Bulletin MSG30-2901-INST/UK

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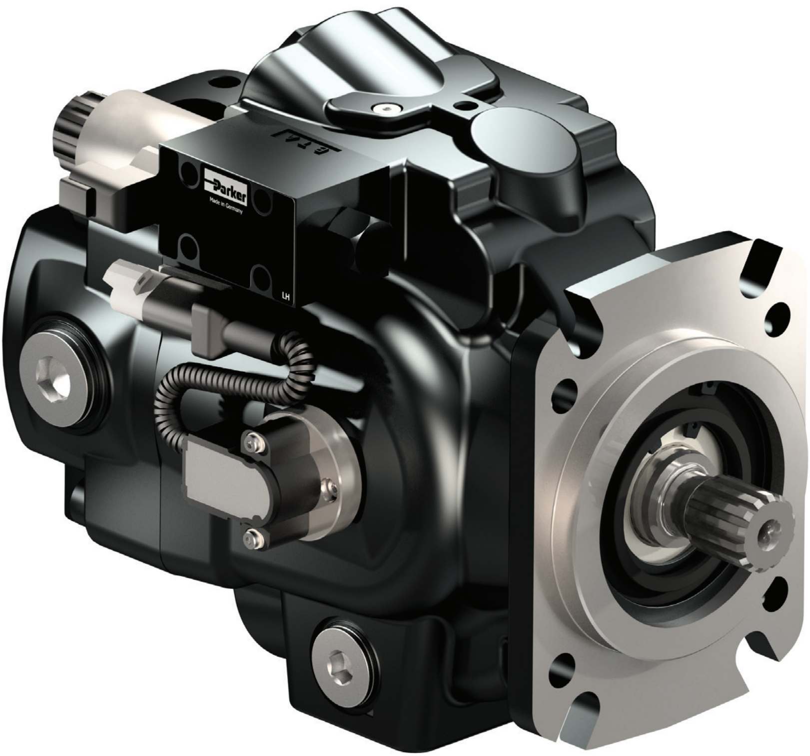
Installation and setup manual
Series eP2 / eP3 Electronic Controls

Effective: March 01, 2019
Supersedes: March 01, 2018



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Pump & Motor Division Europe
Chemnitz, Germany

Installation, Start-up and Setup

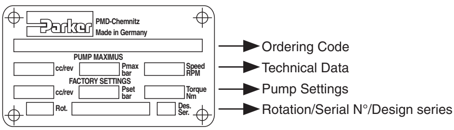
In order to provide for safe and failure-free operation of hydraulic pumps of series P2/P3 it is mandatory to conduct a careful installation and start up procedure.

Respective requirements as well as aspects specific for the electronically controlled pump models are listed and described within the following instructions. During installation and start up the following steps need to be carried out carefully.

1.Preparation

1.1. Model code check

Beside information on pump settings, design series and manufacturing date the pump's nameplate also shows the ordering code of the pump, which needs to be compared to your order acknowledgement / shipping papers.



1.2. Visual inspection

Make sure that all components of the shipment are complete, free of damage as well as outside contamination. Also please check for a proper protection against ingression of contaminants.

1.3. Rotation check

Please make sure that the pump's rotational direction fits the requirements of the driving mechanism. The rotational direction of P2 and P3 piston pumps always refers to view from shaft end and can be taken from both the nameplate as well as an arrow machined into the rear cover.

Clockwise rotation

Counter-clockwise rotation

Contamination is the number one cause for component failure. Therefore maximum care and cleanliness are required during all handling of parts which are in contact with the hydraulic fluid. All ports of the pump must be covered / plugged until the connectors and hoses are mounted. Perform assembly preferably in a dry and dust free room. Use only suitable tools.

2.Installation

2.1. Drive input

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 subject to radial loads require the installation of an outboard bearing. Axial loads are not permitted.

2.2. Connections

Avoid rigid connection between pump and reservoir to prevent excitation of the whole system due to pump vibrations. Same goes for connections to frame.

