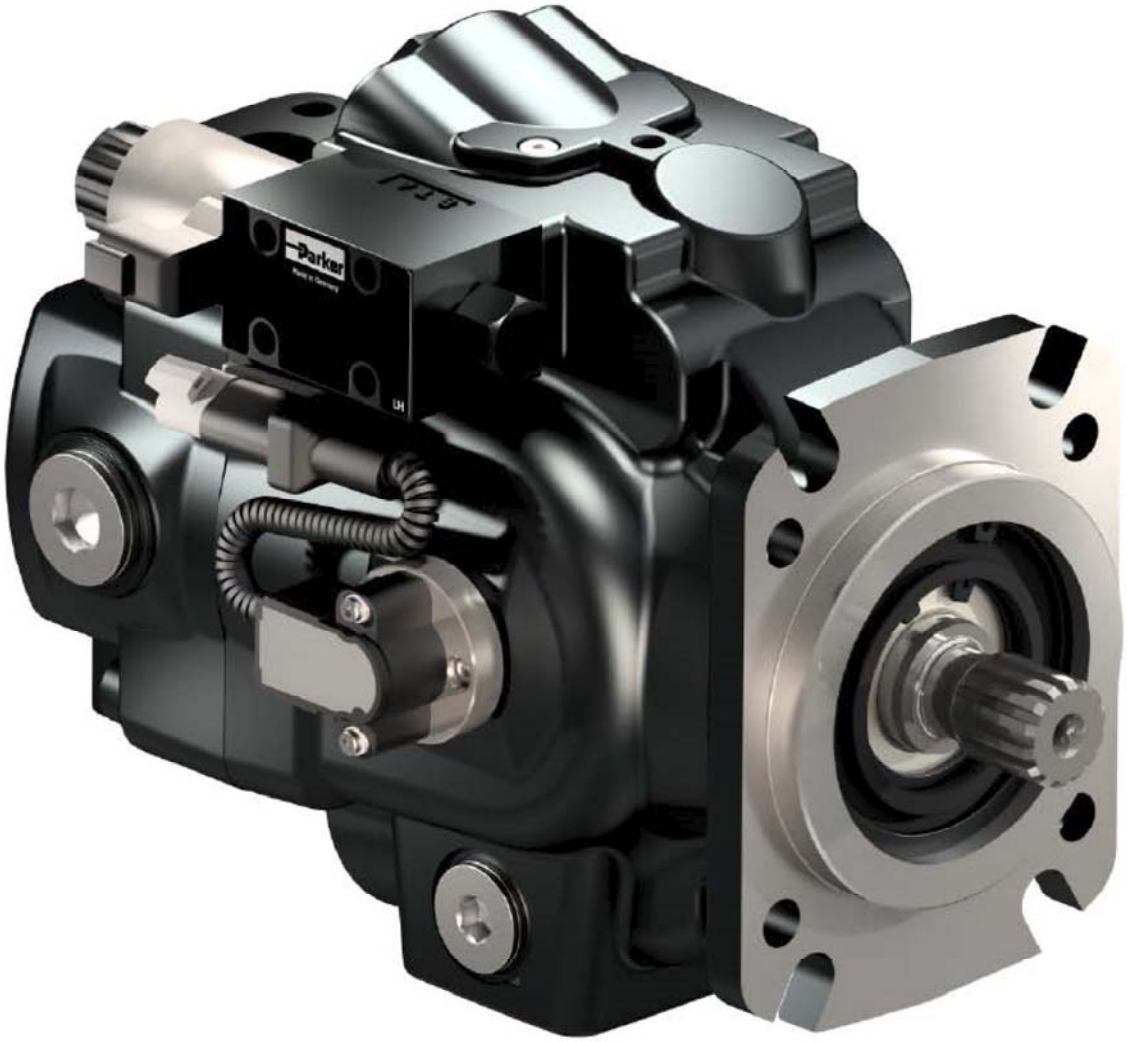

Axial Piston Pumps

Series eP2/eP3 - Electronic Controls
Variable Displacement

parker.com/pmde

Contents

Conversion factors

1 kg	2.20 lb
1 N	0.225 lbf
1 Nm	0.738 lbf ft
1 bar	14.5 psi
1 l	0.264 US gallon
1 cm^3	0.061 cu in
1 mm	0.039 in
$^9/_5$ °C + 32	1°F
1 kW	1.34 hp

Introduction

Parker's P2 / P3 series has been designed to meet the specific demands of heavy duty mobile applications throughout the following markets:

- Material Handling Equipment (e.g Reachstacker, HD Lift Trucks, AT Cranes)
- Construction Equipment (e.g. Articulated Dump Trucks, Wheel Loaders)
- Mining and Drilling (e.g. Dump Trucks, Drill Rigs)
- Forestry Equipment (e.g. Forwarder, Harvester)

By featuring an optimized envelope and a unique port layout the product line provides for a cost saving direct mount on most typical mobile transmissions. High speed ratings enable high flow and productivity levels. With continuous pressure ratings of up to 350 bar P2 / P3 provides a high power density and enables downsizing of mobile machinery. As a standard every P2 / P3 comes with an integrated pre-compression volume which ensures low ripple operation and reduced noise emissions.

After having proven in load-sensing systems for many years Parker's series P2 / P3 is now extended by a new electronic control concept (eP2 / eP3), setting new standards in responsiveness, stability and efficiency.

Technical Features

- Variable displacement, axial piston pumps for open circuit hydraulic systems
- Electronic displacement control with optional pressure limitation, input torque limitation and speed compensation (flow control)
- Electronic displacement feedback
- Optional electronic pressure feedback
- Available as standard (eP2075, eP2145) and supercharged version (eP3145)

Customer Benefits

- Increased fuel efficiency by considerably reduced control losses
- Opportunity to eliminate LS losses by the introduction of a new electro-hydraulic system approach
- High productivity by outstanding responsiveness and stability of the closed loop displacement control as well as maximized output flow
- Increased machine availability and improved subsystem communication by condition monitoring opportunities
- Cost saving installation by direct PTO mount
- High altitude operation capability
- Low noise level and reduced flow ripple

Technical Data

Series and Pump Size		eP2075	eP2145	eP3145
Maximum displacement	[cm3/rev]	75	145	145
Self priming speed at 1 bar absolute inlet pressure [1)]	[rpm]	2500	2200	2500
Nominal pressure [2)]	[bar]	320	350	350
Minimum inlet pressure, absolute	[bar]	0,8	0,8	0,8
Maximum inlet pressure, absolute	[bar]	10	10	1,5
Maximum case drain pressure, absolute	[bar]	1,5	1,5	1,5
Minimum outlet pressure, absolute	[bar]	15	15	15
Weight with electronic displacement control (EC, EF)	[kg]	41,6	75,6	73,6
Mass moment of inertia (at axis of shaft)	[kg m2]	0,0101	0,0241	0,0264

1) Detailed inlet characteristics (at varying speed, displacement and inlet pressure conditions) can be taken from catalog HY30-2800/UK
2) For maximum operating pressures exceeding above mentioned nominal ratings please consult manufacturer.

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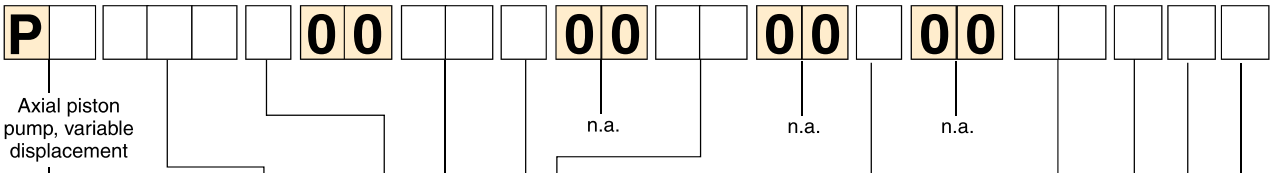
Pump & Motor Division Europe
Chemnitz, Germany



Code	Pump Series
P2	standard
P3	supercharged

Code	Pump Size (max. displacement in cc/rev)	
	eP2	eP3
075	75	-
145	145	145

Code	Shaft Rotation
R	clockwise (CW)
L	counter-clockwise (CCW)

Code	Shaft Type	Pump Size	
		75	145
B2	SAE B-B Spline	•	-
C1	SAE C Spline	•	•
C2	SAE C-C Spline	•	•
C3	SAE C Spline (w/o undercut)	•	•
D1	SAE D Spline	-	•
D2	SAE D Spline (w/o undercut)	-	•
M6	DIN 5480 Spline, W50	-	•

Code	Mounting Flange	Pump Size	
		75	145[1)]
C	SAE J744 127-2/4 (C)	•	-
D	SAE J744 152-4 (D)	-	•

1) Please consult manufacturer for other mounting flange options.

