CODESYS

EtherCAT®

Electrohydraulic Control Module Series PACHC
Operation Manual

Bulletin MSG11-5715-720/UK

Parker

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1. Preface

1.1 Nonwarranty Clause

We checked the contents of this publication for compliance with the associated hard- and software. We can, however, not exclude discrepancies and do therefore not accept any liability for the exact compliance. The information in this publication is regularly checked, necessary corrections will be part of the subsequent publications.

1.2 Production Site

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1.3 Reference to Online Version

This manual is regularly updated. The latest version is available on our website www.parker.com/ISDE under “Support”.

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1.5 Copyright

2 Introduction

2.1 Device Assignment

This manual is valid for the following device:

- PACHC

2.2 Type Specification Plate PACHC

You will find the exact description of the device on the type specification plate:

Explanation of the type specification plate	
1	EtherCAT logo
2	QR code
3	CE conformity
4	UL certified
5	Manufacturer logo
6	Device name
7	Analogue inputs
8	Analogue outputs
9	Supported interfaces for position feedback sensor
10	Max. ambient temperature
11	Supply voltage
12	Pin assignment
13	Manufacturer address

Type specification plate on the right-side wall
Label with serial number on aluminum frame

2.3 Safety Instructions

2.3.1 Target Group of this Operation Manual

This instruction manual contains all information necessary for the use of the described product (control device, control terminal, software, etc.) according to instructions. It is written for design, project planning, servicing and commissioning experts. For proper understanding and error-free application of technical descriptions, instructions for use and particularly of notes of danger and warning, extensive knowledge of automation technology is compulsory.

2.3.2 Hazard and other Warnings

Please refer to the additional notices which we have marked by symbols throughout this instruction manual. While some of these notices make you aware of possible dangers, others are intended as a means of orientation. They are described further down below in descending order of importance.

Every alert and hazard warning is made up as follows:

Type and source of risk

Potential consequences of non-observance

→ Preventive measures

	**DANGER**
	A DANGER warning makes you aware of an immediately hazardous situation which will cause a serious or fatal accident if not observed.

	**CAUTION**
	A CAUTION alert makes you aware of a potentially hazardous situation which may cause an accident or damage to this or other devices if not observed.

	**NOTE**
	A NOTE makes you aware of a potentially hazardous situation which may cause damage to this or other devices if not observed.

2.3.3 General Hazards

The device described in this manual is designed in accordance with the latest technology and is safe in operation. Nevertheless, the device can entail certain hazards if used improperly or for purposes other than those explicitly intended.

Electronic, moving and rotating components can

- constitute a hazard for body and life of the user, and
- cause material damage

2.3.4 Designated Use

Parker's products are designed, developed and manufactured for standard industrial use. They must not be used for any other purposes than the ones specified in the catalogue or the associated technical documentation. Proper and safe operation depends on the products being transported, stored, lined up, mounted, installed, put into service, operated, and serviced correctly. Ambient conditions must be within the admissible limits. Notes and information in the associated documentation apply at all times.

The device is designed for operation in electric power drive systems (VDE0160). Motion sequences can be automated with this device. Several motion sequences can be combined by interconnecting several of these devices. Mutual interlocking functions must be incorporated for this purpose.

2.3.5 Safety-conscious Working

This device may be operated only by qualified personnel.

Qualified personnel in the sense of these operating instructions consists of:

- Persons who, by virtue to their training, experience and instruction, and their knowledge of pertinent norms, specifications, accident prevention regulations and operational relationships, have been authorized by the officer responsible for the safety of the system to perform the required task and in the process are capable of recognizing potential hazards and avoiding them (definition of technical personnel according to VDE105 or IEC364),
- Persons who have a knowledge of first-aid techniques and the local emergency rescue services.
- Persons who have read and will observe the safety instructions.
- Those who have read and observe the manual or help (or the sections pertinent to the work to be carried out).

This applies to all work relating to setting up, commissioning, configuring, programming, modifying the conditions of utilization and operating modes, and to maintenance work.

This manual and the help information must be available close to the device during the performance of all tasks.

2.3.6 Special Safety Instructions

- Check the correct association of the device and its documentation.
- Never detach electrical connections while voltage is applied to them.
- Safety devices must be provided to prevent human contact with moving or rotating parts.
- Make sure that the device is operated only when it is in perfect condition.
- Implement and activate the stipulated safety functions and devices.
- Operate the device only with the housing closed.
- Make sure that all devices are sufficiently fixed.

Project planning

- 24 V DC power supply: generate as electrically safely separated low voltage. Suitable devices include split-winding transformers built in compliance with European Standard EN 60742 (corresponds to VDE 0551).
- Power breakdowns or power fades: the program structure is to ensure that a defined state at restart excludes all dangerous states.
- Emergency-off installations must comply with EN 60204/IEC 204 (VDE 0113). They must be operative at any time.
- Safety and precautions regulations for qualified applications have to be complied with.
- Please refer to the notices of warning which, at relevant places, will make you aware of possible sources of dangerous mistakes or faults.
- Relevant standards and VDE regulations are to be complied with in every case.
- Control elements are to be installed in such a way as to exclude unintended operation.
- Lay control cables such that interference (inductive or capacitive) is excluded if this interference could influence controller operation or its functionality.

Maintenance and servicing

- Precautions regulation VBG 4.0 to be observed when measuring or checking a controller after power-up. This applies to § 8 (Admissible deviations when working on parts) in particular.
- Repairs must be carried out by specially trained Parker staff only. Warranty expires in every other case.
- Only use parts approved of by Parker. Only genuine Parker modules must be used in modular controllers.
- Modular systems: always plug or unplug modules in a power-down state. You may otherwise damage the modules or (possibly not immediately recognisably!) inhibit their functionality.
- Always dispose of (rechargeable) batteries as hazardous waste.

2.4 Electromagnetic Compatibility

Definition

Electromagnetic compatibility is the ability of a device to function satisfactorily in its electromagnetic environment without itself causing any electromagnetic interference that would be intolerable to other devices in this environment.

Of all known phenomena of electromagnetic noise, only a certain range occurs at the location of a given device. These kinds of noise are specified in the applicable product standards.

The design and immunity to interference of programmable logic controllers are internationally governed by standard IEC 61131-2 which, in Europe, has been the basis for EN 61131-2.

NOTE

Refer to IEC 61131-4, User's Guideline, for general installation instructions to be complied with to ensure that hardware interface factors and the ensuing noise voltages are limited to tolerable levels.

Interference emission

Interfering emission of electromagnetic fields, HF compliant to EN 55011, limiting value class A, Group 1

NOTE

If the controller is designed for use in residential areas, high-frequency emissions must comply with limiting value class B as described in EN 55011.

Fitting the controller into earthed metal cabinets and installing filters in the supply lines may produce a shielding compliant to the above standard.

General notes on installation

As component parts of machines, facilities and systems, electronic control systems must comply with valid rules and regulations, depending on their field of application.

General requirements concerning the electrical equipment of machines and aiming at the safety of these machines are contained in Part 1 of European Standard EN 60204 (corresponds to VDE 0113).

Electrical immission safeguard

To eliminate electromagnetic interference, connect the control system to the protective earth or functional earth conductor. Practice best cable routing.

Cable routing and wiring

Keep power circuits separate from control circuits:

- DC voltages 60 V ... 400 V
- AC voltages 25 V ... 400 V

Joint laying of control circuits is allowed for:

- shielded data signals
- shielded analogue signals
- unshielded digital I/O lines
- unshielded DC voltages < 60 V
- unshielded AC voltages < 25 V

Location of installation

Ensure that temperatures, contaminations, impact, vibration or electromagnetic interference are no impediment to the installation.

Temperature

Consider heat sources such as general heating of rooms, sunlight, heat accumulation in assembly rooms or control cabinets.

Contamination

Use suitable casings to avoid possible negative influences due to humidity, corrosive gas, liquid or conducting dust.

Impact and vibration

Consider possible influences caused by motors, compressors, transfer lines, presses, ramming machines and vehicles.

Electromagnetic interference

Consider electromagnetic interference from various local sources: motors, switching devices, switching thyristors, radio-controlled devices, welding equipment, arcing, switched-mode power supplies, converters/inverters.

Special sources of interference

Inductive actuators

Switching off inductances (such as from relays, contactors, solenoids or switching magnets) produces surge voltages. It is necessary to reduce these extra voltages to a minimum.

Throttling elements could be diodes, Z-diodes, varistors or RC elements. Their rating should conform to the specifications provided by the manufacturer or supplier of the actuators.

3. System Description

3.1 PAC

Parker PAC is a system of control I/O modules for interconnecting the process signals in an EtherCAT network.

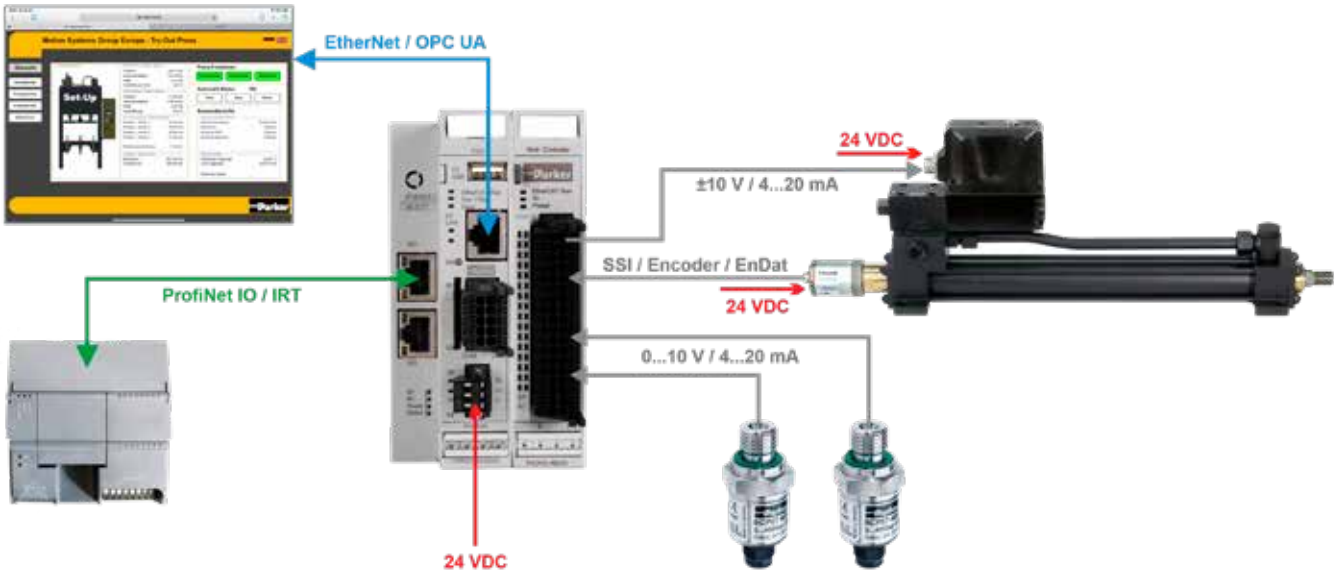
3.2 Development Environment CODESYS V3.5

For operation of PACHC, development environment CODESYS 3.5 with actual Service Pack is required. The version to be used is available for download on the PACHC product page.

4. Product Description

4.1 PACHC

The PACHC is a controller module for high-dynamic and precise control of 1-2 hydraulic axes. It was developed for operation at the Parker Automation Controller (PAC). The device is an EtherCAT slave and is operated at the Parker E-Bus. In conjunction with the bus coupler PACIO-400-00 it can be used in a standard EtherCAT network.



The PACHC is connected to local analogue sensors like pressure and force sensors and digital position feedback systems for reading actual values. Hydraulic valves are controlled via the analogue outputs.

Properties:

- Position, force and pressure control for 1-2 axes
- Sampling time 250 µs
- Digital interfaces for position feedback systems (SSI, Encoder TTL/HTL/RS422, EnDAT)
- Inputs: 2 x 0…10 V
  optional 2 x 0/4...20 mA
- Outputs: 2 x 0...10 V, -10 V, +10 V
  optional 2 x 0/4...20 mA
- Fail-safe storage of all device parameters in Flash
- Library with comprehensive motion functions

4.2 Contents of Package

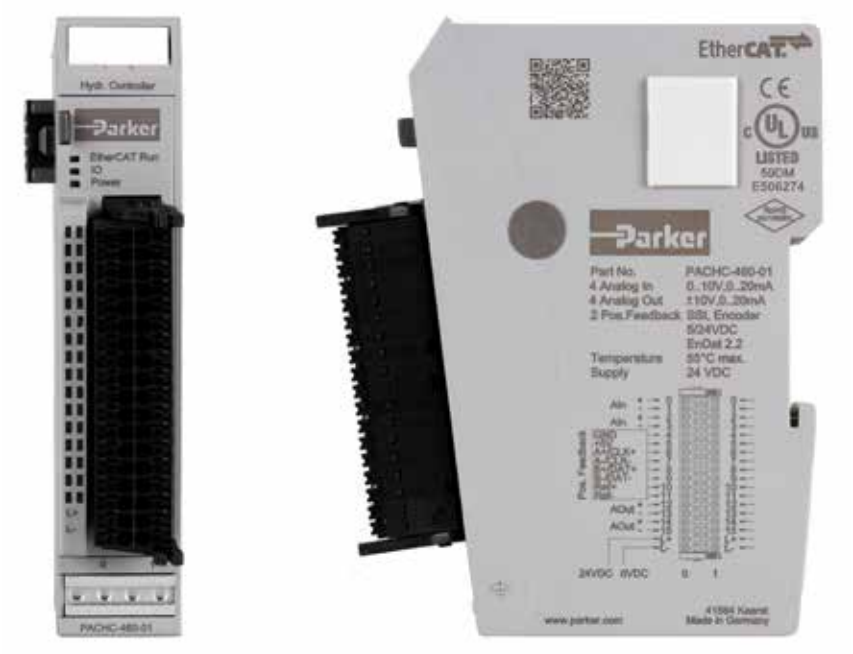
The PACHC package includes:

- PACHC
- Connector

4.3 Intended Use

The unit is solely permitted for use in fully enclosed control cabinets or rooms. Exhaust heat develops down the side of unit, i.e. at the aluminium heat sink. Verify that the place of installation is ventilated properly.

4.4 Front and Side View



4.5 Connectors

While all external connectors plug in at the front of the unit, the connection to a PAC120/PAC340 system is via the EtherCAT E-bus interface on the left side. Additional PACHC and PACIO modules can be connected via the right EtherCAT E-bus interface under the removable cover.

Pin row 0	Assignment	Alternatively function		Assignment	Pin row 1
		SSI	EnDAT		
0	AIN_I/U_0+			AIN_I/U_2+	0
1	AIN_I/U_0-			AIN_I/U_2-	1
2	AIN_I/U_1+			AIN_I/U_3+	2
3	AIN_I/U_1-			AIN_I/U_3-	3
4	Supply voltage position feedback system 0 V			Supply voltage position feedback system 0 V	4
5 [1)]	Supply voltage position feedback system 5 V / 150 mA			Supply voltage position feedback system 5 V / 150 mA	5 [1)]
6	Encoder_0_A+	SSI_CLK+	EnDAT_CLK+	Encoder_1_A+	6
7	Encoder_0_A -	SSI_CLK-	EnDAT_CLK-	Encoder_1_A -	7
8	Encoder_0_B+	SSI_DAT+	EnDAT_DAT+	Encoder_1_B+	8
9	Encoder_0_B -	SSI_DAT-	EnDAT_DAT-	Encoder_1_B -	9
10	Encoder_0_N+		EnDAT_CNT+	Encoder_1_N+	10
11	Encoder_0_N -		EnDAT_CNT-	Encoder_1_N -	11
12	AOUT_I/U0+			AOUT_I/U2+	12
13	AOUT_I/U0-			AOUT_I/U2-	13
14	AOUT_I/U1+			AOUT_I/U3+	14
15	AOUT_I/U1-			AOUT_I/U3-	15
L+	L+ 24 VDC			L+ 24 VDC	L+
L-	L- 0V			L- 0V	L-

[1)] The 5V supply voltage for the position control is only present at pins 0-5 and 1-5 if a digital encoder is configured.

4.6 Indicators and Controls

4.6.1 Indicators

The status LEDs indicate the status of the PACHC module.

EtherCAT Run

Status	LED flash code	Explanation
Init	off	Status: Initialising, no data exchange
Pre-Op	off/green 1:1	Status: Pre-operational, no data exchange
Safe-Op	off/green 5:1	Safe operation, inputs readable
Op	green, on	Operational, unrestricted data exchange

Device status

Status	LED flash code	Explanation
Ok	green, on	No error
Error	flashing red	Connection error
Start, error	red, cont. light	Module not initialized

Power supply

Status	LED flash code	Explanation
On	green	24 V DC available
Off	off	24 V DC not available

Analogue inputs

Status	LED flash code	Explanation
Ok	green, on	No error
Error	red	Connection error, outside of the permissible value range

Digital position control systems

Status	LED flash code	Explanation
On	green	Input signal high
Off	off	Input signal low

Analogue outputs

Status	LED flash code	Explanation
On	green	Analogue output active
Off	off	Analogue output inactive

5. Operation

This chapter describes the configuration and commissioning for the operation of the PACHC on a PAC module.

5.1 Installation

5.1.1 Mechanical Installation

→ PAC120 / PACHC / PACIO modules are intended for mounting rail installation (DIN EN 50022, 35 mm x 7.5 mm).

<u>To snap on a single module</u>

→ Push up the module against the mounting rail from below, allowing the metal spring to snap in between mounting rail and mounting area as illustrated.

→ Push the module against the mounting wall until it snaps in.

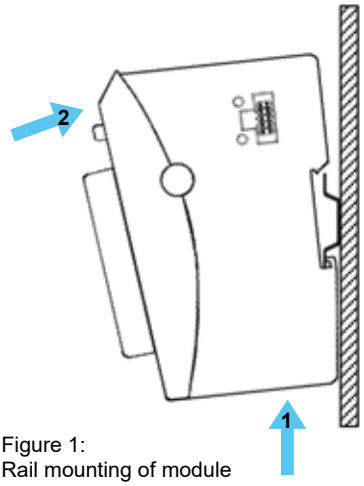


Figure 1:
Rail mounting of module

<u>To interconnect two modules</u>

→ After snapping on the first module to the rail, snap on the second module about 1 cm away towards the right of the first module.

→ Push the second module along the rail towards the first module until you hear the locking device snap in.

<u>To disconnect two modules</u>

→ Push down the unlock button (see Figure 2) of the module that you wish to disconnect from the module to the left of it.

→ Push both modules away from one another until they are about 1 cm apart.

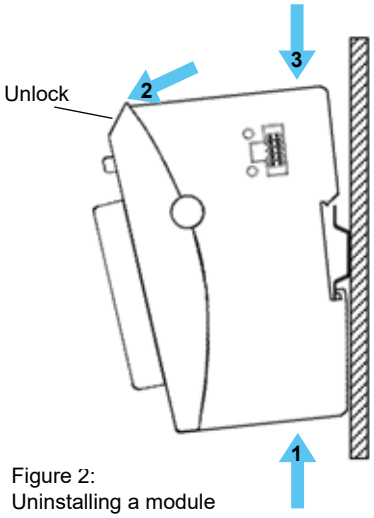


Figure 2:
Uninstalling a module

<u>To take down a single module</u>

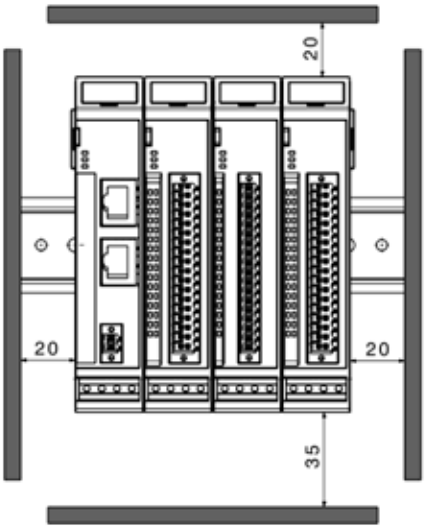
→ Push the module up and against the metal spring located on the underside of the rail guide.

→ Tip the module away from the rail as shown in the illustration.

→ Pull the module down and out of the mounting rail.

Installation position

The mounting rail is mounted horizontally, the socket connectors of the modules face forward. To ensure sufficient ventilation through the convection slits of the modules, the minimum distance of 20 mm upwards and 35 mm downwards to neighbouring units and control cabinet surfaces must not be undercut. The lateral distance to third-party devices and control cabinet surfaces must not be less than 20 mm.



NOTE

Order of modules in the PAC system

To ensure smooth functioning of the entire PAC system, arrange the PAC modules according to their E-bus load so that the modules with the greatest E-bus load are arranged directly after the head module (bus coupler or controller). Observe the maximum bus load of the head module.

5.1.2 Electrical Installation

CAUTION

Dangerous failures due to incorrect power supply

The unit can be damaged or destroyed by an incorrect voltage supply and dangerous failures can occur.

Measures to avoid:

→ For the 24 V DC supply of controllers or bus couplers, we recommend using PELV/SELV-capable power supply units in accordance with EN50178 or EN60950-1.
→ If the power supply is earthed (PELV system), only an earth connection with GND is permissible. Earthing variants in which the earth is connected to +24 V are not permitted.
→ Furthermore, you must note that only a maximum voltage U max. < 33 V may act on these modules, even in the event of a fault. If you cannot exclude this risk, external fusing of the power supply is mandatory..
→ To ensure trouble-free operation, the supply lines of a PAC module block must be laid in a star configuration with the shortest possible lines from a central supply connection.

Earthing

Connect the PACHC modules to earth by attaching the metal housing to functional earth.

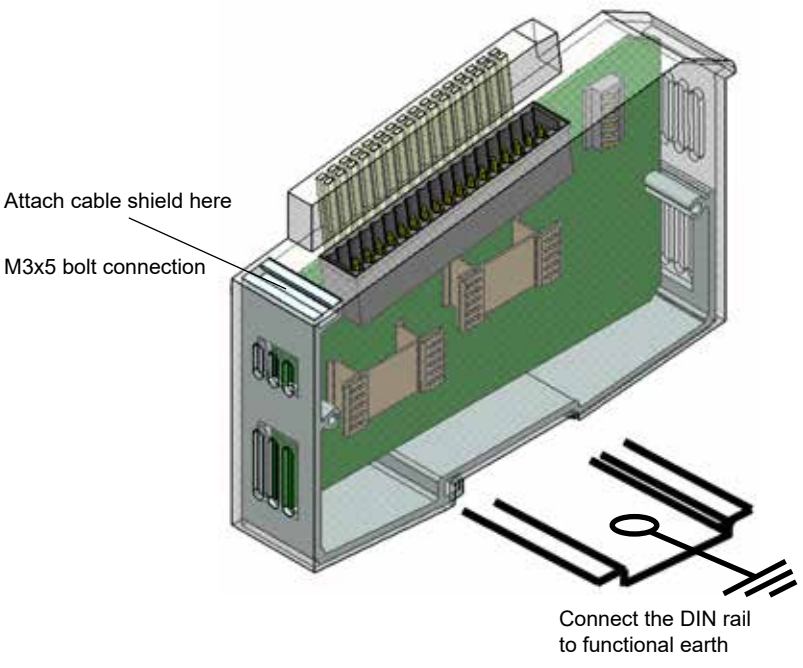
Since the functional earth connector dissipates HF currents, it is of utmost importance for the module's noise immunity.

HF interference is dissipated from the electronics board to the metal housing. The metal housing therefore needs to be suitably connected to a functional earth connector.

You will normally have to ensure that

- the connection between module housing and DIN rail conducts well,
- the connection between DIN rail and switching cabinet conducts well,
- the switching cabinet is safely connected to earth.

In special cases, you may attach the earth wire straight to the module.



Note

Earth wires should be short and have a large surface (copper mesh). Refer to http://en.wikipedia.org/wiki/ground_(electricity) for further details

Module interconnection

The PACHC modules electrically connect by completely pushing the modules together. This automatically connects them to the EtherCAT bus system and supplies power to the EtherCAT communication modules. PAC120 is always the first module of a PACHC/PACIO block.

Please note that the power supplied by PAC120 limits the number of PAC modules you may connect to a single block.

Logic Power Supply (24 V DC)

Power to the logic circuitry is supplied through lines L+ and L- of the module plug.

!	**CAUTION**
	Risk of electric voltage Supply voltages outside of the admissible range may destroy the unit. → Before turning on the supply voltage, verify that it is within the admissible voltage range.

5.2 Development Environment CODESYS V3.5

Installing CODESYS V3.5 on the Project Engineering PC

CODESYS V3.5 is based on a CODESYS V3 runtime system and is a device-independent system for programming control units. It conforms to standard IEC 61131-3 and supports all standardized IEC programming languages plus the integration of C code routines and object-orientated programming.

In conjunction with runtime system CODESYS Control Win V3 it also allows the use of "multi-device" and "multi-application" programs. Owing to its component-based architecture, it supports customer-specific configurations of and extensions to the user interface.

Before installing CODESYS V3.5, please read and take note of the system requirements:

Windows XP / 7 / 8 / 10, appropriate PC hardware matching the Windows version installed.

Device Description

Before the IEC 61131-3 development tool CODESYS V3.5 can be used to operate a device, the device and its properties are to be made known to the runtime system.

A separate plug-in, the Device Repository, provides the local system and your projects with the device definition management functions. Among other features, it contains commands of category devices which you will normally find in the Tools menu.

→ Open the Tools menu and pick Device Repository...
→ Screen Device Repository is displayed
→ Expand the tree with the name “Control Units (PLC)”

The Device Repository hosts the descriptions of all devices currently installed on the local system and makes the devices available for programming in CODESYS. Devices are installed in and uninstalled directly from the Device Repository.

The screen “Device Descriptions Installed” displays the “Name”, “Vendor” and “Version” of every device that is currently installed. Click on the plus and minus signs to expand or collapse the "branches".

5.2.1 Installing Device Descriptions and Libraries via Package

The required device descriptions and libraries as well as sample programmes and application templates for the PAC120 and other PAC modules such as the PACHC are combined in a package and can be installed together. This simplifies handling considerably compared to the steps in 6.1.1 and 6.1.2.

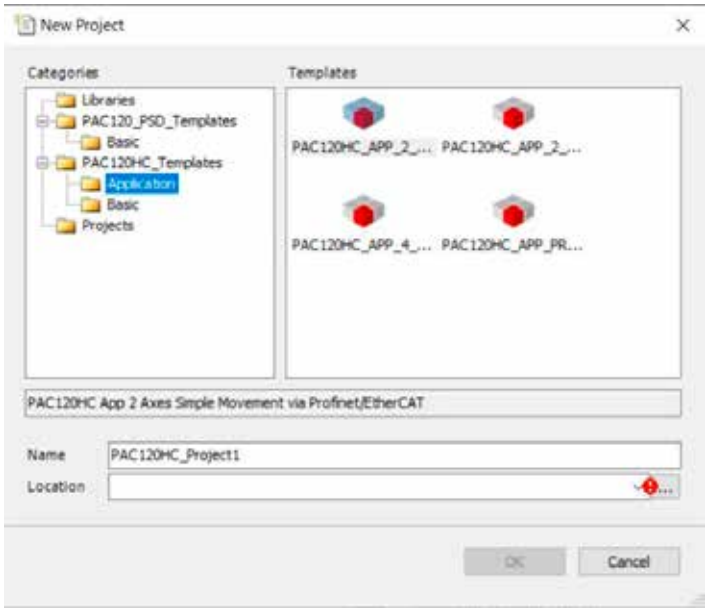
For installation, the package manager must be available within CODESYS and must be installed from the CODESYS homepage if necessary.

→ Open the 'Package Manager' in the 'Tools' menu.
→ Click on 'Install'
→ Select the package file on your computer and click on Open.

