Bulletin MSG30-2902-INST

Installation and Start-Up Manual

PCM – Pump Control Module for electronically controlled piston pumps of series eP2/eP3

Effective: September 1st 2019

Supersedes: version of March, 1st 2018

Firmware: PCM-TC41_07_00_00_01_504 and higher

Visit our homepage for additional support
parker.com/pmde

Contents

1 Introduction

1.1 Application description

The pump control module (PCM) is an IQAN® MC41 with a pump specific application installed. The application is capable to run the pump with primary control as well as an additional secondary control (option).

The primary control can be displacement control or displacement control with pressure limitation. The secondary control options, selectable by settings, are torque limitation or/and flow control / speed compensation.

Control Option		Description
Primary Control	Secondary Control	
D		Closed loop displacement control
DP		Closed loop displacement control with pressure cut off
	T	+ torque limitation (pressure sensor required)
	S	+ flow control / speed compensation (speed feedback required)

1.2 Connectivity

The module can be driven as a stand alone module with both analog and digital inputs or as a CAN module (CAN based set points), connected to a J1939 CAN-BUS.

The settings can be changed in different ways:

- Via the Graphical User Interface (GUI) IQAN® Run (PC Version) and USB CAN Interface
- Via IQAN® Run App (iOS Tablet) and IQAN® G11 Bluetooth modem
- Via CAN BUS (please refer to chapter 9 CAN BUS protocol for available settings)

1.3 CAN BUS

The PCM has two CAN BUS connections:

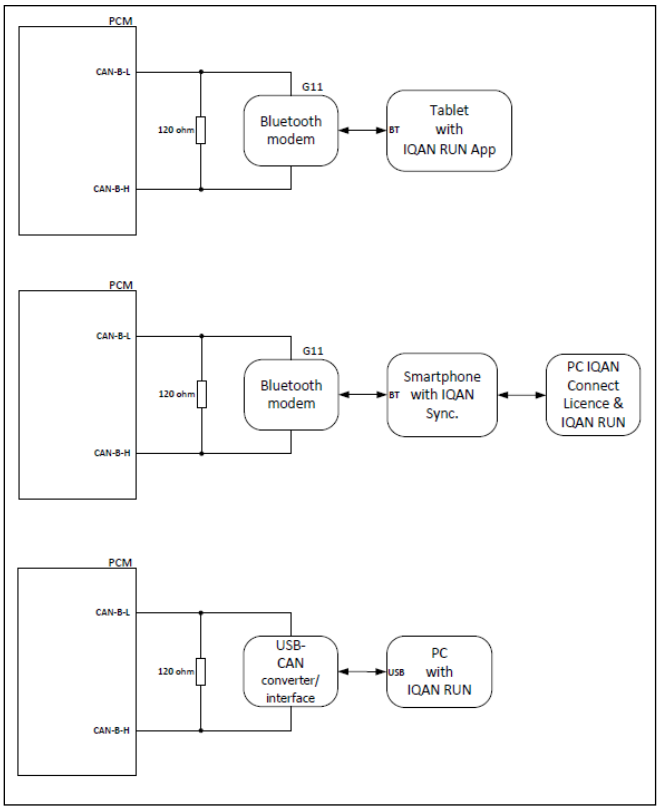
J1939 communication BUS

CAN-A is the J1939 BUS for the communication with an external master controller. Respective protocol is described in chapter 9 (CAN BUS protocol, page 32).

Diagnostics BUS

CAN-B is reserved for diagnostics communication.

IQAN® Run software includes numerous tools for log in operation, tuning, measuring, log access, performance checks and troubleshooting. In order to use the diagnostic tools of IQAN® Run there are different connecting options:



Connection to the PCM

Connection to Diagnostics via G11 Bluetooth modem

The IQAN-G11 features a CAN interface to communicate with the PCM to provide remote diagnostic capabilities. The signals on the CAN connection terminals CAN-Low and CAN-High must match the signals on the CAN terminals of the connected device.

Connection to Diagnostics via High Speed CAN interface

A high-speed CAN interface is required to use this feature. Contact Parker for information about supported CAN interfaces.

2 Application safety

This section contains information on how to improve the safety of applications. It is important that you read this chapter before you start creating applications for machines.

2.1 Risk assessment

A risk assessment must be conducted for all types of machinery. For guidance on risk assessment, we recommend using a standard such as EN ISO 14121-1.

The result of the risk assessment will influence the way implementation of functions in overlaying machine control.

The risk assessment must not be limited to just considering faults in the control system during normal operation, it must also cover other activities in the machine life cycle. When introducing a programmable controller on the machine, activities related to the updating of the application logic or its parameters must also be considered.

Design for safe operation is always the responsibility of the machine designer. This includes both selection of components and design of the application logic.

2.2 Sending data to the PCM

When downloading data to the PCM, the machine's engine must be switched off. The machine must be prevented from moving. Note that when a project is being downloaded to the PCM, the system's outputs become inactive.

When sending data to the PCM via a remote connection, special attention must be paid. Before the download can start, the driver must acknowledge the download request.

NOTICE

The PCM is not locked for application downloads. Do not download another application to the module. Otherwise the pump application is not working anymore.

2.3 Protecting the project and access levels

To prevent unauthorized personnel from modifying settings the application is secured with log in codes. Below table shows the different access levels for different functionalities.

Access level	Username*	Password*
All	-	-
Customer	Customer	Parker
Service	Service	PCMentry

)* Case sensitive

Adjust groups	Min. access level
Communication	All
Module settings	Customer
Application settings	Customer
Calibration setting	Customer
PID settings	Service

Measure groups	Min. access level
Digital I/O	All
Analog I/O	All
CAN_inputs PDO_1-2*	Customer
CAN_inputs SDO_1*	Customer
CAN inputs SDO_2-5*	Customer
CAN_outputs PDO1-2*	Customer
CAN_outputs PDO_2*	Customer
Calibration	Customer
Diagnostics 1	Customer
Diagnostics 2	Customer
Diagnostics 3	Customer
Control_loops	Service

*only visible with Cmd_Input_sel = 0 (CAN)

Logs	Min. access level
PCM slave log	Customer
Communication config	Customer
Pump config	Customer
Pump PID config	Customer

3 Input and Output types, Installation

3.1 Supply Voltage

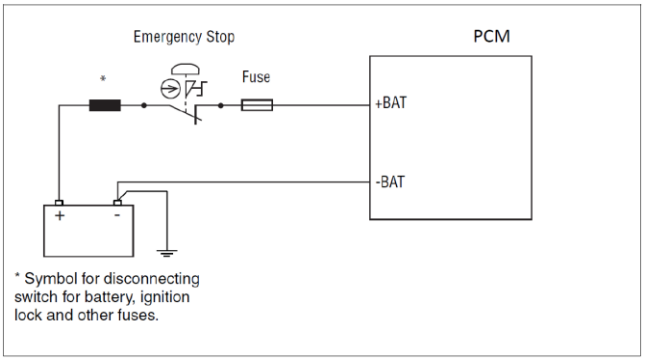
Before electrical installation of the PCM and connection of sensors, valves and CAN BUS, make sure the ignition lock is turned off and the battery is disconnected.

Emmergency Stop

Make sure that an Emergency Stop, disconnecting the power supply, is easily accessible at any time. Below figure shows how to connect the emergency stop.

Connecting of Supply Voltage

Supply voltage should be within the operating interval (for reference please see Section 15). Connect the supply voltage to +BAT and -BAT. Protect the module by using a fuse. (Please see section 15 for the recommended fuse level).



Connecting the emergency stop to voltage supply.

NOTICE

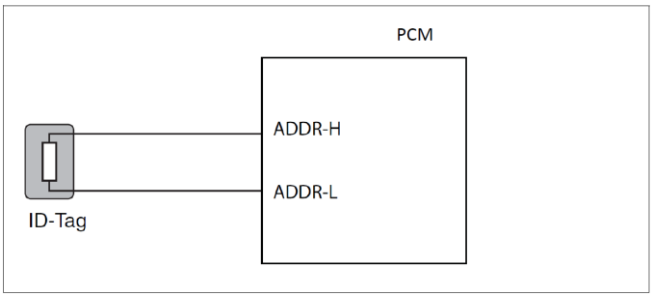
Do not use the chassis as negative terminal.

Polarity reversal

The module is protected against power supply polarity reversal and over-voltage, provided an external fuse is being used. Without fuse, polarity reversal can damage the unit.

3.2 Adressing and terminating

The PCM is designed as slave module and needs an ID-tag with adress 0.



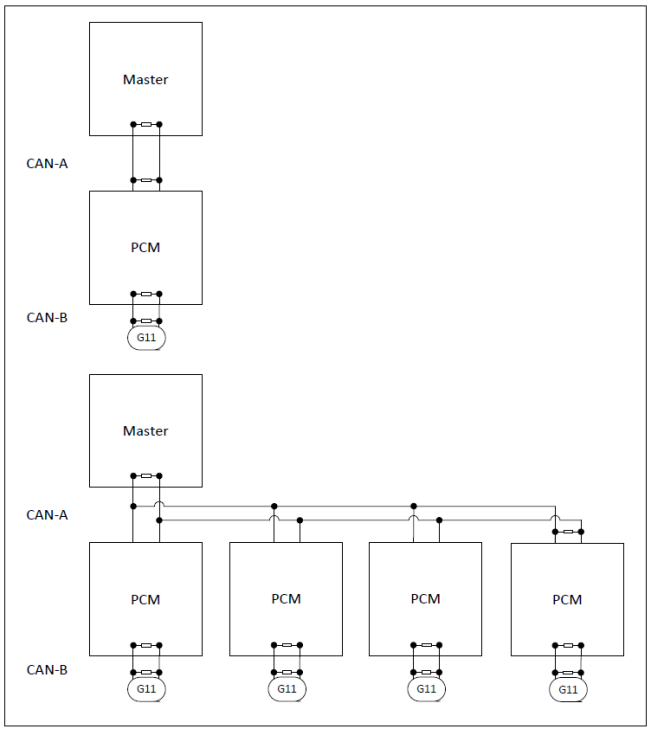
Connecting of ID-tag

The appropiate ID-tags for the mating Molex Connector can be sourced under article 20085130. Further Connector types are available in the IQAN® Accessories catalog (please refer to section 19, page 64).

NOTICE

The PCM is configurated as J1939 slave. Therewith the module can not be configured in an IQAN multi master environment.

Currently each PCM needs to be accessed with its own diagnostics bus (CAN-B) for configuration, service, etc. Please refer to section 1.3.



Example: bus termination and diagnostic bus connection in single and multiple usage.

NOTICE

The G11 only needs to be connected in case of configuration, service, system analysis and diagnostics.

Termination – CAN-A

The J1939 CAN BUS (CAN-A) needs to be terminated with a 120Ω resistor at both sides (at the beginning and the end of the twisted pair CAN cable) according to common CAN standards.

For appropriate termination tags please refer to IQAN® accessories catalogue (Appendix E - reference documentation).

NOTICE

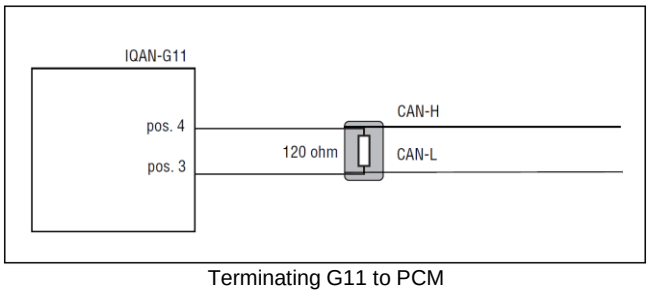
CAN-A as well as CAN-B are internally terminated by default on PCM side. This termination is linked to the parameters Term_CAN_A_active and Term_CAN_B_active in the Adjust Group Communication (please refer to section 8.1, page 21).

NOTICE

When using using multiple PCMs with one master, only the module at the end needs to be terminated. The maximum amount of PCMs on one J1939 bus is limited to 4.

Termination – CAN-B

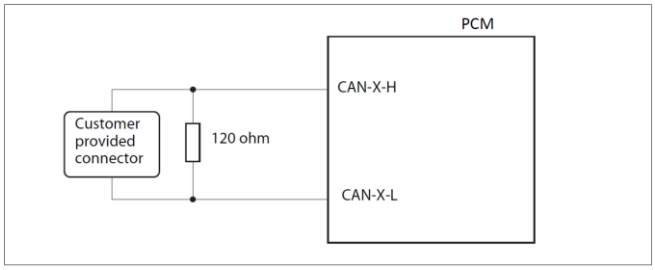
If an IQAN®-G11 Bluetooth modem for remote diagnostics is located at the end of the CAN BUS, it must have a termination resistor installed to terminate the BUS.



Terminating G11 to PCM

If a High speed CAN Interface is located at the end of the CAN BUS, it must have a termination resistor installed to terminate the BUS as well.

A flying lead cable may be connected to the PCM to provide a connector interface. The connection from PCM to diagnostic CAN interface can be made quite easily. It is recommended that the connector is a sealed, automotive type. When not used this connector should be protected from the environment by a cover or mating blank plug.



Connection for CAN communication

3.3 Reference voltage (VREF)

The PCM is internally equipped with a voltage regulator to generate the reference voltage VREF. The standard reference voltage will feed all pump sensors and potentiometers for commanding the PCM.

NOTICE

It is strongly recommended to use the module's -VREF and +VREF for all sensors and potentiometers that are connected to the module inputs. This will reduce bad measurement based on potential fault (i.e. different ground points for other supplies in relation to PCM ground, -BAT).

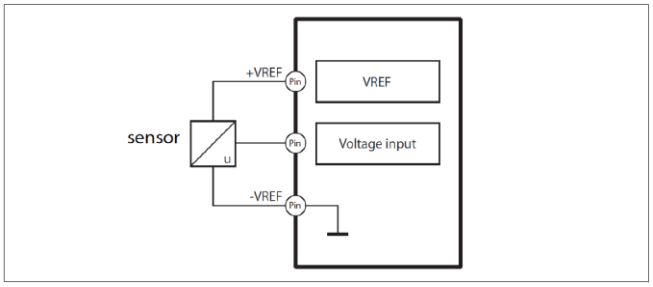
Please see section 15, page 56 for the maximum load on VREF.

The pump sensors as well as the optional frequency sensor (if supplied with 5V regulated) are powered with the VREF-A (5V).

The optional external potentiometers can be powered with the VREF-B (5V). Advised are potentiometers with at least 1kΩ resistance to prevent overload of the VREF.

NOTICE

The negative terminal of the sensor and potentiometer must not be connected to the chassis.

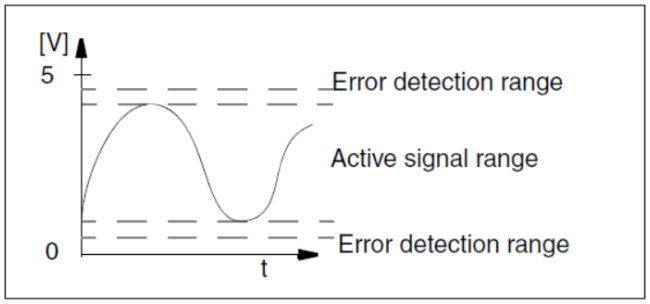


Example of powering a sensor with VREF

3.4 Voltage Inputs (VIN) for sensors

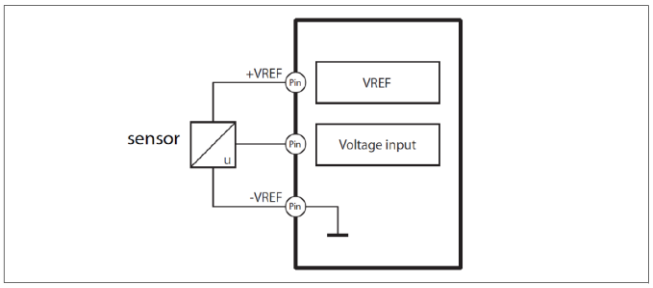
The sensor signal range must be 0-5 VDC. To detect signal errors such as short circuits or interruptions the active signal range should be within 0.5-4.5 VDC.

The current consumption related to the voltage input is negligible.



Active signal range

Please refer to section 4, page 12 for recommendations regarding wiring and Pin assignment.



Example: Sensor Connection

NOTICE

For the appropriate function of the PCM's control loops the original equipped Parker sensors are mandatory. If needed please refer to the spare part list for replacements.

3.5 Voltage Inputs (VIN) for commands

The command signal range must be 0-5 VDC. There is no error dection such as mentioned for the voltage inputs for sensors.

NOTICE

The signal quality significantly influences the quality of the control performance. Below shown requirements need to be fullfilled:

- Ripple < 1,3mV
- Free of surge voltage

3.6 Frequency Input (FIN)

Please see section 15 for frequency ranges and trigger levels.

The following sensor types can be used:

- push-pull,
- NPN (open collector),
- NPN with pull-up.

NOTICE

Parker recommends a minimum of 10 pulses per revolution of pump shaft. This guarantees a minimum resolution of 1% at 600rpm. At higher speeds the resolution automatically increases.

The current consumption of the sensor should not exceed 100mA if connected to VREF-A (VREF for sensor supply).

The positive terminal of the sensor is connected to supply. The negative terminal of the sensor is connected to GND. If the VREF is used sensors GND should be connected to VREF-. If the BAT+ is used for supply sensors GND should be connected to BAT-.

Please refer to the technical instruction of the sensor for the appropriate power supply range and an appropriate supply connection.