Code	Control Option (failsafe option)	Electronic Displacement Sensor
EC	electronic valve with zero displacement default	included
EF	electronic valve with max. displacement default	included

Code	Seals	Shaft Seal	Availability
N	NBR	single, FPM	standard
B		single, NBR	standard
V	FPM	single, FPM	standard
D	NBR	double, FPM	on request
Q		double, NBR	on request
T	FPM	double, FPM	on request

Code	Paint Option	Pump Series	
		eP2	eP3
U	no paint	•	-
P	Parker black primer	•	-
D	no paint	-	•
E	Parker black primer	-	•

Code	Multiple Pump Option
1	shipped as individual pump

Code	Port Location and Threads	Pressure Sensor
A	Side ports, UNC threads	no
B	Side ports, metric threads	
C	Side ports, UNC threads	yes
D	Side ports, metric threads	

Code	Through Drive	Pump Size	
		75	145
S1	no through drive	•	•
T1	prepared for through drive (solid cover plate)	•	•
A1	flange 82-2 (A), coupling SAE A spline (9T)	•	•
B1	flange 101-2 (B), coupling SAE B spline (13T)	•	•
B2	flange 101-2 (B), coupling SAE B-B spline (15T)	•	•
C1	flange 127-2 (C), coupling SAE C spline (14T)	•	•
C2	flange 127-2 (C), coupling SAE C-C spline (17T)	-	•
C3	flange 127-4 (C), coupling SAE C spline (14T)	•	•
C4	flange 127-4 (C), coupling SAE C-C spline (17T)	-	•
D3	flange 152-4 (D), coupling SAE D spline (13T)	-	•

Electronic Displacement Controls EC and EF

Electronically displacement controlled eP2 / eP3 provides an output flow defined by a displacement input command and maintains its swash angle (and thereby output flow level) until a new displacement command is received.

Under static displacement control conditions - i.e. as long as actual pump displacement (actual value) corresponds to displacement command (nominal value) - the control spool of the pump‘s control valve is held at metering edge (zero point). This is realized by applying a defined holding current (PWM signal) to the valve‘s proportional solenoid. If commanded displacement changes (actual value ≠ nominal value) the control spool is moved from its zero point. Depending on specified default setting (EC: 0% displacement / EF: 100% displacement) raising the current either results in an increased (EC) or decreased (EF) displacement of the pump. As soon as desired displacement has been achieved (actual value = nominal value) the control spool returns to its zero point.

Default options (behaviour at power loss):

EC 0% (zero displacement)

EF 100% (maximum displacement)

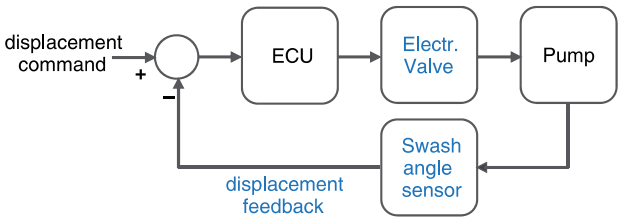
A minimum servo pressure of 15 bar is required to control the pump. Without adequate servo pressure the pump is mechanically biased on stroke. If a system pressure of below 15 bar is required the pump might be equipped with a preload valve. Please consult Parker for further information.

Closed control loop

By featuring both an electro-proportional directional control valve and a swash angle sensor the eP2 / eP3 design takes advantage of a closed control loop which provides for:

- Increased accuracy and system response
- Higher stability and minimized oscillation
- Improved fuel efficiency
- Electronic displacement feedback for analysis and sub-system communication

Closed loop working principle:



Power savings

Compared to a conventional hydro-mechanical compensator based approach the electronic displacement control of eP2 / eP3 is characterized by a significantly reduced compensator oil consumption and thereby increased volumetric efficiency. Thus eP2 / eP3 provides for considerable power savings (measured values at 1500 rpm):

	100 bar	300 bar
eP2075 power saving compared to LS controlled pump [kW]	0.2	0.85

Fuel saving potentials

Beside providing for improved control characteristics as well as power savings by control design eP2 / eP3 also enables new hydraulic system approaches such as the purely electronic control of single actuator operation, which eliminates the delta p losses of a conventional LS system.

Example:

Δp = 20 bar
Q = 150 L/min (75 cc/rev @ 2.000 rpm)

Resulting power consumption = 5 kW

Potential fuel saving @ 1.500 h/a and 0,2 l/kWh:
1.500 l/a

Typical response times

(Displacement control)

		100 bar	300 bar
t destroke (90% to 10% displ.) [ms]	eP2075	105	135
	eP2145 / eP3145	135	155
t onstroke (10% to 90% displ.) [ms]	eP2075	140	115
	eP2145 / eP3145	125	110

Control Functions and Options

As an option eP2 / eP3 can be equipped with a pressure sensor to either grant for pressure monitoring or to realize electronic pressure limitation. Pressure limitation function as well as secondary control options such as variable input torque limitation and speed compensation / flow control require the usage of a Parker supplied Pump Control Module (PCM). PCM command inputs can be both analog (0..5V) or CAN (J1939).

The following chart shows the range of available control functions (eff. March, 2018):

Control option	
Main	Secondary
D [1] displacement control	
DP [2] displacement control w pressure limitation	
	T [2] torque limitation
	S [2] speed compensation / flow control

1) Can be realized with Parker PCM or customer ECU (closed control loop)
2) Requires Parker PCM

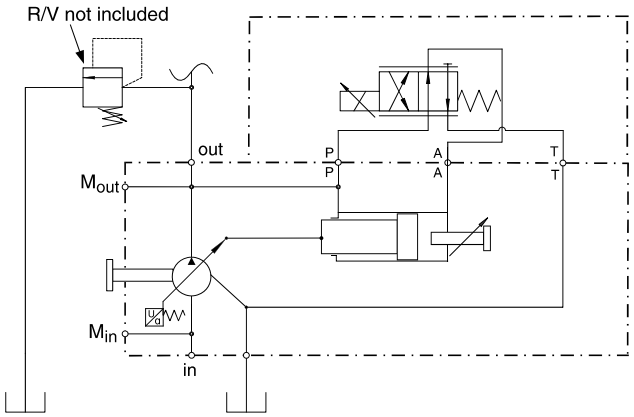
Beside pressure limitation (which defines a maximum pressure setting) a variable pressure control function can be made available on request. Please consult manufacturer for further details.

Note:
The hydraulic circuit must be equipped with a main flow relief valve to secure pump and hydraulic components. This main flow relief valve is outside the scope of supply.