The PAC120+PACHC package can be found on the product homepage

http://www.parker.com/PAC120

The sample programs (templates) can be opened under "New Project" after the package has been installed.



The corresponding tree structure with the associated devices is already preconfigured in the templates.

5.2.2 Installing Device-specific Libraries

Similar to the device description files, CODESYS keeps libraries in a dedicated repository, i.e. the Library Repository in this case. The following device-specific libraries are available for PACHC:

- PKR_PACHC
- SM3_Drive_ETC_Parker_HydraulicControl_Itfs

→ Open the Tools menu and pick Library Repository

→ The Library Repository dialog is displayed

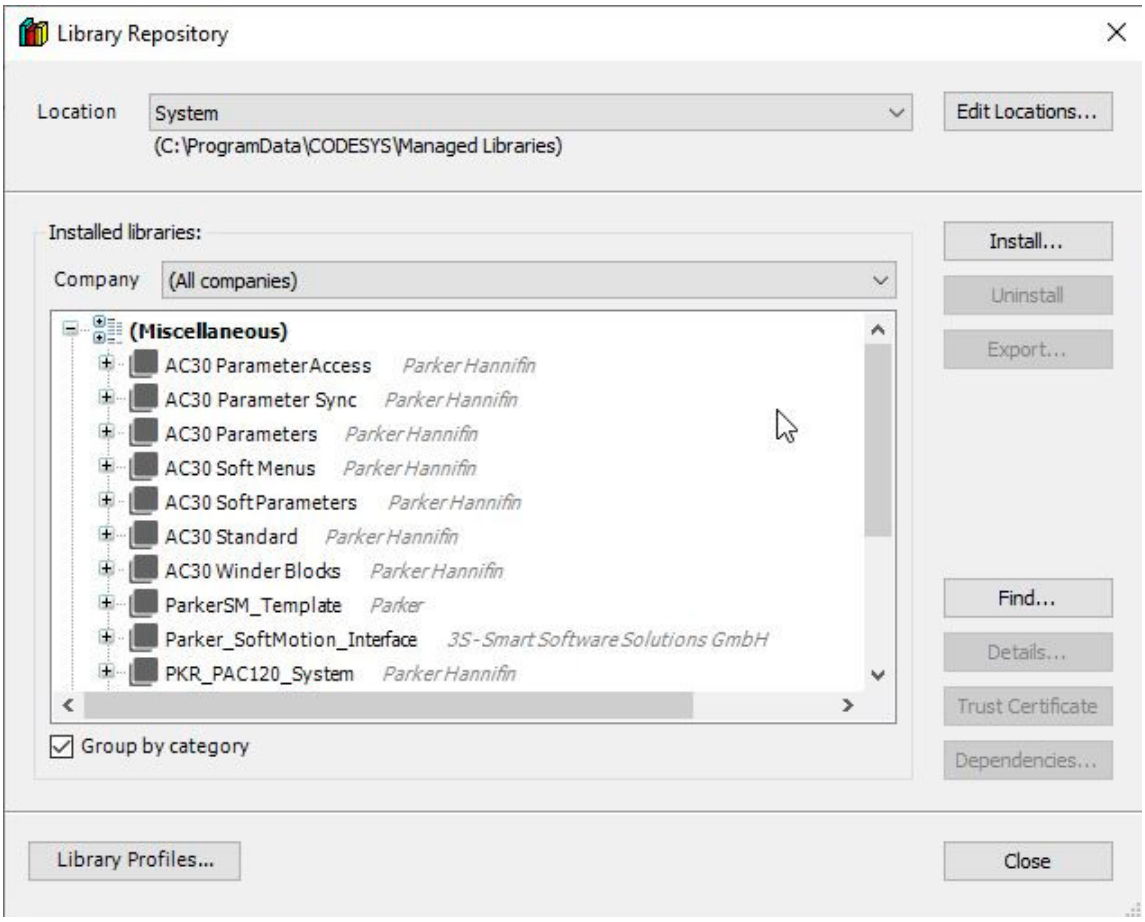


Figure: Library Repository

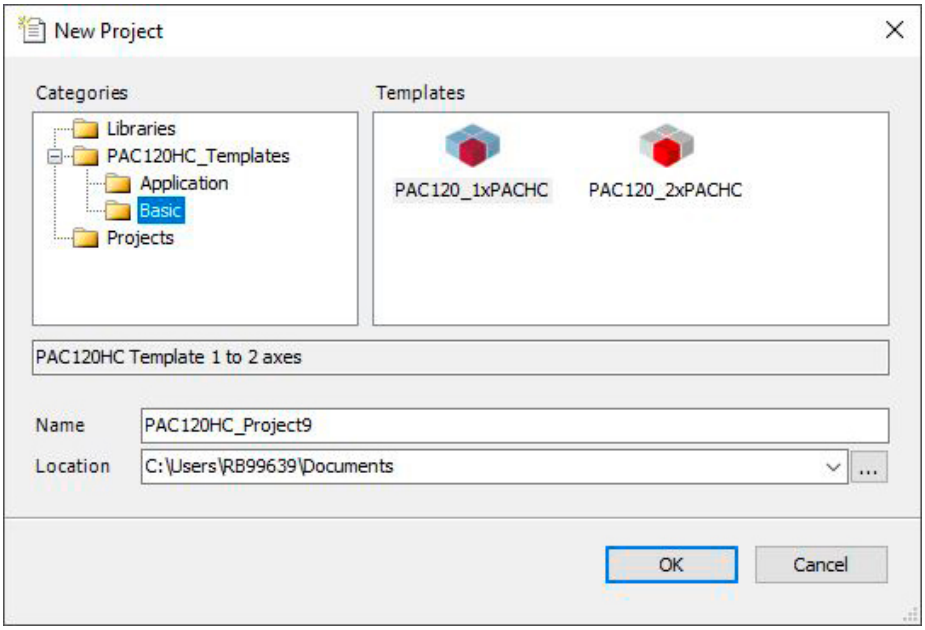
Click on “Install”... to install a new library in the local system and make it available for use in the programming system.

Browse to the location where your libraries are saved. The default filter is “Compiled Libraries” (*.compiled-library) which is the format in which libraries are normally made available. Choose the library you wish to install and click on “Open”. Once installed, the library will appear on the tree “Installed Libraries”.

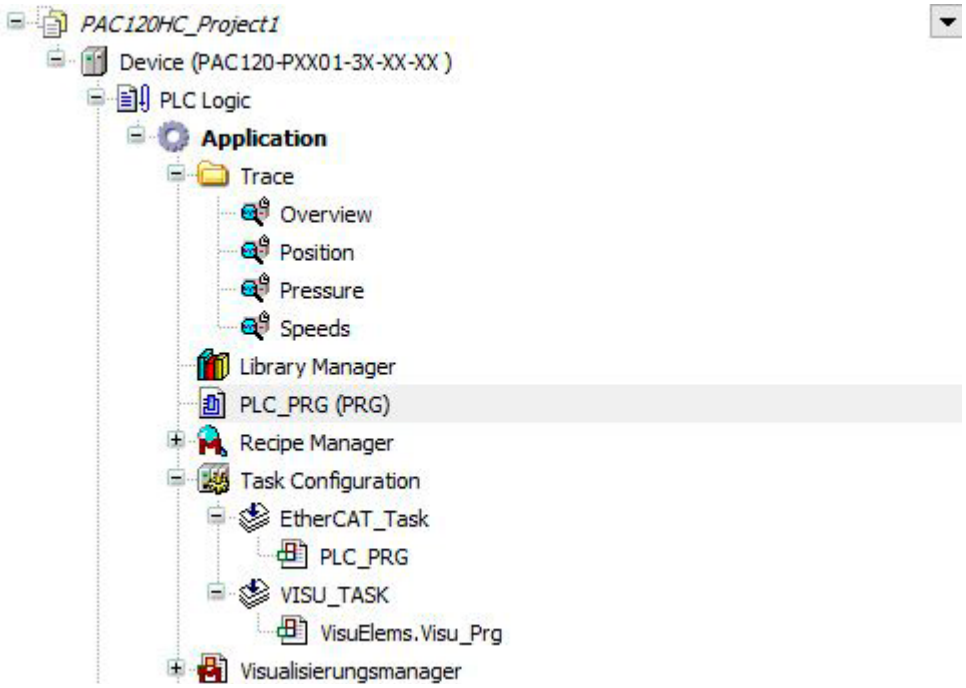
5.2.3 Using the Project Templates

The PAC120HC package on the Parker website for the PAC contains project templates for various applications that can be used as a starting point for your own programme development.

The templates from the PAC120HC package are displayed under File New Project.



In the project template, the complete device tree consisting of one PAC120 and one PACHC (PAC120_1xPACHC) or one PAC120 and two PACHCs (PAC120_2xPACHC) is already included and no longer needs to be created manually. In addition, the template also adds the visualisation for the PACHC set-up and trace settings to the application.

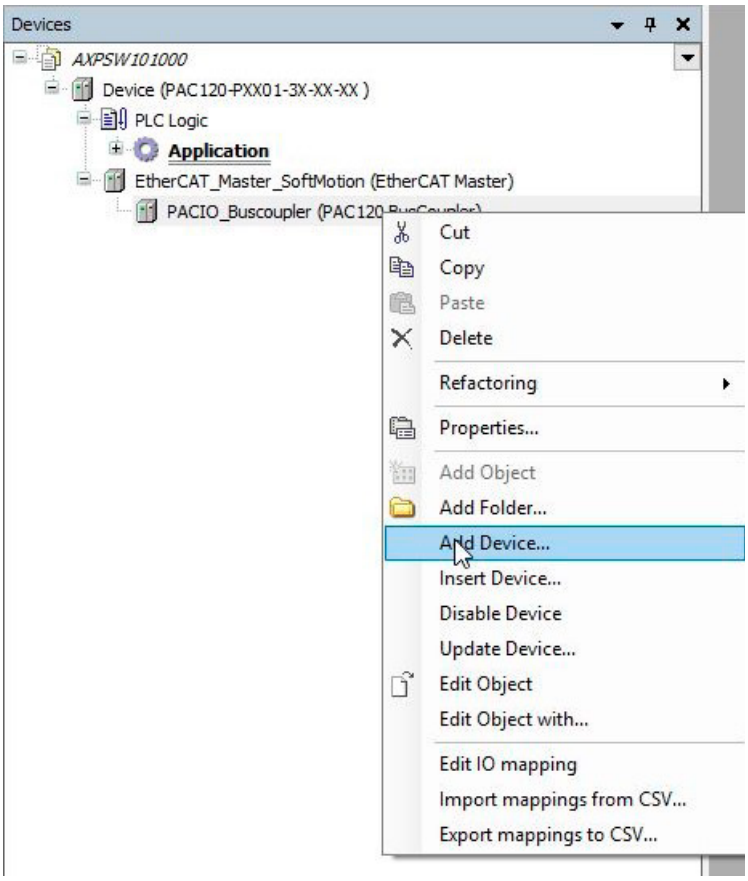


How the device tree is set up without a template and how further components can be added to it is described in the following chapter.

5.2.4 Adding PACHC (offline)

EtherCAT devices can also be added offline.

- Click with the right mouse button on the device “PAC120_BusCoupler”
- Select option “Add Device”



- Select Parker Hannifin as vendor and select the Hydraulic Controller (PACHC-460-01). Then click “Add Device”.
- The PACHC module will be added to the project tree and the required libraries will be installed. Additionally, two axes with the name “Parker_HydraulicControl_x” are created and inserted into the object tree below the device. If you click with the right mouse button on the axes and select “Rename” you can change the name. These axis names will be used in the application program as reference for the function blocks and for accessing to axis objects.

If you want to use the 3S SoftMotion, select “Hydraulic Controller Softmotion drives (PACHC-460-01)” instead of “Hydraulic Contoller (PACHC-460-01)”. In this case both axes are named „SM3_Drive_ETC_Parker_HydraulicControl_x”.

5.2.5 Communication

PACHC is completely parameterized and operated via the EtherCAT interface. The device does not have an additional interface so that all parameters required during the configuration or for the runtime of the IEC program are exchanged via the bus interface. The application program can access all PACHC parameters via SDOs and PDOs.

All parameters can be stored fail-safe on the device. This requires an additional storage command.

Parameters can be read and written either directly in the development environment via the configuration tool or via parameter lists (recipes).

The most important input and output values are transmitted cyclically. The default mapping contains all important values. Values which are not included in the PDO mapping are transmitted as SDOs only if necessary. CAN over EtherCAT (CoE) is the protocol being used.

PACHC supports device profile CiA 402: Device profile for drives and motion control. In addition to the objects according to CiA 402, further manufacturer-specific objects are implemented which are required for the functions of the Parker library PACHC.

5.2.6 Control Values

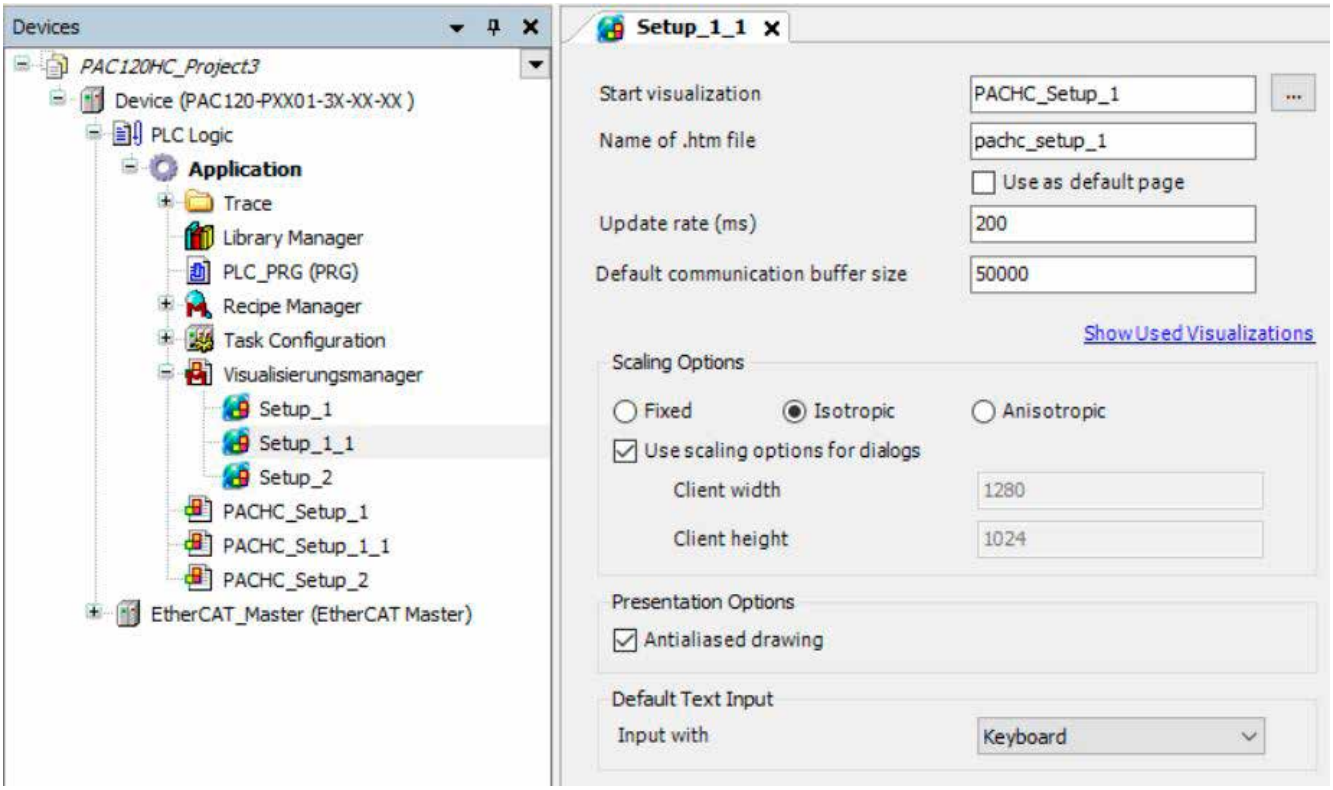
For controlling the PACHC, control value like e.g. command values from the PAC or a comparable EtherCAT Master controller are cyclically transmitted to the PACHC. These values are marked with the prefix Rx.

5.2.7 Status Values

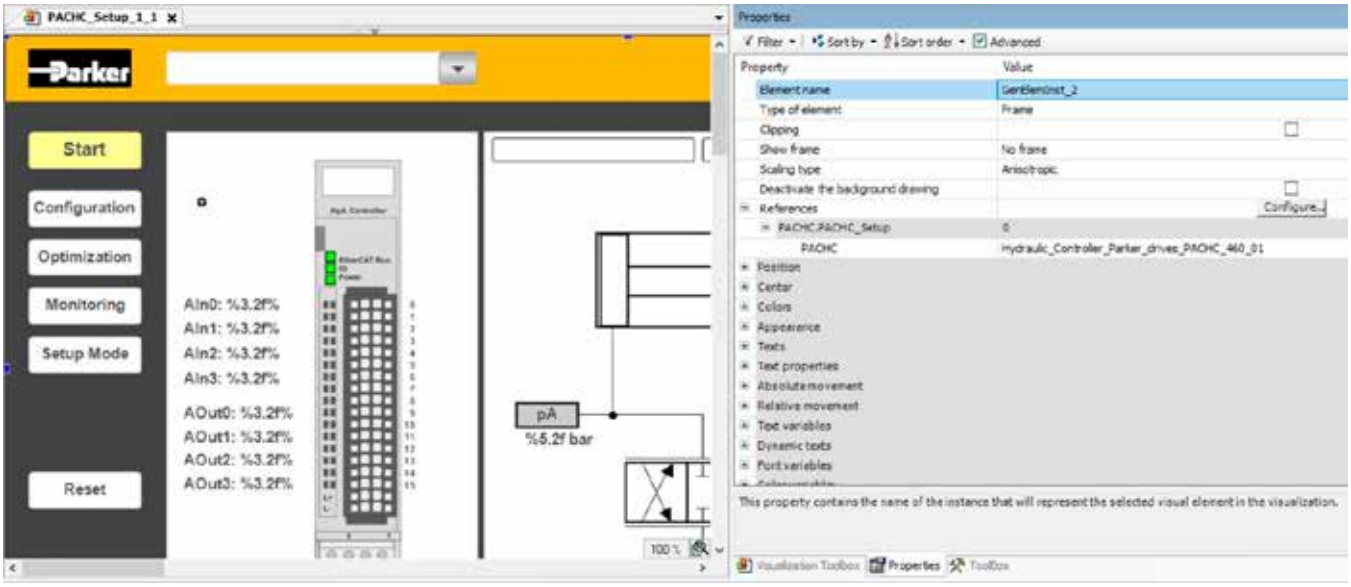
Status values are values which describe a certain status or condition of the device respectively drive. All parameters sent from the PACHC to the EtherCAT Master contain the prefix Tx.

5.3 Configuration

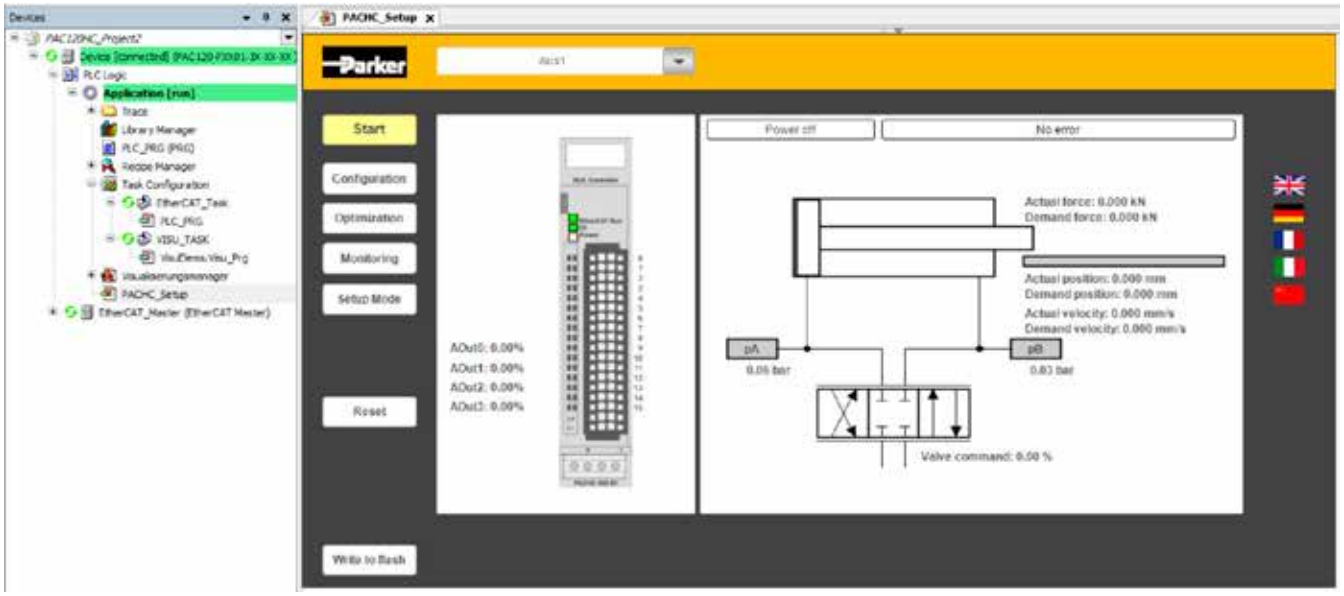
Configuration and setup of the hydraulic axes connected to the PACHC is carried out via the PACHC_Setup visualization page. When using the sample programs as described in Chapter 5.2.1, the PACHC_Setup visualization page is already created (in a sample program with two PACHC modules, two pages, PACHC_Setup_1 and PACHC_Setup_2, are created accordingly). If several PACHC modules are used, the necessary additional configuration interfaces can be added as follows: Duplicate the visualization page from the sample program by copying and pasting it back under "Application". Similarly, duplicate the existing WebVisu under "Application Visualization Manager". Then select the previously added visualization under "Start visualization" and change the name of the website.



The link to the corresponding PAC module is created by double-clicking anywhere in the opened visualization. The "Properties" window is displayed on the right, where you can enter the name from the device tree under "Referenced visualizations" or select it by double-clicking in the menu.



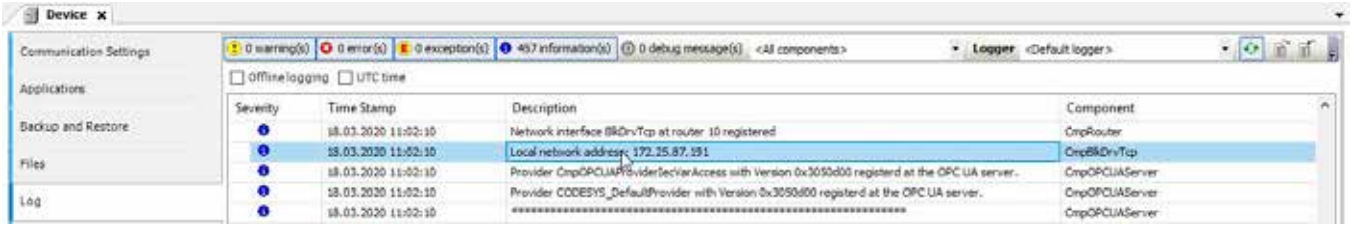
The configuration interface can be used either within CODESYS or via a standard web browser.



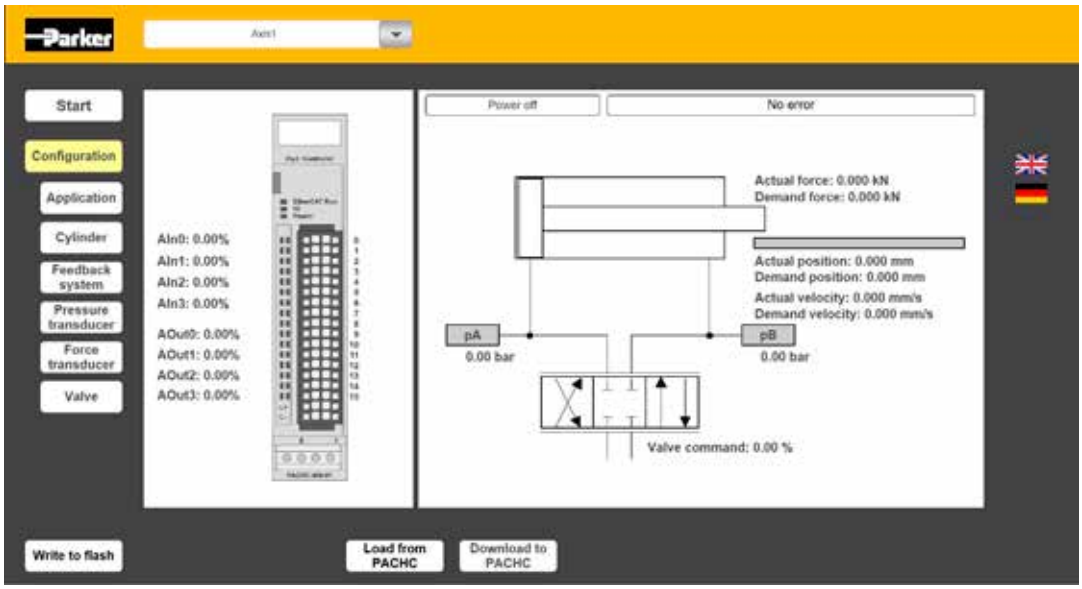
To use the configuration page within CODESYS, connect to the PAC120/340 and open the inserted visualization from the project tree with a double-click.

In the web browser, enter the IP address '8080/name_of_website.htm' to launch the configuration page. The address of the PAC120 or PAC340 used must be entered as the IP address. With the permanently stored IP address in the delivery state, this would be **http://169.254.116.116:8080/pachc_setup.htm**, for example

The IP address can be read out in CODESYS (Device → Log). The factory setting of the IP address can be found in the respective PAC device documentation.



In both cases, there must be an active project on the PAC120/340 and the device must be in the Run status. An example program can be loaded as a template from the product homepage https://ph.parker.com/de/de/electrohydraulic-control-module-series-pachc.
To start configuring the PACHC, click the "Configuration" button.



If an existing device configuration is to be changed, it must first be read. All setting values are read from the device with the "Load from PACHC" button.

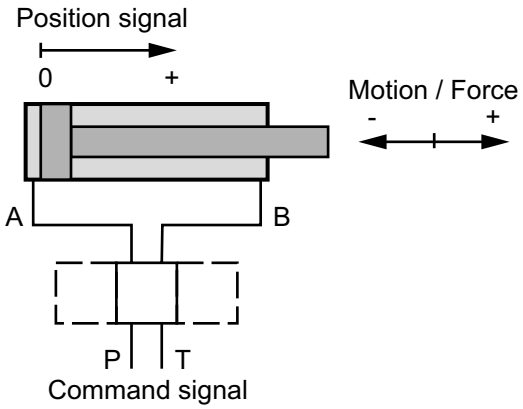
The individual configuration steps are described below.

5.3.1 Unit

All values are displayed, as far as meaningful, in physical units. Metric system with units bar, kg, m, mA, N and V is used.

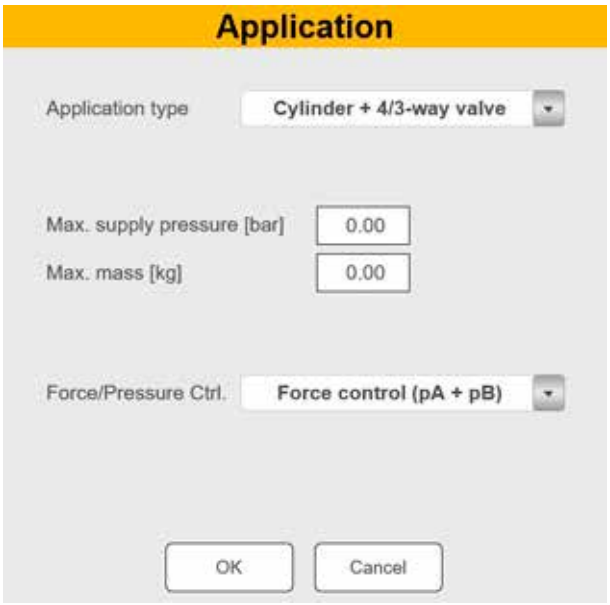
5.3.2 Direction Sense

The direction sense of the PACHC was defined that the cylinder extends at increasing displacement signal. For this purpose, one volume flow is directed to the larger area of cylinder (A) and a volume flow drains from the smaller area (B). If the larger area of the cylinder (A) is pressurized and the smaller area (B) is relieved, the cylinder generates a positive force.
In both cases the valve opens P to A and B to T at a positive command signal.