Suction port: Ensure an absolute gas tight connection of the pumps suction port in order to prevent cavitation and noise. Further on avoid sharp elbows, restrictions of inlet diameter and turbulences at the pump's inlet. The suction pipe must have access to clean, cooled and filtered fluid, which is free of air bubbles. Pipe end is recommended to be cut under 45°.

Series P2/P3's maximum operating speed is determined by actual displacement and inlet pressure. Detailed values can be taken from the catalogs MSG30-2800 and MSG30-2900. If the pump is controlled by a Parker PMDE supplied pump control module (PCM) and the speed feedback is tied into the controller, a warning message will be generated and logged in case the measured drive speed exceeds respective limitations.

Minimum pump inlet pressure under static and dynamic load (P2, eP2, P3, eP3):
$p_{in,min}$ = **0.8 bar abs**.

Maximum pump inlet pressure (P2, eP2):
$p_{in,max}$ = **10 bar abs**.

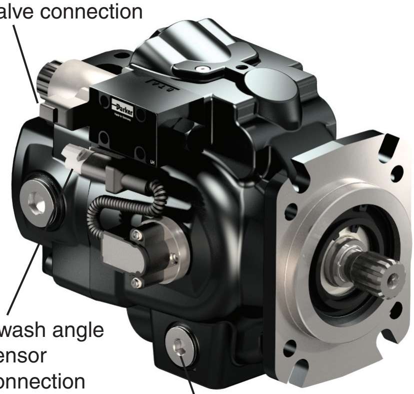
Maximum pump inlet pressure (P3, eP3):
$p_{in,max}$ = **1.5 bar abs**.

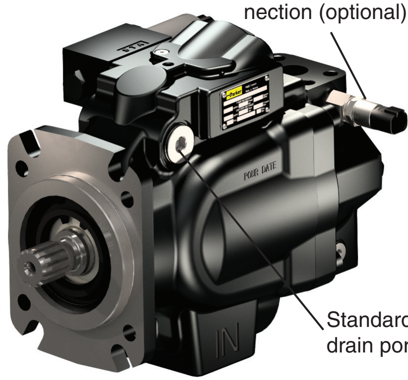
Pressure port: Select correct pressure rating for pipe / hose and connectors. Take pressure peaks into account. Dimension the piping according to the port size. Prevent excitation of the system by using flexible port connections. Maximum pressure ratings must not be exceeded (see MSG30-2800; MSG30-2900). If the pump is controlled by a Parker PMDE supplied PCM and the pressure feedback is tied into the controller, a warning message will be generated and logged in case the measured pump pressure exceeds respective limitations.

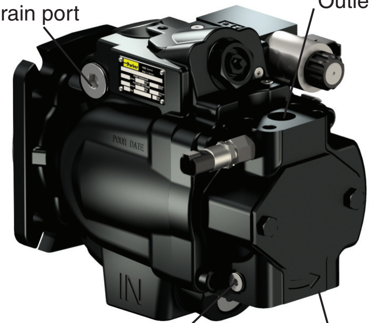
Drain port: Always use highest possible drain port of the pump (above pump's centerline). Do not combine drain lines. Use low pressure pipe / hose, as short as possible and full cross section according to port dimension (see MSG30-2800; MSG30-2900). Do not use elbows or sharp corners. To prevent the pump's case from emptying add a bridge higher than pump's top to drain line if required. Drain pipe must end at least 200 mm below minimum hydraulic tank fluid level. Length should not exceed 2 m, otherwise use larger pipe diameter than port size.

Maximum cont. case drain pressure (P2, eP2, P3, eP3):
$p_{case,max}$ = **1.5 bar abs**.

For reasons of better heat dissipation the drain ports of P2 can also be used for flushing. Recommended flushing flow is 6 to 10 l/min (P2075), 8-11 l/min (P2145). In case of deadhead operation exceeding 15 minutes and 100 bar case flushing is strongly recommended.







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2.3. Electrical interfaces, PIN assignment

Check voltage, current, phase and connection properties before plugging in any electrical component. Following mating connectors need to be used to connect the actuator and sensors properly.

Electrical component	Connector	Mating Connector
Valve	DT04-2P	DT06-2S
Swash angle sensor	DT04-3P	DT06-3S
Pressure Sensor	DT04-4P	DT06-4S

With correctly installed and mounted mating connector all "DEUTSCH" connectors used meet protection class IP 67.