Control Schematics

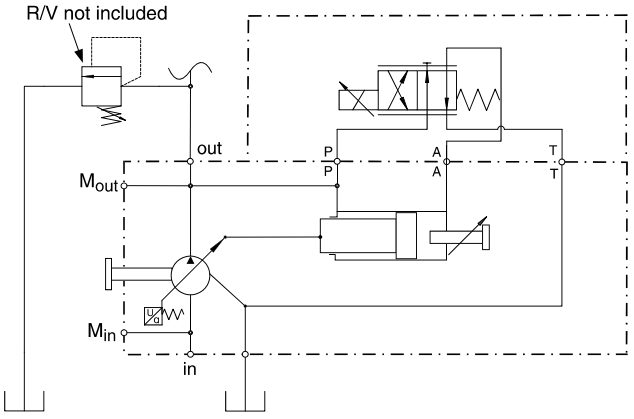
Displacement control w/o Parker supplied PCM

0% default setting (EC), standard valve position



Displacement control w/o Parker supplied PCM

100% default setting (EF), standard valve position



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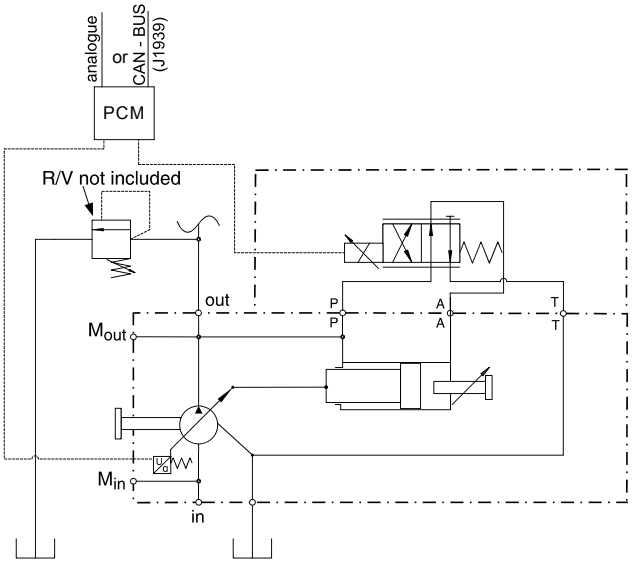
Displacement control (main: D)
w/ Parker supplied PCM

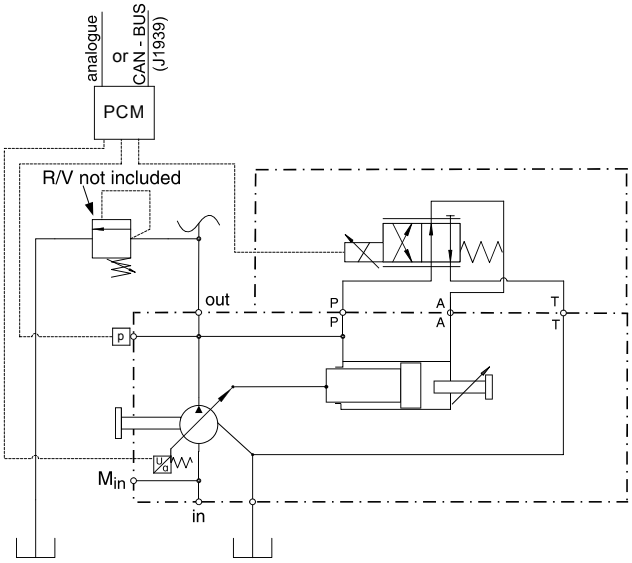
Example:
0% default setting (EC), standard valve position



Displacement control with optional pressure limitation (main: D / DP)
w/ Parker supplied PCM
w/ Pressure Sensor

- Optional torque limitation (secondary: T)

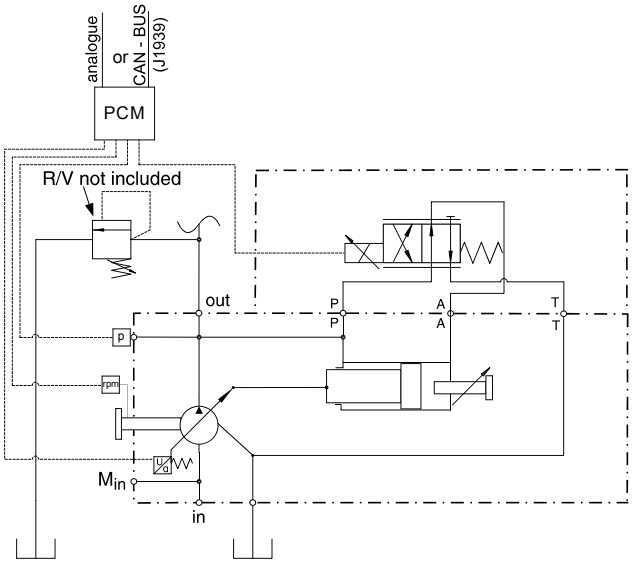
Example:
0% default setting (EC), standard valve position



Displacement control with optional pressure limitation (main: D / DP)
w/ Parker supplied PCM
w/ Pressure sensor

- Optional torque limitation (secondary: T)
- Optional speed compensation / flow control (secondary: S)
- External speed sensor (not pump mounted, outside scope of supply) or CAN speed feedback required for speed compensation

Example:
0% default setting (EC), standard valve position



Technical Data

Proportional control valve

General	
Model	Parker D1FB series
Design	Direct operated proportional DC valve (4/2 design)
Connector	Deutsch DT04-2P
Mating connector	Deutsch DT06-2S
Protection class	IP 67 in accordance with EN 60529 (with correctly installed and mounted mating connector)
Wiring recommendation	Stranded wire cable, min. 0.75 mm² (AWG 18)
Electrical characteristics	
Supply voltage	12 V (standard option)
Current consumption	2,2 A (standard option)
Nominal resistance (at 20 °C)	4,4 Ω
Recommended dither frequency	120 Hz
Recommended dither amplitude	4%
Operating time	100%

Swash angle sensor

General	
Model	Parker RS52 series
Design	Ratiometric hall effect sensor
Connector	Deutsch DT04-3P
Mating connector	Deutsch DT06-3S
Protection class	IP 67 in accordance with EN 60529 (with correctly installed and mounted mating connector)
Wiring recommendation	Stranded wire cable, min. 0.5 mm² (AWG 20)
Electrical characteristics	
Supply voltage	5 VDC regulated
Current consumption	12 mA max.
Output signal voltage	[2,5…4,5]V (standard control valve position)
	[2,5…0,8]V (control valve on opposite side of pump)
Max. output voltage drift	0,5mV/°C
Sinusoidal vibration	MIL-STD-202G, method 204D, 10-2kHz, 10G peak, 8 hr/axis
Random vibration	MIL-STD-202G, method 214A, 5-2kHz, 7,68G rms, 8 hr/axis
Approvals	
CE	2014/30/EU, EMC Directive

Pressure sensor

General	
Model	Parker SCP02 series
Design	Ratiometric pressure sensor
Connector	Deutsch DT04-4P
Mating connector	Deutsch DT06-4S
Protection class	IP 67 in accordance with EN 60529 (with correctly installed and mounted mating connector)
Wiring recommendation	Stranded wire cable, min. 0.5 mm² (AWG 20)
Electrical characteristics	
Supply voltage	5 VDC regulated
Current consumption	14 mA max.
Output signal voltage	[0,5…3,7]V (eP2075)
Max. output voltage drift	0,5 mV/°C
Vibration resistance	IEC 60068-2-6: 20g
Shock resistance	IEC 60068-2-27: 700g
Approvals	
CE	2014/30/EU, EMC Directive

Pump Control Module - PCM

- Task oriented controller with eP2 / eP3 specific firmware
- Covers all primary and secondary control functions (see page 6)
- Can be operated as both stand alone module (analog inputs) or CAN module (J1939)
- High reliability connectors system for harsh mobile environment
- CE certified

Ordering Code 1450039

Technical Data

General	
Model	Parker PCM
Design	IQAN task oriented controller with pump specific firmware
Weight	350 g
Temperature range	[-40…+85]°C
Protection class	IP 65 in accordance with EN 60529
Connector	1 x Molex MX123, 66 pos.
Electrical characteristics	
Supply voltage	[9…32]VDC
Current consumption at idle	typ. 180mA (24V)
	typ. 250mA (12V)
Network	
CAN buses	2
Protocols	ICP (IQAN CAN Protocol) for diagnostic communication
	SAE J1939 for master communication
Approvals	
CE	2014/30/EU, EMC Directive
E-mark	ECE Regulation No. 10.05:2014, approval N° E5 10 R - 05313

Related documents

Further information regarding electronic components, functionality and integration of eP2 / eP3 can be taken from the following related documents:

MSG30-2901-INST (Installation, start up and setup manual - electronic controls)

