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### Fan Drive system

In mobile equipment and transport vehicles, it is important to optimise performance, reduce noise and minimise emissions. To do this effectively, it is useful to have a heat dissipation system that is capable of varying its performance according to the machine's actual operating requirements. The Fan Drive system is a **smart system** that **decouples the fan speed from the revolutions of the internal combustion engine and optimises its performance according to the specific operating situation** by managing the parameters according to the programmed logics.

The HPLMF2 family consists of a **Group 2 external gear motor** in aluminium with a cast iron flange and cover with the **electro-hydraulic fan control logics** all integrated into the hydraulic motor cover.

### Features

The integrated HPLMF2 fan drives consist of a **Group 2 aluminium gear motor** with a cast iron flange and cast iron cover with **integrated electro-hydraulic logics**.

When signals are received from sensors or the CAN network, a **programmable electronic control unit pilots an electric or electro-hydraulic actuator** which controls the fan speed according to actual cooling requirements. The system **can be equipped with a reverser** which cleans the radiator core.

### Benefits

Thanks to their compactness, functionality and price-performance ratio, **HPLMF2 integrated Fan Drive systems are the ideal solution for controlling cooling in new-generation IC engines** in their flow rate range. The possibility of housing the SMART POWER control unit makes it possible to construct specific speed control ramps or completely deactivate rotation when the IC engine is idling. This makes the product **suitable for every need and maximises energy saving**.

### Range

The range consists of four models which can be identified by the cover codes **QB, QC, PA and PD** which represent the logical core of the product. Each cover model is available in additional versions which are described in the respective product sheets.

For each type of cover, the customer can configure the motor by choosing the displacement, flange, shaft and any integrated support.

### Recommendations

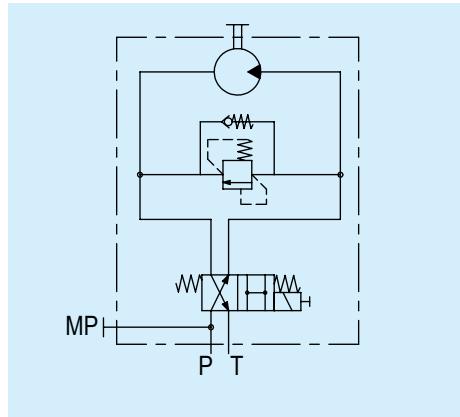
Users are advised to use the **HPLMF2 product within the pressure, flow rate and speed limits defined in this catalogue** and select the direction of rotation according to the cover model.

For different applications and/or conditions of use, please contact our technical sales department.

## HPLMF2 QB

### **Motor with ON-OFF fan stop.**

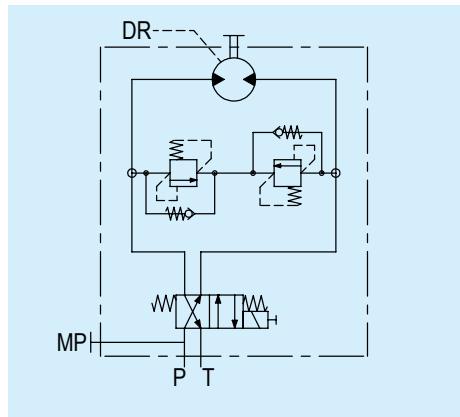
This stops the fan and bypasses all oil directed to the motor when the coil is energised.



## HPLMF2 QC

### **Reversible motor.**

This reverses the direction of rotation of the fan. This is required whenever poor cleaning of the cooling system affects its efficiency.

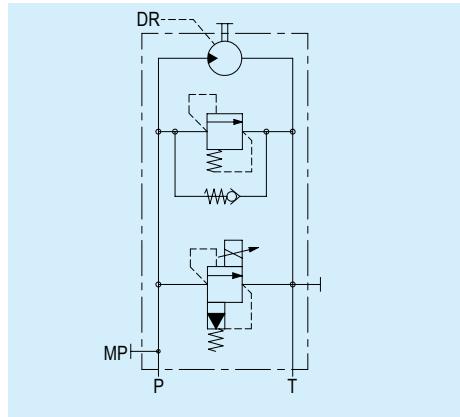
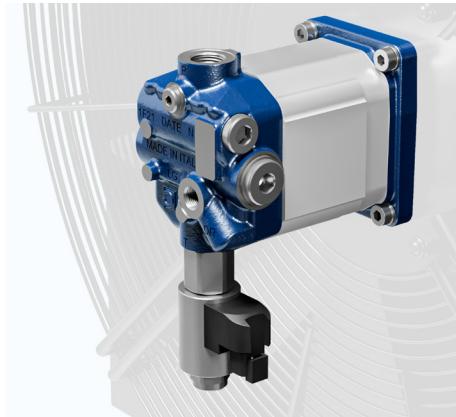


## HPLMF2 PA

### **Motor with proportional speed control.**

This varies the fan speed when the coil is energised by discharging part of the flow directly to the motor.

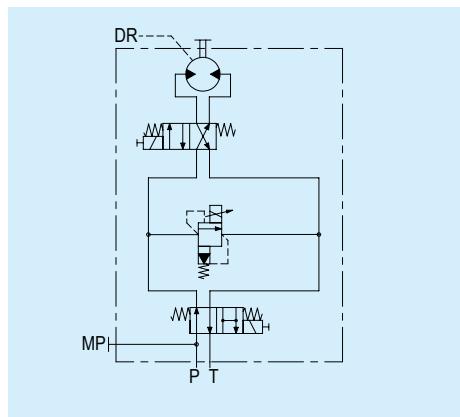
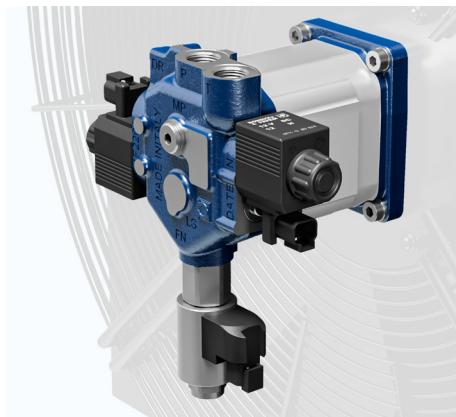
In a non-energised condition, the fan will operate at maximum speed. This safety logic allows the system to be in maximum cooling condition if there is no electrical signal.



## HPLMF2 PD

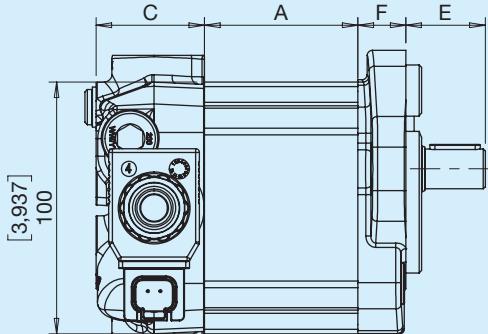
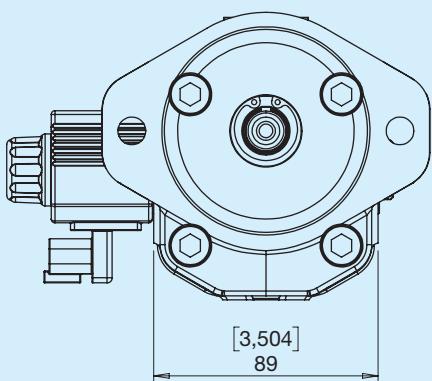
### **Motor with proportional speed control plus reversal.**

This allows proportional control of the fan speed (with a safety logic) and the possibility of reversing the direction of rotation.



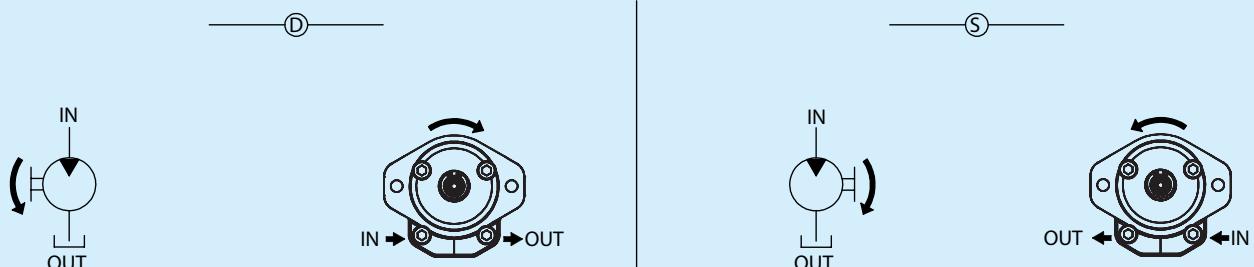
## HPLMF2 QB





C - See section on covers E - See section on shafts F - See section on flanges

## Definition of rotation



## Combinations of rotations / cover

### Rotation

D

S

QB

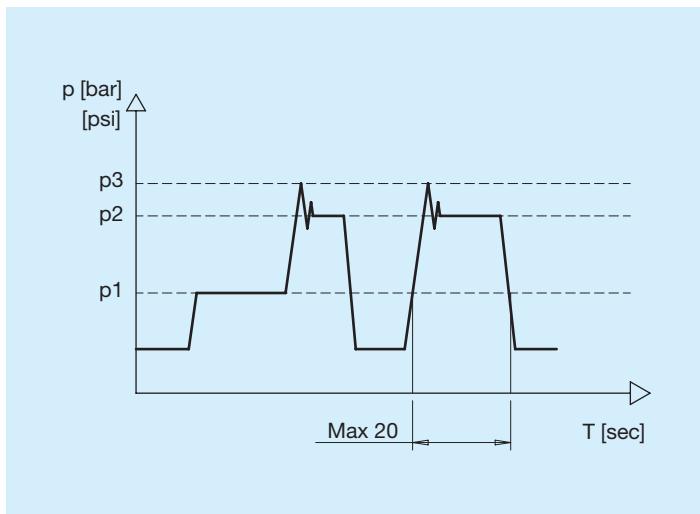
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## Dimensions and technical data

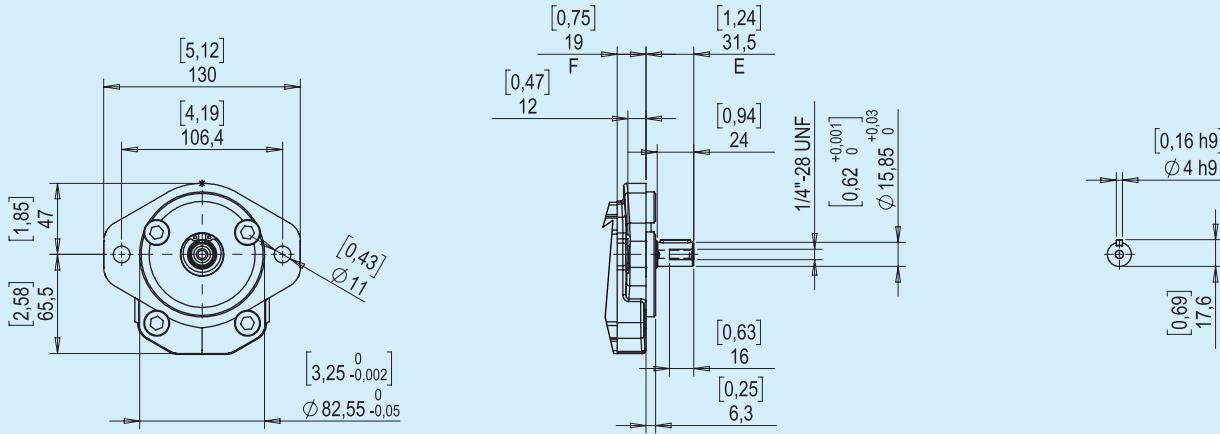
HPLMF2	Nominal displacement		Continuous pressure		Intermittent pressure		Peak pressure		Rotational speed		A	
	cm <sup>3</sup>	in <sup>3</sup>	bar	psi	bar	psi	bar	psi	min <sup>-1</sup>	min <sup>-1</sup>	mm	in
<b>06</b>	6,00	0,37	240	3481	260	3771	300	4351	3000	700	51,85	2,04
<b>08</b>	8,50	0,52	230	3336	250	3626	280	4061	2500	700	56,35	2,22
<b>11</b>	11,00	0,67	230	3336	250	3626	280	4061	2000	700	60,85	2,40

## Pressure definition

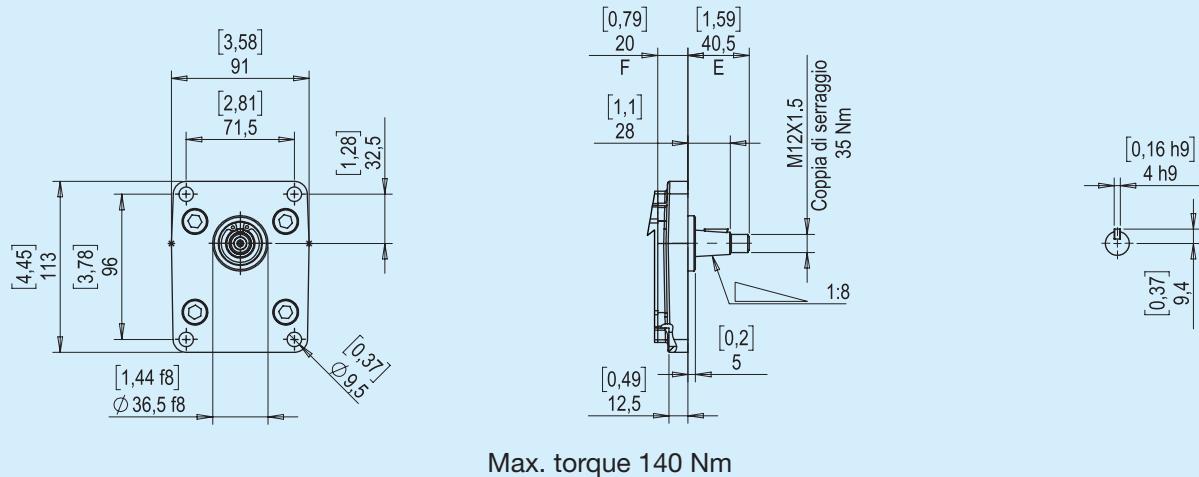


- p1** Continuous pressure
- p2** Intermittent pressure  
Maximum pressure permitted for short periods (max. 20 sec)
- p3** Peak pressure  
Maximum permitted pressure intended as peak pressure of Vmax

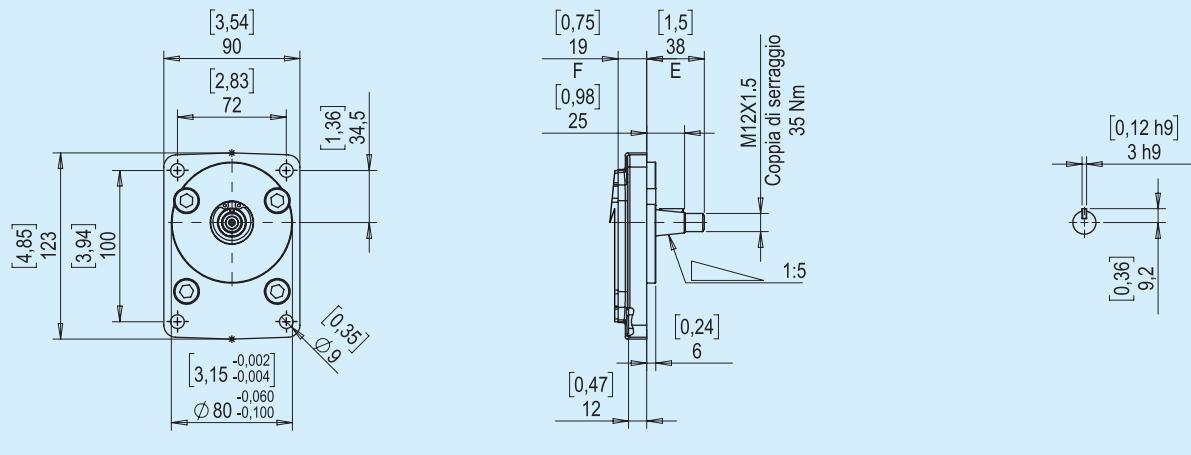
## QP SAE A 2 cast iron holes - Round SAE A



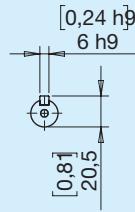
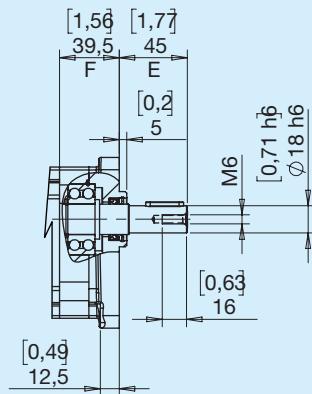
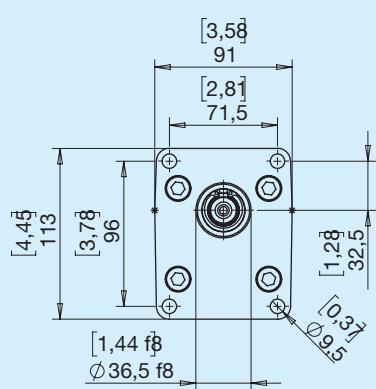
## LL European cast iron flange - Tapered 1:8



## VM German cast iron flange - Tapered 1:5

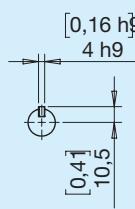
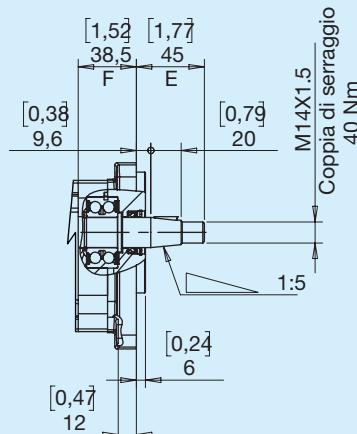
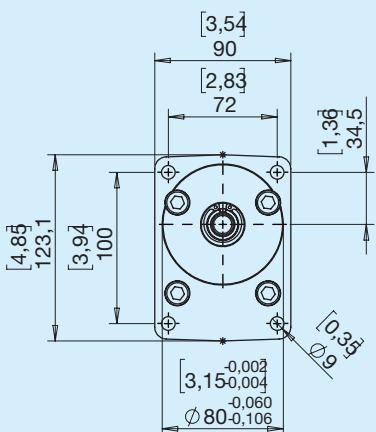


## I1 European cast iron flange - Round D18



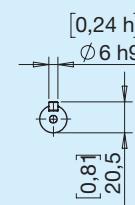
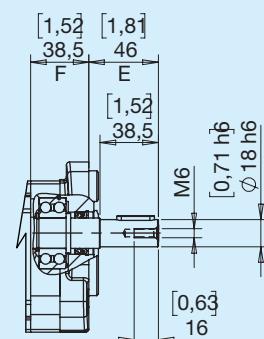
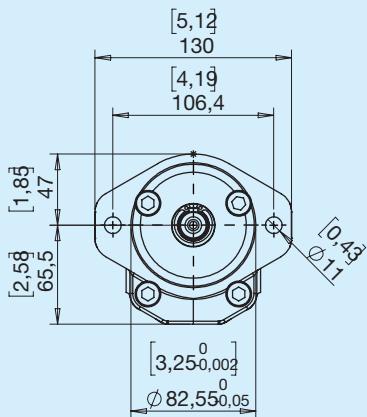
Max. torque 100 Nm