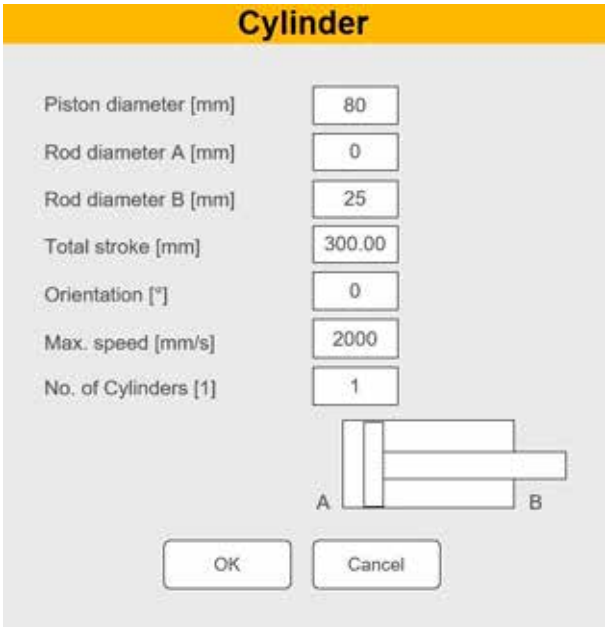
The direction of the position measuring system and the valve can be changed in the configuration so that the behavior corresponds to the above definition.

5.3.3 Application



Application type	The application type selects the representation of the hydraulic system in the configuration tool
Max. supply pressure	Value describes maximum supply pressure during normal operation. It is used to calculate the maximum velocity gain of the valve
Max. mass	This value defines the maximum mass including piston rod to be moved by the cylinder. Value is needed for the natural frequency calculation of the axis.
Force-/pressure controller	Via this drop-down menu the type of force-/pressure controller is selected. Either force, differential pressure depending on area ratio or pressure pA or pB can be controlled.

5.3.4 Cylinder



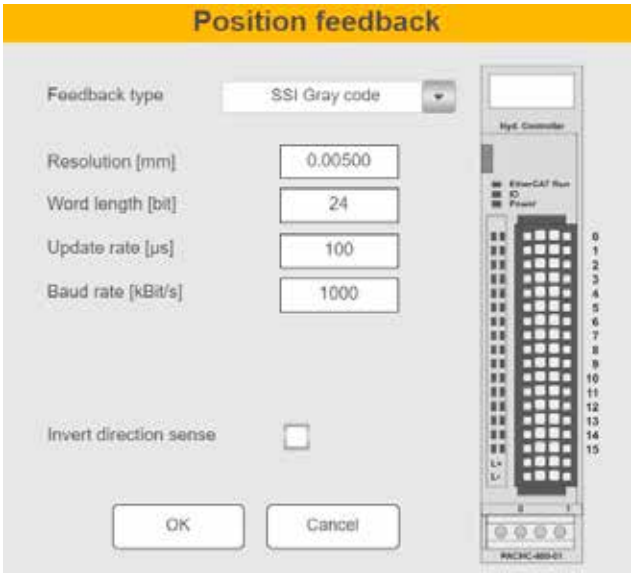
Piston diameter [mm]	Value indicates piston diameter of the cylinder.
Rod diameter A [mm]	Value indicates rod diameter on the side with larger cylinder area. For differential cylinders value is zero.
Rod diameter B [mm]	Value indicates rod diameter on the side with smaller cylinder area.
Total stroke [mm]	Value indicates max. cylinder stroke. The actual value is usually significantly smaller.
Orientation [°]	Value indicates the cylinder orientation angle in degrees. 90° means that the cylinder in a vertical position and the piston rod (side B) is facing up.
Max. speed [mm/s]	Value indicates the max. permissible cylinder speed. During operation, PACHC is monitoring the set and actual cylinder speed. If the permissible speed is exceeded by more than 10 %, PACHC triggers an error reaction.
No. of cylinders	If several cylinders are operated in parallel on an axis, the number of cylinders can be inserted here. PACHC calculates the total area which is used for the calculation of force based on the number of cylinders and the indicated diameters. Default value is “1”.

5.3.5 Position Feedback System

Encoders with the following interfaces can be used as position feedback system:

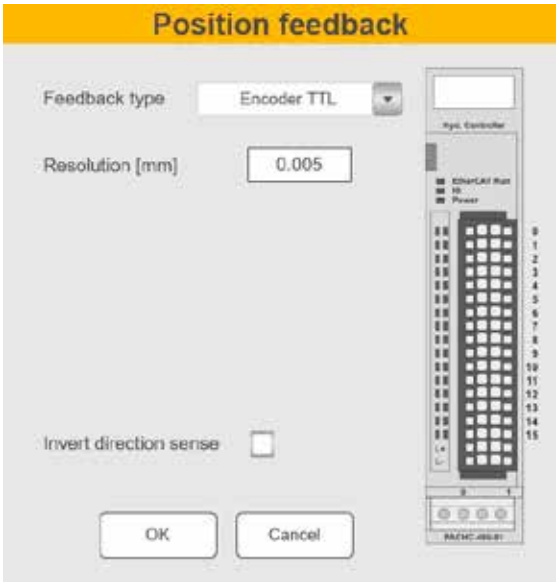
- SSI Binary
- SSI Gray Code
- Encoder TTL
- Encoder HTL
- Encoder RS422
- EnDat 2.2
- Analog
- EtherCAT (via Master)

5.3.5.1 SSI Binary / SSI Gray Code



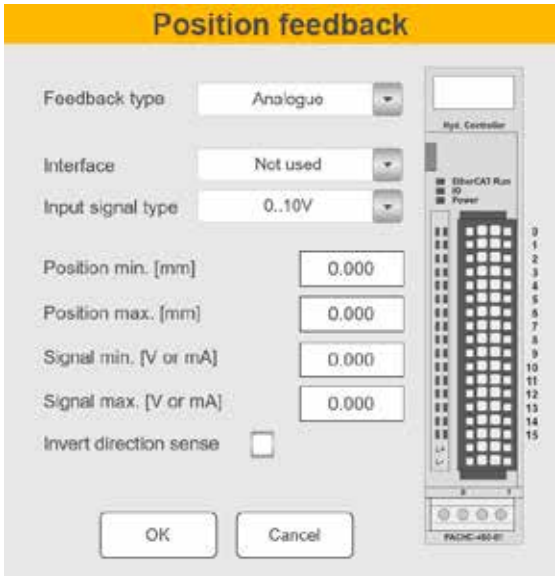
Resolution	Indicates the conversion factor length unit per increment of the position feedback system.
Word length	Indicates the telegram length of the encoder in Bit.
Update rate [µs]	The update rate defines the timing of the data transmission between encoder and PACHC.
Baud rate [kbit/s]	Determines the data transmission rate between encoder and PACHC.
Direction sense	Invert direction sense. If the movement direction deviates from the predefined direction sense, it can be inverted via the parameter Invert Direction sense. Value “1” means that inversion is activated.

5.3.5.2 Encoder TTL / Encoder HTL / Encoder RS422



Resolution	Indicates the conversion factor length unit per increment of the position feedback system. With encoders TTL and HTL, PACHC analyzes all 4 edges of the measuring tracks and calculates the sensor signal internally with a four times higher resolution.
Direction sense	Invert direction sense If the movement direction of the position feedback system deviates from the predefined direction sense, it can be inverted via the parameter Invert Direction sense. Value “1” means that inversion is activated.

5.3.5.3 Analogue Encoder

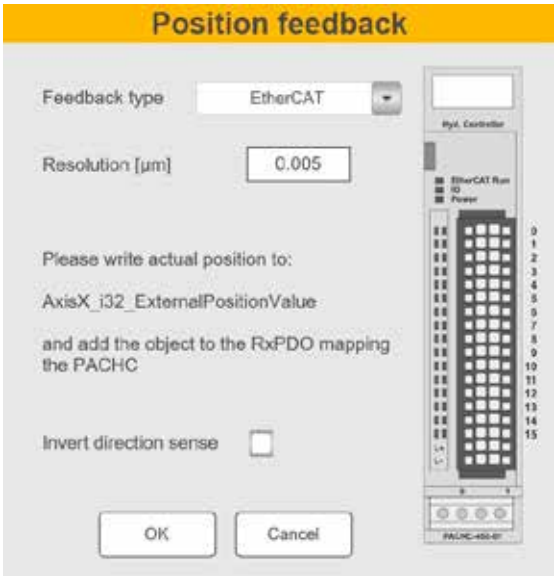


Interface	Analogue interface to which the sensor is connected.
Input signal type	Signal type of the sensor output signal. Current and voltage sensors can be used.
Position min. [mm]	Minimum feedback position
Position max. [mm]	Maximum feedback position
Signal min. [mA or V]	Minimum feedback system output signal
Signal max. [mA or V]	Maximum feedback system output signal
Direction sense	Invert direction sense If the movement direction of the position feedback system deviates from the predefined direction sense, it can be inverted via the parameter Invert Direction sense. Value “1” means that inversion is activated.

5.3.5.4 EtherCAT Encoder

It is possible to transmit the actual position also directly via the EtherCAT bus from EtherCAT Master to the PACHC.

	Note
	Please note that the actual value is delayed if the actual position is transmitted via the EtherCAT bus. This delay has a negative impact on the overall dynamic of the control axis and thus on the position and/or force/pressure control.



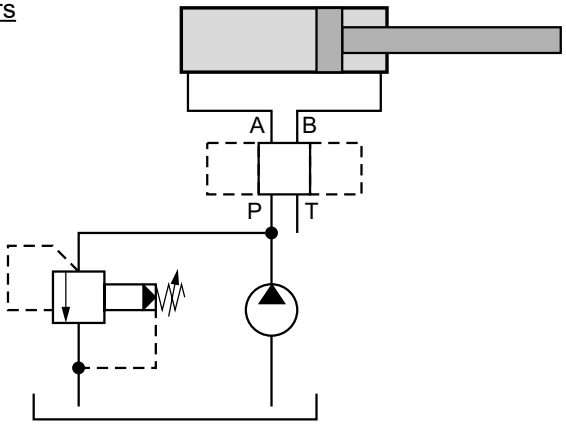
Resolution	Indicates the conversion factor length unit per increment of the position feedback system. Typically, the actual position is transmitted via the EtherCAT bus in unit mm so that resolution = 1 can be selected.
Direction sense	Invert direction sense If the movement direction of the position feedback system deviates from the predefined direction sense, it can be inverted via the parameter Invert Direction sense. Value “1” means that inversion is activated.

5.3.6 Pressure Sensors

Pressure sensors can be used for pressure or force control. If pressure sensors are used for force control, the resulting force is calculated on the basis of cylinder area A and B and the pressures in the cylinder chambers pA and pB.

Up to 4 pressure sensors per axis can be parameterized. The logical assignment is shown in the following figure.

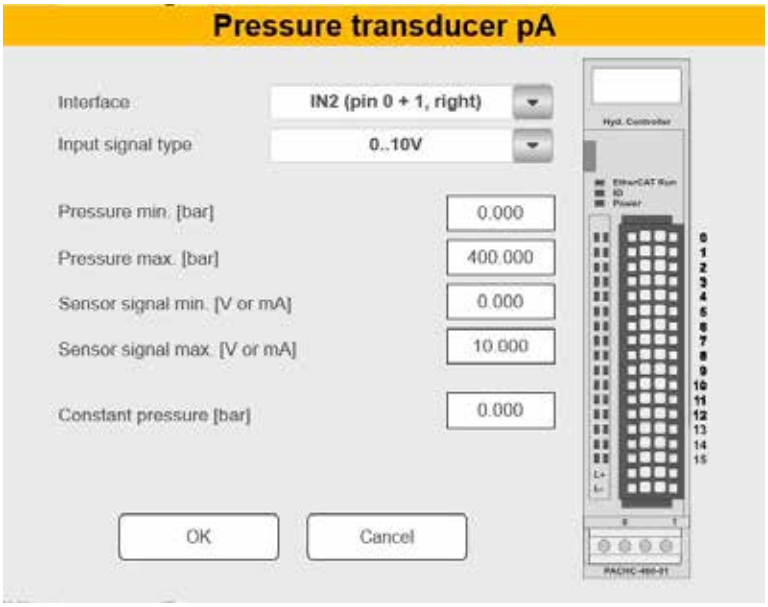
Logical layout of pressure sensors



Up to 4 analogue pressure sensors for both control axes available on the PACHC can be connected to the PACHC. Optionally the actual pressure value can be transmitted from EtherCAT Master to PACHC via EtherCAT bus.

	Note
☞	Please note that the actual value is delayed if the actual position is transmitted via the EtherCAT bus. This delay has a negative impact on the overall dynamic of the control axis and thus on the position and/or force/pressure control.

At constant pressure at one port, a pressure sensor can be omitted and instead a constant pressure value can be preset.



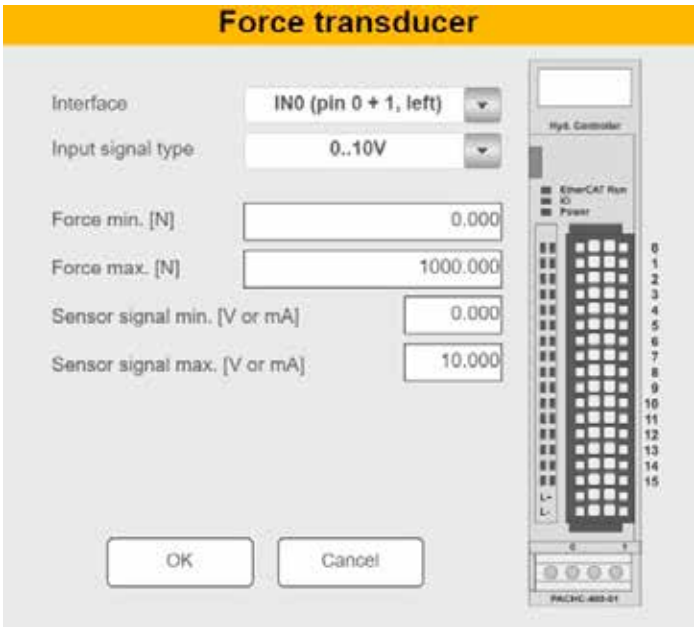
Interface	Interface to which the sensor is connected.
Input signal type	Signal type of the sensor output signal. Current and voltage sensors can be used.
Pressure min. [bar]	Minimum pressure
Pressure max. [bar]	Maximum pressure
Sensor signal min. [V or mA]	Minimum pressure sensor output signal
Sensor signal max. [V or mA]	Maximum pressure sensor output signal
Constant pressure	If no sensor is connected but pressure is known and constant, it can be preset as constant value.

5.3.7 Force Transducer

To achieve a better control accuracy, a force transducer can be used for force control instead of pressure transducers. If a force transducer is parameterized, it is used for calculation the actual force. In this case the pressures of the optional pressure transducers are no longer used for the actual force calculation.

The actual force value can be read in either via one of the 4 analogue inputs or via the EtherCAT bus.

	Note
☞	Please note that the actual value is delayed if the actual force value is transmitted via the EtherCAT bus. This delay has a negative impact on the overall dynamic of the control axis and thus on the force control.



Interface	Interface to which the sensor is connected.
Input signal type	Signal type of the sensor output signal. Current and voltage sensors can be used.
Force min. [N]	Minimum force
Force max. [N]	Maximum force
Sensor signal min. [V or mA]	Minimum force transducer output signal
Sensor signal max. [V or mA]	Maximum force transducer output signal

5.3.8 Valves

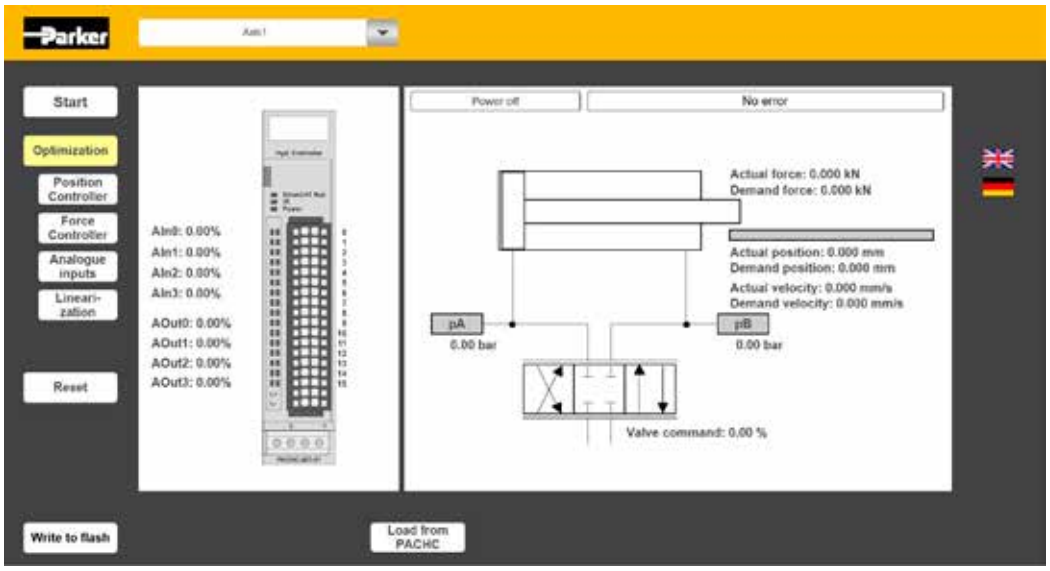
For controlling a hydraulic axis, up to 4 valves can be operated at one PACHC. Within the application, various combinations are possible. For example, a drive can be controlled with different valves for piston and rod side or for position and force/pressure control.

The 4 valves can be partitioned arbitrarily on both axes. Valve outputs which are not used can be used as analogue outputs in the IEC program.

Valve type	Type of valve The following types are available: • 4/3 directional control valve (+ 100 %=p->A) • 4/3 directional control valve (+ 100 %=p->B) • 3/3 directional control valve (+ 100 %=p->A) • 2/2 throttle valve • Pressure valve
Command signal	Type of valve command signal Current and voltage valves with the following input signals can be used: -10..10 V 0..10 V 4..20 mA 0..20 mA EtherCAT
Used in position controller	The parameter is used to select whether the valve is controlled by the position controller or by the default value.
Used in pressure controller	With this parameter it is selected if the valve is controlled by the position controller or with the default value.
Valve port A	Value indicates the usage of the port in the application. Available are: Cylinder port A Cylinder port B Supply pressure Tank
Valve port B	Available are: Cylinder port A Cylinder port B Supply pressure Tank

5.4 Optimization

The optimization is used to adjust the control parameters and thus to optimize the movement of the drive. The display is switched via the button “Optimization”.

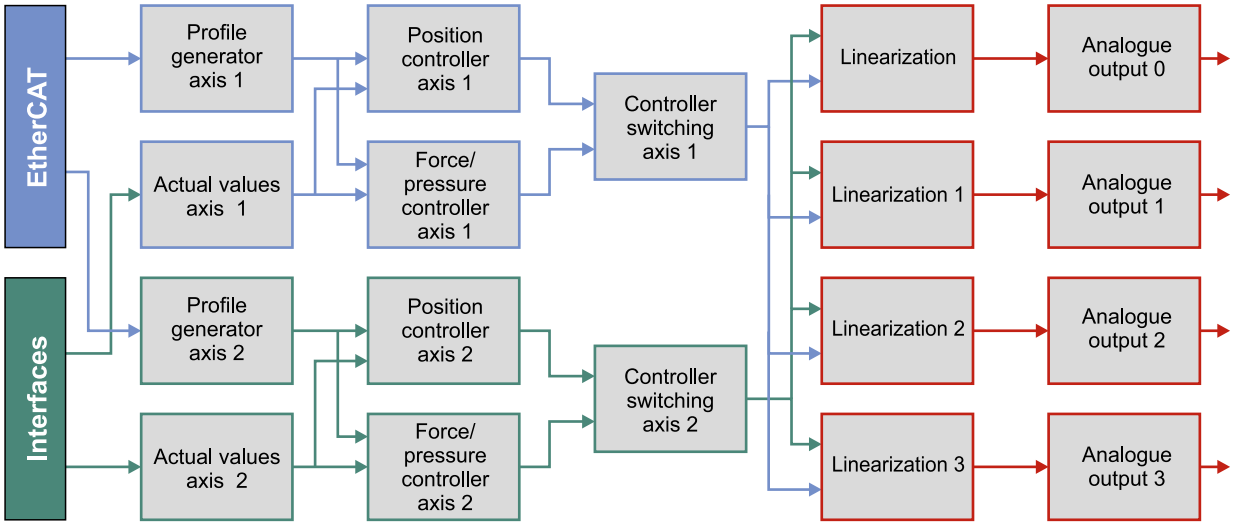


The function to be optimized can be selected with the left-side buttons and the corresponding parameter list is displayed. Clicking the button “Send parameters” sends the parameters to the PACHC. They are not automatically saved on the device. To save the parameters please use the button “Write to flash”.

!	**CAUTION**
	Writing the parameters to Flash can have a negative impact on the control performance because the sampling time of the controller may be exceeded for a short period. It is recommended only to save values if both axes are in status “Power off”.

5.4.1 Controller Functions

PACHC has a controller each for position and force resp. pressure per axis. The movement commands of the PACHC library automatically switch between both controllers. The controller command signal is aligned during switching to accomplish a bumpless transfer at the controller output. The controller sampling time is 250 µs. The following figure provides an overview on the device structure.



5.4.2 Position Controller

5.4.2.1 Controller Structure

The position controller basically consists of a proportional controller with an integrator connected in parallel. To further reduce the tracking error, feed-forwards for velocity and acceleration are available. In addition, velocity and acceleration can be used as feedback.

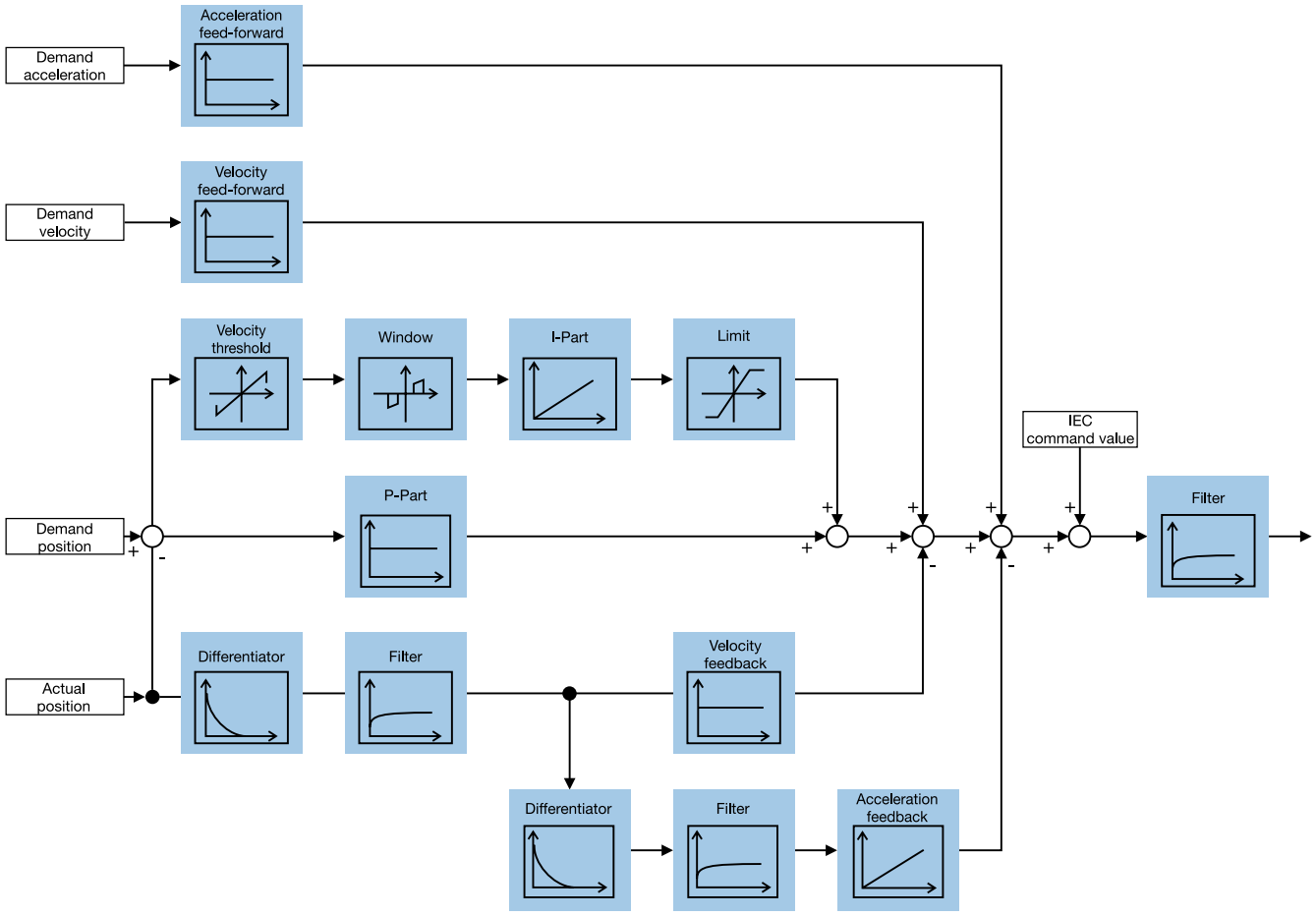
Before feedbacks for velocity and acceleration can be used, signal qualities have to be tested and filter values must be reasonably adapted. In case of insufficient signal quality, the control becomes unstable.

In typical applications usually only velocity feed-forward, proportional controller and integrator are used whereby the integrator is often only deployed for fine positioning at small velocities and low tracking errors. If the actual velocity value is lower than the velocity threshold for the I-part and the absolute value of the tracking error value is smaller than the outer window and larger than the inner window, the integrator command value is changed. Otherwise the output remains constant.

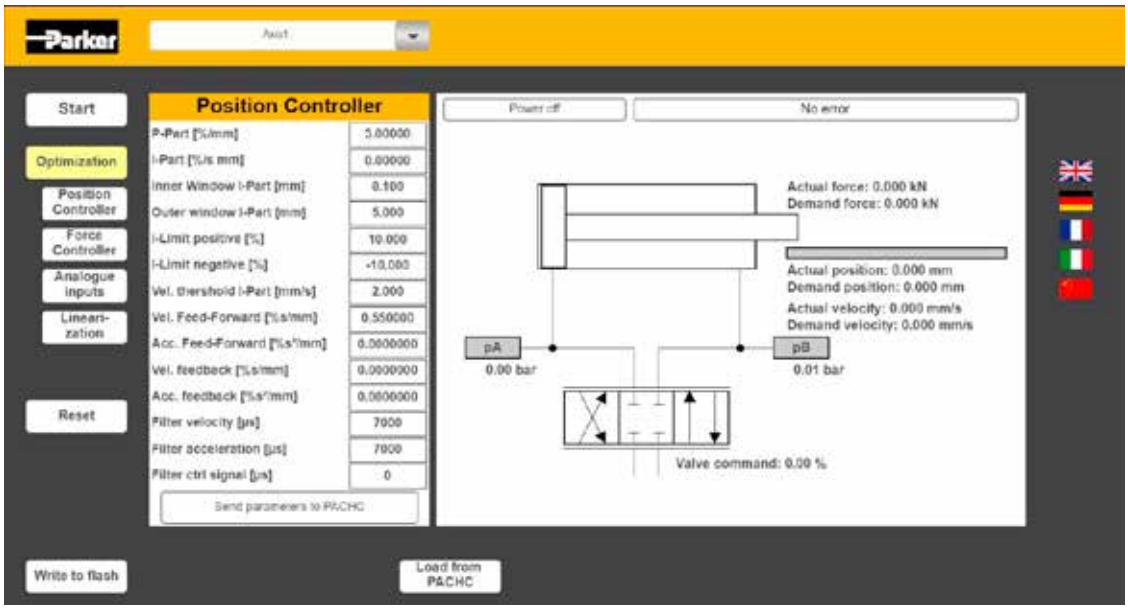
To prevent the wind-up effect, the integrator command value can be limited by an upper and lower limit.