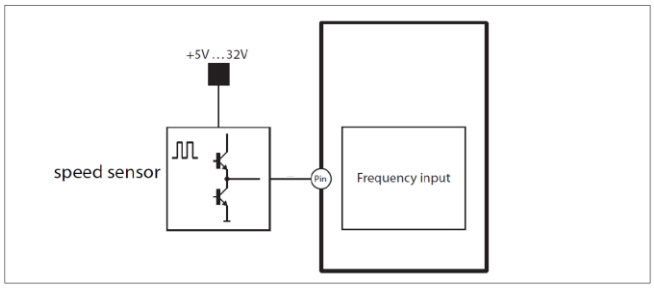
NOTICE

The negative terminal of the sensor must not be connected to the chassis.

Connecting to push-pull type frequency sensor

Push-pull sensors are preferred because they constantly provide a signal (either to power or

ground) and do not 'float' which could cause errors in reading the signal.

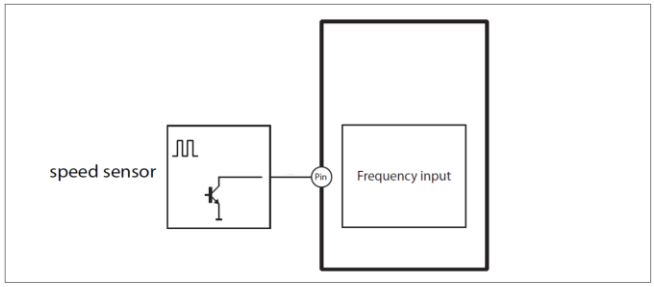


Example: push-pull type frequency sensor

NOTICE

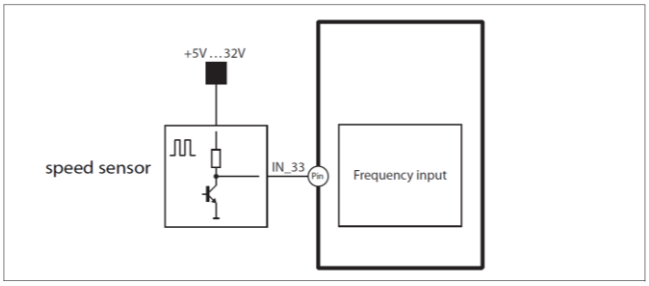
The negative terminal of the sensor must not be connected to the chassis.

Connecting NPN type frequency sensor



Example: NPN type frequency sensor

Connecting NPN type frequency sensor with pull-up

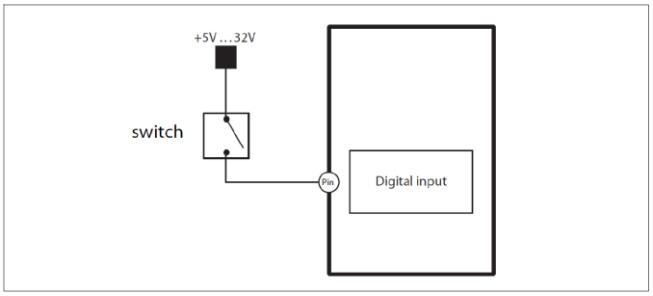


Example: NPN type frequency sensor with pull-up

3.7 Digital Inputs (DIN)

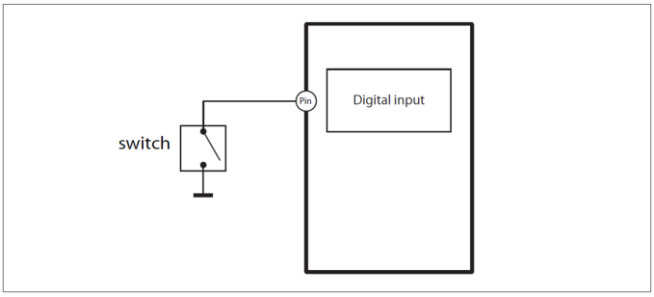
The controller is equipped with high side and low side digital Inputs. Please refer to section 15, page 56 for the logic levels.

High side digital inputs need to be connected to BAT+ for activation. The high side inputs are equipped with pull down resistor. If the digital in pin is not connected the controller automatically reads a low input value. The high side digital inputs can be either supplied with BAT+ or +VREF-B.



Example: High side DI

Low side digital inputs need to be connected to BAT- for activation. The low side inputs are internally equipped with pull-up resistors. If the digital in pin is not connected the controller automatically reads a high input value.



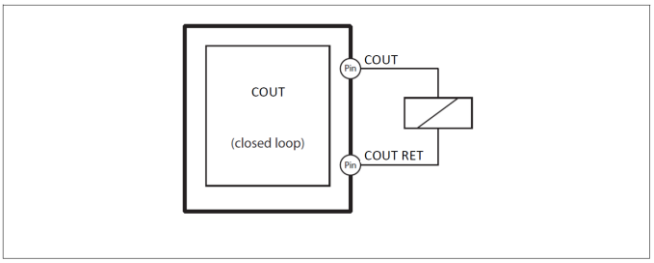
Example: Low side DI

3.8 Digital Inputs on Voltage Input 0-32V

The voltage inputs are used as digital input. The signal range must be 0-32 VDC. The Input becomes true with a signal higher than 4 VDC and false with a signal lower than 0,5 VDC.

3.9 Proportional current output (COUT)

The COUT is a current regulated PWM output used to control the pumps proportional valve. Please see section 15 for current range and loads.



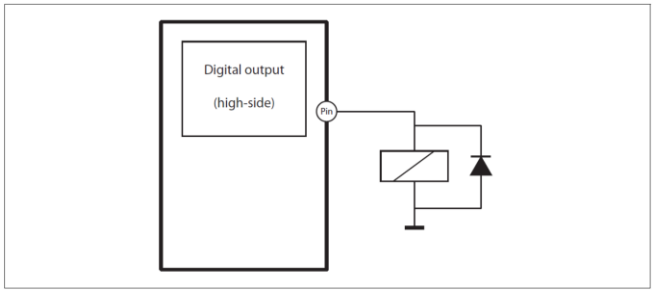
Example: COUT

NOTICE

Do not install diodes across coils for COUTs.

3.10 Digital outputs

The high side digital outputs are switched digital outputs used to control on-off valves and devices. For output specifications and loads, see section 15.



Example: High side digital output

Function
On/off output with current sense (open loop).

Drive capability
Power driver high-side is connected to drive single load current.

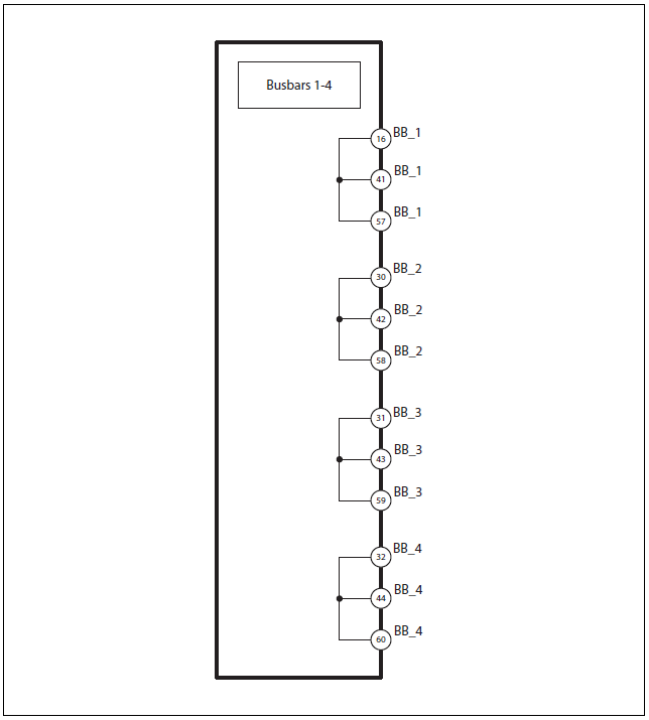
NOTICE

Install diodes across the coil for on-off outputs.

3.11 Busbar pins

The PCM has 4 sets of pins that are internally connected to 4 busbars, *BB_1* to *BB_4*. There are 3 common pins per busbar. The internal bussed pins are intended to be used for jumper, splice or tap functions instead of externally in the harness.

Please refer to section 4.12, page 13 for the assignment recommendation.

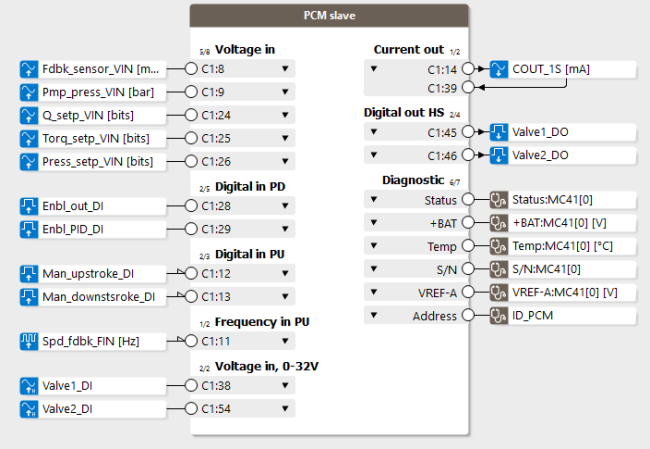


Busbar Pins and Grouping

4 Pin assignment and wiring recommendations

Please refer to section 14 for the connector description.

Below shown is an overview with the I/Os of the PCM.



I/O overview PCM

4.1 Voltage Inputs (VINs)

Connection	Signal	Supply	GND
Fdbk_sensor_VIN	8	7 (+VREF-A)	35 (-VREF)
Pmp_press_VIN	9	7 (+VREF-A)	35 (-VREF)
Q_setp_VIN	24	51 (+VREF-B)	23 (-VREF)
Torq_setp_VIN	25	51 (+VREF-B)	23 (-VREF)
Press_setp_VIN	26	51 (+VREF-B)	23 (-VREF)

4.2 Digital Inputs (DIs) with Pull Down

Connection	Signal	Supply	BAT-
Enbl_out_DI (HS)	28	65 (BAT +)/ 51 (+VREF-B)	-
Enbl_PID_DI (HS)	29	65 (BAT +)/ 51 (+VREF-B)	-

4.3 Digital Inputs (DIs) with Pull Up

Connection	Signal	Supply	BAT-
Man_upstroke_DI (LS)	12	-	66
Man_downstroke_DI (LS)	13	-	66

NOTICE

Please mind the different electrical installation of high side and low side digital inputs. Please refer to section 3.7.

4.4 Frequency Input (FIN) with Pull Up

Connection	Signal	Supply*	GND*
Spd_fdbk_FIN	11	7 (+VREF-A) / 65 (BAT+)	35 (VREF-) / 66 (BAT-)

*Dependent on chossen sensor type

4.5 Digital Inputs on Voltage Input, 0-32V

Connection	Signal	Supply*
Valve1_DI	38	65 (BAT +) / 51 (+VREF-B)
Valve2_DI	54	65 (BAT +) / 51 (+VREF-B)

NOTICE

The Input becomes true with a signal higher than 4 VDC and false with a signal lower than 0,5VDC.

4.6 Current Out (COUT)

Connection	Signal	Return +
COUT_1S	14	39

4.7 Digital Outs (DOUT)

Connection	Signal	BAT -
Valve1_DO	45	66
Valve2_DO	46	

4.8 Power Supply

Connection	PIN
BAT +	65
BAT –	66

4.9 CAN BUS

Connection	PIN	Comment
CAN-A-L	1	J1939 Interface
CAN-A-H	17	
CAN-B-L	2	Diagnostics BUS IQAN Run
CAN-B-H	18	

NOTICE

These PINs may also be used as plug in for termination resistors.

4.10 Adressing

Connection	PIN
ADDR-L	4
ADDR-H	20

4.11 Reference Supplies (VREFs)

Connection	PIN	Comment
+VREF-A	7	Sensors
-VREF	35	
+VREF-B	51	Commands (potentiometers) / Digital Inputs
-VREF	23	

4.12 Busbars - configuration recommendation

Busbar 1 BB_1	PIN 16	PIN 41	PIN 57
Splice of VREF-A	Feed from PIN 7	Supply of Fdbk_sensor_VIN	Supply of Pmp_press_VIN

Busbar 2 BB_2	PIN 30	PIN 42	PIN 58
Splice of -VREF	Return to PIN 35	VREF- of Fdbk_sensor_VIN	VREF- of Pmp_press_VIN

Busbar 3 BB_3	PIN 31	PIN 43	PIN 59
Splice of VREF-B	Feed from PIN 51	Supply of Q_setp_VIN	Supply of Press_setp_VIN

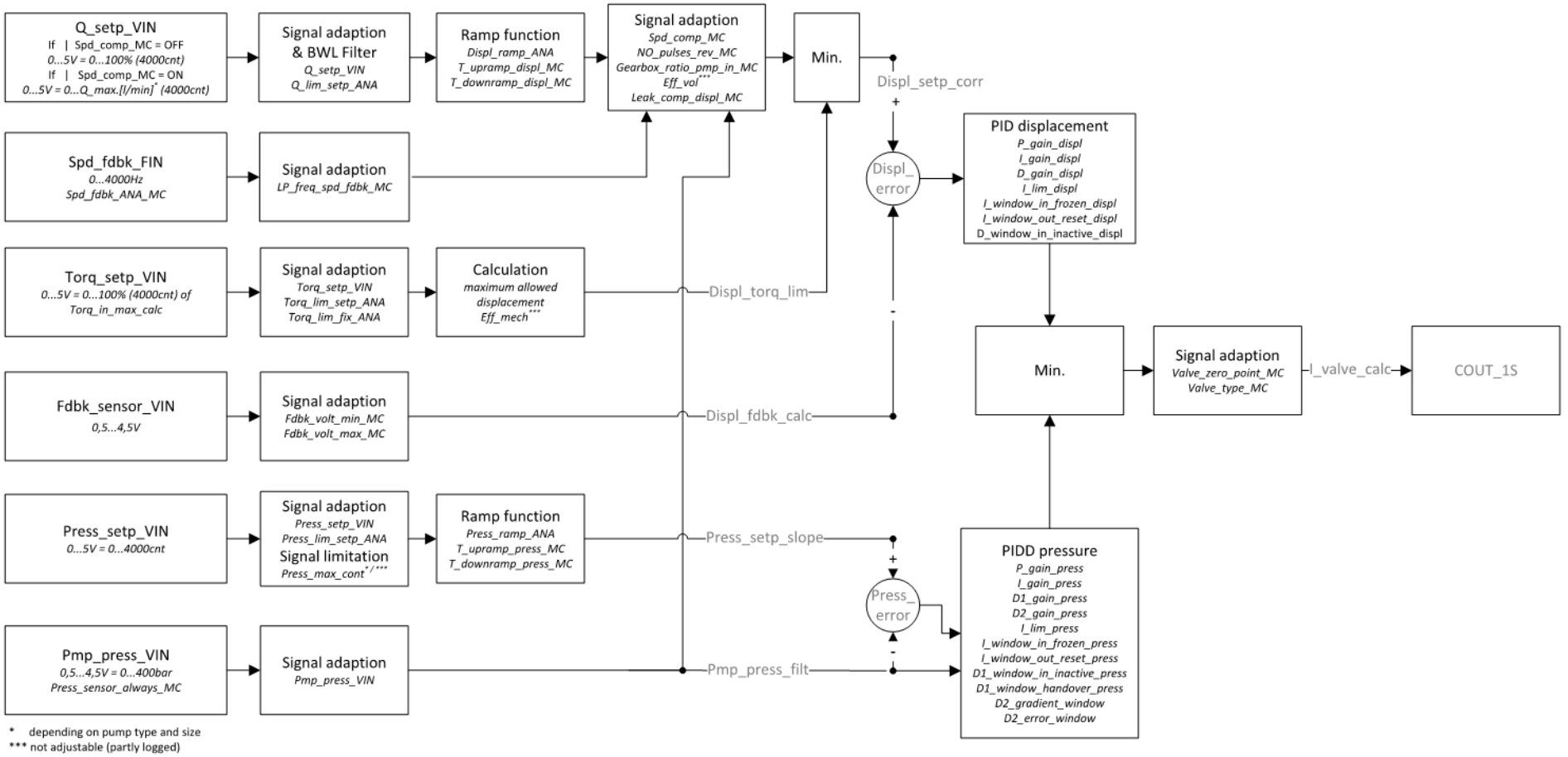
Busbar 4 BB_4	PIN 32	PIN 44	PIN 60
Splice of -VREF	Return to PIN 23	VREF- of Q_setp_VIN	VREF- of Press_setp_VIN

5 Control Loop Diagrams

Below shown pictures describe the controllers general software architecture. There are two main control loops for displacement control and the pressure limitation.