MSG30-2902-INST (Installation and start up manual - PCM)

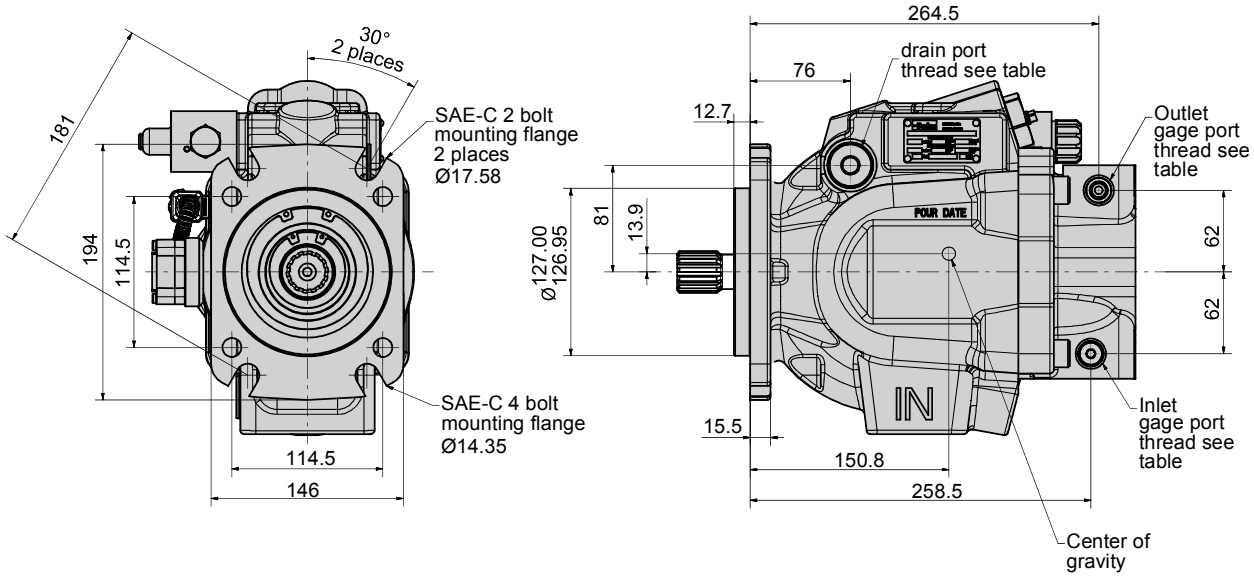
MSG30-2903-INST (Installation and start up manual - CAN PlugIn)

eP2075

Pump shown is a CW rotation eP2075 with proportional control valve and swash angle sensor. Dimensions for EC and EF control option are identical.

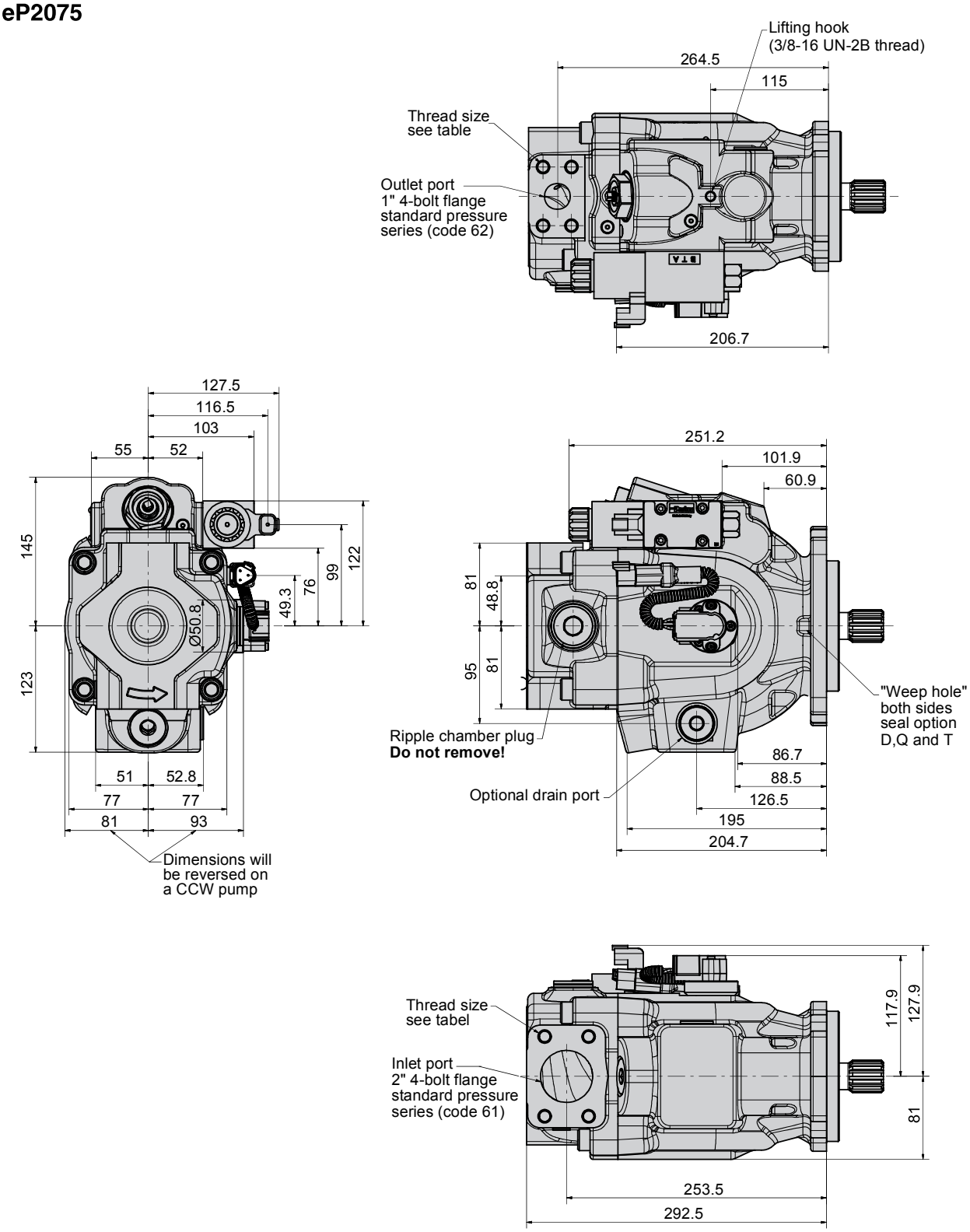
CCW pump will have inlet and outlet gage port on opposite side of rear cover.

If required by installation the control valve and the swashangle sensor can be positioned at opposite side of the pump. Please consult manufacturer for details.



Port & threads option	Drain port	Inlet port	Outlet port	Inlet & outlet gage port
A / C (UNC)	SAE-12 straight thread / O-ring port: 1-1/16-12 thread	1/2-13 UN	7/16-14 UN	SAE-4 straight thread / O-ring port: 7/16-20 UN thread
B / D (metric)	ISO 6149 straight thread / O-ring port: M27 x 2 thread	M12 x 1,75	M12 x 1,75	ISO 6149 straight thread / O-ring port: M12 x 1,5 thread

eP2075

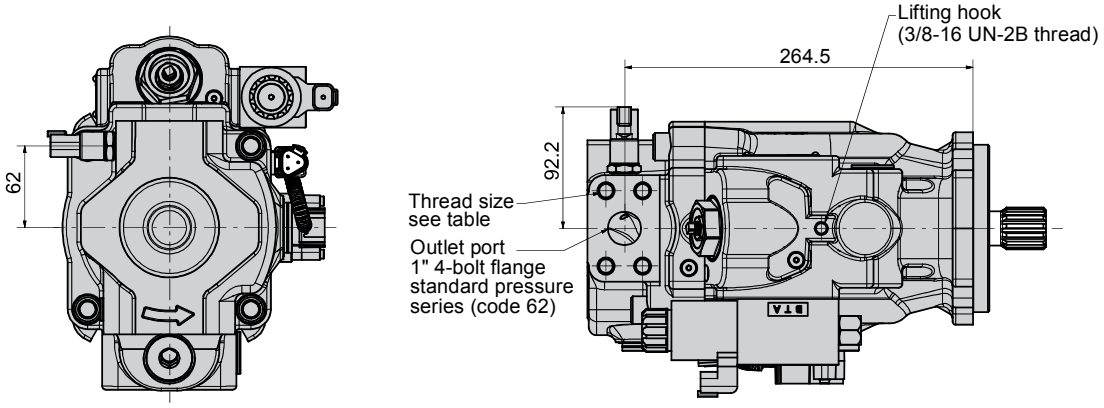


For **thru drive dimensions and shaft information** please check catalogue **MSG30-2800/UK** (Axial Piston Pumps – Series P2 / P3).

