN	OUT	D1
2"	1"	Drain port

Dimensions at page 38 ÷ 39

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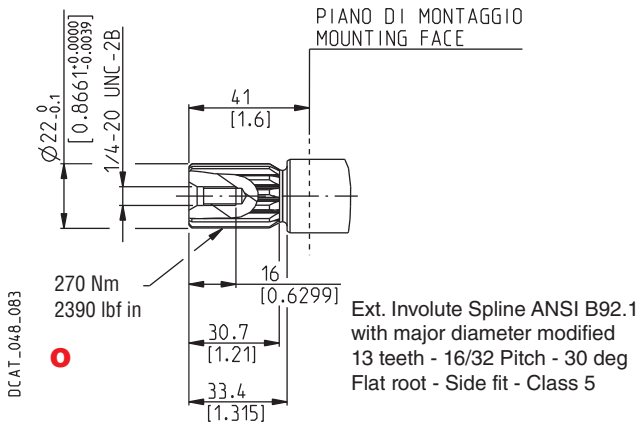
**MVP30**

**DRIVE SHAFTS**

**SAE "B" SPLINE**

**04**

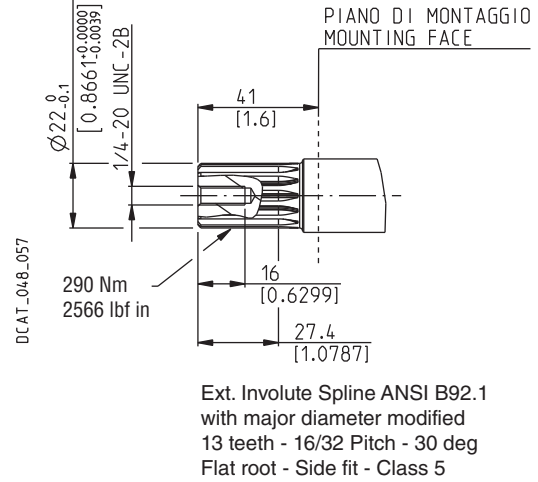
Mounting face refers to flange code **S5**



**SAE "B" SPLINE**

**4R**

Mounting face refers to flange code **S5**

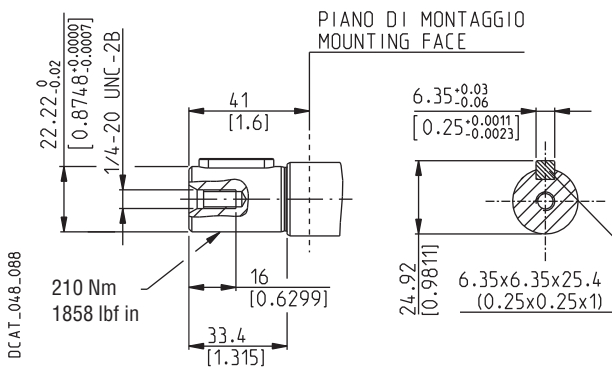


Replaces: 03/06.2011

**SAE "B" STRAIGHT**

**32**

Mounting face refers to flange code **S5**



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For different drive shafts, please consult our technical department.

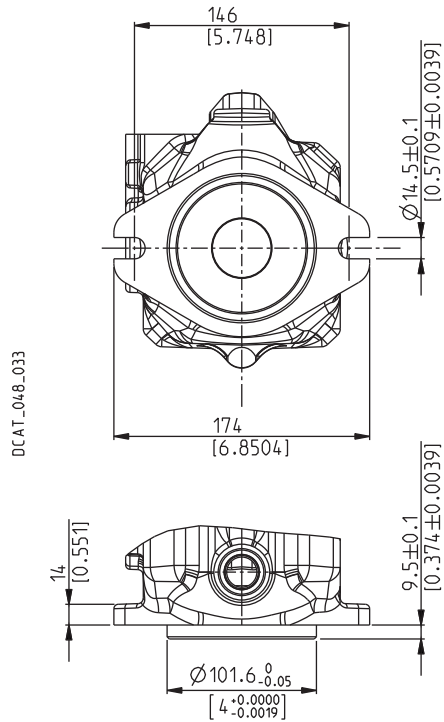


## MOUNTING FLANGES AND TABLE OF COMPATIBILITY

**SAE "B" 2 HOLES**

**S5**

Conforms to SAE J744



Replaces: 03/06.2011

**DRIVE SHAFTS**  
See page 32 ÷ 35

Pump type	<b>04</b>	<b>4R</b>	<b>32</b>	<b>05</b>	<b>5R</b>	<b>06</b>	<b>6R</b>	<b>34</b>
<b>MVP 30</b>	X	X	X					
<b>MVP 48</b>	X	X	X	X	X			
<b>MVP 60</b>				X	X	X	X	X