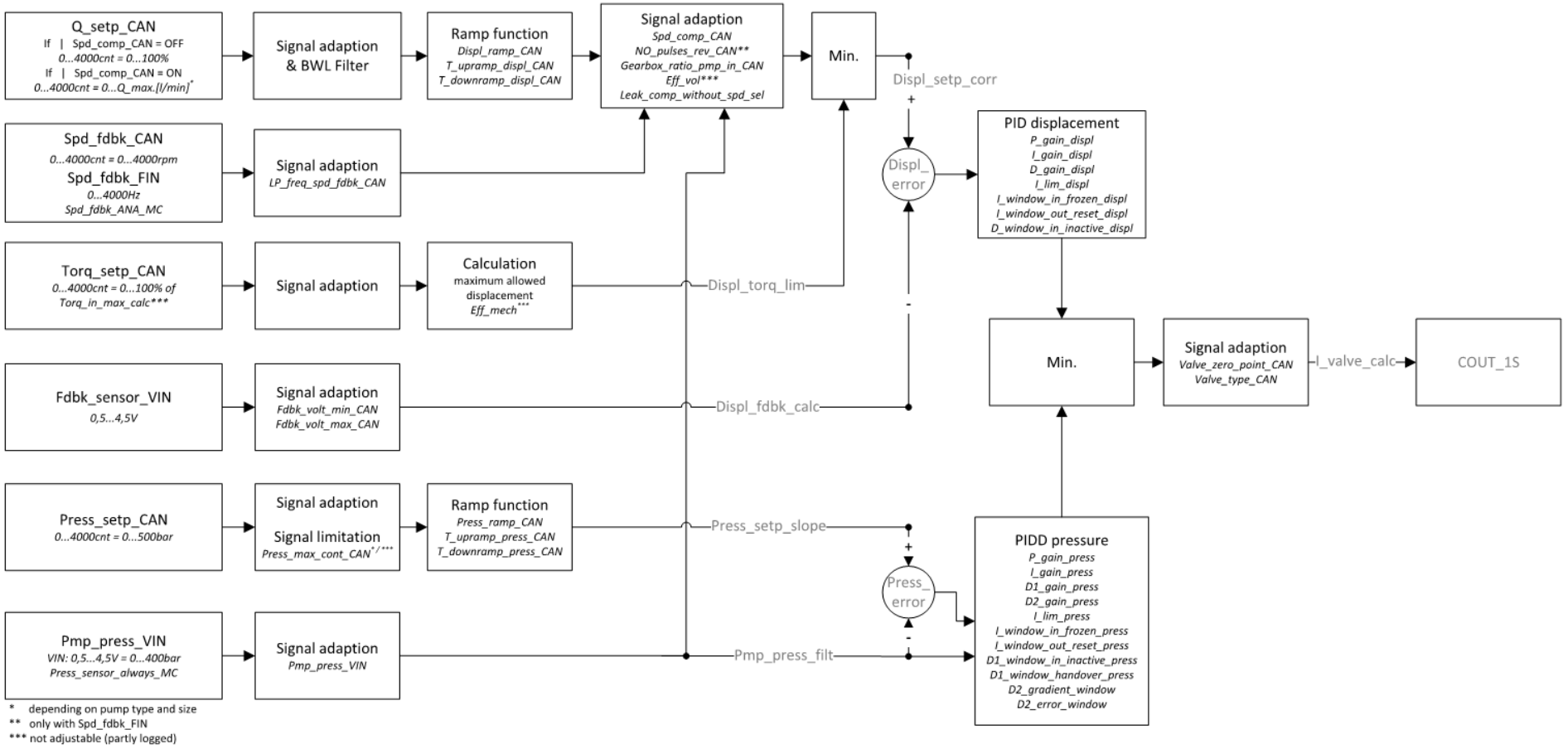
5.1 Stand alone module with analog and digital I/Os

The italic black text describes parameter settings (please refer to section 8), the italic grey text describes internal calculated parameters (please refer to section 11.10).



5.2 Slave module with J1939 communication

The italic black text describes parameter settings (please refer to section 9), the italic grey text describes internal calculated parameters (please refer to section 11.10).



6 Modes

The PCM operates in different modes. In general those are divided in idle modes and operation modes. Below table shows their activation logic.

Modes		Pump control mode*	Enbl_out on	Enbl_PID on
Idle	Log files	0, 1, 2	0	0
	Settings	0, 1, 2	0	1
	Manual	0, 1, 2	1	0
Operating	Displacement control	1	1	1
	Displacement control with pressure limitation	2	1	1

*adjusted with parameter: Ctrl_type_CAN or Ctrl_type_ANA respectively

NOTICE

The current “Active_mode” is available via the measure group Diagnostics (Please refer to section 11.3, page 50).

The digital Enable and CAN Enable signals are series connected. Means both need to be set when operating the pump with CAN commands.

Name	Status	Value	Unit
Communication			
Digital I/O			
Analog I/O			
CAN_inputs PDO_1-2			
CAN inputs SDO_1			
CAN inputs SDO_2-5			
CAN inputs SDO_6-8			
CAN_outputs PDO_1-2			
CAN outputs PDO_2			
Calibration			
Diagnostics 1			
Cmd_input_sel	OK	CAN	
Active_MODE	OK	SETTINGS	
Enbl_out_ON	OK	False	
Enbl_PID_ON	OK	True	
Displ_ctrl_active	Disabled	False	
Press_ctrl_active	Disabled	False	
Torq_lim_active	Disabled	False	
Spd_comp_active	OK	False	

Example: Active_MODE

6.1 Idle modes

Controller modes for parameter tuning, performing start up, sensor calibration/recalibration and diagnostics.

6.1.1 Log files

The module creates three different types of logs. System logs (*PCM log*) which are enabled continuosly and three different event logs (*Communication config*, *Pump config*, *Pump PID config*) which are triggered by enabling the mode Log files.

The log files are deriveable with the diagnostics bus and IQAN Run (please refer to chapter 1.3, page 5). All logs can be either printed or saved . System logs are unerasable. Event logs erase themselve before writing a new set when entering the mode Log files.

Logs

Name	Log type	Module	Record count	Status
PCM slave log	System log	MC41-0	57	OK
Communication config	Event log	MC41-0	13	OK
Pump config	Event log	MC41-0	30	OK
Pump PID config	Event log	MC41-0	19	OK

Example: Logs

NOTICE

Field servicing starts with deriving logs from the controller.

Furthermore the adjust group *communication* (please refer to section 8.1, page 21) is available within this type of idle mode.

System log – PCM Slave log

Different system information such as log in and log out operations, start ups and also I/O errors (e.g. open load, low error, high error) are documented.

Log: PCM log

Index	Time	Description	Value/Status
69	Start 649, 00:08:37	COUT_1S	Open load
70	Start 649, 00:08:37	Pmp_press_VIN	Low error
71	Start 649, 00:08:37	COUT_1S	Open load
72	06.06.2017 16:56:30	System started	

Example: PCM log

Event log – Communication configuration (Communication config)

Please refer to section 8.1, page 21 for a more detailed parameter descriptions.

Name	***Data / corresponding parameter setting [unit]***
Serial_number_PCM	*Controller serial number*
Cmd_input_sel	*Communication interface, CAN or ANALOG, Cmd_input_sel [text].*
SA_PCM	*Source adress PCM / SA_PCM [-]*
SA_MASTER	*Source adress setting of MASTER / SA_MASTER [-]*
Timeout PDO_1_in	*Time out setting of command protocol PDO1 / Timeout PDO_1_in [-]*
Timeout PDO_2_in	*Time out setting of command protocol PDO 2 / Timeout PDO_2_in [-]*
Transmitrate PDO_1_out	*Transmit rate of feedback protocol PDO1 / Transmitrate PDO_1_out [-]*
Transmitrate PDO_2 out	*Transmit rate of feedback protocol PDO2 / Transmitrate PDO_2_out [-]*
Term_CAN_A_active	*Internal termination CAN-A / Term_CAN_A_active [-]*
Term_CAN_B_active	*Internal termination CAN-B / Term_CAN_B_active [-]*
Timeout_PDO1	*Memory channel showing time out of PDO1 [-]*
Timeout_PDO2	*Internal digital channel showing time out of PDO2 [-]*
*TM_ sensors active**	*Enable for Telematic sensors*
*TM_J1939_active**	*Enable for Telematics J1939 messages.*
*Transmitrate_TM_Process_Data**	*Transmitrate of Telematics Process data protocol*
*Transmitrate_TM_Pump_Data**	*Transmitrate of Telematics static data protocols*

*Telematics is an option. Please contact your sales partner or the manufacturing division for further information.

Log: Communication config (17 / 17 records)

Index	Date/Time	Description	Value/Status
1	27.08.2019 12:02:41	Log cleared	License 4C72-7703-2FFD-0CAA
2	27.08.2019 12:02:41	Serial_number_PCM	9340010001
3	27.08.2019 12:02:41	Cmd_input_sel	CAN
4	27.08.2019 12:02:41	SA_PCM	46
5	27.08.2019 12:02:41	SA_MASTER	39
6	27.08.2019 12:02:41	Timeout PDO1_in [ms]	150
7	27.08.2019 12:02:41	Timeout PDO2_in [ms]	200
8	27.08.2019 12:02:41	Transmitrate PDO1_out [ms]	100
9	27.08.2019 12:02:41	Transmitrate PDO2_out [ms]	100
10	27.08.2019 12:02:41	Term_CAN_A_active	True
11	27.08.2019 12:02:41	Term_CAN_B_active	True
12	27.08.2019 12:02:41	Timeout_PDO1	False
13	27.08.2019 12:02:41	Timeout_PDO2	True
14	27.08.2019 12:02:41	TM_sensors_active	False
15	27.08.2019 12:02:41	TM_J1939_active	False
16	27.08.2019 12:02:41	Transmitrate_TM_Process_Data [ms] [ms]	1000
17	27.08.2019 12:02:41	Transmitrate_TM_Pump_Data [ms] [ms]	60000

Example: Communication config

Event log - Pump configuration (Pump config):

Please refer to section 8 for detailed parameter descriptions.

Name	**Data / *corresponding parameter setting [unit]***
Serial_number_PCM	Controller serial number.
Cmd_input_sel	Communication interface, CAN or ANALOG, *Cmd_input_sel [text].*
Displ_ramp_ON	*Displ_ramp_*[*1] [digital].*
Press_ramp_ON	*Press_ramp_*[*1] [digital].*
Torq_lim_fix_ANA	*Torq_lim_fix_ANA [digital].*
Q_lim_setp_ANA	*Q_lim_setp_ANA [% of Q_max*[*4]].*
Press_lim_setp_ANA	*Press_lim_setp_ANA [% of Press_max_cont].*
Displ_ramp_ON	*Displ_ramp_*[*1] [digital].*
Torq_lim_setp_ANA	*Torq_lim_setp_ANA [% of Torq_in_max_calc].*
Press_ramp_ON	*Press_ramp_*[*1] [digital].*
Torq_lim_fix_ANA	*Torq_lim_fix_ANA [digital].*
T_upramp_displ_MC	*T_upramp_displ_*[*2] [ms].*
T_downramp_displ_MC	*T_downramp_displ_*[*2] [ms].*
T_upramp_press_MC	*T_upramp_press_*[*2] [ms].*

T_downramp_press_MC	*T_downramp_press_*[*2] *[ms].*
Gearbox_ratio_pmp_in_MC	*Gearbox_ratio_pmp_in_*[*2] *[-].*
NO_pulses_rev_MC	*NO_pulses_rev_*[*2] *[-].*
Press_sensor_always_MC	*Press_sensor_always_*[*2] *[digital].*
Leak_comp_displ_MC	*Leak_comp_displ_*[*2] *[digital].*
BWL_freq_spd_fdbk_MC	*BWL_freq_spd_fdbk_*[*2] *[rpm].*
Pump_type_select	Combination out of *pump_series_*[*2] and *pump_size_*[*2] *[text].*
Valve_type_select	*valve_type_*[*2] *[text].*
Ctrl_type_sel	*Ctrl_type_*[*3] *[text].*
Spd_fdbk_ANA_MC	*Spd_fdbk_ANA_*[*2] *[digital].*
Valve_press_comp_inactive_MC	*Valve_press_comp_ inactive_*[*2] *[digital]*
Spd_comp_active	*Spd_comp_*[*1] *[digital].*
Fdbk_volt_min_MC	*Fdbk_volt_min_*[*2] *[mV].*
Fdbk_volt_max_MC	*Fdbk_volt_max_*[*2] *[mV].*
Valve_zero_point_MC	*Valve_zero_point_*[*2] *[%].*
Displ_max	pump displacement based on Pump_type_select *[cc].*
Press_max_cont	Maximum allowed pressure according to catalogue *[bar].*
Spd_max_FD	Self priming speed valid for for 1.0 bar absolute p_inlet and 100%/ full displacement *[rpm].*
Torq_in_max_calc	Maximum theoretical input torque *[%].* Max. allowed shaft torque may differ!

Footnotes:
The Parameter suffix differ depending on the chosen communication type.

Communication	ANALOG	CAN
*1	ANA	CI/CO
*2	MC	CI/CO
*3	SEL	CI/CO

*4: if Speed_comp = true, Q_max = Spd_max_FD*Displ_max/1000
if Speed_comp = false, Q_max = 100%
*5: T_max = 1,59 * Displ_max * Press_max_cont / 95

Example: Pump config log

Event log - Pump PID configuration (Pump PID config):

Name	**Data / *corresponding parameter setting [unit]***
Serial_number_PCM	Controller serial number.
Cmd_input_sel	Communication interface, CAN or ANALOG, *Cmd_input_sel [text].*
Ctrl_type_sel	*Ctrl_type_*[*3] *[text].*
Pump_type_select	Combination out of *pump_series_*[*2] and *pump_size_*[*2] *[text].*
Valve_type_select	*valve_type_*[*2] *[text].*
Valve_zero_point_MC	*Valve_zero_point_*[*2] *[%].*
P_gain_displ_MC	*P_gain_displ_*[*2] *[-].*
I_gain_displ_MC	*I_gain_displ_*[*2] *[-].*
D_gain_displ_MC	*D_gain_displ_*[*2] *[-].*
I_lim_displ_MC [%]	*I_lim_displ_*[*2] *[%].*
I_lim_in_frozen_displ_MC	*I_lim_in_frozen_displ_*[*2] *[%]*
I_window_out_reset_displ_MC	*I_window_out_reset_displ_*[*2] *[%]*
D_window_in_inactive_displ_MC	D_window_in_inactive_ displ_[*2] [%]

P_gain_press_MC	*P_gain_press_*[*2] *[-].*
I_gain_press_MC	*I_gain_press_*[*2] *[-].*
D1_gain_press_MC	*D1_gain_press_*[*2] *[-].*
I_lim_press_MC	*I_lim_press_*[*2] *[%].*
I_window_in_frozen_press_MC	I_window_in_frozen_press_[*2] [bar]
I_window_out_reset_press_MC	I_window_out_reset_press_[*2] *[bar]*
D1_window_in_inactive_press_MC	D1_window_in_inactive_press_[*2] *[%]*
D1_window_handover_press_MC	*D1_window_handover_press_*[*2] *[bar/s]*
D2_gain_press_MC	*D2_gain_press_*[*2] *[-]*
D2_gradient_window_MC	*D2_graident_window_*[*2] *[bar/s]*
D2_error_window_MC	*D2_error_window_*[*2] *[bar]*
Displ_setp_idle_MC	*Displ_setp_idle_MC*
Press_setp_idle_MC	Press_setp_idle_MC

Footnotes:
The Parameter suffix differ depending on the chosen communication type.

Communication	ANALOG	CAN
*2	MC	CAN
*3	SEL	CAN

Log: Pump PID config (26 / 26 records)

Index	Date/Time	Description	Value/Status
1	27.08.2019 14:11:14	Log cleared	License 4C72-7703-2FFD-0CAA
2	27.08.2019 14:11:14	Serial_number_PCM	934010001
3	27.08.2019 14:11:14	Cmd_input_sel	CAN
4	27.08.2019 14:11:14	Valve_zero_point_MC [%]	0,00
5	27.08.2019 14:11:14	P_gain_displ_MC	0
6	27.08.2019 14:11:14	I_gain_displ_MC	0
7	27.08.2019 14:11:14	D_gain_displ_MC	0
8	27.08.2019 14:11:14	I_lim_displ_MC [%]	0
9	27.08.2019 14:11:14	I_lim_in_frozen_displ_MC [%]	0,00
10	27.08.2019 14:11:14	I_window_out_reset_displ_MC [%]	0
11	27.08.2019 14:11:14	D_window_in_inactive_displ_MC [%]	0,00
12	27.08.2019 14:11:14	P_gain_press_MC	0
13	27.08.2019 14:11:14	I_gain_press_MC	0
14	27.08.2019 14:11:14	D1_gain_press_MC	0
15	27.08.2019 14:11:14	I_lim_press_MC [%]	0
16	27.08.2019 14:11:14	I_window_in_frozen_press_MC [bar]	0
17	27.08.2019 14:11:14	D1_window_in_inactive_press_MC [bar]	0
18	27.08.2019 14:11:14	D1_window_handover_press_MC [bar/s]	0
19	27.08.2019 14:11:14	Ctrl_type_sel	D_mode
20	27.08.2019 14:11:14	Pump_type_select	P2060
21	27.08.2019 14:11:14	Valve_type_select	P2/P3: EC-P2-4902
22	27.08.2019 14:11:14	D2_gain_press_MC	0
23	27.08.2019 14:11:14	D2_gradient_window_MC [bar/s]	0
24	27.08.2019 14:11:14	D2_error_window_MC [bar]	0
25	27.08.2019 14:11:14	Displ_setp_idle_MC [%]	0
26	27.08.2019 14:11:14	Press_setp_idle_MC [bar]	0

Example: Pump PID log

6.1.2 **Settings**

The module accepts parameter changes via diagnostic bus and IQAN Run or via the J1939 communication bus (SDO commands, please refer to section 9, page 32).

6.1.3 **Manual**

This mode is implemented for service and calibration purposes. The module enables the pump driving digital between full stroke and dead head in conjunction with the corresponding digital ins Manual_upstroke_DI or Manual_downstroke_DI (please refer to section 4.2, page 12) or corresponding BUS commands Manual_upstroke_CI and Manual_downstroke_CI respectively (please refer to section section 9, page 32). Valve_output_manual_MC / Valve_output_manual_CI is applied to the valves control loop output.

Valve condition	Manual_upstroke_DI (ANALOG communication) Man_upstroke_CAN (CAN Communication)	Manual_downstroke_DI (ANALOG communication) Man_downstroke_CAN (CAN Communication)	Example COUT_1S, Fail safe 0%, Code EC [Fail safe 100%, Code EF]
Engaged in neutral position	0	0	≈53% (≈1160mA)
Engaged to upstroke the pump	1	0	>53% [<53%]
Engaged to downstroke the pump	0	1	<53% [>53%]
Engaged to downstroke the pump	1	1	<53% [>53%]

NOTICE

The pump increases or decreases displacement also without enabling the corresponding digital ins if the valve zero point is not set properly.