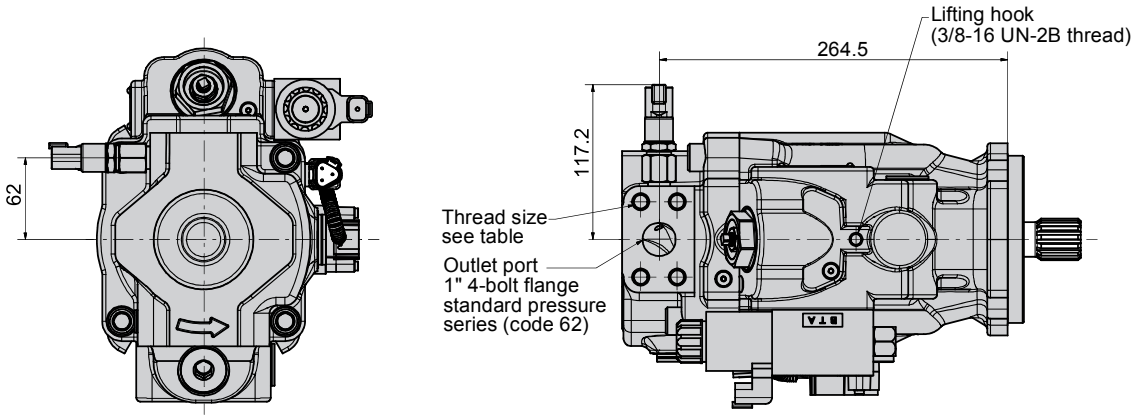
eP2075 w/ pressure sensor

Pump shown is a CW rotation eP2075 with proportional control valve, swash angle sensor and pressure sensor.

Port option C (pump with UNC threads)



Port option D (pump with metric threads)



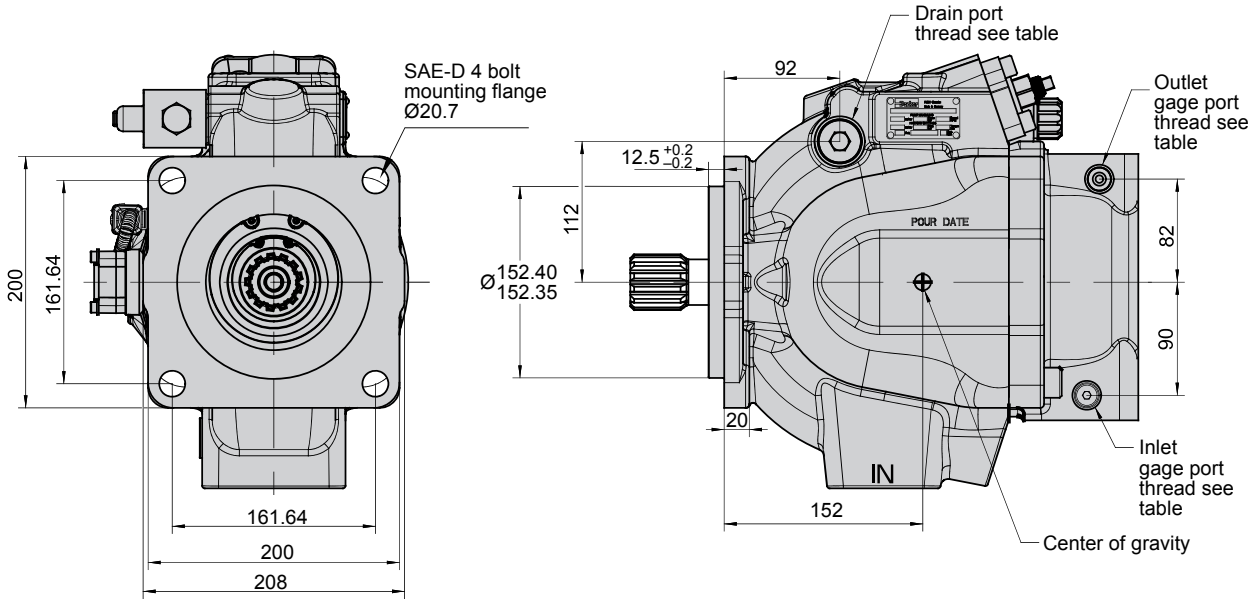
Port & threads option	Drain port	Inlet port	Outlet port	Inlet & outlet gage port
A / C (UNC)	SAE-12 straight thread / O-ring port: 1-1/16-12 thread	1/2-13 UN	7/16-14 UN	SAE-4 straight thread / O-ring port: 7/16-20 UN thread
B / D (metric)	ISO 6149 straight thread / O-ring port: M27 x 2 thread	M12 x 1,75	M12 x 1,75	ISO 6149 straight thread / O-ring port: M12 x 1,5 thread

eP2145

Pump shown is a CW rotation eP2145 with proportional control valve and swash angle sensor. Dimensions for EC and EF control option are identical.

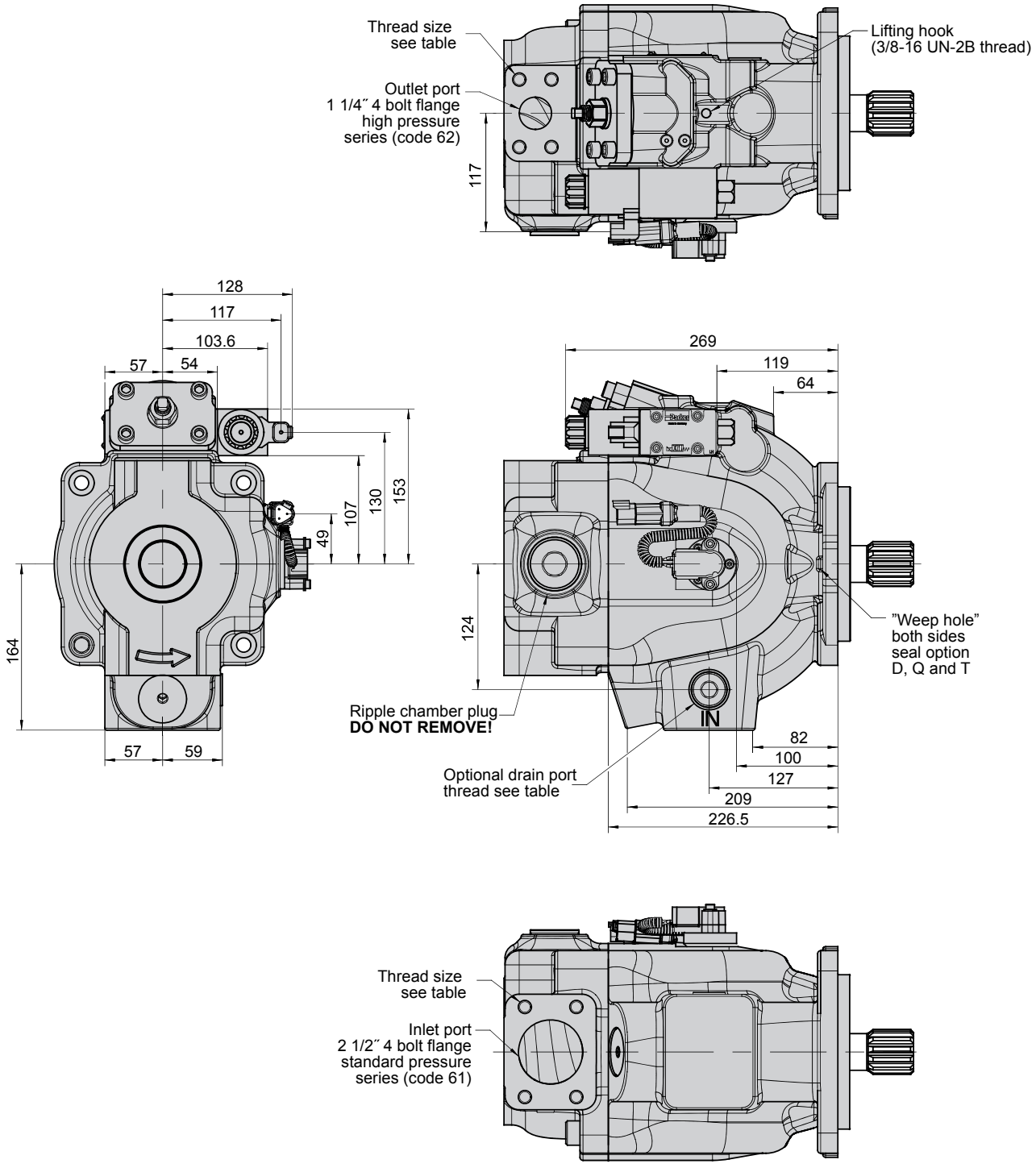
CCW pump will have inlet and outlet gage port on opposite side of rear cover.