## I2 German cast iron flange - Tapered (1:5)



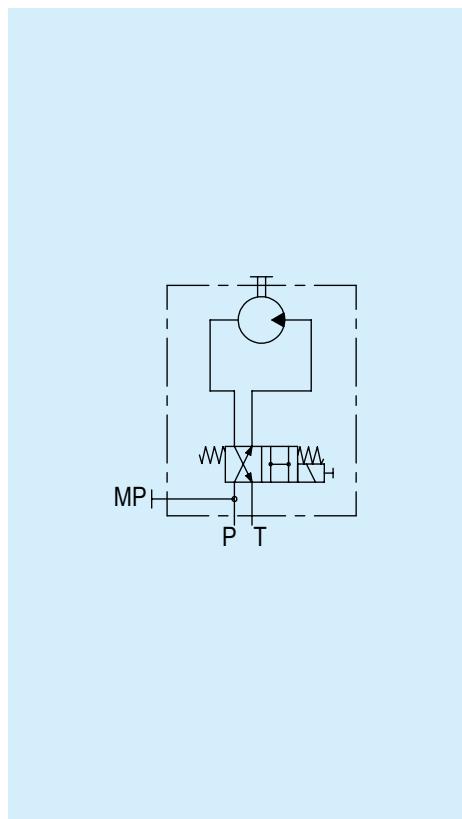
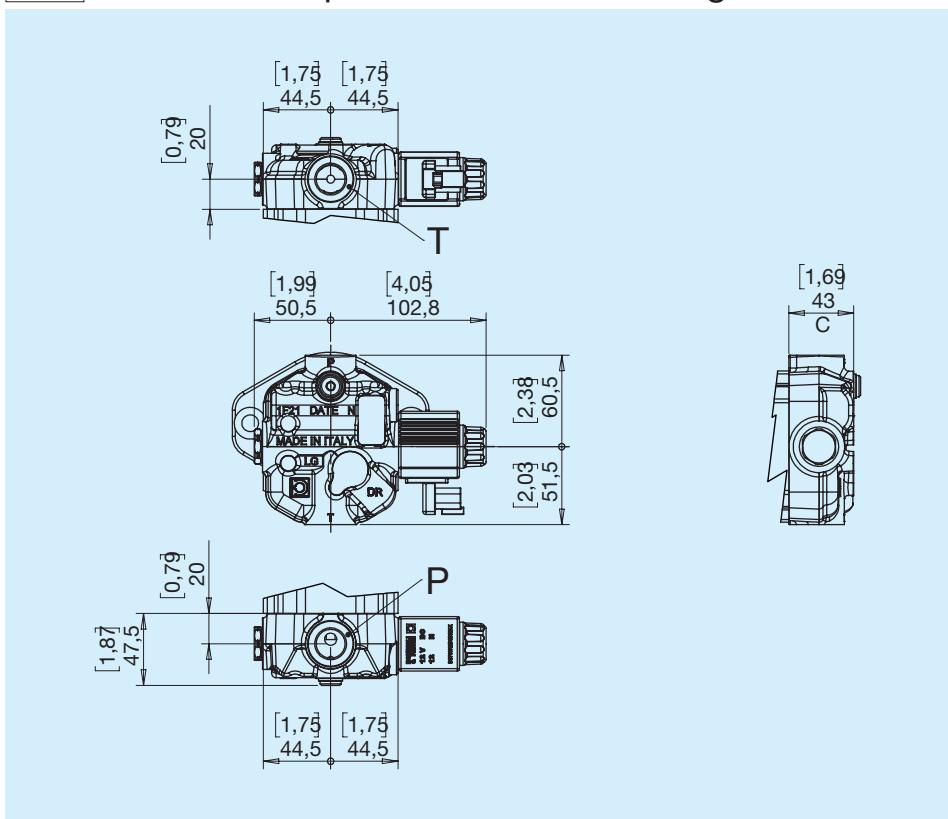
Max. torque 100 Nm

## I3 SAE A 2 cast iron flange - Round D18

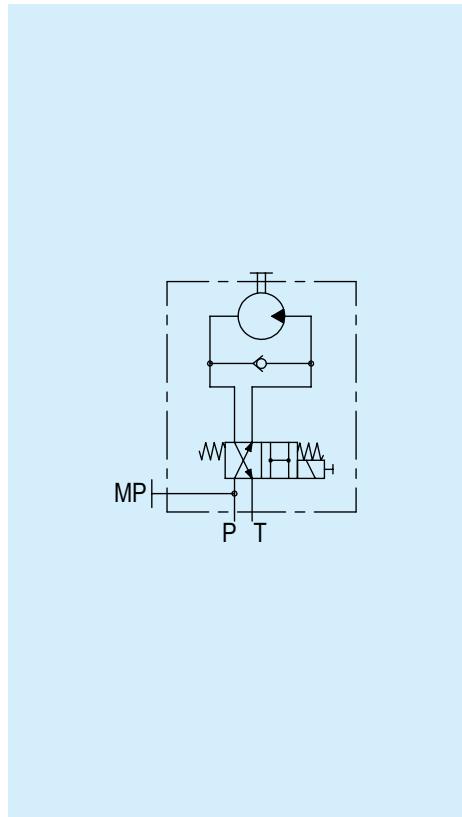
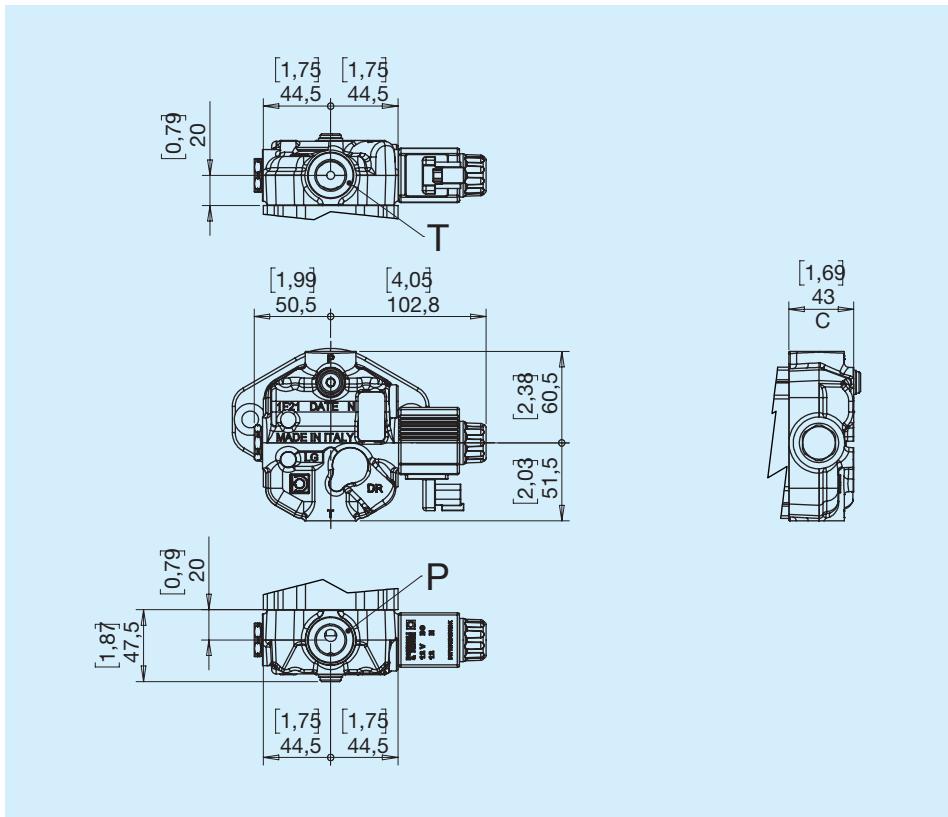


Max. torque 100 Nm

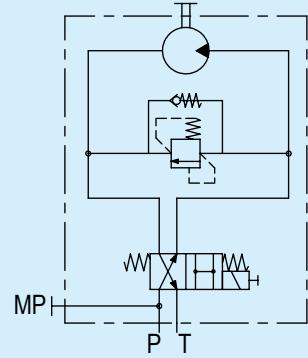
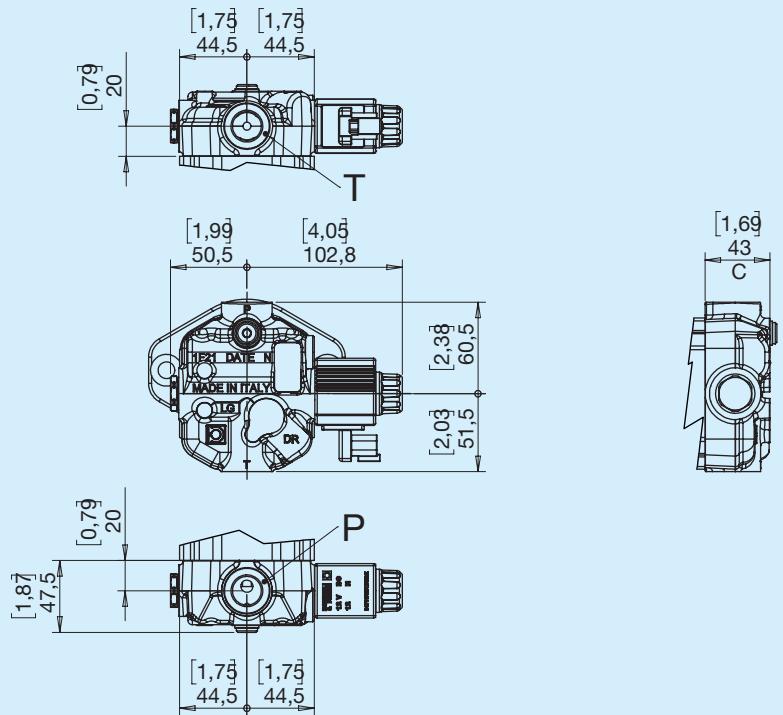
### NN QB - Without pressure relief and filling valve



### VC QB - Filling valve only

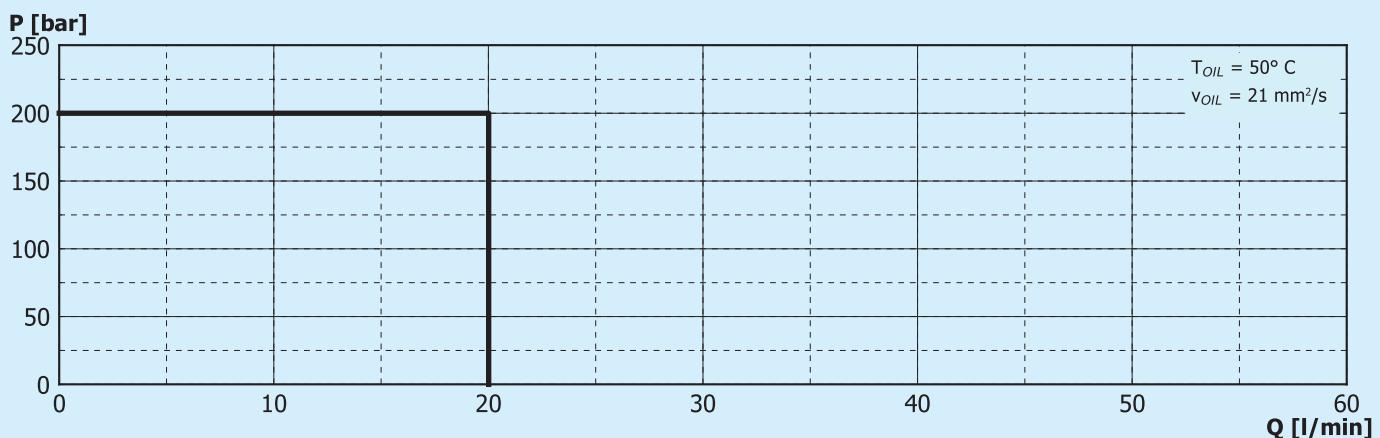


## 25 QB - With pressure relief and filling valve



The numerical value that identifies the version varies according to the desired pressure relief valve calibration. See the "ordering instructions" for available settings.

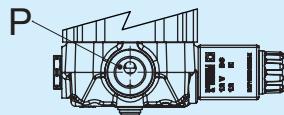
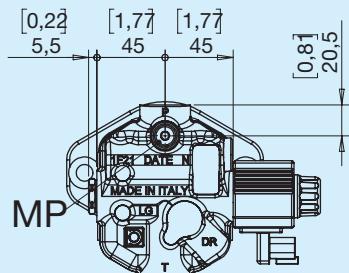
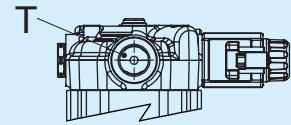
## Limits of use



N.B.: The graph shows the performance limits for correct operation of the ON/OFF valve

## Electrical characteristics

Voltage	12	24	$V (\pm 10\%)$
Resistance at 20°C	4.5	19.4	$\Omega (\pm 7\%)$
Absorbed current	2.7	1.24	A
Power	26.5	30	W



## Thread ports 'P-T'

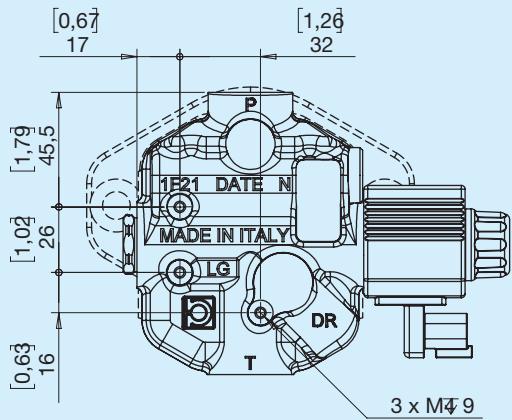
Code	Type	Torque ± 10% Nm
<b>B</b>	G4 - PORT ISO 1179-1 - G1/2"	70
<b>R</b>	U5 - PORT ISO 11926-1 - 7/8"-14	70

## Thread gauge port 'MP'

Code	Type	Torque ± 10% Nm
<b>0</b>	Nessuna	-
<b>Q</b>	G1 - PORT ISO 1179-1 - G1/8"	12

\*Gauge port "MP" being supplied; it is fitted with a removable cap.

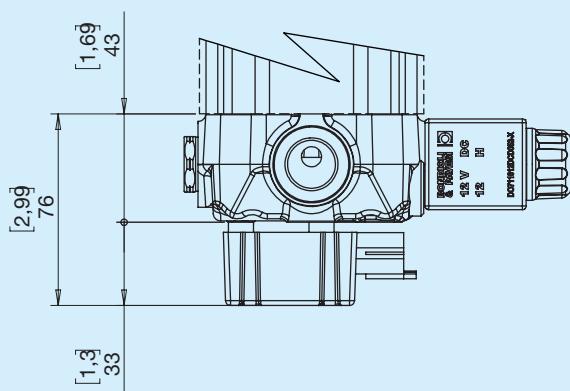
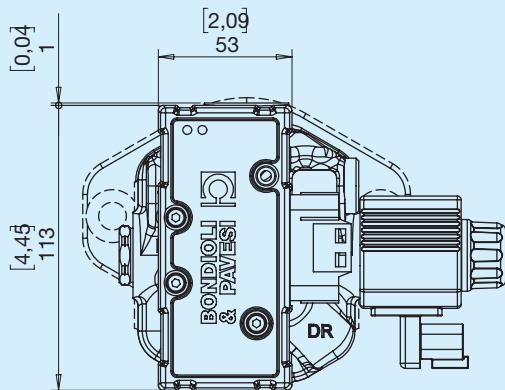
## P Fitting for ECU



This option excludes the possibility of having an 'MP' gauge port.

The dimensions shown guarantee optimum installation of the SMAT POWER FAN electronic board.

## M With ECU SMAT POWER FAN



This option excludes the possibility of having an 'MP' gauge port.

## SMAT POWER FAN technical data

### TECHNICAL DATA

POWER SUPPLY VOLTAGE	9 - 30 Vdc
CURRENT CONSUMPTION	Standby: 80 mA Max Current 1 Channel LSD: 100 mA Max Current 1 Channel HSD: 3 A @12Vdc 2 A @24Vdc Max Total Current: 4 A @12Vdc 3 A @24Vdc
ANALOG INPUTS	4 0 - 5 Vdc, Rheo, 4 - 20 mA
DIGITAL INPUTS	1 (internal pull-down resistor)
FREQUENCY INPUTS	2 Max: 10kHz, 1Vrms (internal pull-up resistor)
DIGITAL/PWM OUTPUTS	4 Low Power PWM Frequency: 100 - 400 Hz
COMMUNICATION LINE	2 RS232, CAN 2.0 B
COMPATIBLE PROTOCOLS	SAE J1939, CANopen
MICROCONTROLLER	PIC18F (8 bit) 32MHz Flash: 64 kB, RAM: 3 kB, EEPROM: 1 kB
OPERATIONG/STORAGE TEMPERATURE	-40 ... 85 °C (-40 ... 185 °F)
PROTECTION	IP 67 (with plug inserted)
WEIGHT	280 g +- 10g

### ENVIRONMENT DATA

EMI/RFI RATIO	100 V/m
VIBRATION	EN 60068-2-6
MECHANICAL SHOCK	ISO 15003, par. 5.5.2 level 3
CE COMPLIANT	

The dimensions shown guarantee optimum installation of the SMAT POWER FAN electronic board.

<b>HPLMF2</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<hr/>															
1	2	Displacement													
		06		08					11						
3	Direction of rotation														
	S	Anti-clockwise/left		D	Clockwise/right										
4	5	Shaft flanges													
		QP	SAE A 2 cast iron holes - Round SAE A	LL	European cast iron flange - Tapered 1:8	VM	German cast iron flange - Tapered 1:5								
6	Integrated supports														
	I1	European cast iron flange - Round D18	I2	German cast iron flange - Tapered (1:5)	I3	SAE A 2 cast iron flange - Round D18									
7	8	Seals													
		B	NBR												
9	10	Cover model													
		QB	Fan ON-OFF stop												
11	Cover version														
	NN	Without filling valve	09	90 bar	15	150 bar	21	210 bar							
	VC	Filling valve only	10	100 bar	16	160 bar	22	220 bar							
	05	50 bar	11	110 bar	17	170 bar	23	230 bar							
	06	60 bar	12	120 bar	18	180 bar	24	240 bar							
	07	70 bar	13	130 bar	19	190 bar	25	250 bar							
	08	80 bar	14	140 bar	20	200 bar									
12	Ports P-T														
	B	G4 - PORT ISO 1179-1 - G1/2"	R	U5 - PORT ISO 11926-1 - 7/8"-14											
13	Thread gauge port "MP"														
	0	None	Q	G1 - PORT ISO 1179-1 - G1/8"											
14	Voltage and connectors														
	G	12V Deutsch DT04-2P	H	24V Deutsch DT04-2P											

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## Electronic board

- |          |      |          |                 |          |                         |
|----------|------|----------|-----------------|----------|-------------------------|
| <b>N</b> | None | <b>P</b> | Fitting for ECU | <b>M</b> | With SMAT POWER FAN ECU |
|----------|------|----------|-----------------|----------|-------------------------|

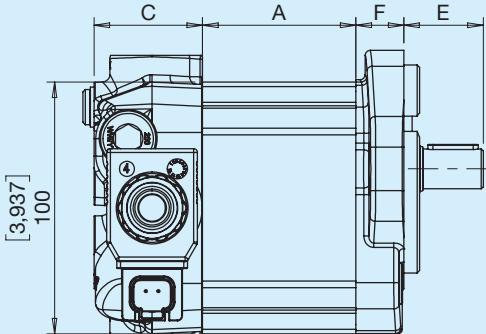
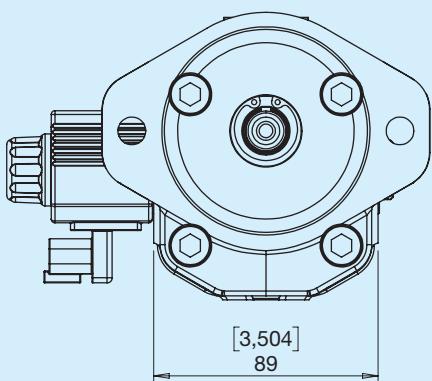
15

## External treatment

- |          |      |          |              |
|----------|------|----------|--------------|
| <b>N</b> | None | <b>Z</b> | Zinc plating |
|----------|------|----------|--------------|