NOTICE

Carefully use manual mode. The pump is driven digitally without any consideration of the system pressure and swash angle feedback.

6.2 Operating modes

6.2.1 Displacement control

The PID control loop and corresponding I/Os for displacement control are active. Furthermore the secondary controls torque limitation and speed compensation/flow control can be activated (please refer to section 1.1, page 5).

6.2.2 Displacement control with pressure limitation

The PID/PIDD control loop and corresponding I/Os for displacement control with pressure limitation are active. Furthermore the secondary controls torque limitation and speed compensation / flow control can be activated (please refer to section 1.1, page 5).

NOTICE

The hydraulic capacity between pump and actuator must not deceed 10 times pump displacement for a proper function of the pressure cut-off.

Pump size	Minimum [cc]
75	750
105	1050
145	1450

Minimum hydraulic system capacity between pump and actuator.

7 General Settings

Settings are generally divided into:

- Integer parameter
- Digital parameter
- Function parameter
- State parameter
- Memorizing parameter

Some of the parameter are adjustable, some are fixed and depending on the chosen pump configuration. All changeable parameters are located in adjust groups. A log in code may needed for accessing (Please refer to section 2.3, page 6).

NOTICE

All Settings which can be changed with CAN are internally saved as memorizing parameters (MC channel). These MC channels are internally used for all further processing. Therefore these MC channels can also be changed with IQAN Run. Besides changing, MC channels can also set to factory defaults over CAN and IQAN Run. All further parameters can only be changed and set to factory defaults with IQAN Run (Please refer to section 1.2).

Below table shows general settings which are used for internal controller calculations and which are referred to in the following sections.

Pump series	**Pump size**	**Displ_max [cc/rev]** Maximal pump displacement (Please refer to catalogue)	**Spd_max_FD [rpm]** Maximal allowed pump speed at 1.0 bar absolute p_inlet and 100% displacement	**Flow_max [l/min]** Maximal theoretical flow	**Press_max_cont** Maximal continous pressurre (Please refer to catalogue)	**T_max** Maximal theoretical torque (mechnical restrictions disregarded)
P2	75	75	2500	187,5	320	402
P2	105	105	2300	241,5	350	615
P2	145	145	2200	319,0	350	850
P3	105	105	2600	273	350	615
P3	145	145	2500	362,5	350	850

8 Parameter and Setting description

The PCM settings are organized in adjust groups according to their function. The defaults are factory set. They may be changed if the application demand or the pump hardware is not in accordance with the given default setting. The default settings are shown in bold in the following text. Please refer to section 2.3, page 6 for access levels of the adjust groups.

NOTICE

All parameter selections need to correspond with the physical pump hardware. Disregard may have serious consequences.

NOTICE

Adjust parameter defaults value can be recoverd with IQAN Run if necessary.

8.1 Adjust Group - Communication

NOTICE

After Changing a parameter of this Adjust group supply needs to be switched off and on for restarting the module and activating the changed parameter.

Cmd_Input_sel

State parameter selecting **CAN** or ANALOG based commands.

NOTICE

Available in mode LOGFILES only (please refer to section 6 page 16).

NOTICE

Set point VINs are not evaluated in CAN mode. The set points must be set via CAN. The digital enable must be connected in CAN mode also for safety reasons.

SA_PCM

State parameter setting the PCM's source address.

Value – SA_PCM	Interpretation
46	**Standard SA**
165	Optional SA
166	Optional SA
167	Optional SA

NOTICE

The factory setting needs to be changed for unique identification when a second, third and fourth PCM in parallel are communicating with one master controller on one J1939 BUS.

NOTICE

The maximum amount of PCMs commanded by one master controller and/or J1939 bus is 4.

SA_MASTER

State parameter setting the master's source adress.

Value – SA_MASTER	Interpretation
39	**Standard SA**
33	Optional SA

Timeout PDO1_in

Integer parameter setting the time out of incoming PDO1.

Value range – Timeout PDO1_in	Step Size
20…150 **(150)**	10

Timeout PDO2_in

Integer parameter setting the time out of incoming PDO2.

Value range – Timeout PDO2_in	Step Size
40…200 **(200)**	10

NOTICE

After 2 time outs in sequence the module turns iff communication.

Transmitrate PDO1_out

Integer Parameter setting the transmit rate of PDO1 to Master controller.

Value range – Transmitrate PDO1_out	Step Size
10…100 **(10)**	10

Transmitrate PDO2_out

Integer Parameter setting the transmit rate of PDO2 to Master controller.

Value range – Transmitrate PDO2_out	Step Size
10…100 **(10)**	10

Term_CAN_A_active

Digital parameter activating the termination resistor of CAN BUS A at the PCM.

Value – Term_CAN_A_active	Interpretation
True	**resistor activated**
False	Resistor deactivated

Term_CAN_B_active

Digital parameter activating the termination resistor of CAN BUS B at the PCM.

Value – Term_CAN_B_active	Interpretation
True	**resistor activated**
False	Resistor deactivated

8.2 Adjust Group - Module Settings

Parameters organized in this adjust group defining the base adjustments for the PCM controller in regard to the driven pump application.

Pump_series_MC

Selection of pump series. This parameter furthermore limits the value ranges of other settings e.g. maximum pressure and maximum rotational speed of the pump.

Pump_size_MC

Selection of the pump's maximum displacement. The selectable values are depending on parameter pump serie.

Pump series	Pump size	Pump_series_MC	Pump_size_MC
eP2	60	0	NA
eP2	75	0	1
eP2	105	0	2
eP2	145	0	3
eP3	105	1	0
eP3	145	1	1

Valve_type_MC

Selection of fail safe option (please refer to the model code option: EC/EF) and valve position on the pump. This parameter controls the direction sense of the current output.

Value – Valve_Type_MC	Valve configuration	
	Fail safe	Valve position
0	**0%**	**Standard**
1	100%	Standard
2	0%	Opposite side of the pump
3	100%	Opposite side of the pump

Ctrl_type_ANA

State parameter selecting the pump's main control mode. This Parameter activates the different control loops. Furthermore, these main control types can be superimposed with secondary control such as flow control / speed compensation (with parameter speed_comp) and torque limitation (with parameter Torq_lim_fix_ANA).

Value – Ctrl_type_ANA	Pump control mode	Description
0	Idle (Logfiles, Settings, Manual)	No control loop active
1	D_Mode	Displacement control loop active
2	DP_Mode	Displacement control with pressure limitation active

NOTICE

Besides the control activation the output activation also requires the corresponding DI settings for enabling. Please refer to section 6, page 16.

NOTICE

Pressure limitation requires a pressure sensor at delivery.

Displ_ramp_ANA

Digital parameter activating the processing of internal set ramps. This parameter works in conjuction with T_upramp_displ_MC and T_downramp_displ_MC.

Value – Displ_ramp_ANA	Interpretation
False	**Not evaluated**
True	Evaluated

NOTICE

Factory set minimum ramps are always active in order to obtain an optimal control result.

Press_ramp_ANA

Digital parameter activating the processing of internal set ramps. This parameter works in conjuction with T_upramp_press_MC and T_downramp_press_MC.

Value – Press_ramp_ANA	Interpretation
False	**Not evaluated.**
True	Evaluated.

NOTICE

Factory set minimum ramps are always active in order to obtain an optimal control result.

Torq_lim_fix_ANA

Digital parameter deactiviating the external command for torque limitation for analog command signals.

Value – Torq_lim_fix_ANA	Interpretation
False	external torque limitation command is evaluated.
True	**External torque limitation command is not evaluted.**

NOTICE

The internal torque limitation (Torq_lim_setp_ANA) is set to 100% by default. If the pump is compensating already at low input torque please check setting of parameter *Pump_size_MC* or the corresponding CAN BUS command.

Spd_comp_ANA

Digital parameter activating the speed compensation or flow control.

Value – Spd_comp_ANA	Interpretation
False	**External speed signal is not evaluated.**
True	External speed signal is evaluated.

NOTICE

An external speed feedback (CAN or analog via frequency input) is necessary to use this function.

NOTICE

The external speed feedback's quality significantly influences the quality of the control performance. Please refer to section 3.6, page 9 for minimum requirements.

8.3 Adjust Group - Application settings

Parameters organized in this adjust group set the base adjustments to the driven pump.

Q_lim_setp_ANA [%]

Integer parameter changing percentage of the upper setpoint limit for displacement or flow command.

Value range – Q_lim_setp_local	Step Size
10…100 **(100)**	1

NOTICE

Limitation of maximum displacement must be done electronically.

Press_lim_setp_ANA [%]

Function parameter changing percentage of the upper setpoint limit for pressure command in regard to the corresponding maximum pump pressure.

Value range – Press_lim_setp_ANA	Step Size
10…100 **(100)**	0,25

Torq_lim_setp_ANA [%]

Integer parameter changing percentage of the upper setpoint limit for torq command.

Value range – Torq_lim_setp_ANA	Step Size
10…100 **(100)**	1

T_upramp_displ_MC [ms]

Integer parameter setting ramp time for rising displacement commands in ms.

Value range - T_upramp_displ_MC	Step Size
0…25000 **(0)**	25

NOTICE

Factory set minimum settings for all ramps are active in order to obtain optimal control result.

NOTICE

Ramps on displacement command are active in conjunction with parameter *Displ_ramp_ANA.*

T_downramp_displ_MC [ms]

Integer parameter setting ramp time for dropping displacement commands in ms.

Value range – T_downramp_displ_MC	Step Size
0…25000 **(0)**	25

T_upramp_press_MC [ms]

Integer parameter setting ramp time for rising pressure commands in ms.

Value range – T_upramp_press_MC	Step Size
0…25000 **(0)**	25

T_downramp_press_MC [ms]

Integer parameter setting ramp time for dropping pressure commands in ms.

Value range – T_downramp_press_MC	Step Size
0…25000 **(0)**	25

NOTICE

Ramps on Pressure command are active in conjunction with parameter *Press_ramp_MC.*

Valve1_delay_on_MC [ms]

Integer parameter setting the delay time activating Valve1_DO in ms.

Value range - Valve1_delay_on_MC	Step Size
0…10000 **(0)**	10

Valve1_delay_off_MC [ms]

Integer parameter setting the delay time deactivating Valve1_DO in ms.

Value range - Valve1_delay_off_MC	Step Size
0…10000 **(0)**	10

Valve2_delay_on_MC [ms]

Integer parameter setting the delay time activating Valve2_DO in ms.

Value range – Valve2_delay_on_MC	Step Size
0…10000 **(0)**	10

Valve2_delay_off_MC [ms]

Integer parameter setting the delay time deactivating Valve2_DO in ms.

Value range – Valve2_delay_off_MC	Step Size
0…10000 **(0)**	10

Valve_output_manual_MC [%]

Function parameter setting the percentage offset from control loop output for the valve's neutral position towards manual upstroke or manual downstroke.

Value range – Valve_output_manual_MC	Step Size
0…50 **(25)**	0,2

NOTICE

Parameter Valve_zero_point_MC (please refer to section 8.3, page 25) is continously added to the control loop output.

Gearbox_ratio_pmp_in_MC [-]

Function parameter setting the gear ratio between shaft speed at speed sensor and shaft speed at pump drive shaft speed. Gearbox_ratio_pmp_in_MC > 1, pump speed higher than sensor speed. Gearbox_ratio_pmp_in_MC < 1, pump speed lower than sensor speed.

Value range – Gearbox_ratio_pmp_in_MC	Step Size
0,01…10,00 **(1,00)**	0,01

NOTICE

This parameter is used if e.g. a PTO is between speed sensor and pump.

NO_pulses_rev_MC [-]

Integer parameter defining the number of pulses per revolution scaling the frequency input to a speed signal.

Value range – NO_pulses_rev_MC	Step Size
0…250 **(36)**	1

NOTICE

The according speed sensor should send at least 10 pulse/rev for a minimum on signal quality and furthermore for a minimum on control performance. (Please refer to section 3.6, page 9 for minimum requirements)

Press_sensor_always_MC [-]

Digital parameter activating the VIN Pmp_press_VIN and the corresponding input monitoring regardless of the chosen pump control mode. Please refer to section 8.2, page 22.

Value – Press_sensor_always_MC	Interpretation
False	**Not evaluated.**
True	Evaluated.

NOTICE

In Case of Ctrl_type set ot DP Mode the sensor is evaluated regardless of the parameter setting.

Leak_comp_displ_MC [-]

Digital parameter activating the pressure depending leak compensation calculation when speed compensation (flow control) is not activated.

Value – Leak_comp_displ_MC	Interpretation
False	**leak compensation not active**
True	leak compensation active

NOTICE

A pressure feedback (pressure sensor at delivery) is necessary to use this function.

Spd_fdbk_ANA_MC [-]

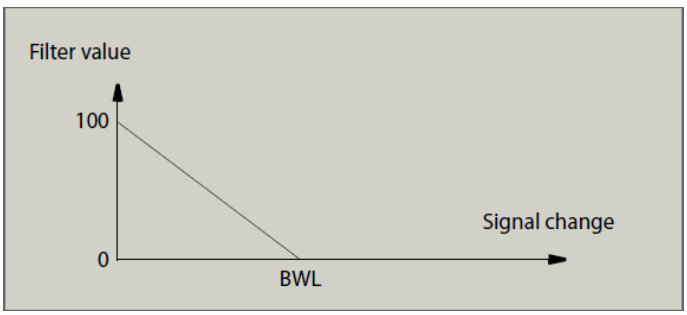
Digital parameter to activate frequency input when using an analog speed sensor instead of a speed feedback via J1939 Bus.

Prequisite: *NO_pulse_rev_MC* is set properly.

Value – Spd_ANA_MC	Interpretation
False	**Frequency input is not evaluated.**
True	Frequency input is evaluated.

BWL_spd_fdbk_MC [rpm]

The BWL Filter is a variable Filter, where the filter value is decided by the relative change of the input signal.



Filter value as function of input signal change.

Value range – BWL_spd_fdbk_MC	Step Size
0…100 **(50)**	2

NOTICE

The higher the parameter setting the more smoothed gets the speed signal.

Valve_press_comp_inactive_MC [-]

Digital parameter to deactivate the valves pressure depending neutral point compensation.

Value – Valve_press_comp_inactive_MC	Interpretation
False	**Compensation on**
True	Compensation off

NOTICE

Applications with high inertia actuators require a deactivated neutral point compensation.

8.4 Adjust Group - Calibration settings

Parameters organized in this adjust group are setting electrical boundaries in regard to sensor, actuator and voltage ins.

Fdbk_volt_min_MC

Integer parameter setting the displacement sensor feedback at dead head in mV.

Value range – Fdbk_volt_min_MC	Step Size
500…4500 **(2500)**	1

Fdbk_volt_max_MC

Integer parameter setting the displacement sensor feedback at 101% displacement in mV.

Value range – Fdbk_volt_max_MC	Step Size
500…4500 **(please see Notice)**	1

NOTICE

The default settings are depending on the choosen setting of parameter valve type. Please refer to section 8.2, page 22.

	$U_{Default\ min\ displ.}$[mV]	$U_{default\ max\ displ.}$[mV]
Standard valve and sensor position	2500	4300
Valve and sensor on opposite side		700

NOTICE

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.

Valve_zero_point_MC

Function parameter setting an offset to the control loop's output in order to gain the valve's neutral position.

Value range – Valve_zero_point_MC	Step Size
-12,5…12,5 **(0)**	0,1

NOTICE

In static displacement control conditions the valve consumes approx. 53% of its nominal current (2200mA). Due to manufacturing tolerances, the neutral point 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 2000mA max. current.

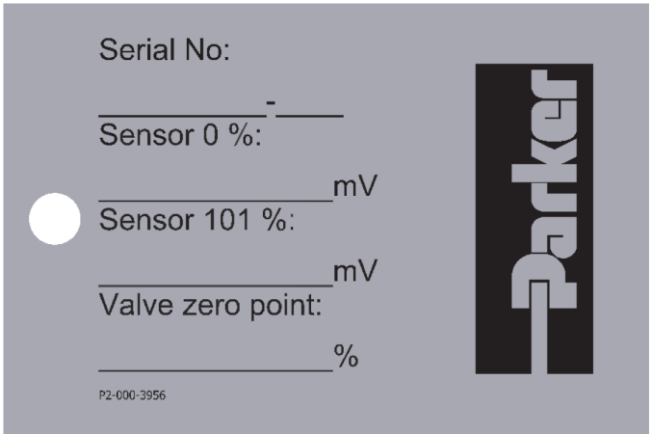
Example:

Valve zero point: +1% → +20mA

Valve zero point -0,5% → -10mA

NOTICE

Input for the parameter Fdbk_volt_min_MC, Fdbk_volt_max_MC and Valve_zero_adjust_MC needs to be taken from each pump individually using the below shown pump tag attached to each pump.



Example: Pump tag

NOTICE

The PCM internally measures the supply voltage. When using the module with a 12 V supply a constant offset of +1% (20mA) for Code EC and - 1% (-20mA) for Code EF is added to the current out.

Pmp_press_VIN

Calibration of the pressure sensors minimum and maximum voltage in mV.

Min. point Pmp_press_VIN (0bar)	250…750 **(500)**
Max. point Pmp_press_VIN (400bar)	4250…4750 **(4500)**

Q_setp_VIN

Calibration of the displacement command minimum and maximum voltage in mV.

Min. point Q_setp_VIN (0%/0cnt)	0…500 **(0)**
Max. point Q_setp_VIN (100%/4000cnt)	4500…5000 **(5000)**

Press_setp_VIN

Calibration of the pressure command minimum and maximum voltage in mV.

Min. point Press_setp_VIN (0bar/0cnt)	0…500 **(0)**
Max. point – Press_setp_VIN (press_max_cont/4000cnt)	4500…5000 **(5000)**

Torq_setp_VIN

Calibration of the torq command minimum and maximum voltage in mV.