PIN assignment - valve:

The terminal assignment of supply and GND is not important for functionality of the valve.
PIN assignment – swash angle sensor:

PIN assignment – swash angle sensor:

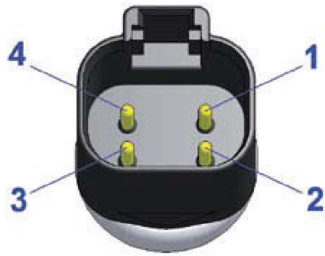
PIN / Terminal	Connection
A	5V / VREF+ / Supply – red
B	0V / VREF- / GND – black
C	Signal – blue

NOTICE

Do not treat the sensor with electro static painting.

PIN assignment - pressure sensor:

PIN / Terminal	Connection
1	5V / VREF+ / Supply
2	0V / VREF- / GND
3	Signal
4	n.c.



2.4. Wiring recommendations

Component	Cross section	Cable type
Valve	min. 0,75 mm² (AWG 18)	Stranded wire cable
Swash angle sensor	min. 0,5 mm² (AWG 20)	Stranded wire cable
Pressure Sensor	min. 0,5 mm² (AWG 20)	Stranded wire cable

2.5. Power supply – sensors, reference voltage

Output voltage	5V ± 150mV
Max. out voltage drift	0,5mV/°C
Recommended load current	150mA
Recommended protection	Overload, SCB (Short to Battery) , SCG (Short to Ground)
Diagnostic	Over-/ undervoltage recommended for error detection
Recommended over-/ undervoltage threshold	±500mV from nominal value

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2.6. Sensor properties

	Swash angle sensor	Pressure sensor
Output	Ratiometric	
Supply voltage [V]	5V regulated	
Supply current [mA]	12mA Max.	14mA Max.
Over voltage protection	+14,4V < 10 Min.	+5,5V
Reverse polarity protection	-14,4V < 10 Min.	None
Protection Class	IP67	IP67
Signal working range [mV]	standard valve position: 2500mV-4500mV Valve on opposite side of the pump: 2500mV-800mV	500mV-3700mV 75 cc pumps (pmax cont= 320bar)
Signal @ index position	2500mV (@ 0% Displacement)	500mV (@ 0 bar pressure)

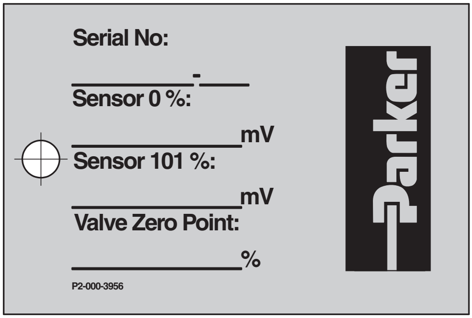
2.7. Valve properties

Supply voltage [V]	12
Current consumption [mA]	2200
Resistance [Ω]	4.4
Recommended dither frequency [Hz]	120
Recommended dither amplitude [%]	4
Operating time [%]	100

2.8. Electrical displacement adjustment

All axial piston pumps of series eP2 are equipped with an adjusted and sealed displacement limiter. Do not change this setting. Maximum displacement should be limited electronically.

The factory setting is at 101% of the nominal pump displacement. Therewith the mechanical displacement limiter is 1% out of the pumps electronic controlled working range. This prevents the control from running into boundary issues.



Using a PCM as pump controller, the voltages for 0% and 101% (shown on the pump tag) can directly be used for the calibration of the swash angle feedback sensor. Displacement limitation below 100% needs to be realized electronically by controller parameterization.

Using a third party controller the voltage for 101% needs to be recalculated to 100% by using the following formulae.

Standard valve position:

$$Sensor\ 100\% = \frac{(Sensor\ 101\% - Sensor\ 0\%)}{1.01} + Sensor\ 0\%)$$

Valve mounted on opposite side of the pump:

$$Sensor\ 100\% = Sensor\ 0\%) - \frac{(Sensor\ 0\% - Sensor\ 101\%)}{1.01}$$

NOTICE

An adjustment exceeding the nominal displacement (Sensor 100%) can destroy the pump.