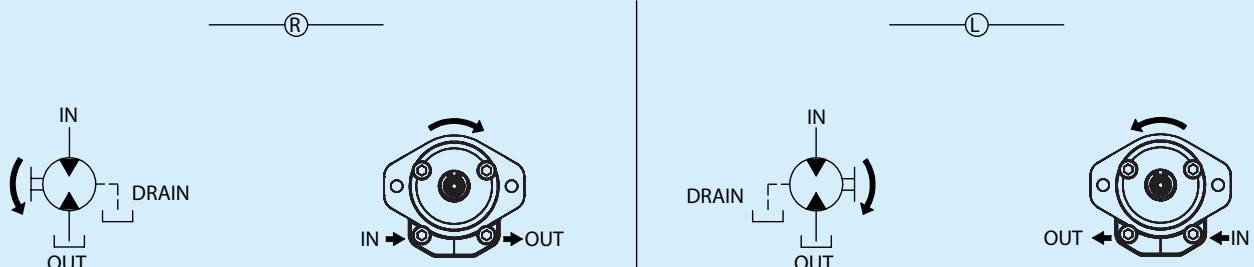
## HPLMF2 QC





C - See section on covers E - See section on shafts F - See section on flanges

## Definition of rotation



## Combinations of rotations / cover

### Rotation

R

L

QC

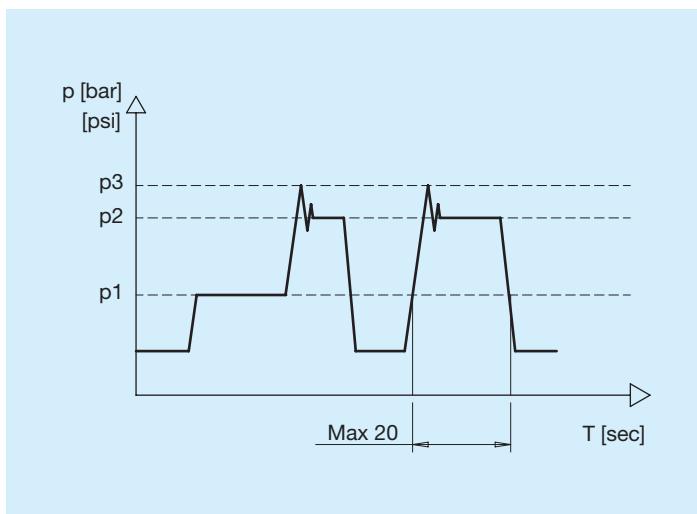
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## Dimensions and technical data

HPLMF <sup>2</sup>	Nominal displacement		Continuous pressure		Intermittent pressure		Peak pressure		Rotational speed		A	
	cm <sup>3</sup>	in <sup>3</sup>	bar	psi	bar	psi	bar	psi	min <sup>-1</sup>	min <sup>-1</sup>	mm	in
<b>06</b>	6,00	0,37	240	3481	260	3771	300	4351	4000	700	51,85	2,04
<b>08</b>	8,50	0,52	230	3336	250	3626	280	4061	4000	700	56,35	2,22
<b>11</b>	11,00	0,67	230	3336	250	3626	280	4061	3000	700	60,85	2,40
<b>14</b>	14,50	0,88	230	3336	250	3626	280	4061	2500	700	67,25	2,65

## Pressure definition

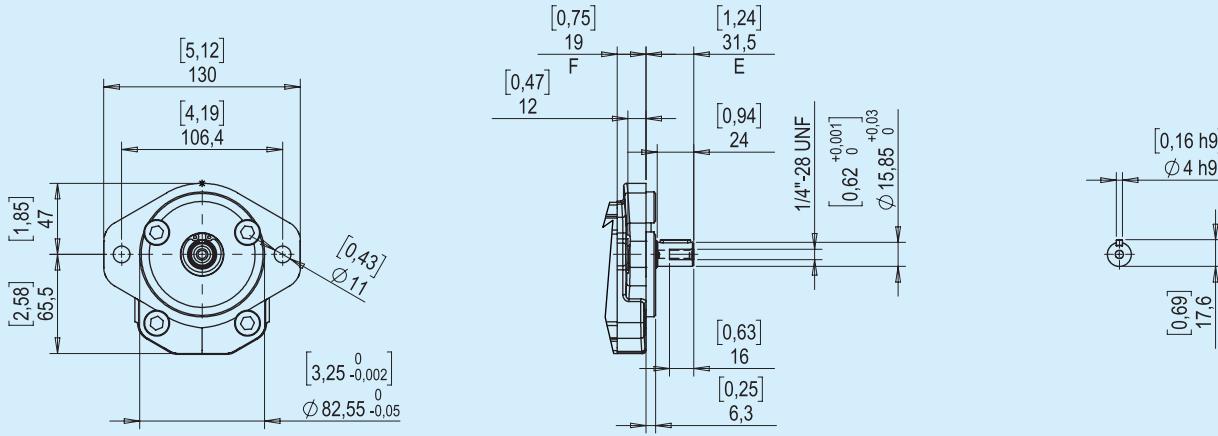


**p1** Continuous pressure

**p2** Intermittent pressure  
Maximum pressure permitted for short periods (max. 20 sec)

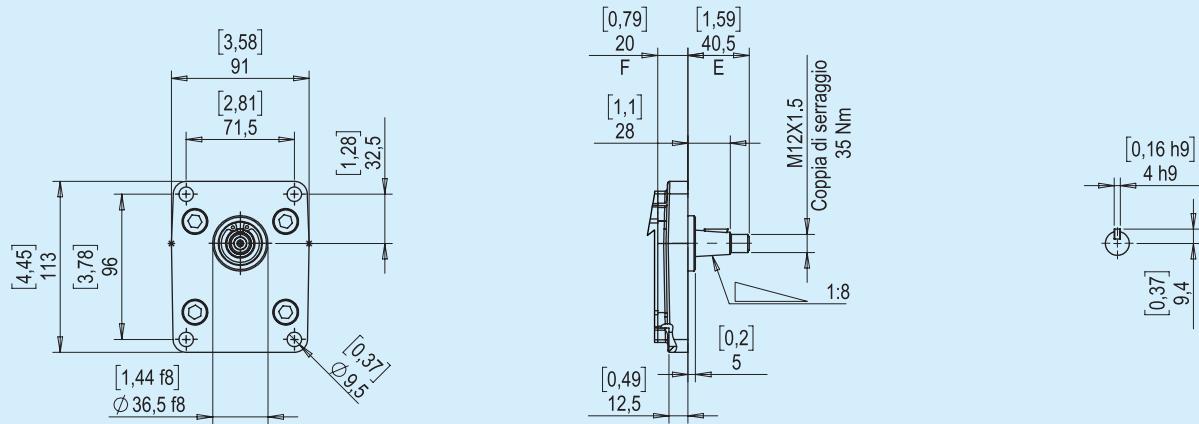
**p3** Peak pressure  
Maximum permitted pressure intended as peak pressure of Vmax

## QP SAE A 2 cast iron holes - Round SAE A



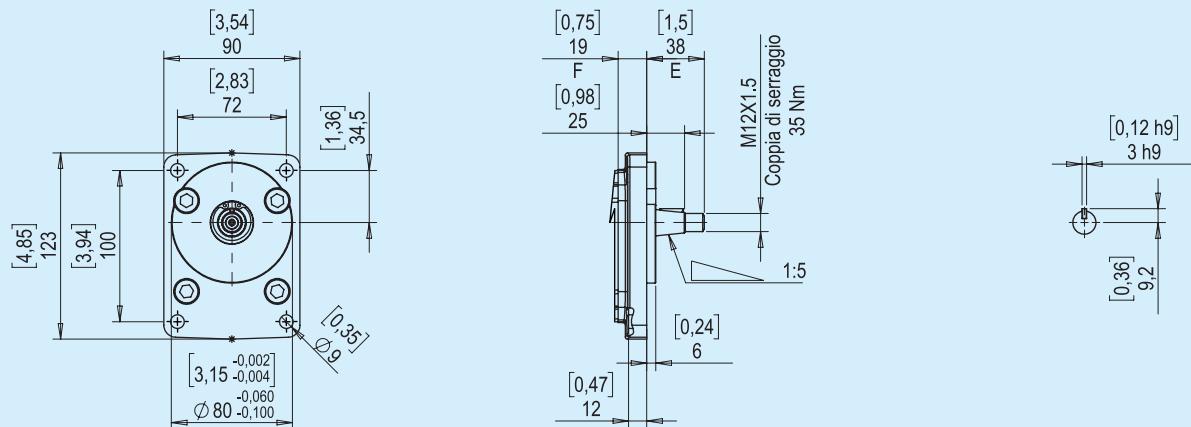
Max. torque 70 Nm

## LL European cast iron flange - Tapered 1:8



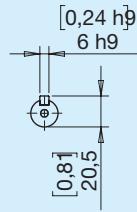
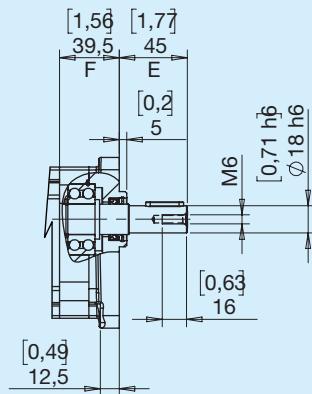
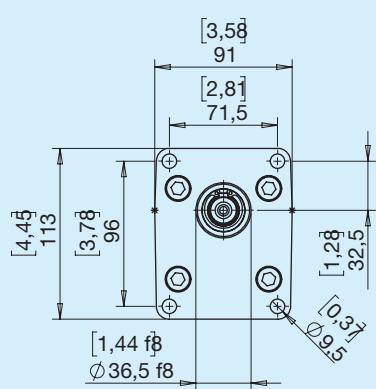
Max. torque 140 Nm

## VM German cast iron flange - Tapered 1:5



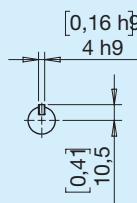
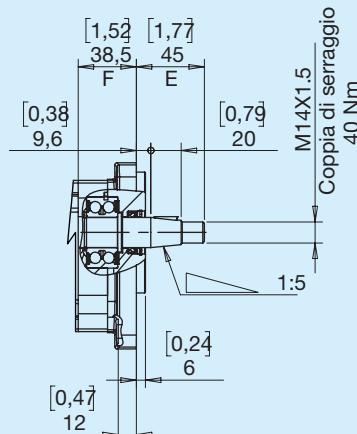
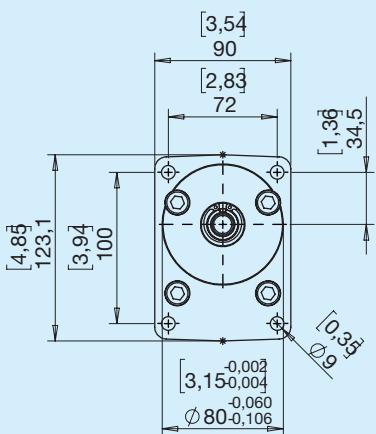
Max. torque 120 Nm

## I1 European cast iron flange - Round D18



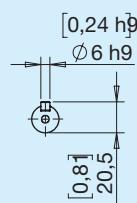
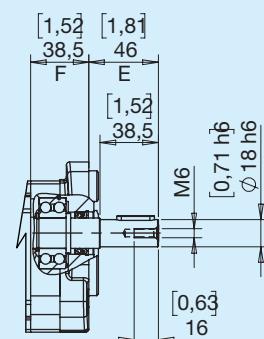
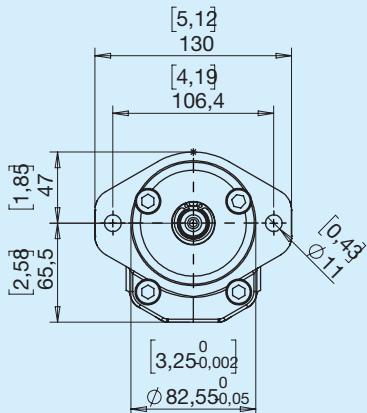
Max. torque 100 Nm

## I2 German cast iron flange - Tapered (1:5)



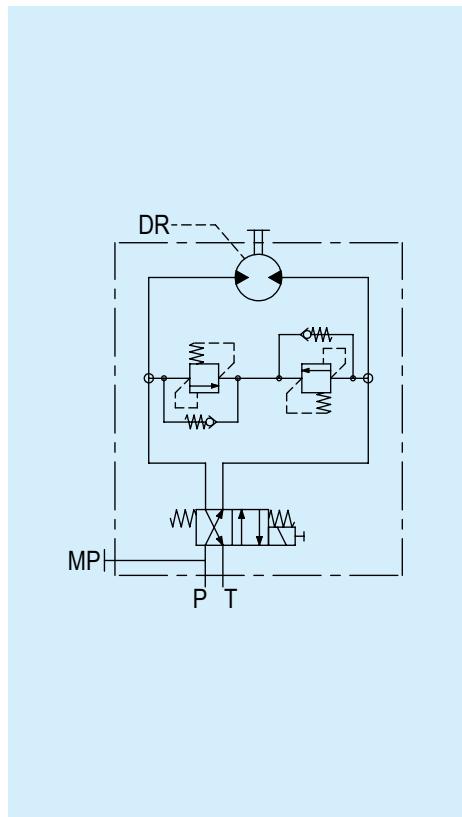
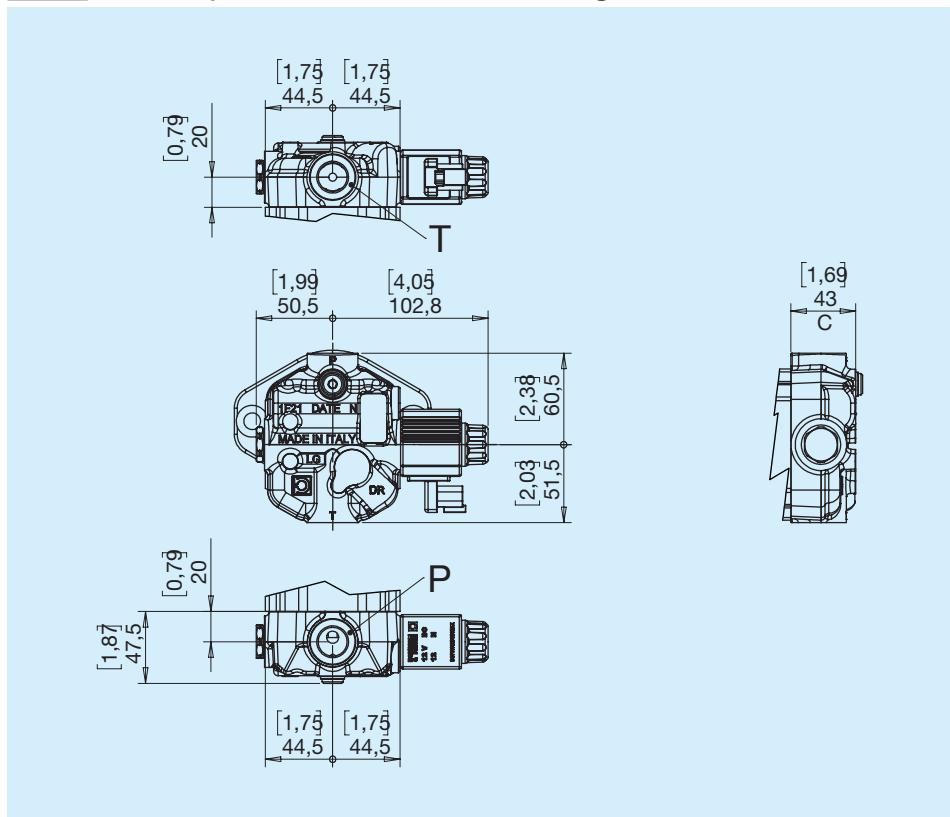
Max. torque 100 Nm

## I3 SAE A 2 cast iron flange - Round D18



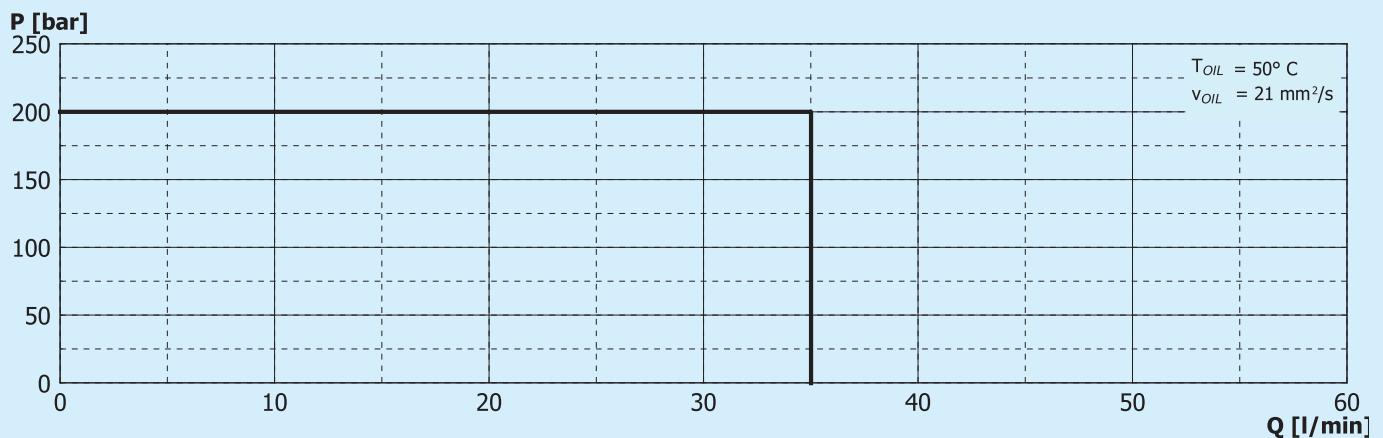
Max. torque 100 Nm

**QC** - With pressure relief and filling valves



See the 'ordering instructions' for available valve settings.

## Limits of use



N.B.: The graph shows the performance limits for correct operation of the reversing valve

## Electrical characteristics

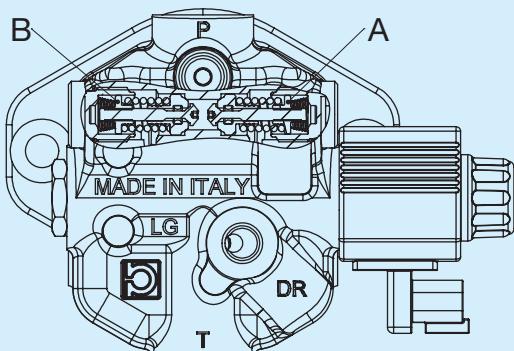
Voltage	12	24	$V (\pm 10\%)$
Resistance at $20^\circ C$	4,5	19,4	$\Omega (\pm 7\%)$
Absorbed current	2,7	1,24	A
Power	26,5	30	W

## A) Pressure relief and filling valve - main.

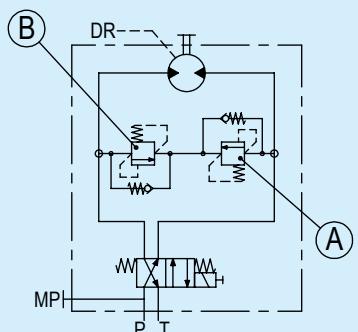
The 'main' pressure relief and filling valve protects the motor during rotation in the primary direction

## B) Pressure relief and filling valve - secondary.

The 'secondary' pressure relief and filling valve protects the motor when rotating in the opposite direction.