In addition to the controller parts described above, an additional command value part can be activated in the application program. For this purpose, the object 'PosCtrlDisturbanceOffset' can be used. It is not included in the EtherCAT standard mapping and needs to be added manually (→RxPd06).

Via an additional first-order filter at the controller output, the controller output signal can be additionally filtered to prevent a high-frequency stimulation of the control loop.



5.4.2.2 Setting Values



P-Part [%/mm]	Proportional controller gain Kp
I-Part [%/(s*mm)]	Integral controller gain Ki
Inner window I-Part [mm]	Inner tracking error window for the I-Part If the absolute value of the tracking error value is smaller than this value, the command value part of the integrator is not changed anymore.
Outer window I-Part [mm]	Outer tracking error window for the integrator If the absolute value of the tracking error value is larger than this value, the command value part of the integrator is not changed anymore.
I-Limit negativ [%]	Negative limitation of the command value part of the integrator The command value is limited downward to this value.
I-Limit positive [%]	Positive limitation of the command value part of the integrator The command value is limited upward to this value.
Vel. threshold [mm/s]	Velocity threshold of the integrator If the absolute value of the actual velocity value is larger than this value, the command value part of the integrator is not changed anymore.
Vel. feed-forward [%/(mm/s)]	Velocity feed-forward With this factor the demand velocity is multiplied and added to the total command value of the controller.
Acc. feed-forward [%/(mm/s²)]	Acceleration feed-forward With this factor the demand acceleration is multiplied and added to the total command value of the controller.
Vel. feedback [%/(mm/s)]	Velocity feedback With this factor the actual velocity is multiplied and subtracted from the total command value of the controller.
Acceleration feedback [%/(mm/s²)]	Acceleration feedback With this factor the actual acceleration is multiplied and subtracted from the total command value of the controller.
Filter velocity [µs]	Filter time constant of the PT1 filter of the velocity value.
Filter ctrl signal [µs]	Filter time constant of the PT1 filter at the controller output.
Filter acceleration [µs]	Filter constant of the PT1 filter of the acceleration value.

5.4.3 Force/pressure Controller

5.4.3.1 Controller Structure

The force/pressure controller is a PID controller with optional velocity feed-forward and force feed-forward.

Like the position controller, the force controller includes additional limiting functions for the integrator. If the absolute value of the tracking error value is smaller than the outer window and larger than the inner window, the integrator command value is changed. Otherwise the output remains constant. To prevent the wind-up effect, the integrator command value can be limited by an upper and lower limit.

The velocity feed-forward allows the dynamic force/pressure control of forcibly guided drives (e.g. die cushion). By means of the actual velocity, the velocity-dependent opening of the valve for the unloaded drive is calculated in parallel to the controller and added to the total command value. For controls with pressure valves or internally pressure-controlled pumps the parameter should be set to zero.

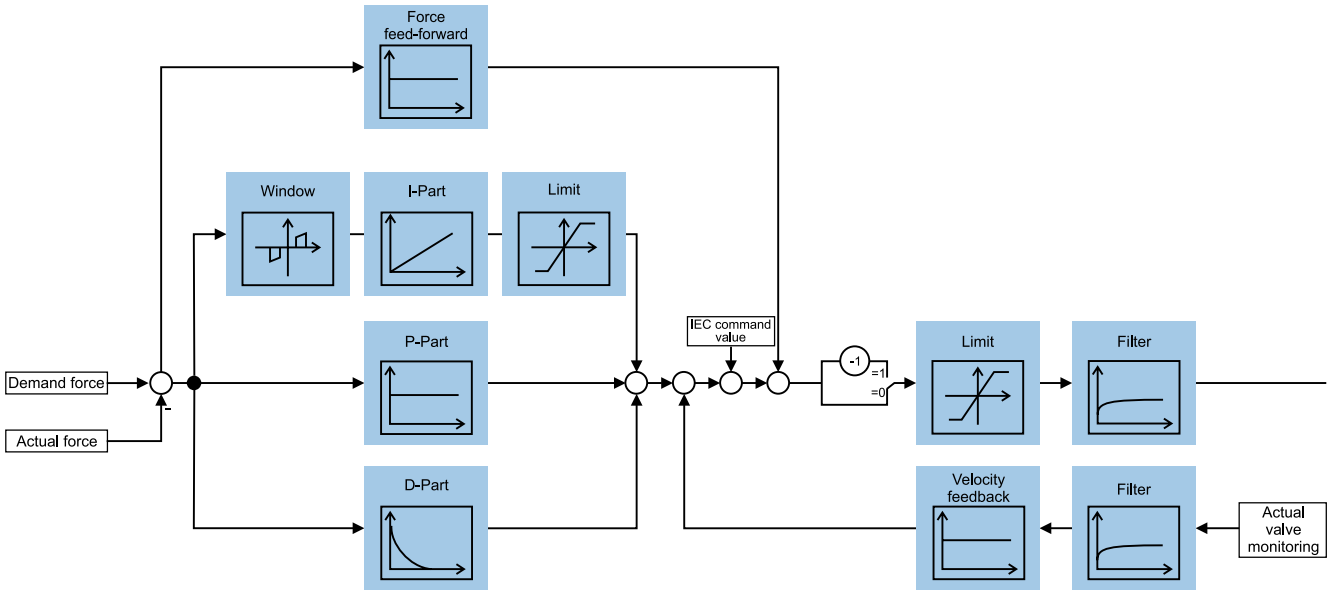
Before the velocity feed-forward can be used, signal quality has to be checked and the filter value for the actual velocity has to be reasonably adapted. In case of insufficient signal quality, the control becomes unstable. If no position feedback system is connected or configured, the function cannot be used.

The force feed-forward allows the dynamic force/pressure control with proportional pressure valves and internally pressure-controlled pumps. In contrast to directional control valves, for these components the output pressure is proportional to the command signal. By means of the demand value, the force feed-forward is calculated in parallel to the controller and added to the total command value. For controls with directional control or flow control valves the parameter should be set to zero.

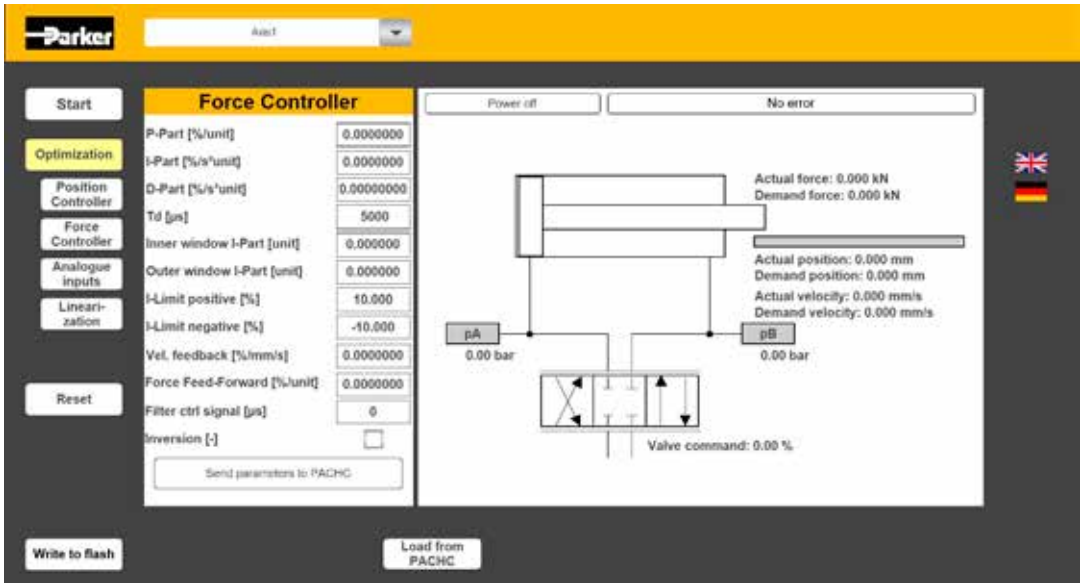
If a valve is used for position as well as force/pressure control, it may happen in rare cases that the direction senses of the two controllers do not match. By means of the parameter inversion the direction sense of the force/pressure controller can be adapted.

In addition to the controller parts described above, an additional command value part can be activated in the application program. For this purpose, the object ‘FCtrlDisturbanceOffset’ can be used. It is not included in the EtherCAT standard mapping and needs to be added manually.

Via an additional first-order filter at the controller output, the controller output signal can be additionally filtered to prevent a high-frequency stimulation of the control loop.



5.4.3.2 Setting Values



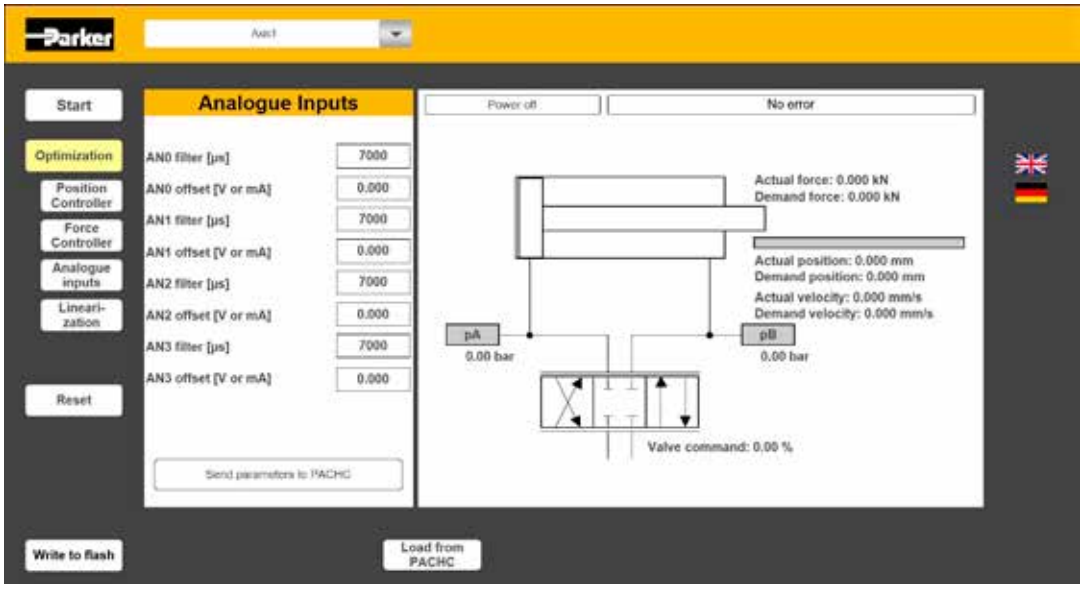
P-Part [%/N]	Proportional controller gain
I-Part [%/(s*N)]	Integral controller gain
D-Part [%/(s*N)]	Differentiating controller gain
Td [µs]	Time constant of the D-Part This value defines how fast the differentiating command value part of the controller is reduced.
Inner window I-Part [N]	Inner tracking error window for the I-Part If the absolute value of the tracking error value is smaller than this value, the command value part of the integrator is not changed anymore.
Outer window I-Part [N]	Outer tracking error window for the integrator If the absolute value of the tracking error value is larger than this value, the command value part of the integrator is not changed anymore.
I-Limit negative [%]	Negative limitation of the command value part of the integrator The command value is limited downward to this value.
I-Limit positive [%]	Positive limitation of the command value part of the integrator The command value is limited upward to this value.
Velocity feedback [%/(mm/s)]	Velocity feedback With this factor the actual velocity is multiplied and added to the total command value of the controller.
Force feed-forward [%/N]	Force feed-forward With this factor the demand value is multiplied and added to the total command value of the controller.
Filter control signal [µs]	Filter time constant of the PT1 filter at the controller output.
Inversion	With this parameter the command value sign of the force/pressure controller can be changed. Value “1” means inversion is activated.

5.4.4 Analogue Inputs

To achieve a better signal quality, the analogue input signals can be filtered and controlled with an offset. Filter and offset are used in the actual value calculation. The value'AInX_AInAcutualValue" includes the unfiltered value without offset.

The filtering of the analogue input signals cannot replace the braid shield of the sensor cables. Please only use braided sensor cables to transmit encoder signals to the PACHC.

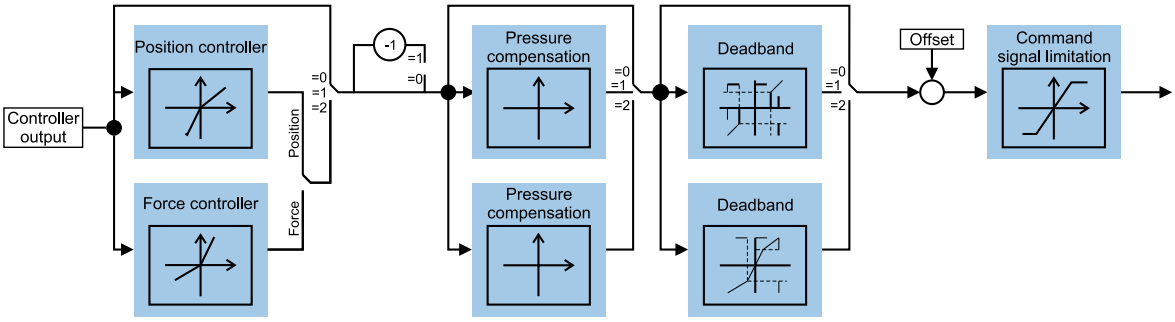
	CAUTION
	Too strong filtering causes an additional delay and phase shifting and can later make the control instable. Only filter the analogue signals as strong as absolutely necessary.



AN0 Filter [µs]	Filter constant of the PT1 filter for analogue input 0 in unit µs.
AN0 Offset [V or mA]	Offset to analogue input 0. The unit follows from the selected signal type. This value is always added to the measured value before calculating the actual value (e.g. pressure pA).
AN1 Filter [µs]	Filter constant of the PT1 filter for analogue input 1
AN1 Offset [V or mA]	Offset to analogue input 1. The unit follows from the selected signal type. This value is always added to the measured value before calculating the actual value (e.g. pressure pA).
AN2 Filter [µs]	Filter constant of the PT1 filter for analogue input 2.
AN2 Offset [V or mA]	Offset to analogue input 2. The unit follows from the selected signal type. This value is always added to the measured value before calculating the actual value (e.g. pressure pA).
AN3 Filter [µs]	Filter constant of the PT1 filter for analogue input 3.
AN3 Offset [V or mA]	Offset to analogue input 3. The unit follows from the selected signal type. This value is always added to the measured value before calculating the actual value (e.g. pressure pA).

5.4.5 Linearization

Linearization follows to the controller output. It comprises a number of functions as briefly described below. The linearization functions are separately available for each valve output. All settings have to be set individually for each valve output used.



5.4.5.1 Direction-dependent Gain

With the direction-dependent gain, the unequal areas of a differential cylinder can be compensated. There are independent gain factors for moving in positive or negative direction. Depending on the movement direction of the drive, the controller output is multiplied with the positive or negative gain factor.

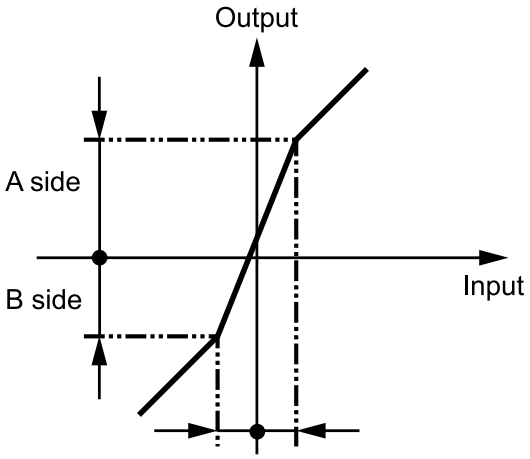
The gain factors are available separately for position and force/pressure controllers. Switching between the factors is done automatically.

5.4.5.2 Inversion

If the direction sense of the valve does not match with the specification to extend the cylinder at a positive valve command signal, the command signal can be inverted. Depending on the selected valve type, this value is preset. In addition, the direction sense in the force/pressure controller settings can be changed separately for the force/pressure controller if the direction senses of position and force/pressure controller do not match.

5.4.5.3 Deadband Compensation

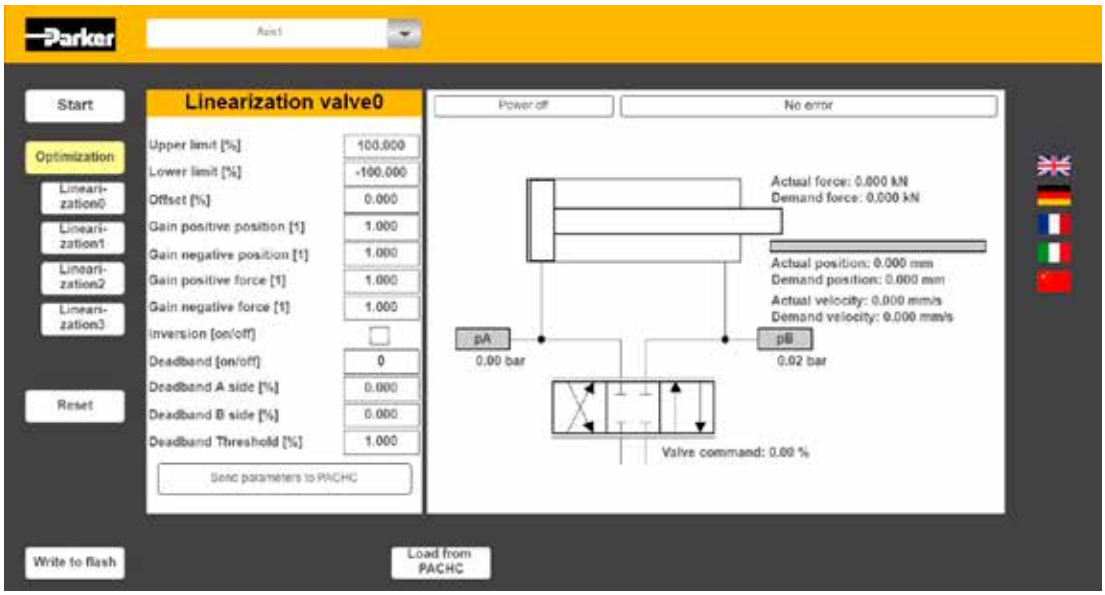
If overlap valves are used and the overlap is not already adjusted by the valve electronics, they can be optimized by use of the deadband compensation. Overlap and step sizes can be found in the technical data of the valves used. The threshold is preset and can be adapted to the application.



5.4.5.4 Command Signal Limitation

To reduce axis velocity, the command signal range for valve control can be limited by means of the output limitation. Particularly during initial commissioning, a temporary limitation of the valve command value is useful to prevent damage to the drive. The limitation has to be set for each valve respectively for each analogue output separately.

5.4.5.5 Settings



Upper limit [%]	Upper limit of the valve command value Command value is limited downward to this value.
Lower limit [%]	Lower limit of the valve command value Command value is limited upward to this value.
Offset [%]	Offset for valve command value This value is always added to the valve command value if the device is in status PowerOn.
Gain positive position [n]	Direction-dependent gain factor for the positive direction of the position controller If the command value of the position controller is greater than zero, it is multiplied with this factor.
Gain negative position [n]	Direction-dependent gain factor for the negative direction of the position controller If the command value of the position controller is smaller than zero, it is multiplied with this factor.
Gain positive force [n]	Direction-dependent gain factor for the positive direction of the force controller If the command value of the position controller is greater than zero, it is multiplied with this factor.
Gain negative force [n]	Direction-dependent gain factor for the negative direction of the force controller If the command value of the position controller is smaller than zero, it is multiplied with this factor.
Inversion [on/off]	With this parameter the sign of the valve command value can be changed. Value “1” means inversion is activated.
Deadband [on/off]	With this parameter, the dead band compensation can be activated. Value "0" means deadband compensation is switched off. Value "1" means deadband compensation with constant zero in the deadband. Value "2" means deadband compensation with linearization in the deadband.
Deadband [on/off]	With this parameter the deadband compensation can be activated. Value “1” means deadband compensation is activated.
Deadband A side [%]	Compensation jump in positive direction If the valve command value is greater than the positive deadband threshold, this value is added to the valve command value.
Deadband B side [%]	Compensation jump in negative direction If the valve command value is smaller than the negative deadband threshold, this value is added to the valve command value.
Deadband threshold [%]	Deadband threshold for positive and negative direction

5.5 Monitoring and Error Handling

5.5.1 Error Response

PACHC is monitoring a number of internal and external errors. A complete list with all errors can be found in the appendix. In the configuration and also via the function block 'PACHC_SetErrorReaction' in the IEC program, error responses to the different errors can be set. The following options can be selected as error responses:

- No reaction
- Stop, controller active
- Stop, controller inactive

With “No reaction”, error reaction and error message are deactivated. In this case the error is ignored.

With “Stop, controller active” an active positioning is ramped down to velocity zero via an adjustable ramp and then the actual position is controlled.

With “Stop, controller inactive” an active positioning is ramped down to velocity zero via an adjustable ramp and then control is deactivated. Depending on the hydraulic design, the axis hold position is left.

With active force/pressure control it is switched to “Stop, controller active” and to “Stop, controller inactive” to position control and the actual velocity is – as described before – ramped down to velocity zero.

5.5.2 Tracking Error Monitoring

If the absolute value of the tracking error position respectively force/pressure leaves the selected tracking error window, the tracking error time starts. If absolute value of the tracking error is still larger than the tracking error window after expiration of the tracking error time, the selected error reaction is triggered. If absolute value of the tracking error falls below the tracking error window, tracking error time is stopped and reset.

5.5.3 Travel Limits

PACHC is monitoring the travel limits in position and force/pressure control. If the travel limits are exceeded or undercut, the selected error reaction is triggered.

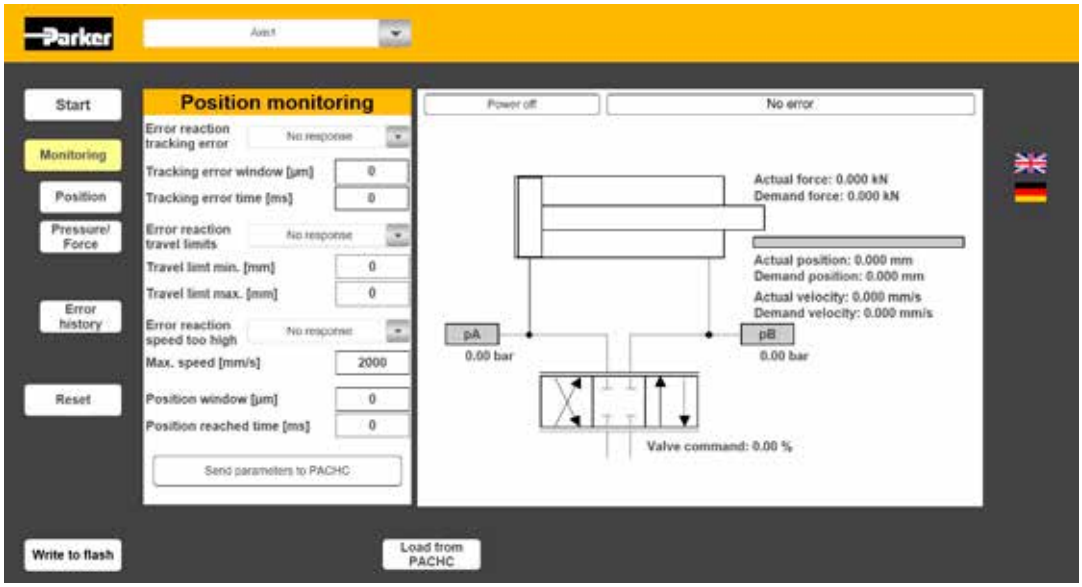
5.5.4 Monitoring Maximum Speed

If the actual speed exceeds the maximum permissible speed, the selected error reaction is triggered. The monitoring triggers the error directly without delay. This monitoring is only active if a position control system for the drive was parameterized.

5.5.5 Monitoring Maximum Force

If the actual force exceeds the maximum permissible force, the selected error reaction is triggered. The monitoring triggers the error directly without delay. This monitoring is only active if pressure sensors for pA and pB and/or a force sensor were parameterized.

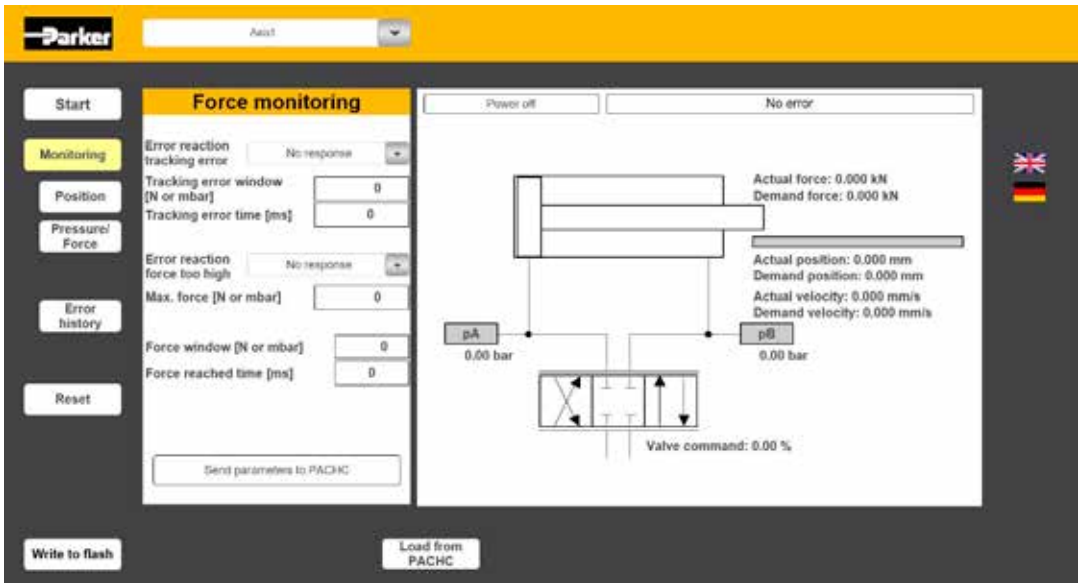
5.5.6 Dialogue Position Monitoring



Tracking error window [µm]	Maximum permissible tracking error If the absolute value of the tracking error value exceeds this value, the tracking error time starts. If the absolute value of the tracking error value undercuts this value the time is reset.
Tracking error time [ms]	Time to expire before a tracking error is triggered.
Travel limit min. [mm]	Travel limit in negative travel direction
Travel limit max. [mm]	Travel limit in positive travel direction
Max. speed [mm/s]	Maximum permissible drive speed
Position window [µm]	Position threshold for “In position” message If the absolute value of the tracking error value undercuts this value, the “Position reached” time starts. If the tracking error exceeds this value again, time is reset.
Position reached time [ms]	Time to expire before message “Position reached” appears.