X Available combination

05/10.2014

## PORTS SIZES

Ports type	INLET / OUTLET PORTS						DRAIN PORTS		LOAD SENSING PORTS		KP20 / PHP20 GEAR PUMPS	
	Split SSM		Split SSS		SAE ODT		Gas BSPP	SAE ODT (●)	Gas BSPP	SAE ODT (●)	Gas BSPP	SAE ODT
	IN	OUT	IN	OUT	IN	OUT	D1	D1	X	X	OUT	OUT
MVP 30	MD	MB	SD	SB	—	—	—	OB	GA	03	GD	OC
MVP 48	ME	MC	SE	SC	OH	OF	GD	OC	GA	03	GD	OC
<b>MVP 60</b>	<b>MF</b>	<b>MC</b>	SF	SC	MF	OF	GD	OC	GA	03	GD	OC

(●) Available only with inlet and outlet ports type Split SSS and SAE ODT.



Tightening torque for low pressure side port

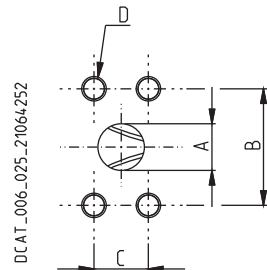


Tightening torque for high pressure side port [values obtained at 350 bar (5075 psi)]

### SAE FLANGED PORTS J518 - Standard pressure series 3000 psi - Code 61 **SSM**

Metric thread ISO 60° conforms to ISO/R 262

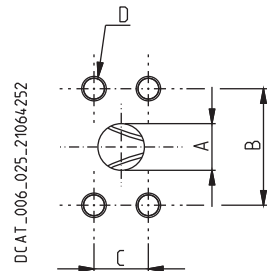
CODE	Nominal size	A	B	C	D		
		mm (in)	mm (in)	mm (in)	Thread Depth mm (in)	Nm (lbf in)	Nm (lbf in)
<b>MB</b>	3/4"	20 (0.7874)	47,6 (1.8740)	22,2 (0.8740)	M 10 17 (0.6693)	—	45 <sup>+2,5</sup> (398 ÷ 420)
<b>MC</b>	<b>1"</b>	<b>25,4 (1.0000)</b>	<b>52,4 (2.0630)</b>	<b>26,2 (1.0315)</b>	<b>M 10 17 (0.6693)</b>		<b>30<sup>+2,5</sup> (266 ÷ 288)</b>
<b>MD</b>	1" 1/4	32 (1.2598)	58,7 (2.3110)	30,2 (1.1890)	M 10 17 (0.6693)	20 <sup>+1</sup> (177 ÷ 186)	—
<b>ME</b>	1" 1/2	38,1 (1.5000)	69,8 (2.7480)	35,7 (1.4055)	M 12 20 (0.7874)	30 <sup>+2,5</sup> (266 ÷ 288)	—
<b>MF</b>	<b>2"</b>	<b>51 (2.0079)</b>	<b>77,8 (3.0630)</b>	<b>42,9 (1.6890)</b>	<b>M 12 20 (0.7874)</b>	<b>30<sup>+2,5</sup> (266 ÷ 288)</b>	



### SAE FLANGED PORTS J518 - Standard pressure series 3000 psi - Code 61 **SSS**

American straight thread UNC-UNF 60° conforms to ANSI B 1.1

CODE	Nominal size	A	B	C	D		
		mm (in)	mm (in)	mm (in)	Thread Depth mm (in)	Nm (lbf in)	Nm (lbf in)
<b>SB</b>	3/4"	20 (0.7874)	47,6 (1.8740)	22,2 (0.8740)	3/8 - 16 UNC-2B 17 (0.6693)	—	30 <sup>+2,5</sup> (266 ÷ 288)
<b>SC</b>	1"	25,4 (1.0000)	52,4 (2.0630)	26,2 (1.0315)	3/8 - 16 UNC-2B 17 (0.6693)	—	35 <sup>+2,5</sup> (310 ÷ 332)
<b>SD</b>	1" 1/4	32 (1.2598)	58,7 (2.3110)	30,2 (1.1890)	7/16 - 14 UNC-2B 17 (0.6693)	25 <sup>+1</sup> (221 ÷ 230)	—
<b>SE</b>	1" 1/2	38,1 (1.5000)	69,8 (2.7480)	35,7 (1.4055)	1/2 - 13 UNC-2B 20 (0.7874)	30 <sup>+2,5</sup> (266 ÷ 288)	—
<b>SF</b>	2"	51 (2.0079)	77,8 (3.0630)	42,9 (1.6890)	1/2 - 13 UNC-2B 20 (0.7874)	30 <sup>+2,5</sup> (266 ÷ 288)	—



03/06.2011

# FLOW COMPENSATOR (Load-sensing)

**LS**

Regulates the pump displacement to maintain a constant (load independent) pressure drop across a flow metering device. In the standard version the flow compensator is combined with pressure compensator.