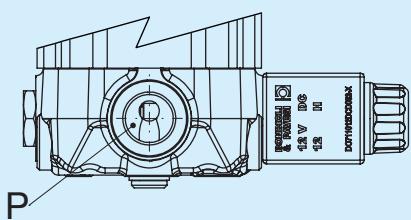
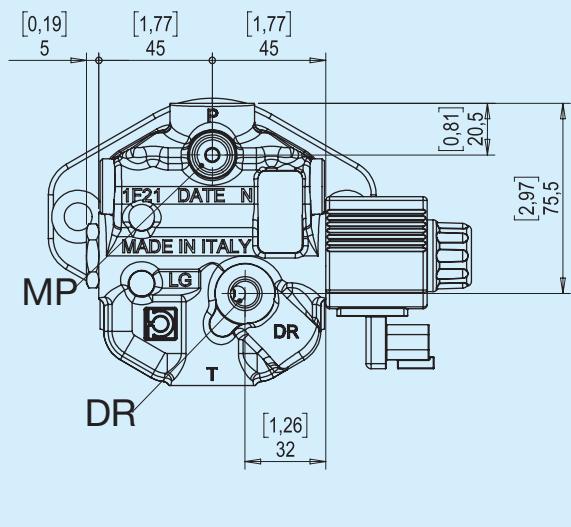
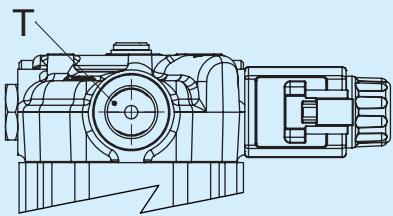


See the "ordering instructions" for available valve settings..



To protect the motor during inversion, the relief valve must be calibrated to a pressure that is at least 40 bar lower than the intermittent motor pressure.

See the "ordering instructions" for available valve settings.



## Thread ports 'P-T'

Code	Type	Torque ± 10% Nm
B	G4 - PORT ISO 1179-1 - G1/2"	70
R	U5 - PORT ISO 11926-1 - 7/8"-14	70

## Thread drain port 'DR'

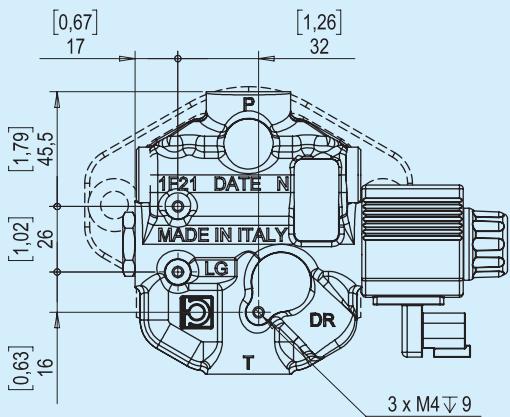
Code	Type	Torque ± 10% Nm
L	G2 - PORT ISO 1179-1 - G1/4"	27
P	U3 - PORT ISO 11926-1 - 9/16"-18	27

## Thread gauge port 'MP'

Code	Type	Torque ± 10% Nm
0	None	-
Q	G1 - PORT ISO 1179-1 - G1/8"	12

\*Gauge port 'MP' being supplied; it is fitted with a removable cap.

### P Fitting for ECU

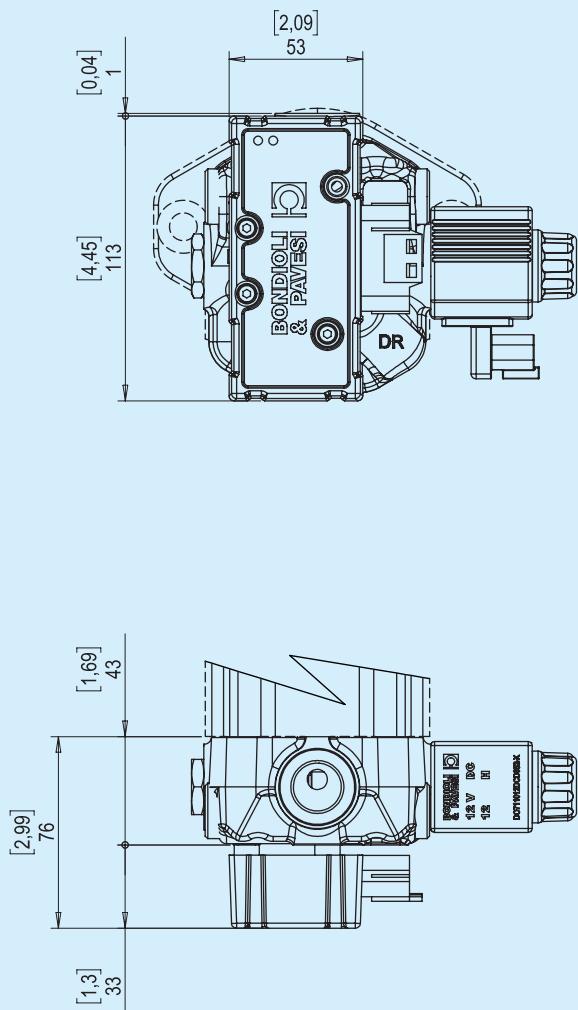


This option excludes the possibility of having an 'MP' gauge port.

With this configuration the drain port 'DR' is positioned on the side.

The dimensions shown guarantee optimum installation of the SMAT POWER FAN electronic board.

## M With SMAT POWER FAN ECU



This option excludes the possibility of having an 'MP' gauge port.

## SMAT POWER FAN technical data

### TECHNICAL DATA

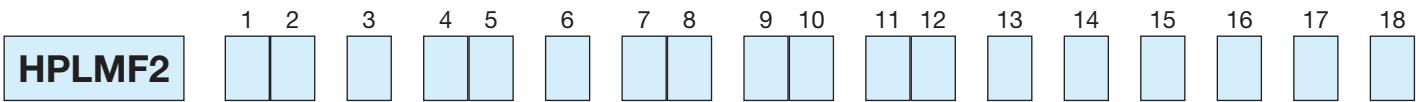
POWER SUPPLY VOLTAGE	9 - 30 Vdc
CURRENT CONSUMPTION	Standby: 80 mA Max Current 1 Channel LSD: 100 mA Max Current 1 Channel HSD: 3 A @12Vdc 2 A @24Vdc Max Total Current: 4 A @12Vdc 3 A @24Vdc
ANALOG INPUTS	4 0 - 5 Vdc, Rheo, 4 - 20 mA
DIGITAL INPUTS	1 (internal pull-down resistor)
FREQUENCY INPUTS	2 Max: 10kHz, 1Vrms (internal pull-up resistor)
DIGITAL/PWM OUTPUTS	4 Low Power PWM Frequency: 100 - 400 Hz
COMMUNICATION LINE	2 RS232, CAN 2.0 B
COMPATIBLE PROTOCOLS	SAE J1939, CANopen
MICROCONTROLLER	PIC18F (8 bit) 32MHz Flash: 64 kB, RAM: 3 kB, EEPROM: 1 kB
OPERATION/STORAGE TEMPERATURE	-40 ... 85 °C (-40 ... 185 °F)
PROTECTION	IP 67 (with plug inserted)
WEIGHT	280 g +- 10g

### ENVIRONMENT DATA

EMI/RFI RATIO	100 V/m
VIBRATION	EN 60068-2-6
MECHANICAL SHOCK	ISO 15003, par. 5.5.2 level 3
CE COMPLIANT	

With this configuration the drain port "DR" is positioned on the side.

The dimensions shown guarantee optimum installation of the SMAT POWER FAN electronic board.



1 2	Displacement			
	06	08	11	14
3	Direction of rotation			
	R Bidirectional rear external drainage - right rotation	L Bidirectional rear external drainage - left rotation		
4 5	Shaft flanges			
	QP SAE A 2 cast iron holes - Round SAE A	LL European cast iron flange - Tapered 1:8	VM German cast iron flange - Tapered 1:5	
6	Integrated supports			
	I1 European cast iron flange - Round D18	I2 German cast iron flange - Tapered (1:5)	I3 SAE A 2 cast iron flange - Round D18	
7 8	Seals			
	B NBR			
9 10	Cover version			
	QC With pressure relief and filling valves			
11 12	Pressure relief and filling valve - main			
	05 50 bar	11 110 bar	17 170 bar	23 230 bar
	06 60 bar	12 120 bar	18 180 bar	24 240 bar
	07 70 bar	13 130 bar	19 190 bar	25 250 bar
	08 80 bar	14 140 bar	20 200 bar	
	09 90 bar	15 150 bar	21 210 bar	
	10 100 bar	16 160 bar	22 220 bar	
13	Pressure relief and filling valve - secondary			
	05 50 bar	11 110 bar	17 170 bar	23 230 bar
	06 60 bar	12 120 bar	18 180 bar	24 240 bar
	07 70 bar	13 130 bar	19 190 bar	25 250 bar
	08 80 bar	14 140 bar	20 200 bar	
	09 90 bar	15 150 bar	21 210 bar	
	10 100 bar	16 160 bar	22 220 bar	

13

**Ports P-T**

**B** G4 - PORT ISO 1179-1 -  
G1/2"

**R** U5 - PORT ISO 11926-1 -  
7/8"-14

14

**Thread drain port "DR"**

**L** G2 - PORT ISO 1179-1-G 1/4"

**P** U3 - PORT ISO 11926-1 -  
9/16"-18

15

**Thread gauge port "MP"**

**O** None

**Q** G1 - PORT ISO 1179-1 -  
G1/8"

16

**Voltage and connectors**

**G** 12V Deutsch DT04-2P

**H** 24V Deutsch DT04-2P

17

**Electronic board**

**N** None

**P** Fitting for ECU

**M** With SMAT POWER FAN ECU

18

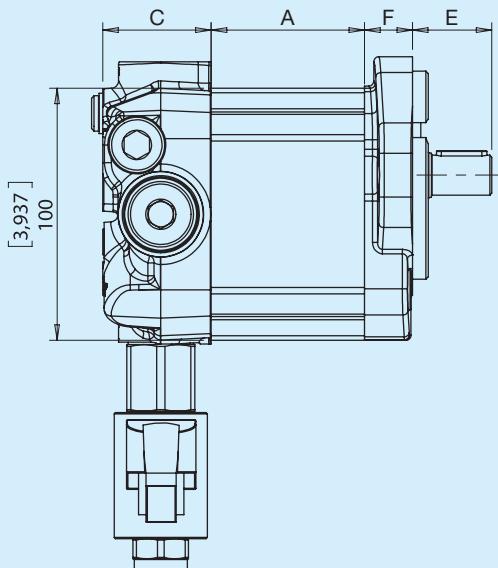
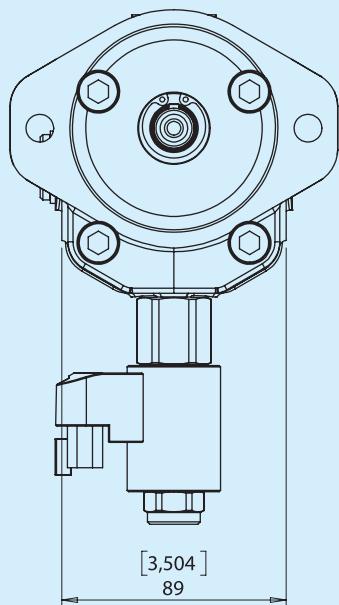
**External treatment**

**N** None

**Z** Zinc plating

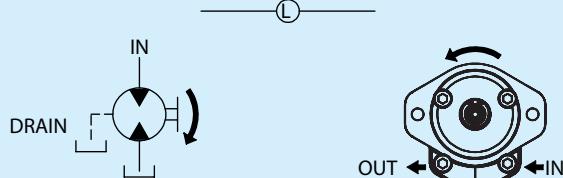
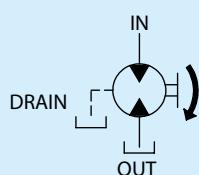
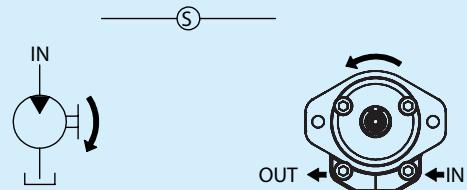
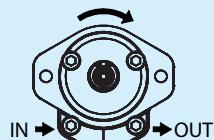
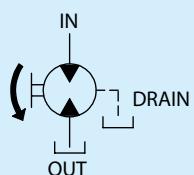
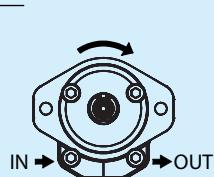
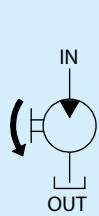
# HPLMF2 PA





C - See section on covers E - See section on shafts F - See section on flanges

## Definition of rotation



## Combinations of rotations / cover

### Rotation

R	L	D	S
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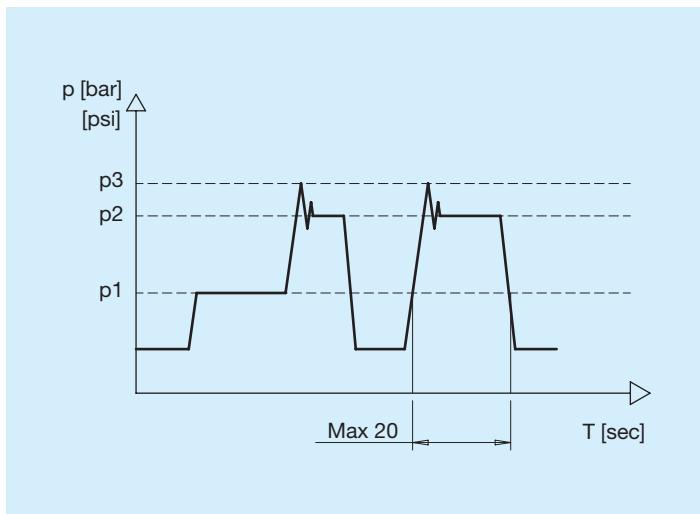
PA
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•	•	•	•
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## Dimensions and technical data

HPLMF2	Nominal displacement		Continuous pressure		Intermittent pressure		Peak pressure		Rotational speed		A	
	cm <sup>3</sup>	in <sup>3</sup>	bar	psi	bar	psi	bar	psi	min <sup>-1</sup>	min <sup>-1</sup>	mm	in
<b>06</b>	6,00	0,37	240	3481	260	3771	300	4351	4000	700	51,85	2,04
<b>08</b>	8,50	0,52	230	3336	250	3626	280	4061	4000	700	56,35	2,22
<b>11</b>	11,00	0,67	230	3336	250	3626	280	4061	4000	700	60,85	2,4
<b>14</b>	14,50	0,88	230	3336	250	3626	280	4061	4000	700	67,25	2,65
<b>17</b>	17,00	1,04	230	3336	250	3626	280	4061	4000	700	71,25	2,83
<b>20</b>	19,50	1,19	200	2901	220	3191	250	3626	3000	700	76,25	3

## Pressure definition

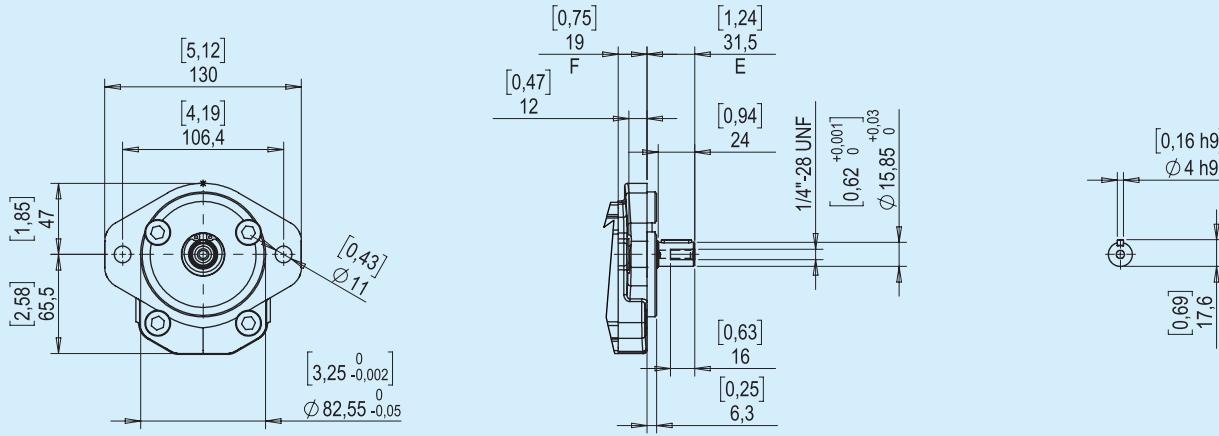


**p1** Continuous pressure

**p2** Intermittent pressure  
Maximum pressure permitted for short periods (max. 20 sec)

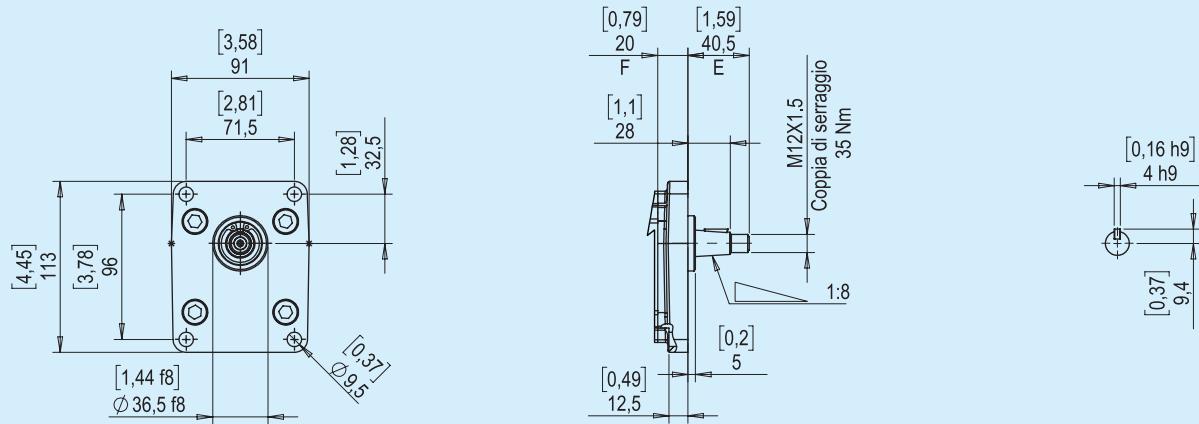
**p3** Peak pressure  
Maximum permitted pressure intended as peak pressure of  $V_{max}$

## QP SAE A 2 cast iron holes - Round SAE A



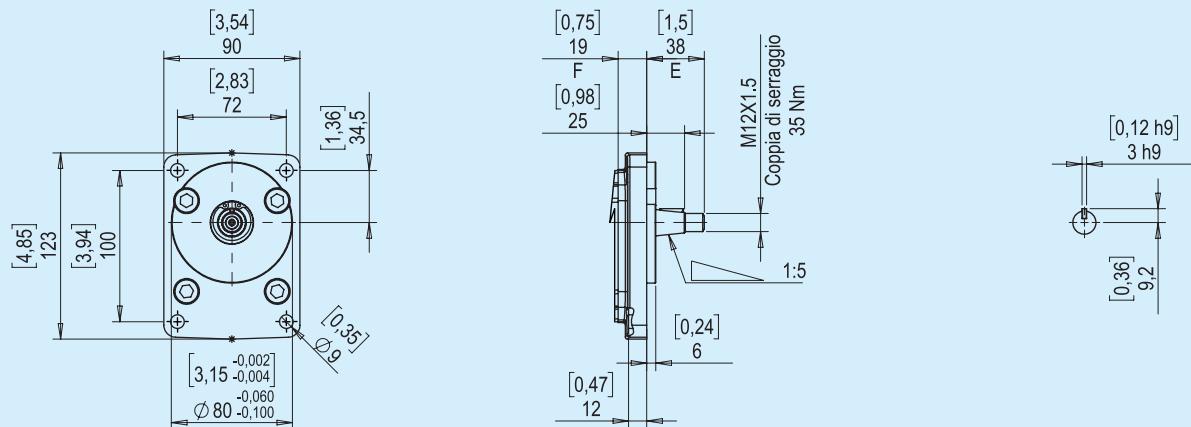
Max. torque 70 Nm

## LL European cast iron flange - Tapered 1:8



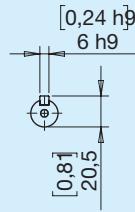
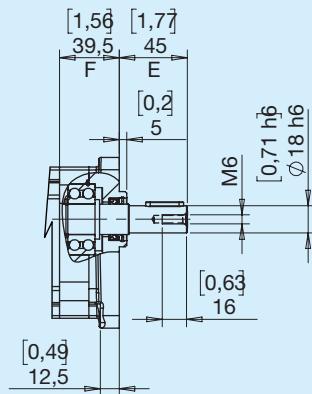
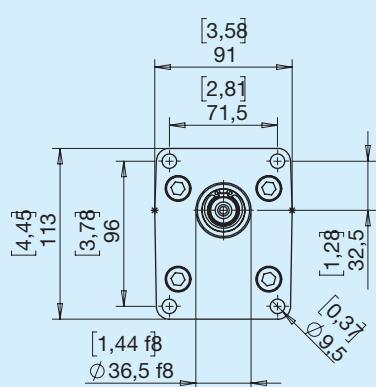
Max. torque 140 Nm