2.9. eP2 / eP3 control functions

The eP2 pump is designed for open circuit, heavy duty mobile hydraulic systems.

By featuring an electro-proportional directional valve in combination with a swash angle sensor it is capable to precisely follow an electrical displacement command and thereby to operate as a displacement controlled unit. Furthermore the pump can be equipped with an optional pressure sensor to either grant for pressure monitoring or to realize electronic pressure limitation (in combination with Parker PCM). The PCM is also capable to manage secondary controls such as variable torque limitation and speed compensation / flow control. The inputs can be both analogue based on mobile voltage signals (0-5 V) or CAN (J1939).

A minimum pressure of 15 bar at the pump outlet is required to fully de-stroke the pump. Depending on system requirements the pump might be equipped with a preload valve to ensure this control condition. There are different configurations of preload valves also in combination with main flow pressure reliefs and main flow logic elements available. Please consult Parker for further information.

2.10. Valve function

In static displacement control conditions the valve consumes approx. 53% of its nominal current (2200 mA).
Due to manufacturing tolerances, this neutral point and therewith the current engaging this neutral position can differ from valve to valve. The necessary offset adjustment is stated on the pumps tag for each individual pump. This “valve zero point” refers to 2000 mA current.

Example:

Valve Zero point: +1% → +20 mA

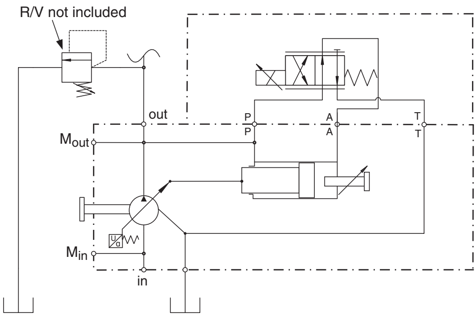
Valve Zero point -0,5% → -10 mA

Depending on the pump’s fail safe control option (0% or 100%) the valve current is acting differently to the pumps displacement control.

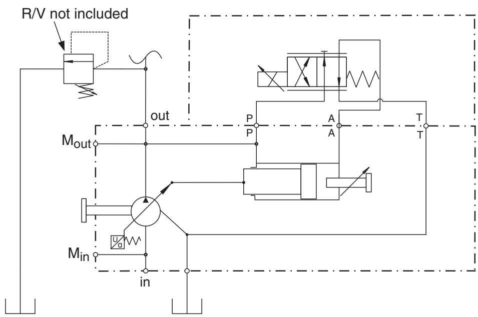
Below table explains the reaction of the pump’s displacement control.

	0% FS	100% FS
$I_{valve} > I_{neutral}$	Displacement increasing	Displacement decreasing
$I_{valve} = I_{neutral}$	Displacement constant	Displacement constant
$I_{valve} < I_{neutral}$	Displacement decreasing	Displacement increasing

Fail Safe 0% (Standard control position)



Fail Safe 100% (Standard control position)