Min. point Torq_setp_VIN (0%/0cnt)	0…500 **(0)**
Max. point Torq_setp_VIN (100%/4000cnt)	4500…5000 **(5000)**

8.5 Adjust Group - PID settings

NOTICE

Available with login level *Service* only. Please refer to 2.3, page 6.

Displacement control loop

P_gain_displ_MC [-]

Integer parameter setting proportional gain.

Value range – P_gain_displ_MC	Step Size
0…1000 **(75cc/150, 105cc/210, 145cc/290)**	10

I_gain_displ_MC [-]

Integer parameter setting integral gain.

Value range – I_gain_displ_MC	Step Size
0…1000 **(200)**	10

D_gain_displ_MC [-]

Integer parameter setting differential gain.

Value range – D_gain_displ_MC	Step Size
0…1000 **(50)**	10

I_lim_displ_MC [%]

Integer parameter limiting the integral action in percent.

Value range – I_lim_displ_MC	Step Size
0…50 **(20)**	1

I_window_in_frozen_displ_MC [%]

Function parameter setting a symmetrical window on the displacement error. If the displacement error gets smaller than the stated parameter the integral action gets frozen.

Value range – I_window_in_frozen_displ_MC	Step Size
0…5 **(0,5)**	0,1

I_window_out_reset_displ_MC [%]

Integer parameter setting a symmetrical window on the displacement error. If the displacement error gets bigger than stated the integral action gets reset to 0.

Value range – I_window_out_frozen_displ	Step Size
0…100 **(15)**	1

D_window_in_inactive_displ_MC [-]

Function parameter setting a symmetrical window on the displacement error. If the displacement error gets smaller than the stated parameter the differantial action gets deactivated.

Value range – D_window_in_inactive_displ_MC	Step Size
0…5 **(5)**	0,1

Pressure control loop

P_gain_press_MC [-]

Integer parameter setting proportional gain.

Value range – P_gain_press_MC	Step Size
0…250 **(75cc/40, 105cc/40, 145cc/50)**	1

I_gain_press_MC [-]

Integer parameter setting loop integral gain.

Value range – I_gain_press_MC	Step Size
0…1000 **(75cc/150, 105cc/300, 145cc/450)**	10

D1_gain_press_MC [-]

Integer parameter setting error based differential gain.

Value range – D1_gain_press_MC	Step Size
0…2000 **(75cc/200, 105cc/150 145cc/160)**	10

I_lim_press_MC [%]

Integer parameter setting a symmetrical window (±) for the limitation of the integral action in percent.

Value range – I_lim_press_MC	Step Size
0…50 **(20)**	1

I_window_in_frozen_press_MC [bar]

Integer parameter setting a symmetrical window (±) on the pressure error. If the pressure error gets smaller than the stated parameter the integral action gets frozen.

Value range – I_window_in_frozen_press_MC	Step Size
0…10 **(2)**	1

I_window_out_reset_press_MC [bar]

Integer parameter setting a symmetrical window on the pressure error. If the pressure error gets bigger than stated the integral action gets reset to 0.

Value range – I_window_out_reset_press_MC	Step Size
0…150 **(50)**	1

D1_window_in_inactive_MC [bar]

Integer parameter setting a symmetrical window (±) on the pressure error. If the pressure error gets smaller than the stated parameter the error based differential gain gets frozen.

Value range – D1_window_in_inactive_MC	Step Size
0…100 **(0)**	1

D1_window_handover_press_MC [bar/s]

Integer parameter describing the handover point between D1 & D2 action.

Value range – D1_window_handover_press_MC	Step Size
0…5000 **(1000)**	100

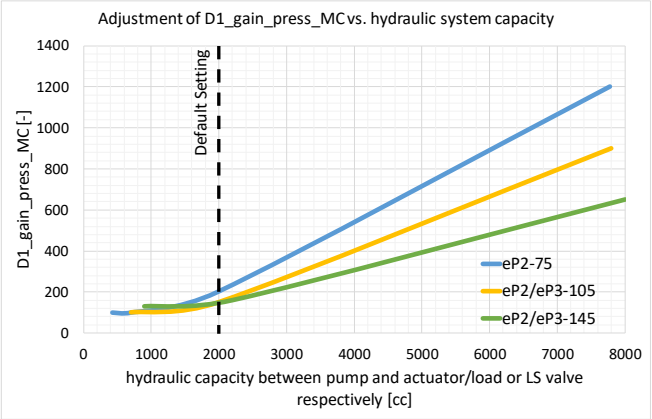
D2_gain_press_MC [-]

Integer parameter setting pressure gradient based differential gain.

Value range – D_gain_press	Step Size
0…1000 **(200)**	10

NOTICE

D1_gain_press_MC needs to be adjusted according to the hydraulic capacity between pump and load or actuator respectivitly.



NOTICE

The hydraulic capacity between pump and actuator must not deceed 10 times pump displacement for a proper function of the pressure cut-off.

Pump size	Minimum hydraulic cap.[cc]
75	750
105	1050
145	1450

D2_gradient_window_MC [bar/s]

Integer parameter based on the pressure gradient signal to trigger the activness of D2 action. If the pressure gradient is smaller as the set value the D2 action is 0.

Value range – D2_gradient_window_MC	Step Size
0…5000 **(1000)**	100

D2_error_window_MC [bar]

Integer parameter describing a second condition besides the D2_gradient_window_MC to activate the D2 action. If the pressure error is higher than stated with the parameter AND the pressure gradient is higher than D2_gradient_window_MC, D2 action is going to be active.

Value range – D2_error_window_MC	Step Size
10…250 **(50)**	1

9 CAN BUS protocol

Messaging

When a PDO or SDO message is send all parameters in that specific PDO or SDO need to be filled with the correct values, otherwise the parameter may get wrong settings. The process set points (PDO1) CAN max (4000 cnt) need to be maintained by the machine control. They are not limited inside the PCM. Minimum delay between two messages of a one PGN is 10ms.

SDO Settings

SDO Parameter are working as memorizing channels and are stored in the non-voltile memory so that they are preserved during power off.

NOTICE

For safety reasons both the CAN and digital inputs for Enable PID and Enable Out need to be set for activating the control loops.

NOTICE

CAN BUS timeouts are detectable with the *Communication configuration* log (section 6.1.1) or the measure group *CAN_inputs PDO_1-2* (section 11.3). **In case of a CAN BUS timeout, all outputs (COUT_1S, Valve_1_DO, Valve_2_DO) are disabled.**

9.1 CAN command protocol - Properties

CAN -interface	J1939 (250kBit/s)									
PGN	61184, PropA									
page number	0	1	2	3	4	5	6	7	8	9
page name	PDO_1_in	PDO_2_in	SDO_1_in	SDO_2_in	SDO_3_in	SDO_4_in	SDO_5_in	SDO_6_in	SDO_7_in	SDO_8_in
page description	Setpoints PDO1	Commands PDO2	Application SDO1	Ramps SDO2	Valves SDO3	Calibration SDO4	Pump data SDO5	Para displ. PID ctrl. SDO6	Para press.1 PID ctrl. SDO7	Para press.2 PID ctrl. SDO8
Message priority	3	3	3	3	3	3	3	3	3	3
Min. transmit rate - Master [ms]*	10	10	on request (min. 10ms)	on request (min. 10ms)	on request (min. 10ms)	on request (min. 10ms)	on request (min. 10ms)	on request (min. 10ms)	on request (min. 10ms)	on request (min. 10ms)
Max. transmit rate - Master [ms]*	100	100								
Min. timeout - PCM [ms]	20	40								
Max. timeout - PCM [ms]	150 (default)	200 (default)	no	no	no	no	no	no	no	no

only when using PCM Plugin module

	default	optional		
SA sender (Master)	39	33		
SA destination (PCM)	46	165	166	167

9.3 page 0 - PDO_1_in - Set points

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	MC Default	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	-	**page number = 0**
NA	1.7 - 1.8	7	2	1	0	3	-	-	
Q_setp_CI*	2.1 - 3.4	9	12	1	0	4000	cnt	-	* see note
Torq_setp_CI**	3.5 - 4.8	21	12	1	0	4000	cnt	-	** see note
Press_setp_CI	5.1 - 6.4	33	12	0,125	0	4000	cnt	-	
Spd_fdbk_CI	6.5 - 7.8	45	12	1	0	4000	rpm	-	
Factory proprietary	8.1 - 8.8	57	8	1	0	63	-	-	
Sum			**64**						

* Resolution/bit:
If Speed_comp_CI = ON: Displ_max_CO * Spd_max_FD_CO / 4000000 [l/min/bit], see data in SDO_5
If Speed_comp_CI = OFF: 100% / 4000 [%/bit]
Example for eP2075 (75cc, 2500rpm): displ. ctrl = 0,025%/bit , Q ctrl: 0,046875 l/min/bit

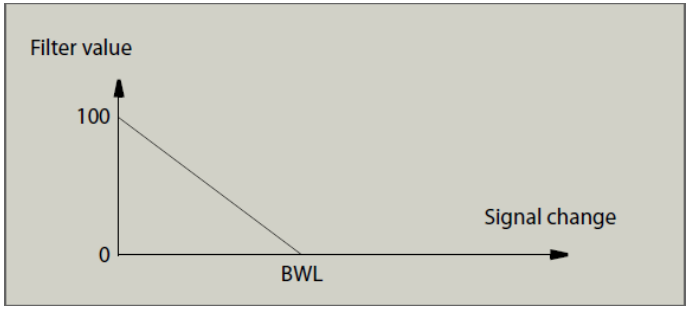
** Resolution/bit: Torq_in_calc_max_CO/4000 [Nm/bit], see data in SDO_5
Example for eP2075 (401Nm): 0,10025 Nm/bit

NOTICE

If command ramps for Q_setp_CI and Press_setp_CI are send via the CAN command signal, a transmit rate of 10ms is neccesary. If this transmit rate can not be fulfilled the use of internal ramps is recommended.

NOTICE

If Spd_fdbk_CI is tied into the control a minimum update rate (transmit rate) of 20ms is neccesary. If this can not be fulfilled the signal needs to be smoothed with the Filter BWL_spd_fdbk_CI / BWL_spd_fdbk_MC. The BWL Filter is a variable Filter, where the filter value is decided by the relative change of the input signal.



Filter value as function of input signal change.

NOTICE

In the PCM no ramp functions are applied to command signal Torq_setp_CAN for dynamic control responses. Therefore the signal should be free of ripple.

9.4 page 1 - PDO_2_in - Commands

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	MC Default	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	-	**page number = 1**
NA	1.7 - 1.8	7	2	1	0	3	-	-	
Ctrl_type_CAN	2.1 - 2.4	9	4	1	0	15	-	-	0 = Idle (Logfiles, Manual, Settings - Enable dependent), 1 = Displ_control (both Enbl_out = Enbl_PID = ON), 2 = Displ_control with press. lim. (both Enbl_out = Enbl_PID = ON) 3…15 = NA
Factory proprietary	2.5 - 2.8	13	4	1	0	15	-	-	
Enable_out_CI	3.1 - 3.2	17	2	1	0	3	-	-	0 = OFF, 1 = ON, 2…3 = NA
Enable_PID_CI	3.3 - 3.4	19	2	1	0	3	-	-	
Displ_ramp_CI	3.5 - 3.6	21	2	1	0	3	-	-	
Spd_comp_CI	3.7 - 3.8	23	2	1	0	3	-	-	
Valve1_CI	4.1 - 4.2	25	2	1	0	3	-	-	
Valve2_CI	4.3 - 4.4	27	2	1	0	3	-	-	
Man_upstroke_CI	4.5 - 4.6	29	2	1	0	3	-	-	0 = OFF, 1 = ON, 2…3 = NA (Only evaluated in Manual mode)
Man_downstroke_CI	4.7 - 4.8	31	2	1	0	3	-	-	
Press_ramp_CI	5.1 - 5.2	33	2	1	0	3	-	-	
Factory proprietary	5.3 - 5.8	35	6	1	0	63	-	-	
	6.1 - 6.8	41	8	1	0	250	-	-	
	7.1 - 7.8	49	8	1	0	250	-	-	
	8.1 - 8.6	57	6	1	0	63	-	-	
	8.7- 8.8	63	2	1	0	3	-	-	
Sum			**64**						

9.5 page 2 - SDO_1_in - Application

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	MC Default	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	-	**page number = 2**
SDO_1 command	1.7 - 1.8	7	2	1	0	3	-	-	0 = Read, 1 = NA, 2 = Write, 3 = NA
Pump_series_MC_CI	2.1 - 2.4	9	4	1	0	15	-	0	0 = P2, 1 = P3, 2…15 = NA
Pump_size_MC_CI	2.5 - 2.8	13	4	1	0	15	-	0	0 = NA, 1 = 75cc, 2 = NA, 3= 145cc, 4…15 = NA
Valve_type_CI	3.1 - 3.4	17	4	1	0	15	-	0	0 = Standard control, FS 0, code EC; 1 = Standard control, FS 100, code EF; 2 = valve on opposite side, FS 0, code EC; 3 = valve on opposite side, FS 100, code EF; 4…15 = NA
Factory proprietary	3.5 - 3.6	21	2	1	0	15	-	-	0 = OFF, 1 = ON
Factory proprietary	3.7 - 3.8	23	2						
NO_pulses_rev_CI	4.1 - 4.8	25	8	1	0	250	-	36	
Gearbox_ratio_pmp_in_CI	5.1 - 6.2	33	10	0,01	0	1000	-	1.00	<1: pump speed lower than measured shaft speed >1: pump speed higher than measured shaft speed
BWL_spd_fdbk_CI	6.3 - 6.8	43	6	2	0	50	-	50	maybe increased with noisy speed feedback signal
Valve_output_manual_CI	7.1 - 7.8	49	8	0,2	0	250	%	25	
Press_sensor_always_CI	8.1 - 8.2	57	2	1			-	0	0 = OFF, 1 = ON
Leak_comp_displ_CI	8.3 - 8.4	59	2	1			-	0	0 = OFF, 1 = ON
Spd_fdbk_ANA_CI	8.5 - 8.6	61	2	1			-	0	0 = OFF, 1 = ON
Valve_press_comp_inac-tive_CI	8.7 - 8.8	63	2	1			-	-	
Sum			**64**						

9.6 page 3 - SDO_2_in - Ramps

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	MC Default	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	-	**page number = 3**
SDO_2 command	1.7 - 1.8	7	2	1	0	3	-	-	0 = Read, 1 = NA, 2 = Write, 3 = NA
T_upramp_displ_CI	2.1 - 3.2	9	10	25	0	1000	ms	0	
T_downramp_displ_CI	3.3 - 4.4	19	10	25	0	1000	ms	0	
T_upramp_press_CI	4.5 - 5.6	29	10	25	0	1000	ms	0	
T_downramp_press_CI	5.7 - 6.8	39	10	25	0	1000	ms	0	
Factory proprietary	7.1 - 7.8	49	8	1	0	250	-	-	
Factory proprietary	8.1 - 8.8	57	8	1	0	250	-	-	
Sum			**64**						

9.7 page 4 - SDO_3_in - Valves

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	MC Default	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	-	**page number = 4**
SDO_3 command	1.7 - 1.8	7	2	1	0	1	-	-	0 = Read, 1 = NA, 2 = Write, 3 = NA
Valve1_delay_on_CI	2.1 - 3.2	9	10	10	0	1000	ms	0	
Valve1_delay_off_CI	3.3 - 4.4	19	10	10	0	1000	ms	0	
Valve2_delay_on_CI	4.5 - 5.6	29	10	10	0	1000	ms	0	
Valve2_delay_off_CI	5.7 - 6.8	39	10	10	0	1000	ms	0	
Factory proprietary	7.1 - 7.8	49	8	1	0	250	-	-	
Factory proprietary	8.1 - 7.8	57	8	1	0	250	-	-	
Sum			**64**						

9.8 page 5 - SDO_4_in - Calibration

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	MC Default	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	-	**page number = 5**
SDO_4 command	1.7 - 1.8	7	2	1	0	3	-	-	0 = Read, 1 = NA, 2 = Write, 3 = NA
Fdbk_volt_min_CI	2.1 - 3.8	9	16	1	0	5000	mV	2500	Please see pump tag for reference.
Fdbk_volt_max_CI	4.1 - 5.9	25	16	1	0	5000	mV	4300	
Valve_zero_point_CI	6.1 - 6.8	41	8	0,1	-12,5	250	%	0	
Factory proprietary	7.1 - 7.8	49	8	0,2	0	250	%	0	
Factory proprietary	8.1 - 8.8	57	8	0,2	0	250	%	0	
Sum			**64**						

9.9 page 6 - SDO_5_in - Pump data

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	MC Default	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	-	**page number = 6**
SDO_5 command	1.7 - 1.8	7	2	1	0	1	-	-	0 = Read only implemented
NA	2.1 - 8.8	9	56	-	-	-	-	-	
Sum			**64**						

9.10 page 7 – SDO_6_in - Para displ. PID ctrl.

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	MC Default	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	-	**page number = 7**
SDO_6 command	1.7 - 1.8	7	2	1	0	3	-	-	0 = Read, 1 = NA, 2 = Write, 3 = NA
P_gain_displ_CI	2.1 - 2.8	9	8	10	0	100	-	-	
I_gain_displ_CI	3.1 - 3.8	17	8	10	0	100	-	-	
D_gain_displ_CI	4.1 - 4.8	25	8	10	0	100	-	-	
I_lim_displ_CI	5.1 - 5.8	33	8	1	0	50	%	-	
I_window_in_frozen_displ_CI	6.1 - 6.8	41	8	0,1	0	50	%	-	
I_window_out_reset_displ_CI	7.1 - 7.8	49	8	1	0	100	%	-	
D_window_in_inac-tive_displ_CI	8.1 - 8.8	57	8	0,1	0	50	%	-	
Sum			**64**						

9.11 page 8 – SDO_7_in - Para press.1 PID ctrl.