## VM German cast iron flange - Tapered 1:5



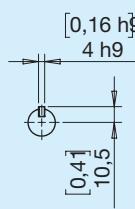
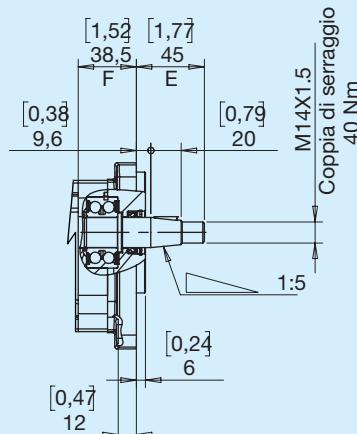
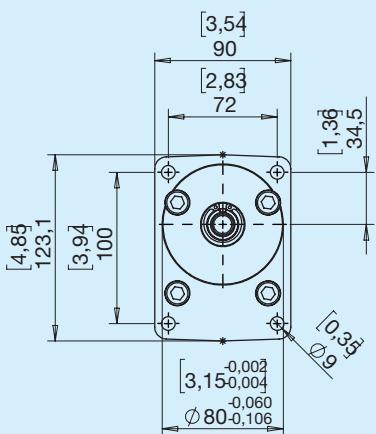
Max. torque 120 Nm

## I1 European cast iron flange - Round D18



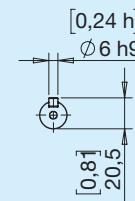
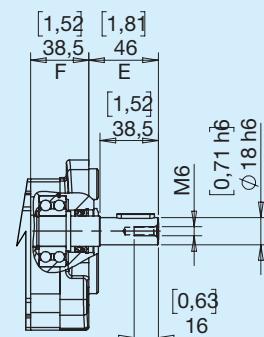
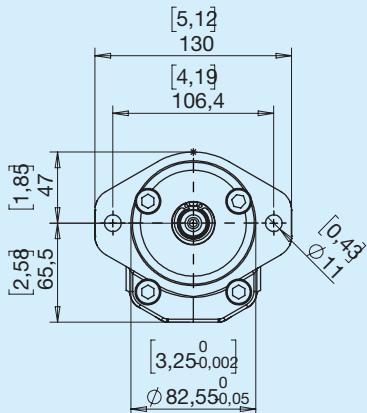
Max. torque 100 Nm

## I2 German cast iron flange - Tapered (1:5)



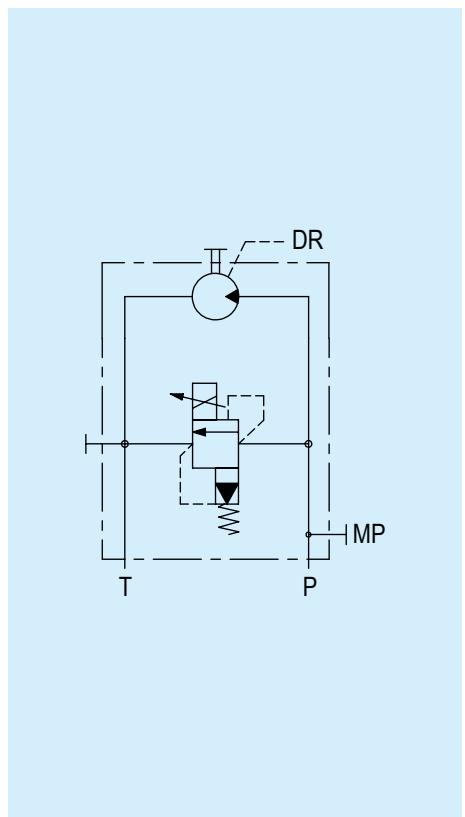
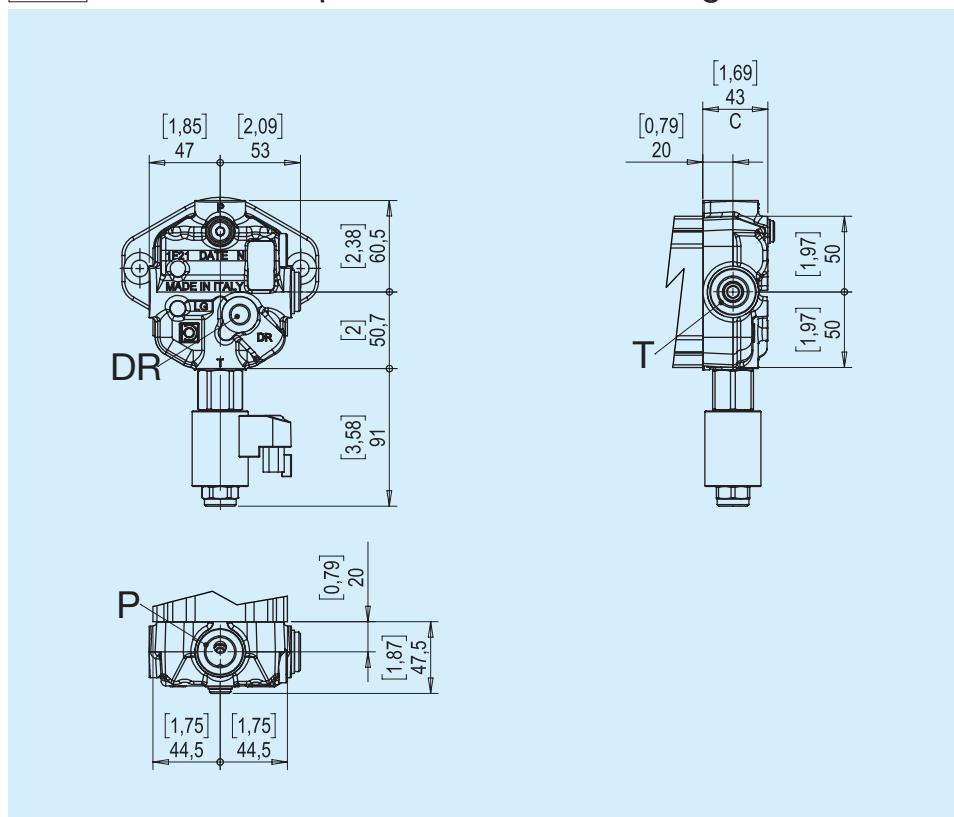
Max. torque 100 Nm

## I3 SAE A 2 cast iron flange - Round D18

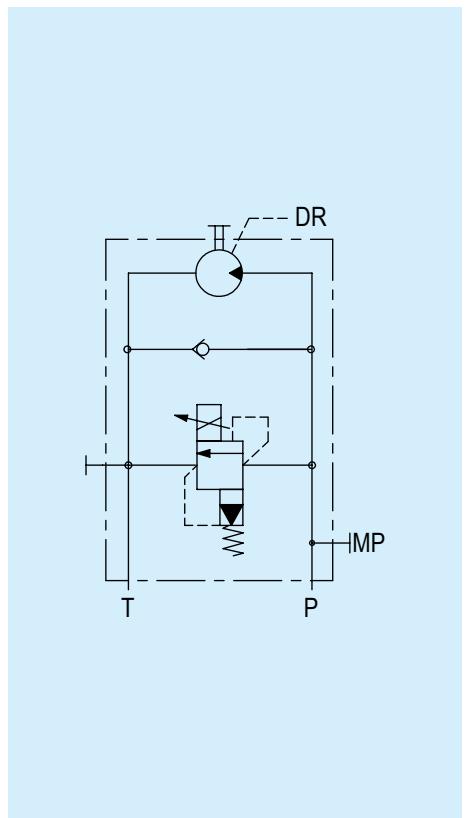
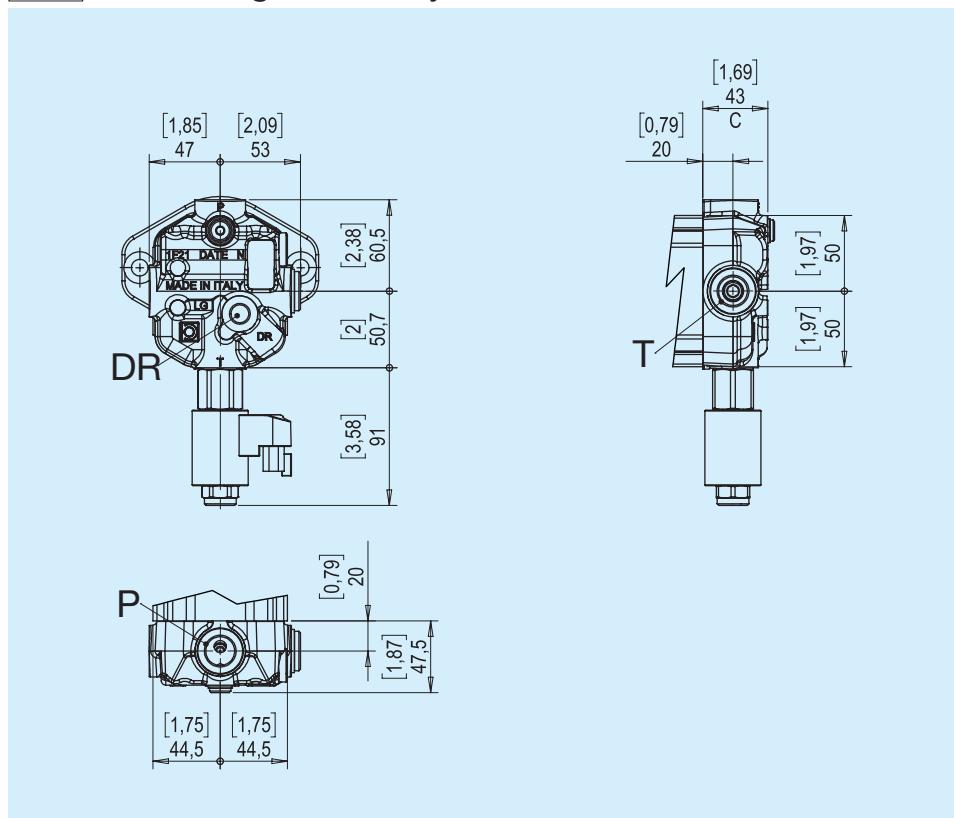


Max. torque 100 Nm

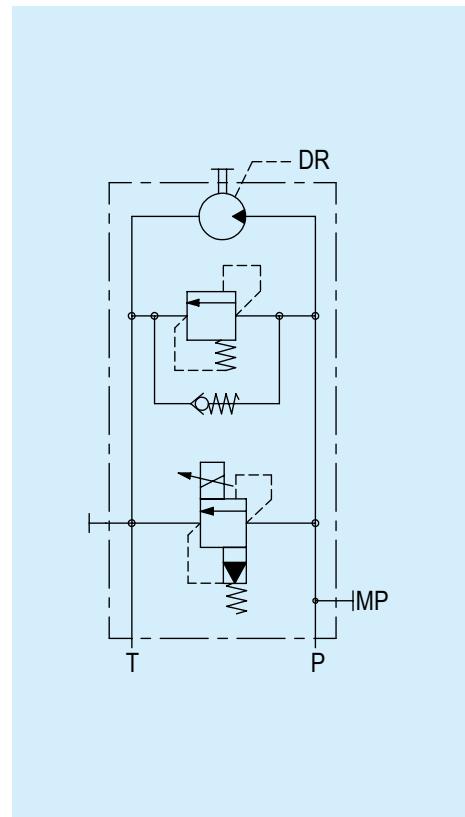
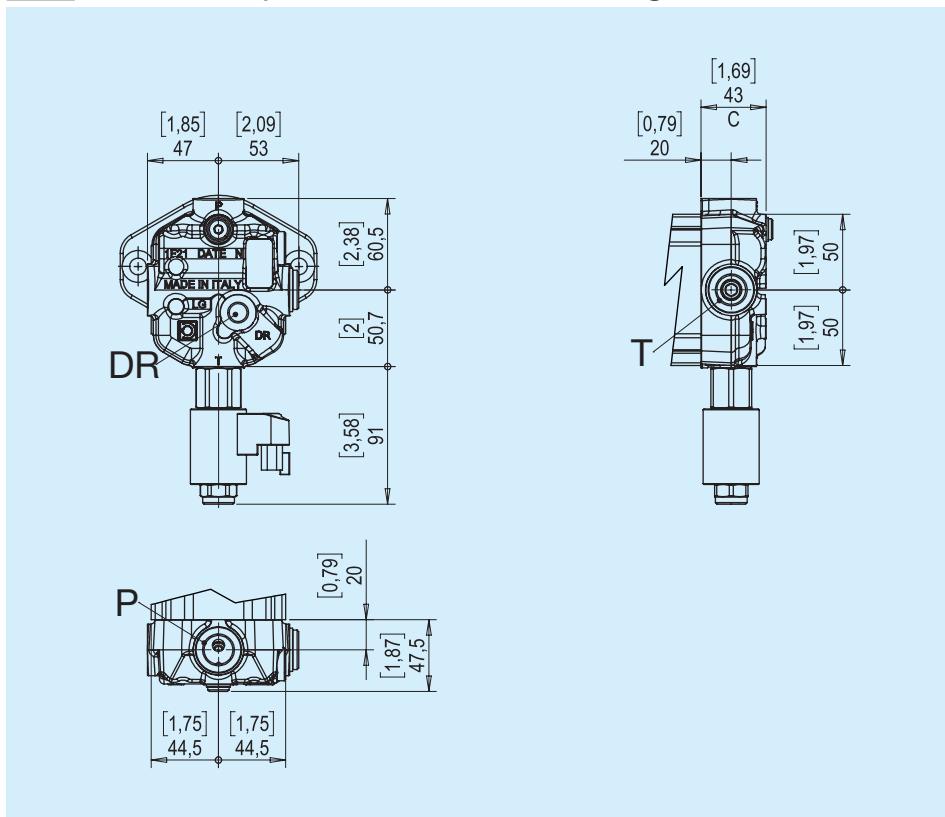
**NN** PA - Without pressure relief and filling valve



**VC** PA - Filling valve only



## 25 PA - With pressure relief and filling valve

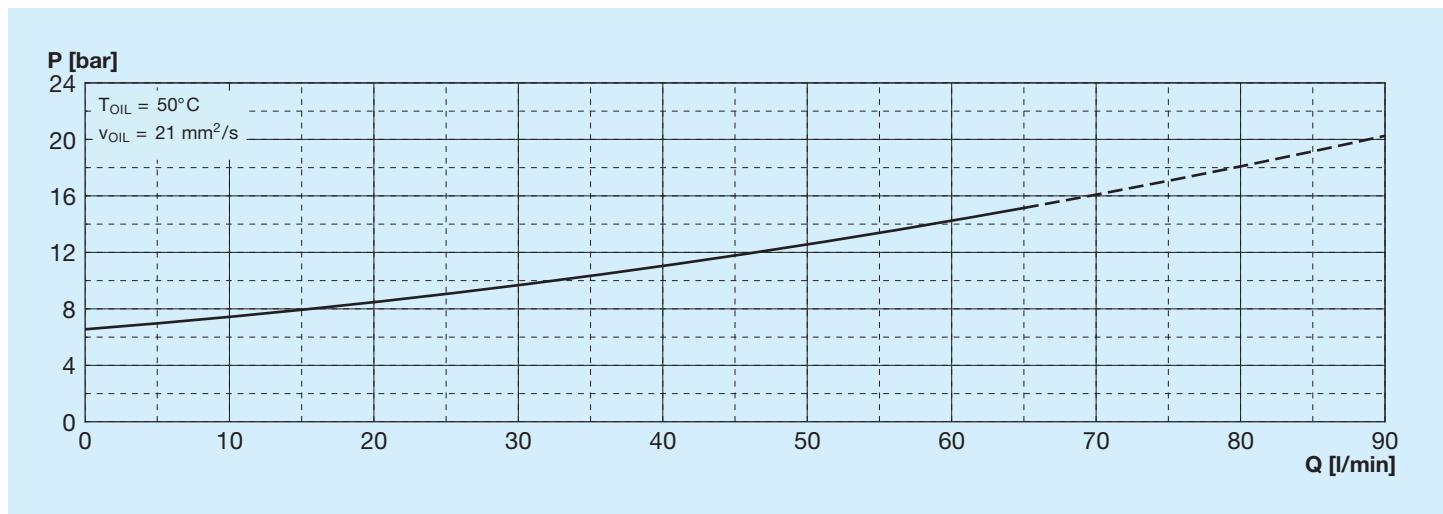


The numerical value that identifies the version varies according to the desired pressure relief valve calibration. See the "ordering instructions" for available settings.