Flow compensator type	Pressure compensator	Differential pressure setting range	Standard setting
		bar (psi)	bar (psi)
<b>LS0</b> (■)	<b>RPO</b>	12 ÷ 40 (174 ÷ 580)	14 (203)
<b>LS2</b> (◆)	<b>RPO</b>		
<b>LS3</b> (●)	<b>RPO</b>		

- (■): Suggested when the directional control valve does not have the bleed function
- (◆): Y is plugged. Suggested when the directional control valve has the bleed function
- (●): For remote pressure control.

Pilot flow ≈ 1,3 ÷ 1,5 l/min (0.34 ÷ 0.40 US gpm)

In standard setting conditions 14 bar (203 psi) the stand-by pressure is 15±2 bar (218±29 psi).

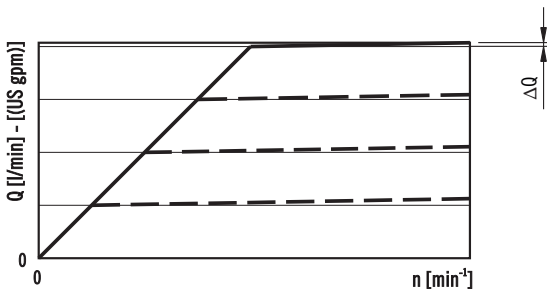
**NOTES**

Available without pressure compensator RP.  
For more information, please consult our technical sales department.

**OPERATING CURVES**

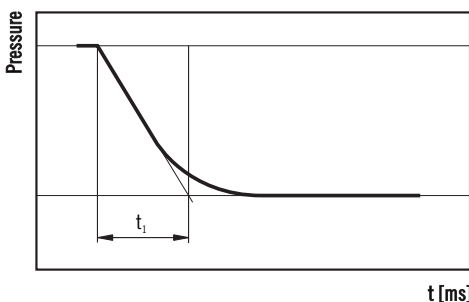
Curves have been obtained at the speed of 1500 min<sup>-1</sup> and oil temperature 50 °C (122 °F).

Curve at variable speed

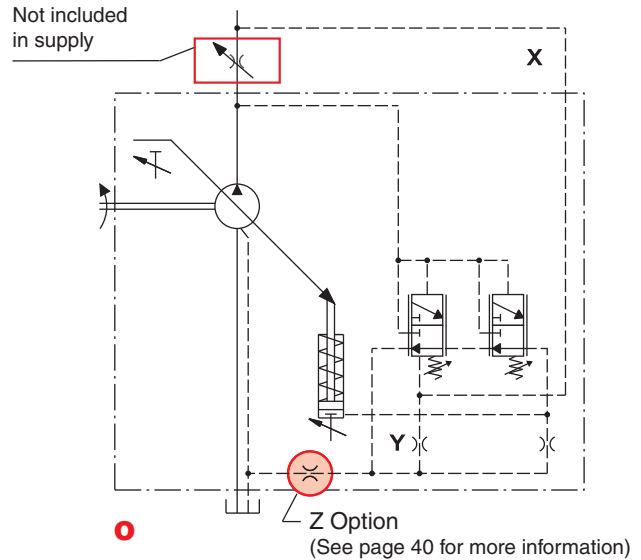


**RESPONSE TIME**

According to SAE J745 (using outlet pressure).

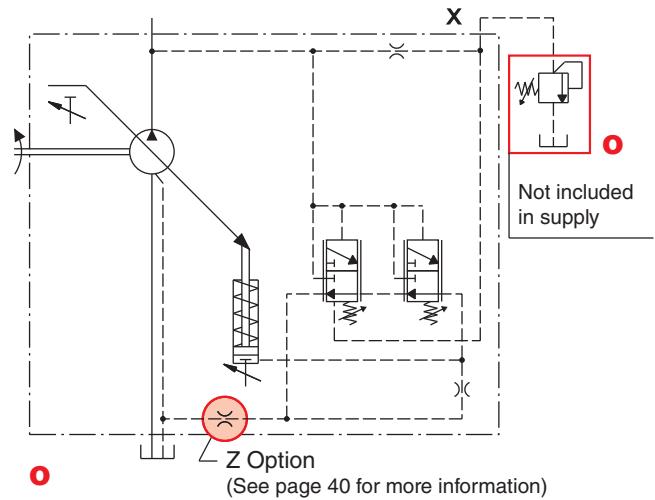


**LS0 - LS2**



Replaces: 04/01.2012

**LS3 - Remote pressure compensator**



**ΔQ max**

Pump type	l/min (US gpm)
<b>MVP 30</b>	0,9 (0.24)
<b>MVP 48</b>	1,7 (0.45)
<b>MVP 60</b>	2,5 (0.66)

**t<sub>1</sub>**

Pump type	Response time [ms] (off stroke)
<b>MVP 30</b>	120
<b>MVP 48</b>	120
<b>MVP 60</b>	120

According to SAE J745 (using outlet pressure)

05/10.2014