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	MC Default	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	-	**page number = 8**
SDO_7 command	1.7 - 1.8	7	2	1	0	3	-	-	0 = Read, 1 = NA, 2 = Write, 3 = NA
P_gain_press_CI	2.1 - 2.8	9	8	1	0	250	-	-	
I_gain_press_CI	3.1 - 3.8	17	8	10	0	100	-	-	
D1_gain_press_CI	4.1 - 4.8	25	8	10	0	100	-	-	
I_lim_press_CI	5.1 - 5.8	33	8	1	0	50	%	-	
I_window_in_frozen_press_CI	6.5 - 6.8	41	8	1	0	10	%	-	
I_window_out_reset_press_CI	7.1 - 7.8	49	8	1	0	150	%	-	
D1_window_in_inactive_CI	8.1 - 8.8	57	8	1	0	100	bar	-	
Sum			**64**						

9.12 page 9 - SDO_8_in - Para press.2 PID ctrl.

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	MC Default	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	-	**page number = 9**
SDO_8 command	1.7 - 1.8	7	2	1	0	3	-	-	0 = Read, 1 = NA, 2 = Write, 3 = NA
D1_window_hando-ver_press_CI	2.1 - 2.8	9	8	100	0	50	-	-	
D2_gain_press_CI	3.1 - 3.8	17	8	10	0	200	-	-	
D2_gradient_window_CI	4.1 - 4.8	25	8	100	0	50	-	-	
D2_error_window_CI	5.1 - 5.8	33	8	1	0	250	-	-	
Factory proprietary	6.1 - 6.8	41	8	1	0	25	%	-	
Factory proprietary	7.1 - 7.8	49	8	1	0	50	bar	-	
Factory proprietary	8.1 - 8.8	57	8	1	0	250		-	
Sum			**64**						

9.13 CAN feedback protocol - Properties

CAN -interface	J1939 (250kBit/s)									
PGN	65534, PropB_FE									
page number	0	1	2	3	4	5	6	7	8	9
page name	PDO_1_out	PDO_2_out	SDO_1_out	SDO_2_out	SDO_3_out	SDO_4_out	SDO_5_out	SDO_6_out	SDO_7_out	SDO_8_out
page description	Process PDO1	Status/Error/Warnings PDO2	Application SDO1	Ramps SDO2	Valves SDO3	Calibration SDO4	Pump data SDO5	Para displ. PID ctrl. SDO6	Para press.1 PID ctrl. SDO7	Para press.2 PID ctrl. SDO8
Message priority	6	6	6	6	6	6	6	6	6	6
Min. transmit rate - PCM [ms]	10	10	10	10	10	10	10	10	10	10
Max. transmit rate - PCM [ms]	100 (default)	100 (default)								
Min. timeout - Master [ms]*	20	40								
Max. timeout - Master [ms]*	150 (default)	200 (default)	no	no	no	no	no	no	no	no

	default	optional		
SA destination (Master)	39	33		
SA sender (PCM)	46	165	166	167

only when using PCM Plugin module

9.14 page 0 - PDO_1_out - Process

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	**Page number = 0**
NA	1.7 - 1.8	7	2	1	0	3	-	
Q_out_fdbk_CO*	2.1 - 3.4	9	12	1	0	4000	cnt	* see note
Torq_in_fdbk_CO**	3.5 - 4.8	21	12	1	0	4000	cnt	** see note
Press_out_fdbk_CO	5.1 - 6.4	33	12	0,125	0	4000	cnt	
Spd_fdbk_pmp_filt_CO	6.5 - 7.8	45	12	1	0	4000	rpm	Adapted speed signal either CAN or FIN
Factory proprietary	8.1 - 8.2	57	2	1	0	3	-	
Factory proprietary	8.3 - 8.8	59	6	1	0	63	-	
Sum			**64**					

* Resolution/bit:

If Speed_comp_CI = ON — Displ_max_CO * Spd_max_FD_CO / 4000000 [l/min/bit], see data in SDO_5

If Speed_comp_CI = OFF — 100% / 4000 [%/bit]

Example for eP2075 (75cc, 2500rpm): displ. ctrl = 0,025%/bit , Q ctrl: 0,046875 l/min/bit

** Resolution/bit: Torq_in_calc_max_CO/4000 [Nm/bit], see data in SDO_5

Example for eP2075 (401Nm): 0,10025 Nm/bit

9.15 page 1 - PDO_2_out - Status

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	**Page number = 1**
NA	1.7 - 1.8	7	2	1	0	3	-	
Enbl_out_ON_CO	2.1 - 2.2	9	2	1	0	3	-	0 = OFF, 1 = ON, 2…3 = NA
Enbl_PID_ON_CO	2.3 - 2.4	11	2	1	0	3	-	
Displ_PID_active_CO	2.5 - 2.6	13	2	1	0	3	-	
Press_PID_active_CO	2.7 - 2.8	15	2	1	0	3	-	
T_lim_active_CO	3.1 - 3.2	17	2	1	0	3	-	
Spd_comp_active_CO	3.3 - 3.4	19	2	1	0	3	-	
Factory proprietary	3.5 - 3.6	21	2	1	0	3	-	
Factory proprietary	3.7 - 3.8	23	2	1	0	3	-	
Active_Mode_CO	4.1 - 4.4	25	4	1	0	7	-	0 = IDLE, 1 = LOGFILES, 2 = SETTINGS, 3 = MANUAL, 4 = D_MODE, 5 = DP_MODE
Factory proprietary	4.5 - 4.6	29	2	1	0	3	-	
Factory proprietary	4.7 - 4.8	31	2	1	0	3	-	
WRN: Q_setp_too_high_CO	5.1 - 5.2	33	2	1	0	3	-	0 = OFF, 1 = ON, 2…3 = NA
WRN: Pmp_spd_too_high_CO	5.3 - 5.4	35	2	1	0	3	-	
WRN: Pmp_press_too_high_CO	5.5 - 5.6	37	2	1	0	3	-	
WRN: Fdbk_cal_limits_CO	5.7 - 5.8	39	2	1	0	3	-	
Factory proprietary	6.1 - 6.2	41	2	1	0	3	-	
Factory proprietary	6.3 - 6.4	43	2	1	0	3	-	
Factory proprietary	6.5 - 6.6	45	2	1	0	3	-	
Factory proprietary	6.7 - 6.8	47	2	1	0	3	-	
ERR: fdbk_sensor_CO	7.1 - 7.2	49	2	1	0	3	-	0 = OFF, 1 = ON, 2…3 = NA For general indication purposes only. For detailed information connect to IQAN Run (App or desktop version)
ERR: COUT_CO	7.3 - 7.4	51	2	1	0	3	-	
ERR: PCM_CO	7.5 - 7.6	53	2	1	0	3	-	
ERR: press_sensor_pmp_CO	7.7 - 7.8	55	2	1	0	3	-	
Factory proprietary	8.1 - 8.2	57	2	1	0	3	-	
ERR: valve1_DO_CO	8.3 - 8.4	59	2	1	0	3	-	
ERR: valve2_DO_CO	8.5 - 8.6	61	2	1	0	3	-	
Factory proprietary	8.7 - 8.8	63	2	1	0	3	-	
Sum			**64**					

9.16 page 2 - SDO_1_out - Application

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	**Page number = 2**
NA	1.7 - 1.8	7	2	1	0	3	-	
Pump_series_CO	2.1 - 2.4	9	4	1	0	15	-	0 = P2, 1 = P3, 2…15 = NA
Pump_size_CO	2.5 - .2.8	13	4	1	0	15	-	0 = NA, 1 = 75cc, 2 = NA, 3= 145cc, 4…15 = NA
Valve_type_CO	3.0 - 3.4	17	4	1	0	15	-	0 = Standard control, FS 0; 1 = Standard control, FS 100; 2 = valve on opposite side, FS 0; 3 = valve on opposite side, FS 100; 4…15 = NA
Factory proprietary	3.5 - 3.6	21	2	1	0	15	-	0 = OFF, 1 = ON
Factory proprietary	3.7 - 3.8	23	2					
NO_pulses_rev_CO	4.1 - 4.8	25	8	1	0	250	-	
Gearbox_ratio_pmp_in_CO	5.1 - 6.2	33	10	0,01	0	1000	-	<1: pump speed lower than measured shaft speed >1: pump speed higher than measured shaft speed
BWL_spd_fdbk_CO	6.3 - 6.8	43	6	2	0	50	-	maybe increased with noisy speed feedback signal
O	7.1 - 7.8	49	8	0,2	0	250	%	
Pressure_sensor_always_CO	8.1 - 8.2	57	2					0 = OFF, 1 = ON
Leak_comp_no_spd_fdbk_CO	8.3 - 8.4	59	2					0 = OFF, 1 = ON
Spd_fdbk_local_CO	8.5 - 8.6	61	2					0 = OFF, 1 = ON
Valve_press_comp_inac-tive_CO	8.7 - 8.8	63	2	1	0	3	-	0 = OFF, 1 = ON
Sum			**64**					

9.17 page 3 - SDO_2_out - Ramps

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	**Page number = 3**
NA	1.7 - 1.8	7	2	1	0	3	-	
T_upramp_displ_CO	2.1 - 3.2	9	10	25	0	1000	ms	
T_downramp_displ_CO	3.3 - 4.4	19	10	25	0	1000	ms	
T_upramp_press_CO	4.5 - 5.6	29	10	25	0	1000	ms	
T_downramp_press_CO	5.7 - 6.8	39	10	25	0	1000	ms	
Factory proprietary	7.1 - 7.8	49	8	1	0	250	-	
Factory proprietary	8.1 - 8.8	57	8	1	0	250	-	
Sum			**64**					

9.18 page 4 - SDO_3_out - Valves

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	**Page number = 4**
NA	1.7 - 1.8	7	2	1	0	3	-	
Valve1_delay_on_CO	2.1 - 3.2	9	10	10	0	1000	ms	
Valve1_delay_off_CO	3.3 - 4.4	19	10	10	0	1000	ms	
Valve2_delay_on_CO	4.5 - 5.6	29	10	10	0	1000	ms	
Valve2_delay_off_CO	5.7 - 6.8	39	10	10	0	1000	ms	
Factory proprietary	7.1 - 7.8	49	8	1	0	250	-	
Factory proprietary	8.1 - 7.8	57	8	1	0	250	-	
Sum			**64**					

9.19 page 5 - SDO_4_out - Calibration

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	**Page number = 5**
NA	1.7 - 1.8	7	2	1	0	3	-	
Fdbk_volt_min_CO	2.1 - 3.8	9	16	1	0	5000	mV	Please see pump tag for reference.
Fdbk_volt_max_CO	4.1 - 5.9	25	16	1	0	5000	mV	
Valve_zero_point_CO	6.1 - 6.8	41	8	0,1	-12,5	250	%	
Factory proprietary	7.1 - 7.8	49	8	0,2	0	250	%	
Factory proprietary	8.1 - 8.8	57	8	0,2	0	250	%	
Sum			**64**					

9.20 page 6 - SDO_5_out - Pump data

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	**Page number = 6**
NA	1.7 - 1.8	7	2	1	0	3	-	
Displ_max_CO	2.1 - 3.5	9	16	0,1	0	8000	cc/bit	
Press_max_cont_CO	4.1 - 5.4	25	12	0,125	0	4000	bar/bit	
Spd_max_FD_CO	5.5 - 6.8	37	12	1	0	4000	rpm/bit	
Torq_in_calc_max_CO	7.1 - 8.4	49	12	1	0	4000	Nm/bit	
Factory proprietary	8.5 - 8.8	61	4	1	0	16	-	
Sum			**64**					

9.21 page 7 - SDO_6_out - Para displ. PID ctrl. SDO6

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	**Page number = 7**
NA	1.7 - 1.8	7	2	1	0	3	-	
P_gain_displ_CO	2.1 - 2.8	9	8	10	0	100	-	
I_gain_displ_CO	3.1 - 3.8	17	8	10	0	1000	-	
D_gain_displ_CO	4.1 - 4.8	25	8	10	0	1000	-	
I_lim_displ_CO	5.1 - 5.8	33	8	1	0	50	%	
I_window_in_frozen_displ_CO	6.1 - 6.8	41	8	0,1	0	50	%	
I_window_out_reset_displ_CO	7.1 - 7.8	49	8	1	0	100	%	
D_window_in_inactive_displ_CO	8.1 - 8.8	57	8	0,1	0	50	%	
Sum			**64**					

9.22 page 8 - SDO_7_out - Para press.1 PID ctrl. SDO7

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	**Page number = 8**
NA	1.7 - 1.8	7	2	1	0	3	-	
P_gain_press_CO	2.1 - 2.8	9	8	1	0	250	-	
I_gain_press_CO	3.1 - 3.8	17	8	10	0	100	-	
D1_gain_press_CO	4.1 - 4.8	25	8	10	0	100	-	
I_lim_press_CO	5.1 - 5.8	33	8	1	0	50	%	
I_window_in_frozen_press_CO	6.1 - 6.8	41	8	1	0	10	%	
I_window_out_reset_press_CO	7.1 - 7.8	49	8	1	0	150	%	
D1_window_in_inactive_CO	8.1 - 8.8	57	8	1	0	100	bar	
Sum			**64**					

9.23 page 9 - SDO_8_out - Para press.2 PID ctrl. SDO8

Name	Byte	Bit offset	length	res	offset	CAN max	Unit	Remarks
page number	1.1 - 1.6	1	6	1	0	15	-	**Page number = 9**
NA	1.7 - 1.8	7	2	1	0	3	-	
D1_window_handover_press_CO	2.1 - 2.8	9	8	100	0	50	-	
D2_gain_press_CO	3.1 - 3.8	17	8	10	0	200	-	
D2_gradient_window_CO	4.1 - 4.8	25	8	100	0	50	-	
D2_error_window_CO	5.1 - 5.8	33	8	1	0	250	-	
Factory proprietary	6.1 - 6.8	41	8	1	0	25	%	
Factory proprietary	7.1 - 7.8	49	8	1	0	50	bar	
Factory proprietary	8.1 - 8.8	57	8	1	0	250	-	
Sum			**64**					

9.25 Examples - configurations via CAN of SDO_1

Time [ms]	Priority	PGN	SA/DA	Text en clair	Data
0,00	3	e61184	39/46	Proprietary A	2 16 240 50 110 80 95 255
3,41	6	e65534	46	Proprietary B	194 16 240 36 100 20 125 255
4600,36	3	e61184	39/46	Proprietary A	130 16 240 50 110 80 95 255
7050,67	3	e61184	39/46	Proprietary A	2 16 240 50 110 80 95 255
7053,15	6	e65534	46	Proprietary B	194 16 240 50 110 80 95 255
9400,75	3	e61184	39/46	Proprietary A	66 16 240 50 110 80 95 255
9403,14	6	e65534	46	Proprietary B	194 16 240 36 100 20 125 255
11600,91	3	e61184	39/46	Proprietary A	2 16 240 50 110 80 95 255
11602,98	6	e65534	46	Proprietary B	194 16 240 36 100 20 125 255

NOTICE

All undefined bits in the CAN messages are set to 1 by default in the above example, both at master and PCM side.

Interpretation	Byte 1-8 [dec]	Byte 1 [dec]	Byte 1 [bin]			Byte 2-8
			Bit 8 read/write	Bit 7 default	Bit 1-6 page number	SDO parameter data
Master read command	2 16 240 50 110 80 95 255	2	0	0	000010	not evaluated at PCM
PCM answer	194 16 240 36 100 20 125 255	194	1	1	000010	16 240 36 100 20 125 255
Master write command	130 16 240 50 110 80 95 255	130	1	0	000010	16 240 50 110 80 95 255
Master read command	2 16 240 50 110 80 95 255	2	0	0	000010	not evaluated at PCM
PCM answer	194 16 240 50 110 80 95 255	194	1	1	000010	16 240 50 110 80 95 255
Master default command	66 16 240 50 110 80 95 255	66	0	1	000010	not evaluated at PCM
PCM answer	194 16 240 36 100 20 125 255	2	1	1	000010	16 240 36 100 20 125 255
Master read command	2 16 240 50 110 80 95 255	2	0	0	000010	not evaluated at PCM
PCM answer	194 16 240 36 100 20 125 255	2	1	1	000010	16 240 36 100 20 125 255

10 IQAN RUN Interface – Adjust Groups

Please refer to section 2.3 for the detailed access levels of adjust groups. For the description of the adjust parameter please see section 8.

Below pictures show the adjust groups when connected with IQAN Run. Each adjust can be set to factory defaults with the function button *Reset Group*.