In the application program it can be queried via the variable AxisName.PositionReached if the demand position was reached within the “In position” window and the “In position” time.

5.5.7 Settings Force/Pressure Control

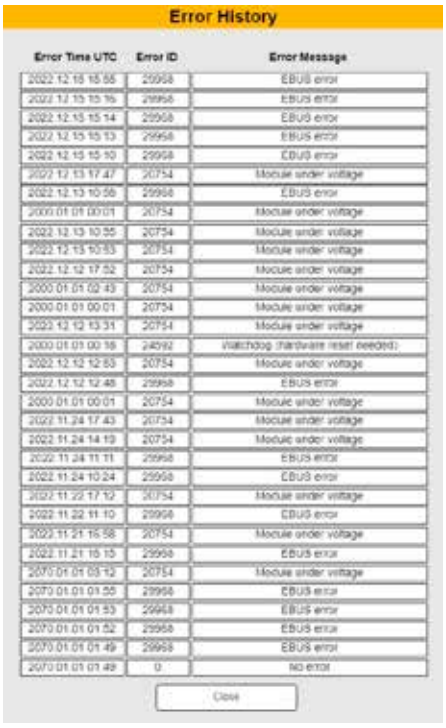


Tracking error window [N or mbar]	Maximum permissible tracking error If the absolute value of the tracking error value exceeds this value, the tracking error time starts. If the tracking error value undercuts this value, the time is reset.
Tracking error time [ms]	Time to expire before a tracking error is triggered.
Max. force [N or mbar]	Maximum permissible drive force
Force window [N or mbar]	Position threshold for “Force reached” message If the absolute value of the tracking error value undercuts this value, the “Force reached” time starts. If the tracking error exceeds this value again, time is reset.
Force reached time [ms]	Time to expire before message “Force reached” appears.

In the application program it can be queried via the variable AxisName.ForceReached if the demand position was reached within the “Force” window and the “Force reached” time.

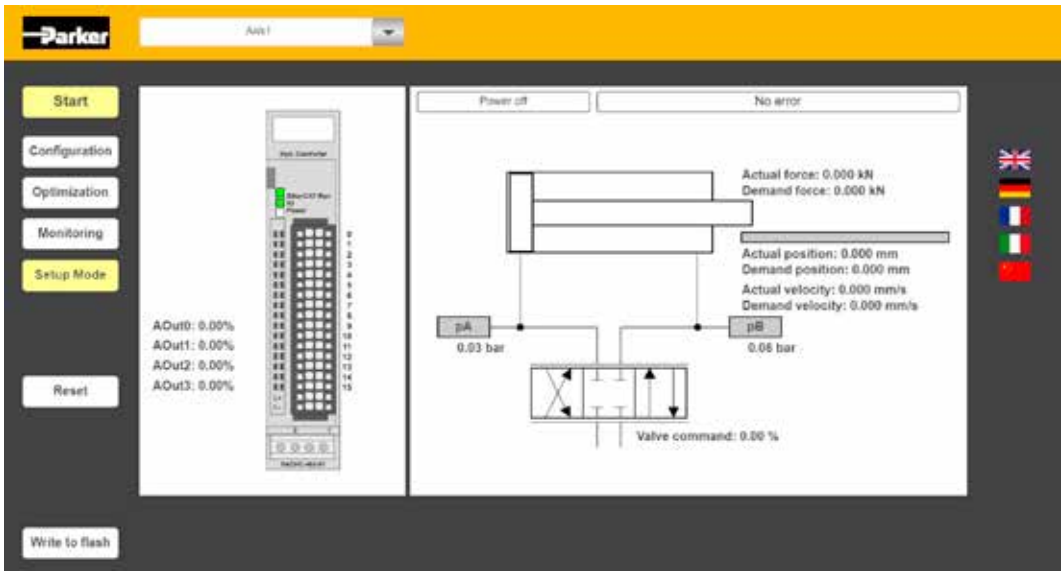
5.5.8 Dialogue Error History

With the button “Error history”, the list of recent 32 errors can be read from the PACHC. Error ID, error message and error time are displayed.

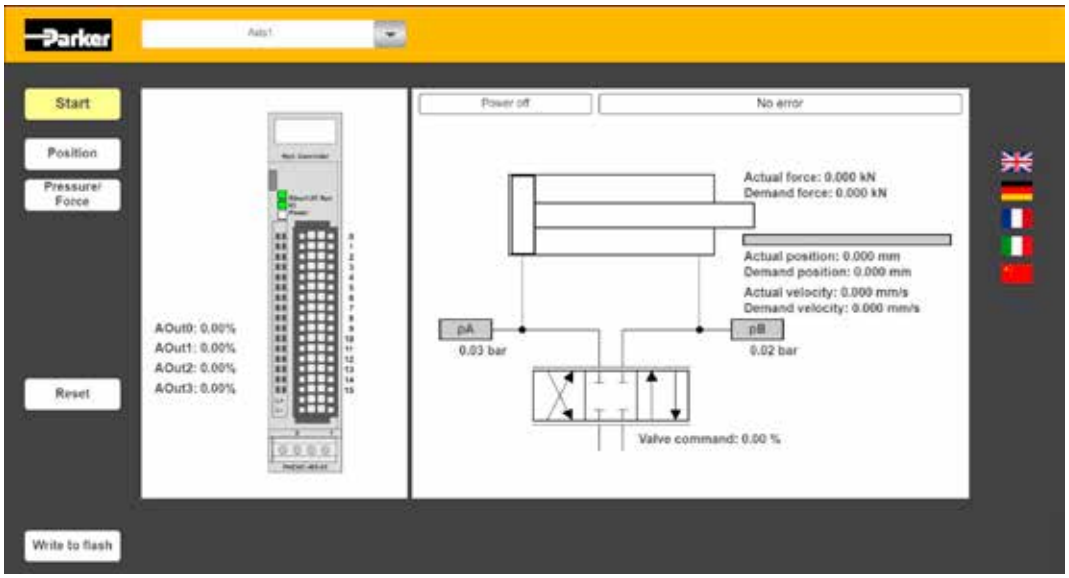


5.6 Commissioning

The commissioning function can be used to support commissioning for position, force or pressure control.

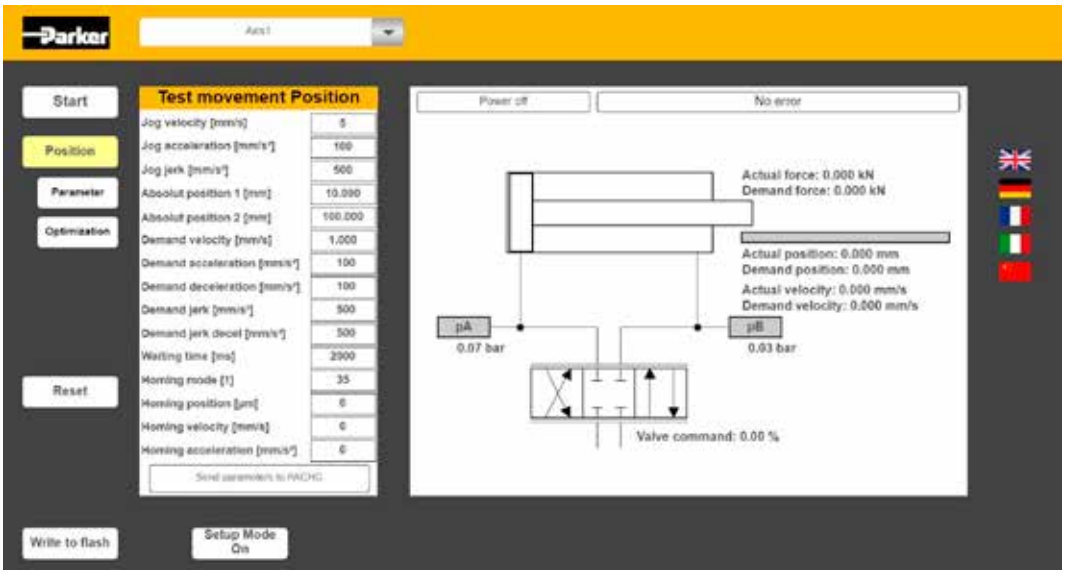


The commissioning function is available for position and for pressure/force control.



Position:

Values for manual operation (jog), for positioning between two positions with waiting time and for setting the zero point of the axis can be set.

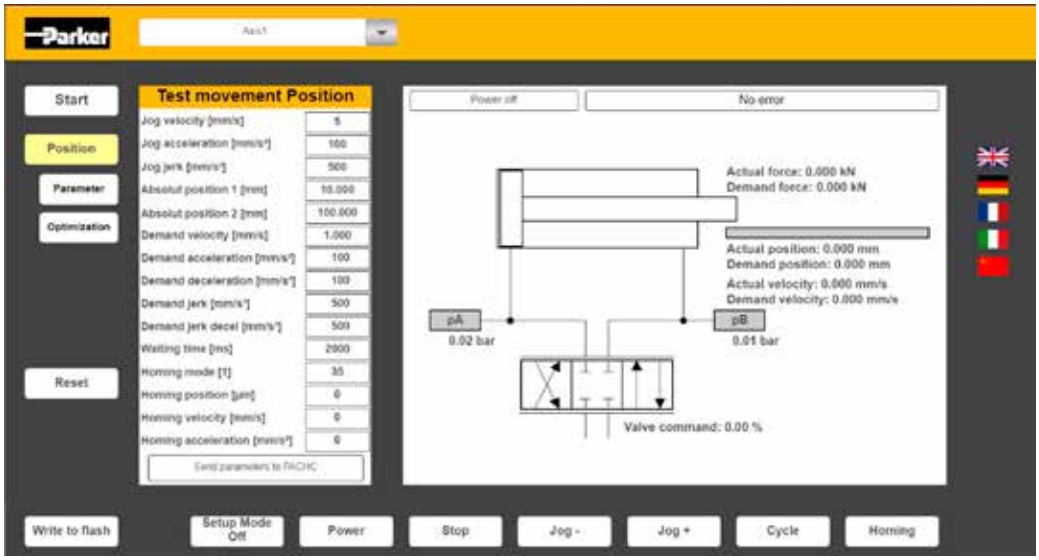


The control and regulation parameters are set under Optimization in order to optimize the movement of the drive (see chapter 5.4 Optimization).

The commissioning mode is activated via the "Commissioning On" button.

!	**CAUTION**
	The application program should be stopped to avoid affecting the two functions (a warning is displayed).

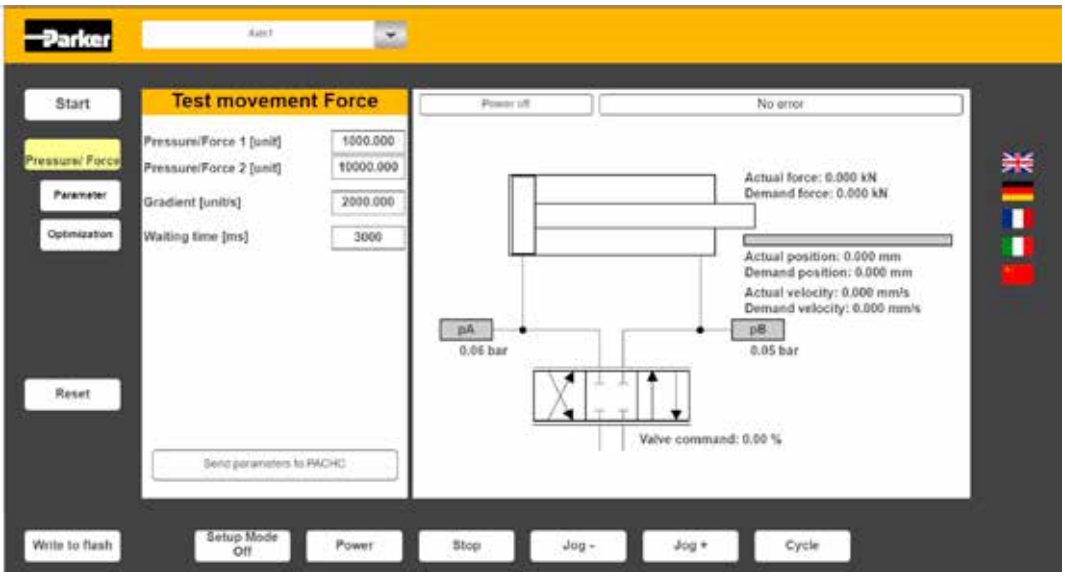
If the commissioning mode is activated, the corresponding functions can be activated.



Setup Mode On/Off	Starts or stops the setup mode
Power	Controller is energised, changes from Power Off to Standstill
Stop	Controller changes to stop
Jog-	Manual operation (jog) in negative direction
Jog+	Manual operation (jog) in positive direction
Cycle	Starts test movement, moves between 2 positions at set speed
Homing	Sets the zero point of the axis

Force/Pressure:

Same as position, only the settings for the test movement are force/pressure and not position.

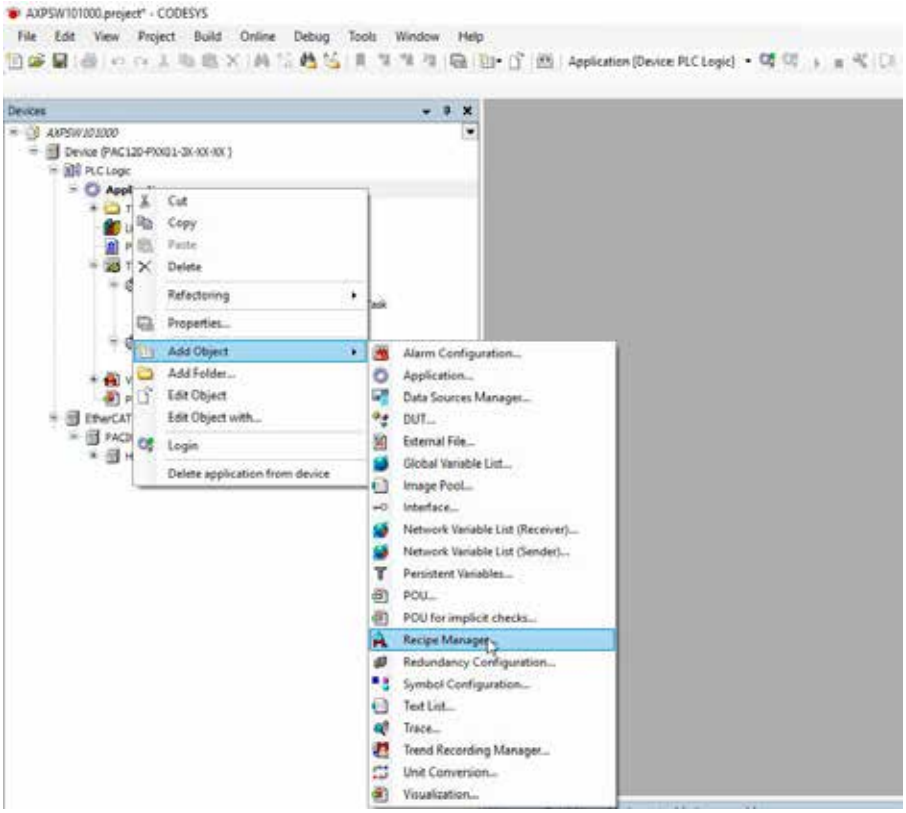


Setup Mode On/Off	Starts or stops the setup mode
Power	Controller is energised, changes from Power Off to Standstill
Stop	Controller changes to stop
Jog-	Manual operation (jog) in negative direction with set gradient
Jog+	Manual operation (jog) in positive direction with set gradient
Cycle	Starts test movement, moves between 2 pressures/forces with set gradient

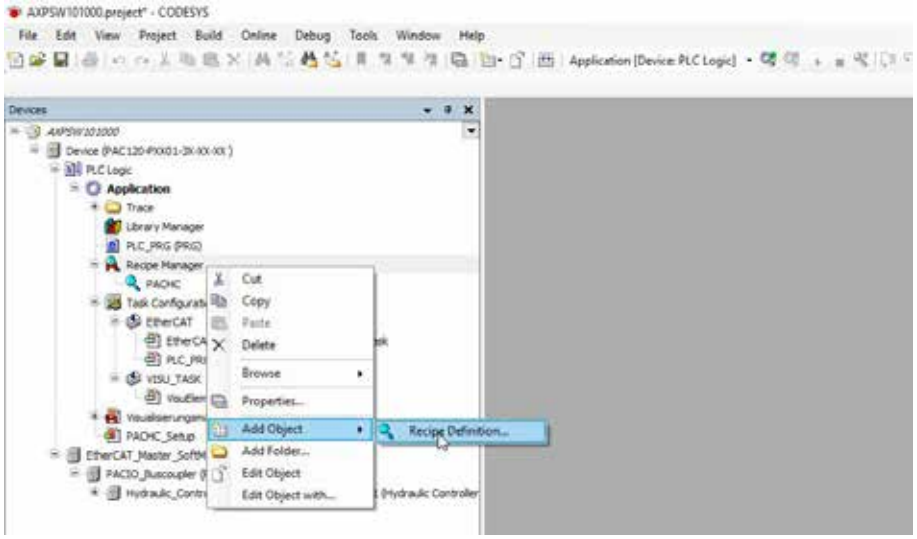
5.7 Saving and Loading Parameters

The PACHC parameters can be saved and loaded via the Recipe Manager in CODESYS and on the PAC Controller. To this, add the Recipe Manager and a Recipe Definition to the object tree.

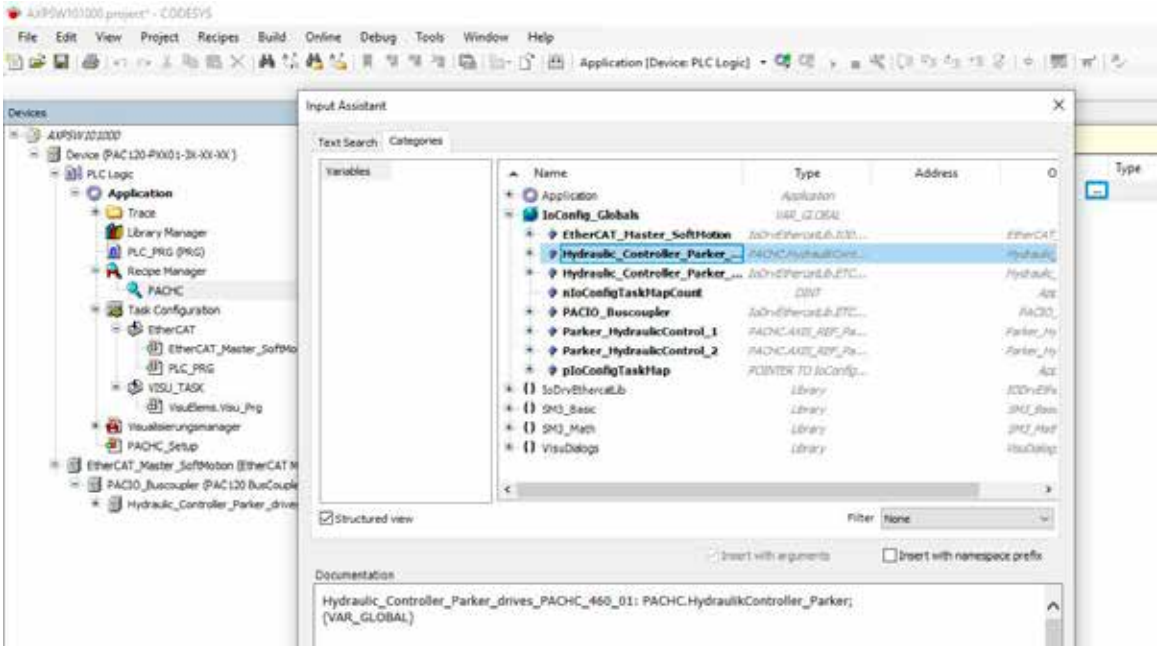
- Click with the right mouse button on “Application”.



- Click with the right mouse button on “Reciep Manager” and then “Add Object” -> “Recipe Definition”



- Open “Recipe Definition” with double click and add as variables under ‘IoConfig_Globals’ the PACHC (Hydraulic_Controller_Parker_drives_PACHHC_460_01) and both axes (Parker_HydraulicControl_1 und Parker_HydraulicControl_2)



For further details regarding usage of recipes see CODESYS Help.

5.8 Typical Procedure for Controller Commissioning

- Limit valve command values
- Set controller parameters Kp and Ki to zero
- Set small value for velocity feed-forward
- Move drive in jog mode with velocity feed-forward only
- Check direction sense and change if necessary
- If the axis is strongly drifting, set valve offset so that the axis shows only slight drifting
- Define machine zero point
- Move drive in jog mode and if necessary, change filters for actual position, velocity and acceleration value
- Move drive in jog mode and adjust P-part
- Increase valve command value limits
- Move drive in the cycle forth and back at different velocities and further optimize control parameters and velocity feed-forward
- Optimize remaining control parameters and feed-forward

For force/pressure control, perform the same steps.

6. Programming

PACHC is supplied with an own library for CODESYS 3.5. In this library all function blocks to control the axes of the PACHC are included.

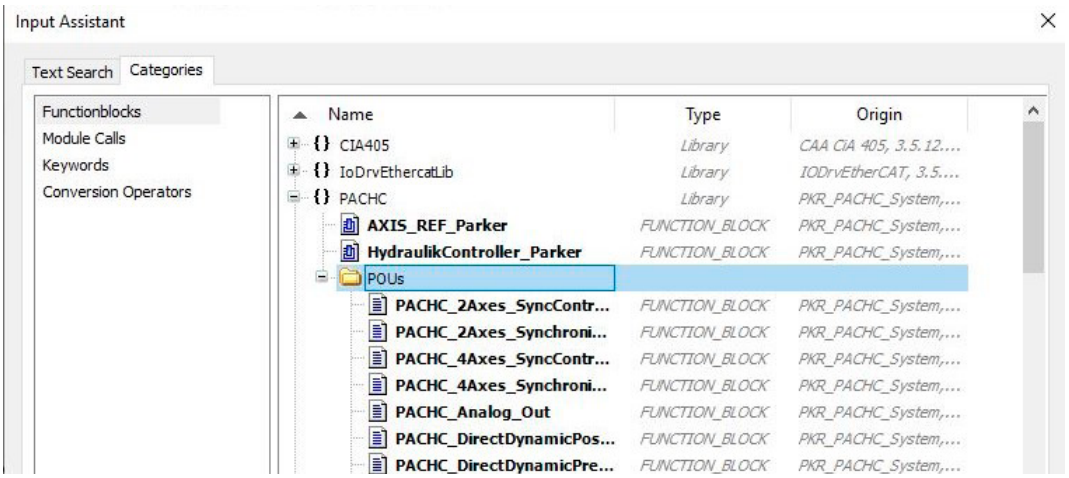
Moreover, the controller is also supporting the 3S SoftMotion library. To use the SoftMotion library, the PAC must have the necessary license (option). The function blocks from the Parker PACHC library do not require an additional license.

6.1 PACHC Library

The following unction blocks are included in the library:

Function block	Description
PACHC_2Axes_CalcPosition	Calculates the minimal, maximal and average position from the actual positions of both axes
PACHC_2Axes_SyncController	2 axes synchronous controller
PACHC_2Axes_Synchronization	Synchronized movement of 2 axes
PACHC_4AxesCalcPosition	Calculates the minimal, maximal and average position from the actual positions of the 4 axes
PACHC_4Axes_SyncController	4 axes synchronous controller
PACHC_4Axes_Synchronization	Synchronized movement of 4 axes
PACHC_Analog_Out	Output of a value at an analogue interface
PACHC_DirectDynamicPositioning	Direct positioning on an absolute position
PACHC_DirectDynamicPressureForce	Direct approach of a pressure or force
PACHC_Home	Setting machine reference point
PACHC_Jog	Moving in manual operation
PACHC_Jog_Force	Force generation in manual operation
PACHC_MoveAbsolute	Positioning on an absolute position
PACHC_MoveProfile	Profile with preset frequency and amplitude (sinus, triangle, rectangle)
PACHC_MoveProfile_Adjustment	Adaptation of the profile of the actual position to the target profile
PACHC_MoveRelative	Positioning on a relative position
PACHC_MoveVelocity	Endless positioning with preset velocity
PACHC_PositionForceAbsolute	Positioning with overlayed force control
PACHC_Power	Activates and deactivates axis (status change “Disabled to “Standstill”
PACHC_PressureForceAbsolute	Approach of an absolute pressure or an absolute force
PACHC_PressureForceProfile	Traverses a given pressure/force profile
PACHC_PressureForceProfile_Adjustment	Adaptation of the profile of the actual force to the target profile
PACHC_ReadAxisError	Reading out errors
PACHC_ReadStatus	Reading out device status
PACHC_Reset	Resetting an error
PACHC_SetErrorReaction	Setting the error reaction
PACHC_Stop	Stopping a movement
PACHC_TestMovement	Test movement between 2 target positions, with set speed and waiting time
PACHC_TestMovement_Force	Test movement between 2 target pressures/forces, with defined pressure/force gradient and waiting time
PACHC_Write_Flash	Saving parameters permanently on the PACHC

To select a function block, add a function block to your program and press function button F2 to open the input assistant. In the input assistant all function blocks can be found under '*PACHC-POUs'.*



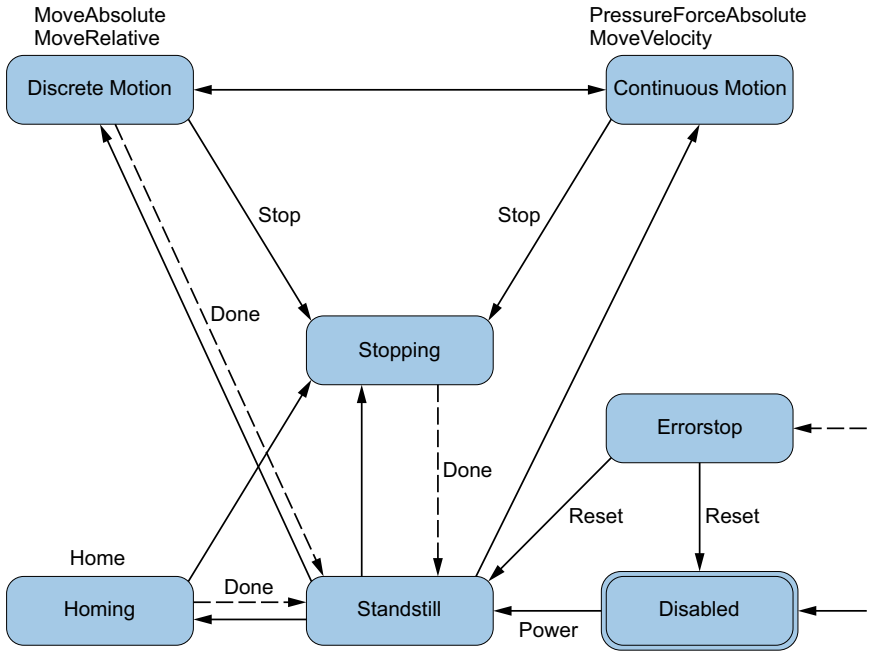
6.2 PLCopen Motion Control

PACHC is supporting the manufacturer-independent standard for motion control according to PLCopen Motion Control.

In this standard, function blocks for motion control and any related status transitions are described.

6.2.1 Status Diagram

In the PLCopen standard the device behavior is described by means of a status diagram. Device statuses are displayed in blue rectangles and status transitions with arrows and the corresponding command respectively function blocks. Only the transitions between the device statuses as shown in the diagram are possible. If a status change which is not allowed shall be done, an error is generated.