If required by installation the control valve and the swash angle sensor can be positioned at opposite side of the pump. Please consult manufacturer for details.



Port & threads option	Drain port	Inlet port	Outlet port	Inlet & outlet gage port
A / C (UNC)	SAE-12 straight thread / O-ring port: 1-1/16-12 thread	1/2-13 UN	1/2-13 UN	SAE-4 straight thread / O-ring port: 7/16-20 UN thread
B / D (metric)	ISO 6149 straight thread / O-ring port: M27 x 2 thread	M12 x 1,75	M12 x 1,75	ISO 6149 straight thread / O-ring port: M12 x 1,5 thread

eP2145

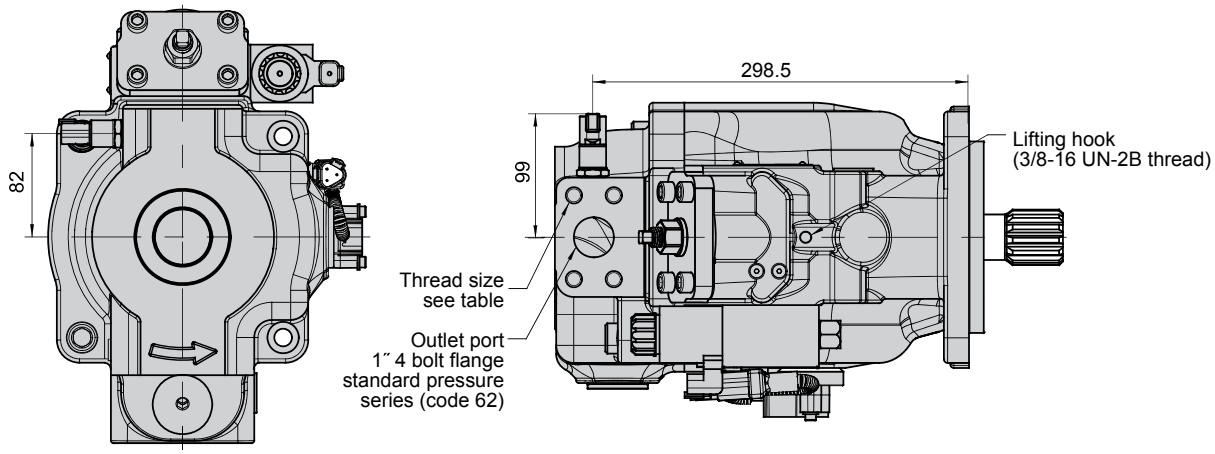


For thru drive dimensions and shaft information please check catalogue **MSG30-2800/UK** (Axial Piston Pumps - Series P2 / P3.

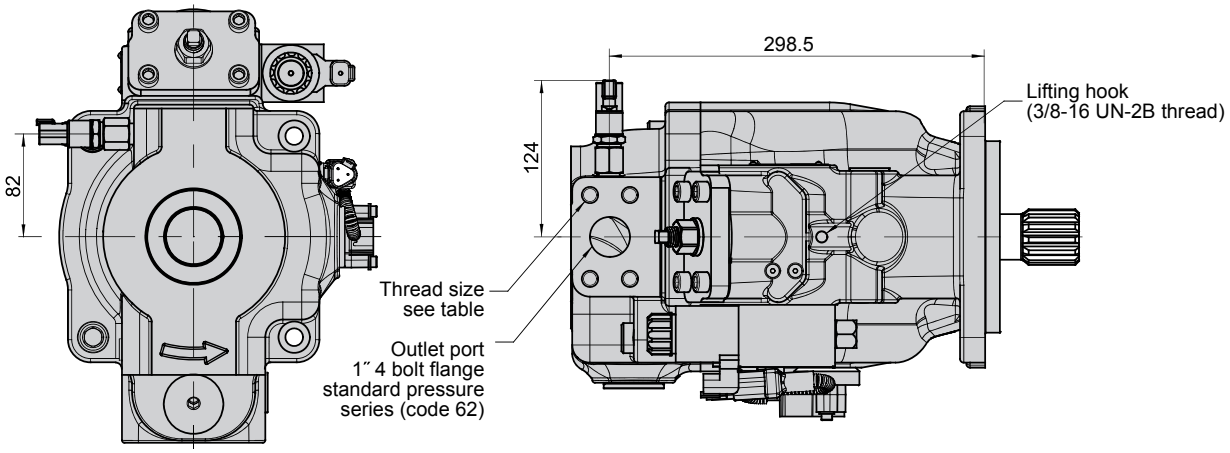
eP2145 w/ pressure sensor

Pump shown is a CW rotation eP2145 with proportional control valve, swash angle sensor and pressure sensor.

Port option C (pump with UNC threads)



Port option D (pump with metric threads)

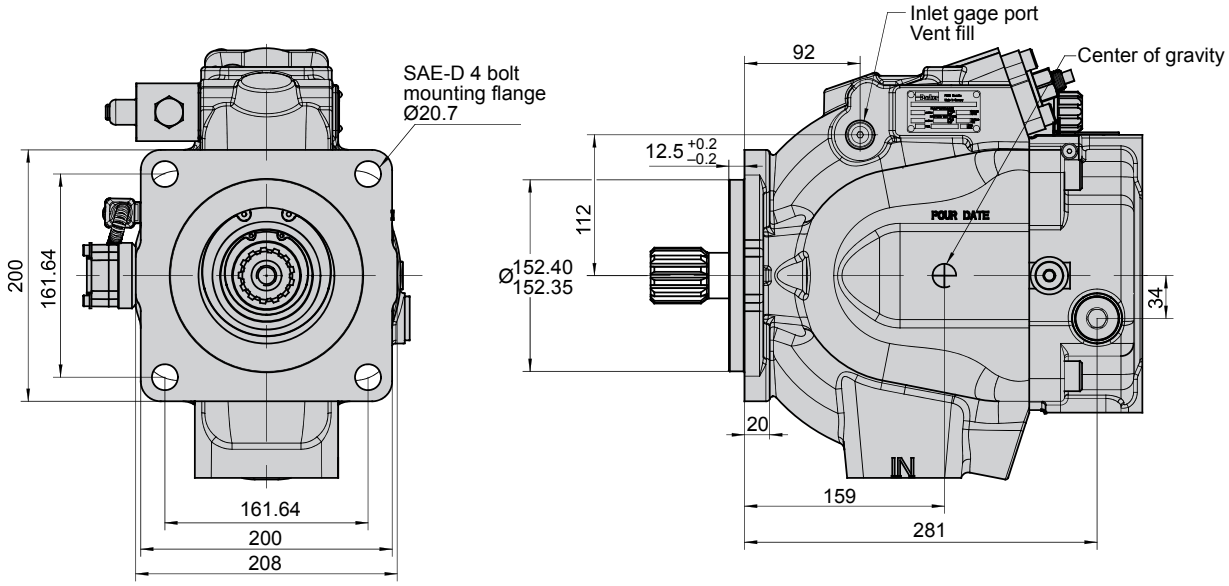


eP3145

Pump shown is a CW rotation eP3145 with proportional control valve and swash angle sensor. Dimensions for EC and EF control option are identical.