Adjust group: Communication

Name	Active mode	Parameter value(s)
Cmd_input_sel		CAN
SA_PCM		46
SA_MASTER		39
Timeout PDO1_in		150
Timeout PDO2_in		200
Transmitrate PDO1_out		100
Transmitrate PDO2_out		100
Term_CAN_A_active		True
Term_CAN_B_active		True
TM_sensors_active		False
TM_J1939_active		False
Transmitrate_TM_Pro...		1000
Transmitrate_TM_Pum...		60000

Example: Adjust Group Communication

Adjust group: Module settings

Name	Active mode	Parameter value(s)
Pump_series_MC		0
Pump_size_MC		0
Valve_type_MC		0
Ctrl_type_ANA		Idle
Displ_ramp_ANA		False
Press_ramp_ANA		False
Torq_lim_fix_ANA		True
Spd_comp_ANA		False

Example: Adjust group Module Settings

Adjust group: Application settings

Name	Active mode	Parameter value(s)
Q_lim_setp_ANA		100
Press_lim_setp_ANA		100,00
Torq_lim_setp_ANA		100
T_upramp_displ_MC		0
T_downramp_displ_MC		0
T_upramp_press_MC		0
T_downramp_press_...		0
Valve1_delay_on_MC		0
Valve1_delay_off_MC		0
Valve2_delay_on_MC		0
Valve2_delay_off_MC		0
Valve_output_manual_...		25,00
Gearbox_ratio_pmp_i...		1,00
NO_pulses_rev_MC		36
Press_sensor_always_...		False
Leak_comp_displ_MC		False
Spd_fdbk_ANA_MC		False
BWL_spd_fdbk_MC		50
Valve_press_comp_in...		False

Example: Adjust group Application Settings

Adjust group: Calibration settings

Name	Active mode	Parameter value(s)
Fdbk_volt_min_MC		2500
Fdbk_volt_max_MC		4300
Valve_zero_point_MC		0,00
Pmp_press_VIN		(500, 4500)
Q_setp_VIN		(0, 5000)
Press_setp_VIN		(0, 5000)
Torq_setp_VIN		(0, 5000)

Example: Adjust group Calibration Settings

NOTICE

All analog inputs, sensor inputs as well as commands inputs can be calibrated to there minimum and maximum value with adjust group calibration settings.

Adjust group: PID settings

Name	Active mode	Parameter value(s)
P_gain_displ_MC		290
I_gain_displ_MC		200
D_gain_displ_MC		50
I_lim_displ_MC		20
I_window_in_frozen_di...		0,50
I_window_out_reset_di...		15
D_window_in_inactive_...		5,00
Displ_setp_idle_MC		0
Press_setp_idle_MC		15
P_gain_press_MC		50
I_gain_press_MC		450
D1_gain_press_MC		160
I_lim_press_MC		20
I_window_in_frozen_p...		2
I_window_out_reset_p...		50
D1_window_in_inactiv...		0
D1_window_handover...		1000
D2_gain_press_MC		200
D2_gradient_window_...		1000
D2_error_window_MC		50

Example: Adjust group PID Settings

11 IQAN RUN Interface – Measure Groups

The visibility of measure groups is depending on login levels. Please refer to section 2.3. All measured items without unit are digital type. All measured items with unit are integer or real type. States of a measured elements are:

- OK – electrical connection.
- Disabled – measured element not evaluated due to parameter or input configuration.
- Low Error – sensor signal out of range, lower limit.
- High Error – sensor signal out of range, higher limit.
- Open Load – open current circuit detected.

11.1 Communication

This measure group shows state and current setting of the PCMs communication parameter. Please refer to section 8.1, page 21.

Name	Status	Value	Unit
Communication			
SA_PCM	OK	46	
SA_MASTER	OK	39	
Timeout PDO1_in	OK	150	ms
Timeout PDO2_in	OK	200	ms
Transmitrate PDO1_out	OK	100	ms
Transmitrate PDO2_out	OK	100	ms
Term_CAN_A_active	OK	True	
Term_CAN_B_active	OK	True	
TM_sensors_active	OK	False	
TM_J1939_active	OK	False	
Transmitrate_TM_Process_Data	OK	1000	ms
Transmitrate_TM_Pump_Data	OK	60000	ms

Example: Measure Group Communication

11.2 Digital I/O and Analog I/O

This measure group shows state and current setting of digital and analog I/Os. Please refer to section 4.1-4.7.

Name	Status	Value	Unit
Communication			
Digital I/O			
Enbl_out_DI	OK	False	
Enbl_PID_DI	OK	True	
Valve1_DI_IDC	Disabled	False	
Valve2_DI_IDC	Disabled	False	
Man_upstroke_DI	Disabled	False	
Man_downstsroke_DI	Disabled	False	
Valve1_DO	Disabled	False	
Valve2_DO	Disabled	False	
Analog I/O			
Fdbk_sensor_VIN	OK	2250,00	mV
Pmp_press_VIN	Disabled	0,00	bar
Spd_fdbk_FIN	Disabled	0,00	Hz
Q_setp_VIN	Disabled	0,00	bits
Torq_setp_VIN	Disabled	0,00	bits
Press_setp_VIN	Disabled	0,00	bits
COUT_1S	Disabled	0	mA

Example: Measure Group Digital I/O and Analog I/O

11.3 CAN_inputs PDO_1-2

CAN_inputs shows state and condition PDO_1_in (section 9.2)and PDO_2_in (section 9.4).

NOTICE

Cmd_input_sel = CAN enables the CAN releated measure groups. Besides this SDOs need a write command before getting active.

Name	Status	Value	Unit
Communication			
Digital I/O			
Analog I/O			
CAN_inputs PDO_1-2			
Q_setp_CI	Disabled	0	bits
Torq_setp_CI	Disabled	0	bits
Press_setp_CI	Disabled	0	bits
Spd_fdbk_CI	Disabled	0	rpm
Ctrl_type_CI	OK	1	
Enbl_out_CI	OK	False	
Enbl_PID_CI	OK	True	
Displ_ramp_CI	OK	False	
Spd_comp_CI	OK	False	
Man_upstroke_CI	OK	False	
Man_downstroke_CI	OK	False	
Valve1_CI	OK	False	
Valve2_CI	OK	False	
Press_ramp_CI	OK	False	
Timeout_PDO1	Disabled	False	
Timeout_PDO2	OK	True	

Example: Measure Group CAN_Inputs PDO_1-2

11.4 CAN_inputs SDO_1

Please refer to section 9.5.

Name	Status	Value	Unit
Communication			
Digital I/O			
Analog I/O			
CAN_inputs PDO_1-2			
CAN inputs SDO_1			
SDO_1_command	OK	0	
Pump_series_CI	OK	1	
Pump_size_CI	OK	1	
Valve_type_CI	OK	0	
NO_pulses_rev_CI	OK	0	
Gearbox_ratio_pmp_in_CI	OK	0,00	
BWL_spd_fdbk_CI	OK	0	rpm
Valve_output_manual_CI	OK	0,00	%
Press_sensor_always_CI	OK	False	
Leak_comp_displ_CI	OK	False	
Spd_fdbk_ANA_CI	OK	False	
Valve_press_comp_inactiv...	OK	False	

Example: Measure Group CAN inputs SDO_1

11.5 CAN_inputs SDO_2-5

Please refer to section 9.6, 9.7, 9.8 and 9.9.

Name	Status	Value	Unit
Communication			
Digital I/O			
Analog I/O			
CAN_inputs PDO_1-2			
CAN inputs SDO_1			
CAN inputs SDO_2-5			
SDO_2_command	OK	0	
T_upramp_displ_CI	OK	0	ms
T_downramp_displ_CI	OK	0	ms
T_upramp_press_CI	OK	0	ms
T_downramp_press_CI	OK	0	ms
SDO_3_command	OK	0	
Valve2_delay_on_CI	OK	0	ms
Valve1_delay_on_CI	OK	0	ms
Valve1_delay_off_CI	OK	0	ms
Valve2_delay_off_CI	OK	0	ms
SDO_4_command	OK	0	
Fdbk_volt_min_CI	OK	0	mV
Fdbk_volt_max_CI	OK	0	mV
Valve_zero_point_CI	OK	-12,50	%
SDO_5_command	OK	0	

Example: Measure Group CAN inputs SDO_2-5

11.6 CAN_inputs SDO_6-8

Please refer to section 9.10, 9.11 and 9.12.

Name	Status	Value	Unit
Communication			
Digital I/O			
Analog I/O			
CAN_inputs PDO_1-2			
CAN inputs SDO_1			
CAN inputs SDO_2-5			
CAN inputs SDO_6-8			
SDO_6_command	OK	0	
P_gain_displ_CI	OK	290	
I_gain_displ_CI	OK	200	
D_gain_displ_CI	OK	50	
I_lim_displ_CI	OK	20	%
I_window_in_frozen_displ_CI	OK	0,50	%
I_window_out_reset_displ_CI	OK	15	%
D_window_in_inactive_disp...	OK	5,00	%
SDO_7_command	OK	0	
P_gain_press_CI	OK	50	
I_gain_press_CI	OK	450	
D1_gain_press_CI	OK	160	
I_lim_press_CI	OK	20	%
I_window_in_frozen_press_...	OK	2	bar
I_window_out_reset_press_...	OK	50	bar
D1_window_in_inactive_pr...	OK	0	bar
SDO_8_command	OK	0	
D1_window_handover_pre...	OK	1000	bar/s
D2_gain_press_CI	OK	200	
D2_gradient_window_CI	OK	1000	bar/s
D2_error_window_CI	OK	50	bar
Displ_setp_idle_CI	OK	0	%
Press_setp_idle_CI	OK	15	bar

Example: Measure Group CAN_Inputs SDO_6-8

11.7 CAN_outputs PDO_1-2 & PDO_2

Please refer to section 9.14 or 9.15.

Name	Status	Value	Unit
Communication			
Digital I/O			
Analog I/O			
CAN_inputs PDO_1-2			
CAN inputs SDO_1			
CAN inputs SDO_2-5			
CAN inputs SDO_6-8			
CAN_outputs PDO_1-2			
Q_out_fdbk_CO	OK	1422	bits
Torq_in_fdbk_CO	OK	0	bits
Press_out_fdbk_CO	OK	0	bits
Q_fdbk_neg_CO	OK	0	bits
Enbl_out_ON_CO	OK	0	bits
Enbl_PID_ON_CO	OK	1	bits
Displ_PID_active_CO	OK	0	bits
Press_PID_active_CO	OK	0	bits
Torq_lim_active_CO	OK	0	bits
Spd_comp_active_CO	OK	0	bits
Active_mode_CO	OK	2	bits
CAN outputs PDO_2			
WRN: Q_setp_too_high_CO	OK	0	bits
WRN: Pmp_spd_too_high_...	OK	0	bits
WRN: Pmp_press_too_hig...	OK	0	bits
WRN: Fdbk_cal_limits_CO	OK	0	bits
ERR: fdbk_sensor_CO	OK	0	bits
ERR: COUT_CO	OK	0	bits
ERR: PCM_CO	OK	0	bits
ERR: press_sensor_pmp_CO	OK	0	bits
ERR: valve1_DO_CO	OK	0	bits
ERR: valve2_DO_CO	OK	0	bits

Example: Measure Group CAN outputs PDO_1-2 & PDO_2

11.8 Calibration

Name	Status	Value	Unit
Communication			
Digital I/O			
Analog I/O			
CAN_inputs PDO_1-2			
CAN inputs SDO_1			
CAN inputs SDO_2-5			
CAN inputs SDO_6-8			
CAN_outputs PDO_1-2			
CAN outputs PDO_2			
Calibration			
Fdbk_volt_min_MC	OK	2500	mV
Fdbk_volt_max_MC	OK	4170	mV
Valve_zero_point_MC	OK	0,00	%
Q_calc_max_4000_MC	OK	362,50	l/min
T_in_calc_max_4000_MC	OK	850,22	Nm

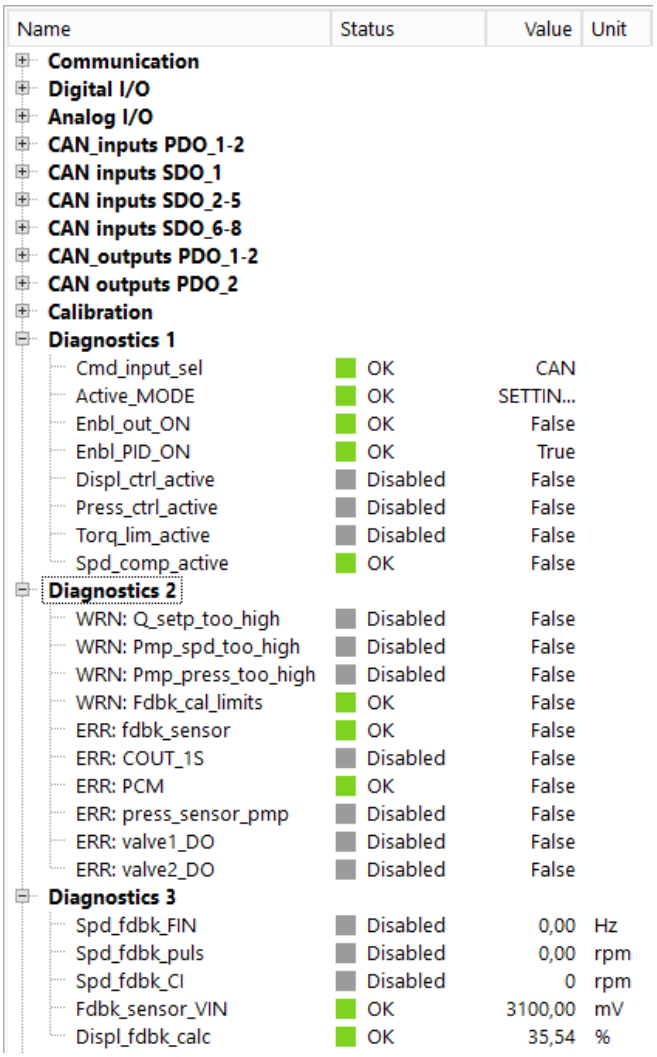
Example: Measure Group Calibration

NOTICE

The measure group calibration is enabled in Setting mode only. Please refer to section 6, page 16.

11.9 Diagnostics 1-3

This measure groups shows several settings to analyse the control system at start up after checking the availability and correctness of I/Os



Example: Diagnotics 1-3

Diagnostics 1

Cmd_input_sel

Communcation interface setting (CAN or ANALOG).

Active_MODE

Shows the current active control mode. Please refer to section 6, page 16

Enbl_out_ON

Parameter enabling the valve current output. Depending on setting of digital in Enbl_out_DI (section 4.2) and/or CAN command Enable_output_ON (section 9.4).

Enbl_PID_ON

Parameter enabling the PID loops. Depending on setting of digital in Enable_PID_DI (section 4.2) and/or CAN command Enable_PID_ON (section 9.4).

Displ_ctrl_active

Digital parameter showing the activity of the displacement control loop.

Press_ctrl_active

Digital parameter showing the activity of the pressure control loop.

Torq_lim_active

Digital parameter showing if the displacement command is actively overwritten by the torque limitation.

Spd_comp_active

Digital parameter showing the setting of either the parameter *Spd_comp_ANA* (section 8.2) or CAN based parameter *Spd_comp_CAN* (section 9.4).

Diagnostics 2

WRN: Q_setp_too_high

Internal digital which is true if either the pump speed is too low or the pump torq is to high or the Q_setp is set higher than 100% due to leakage compensation or the internal Q_lim_setp_ANA is lower than Q_setp.

WRN: Pmp_spd_too_high

Internal digital which is true if the pump speed exeeds the parameter *Spd_max_FD.* Please refer to section 7.

WRN: Pmp_press_too_high

Internal digital which is true if the pump outlet pressure exeeds the parameter *Press_max_cont* Please refer to section 7.

WRN: Fdbk_cal_limits

Internal digital which is true if the span between the two calibrated voltages (Please refer to section 8.4) from the displacement sensor differ more than -5% and +2% from the theoretical voltage span.

ERR: fdbk_sensor

Internal digital which is true if either a high error or a low error is detected at the corresponding voltage in. Please refer to section 4.1 page 12.

ERR: COUT_1S

Internal digital which is true if an open load or over load is detected at the corresponding current out. Please refer to section 4.6 page 12.

ERR: PCM

Internal digital which is true if one of the errors out of section 16, page 61 occurs.

ERR: press_sensor_pmp

Internal digital which is true if either a high error or a low error is detected at the corresponding voltage in. Please refer to section 4.1 page 12.

ERR: valve_1_DO

Internal digital which is true if either an open load or an over load is detected at the corresponding digital out. Please refer to section 4.7.

ERR: valve_2_DO

Internal digital which is true if either an open load or an over load is detected at the corresponding digital out. Please refer to section 4.7.

NOTICE

Errors for ERR: COUT_1S, ERR: valve_1_DO and ERR: valve_2_DO disappear after the error reason have been fixed and enables have been switched ON/OFF.

Diagnostics 3

Spd_fdbk_FIN

Raw signal of Spd_fdbk_FIN in Hertz. Please refer to section 4.4, page 12.

Spd_fdbk_puls

Combined signal of Spd_fdbk_FIN and Parameter NO_pulse_rev_MC (section 8.3) / NO_pulses_rev_CAN (section 9.5) in revolution per minute (rpm).

Spd_fdbk_CI

Raw signal of Spd_fdbk_CAN in revolution per minute (rpm). Please refer to section 9.2, page 33.

Fdbk_sensor_VIN

Raw signal of Fdbk_sensor_VIN (section 4.1).

Displ_fdbk_calc

Scaled displacement feedback in percent [%].

11.10 Closed loops

This measure group shows all main real time parameters of the two control loops shown in section 5 such as set points, actual values, error values, valve output, etc. Please refer to section 8.5 page 29.

Name	Status	Value	Unit
Communication			
Digital I/O			
Analog I/O			
CAN_inputs PDO_1-2			
CAN inputs SDO_1			
CAN inputs SDO_2-5			
CAN inputs SDO_6-8			
CAN_outputs PDO_1-2			
CAN outputs PDO_2			
Calibration			
Diagnostics 1			
Diagnostics 2			
Diagnostics 3			
Closed loops			
Q_setp_slope	Disabled	0,00	%
Displ_setp_corr	Disabled	0,00	%
Displ_fdbk_calc	OK	35,54	%
Displ_error	Disabled	0,00	%
Press_setp_slope	Disabled	0,00	bar
Pmp_press_filt	Disabled	0,00	bar
Press_error_filt	Disabled	0,00	bar
P_action_displ_calc	Disabled	0,00	%
P_action_press_calc_lim	Disabled	0,00	%
I_action_calc	Disabled	0,00	%
I_window_active_displ	Disabled	False	
I_window_active_press	Disabled	False	
D_action_calc	Disabled	0,00	%
PID_active_calc	Disabled	0,00	%
Pmp_press_filt_diff_filt	Disabled	0,00	
D2_action_press_calc_lim	Disabled	0,00	%
Press_ctrl_active	Disabled	False	
COUT_1S	Disabled	0	mA
Spd_fdbk_pmp_filt	Disabled	0,00	rpm
I_zero_press_corr	Disabled	0,00	%
Torq_setp_filt	Disabled	0,00	Nm
Displ_torq_lim	Disabled	0,00	%
Ctrl_type_sel	OK	D_mode	

Example: Measure Group Closed loops

12 IQAN Run Interface - Logs

Please refer to section 6.1.1 for the detailed description of log with IQAN Run.