Permissible displacements based on the maximum flow rate ( $Q=65 \text{ l/min [17.17 US gpm]}$ )

Displacement	PA - Without pressure relief and filling valve	PA - Filling valve only	PA - With pressure relief and filling valve
06	•	•	•
08	•	•	•
11	•	•	•
14	•	•	•
17	•	•	•
20	•	•	•

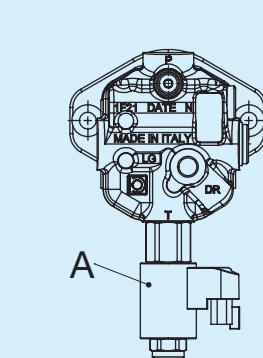
## P-T characteristic curve



## Proportional control valve

Voltage	12	24	V ( $\pm 10\%$ )
Resistance at 20°C	7.2	22	$\Omega (\pm 5\%)$
Minimum current	0	0	$\text{mA} (\pm 5\%)$
Maximum current	1000	600	$\text{mA} (\pm 5\%)$
PWM	50 - 250*	50 - 250*	Hz

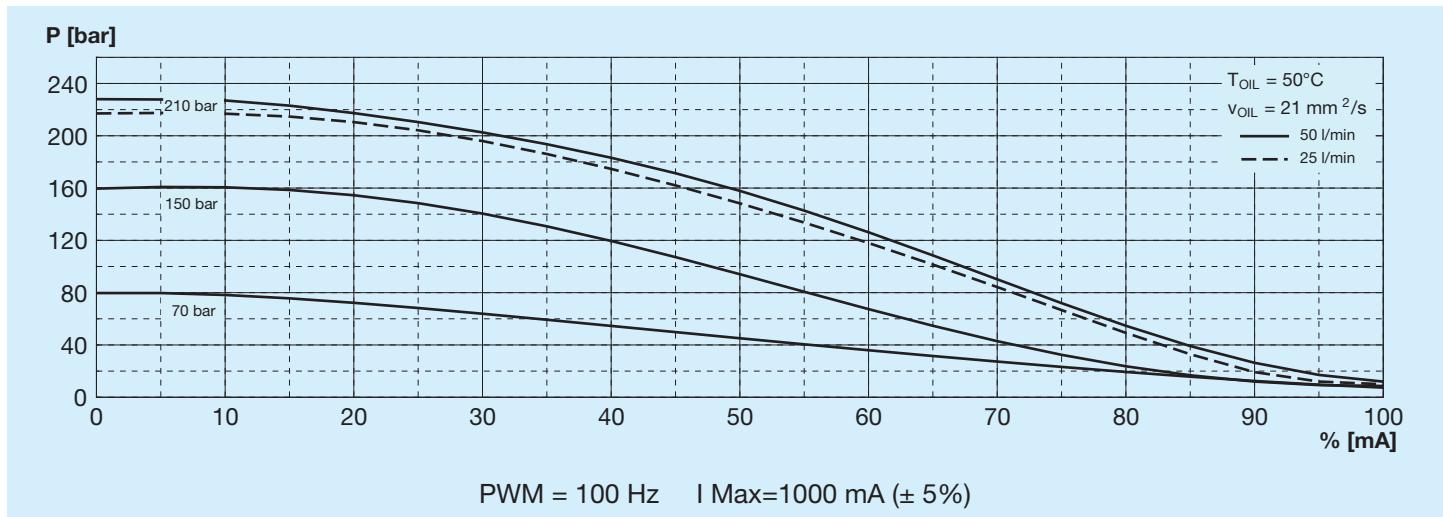
\*100 Hz recommended



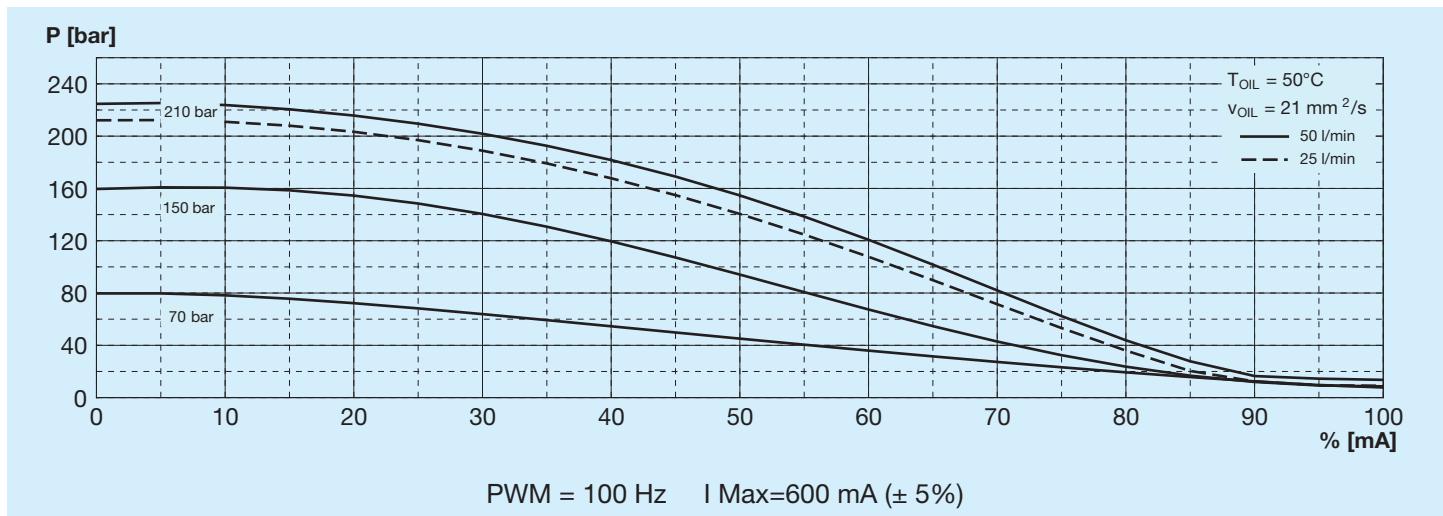
A) Proportional control valve

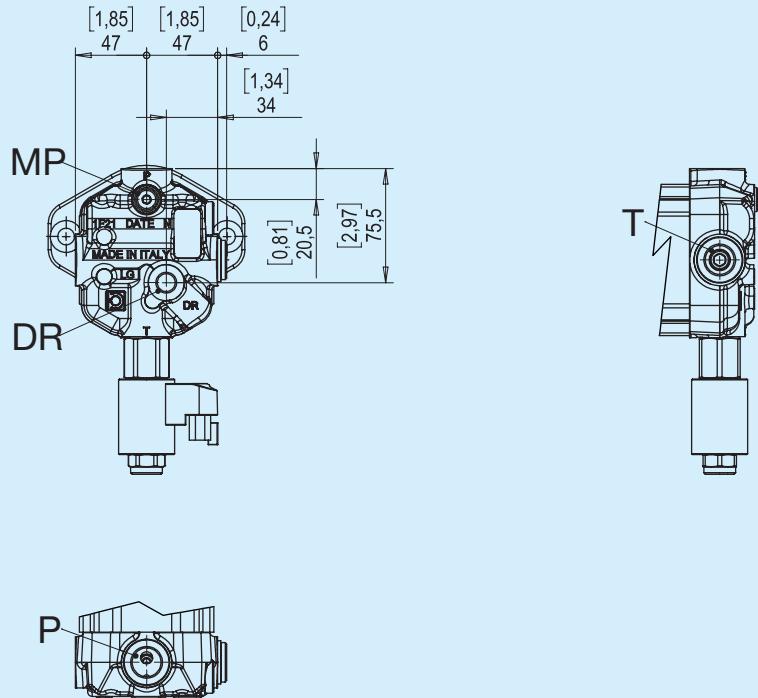
See 'ordering instructions' for available valve settings

## 12V adjustment curve



## 24V adjustment curve





### Thread ports 'P-T'

Code	Type	Torque $\pm 10\%$ Nm
<b>B</b>	G4 - PORT ISO 1179-1 - G1/2"	70
<b>R</b>	U5 - PORT ISO 11926-1 - 7/8"-14	70

### Thread drain port 'DR'

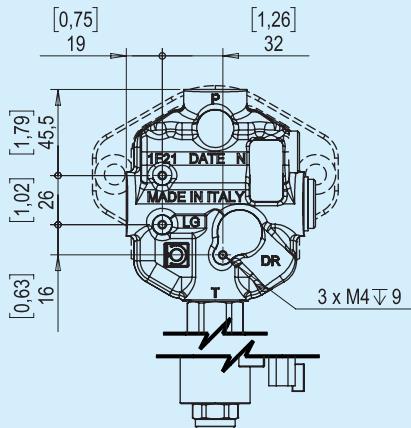
Code	Torque	Torque $\pm 10\%$ Nm
<b>N</b>	None (only for direction of rotation S or D)	-
<b>L</b>	G2 - PORT ISO 1179-1 - G1/4"	27

### Thread gauge port 'MP'

Code	Torque	Torque $\pm 10\%$ Nm
<b>0</b>	None	-
<b>Q</b>	G1 - PORT ISO 1179-1 - G1/8"	27

\*Gauge port 'MP' being supplied; it is fitted with a removable cap.

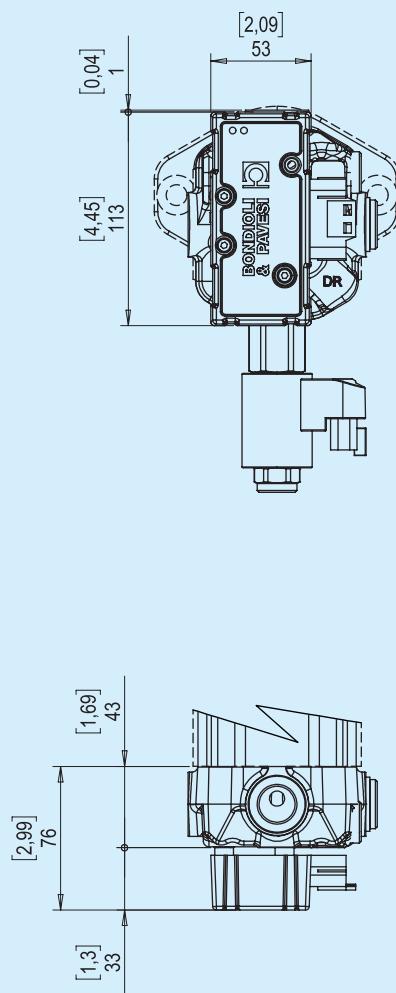
## P Fitting for ECU



This option excludes the possibility of having an 'MP' gauge port.

With this configuration the drain port 'DR' is positioned on the side.

The dimensions shown guarantee optimum installation of the SMAT POWER FAN electronic board.

**M** With ECU SMAT POWER FAN

This option excludes the possibility of having an 'MP' gauge port.

## SMAT POWER FAN technical data

**TECHNICAL DATA**

<b>POWER SUPPLY VOLTAGE</b>	9 - 30 Vdc
<b>CURRENT CONSUMPTION</b>	Standby: 80 mA Max Current 1 Channel LSD: 100 mA Max Current 1 Channel HSD: 3 A @12Vdc 2 A @24Vdc Max Total Current: 4 A @12Vdc 3 A @24Vdc
<b>ANALOG INPUTS</b>	4 0 - 5 Vdc, Rheo, 4 - 20 mA
<b>DIGITAL INPUTS</b>	1 (internal pull-down resistor)
<b>FREQUENCY INPUTS</b>	2 Max: 10kHz, 1Vrms (internal pull-up resistor)
<b>DIGITAL/PWM OUTPUTS</b>	4 Low Power PWM Frequency: 100 - 400 Hz
<b>COMMUNICATION LINE</b>	2 RS232, CAN 2.0 B
<b>COMPATIBLE PROTOCOLS</b>	SAE J1939, CANopen
<b>MICROCONTROLLER</b>	PIC18F (8 bit) 32MHz Flash: 64 kB, RAM: 3 kB, EEPROM: 1 kB
<b>OPERATION/STORAGE TEMPERATURE</b>	-40 ... 85 °C (-40 ... 185 °F)
<b>PROTECTION</b>	IP 67 (with plug inserted)
<b>WEIGHT</b>	280 g +- 10g

**ENVIRONMENT DATA**

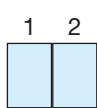
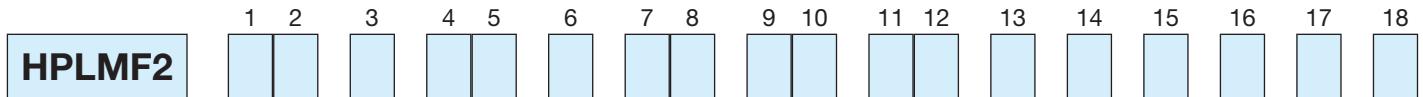
<b>EMI/RFI RATIO</b>	100 V/m
<b>VIBRATION</b>	EN 60068-2-6
<b>MECHANICAL SHOCK</b>	ISO 15003, par. 5.5.2 level 3
	CE COMPLIANT

With this configuration the drain port 'DR' is positioned on the side.

The dimensions shown guarantee optimum installation of the SMAT POWER FAN electronic board.

# Instruction for ordering

**HPLMF2**



## Displacement

<b>06</b>	<b>11</b>	<b>17</b>
<b>08</b>	<b>14</b>	<b>20</b>



## Direction of rotation

<b>S</b>	Anti-clockwise/left	<b>D</b>	Clockwise/right	<b>R</b>	Bidirectional rear external drainage - right rotation	<b>L</b>	Bidirectional rear external drainage - left rotation
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## Shaft flanges

<b>QP</b>	SAE A 2 cast iron holes - Round SAE A	<b>LL</b>	European cast iron flange - Tapered 1:8	<b>VM</b>	German cast iron flange - Tapered 1:5
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## Integrated supports

<b>I1</b>	European cast iron flange - Round D18	<b>I2</b>	German cast iron flange - Tapered (1:5)	<b>I3</b>	SAE A 2 cast iron flange - Round D18
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## Seals

<b>B</b>	NBR
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## Cover model

<b>PA</b>	Proportional fan control
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## Proportional control valve setting

<b>07</b>	70 bar	<b>15</b>	150 bar	<b>21</b>	210 bar
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## Cover version

<b>NN</b>	Without filling valve	<b>09</b>	90 bar	<b>15</b>	150 bar	<b>21</b>	210 bar
<b>VC</b>	Filling valve only	<b>10</b>	100 bar	<b>16</b>	160 bar	<b>22</b>	220 bar
<b>05</b>	50 bar	<b>11</b>	110 bar	<b>17</b>	170 bar	<b>23</b>	230 bar
<b>06</b>	60 bar	<b>12</b>	120 bar	<b>18</b>	180 bar	<b>24</b>	240 bar
<b>07</b>	70 bar	<b>13</b>	130 bar	<b>19</b>	190 bar	<b>25</b>	250 bar
<b>08</b>	80 bar	<b>14</b>	140 bar	<b>20</b>	200 bar		



## Ports P-T

<b>B</b>	G4 - PORT ISO 1179-1 - G1/2"	<b>R</b>	U5 - PORT ISO 11926-1 - 7/8"-14
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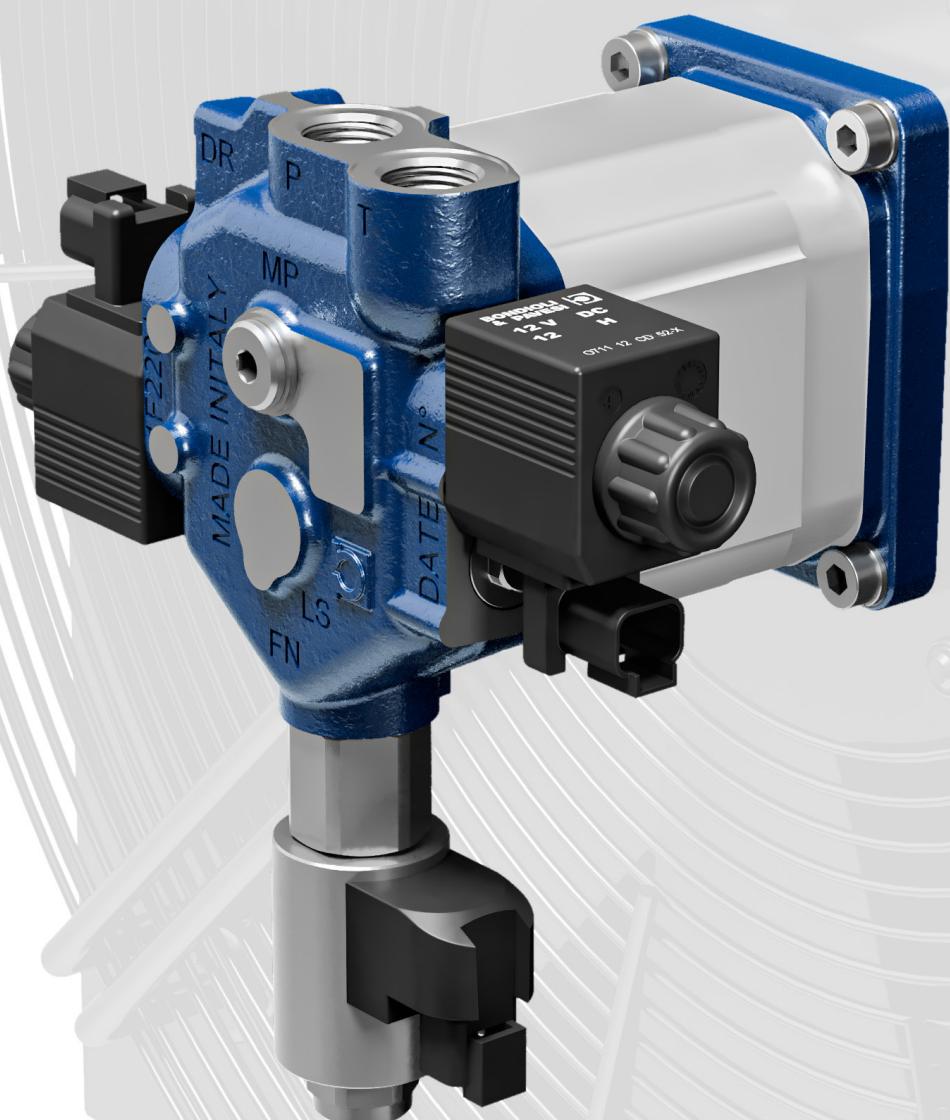


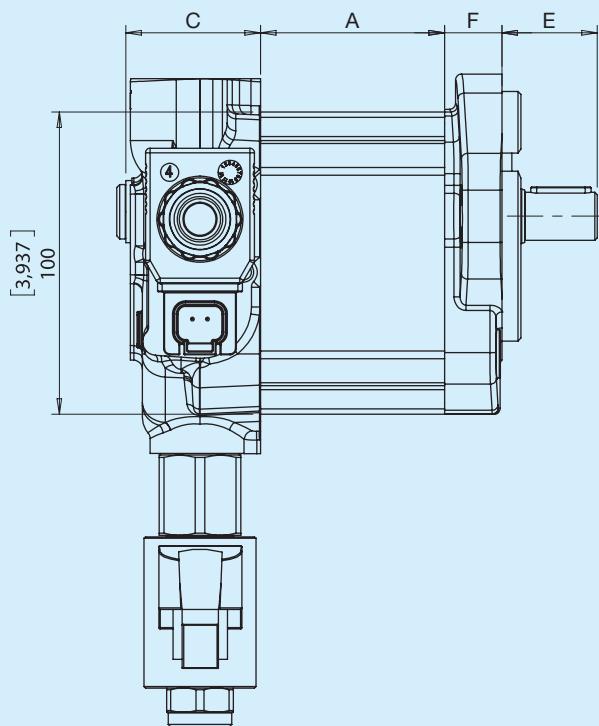
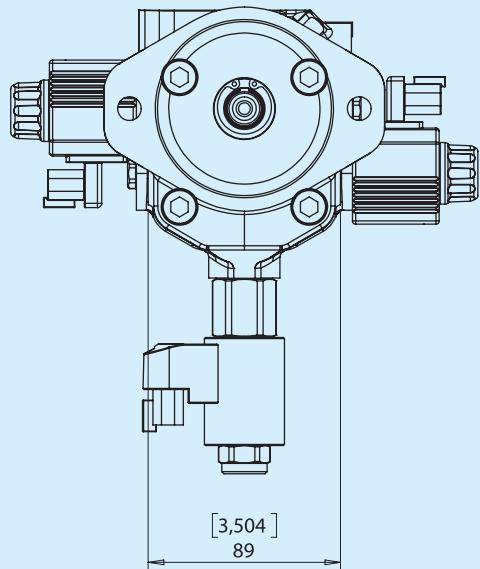
## Thread drain port "DR"

<b>N</b>	None (only for direction of rotation S or D)	<b>L</b>	G2 - PORT ISO 1179-1-G 1/4"	<b>P</b>	U3 - PORT ISO 11926-1 - 9/16"-18
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15	Thread gauge port "MP"		
	<b>O</b>	None	<b>Q</b> G1 - PORT ISO 1179-1 - G1/8"
16	Voltage and connectors		
	<b>G</b>	12V Deutsch DT04-2P	<b>H</b> 24V Deutsch DT04-2P
17	Electronic board		
	<b>N</b>	None	<b>P</b> Fitting for ECU
			<b>M</b> With SMAT POWER FAN ECU
18	External treatment		
	<b>N</b>	None	<b>Z</b> Zinc plating