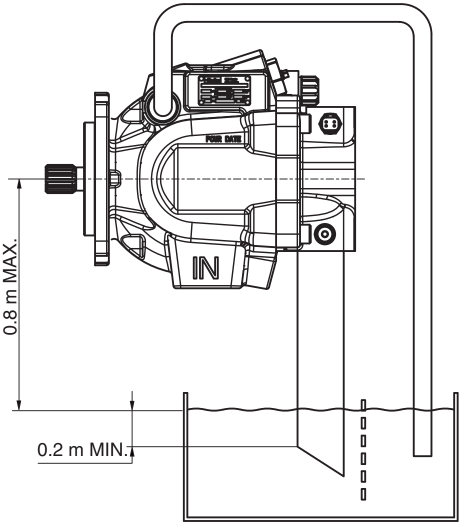


NOTICE

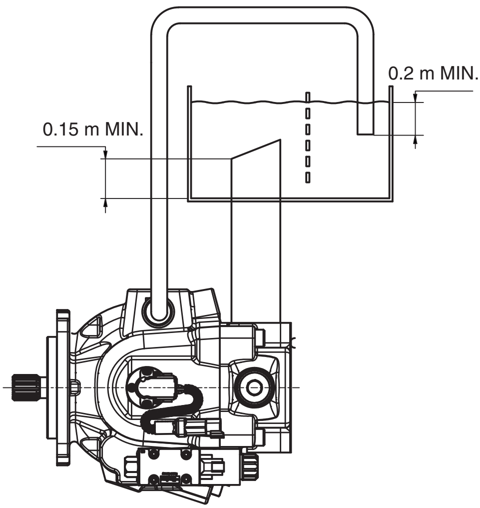
The hydraulic circuit must be equipped with a main flow relief valve to secure pump and hydraulic components. This main flow relief is outside the scope of supply.

2.11. Typical arrangements eP2

(Please consult Parker for deviating approaches)

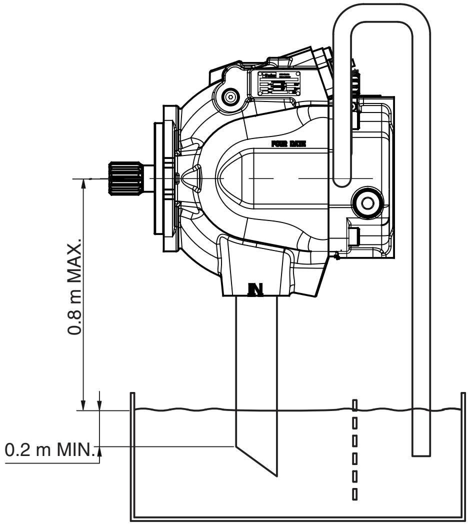


Preferred arrangement for best suction characteristics and low noise level operation.

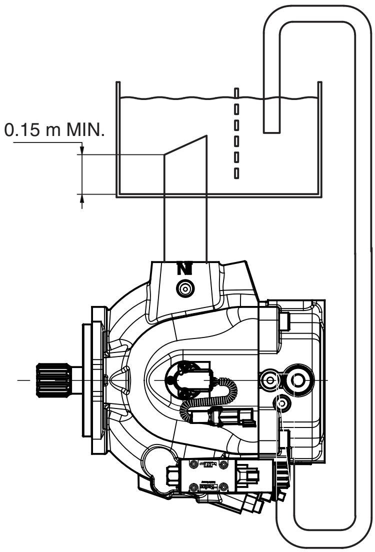


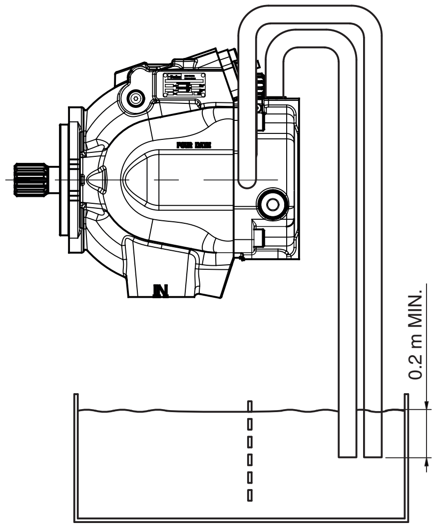
2.12. Typical arrangement eP3

(Please consult Parker for deviating approaches)



Preferred arrangement for best suction characteristics and low noise level operation.





Optional Airbleed Connection. Keep inlet and drain line separate (hot loop).

2.13.Fluid reservoir

Besides being reservoir for the hydraulic fluid the tank also supports heat dissipation, air removal, water removal and contamination sedimentation. The reservoir needs to be carefully sealed against ingression of contamination and water. Breather with filter elements and air dryer shall be used for protection of tank towards ambient air to avoid introducing dust and dirt particles as well as moisture. In terms of dimensioning maximum output flow of the pump(s) needs to be taken into consideration.

2.14.Hydraulic system safety

To ensure human and machine safety under all operating conditions the installation of a main flow relief valve is strongly recommended.

NOTICE

A pump compensator/valve is NOT a safety device.

For eP2/eP3 the installation of an external main flow relief valve is mandatory to secure both the pump and the hydraulic system.