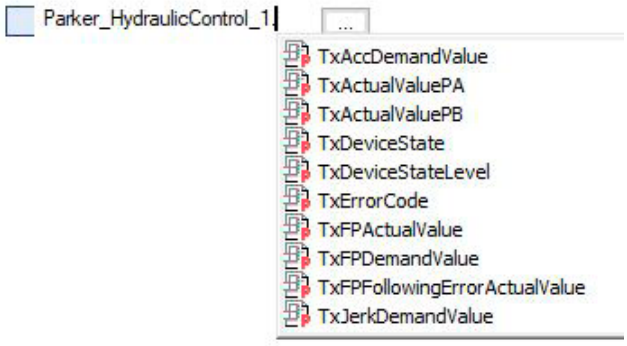


6.3 General Rules / Timing

6.3.1 Access to PACHC Parameters

All available parameters of the corresponding axes can be accessed via the axes names from the object tree as follows:

AxisName.ParameterName



A description of all device and axis parameters can be found in the annex.

	NOTE
	Only those parameters included in the EtherCAT mapping are cyclically updated. All other parameters must be read or written via SDO transfer. There are predefined function blocks for different parameter groups.

6.3.2 Setting Positioning and Force/Pressure

Within an IEC cycle, only one positioning, force or pressure function block may be activated!
If 2 positioning function blocks are activated within a program run, it is not defined which one is executed.

6.3.3 Dynamic Switching from Position to Force/Pressure Control

Depending on the selected motion function block, it is switched automatically via PACHC between position and force/pressure control. The controller output signal is initialized with the old command during transition. Depending on the demand profile, switching can lead to an abrupt change of the control signal.

6.3.4 Status of the Outputs

The outputs *„Done“, „InVelocity“, „Error“, „ErrorID“* and *„CommandAborted“* reset with the falling edge of the *„Execute“* input.
If the *„Execute“* input switches back to FALSE before the function block (e.g. positioning) has been completed (pulse to Execute), the corresponding outputs (e.g. „Done“) will be set for exactly ONE cycle upon termination.
The outputs *„Done“* and *„Error“* are never simultaneously TRUE.
If the instance of a function block receives a new *„Execute“* signal before the function ends, the function block will not show any response (no *„Done“* and no *„CommandAborted“*) in reference to the previous action. .

6.3.5 Input Parameters

Parameters are accepted with the rising edge of the *„Execute“* signal. To set modified parameters active, the function block has to be triggered again with an *„Execute“* signal.

6.3.6 Missing Input Parameters

If an input parameter is missing, the actual value of this instance is used according to IEC61131-3. With the first access the standard value is used. If the input value is incorrect, the Error Output is set *‘True’*.

6.3.7 Position and Distance

‘Position’ is a value defined on a reference system which means a specific position value is a fixed point in the system. *‘Distance’* is the difference between 2 positions.

6.3.8 Signs

'Velocity', 'Acceleration', 'Deceleration', 'Jerk' und *'Pressure'* are always positive values.
'Position', 'Distance' und *'Force'* can be positive as well as negative.

6.3.9 Error Handling

All function blocks have an *‘Error’* output which can be activated by the function block during the block sequence. In case of an axis error, the ErrorID (error number) can be read out with the function block *‘PACHC_ReadAxisError’*.

6.3.10 Behaviour of the “Done” Output

The *‘Done’* output is set if the function block was successfully executed. If a positioning is interrupted by a second positioning before it is completed, the first function block does not set *‘Done’*.

6.3.11 Behaviour of the “CommandAborted” Output

‘CommandAborted’ is set if a positioning is interrupted by a second positioning, by *‘PACHC_Stop’* or *‘PACHC_Power*’.

The reset behavior of *‘CommandAborted’* is identical with *‘Done’*. If *‘CommandAborted’* occurs all other outputs are reset.

6.4 Activating the Drive (PACHC_Power)

FB name	PACHC_Power	
Transition to status “Standstill: disable” resp. “Standstill: powered		
VAR_INPUT		
Enable	BOOL	Activates the function block; a rising edge on input activates the drive, a falling edge deactivates the drive and ramps the velocity to zero.
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Status	BOOL	Controller status (TRUE= drive activated, FALSE= drive deactivated)
Error	BOOL	Error has occurred at activating or deactivating the drive

Notes:

If the input parameter changes “Enable” to “TRUE”, all drive enables are set. The command is only accepted if the axis is not already resp. still activated (output “Status” = FALSE). Furthermore, the device most not be in error mode.

All enables are reset if the input parameter “Enable” changes to FALSE; axis decelerates to velocity = 0 – the output “Status” remains during ramping down on TRUE.

If the drive is in error mode, (error reaction 1: controller active) and the enable input of PACHC_power is deactivated, the drive is deactivated (error reaction 2).

The output “Error” is generated if activating is not possible.

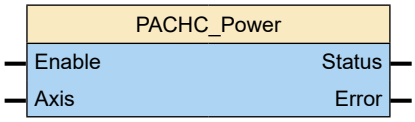
Possible reasons: device in error mode, activation of another IEC function block after execution of PACHC_Power.

Note on step sequence programming:

If the enable input changes to “FALSE”, it interrupts a stop sequence triggered by a rising edge at the Execute input on PACHC_Stop.

Whilst the axis is also after PowerOff in status “Standstill” (but deactivated), the PACHC_Stop Done output is not set.

In step sequences a single request of the PACHC_Stop.Done output for standstill detection is not sufficient. A combination with the signals PACHC_ReadStatus.Standstill or PACHC_Power.Status must follow. See also function block description PACHC_Stop.

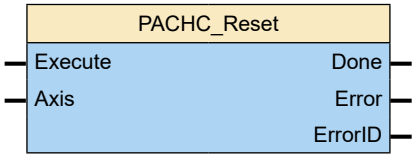


6.5 Acknowledging Errors (PACHC_Reset)

FB name	MC_Reset	
Acknowledge errors (transition from status “Errorstop” to status “Standstill”)		
VAR_INPUT		
Execute	BOOL	Activates function block with positive edge
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Done	BOOL	Error successfully acknowledged, axis again in status “Standstill”
Error	BOOL	Acknowledgment failed / not possible
ErrorID	WORD	Error description according to error history

Note:

After successful acknowledgement, PACHC must be re-activated by a rising edge at the Enable input of the function block PACHC_Power. The execution of the function block may affect the PACHC_MC-Stop function block outputs.



6.6 Stop (PACHC_Stop)

FB name	PACHC_Stop	
Stop actual movement Please note: only one PACHC_Stop instance per axis is permitted!		
VAR_INPUT		
Execute	BOOL	Stops movement
Deceleration	UDINT	Deceleration value (always positive) [mm/s²] Note: the configured PACHC_Stop deceleration ramp is limited. The PACHC_Stop deceleration ramp will not be smaller than the deceleration set in the last movement set.
Jerk	UDINT	Deceleration jerk value [mm/s³] (always positive) Note: the PACHC_Stop deceleration is limited. It is limited to the deceleration in the last movement set.
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Done	BOOL	Movement stopped
Error	BOOL	Error has occurred at stopping the positioning.

Note:

As long as the “Execute” input is set, the axis remains in status “Stopping” (as long as the axis is activated) and cannot execute further movement commands!

If the axis is deactivated by setting the Enable signal of the function block “PACHC_Power” to FALSE, then the status “Stopping” is exited.

If the Enable signal of the “PACHC_Power” function block is set again to TRUE, the axis goes back to status “Stopping” if the Execute input of the PACHC_Stop function block is still TRUE.

Note on step sequence programming:

In step sequences a single request of the Done output for standstill detection is not sufficient because it can only be reported with a significant delay. A combination with the signals PACHC_ReadStatus.Standstill or PACHC_Power.Status must follow.

Example 1: PowerOff during a Stop sequence:

Input FALSE at the PACHC_Power enable input interrupts stop sequence triggered by a rising edge at the Execute input.

The PACHC_Stop function block continues to run in status “Standstill (not powered)” in the background “without function” and is only continued by reaching status “Standstill (powered)” by reactivating the axis with the function block PACHC_Power.

The message of the Done output is delayed until reaching the status “Standstill (powered)”.

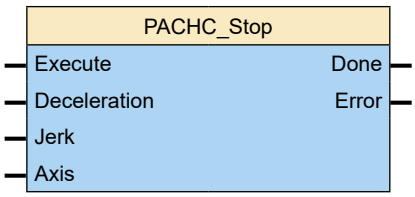
Example 2: Device error during a Stop sequence:

An occurring device error interrupts a stop sequence triggered by a rising edge at the execute input.

The axis is then temporarily in status “Errorstop” and changes only after acknowledging the error with PACHC_Reset in mode “Standstill” (at error reaction 2 initially not powered).

The PACHC_Stop function block continues to run in status “Errorstop” and “Standstill (not powered)” in the background “without function” and is only continued by reaching status “Standstill (powered)” by acknowledging the error (Error reaction 1) (at Error reaction 2 followed by reactivating the axis with the function block PACHC_Power).

The message of the Done output is delayed until reaching the status “Standstill (powered)”.



6.6.1 Stop in Pressure/Force Control

If a position control is configured, PACHC_Stop.Execute = TRUE switches to position control. The axis is stopped by the ramp which is defined via deceleration and jerk.

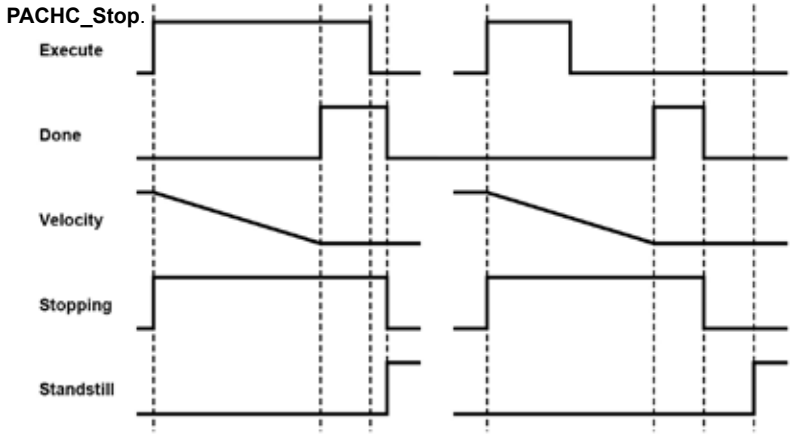
If no position control is defined, PACHC_Stop has no function. Set axis by presetting a demand force resp. demand pressure into a stop status.

6.6.2 Stop: Example 1

The following figure shows an example how the function block PACHC_Stop interrupts and stops an ongoing movement.

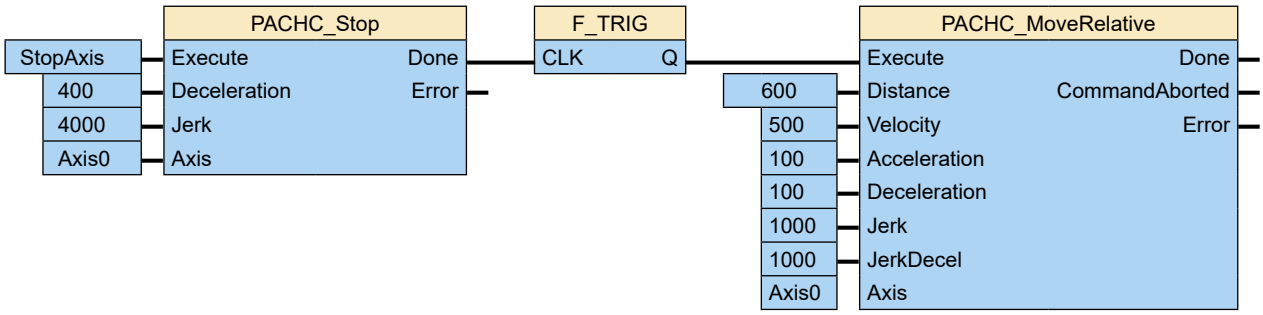
If a position function block is interrupted by the function block PACHC_Stop, it signals “Command Aborted” and cannot be executed as long as the PACHC_Stop function block is active. If the function block PACHC_Stop is inactive (no “Execute” signal), the function block can be executed again.

Timing Diagram

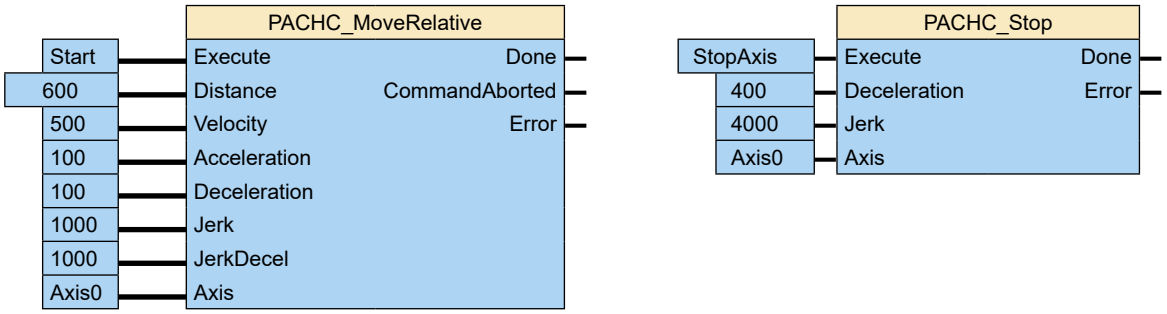


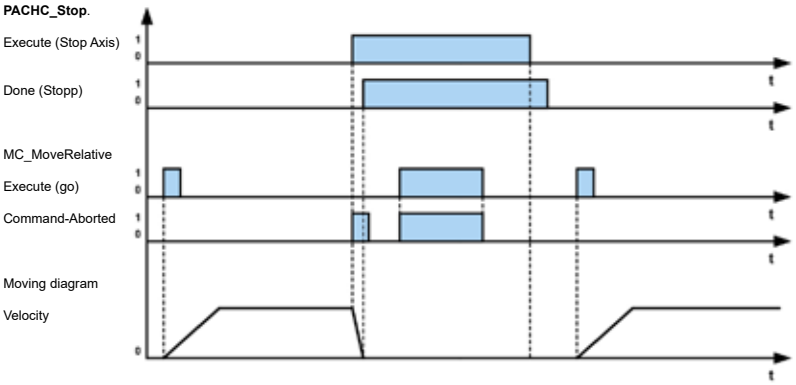
Note:

If a positioning shall follow immediately to the Stop, it can occur with the falling edge of the Done output at the earliest.



6.6.3 Stop: Example 2





6.6.4 Jerk Description

The jerk (in the figure below shown as “4”) describes the acceleration change (derivation of acceleration). Via the jerk limitation, the maximum acceleration change is limited.

A movement process normally starts from standstill, accelerates constantly with the preset acceleration to travel to the target position with the preset velocity. Timely before the target position, the drive is stopped with the preset deceleration to come to a stop at the target position. To get the preset acceleration and deceleration, the drive must change the acceleration (from 0 to demand value resp. from demand value to 0).

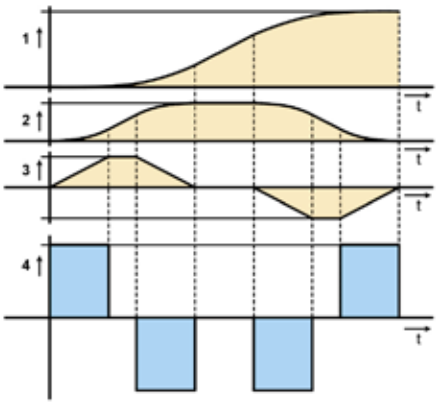
This change velocity is limited by the maximum jerk.

6.6.5 Jerk-free According to VDI2143

According to VDI2143 the jerk is (in contrast to this example) defined as jump during acceleration (infinite value of the jerk function).

Thus, positionings with the PACHC are jerk-free according to VDI2143 because the jerk function is limited.

Movement process

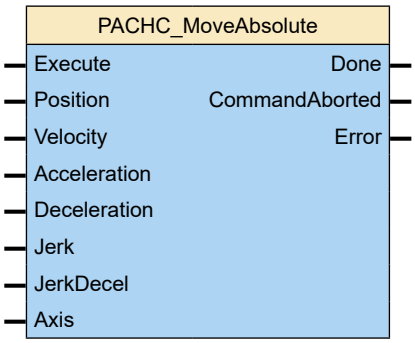


1: Position
2: Velocity
3: Acceleration
4: Jerk

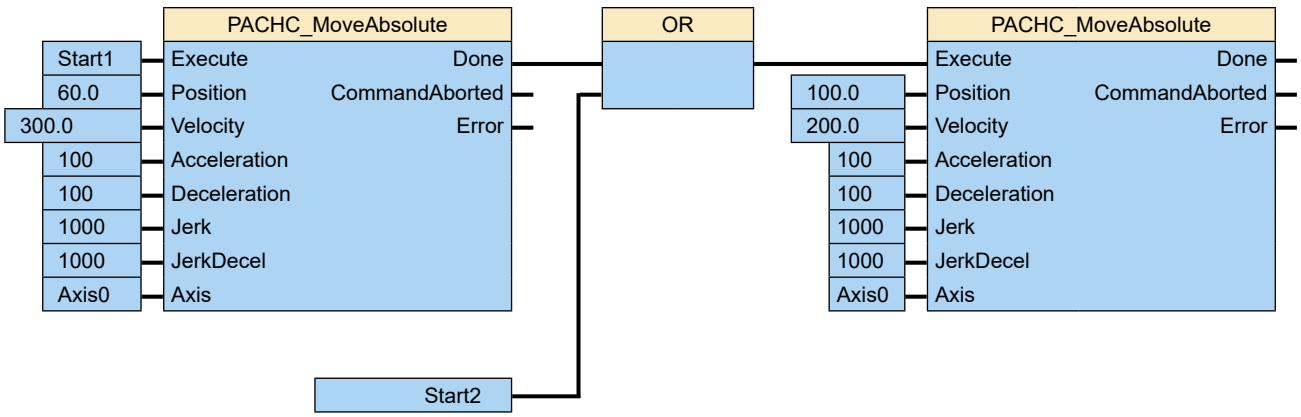
High acceleration changes (high jerk) often have negative impacts on the mechanics. There is a danger, that mechanical resonance points are triggered or shocks are caused by mechanical play. These problems can be minimized by limiting the maximum jerk.

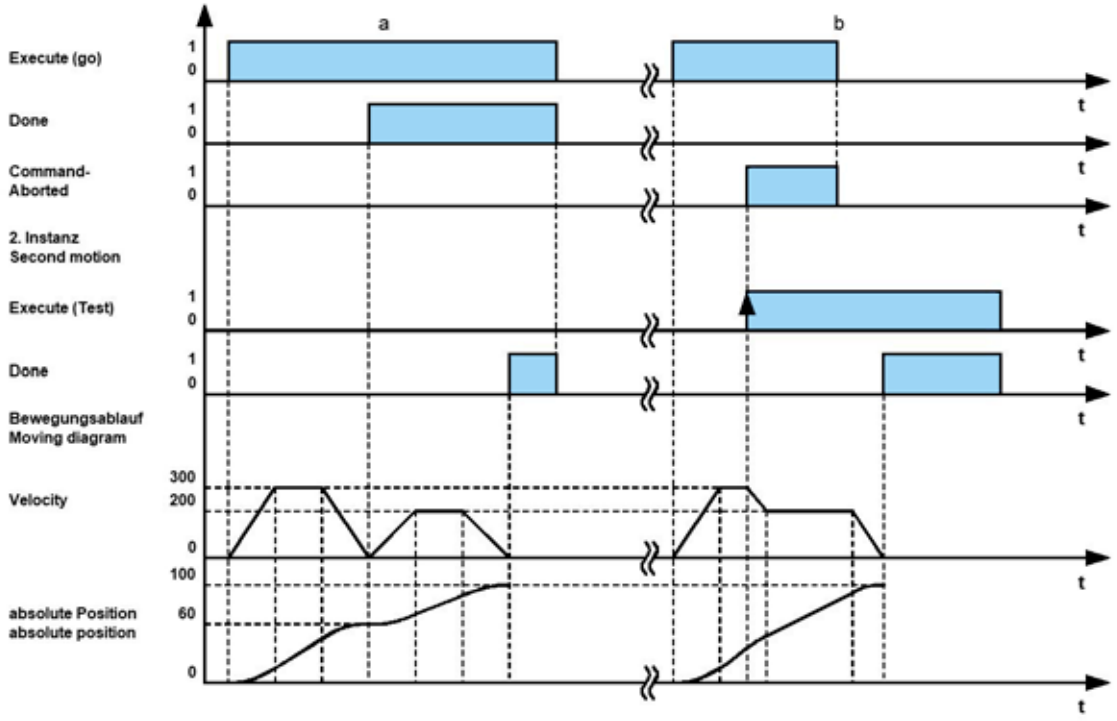
6.7 Absolute Positioning (PACHC_MoveAbsolute)

FB name	PACHC_MoveAbsolute	
Absolute positioning to a preset position		
VAR_INPUT		
Execute	BOOL	Starts function block sequence with positive edge
Position	REAL	Absolute target position of the movement to be executed [mm] (positive and negative direction)
Velocity	REAL	Value of maximum velocity (always positive) (not necessarily reached) [mm/s^2]
Acceleration	UDINT	Acceleration value (always positive) [mm/s^2]
Deceleration	UDINT	Deceleration value (always positive) [mm/s²]
Jerk	UDINT	Acceleration jerk value (always positive) [mm/s^2]
JerkDecel	UDINT	Deceleration jerk value (always positive) [mm/s^2]
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Done	BOOL	Preset target position at position profile generator output is reached
CommandAborted	BOOL	Positioning aborted
Error	BOOL	Error during function block processing



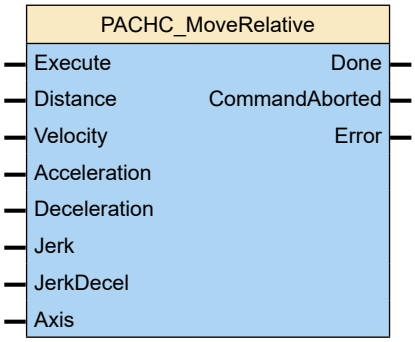
The following figure shows two examples from the combination of two PACHC_MoveAbsolute function blocks.
The left part (a) of the time diagram shows the case if the second function block is executed after the first function block.
If the first function block has reached position 60, output “Done” gives the execute command to the second function block which starts a positioning to position 100.
The right part (b) of the diagram shows the case if the second function block is activated during the execution of the first function block (Start2 = Time). The first function block is automatically interrupted as soon as the second function block is started.
The second function block immediately starts the movement to position 100 regardless of whether position 60 of the first function block was already reached or not.



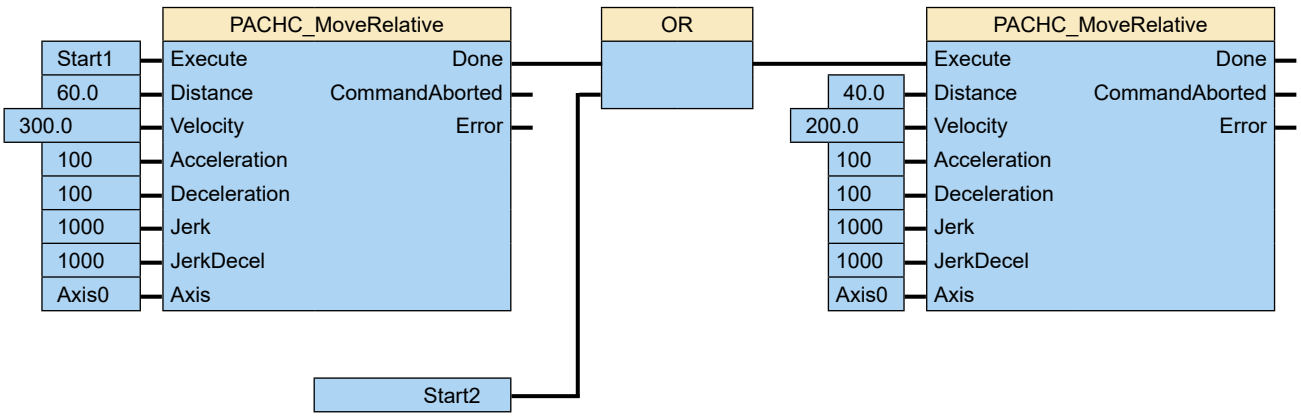


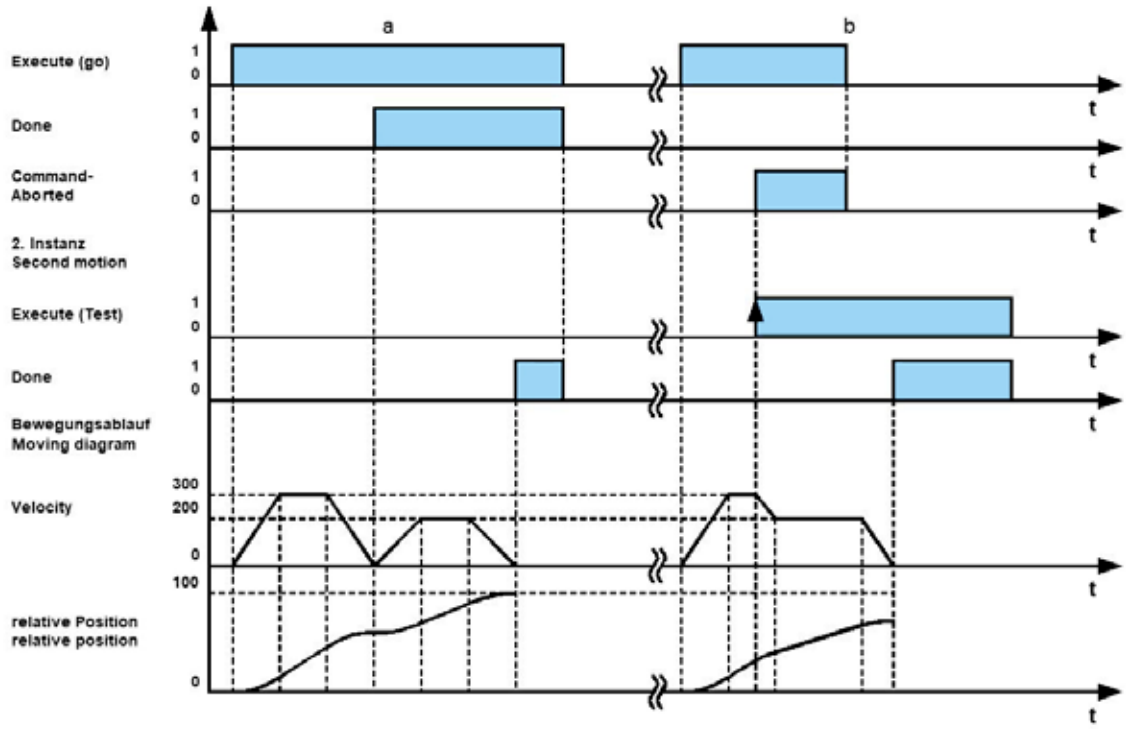
6.8 Relative Positioning (PACHC_MoveRelative)

FB name	PACHC_MC_MoveRelative	
Relative positioning by a preset distance		
VAR_INPUT		
Execute	BOOL	Starts function block sequence with positive edge
Distance	REAL	Relative distance of the movement to be executed [mm]
Velocity	REAL	Value of maximum velocity (always positive) (not necessarily reached) [mm/s²]
Acceleration	UDINT	Acceleration value (always positive) [mm/s²]
Deceleration	UDINT	Deceleration value (always positive) [mm/s²]
Jerk	UDINT	Acceleration jerk value (always positive) [mm/s³]
JerkDecel	UDINT	Deceleration jerk value (always positive) [mm/s³]
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Done	BOOL	Preset target position at position profile generator output is reached
CommandAborted	BOOL	Positioning aborted
Error	BOOL	Error during function block processing
Note: At dynamic positioning (function block is called during positioning), the given position is added to the actual target position.		