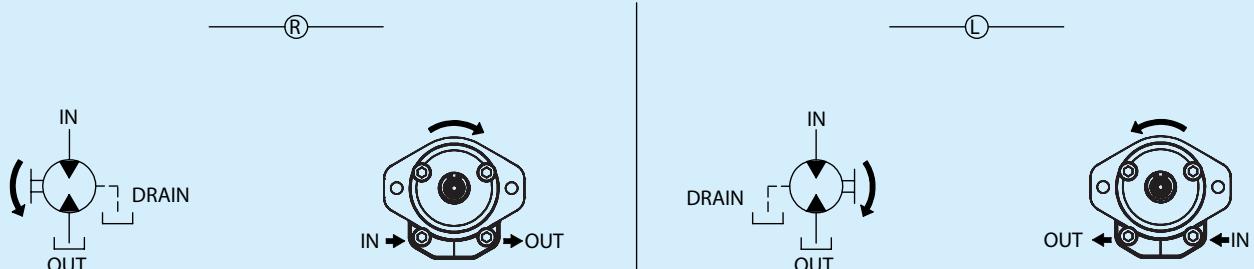
## HPLMF2 PD





C - See section on covers E - See section on shafts F - See section on flanges

### Definition of rotation



### Combinations of rotations - cover

#### Rotation

R

L

PD

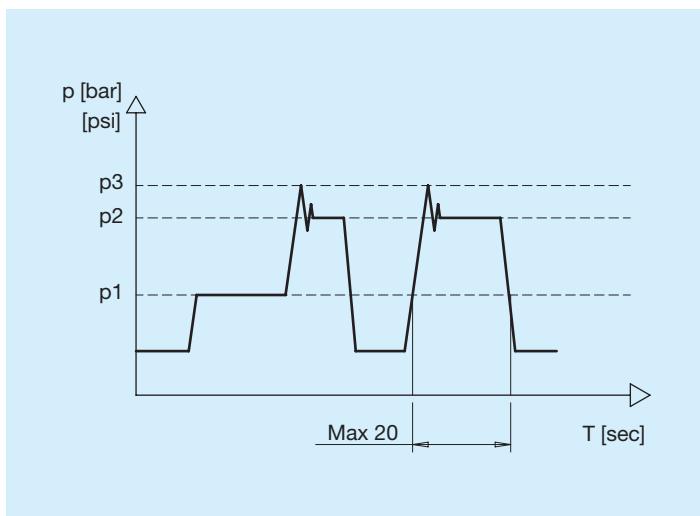
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## Dimensions and technical data

HPLMF2	Nominal displacement		Continuous pressure		Intermittent pressure		Peak pressure		Rotational speed		A	
	cm <sup>3</sup>	in <sup>3</sup>	bar	psi	bar	psi	bar	psi	min <sup>-1</sup>	min <sup>-1</sup>	mm	in
<b>06</b>	6,00	0,37	240	3481	260	3771	300	4351	4000	700	51,85	2,04
<b>08</b>	8,50	0,52	230	3336	250	3626	280	4061	4000	700	56,35	2,22
<b>11</b>	11,00	0,67	230	3336	250	3626	280	4061	4000	700	60,85	2,4
<b>14</b>	14,50	0,88	230	3336	250	3626	280	4061	4000	700	67,25	2,65
<b>17</b>	17,00	1,04	230	3336	250	3626	280	4061	4000	700	71,25	2,83
<b>20</b>	19,50	1,19	200	2901	220	3191	250	3626	3000	700	76,25	3

## Pressure definition

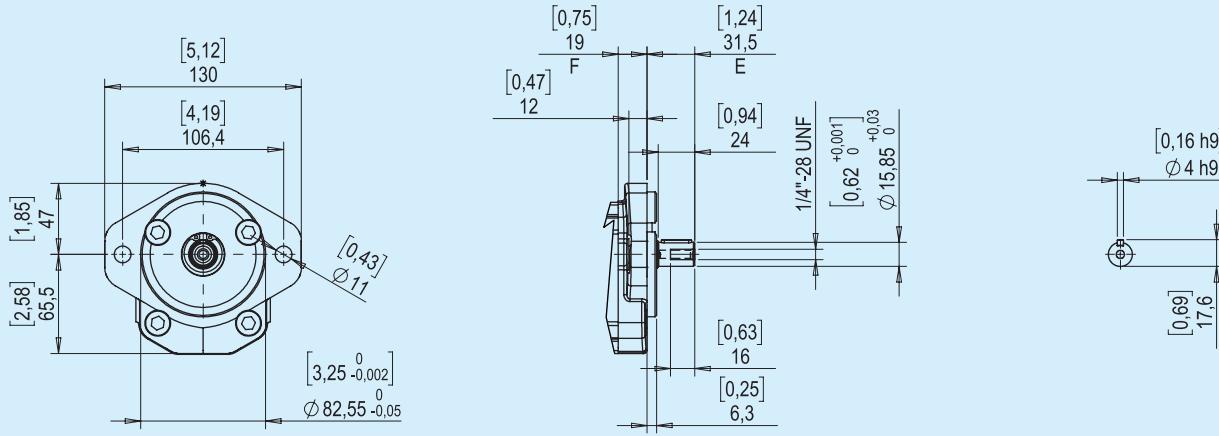


**p1** Continuous pressure

**p2** Intermittent pressure  
Maximum pressure permitted for short periods (max. 20 sec)

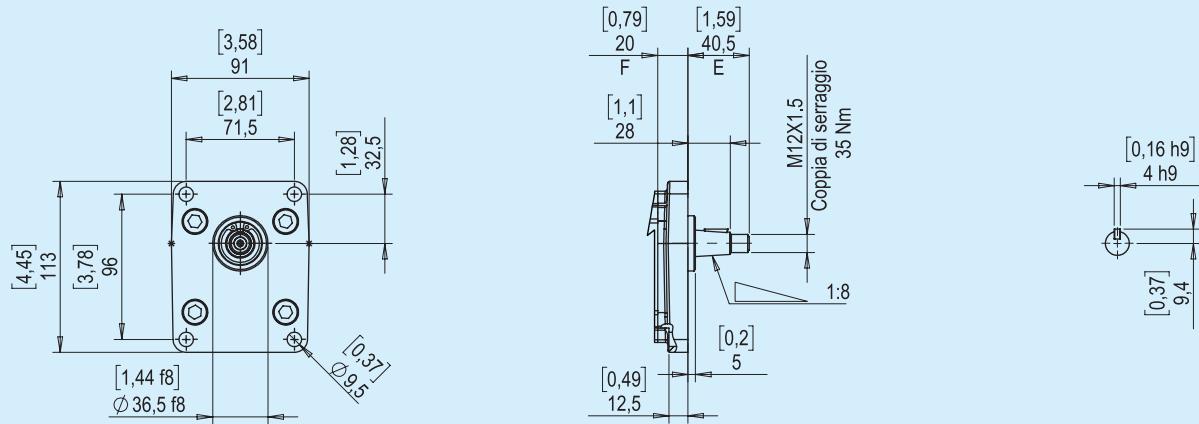
**p3** Peak pressure  
Maximum permitted pressure intended as peak pressure of Vmax

## QP SAE A 2 cast iron holes - Round SAE A



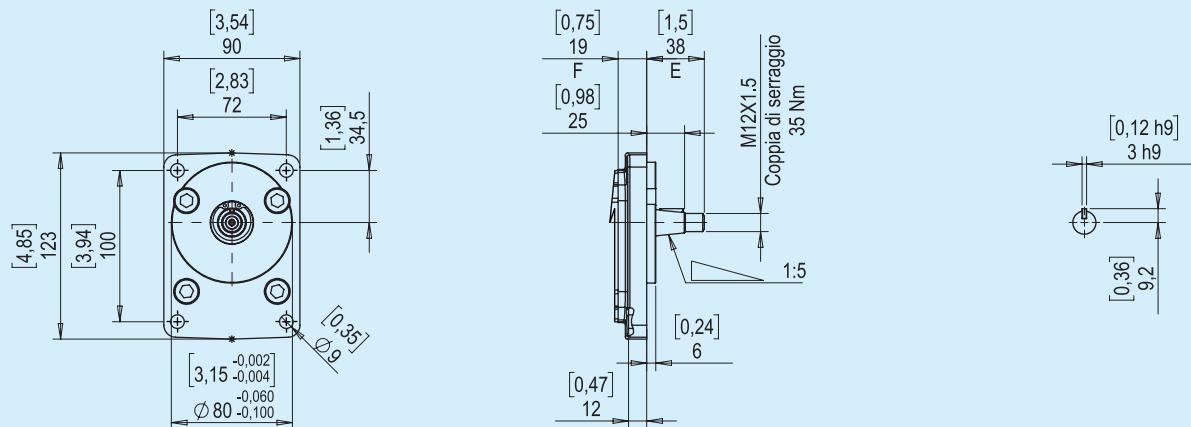
Max. torque 70 Nm

## LL European cast iron flange - Tapered 1:8



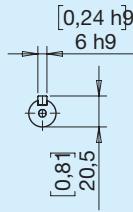
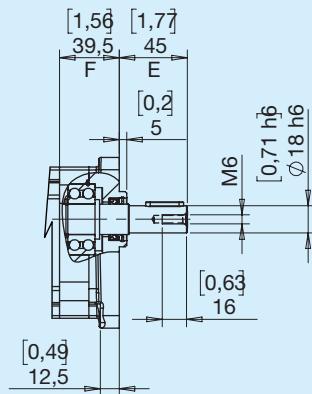
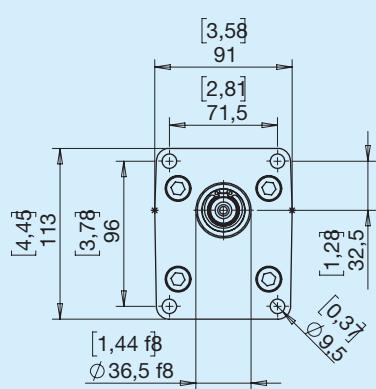
Max. torque 140 Nm

## VM German cast iron flange - Tapered 1:5



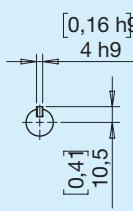
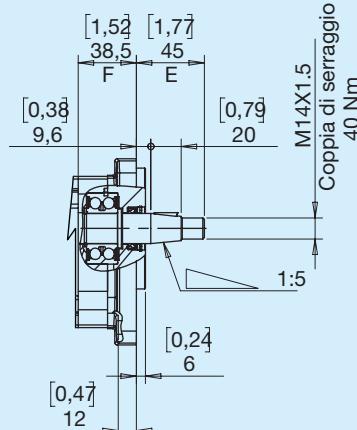
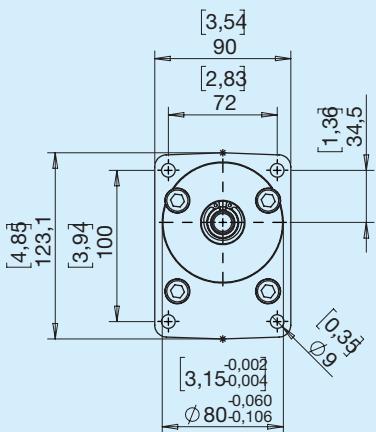
Max. torque 120 Nm

## I1 European cast iron flange - Round D18



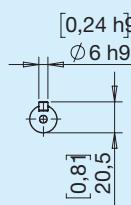
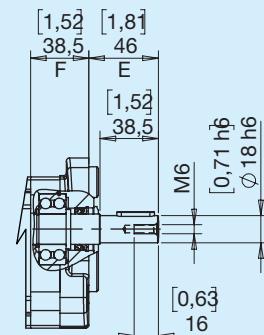
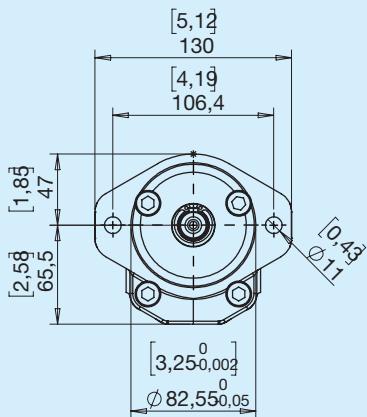
Max. torque 100 Nm

## I2 German cast iron flange - Tapered (1:5)



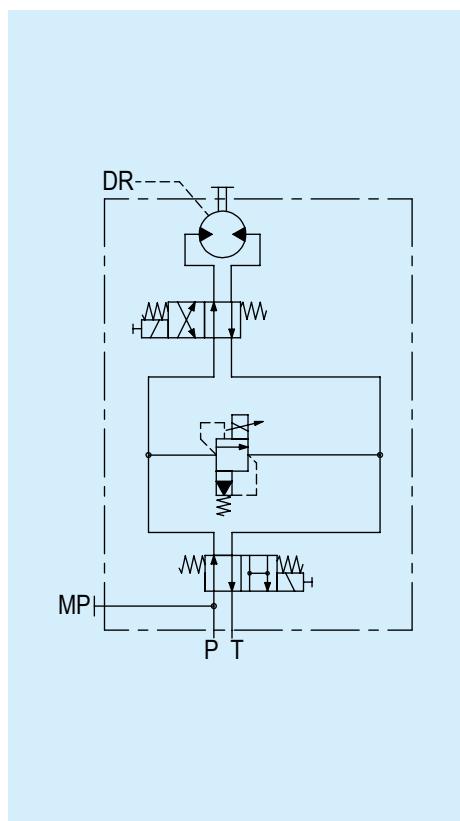
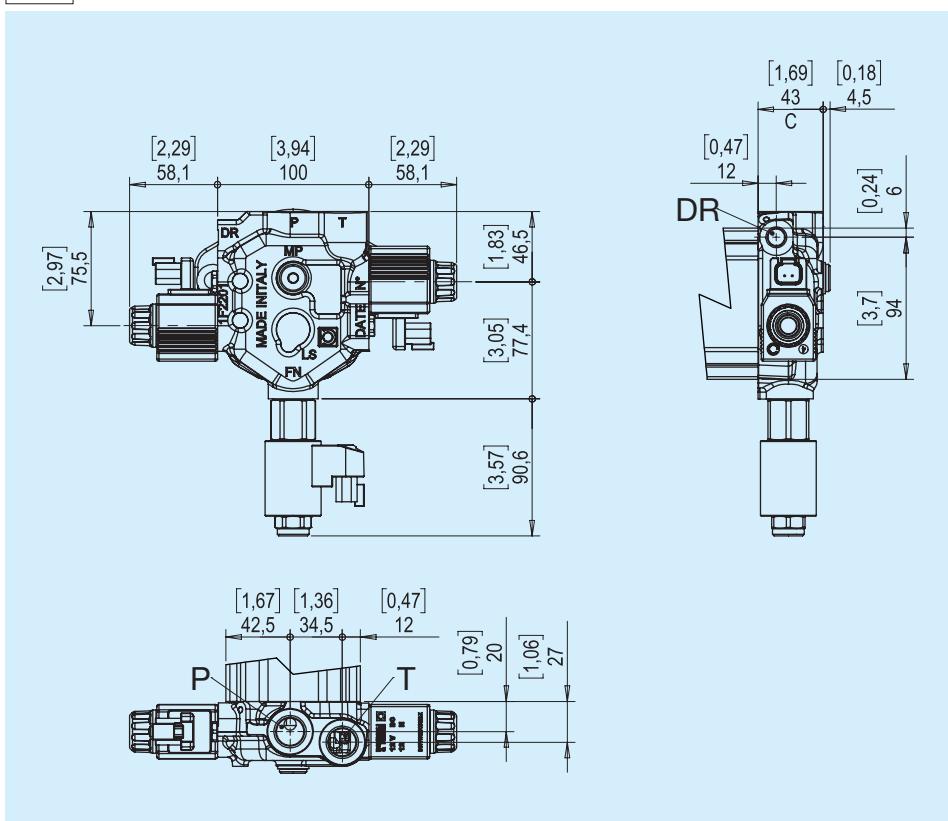
Max. torque 100 Nm

## I3 SAE A 2 cast iron flange - Round D18

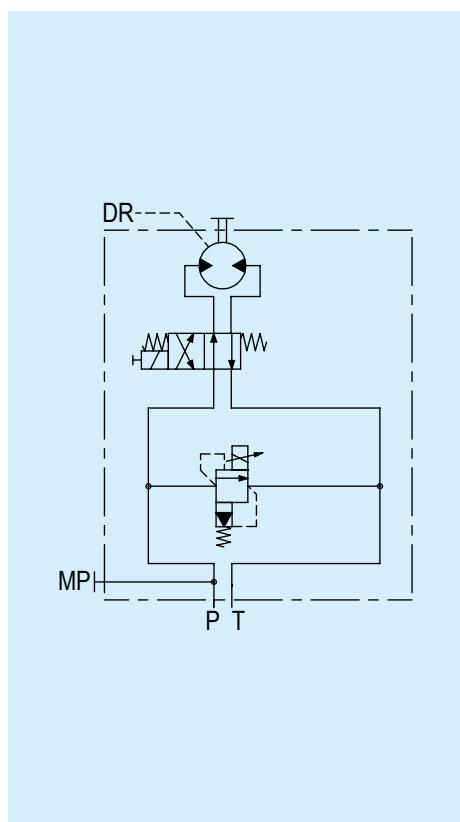
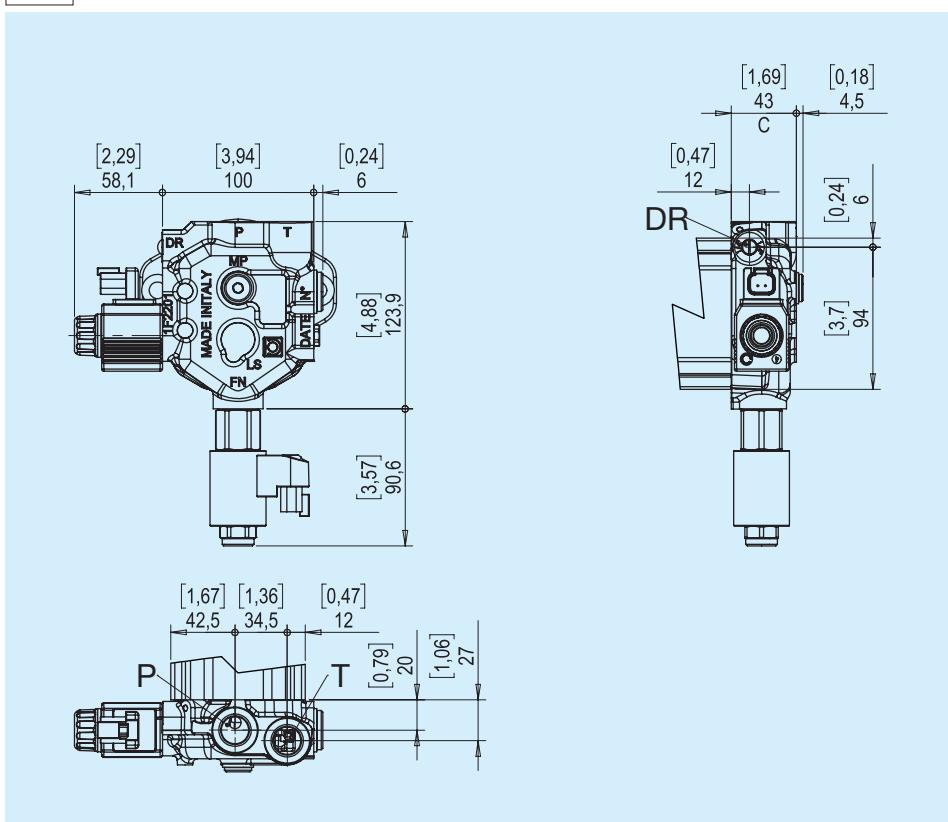