3.Hydraulic fluid requirements

3.1. Recommended 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.

3.2. Cleanliness level

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

3.3. 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)

3.4. Compatibility with Sealing Material

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

4.Start up and Operation

4.1. Start up Procedure

Check if all ports are properly connected and free of damage. All connectors must be tightened. Cross-check rotational direction and alignment of drive.

Inspect reservoir for cleanliness and a proper fluid level.

Prior to start up the pump's case must be filled with the hydraulic fluid via the (upper) drain port in order to ensure lubrication, sealing and a smooth start up.

Open the suction valve (if installed).

Switch the system to free circulation / zero pressure and allow air bleeding to enable the pump to prime.

Start the pump at low speed.

Continue low pressure / low speed operation until pump and system are properly filled and free of air bubbles.

Re-check fluid level in tank. Gradually increase pressure and speed over a timeframe of 5 to 10 minutes. Check if all hoses / pipes and connections are leak free and tight. Be alert for trouble as indicated by changes in sound, system shocks and air in fluid.

If the pump does not build up pressure, double-check the installation.

4.2. 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:

N/D NBR O-rings, FPM shaft seal(s) [-25…+80]°C

B/Q NBR O-rings, NBR shaft seal(s) [-40…+80]°C

V/T FPM O-rings, FPM shaft seal(s) [-25…+80]°C

4.3. Inspection and Maintenance

In general the service life of a piston pump is determined by its bearing lifetime, which is primarily a function of pressure and drive speed cycle, shaft load, temperature as well as quality of the hydraulic fluid. In order to provide for maximum pump life it is strongly recommended to adhere to the following inspection routine.

Continuous monitoring:

Operating temperature, noise levels, vibration.

Daily check up:
Oil level and frothing in reservoir, pump leakage.

Monthly check up:

Fixtures.

Yearly:

Oil check (viscosity, contamination, wear).
Check swash angle sensor calibration, recalibrate if necessary.

5.Trouble Shooting

Component problems and circuit problems are often interrelated. An improper circuit may operate with apparent success but will cause failure of a particular component within it. The component failure can be the effect, not the cause of the problem. The following overview on the most typical issues is offered to provide support in locating and eliminating the cause of problems. Please consult Parker for further questions.

Effect:

Noisy Pump / Erosion on barrel and valve plate

Possible cause:

Air in fluid, cavitation (possibly resulting from leaking inlet connection, low fluid level in reservoir, return lines above fluid level, excessive viscosity of hydraulic fluid / low temperature operation, excessive shaft speed, insufficient inlet pressure)

Effect:

High wear in pump

Possible cause:

- Excessive loads (operating conditions notaccording to pump ratings)
- Fluid contamination (possibly resulting fromimproper filter maintenance, reservoiropenings)
- Improper fluid (excessive viscosity levels, breakdown of fluid, incorrect additives)
- Water in fluid (possibly resulting fromcondensation, faulty breather / strainer)

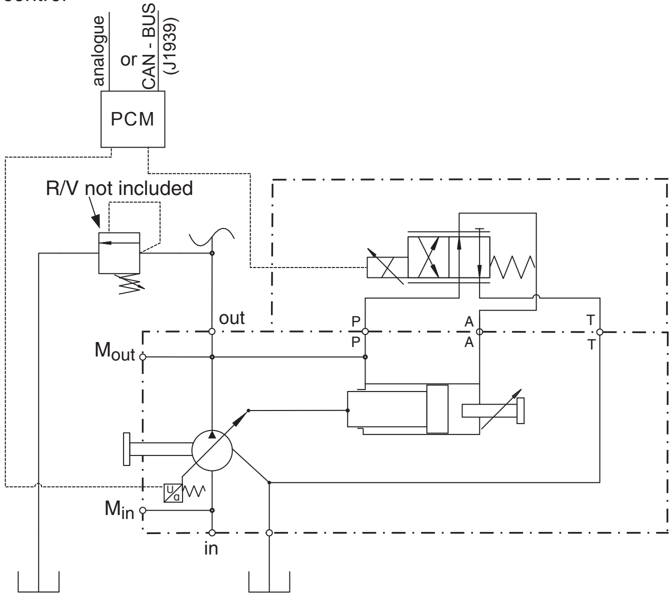
Effect:

Excessive Heating
Possible cause:

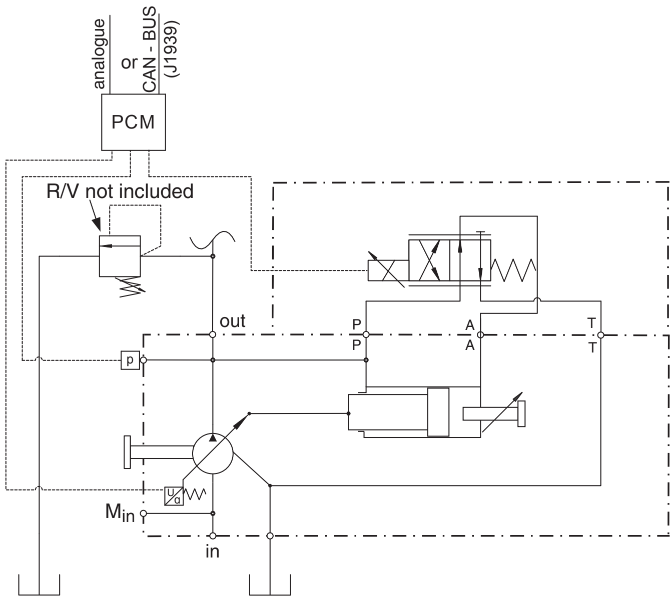
- Excessive pump leakage (possible causedby internal damage, fluid viscosity belowrated minimum)
- Faulty heat exchanger
- Reservoir issues (too little fluid, heat pickupfrom surrounding equipment

6.Appendix - System Layout with pump control module (PCM)

Displacement control



Displacement control, with pressure monitoring or pressure cut-off and optional torque limitation



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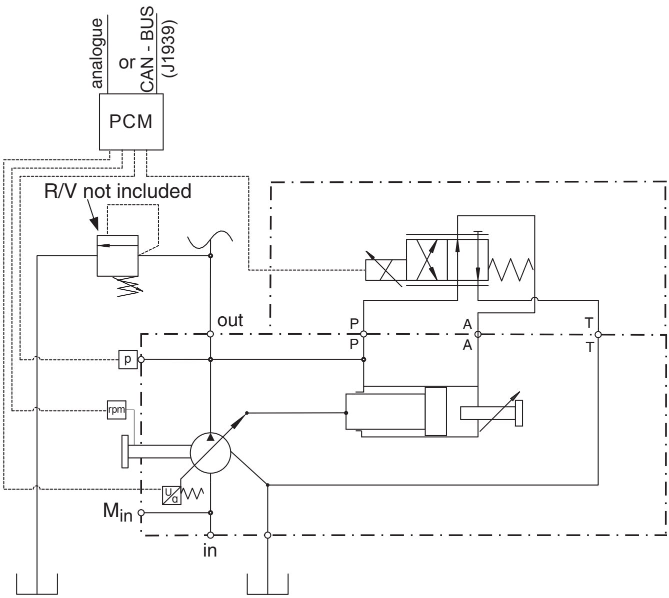
Displacement control, with pressure monitoring or pressure cut-off and optional torque limitation as well as speed compensation (flow control)



Position notification regarding Machinery Directive 2006/42/EC:

Products made by the Pump & Motor Division Europe (PMDE) of Parker Hannifin are excluded from the scope of the machinery directive following the “Cetop” Position Paper on the implementation of the Machinery Directive 2006/42/EC in the Fluid Power Industry.

All PMDE products are designed and manufactured considering the basic as well as the proven safety principles according to:
- ISO 13849-1:2015
- SS-EN ISO 4413:2010

so that the machines in which the products are incorporated meet the essential health and safety requirements.

Confirmations for components to be proven component, e. g. for validation of hydraulic systems, can only be provided after an analysis of the specific application, as the fact to be a proven component mainly depends on the specific application.

Dr. Hans Haas
General Manger
Pump & Motor Division Europe

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 catalogue 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.

Offer of Sale

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