13 Trouble Shooting

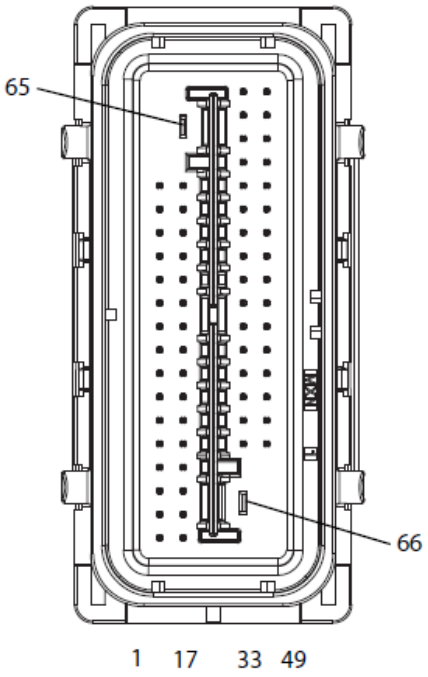
Reason	Solution
No contact to PCM	Check CAN wiring, adressing and termination
Controller is not starting up	Check Power supply and wiring
Voltage inputs are not working	Check power supply with VREF and wiring
	Check measure group *Analog I/Os* with IQAN Run
	Check calibration of analog inputs
Frequency input is not working	Check sensor specification and check with applied wiring
	Check power supply (sensor specification)
	Check measure group *Analog I/Os* for sensor signal and measure group Diagnostics for scaled pump shaft speed with IQAN Run.
	Check air gap between sensor and target
	Check parameter settings of Spd_fdbk_ANA, NO_pulse_rev_MC and Gearbox_ratio_pmp_in_MC
Digital inputs are not working	Check supply and return of high side and low side digital inputs
	Check measure group *Digital I/Os* with IQAN Run
Current out is not working	Check wiring of current out
	Check measure group *Analogl I/Os* with IQAN Run
	Check *Enbl_out_DI and Enbl_out_CAN* signal
	Check Timeouts for PDO 1 and PDO 2
Digital outputs are not working	Check wiring of digital outputs
	Check measure group *Digital I/Os* with IQAN Run
	Check parameter setting activating the digital output (adjust group: *module settings*)
	Check *Enbl_out_DI and Enbl_out_CAN* signal
Displacement control loop is not working	Check *Enbl_PID_DI and Enbl_PID_CAN* signal
	Check *Enbl_out_DI and Enbl_out_CAN* signal
	Check signal of Fdbk_sensor_VIN
	Check command signal quality
	Check speed signal quality (when Spd_comp_ON is selected)
	Check pressure signal quality (when Torq_lim_active is true)
	Check current operating mode (D or DP mode)

	Check parameter setting of valve_zero_point_MC
	Check parameter setting of Pump_type_select and Valve_type_select (log file: Pump config)
	Check parameter setting of PID settings
Pressure control loop is not working	Check *Enbl_PID_DI and Enbl_PID_CAN* signal
	Check *Enbl_out_DI and Enbl_out_CAN* signal
	Check signal of Pmp_press_VIN
	Check command signal quality
	Check current operating mode (DP mode)
	Check parameter setting of valve_zero_point_MC
	Check parameter setting of Pump_type_select and Valve_type_select (log file: Pump config)
	Check parameter setting of PID settings

14 Connector, PCM, C1

Connector C1 pin assignments

Connector kit	**Parker no. 20085114**
Housing	Molex no. 34822-0013
Cover	Molex no. 34565-0003
Pin types	Molex 33467-0024 (0.64 mm) Yazaki 7116-4152-02 (2.8 mm)
Seal	Yazaki 7158-3113-40 (2.8 mm)
Cables	0.75 mm² /18 AWG (0.64 mm) 1.50-2.50 mm² / 14 AWG (2.8 mm)
Plugs (empty pos.)	Molex no. 34586-0001 (0.64 mm)
Crimping tool (all pins)	**Parker no. 20085120**
Prototype cable	**Parker no. 20085124**



15 Appendix A - PCM Technical Overview

System

Operating temperature	-40 to +85 °C ambient
Absolute maximum temperature	-40 to +85 °C ambient
Storage temperature	-40 to +105 °C ambient
Voltage supply on +BAT	9 to 32 Vdc
Power on threshold	typ. 6.5 Vdc
Over voltage on any pin	36 Vdc with respect to -BAT
Reverse polarity protection on +BAT	with external 40 A fuse
Power driver load total	load < 2 x 20 A (MC43) / 1 x 20A (MC41, MC42)
Start up time typ.	500 ms (with a small application)
System cycle time	T_{SC} = 1ms
Data logging typ.	80,000 records
Weight	350g

Environmental ratings

Climate environment

Enclosure, water & dust protection	IEC 60529:2001, IP65; DIN 40050 Part 9:1993, IP6K9K
Salt mist	IEC 60068-2-52:1996 Kb, 72 h
Damp heat, cyclic	IEC 60068-2-30:2005 Db, +55°C, 95% RH, 6 cycles
Damp heat, steady state	IEC 60068-2-78:2001 Cab, +40°C, 93% RH, 21 days
Heat, operation	IEC 60068-2-2:2007 Bb, +85°C, 72 hours
Heat, storage	IEC 60068-2-2:2007 Bb, +100°C, 240 hours
Cold	IEC 60068-2-1:1993 Ab, -40°C, 16 hours
Change of temperature	IEC 60068-2-14:1984 Nb, - 30°C to +70°C, 100 x 4 hours

Mechanical environment

Random vibration	IEC 60068-2-64: 2008 Fh, 15 - 1000 Hz, 11.6 Grms, 3 x 10 h
Bump	IEC 60068-2-27:2008 Ea, 40 g, 6 ms, 1000 * 6 dir

EMC

Radiated emission	ISO 13766:2010/ISO 14982:2009
Conducted emission	EN 55025:2008, 0.15-108 MHz, Class 1
Conducted susceptability	ISO 11452-4:2005, 1 - 200 MHz, 1 kHz, 80% AM, 150 mA
Radiated susceptability	ISO 11452-2:2004, 200-2000 MHz, 1kHz, 80% AM, 100 V/m ISO 11452-2:2004, 800-2000 MHz, PM 577 us/4.6 ms, 60 V/m
Conducted transients susceptability	ISO 7637-2:2004, Pulse 1,2a,2b,3a,3b,4,5, Level 3
Power supply ramp	ISO 7637-3:2007, Level 3
ESD, operation	SAE J1455:2011, Section 4.13.1
ESD, handling	ISO 10605:2008, 8kV (contact),

Markings / Approvals

CE 2014/30/EU	EMC directive
E-mark	ECE regulation No. 10.05:2014, Approval number E5 10 R - 05313

Sensor supply, VREF

Number of VREF	2
Output voltage	5 V ±150 mV, -40 to 85 °C
Output voltage temperature drift	0.50 mV/°C, -40 to 85 °C
Maximum load current	150 mA on each VREF
Protection	overload, SCB, SCG
Diagnostics	over/under voltage
Under/over voltage threshold	±500 mV from nominal value

Voltage inputs

Number of inputs	6 (configuration [choosen communication type and choosen pump control] may reduce number)
PINs	C1:8 – Fdbk_sensor_VIN, C1:9 – Pmp_press_VIN, C1:24 – Q_setp_VIN, C1:25 – Torq_setp_VIN, C1:26 – Press_setp_VIN
Signal full scale	5000 mV ±100 mV
Signal resolution	1.3 mV (12 bits)
Input impedance	36 kohm in parallel with 10 nF
Accuracy with external sensor supply with VREF sensor supply	 ±(0.5 % + 6 mV), -40 to 85 °C ±(0.3 % + 6 mV), -40 to 85 °C
Sample rate	same as system cycle time
Maximum continuous voltage	32 V
Protection	SCB, SCG
Diagnostics	Measure group: Analog I/O

Digital inputs

Digital inputs from Frequency in pull-ups – Low Side Digital-Ins

Number of inputs	2
PINs	C1:12 – Man_upstroke_DI, C1:13 – Man_downstroke_DI
Logic levels *low* *high* *hysteresis*	 <1 V >4 V >150 mV
Input impedance	1.5 kohm pull-up to internal 5V, 10 nF

Sample rate	same as system cycle time T_{SC}
Maximum continuous voltage	32 V
Diagnostics	Measure Group: Digital I/O
Digital inputs from Frequency in pull-downs – High Side Digital Ins	
Number of inputs	2
PINs	C1:28 – Enable_out_DI, C1:29 – Enable_PID_DI
Logic levels	
low	<1 V
high	>4 V
hysteresis	>150 mV
Input impedance	6.8 kohm parallel to 10 nF
Sample rate	same as system cycle time T_{SC}
Maximum continuous voltage	32 V
Diagnostics	Measure group: Digital I/O
Digital inputs from Voltage in (0-32V) – High Side Digital-Ins	
Number of inputs	2
PINs	C1:38 – Valve1_DI, C1:54 – Valve2_DI
Signal full scale	32 V ±350 mV
Input impedance	52 kohm in parallel with 10 nF
Sample rate	same as system cycle time
Maximum continuous voltage	32 V
Protection	SCB, SCG
Diagnostics	none

Frequency inputs

Number of inputs	1
PIN	C1:11 – Spd_fdbk_FIN
Frequency range	Up to 4000 Hz, 50% duty cycle
Frequency timeout	200 ms
Logic levels	
low	<1 V
high	>4 V
hysteresis	>150 mV
Input impedance	
Pull-up type	1.5 kohm pull-up to internal 5V, 10 nF
Pull-down type	6.8 kohm in parallel with 10 nF

Maximum continuous voltage	32 V
Diagnostics	Measure Group Analog I/O

Current Output

Number of outputs	1
PINs	C1:14/39 – COUT_1S
Load restriction max load per output	 2.5 A
Leakage current in OFF state	<1 mA
Output range	100 to 2000 mA
Output resolution	1 mA
Absolute accuracy	±(2 % + 15 mA), -40 to 85°C
Supply rejection	±2 mA, VBAT change 9 to 18V or 18 to 32V
Load rejection	±2 mA, load change ±50%
PWM frequency, FDITH (Hz)	200
Maximum load VBAT = 14V VBAT = 28V and FDITH >= 200 Hz	 5 ohm + 10 mH 10 ohm + 30 mH
Protection	SCB, SCG
Diagnostics	open load, over load, saturation

Digital Outputs – High Side

Number of outputs	2
PINs	C1:45 – Valve1_DO, C1:39 – Valve2_DO
Load restriction max load total max load per output	 4.0 A 4.0 A
Leakage current in OFF state	<2 mA
Minimum load	100mA
Maximum allowable load inductance VBAT =14V, single pulse VBAT =28V, single pulse	(without external clamping diode) 14 Ohm / 366 mH, 9.3 ohm / 126 mH, 7 ohm / 50 mH 5.6 ohm / 30 mH, 4.7 ohm / 20 mH, 3.5 ohm / 9 mH 28 Ohm / 334 mH, 19 ohm / 114 mH, 14 ohm / 46 mH 11 ohm / 28 mH, 9.3 ohm / 18 mH, 8 ohm / 12 mH
Protection	SCB, SCG
Diagnostics Open load, output OFF	 > 17 Kohm @ VBAT = 9V, > 48 Kohm @ VBAT = 18V

Under current threshold, output ON	< 80 mA (can be disabled)
Over current threshold, output ON	>4200 mA
Diagnostics	open load, over load, saturation

CAN

Number of CAN buses	2
CAN – A	J1939 bus / process communication
CAN – B	Diagnostics communication
CAN specification	2.0A and 2.0B
CAN BUS speed	250 kbit/s
Protection	SCB, SCG

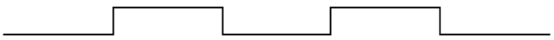
16 Appendix B - Error Codes, messages and actions

If one of the following error is detected, a message will be presented with an error code on the module. In some cases, the module will turn off or at least shut down the outputs, to increase safety.

Warning

Don't use the machine if an error message or error code is activated.

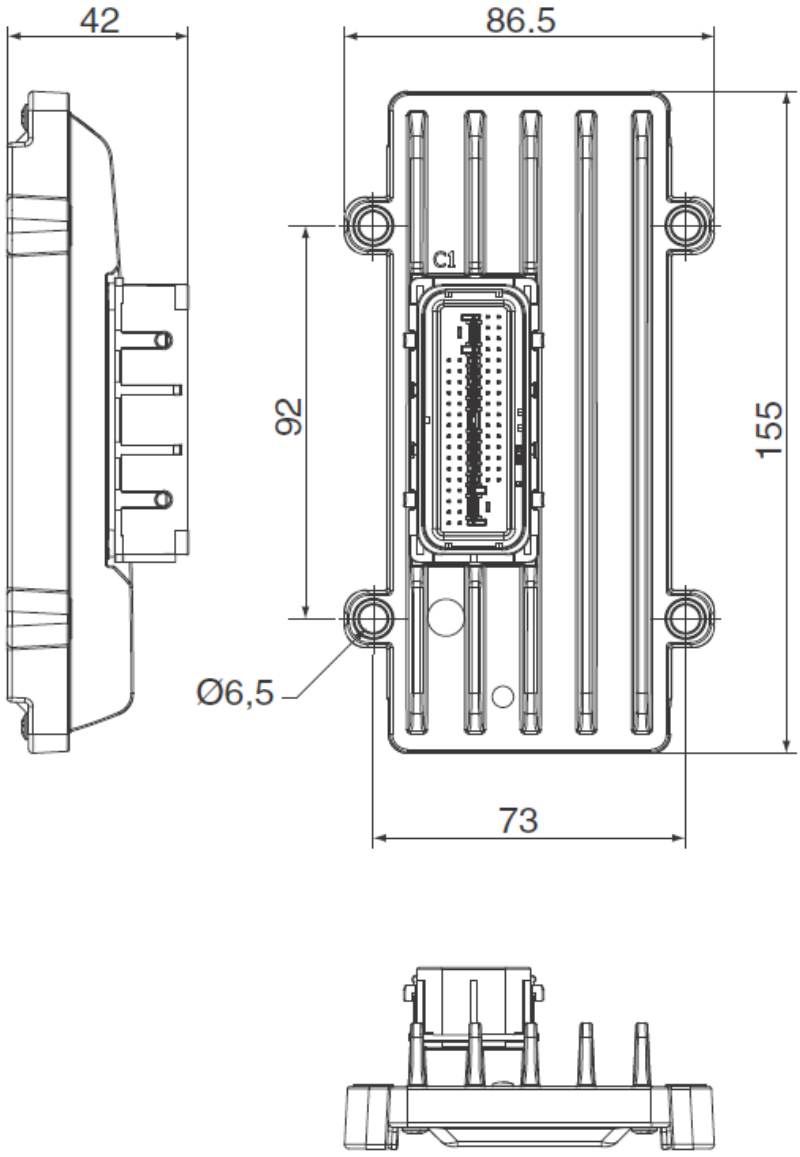
LED indicator showing different MC4x modes

Status	Flash (yellow)
Normal operation	
Application not loaded	
No application available	
Waiting for restart	

Error code	Error	Primary Flash (red) Error category	Secondary Flash (yellow) Error description
1:1	Output		
1:2	Input		
1:3	VREF		
2:1	Power supply		
2:2	Temperature		
3:1	CAN, no contact		
3:2	IDtag error		
3:3	System mismatch		
3:4	CAN error (bus off)		
4:1[a]	Internal error/OSE		
4:3[b]	Critical Stop		

a: This is followed by a longer sequence of flashes, contact Parker.
b: Possible cause of 4:3 error is reverse feed of voltafe on start-up

17 Appendix C - Dimensioning of the PCM module



Unit = mm

18 Appendix D - Ordering Codes

1450039
PCM (Pump control module)

20085124
Prototype installation cable C1: 66 pos. 2,5meters

20085100
G11 Bluetooth dongle for remote diagnostics

Adress and termination Tags
according to IQAN Accessorie catalogue

20085130
ID-Tag for Molex MX64 Connector with adress 0

20085148

Termination tag (120 Ω) for Molex MX64 Connector

19 Appendix E - reference documentation

Installation, start up and setup manual Series P2 / P3 Electronic Controls (eP2)	MSG30-2901-INST
eP2 catalogue	MSG30-2900
IQAN®-G11 Instruction book	MSG17-8416-IB/UK
IQAN®-G11 datasheet	HY33-8416/UK
IQAN® Accessories	MSG18-8319/UK

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

Please contact your Parker representation for a detailed ”Offer of Sale”.

For additional information, spare parts or service requirements please contact:

Parker Hannifin Manufacturing Germany GmbH & Co KG
Pump and Motor Division Europe
Neefestraße 96
09116 Chemnitz, Germany
Tel: +49 (0)371 - 3937 - 0
Fax: +49 (0)371 - 3937 - 488
Email: eP2-Support.PMD145@parker.com
parker.com/pmde

MSG30-2902-INST/UK