Max. torque 100 Nm

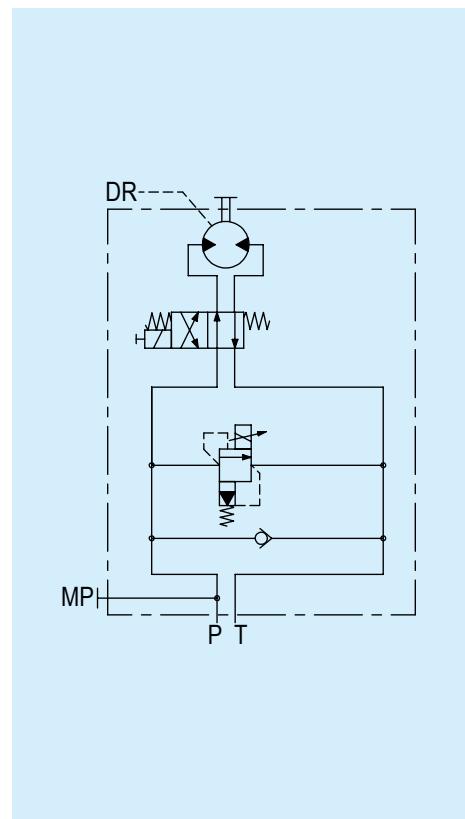
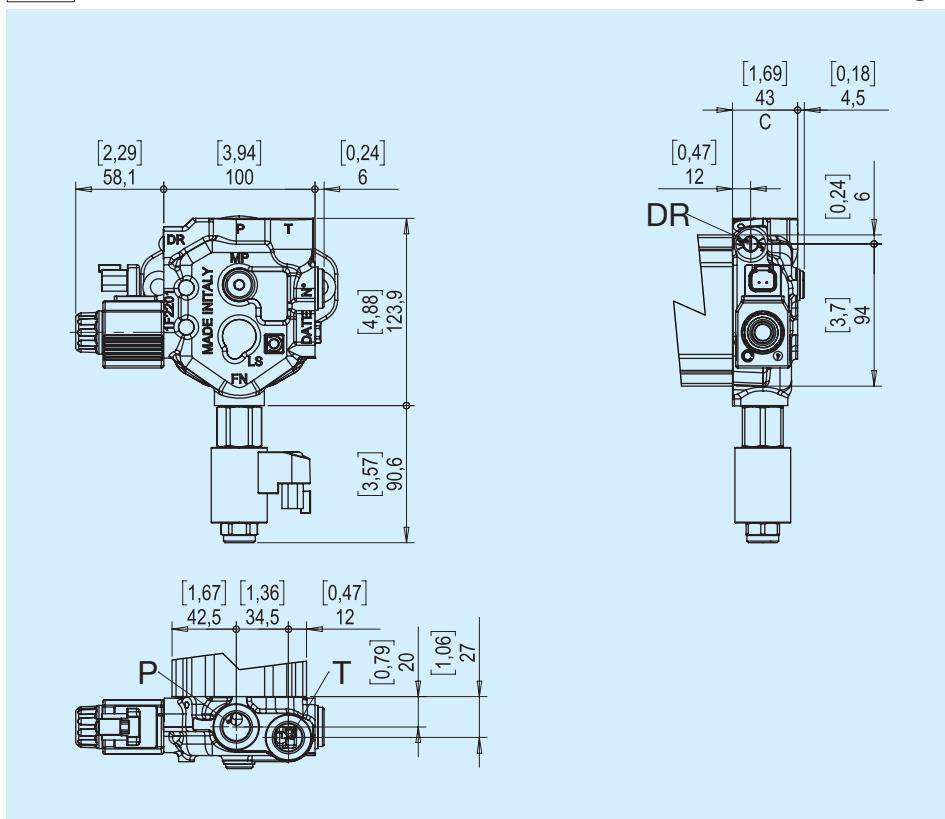
### A PD - Version with STOP function



### B PD - Version without STOP function



## C PD - Version without STOP function and with filling valve

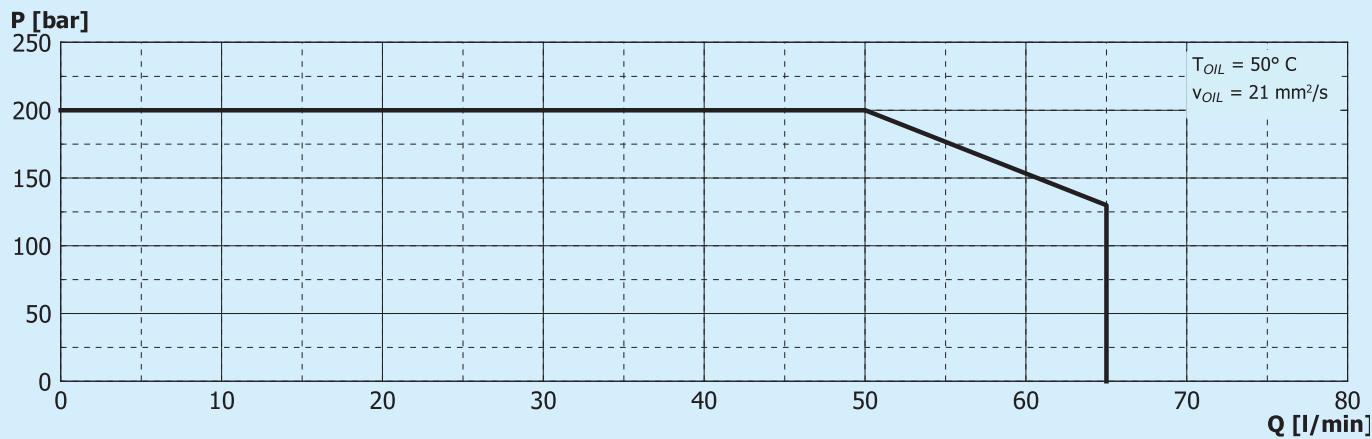


For correct operation, the reversing function must be performed with an energised proportional coil.

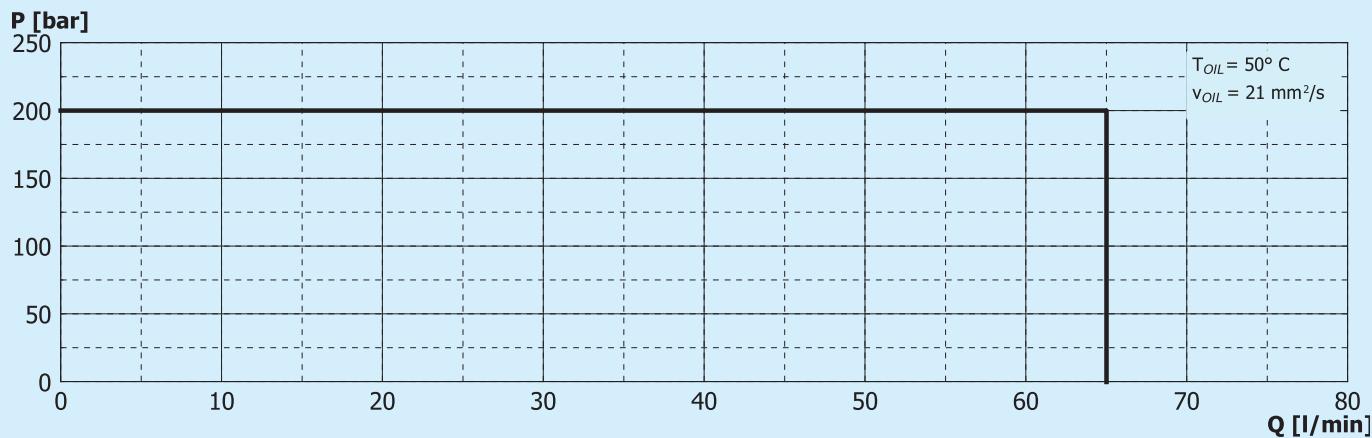
## Reversing of rotation

For all versions, reversing of rotation is guaranteed with pressures of up to 30 bar.

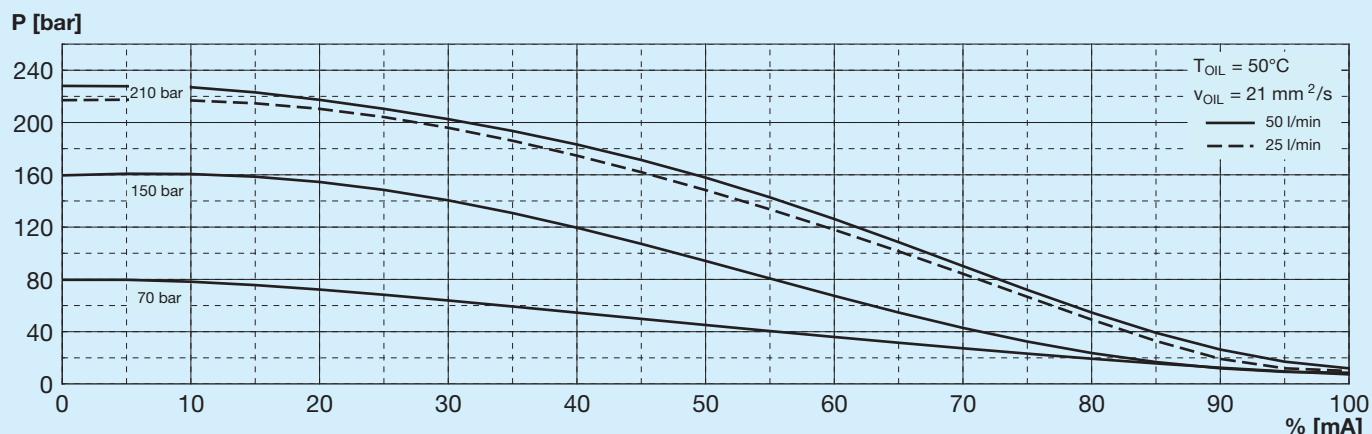
Limits of use version **A** with STOP function



Limits of use version **B** and **C** without STOP function

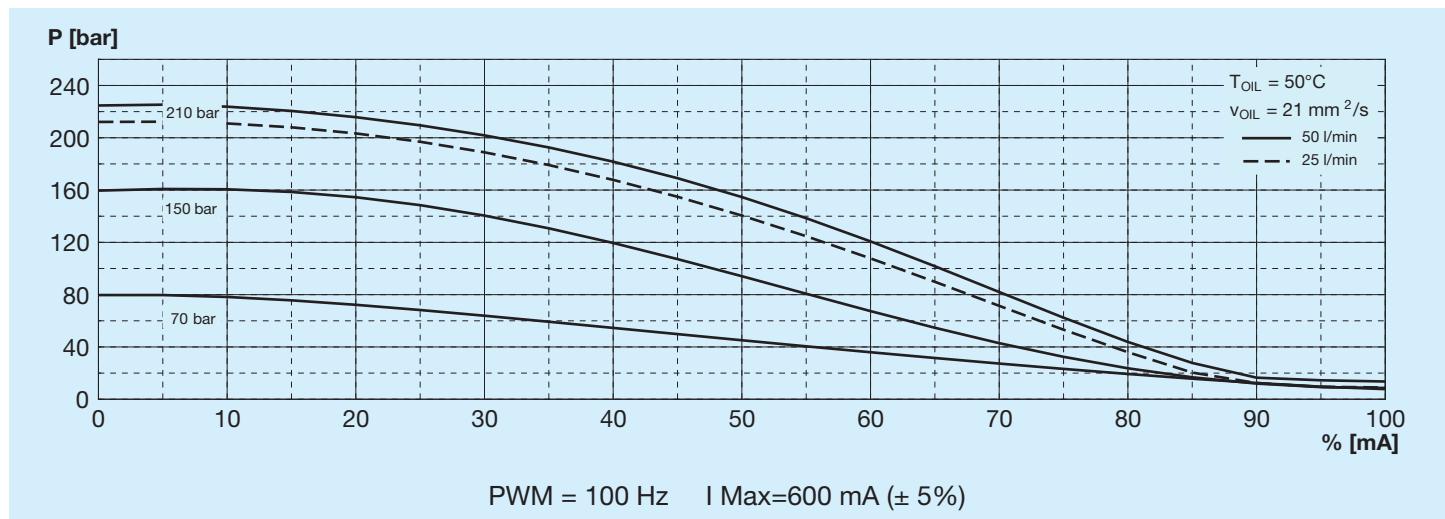


12V adjustment curve



PWM = 100 Hz I Max=1000 mA ( $\pm 5\%$ )

## 24V adjustment curve



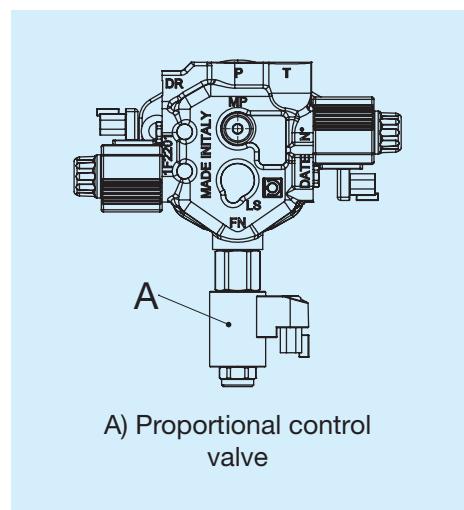
## ON-OFF valves with stop and reverse function

Voltage	12	24	V ( $\pm 10\%$ )
Resistance at 20°C	4.5	19.5	$\Omega$ ( $\pm 7\%$ )
Absorbed current	2.7	1.24	A
Power	26.5	30	W

## Proportional control valve

Voltage	12	24	V ( $\pm 10\%$ )
Resistance at 20°C	7.2	22	$\Omega$ ( $\pm 5\%$ )
Minimum current	0	0	mA ( $\pm 5\%$ )
Maximum current	1000	600	mA ( $\pm 5\%$ )
PWM	50 - 250*	50 - 250*	Hz

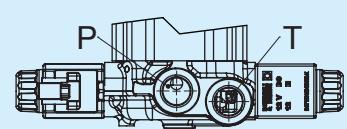
\*100 Hz recommended



See 'ordering instructions' for available valve settings.

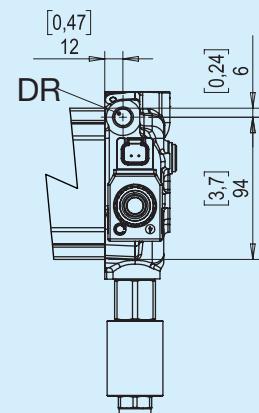
## Thread ports 'P-T'

Code	Type	Torque $\pm 10\%$ Nm
<b>B</b>	G4 - PORT ISO 1179-1 - G1/2"	70
<b>R</b>	U5 - PORT ISO 11926-1 - 7/8"-14	70



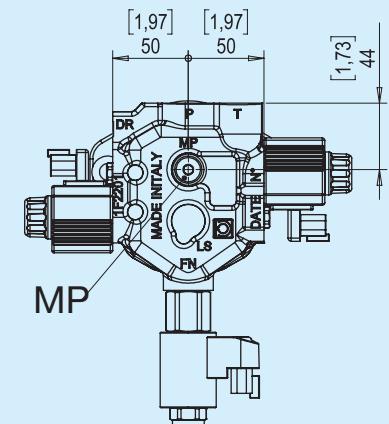
## Thread drain port 'DR'

Code	Type	Torque $\pm 10\%$ Nm
<b>L</b>	G2 - PORT ISO 1179-1 - G1/4"	27
<b>P</b>	U3 - PORT ISO 11926-1 - 9/16"-18	27



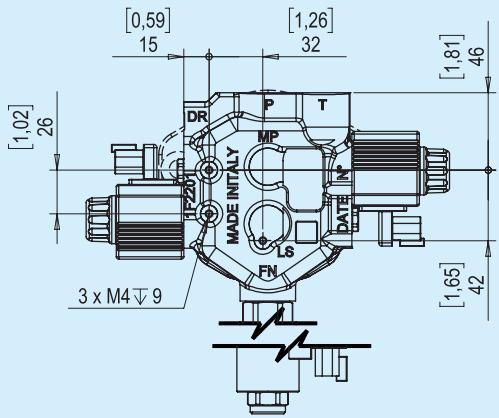
## Thread gauge port 'MP'

Code	Type	Torque $\pm 10\%$ Nm
<b>0</b>	None	-
<b>L</b>	G2 - PORT ISO 1179-1 - G1/4"	27
<b>P</b>	U3 - PORT ISO 11926-1 - 9/16"-18	27



\*Gauge port 'MP' being supplied; it is fitted with a removable cap.

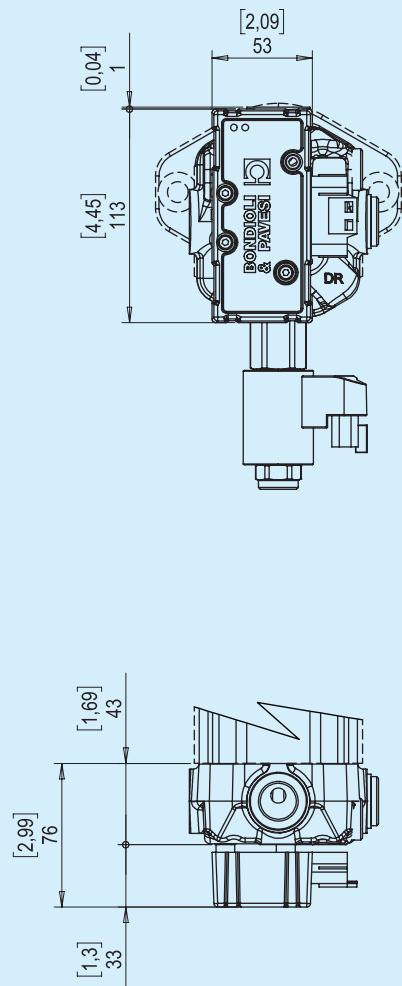
## P Fitting for ECU



This option excludes the possibility of having an 'MP' gauge port.

The dimensions shown guarantee optimum installation of the SMAT POWER FAN electronic board.

## M With SMAT POWER FAN ECU



This option excludes the possibility of having an 'MP' gauge port.

## SMAT POWER FAN technical data

### TECHNICAL DATA

POWER SUPPLY VOLTAGE	9 - 30 Vdc
CURRENT CONSUMPTION	Standby: 80 mA Max Current 1 Channel LSD: 100 mA Max Current 1 Channel HSD: 3 A @12Vdc 2 A @24Vdc Max Total Current: 4 A @12Vdc 3 A @24Vdc
ANALOG INPUTS	4 0 - 5 Vdc, Rheo, 4 - 20 mA
DIGITAL INPUTS	1 (internal pull-down resistor)
FREQUENCY INPUTS	2 Max: 10kHz, 1Vrms (internal pull-up resistor)
DIGITAL/PWM OUTPUTS	4 Low Power PWM Frequency: 100 - 400 Hz
COMMUNICATION LINE	2 RS232, CAN 2.0 B
COMPATIBLE PROTOCOLS	SAE J1939, CANopen
MICROCONTROLLER	PIC18F (8 bit) 32MHz Flash: 64 kB, RAM: 3 kB, EEPROM: 1 kB
OPERATION/STORAGE TEMPERATURE	-40 ... 85 °C (-40 ... 185 °F)
PROTECTION	IP 67 (with plug inserted)
WEIGHT	280 g +- 10g

### ENVIRONMENT DATA

EMI/RFI RATIO	100 V/m
VIBRATION	EN 60068-2-6
MECHANICAL SHOCK	ISO 15003, par. 5.5.2 level 3
CE COMPLIANT	

The dimensions shown guarantee optimum installation of the SMAT POWER FAN electronic board.

<b>HPLMF2</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<hr/>																	
1 Displacement																	
1	2	06		11			17										
08				14			20										
3 Direction of rotation																	
3	R	Bidirectional rear external drainage - right rotation	L	Bidirectional rear external drainage - left rotation													
4	5	Shaft flanges															
QP	SAE A 2 cast iron holes - Round SAE A	LL	European cast iron flange - Tapered 1:8	VM	German cast iron flange - Tapered 1:5												
4 Integrated supports																	
6	I1	European cast iron flange - Round D18	I2	German cast iron flange - Tapered (1:5)	I3	SAE A 2 cast iron flange - Round D18											
5 Seals																	
6	B	NBR															
7 Cover version																	
7	PDA	with STOP function	PDB	without STOP function	PDC	without STOP function and with filling valve											
8	9																
10 Proportional control valve setting																	
10	07	70 bar	15	150 bar	21	210 bar											
11																	
12 Ports P-T																	
12	B	G4 - PORT ISO 1179-1 - G1/2"	R	U5 - PORT ISO 11926-1 - 7/8"-14													
13 Thread drain port "DR"																	
13	L	G2 - PORT ISO 1179-1-G 1/4"	P	U3 - PORT ISO 11926-1 - 9/16"-18													
14 Thread gauge port "MP"																	
14	0	None	L	G2 - PORT ISO 1179-1-G 1/4"	P	U3 - PORT ISO 11926-1 - 9/16"-18											
15 Voltage and connectors																	
15	G	12V Deutsch DT04-2P	H	24V Deutsch DT04-2P													
16 Electronic board																	
16	N	None	P	Fitting for ECU	M	With SMAT POWER FAN ECU											

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## External treatment

**N** None

**Z** Zinc plating