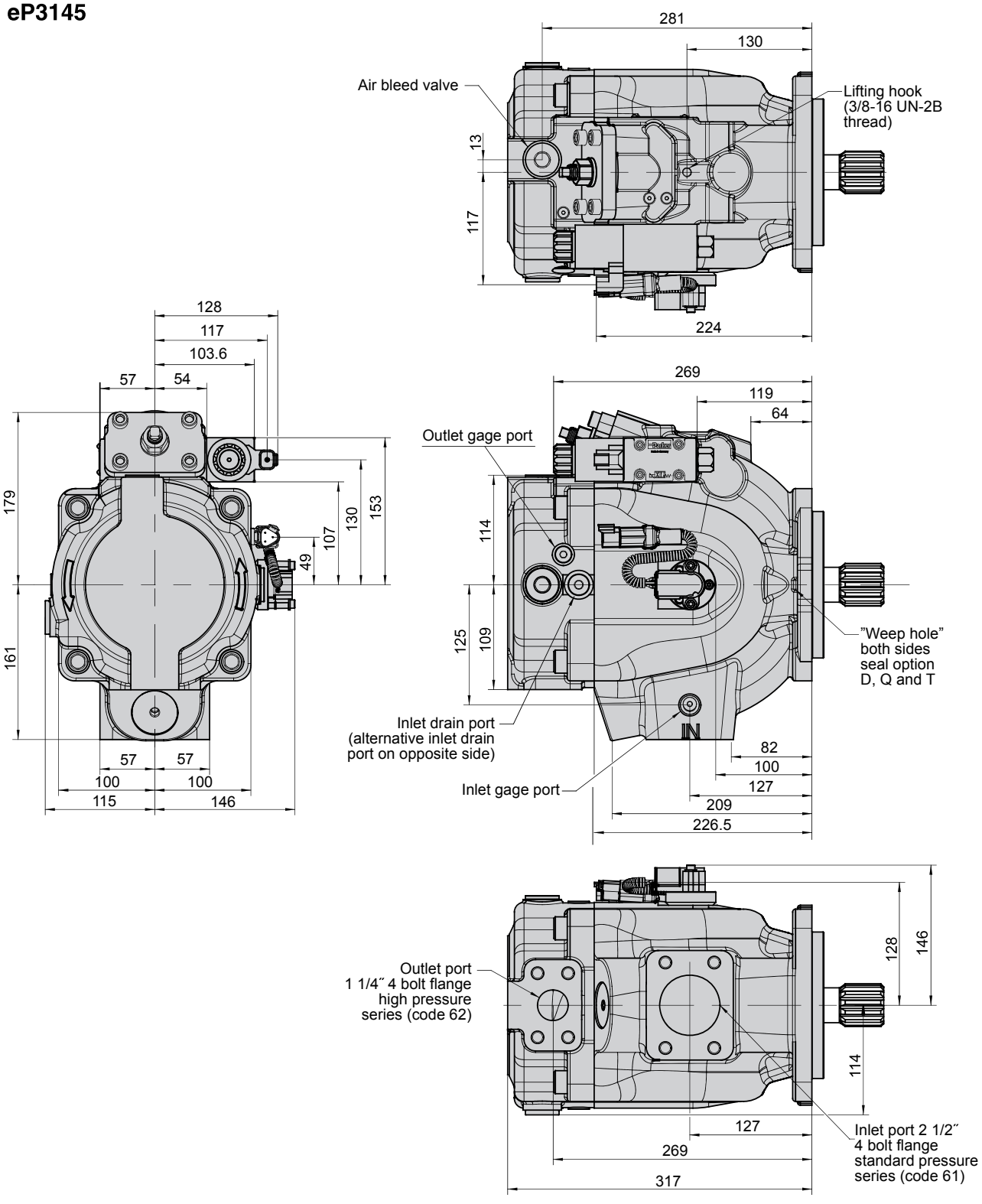
CCW pump will have inlet and outlet gage port on opposite side.

If required by installation the control valve and the swash angle sensor can be positioned at opposite side of the pump. Please consult manufacturer for details.



Port & threads option	Drain port	Inlet port	Outlet port	Inlet & outlet gage port
A / C (UNC)	SAE-8 straight thread / O-ring port: 3/4-16 thread	1/2-13 UN	1/2-13 UN	SAE-4 straight thread / O-ring port: 7/16-20 UN thread
B / D (metric)	ISO 6149 straight thread / O-ring port: M18 x 1.5 thread	M12 x 1,75	M12 x 1,75	ISO 6149 straight thread / O-ring port: M12 x 1.5 thread

eP3145



For thru drive dimensions and shaft information please check catalogue **MSG30-2800/UK** (Axial Piston Pumps - Series P2 / P3.

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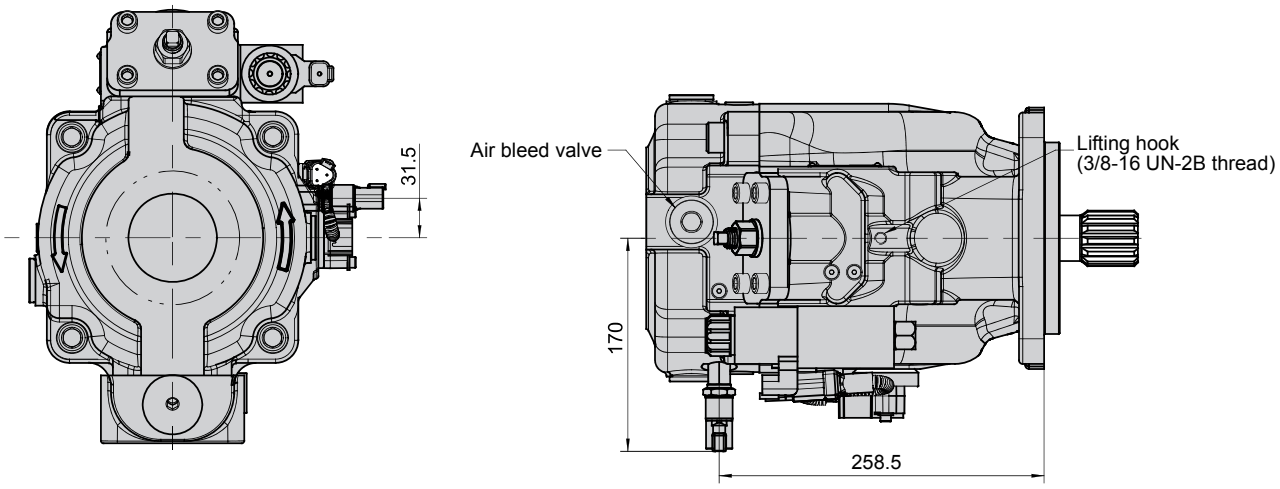
Chemnitz, Germany