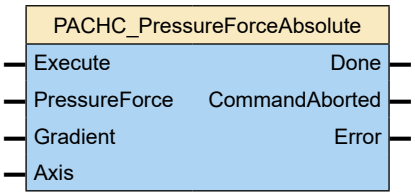
The following figure shows two examples from the combination of two PACHC_MoveRelative function blocks.
The left part (a) of the time diagram shows the case if the second function block is executed after the first function block.
If the first function block has moved 60 mm, output “Done” gives the execute command to the second function block which moves further 40 mm.
The right part (b) of the diagram shows the case if the second function block is activated during the execution of the first function block. Because the second function block starts during execution of the first function block, the first function block is automatically interrupted.
The second function block immediately travels the axis from the actual target position value by 40 mm regardless of whether the 60 mm of the first function block were already moved or not.





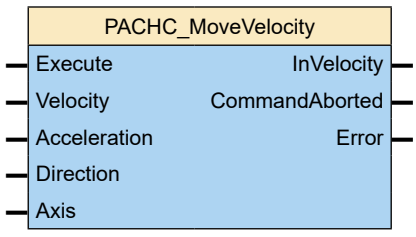
6.9 Setting Force/Pressure (PACHC_PressureForceAbsolute)

FB name	PACHC_PressureForceAbsolute	
Approach of a force command value ($F = p_A*A_A - p_B*A_B$) Approach of a pressure command value (p_A, p_B or p_A-p_B) Selection is made in the configuration		
VAR_INPUT		
Execute	BOOL	Starts function block sequence with positive edge
PressureForce	REAL	Target pressure [bar], target force [N]
Gradient	REAL	Rate of change pressure in [bar/s] Rate of change force in [N/s]
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Done	BOOL	Preset target value at position profile generator output is reached
CommandAborted	BOOL	Command aborted
Error	BOOL	Error during function block processing
Note: If the function block is started during an active positioning, it is switched to force control and the target force/target pressure is ramped starting from the actual force/actual pressure to the desired target force/target pressure “PressureForce” with the “Gradient”. After termination of the function block, the axis continues to control to target force/target pressure. By executing a PACHC_Stop function block, transition to position control occurs. In this course it is controlled decelerated form the actual axis velocity to velocity zero and the reached position is held with the position controller.		



6.10 Endless Positioning (PACHC_MoveVelocity)

FB name	PACHC_MC_MoveVelocity	
Endless controlled positioning with adjustable velocity		
VAR_INPUT		
Execute	BOOL	Starts function block sequence with positive edge
Velocity	REAL	Maximum velocity value (always positive) [mm/s] Value range: 0 mm/s… 20000 mm/s
Acceleration	UDINT	Acceleration and deceleration value (always positive) [mm/s^2] Value range: 1 mm/s2 … 125000000 mm/s^2
Direction	INT	Library constants: PACHC_Positive_Direction, PACHC_Negative_Direction and PACHC_Current_Direction
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
InVelocity	BOOL	Preset target velocity at position profile generator output is reached
CommandAborted	BOOL	Command aborted
Error	BOOL	Error during positioning
Note: To stop the drive, the function block must be interrupted by another function block or the positioning must be stopped by calling the function block PACHC_MC_Stop.		



Example

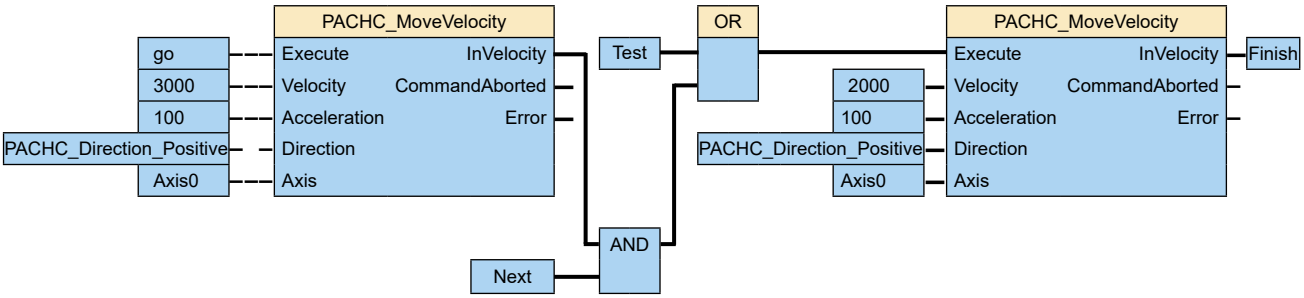
The following figure shows two examples from the combination of two PACHC_MoveVelocity function blocks.

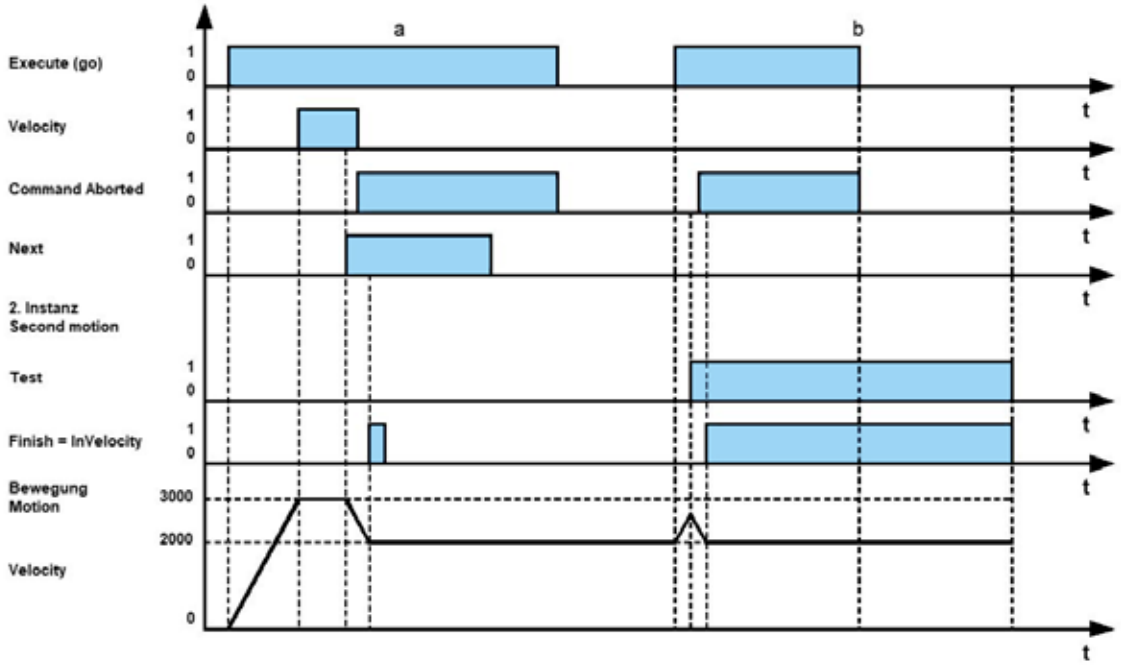
The left part (a) of the time diagram shows the case if the second function block is executed after the first function block.

After the first function block has accelerated to velocity 3000, output “InVelocity” AND – linked with the “Next” signal - gives the execute command to the second function block which starts a deceleration to velocity 2000.

The right part (b) of the diagram shows the case if the second function block is activated during the execution of the first function block. The first function block is automatically interrupted as soon as the second function block is started.

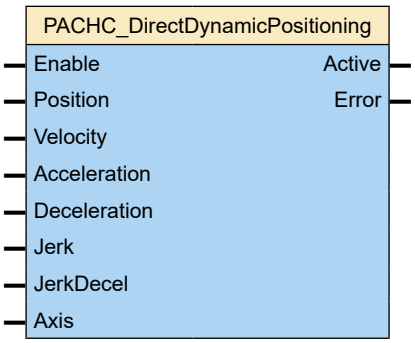
During the acceleration of the first function block, the second function block immediately decelerates to velocity 2000 without having reached the velocity of the first function block.





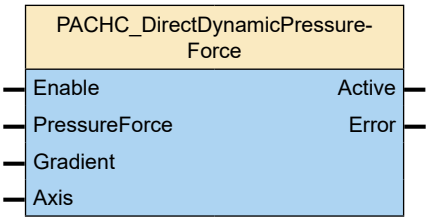
6.11 Direct Positioning (PACHC_DirectDynamicPositioning)

FB name	DirectDynamicPositioning	
Direct positioning to a preset absolute position		
VAR_INPUT		
Enable	BOOL	Starts function block; a rising edge at the input activates the positioning, a falling edge deactivates the movement
Position	REAL	Absolute target position of the movement to be executed (configured unit [Units]) (positive and negative direction)
Velocity	REAL	Maximum velocity value (always positive) (not necessarily reached) [mm/s]
Acceleration	DINT	Acceleration value (always positive) [mm/s²]
Deceleration	DINT	Deceleration value (always positive) [mm/s²]
Jerk	DINT	Acceleration jerk value (always positive) [mm/s³]
JerkDecel	DINT	Deceleration jerk value (always positive) [mm/s³]
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Active	BOOL	Positioning is active
Error	BOOL	Error during function block processing
Note: The difference to the PACHC_MoveAbolute function block is that the PACHC_DirectDynamicPositioning module remains active even after the current target position has been reached, as long as the Enable input is set. A change of the target values automatically starts the new movement.		



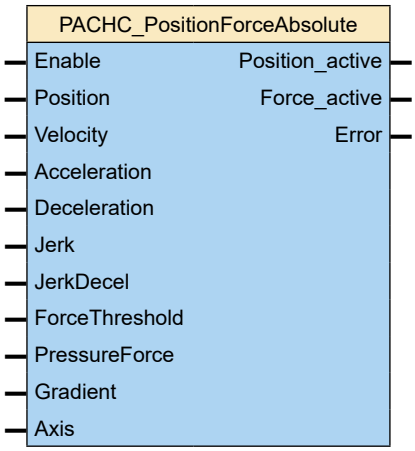
6.12 Direct Approaching of a Pressure, Force Target Value (PACHC_DirectDynamicPressureForce)

FB-Name	PACHC_DirectDynamicPressureForce	
Direct approach of a pressure/force target value		
VAR_INPUT		
Enable	BOOL	Starts function block
PressureForce	REAL	Target pressure [bar], target force [N]
Gradient	REAL	Rate of change pressure in [bar/s] Rate of change force in [N/s]
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Active	BOOL	Positioning is active
Error	BOOL	Error during function block processing
Notes: The function “PACHC_DirectDynamicPressureForce” is similar to “PAC_PressureForceAbsolute”. As long as Enable is set, the function block is active and changes of target force, target pressure and gradient are directly taken over.		



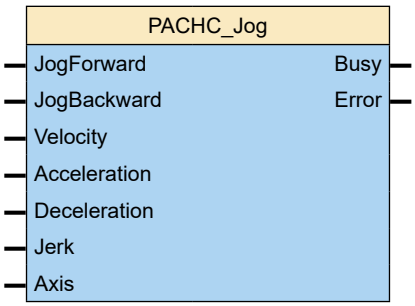
6.13 Positioning with superimposed Force Positioning (PACHC_PositionForceAbsolute)

FB name	PACHC_PositionForceAbsolute	
Starts a positioning with superimposed force positioning		
VAR_INPUT		
Enable	BOOL	Starts function block at positive edge
Position	REAL	Absolute target position of the movement to be executed (positive and negative direction) [mm]
Velocity	REAL	Maximum velocity value (always positive) (not necessarily reached) [mm/s]
Acceleration	UDINT	Acceleration value (always positive) [mm/s²]
Deceleration	UDINT	Deceleration value (always positive) [mm/s²]
Jerk	UDINT	Acceleration jerk value (always positive) [mm/s³]
JerkDecel	UDINT	Deceleration jerk value (always positive) [mm/s³]
ForceThreshold	REAL	Force threshold for changing from position to force control
PressureForce	REAL	Target pressure [bar], target force [N]
Gradient	REAL	Rate of change pressure in [bar/s] Rate of change force in [N/s]
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Position_active	BOOL	Positioning is active
Force_active	BOOL	Force/pressure control is active
Error	BOOL	Error during function block processing
Notes: This function block starts and absolute positioning with superimposed force positioning. If the force threshold is exceeded during travel movement, the axis automatically changes to force control and adjusts the target force. The axis automatically changes back from force control to position control if either the target velocity of the travel profile is exceeded or the target position is reached. During movement, the axis can change several times between position and force control. In force control the movement direction of the axis adjusts depending on the actual force.		

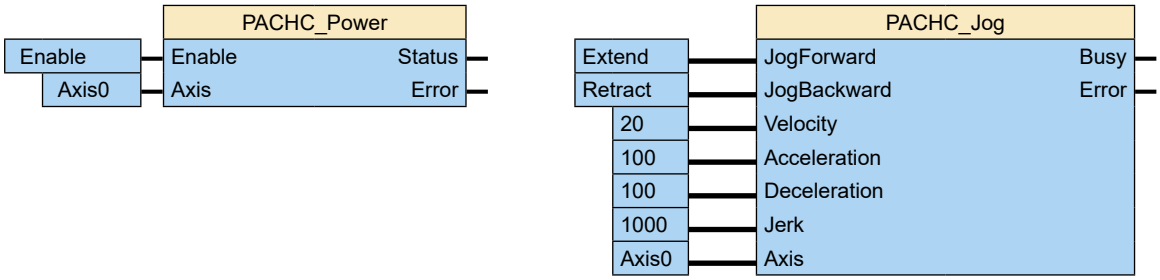


6.14 Manual Operation (PACHC_Jog)

FB name	PACHC_Jog	
Travelling the axis in manual operation (in status “Standstill”)		
VAR_INPUT		
JogForward	BOOL	With JogForward = TRUE the axis travels in positive direction
JogBackward	BOOL	With JogBackward = TRUE the axis travels in negative direction
Velocity	REAL	Velocity value [mm/s]
Acceleration	UDINT	Acceleration value [mm/s²]
Deceleration	UDINT	Deceleration value when stopping [mm/s²]
Jerk	UDINT	Value of the acceleration and deceleration jerk [mm/s³]
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Busy	BOOL	Function block is active (manual operation in progress)
Error	BOOL	Error during manual operation resp. faulty parameters when starting manual operation
Notes: The axis must be in status “Standstill” to start manual operation. Start: When starting the manual operation, output BUSY is set toTRUE. Stop: The axis is brought to a standstill when the corresponding input (JogForward or JogBackward) is set to FALSE again As soon as manual operation is stopped, the output ”Busy” is set to FALSE. Further commands can only be executed after this feedback.		

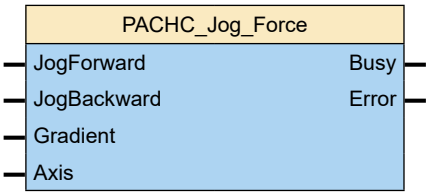


Sample manual traveling



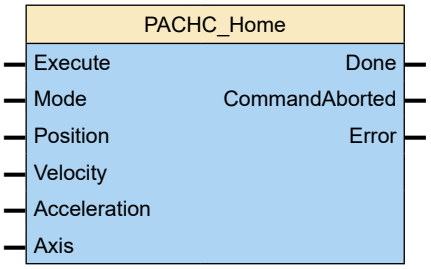
6.15 Manual Operation (PACHC_Jog_Force)

FB name	PACHC_Jog_Force	
Force build-up of the axis in manual operation (in status “Standstill”)		
VAR_INPUT		
JogForward	BOOL	With JogForward = TRUE a positive force is build up
JogBackward	BOOL	With JogBackward = TRUE a negative force is build up
Gradient	REAL	Rate of change force in [N/s]
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Busy	BOOL	Function block is active (manual operation in progress)
Error	BOOL	Error during manual operation resp. faulty parameters when starting manual operation
Notes: The axis must be in status '*Standstill*' to start manual operation. Start: When starting the manual operation, output BUSY is set toTRUE. The axis changes at first setting from '*JogForward*' or '*JogBackward*' to force/pressure control. To return to position control, a '*PACHC_Stop*' or a '*PACHCMoveAbsolute*' must be used. Force ramp: the force ramp is set to 0 if the corresponding input (*JogForward* or *JogBackward*) is set to FALSE again. As soon as manual operation is stopped, the output ”Busy” is set to FALSE. Further commands can only be executed after this feedback.		



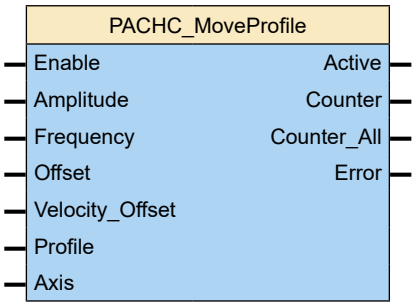
6.16 Machine Reference Point/Homing (PACHC_Home)

FB name	PACHC_Home	
Setting the machine reference point (in status 'Standstill')		
VAR_INPUT		
Execute	BOOL	Starts function block at positive edge
Mode	SINT	35: Sets machine zero in the current position -1: Positioning in positive direction -2: Positioning in negative direction
Position	REAL	Position at machine reference point [mm]
Velocity	UDINT	Value of the speed during zero movement (always positive) [mm/s²]
Acceleration	UDINT	Value of acceleration during zero movement (always positive) [mm/s²]
Axis	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Done	BOOL	Referencing process completed
CommandAborted	BOOL	Referencing process aborted
Error	BOOL	Error during function block processing
Note: This module sets the current actual position to the preset value “Position”. The current target position is also changed so that an eventually given tracking error is preserved. The axis must be in status “Standstill” to start the Homing mode. Mode 35: The current position when activating the module is used as MN. Mode -1: Positioning in positive direction at end of travel range Mode -2: Positioning in negative direction to end of travel range The tracking error threshold (parameterisation via configuration) is evaluated when the drive presses against the end of the travel range. If the threshold is exceeded, the MN is set. During the MN movement, the error reaction "tracking error" is deactivated.		



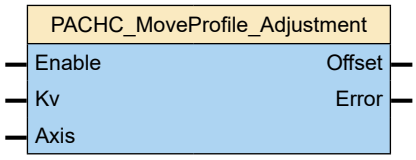
6.17 Running of a Target Profile (PACHC_MoveProfile)

FB name	PACHC_MoveProfile	
Traversing a given position profile		
VAR_INPUT		
Enable	BOOL	Starts the sequence of the function block with a rising edge
Amplitude	REAL	Position setpoint in ± [mm]
Frequency	REAL	Speed in [Hz]
Offset	REAL	Position offset in [mm]
Velocity_Offset	REAL	Speed for movement to position offset in [mm/s]
Profile	INT	Profile selection. 0: sinusoidal, 1: triangular, 2: rectangular
Axis	PACHC_AXIS_REF	Axis reference (name of the drive in the unit tree)
VAR_OUTPUT		
Active	BOOL	Module is active
Counter	UDINT	Shows the number of cycles after a restart
Counter_All	UDINT	Shows the total cycles
Error	BOOL	Errors during module execution
Note: The axis follows a predefined target profile consisting of an amplitude [mm] and a frequency [Hz]. When starting the movement, Offset [mm] is first approached with Velocity_Offset [mm/s] and then the selected profile is started.		



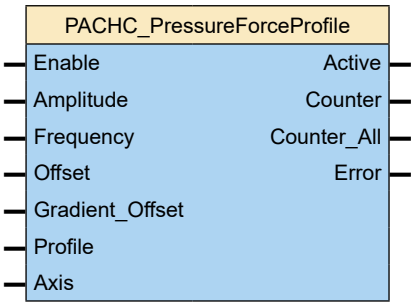
6.18 Adjusting the profile of the actual position to the target profile (PACHC_MoveProfileAdjustment)

FB-Name	PACHC_MoveProfileAdjustment	
Adjusting the profile of the actual position to the target profile		
VAR_INPUT		
Enable	BOOL	Starts the sequence of the function block with a rising edge
Kv	REAL	Factor of the control signal adaptation
Axis	PACHC_AXIS_REF	Axis reference (name of the drive in the device tree)
VAR_OUTPUT		
Offset	BOOL	Offset for control signal adaptation
Error	BOOL	Error during module execution
Hinweis: The function block adapts the profile of the actual position to the setpoint profile, when using different frequencies. This by applying an offset to the controller output signal. The object PosCtrlDisturbanceOffset of the axis must be added as RxPdo to the cyclic EtherCAT mapping.		



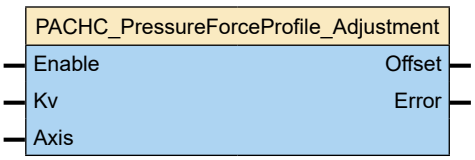
6.19 Traversing a given pressure/force profile (PACHC_PressureForceProfile)

FB-Name	PACHC_PressureForceProfile	
Traversing a given pressure/force profile		
VAR_INPUT		
Enable	BOOL	Starts the sequence of the block with a positive edge
Amplitude	REAL	Pressure/force setpoint in [bar or N]
Frequency	REAL	Pressure ramp in [Hz]
Offset	REAL	Pressure/force offset [bar or N]
Gradient_Offset	REAL	Ramp for pressure/force offset [bar/s or N/s]
Profile	INT	Profile selection. 0: sinusoidal, 1: triangular, 2: rectangular
Axis	PACHC_AXIS_REF	Axis reference (name of the drive in the unit tree)
VAR_OUTPUT		
Active	BOOL	Module is active
Counter	UDINT	Shows the number of cycles after a restart
Counter_All	UDINT	Shows the total cycles
Error	BOOL	Errors during module execution
Hinweis: DThe axis follows a predefined target profile consisting of an amplitude [bar or N] and a frequency [Hz]. When starting the movement, first offset [bar or N] is approached with gradient_offset [bar/s or N/s] and then the selected profile is started.		



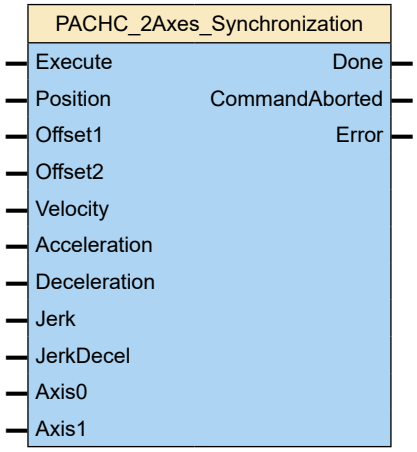
6.20 Adjusting the profile of the actual force to the target profile (PACHC_PressureForceProfile_Adjustment)

FB-Name	PACHC_PressureForceProfile_Adjustment	
Adjusting the profile of the actual force to the target profile		
VAR_INPUT		
Enable	BOOL	Starts the sequence of the function block with a rising edge
Kv	REAL	Factor of the control signal adaptation
Axis	PACHC_AXIS_REF	Axis reference (name of the drive in the device tree)
VAR_OUTPUT		
Offset	BOOL	Offset for control signal adaptation
Error	BOOL	Error during module execution
Hinweis: The module adapts the profile of the actual force to the force target profile when using different frequencies. This by applying an offset to the controller output signal. The object FCtrlDisturbanceOffset of the axis must be added as RxPdo to the cyclic EtherCAT mapping.		



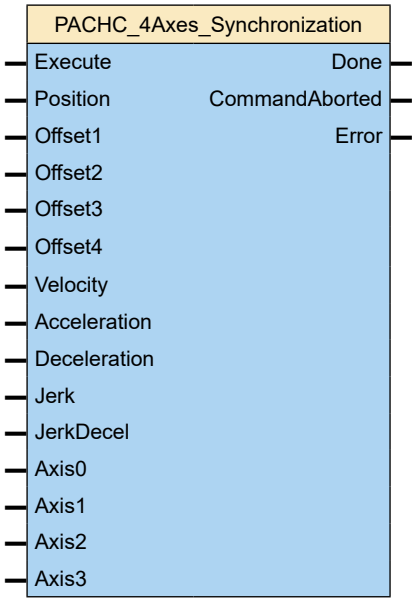
6.21 Synchronous Run of 2 Axes (PACHC_2Axes_Synchronization)

FB name	PACHC_2Axes_Synchronization	
Synchronized travelling of 2 axes to a preset position		
VAR_INPUT		
Execute	BOOL	Starts function block at positive edge
Position	REAL	Absolute target position of the movement to be executed (configured unit) [mm] (positive and negative direction)
Offset1	REAL	Absolute target position axis 1 = Position±Offset2 [mm]
Offset2	REAL	Absolute target position axis 2 = Position±Offset2 [mm]
Velocity	REAL	Maximum velocity value (always positive) (not necessarily reached) [mm/s]
Acceleration	UDINT	Acceleration value (always positive) [mm/s²]
Deceleration	UDINT	Deceleration value (always positive) [mm/s²]
Jerk	UDINT	Value of the acceleration jerk (always positive) [mm/s³]
JerkDecel	UDINT	Value of the deceleration jerk (always positive) [mm/s³]
Axis0	PACHC_AXIS_REF	Axis reference (drive name in device tree)
Axis1	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Done	BOOL	Preset target velocity at position profile generator output is reached
CommandAborted	BOOL	Positioning aborted
Error	BOOL	Error during function block processing
Notes: During execution of the function block, both axes are travelled to a common target position. Additionally, the synchronous controller (PACH_2Axes_SyncController) which controls to the middle actual position of the axes can be activated. The parameters of the synchronous controller must be adjusted separately in the function block PACHC_2Axes_SyncController.		



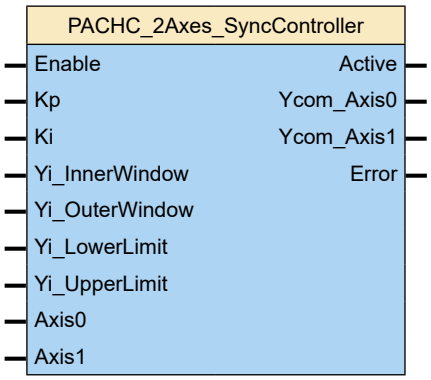
6.22 Synchronized run of 4 axes (PACHC_4Axes_Synchronization)

FB-Name	PACHC_4Axes_Synchronization	
Synchronized travelling of 4 axes to a preset position		
VAR_INPUT		
Execute	BOOL	Starts function block at positive edge
Position	REAL	Absolute target position of the movement to be executed (configured unit) (positive and negative direction) [mm]
Offset1	REAL	Absolute target position axis 1 = Position±Offset2 [mm]
Offset2	REAL	Absolute target position axis 2 = Position±Offset2 [mm]
Offset3	REAL	Absolute target position axis 3 = Position±Offset2 [mm]
Offset4	REAL	Absolute target position axis 4 = Position±Offset2 [mm]
Velocity	REAL	Maximum velocity value (always positive) (not necessarily reached) [mm/s]
Acceleration	UDINT	Acceleration value (always positive) [mm/s²]
Deceleration	UDINT	Deceleration value (always positive) [mm/s²]
Jerk	UDINT	Value of the acceleration jerk (always positive [mm/s³]
JerkDecel	UDINT	Value of the deceleration jerk (always positive) [mm/s³]
Axis0	PACHC_AXIS_REF	Axis reference (drive name in device tree)
Axis1	PACHC_AXIS_REF	Axis reference (drive name in device tree)
Axis2	PACHC_AXIS_REF	Axis reference (drive name in device tree)
Axis3	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Done	BOOL	Preset target velocity at position profile generator output is reached
CommandAborted	BOOL	Positioning aborted
Error	BOOL	Error during function block processing
Notes: During execution of the function block, the 4 axes are travelled to a common target position. Additionally, the synchronous controller (PACH_4Axes_SyncController) which controls to the middle actual position of the axes can be activated. The parameters of the synchronous controller must be adjusted separately in the function block PACHC_4Axes_SyncController.		