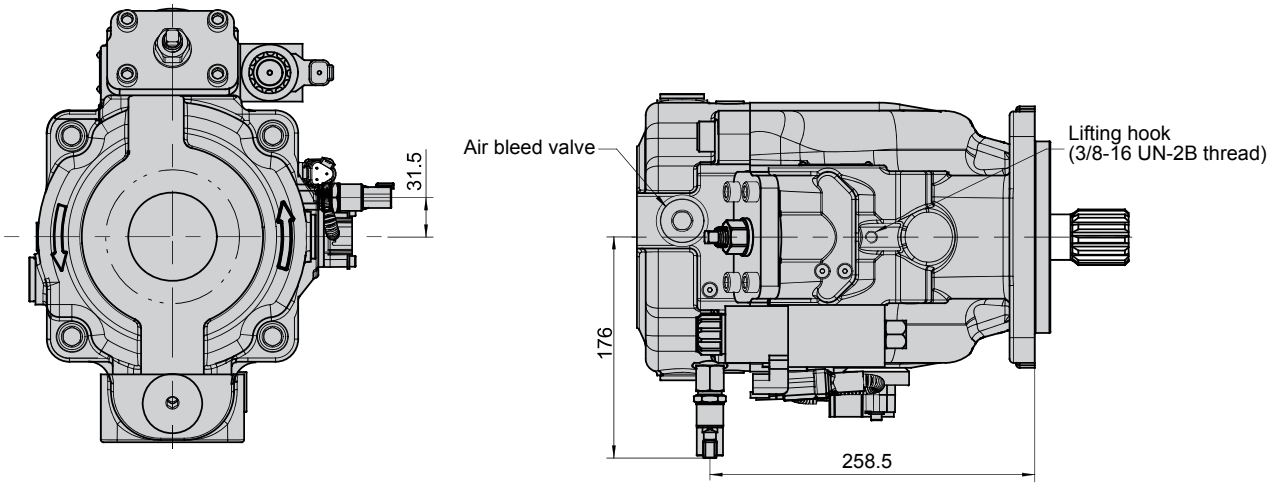
eP3145 w/ pressure sensor

Pump shown is a CW rotation eP3145 with proportional control valve, swash angle sensor and pressure sensor. CCW pump will have inlet and outlet gage port on opposite side.

Port option C (pump with UNC threads)



Port option D (pump with metric threads)



Recommended hydraulic fluids

Hydraulic fluids based on mineral oils acc. to DIN 51524, part 2 and 3 (HLP / HVLP).

Pumps of series P2 / P3 can also be operated with environmentally acceptable (bio-degradable) and synthetic hydraulic fluids. Please consult Parker for further details.

Please check the specification of selected hydraulic fluid for chemical resistance with the pump's sealing material (shaft seal, O-rings).

Hydraulic fluid cleanliness level

For maximum component life and reliability a cleanliness level of 18/16/13 (acc. to ISO 4406) is recommended for eP2 / eP3.

Viscosity

Minimum viscosity for short periods:
10mm²/s (cSt)

Recommended continuous operating viscosity:
[15…40] mm²/s (cSt)

Maximum cold start viscosity:
1000 mm²/s (cSt)

Temperature

Check temperature range of selected seal material and compare with maximum system and ambient temperature.

The following limitations refer to average case drain temperature (measured at drain port), which can be up to 20 °C higher than in the reservoir:

Sealing option	Tmin [°C]	Tmax [°C]
N / D	-25	+80
B / Q	-40	+80
V / T	-25	+80

Shaft Loads

Please strictly follow the instructions of the coupling / PTO supplier regarding axial clearance, axial alignment and angular tolerances. The drive shaft should only carry torque. Units subjected to radial loads require the installation of an outboard bearing. Axial loads are not permitted.

Related Documents

For further information on Installation, start up procedure and trouble shooting please check document **HY30-2901-INST**.

⚠ WARNING – USER RESPONSIBILITY

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

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Parker Worldwide

Europe, Middle East, Africa

AE – United Arab Emirates, Dubai
Tel: +971 4 8127100
parker.me@parker.com

AT – Austria, Wiener Neustadt
Tel: +43 (0)2622 23501-0
parker.austria@parker.com

AT – Eastern Europe, Wiener Neustadt
Tel: +43 (0)2622 23501 900
parker.easteurope@parker.com

AZ – Azerbaijan, Baku
Tel: +994 50 2233 458
parker.azerbaijan@parker.com

BE/LU – Belgium, Nivelles
Tel: +32 (0)67 280 900
parker.belgium@parker.com

BG – Bulgaria, Sofia
Tel: +359 2 980 1344
parker.bulgaria@parker.com

BY – Belarus, Minsk
Tel: +48 (0)22 573 24 00
parker.poland@parker.com

CH – Switzerland, Etoy
Tel: +41 (0)21 821 87 00
parker.switzerland@parker.com

CZ – Czech Republic, Klecany
Tel: +420 284 083 111
parker.czechrepublic@parker.com

DE – Germany, Kaarst
Tel: +49 (0)2131 4016 0
parker.germany@parker.com

DK – Denmark, Ballerup
Tel: +45 43 56 04 00
parker.denmark@parker.com

ES – Spain, Madrid
Tel: +34 902 330 001
parker.spain@parker.com

FI – Finland, Vantaa
Tel: +358 (0)20 753 2500
parker.finland@parker.com

FR – France, Contamine s/Arve
Tel: +33 (0)4 50 25 80 25
parker.france@parker.com

GR – Greece, Piraeus
Tel: +30 210 933 6450
parker.greece@parker.com

HU – Hungary, Budaörs
Tel: +36 23 885 470
parker.hungary@parker.com

IE – Ireland, Dublin
Tel: +353 (0)1 466 6370
parker.ireland@parker.com

IL – Israel
Tel: +39 02 45 19 21
parker.israel@parker.com

IT – Italy, Corsico (MI)
Tel: +39 02 45 19 21
parker.italy@parker.com

KZ – Kazakhstan, Almaty
Tel: +7 7273 561 000
parker.easteurope@parker.com

NL – The Netherlands, Oldenzaal
Tel: +31 (0)541 585 000
parker.nl@parker.com

NO – Norway, Asker
Tel: +47 66 75 34 00
parker.norway@parker.com

PL – Poland, Warsaw
Tel: +48 (0)22 573 24 00
parker.poland@parker.com

PT – Portugal
Tel: +351 22 999 7360
parker.portugal@parker.com

RO – Romania, Bucharest
Tel: +40 21 252 1382
parker.romania@parker.com

RU – Russia, Moscow
Tel: +7 495 645-2156
parker.russia@parker.com

SE – Sweden, Spånga
Tel: +46 (0)8 59 79 50 00
parker.sweden@parker.com

SK – Slovakia, Banská Bystrica
Tel: +421 484 162 252
parker.slovakia@parker.com

SL – Slovenia, Novo Mesto
Tel: +386 7 337 6650
parker.slovenia@parker.com

TR – Turkey, Istanbul
Tel: +90 216 4997081
parker.turkey@parker.com

UA – Ukraine, Kiev
Tel: +48 (0)22 573 24 00
parker.poland@parker.com

UK – United Kingdom, Warwick
Tel: +44 (0)1926 317 878
parker.uk@parker.com

ZA – South Africa, Kempton Park
Tel: +27 (0)11 961 0700
parker.southafrica@parker.com

North America

CA – Canada, Milton, Ontario
Tel: +1 905 693 3000

US – USA, Cleveland
Tel: +1 216 896 3000

Asia Pacific

AU – Australia, Castle Hill
Tel: +61 (0)2-9634 7777

CN – China, Shanghai
Tel: +86 21 2899 5000

HK – Hong Kong
Tel: +852 2428 8008

IN – India, Mumbai
Tel: +91 22 6513 7081-85

JP – Japan, Tokyo
Tel: +81 (0)3 6408 3901

KR – South Korea, Seoul
Tel: +82 2 559 0400

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Tel: +60 3 7849 0800

NZ – New Zealand, Mt Wellington
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SG – Singapore
Tel: +65 6887 6300

TH – Thailand, Bangkok
Tel: +662 186 7000

TW – Taiwan, Taipei
Tel: +886 2 2298 8987

South America

AR – Argentina, Buenos Aires
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BR – Brazil, Sao Jose dos Campos
Tel: +55 800 727 5374

CL – Chile, Santiago
Tel: +56 2 623 1216

MX – Mexico, Toluca
Tel: +52 72 2275 4200

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EMEA Product Information Centre
Free phone: 00 800 27 27 5374
(from AT, BE, CH, CZ, DE, DK, EE, ES, FI, FR, IE, IL, IS, IT, LU, MT, NL, NO, PL, PT, RU, SE, SK, UK, ZA)

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