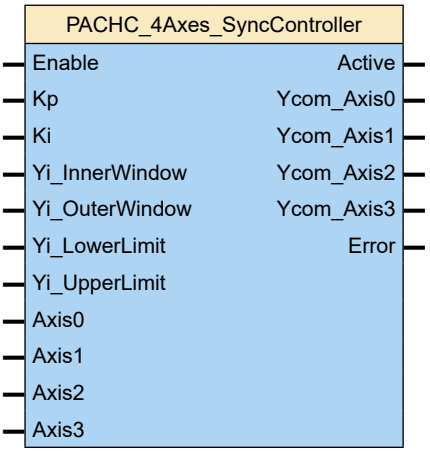
6.23 Synchronous Controller for 2 Axes (PACHC_2Axes_SyncController)

FB name	PACHC_2Axes_SyncController	
The synchronous controller controls to the middle actual position of both axes		
VAR_INPUT		
Enable	BOOL	Starts function block at positive edge
Kp	REAL	Proportional gain synchronous controller [%/mm]
Ki	REAL	Gain integrator of the synchronous controller [%/(mm*s)]
Yi_InnerWindow	REAL	Negative limitation of the integrator output signal [%]
Yi_OuterWindow	REAL	Positive limitation of the integrator output signal [%]
Yi_LowerLimit	REAL	Value indicates the inner value of the window in which the integrator is active [%]
Yi_UpperLimit	REAL	Value indicates the outer value of the window in which the integrator is active [%]
Axis0	PACHC_AXIS_REF	Axis reference (drive name in device tree)
Axis1	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Active	BOOL	Function block is active
Ycom_Axis0	REAL	Controller output signal axis 0
Ycom_Axis1	REAL	Controller output signal axis 1
Error	BOOL	Error during module execution
Note: Controls in case of 2 axes to the middle actual position of both axes.		



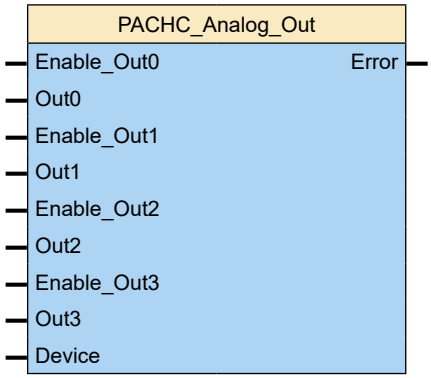
6.24 Synchronous Controller for 4 Axes (PACHC_4Axes_SyncController)

FB name	PACHC_4Axes_SyncController	
The synchronous controller controls to the middle actual position of the 4 axes		
VAR_INPUT		
Enable	BOOL	Starts function block at positive edge
Kp	REAL	Proportional gain synchronous controller [%/mm]
Ki	REAL	Gain integrator of the synchronous controller [%/(mm*s)]
Yi_InnerWindow	REAL	Negative limitation of the integrator output signal [%]
Yi_OuterWindow	REAL	Positive limitation of the integrator output signal [%]
Yi_LowerLimit	REAL	Value indicates the inner value of the window in which the integrator is active [%]
Yi_UpperLimit	REAL	Value indicates the outer value of the window in which the integrator is active [%]
Axis0	PACHC_AXIS_REF	Axis reference (drive name in device tree)
Axis1	PACHC_AXIS_REF	Axis reference (drive name in device tree)
Axis2	PACHC_AXIS_REF	Axis reference (drive name in device tree)
Axis3	PACHC_AXIS_REF	Axis reference (drive name in device tree)
VAR_OUTPUT		
Active	BOOL	Function block is active
Ycom_Axis0	REAL	Controller output signal axis 0
Ycom_Axis1	REAL	Controller output signal axis 1
Ycom_Axis2	REAL	Controller output signal axis 2
Ycom_Axis3	REAL	Controller output signal axis 3
Error	BOOL	Error during module execution
Note: Controls in case of 4 axes to the middle actual position of the 4 axes.		



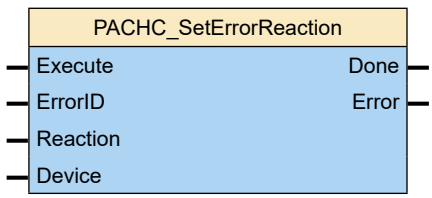
6.25 Writing Analogue Outputs (PACHC_Analog_Out)

FB name	PACHC_Analog_Out	
Allows the use of free (not configured) analogue outputs		
VAR_INPUT		
Enable_Out0	BOOL	Starts Out0 of the function block at positive edge
Out0	REAL	Specification of the analogue value [%]
Enable_Out1	BOOL	Starts Out1 of the function block at positive edge
Out1	REAL	Specification of the analogue value [%]
Enable_Out2	BOOL	Starts Out2 of the function block at positive edge
Out2	REAL	Specification of the analogue value [%]
Enable_Out3	BOOL	Starts Out3 of the function block at positive edge
Out3	REAL	Specification of the analogue value [%]
Device	PACHC	Device reference (name of PACHC in device tree)
Error	BOOL	Error during module execution
Note: The analogue value is only output if the device was previously activated with the function block PACHC_Power.		



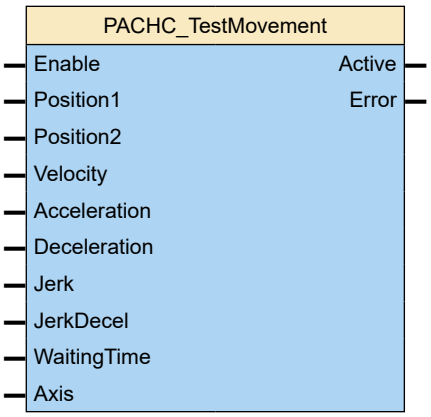
6.26 Setting Error Reaction (PACHC_SetErrorReaction)

FB name	PACHC_SetErrorReaction	
This function block serves for determination of the error reaction. Note: The error reaction cannot be changed in case of error with standard reaction 5 (immediately switch off power supply (without ramp)).		
VAR_INPUT		
Execute	BOOL	Selected error reaction is set for the selected error
ErrorID	WORD	Error number (hexadecimal) for which the error reaction shall be set, e.g. 16#7320 for tracking error axis 0
Reaction	DWORD	Error reaction: 0: no reaction, error is deactivated 1: Ramping up the actual velocity: stay in position controlled status 2: Ramping down the actual speed; then deactivate controller
Device	PACHC	Device reference (name of PACHC in device tree)
VAR_OUTPUT		
Done	BOOL	Selected error reaction was set
Error	BOOL	Error during function block processing
Notes: Error reaction settings from the configuration are overwritten. Error mask settings are made internally via the PACHC objects. If the objects are permanently, the setting is also memorized after power-off. If the ErrorID contains an invalid error number, there is no change. The corresponding error numbers can be found in the appendix from page 82.		



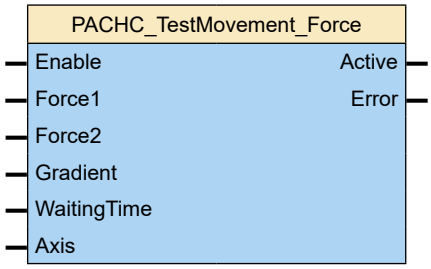
6.27 Test movement between 2 positions, with set speed and waiting time (PACHC_TestMovement)

FB-Name	PACHC_TestMovement	
Test movement between 2 positions, with set speed and waiting time		
VAR_INPUT		
Enable	BOOL	Starts the sequence of the block with a rising edge
Position1	REAL	Absolute target position1 [mm], positive or negative
Position2	REAL	Absolute target position2 [mm], positive or negative
Velocity	REAL	Value of the maximum speed (always positive) (is not always reached) [mm/s]
Acceleration	UDINT	Value of acceleration (always positive) [mm/s²]
Deceleration	UDINT	Value of deceleration (always positive) [mm/s²]
Jerk	UDINT	Value of the acceleration jerk (always positive) [mm/s³]
JerkDecel	UDINT	Value of the deceleration jerk (always positive) [mm/s³]
WaitingTime	UINT	Waiting time at position1 and position2 [ms]
Axis	PACHC_AXIS_REF	Axis reference (name of the drive in the device tree)
VAR_INPUT		
Active	BOOL	Module is active
Error	BOOL	Error during module execution
Hinweis: The axis moves between 2 defined positions at a defined speed. Module is ideal for optimisation.		



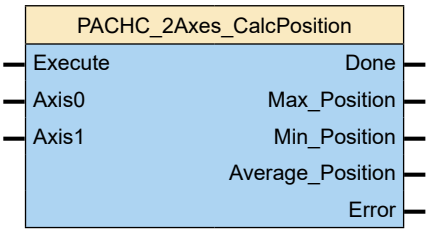
6.28 Test movement between 2 forces or pressures, with defined force/pressure gradient and waiting time (PACHC_TestMovement_Force)

FB-Name	PACHC_TestMovement_Force	
Test movement between 2 forces or pressures, with defined force/pressure gradient and waiting time		
VAR_INPUT		
Enable	BOOL	Starts the sequence of the block with a rising edge
PressureForce1	REAL	Absolute target force1 [N], positive or negative Absolute target pressure1 [bar], positive only
PressureForce2	REAL	Absolute target force2 [N], positive or negative Absolute target pressure2 [bar], positive only
Gradient	REAL	Rate of pressure change [bar/s] Rate of force change in [N/s]
WaitingTime	UINT	Waiting time at pressure/force1 and pressure/force2 [ms]
Axis	PACHC_AXIS_REF	Axis reference (name of the drive in the unit tree)
VAR_INPUT		
Active	BOOL	Module is active
Error	BOOL	Error during module execution
Hinweis: The axis follows 2 defined pressure/force setpoints with a defined pressure/force gradient. Module is ideal for optimisation.		



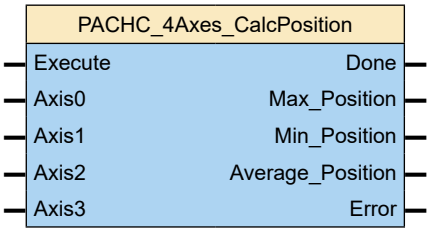
6.29 Calculates the minimum, maximum and average position of both axes (PACHC_2Axes_CalcPosition)

FB-Name	PACHC_2Axes_CalcPosition	
Calculates the minimum, maximum and average position of both axes		
VAR_INPUT		
Execute	BOOL	Starts the sequence of the function block with a rising edge
Axis0	PACHC_AXIS_REF	Axis reference0 (name of the drive in the device tree)
Axis1	PACHC_AXIS_REF	Axis reference1 (name of the drive in the device tree)
VAR_INPUT		
Done	BOOL	Positions are calculated
Max_Position	REAL	Maximum position of the two axes
Min_Position	REAL	Minimum position of the two axes
Average_Position	REAL	Average position of the two axes
Error	BOOL	Error during block execution
Note: The module calculates the maximum, minimum and average position from the actual positions of the two axes at the time of the execute.		



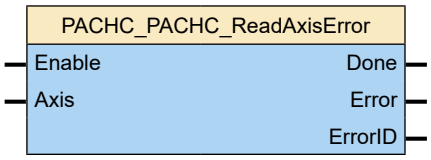
6.30 Calculates the minimum, maximum and average position of the four axes (PACHC_4Axes_CalcPosition)

FB-Name	PACHC_4Axes_CalcPosition	
Calculates the minimum, maximum and average position of the 4 axes		
VAR_INPUT		
Execute	BOOL	Starts the sequence of the function block with a rising edge
Axis0	PACHC_AXIS_REF	Axis reference0 (name of the drive in the device tree)
Axis1	PACHC_AXIS_REF	Axis reference1 (name of the drive in the device tree)
Axis2	PACHC_AXIS_REF	Axis reference2 (name of the drive in the device tree)
Axis3	PACHC_AXIS_REF	Axis reference3 (name of the drive in the device tree)
VAR_INPUT		
Done	BOOL	Positions are calculated
Max_Position	REAL	Maximum position of the axes
Min_Position	REAL	Minimum position of the axes
Average_Position	REAL	Average position of the axes
Error	BOOL	Error during block execution
Note: The module calculates the maximum, minimum and average position from the actual positions of the axes at the time of the execute.		



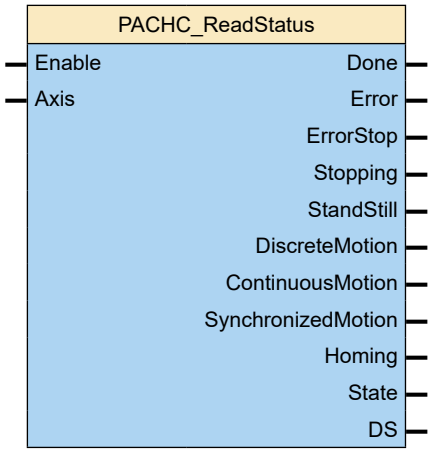
6.31 Reading Actual Error Number (PACHC_ReadAxisError)

FB name	PACHC_ReadAxisError	
Shows the actual error number of the corresponding axis		
VAR_INPUT		
Enable	BOOL	Starts error reading
Axis	PACHC_AXIS_REF	Axis reference (name of drive in device tree)
VAR_OUTPUT		
Done	BOOL	Reading error status was executed
Error	BOOL	Error active (Yes/No)
ErrorID	WORD	Shows the actual error number



6.32 Reading Actual Device Status (PACHC_ReadStatus)

FB name	PACHC_ReadStatus	
Serves to read the actual device status, DeviceStatus		
VAR_INPUT		
Enable	BOOL	Starts error reading
Axis	PACHC_AXIS_REF	Axis reference (name of drive in device tree)
VAR_OUTPUT		
Done	BOOL	Reading error status was executed
Error	BOOL	Error active (Yes/No)
Errorstop	BOOL	In stop mode due to an error
Stopping	BOOL	In stop
StandStill	BOOL	Energized and no motion
DiscreteMotion	BOOL	Discrete motion
ContinuousMotion	BOOL	Continuous motion
SynchronizedMotion	BOOL	Synchronization is active
Homing	BOOL	Homing active
State	BOOL	Current device state as a plain text
DS	UINT	Number of the current device state
Note: The corresponding statuses can be found in the status diagram in chapter 6.2.1		



6.26 Reading and Writing of Parameter Groups

The parameter groups listed below can be read and written by setting the corresponding trigger variable = TRUE.

Parameter Group	Variable
Reading	
All parameters	Axisname.Configuration.b_StartSDOUpload
Writing	
Position controller	Axisname.Configuration.b_StartDownloadPosCtrlParameter
Force controller	Axisname.Configuration.b_StartDownloadFCtrlParameter
Analogue inputs	Axisname.Configuration.b_StartSDODownloadAIn
Linearization0	Axisname.Configuration.b_StartSDODownloadLin0
Linearization1	Axisname.Configuration.b_StartSDODownloadLin1
Linearization2	Axisname.Configuration.b_StartSDODownloadLin2
Linearization3	Axisname.Configuration.b_StartSDODownloadLin3

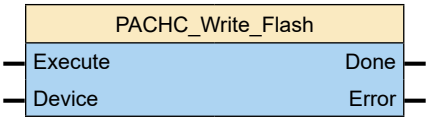
NOTE

As long as the variable is set, a new SDO transfer is continuously initiated which leads to a high bus load.

NOTE

During storing data in Flash, controller oscillations can occur due to increased processor load. The drive should be in status Deenergized/Power Off.

FB name	PACHC_Write_Flash	
Parameters and settings are permanently stored in Flash		
VAR_INPUT		
Execute	BOOL	Starts the function block, changed values are permanently set
Device	PACHC	Device reference (name PACHC in device tree)
VAR_OUTPUT		
Done	BOOL	Storing values was executed
Error	BOOL	Error during module execution



7. Diagnosis

7.1 Error

If an error occurs at an axis of the PACHC, an error message with an error number is generated. The meaning of the error numbers is explained in the spreadsheet in the appendix.

7.2 Error Storage

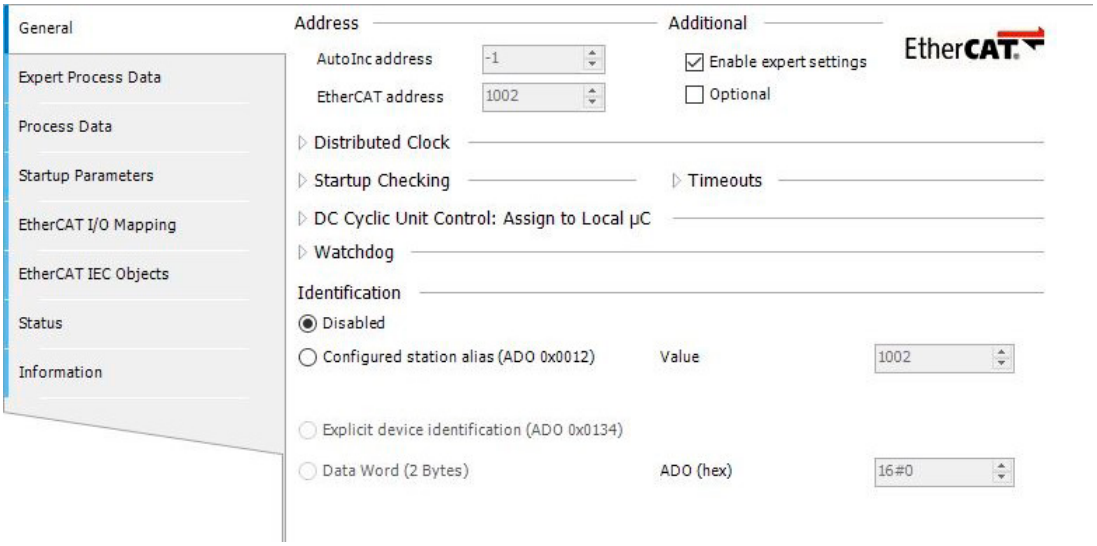
PACHC stores the error numbers and the error date of the last 32 error messages. Messages can be read in the PACHC application program via the function block PACHC_ErrorHistory. They are subsequently displayed for both axes on the PACHC in the field iErrorCodes.

7.3 Firmware Update

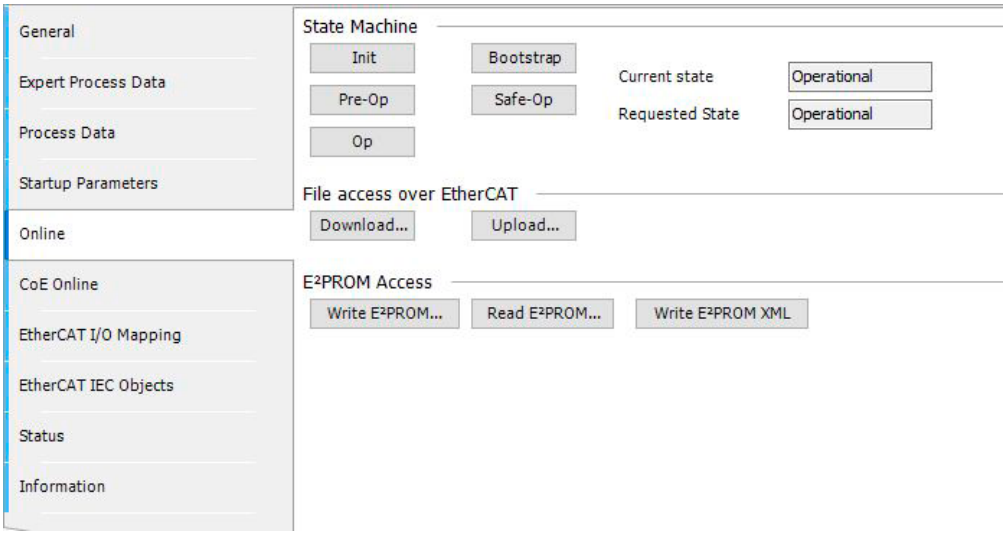
Within the development environment CODESYS V3.5, it is possible to update the PACHC firmware, The current firmware can be found on the PACHC product page on parker.com.

To update the firmware on the PACHC, the device must be connected with the PAC via the E-bus and your computer must be connected online to the PAC.

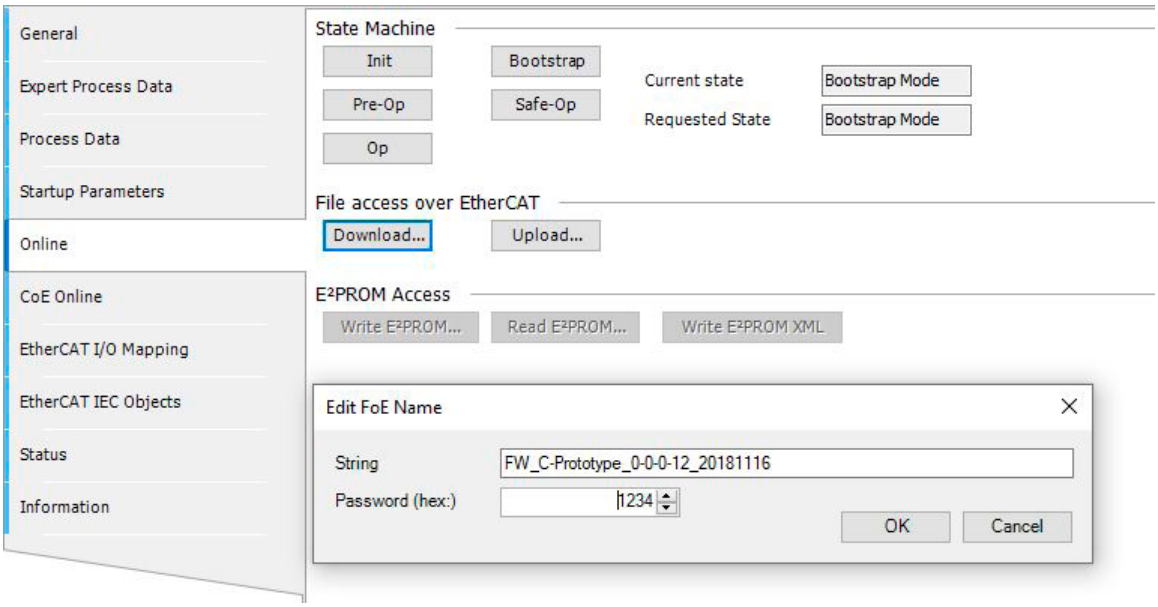
1. Select the PACHC in the device tree and open the corresponding page with a double-click
2. Activate the expert settings



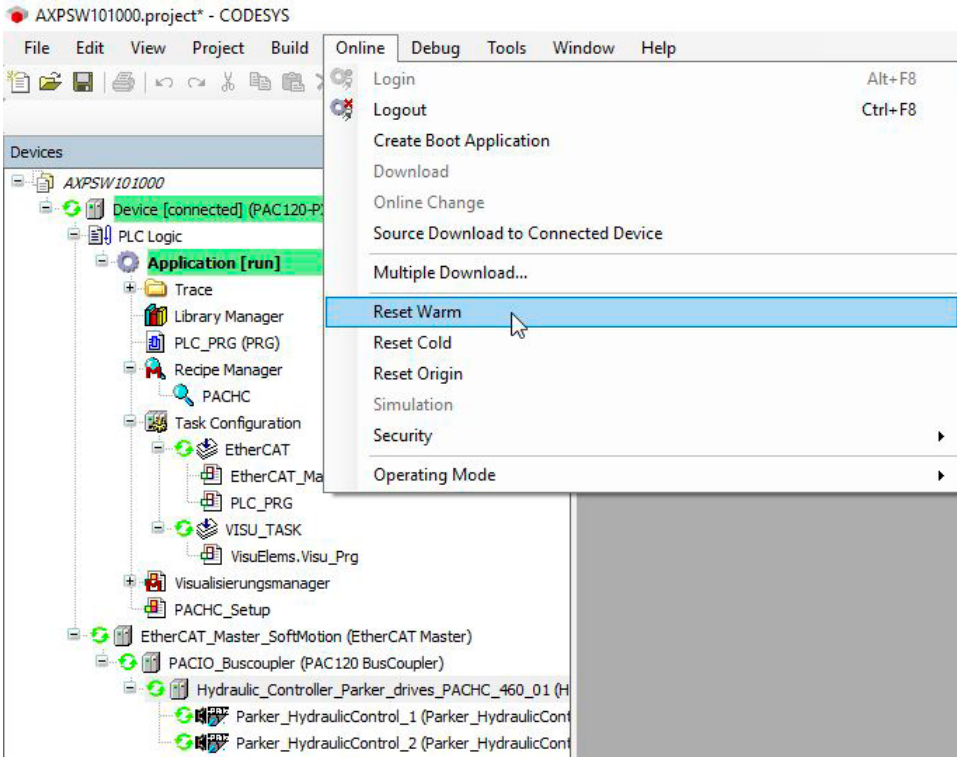
3. Switch PACHC to status „Init” first and then to “Bootstrap”



4. Select Download and then the firmware file *.efw. Password is 1234.



5. Restart device with „Reset warm“.



8. Maintenance / Servicing

8.1 General

Only qualified persons may work on PACHC.

	**CAUTION**
	Do not plug, unplug, mount or touch the connectors during operation. Doing so may destroy the unit or provoke malfunctions → Before working on the unit, turn off all power sources including those feeding power to peripherals such as externally fed sensors, programming devices etc.

	**CAUTION**
	Overheating Overheating may destroy the unit or provoke malfunctions → Verify that the unit's ventilation slots are not covered and that air can circulate.

8.2 Servicing

PACHC requires neither servicing for the specified service life nor any action if it is kept and operated at the admissible ambient conditions specified in section Technical Data.

8.3 Maintenance

Cleaning

Prevent inadmissible contamination while operating and storing PACHC.

To replace modules

Refer to section 5.1.1 Mechanical Installation

8.4 Repairs / Customer Service

	**Note**
	Only the manufacturer or customer service providers authorized by the manufacturer may do repairs and perform corrective maintenance.

8.5 Warranty

The statutory period and conditions of warranty apply. Warranty expires if unauthorized attempts are made to repair the unit / product or any other intervention is performed.

8.6 Taking out of Service

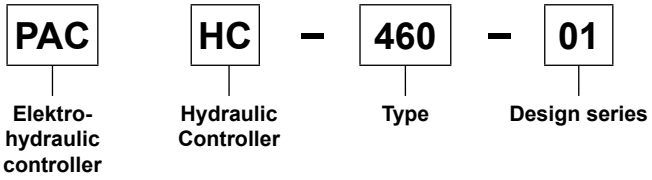
Before disposing of PACHC you must disassemble it and completely take it apart. All metal components can be given to metal recycling.

Electronic scrap

Sort and dispose of electronic components by type. For details on proper disposal please check your national laws and regulations making sure that your method of disposal complies with them.

Treat the packaging as recyclable paper and cardboard.

9. Ordering Code



10. Technical Data

Allgemein	
Function	Controller module with EtherCAT slave function for operation at Parker Automation Controller
Housing / protection class	Aluminium strap, plastic, IP20
Mounting	35 mm DIN rail
Mounting position	Vertical, stackable
Noise stability	Zone B according to EN61131-2, mounting on grounded rail in grounded control cabinet
Environmental conditions	Relative humidity 5 % … 95 % w/o dew
Storage temperature	-25 °C...+70 °C
Operation temperature	0...+55 °C
$MTTF_D$ value	51 a
Weight	0.16 kg
Electrical	
Analogue inputs Optional	4 x 0…10 V 4 x 0/4…20 mA Resolution 12 Bit Sampling rate < 62.5 µs
Analogue outputs Optional	4 x 0…10 V, -10 V, +10 V 4 x 0/4…20 mA Resolution 16 Bit Update rate ≤ 250 µs
Counter / encoder	RS422: 32 Bit, 5 MHz 5/24 V single ended: 32 Bit, 1.6 MHz SSI: 18-32 Bit, 80-1000 Kbit/s EnDAT 2.1: 100 kHz-2 MHz
Field bus interface	EtherCAT internal via E-Bus interface
Connectors	IO connector: 36-pole connector at the front EtherCAT: 10-pole interface on the left side
End module	Not required
ESI file	PACHC_V**.xml
Power supply	24 V DC (19.2 ... 28.8)
E-Bus load	< 250 mA
Potential separation	Modules are potential separated against each other and bus
CE conformity	2004/108/EC
Insulation requirements	Protection class III according to EN 601131-2 Power circuits class 2 according to EN 601131-2 Contact protection according to EN 601131-2 (IEC 60529) Overvoltage category zone 3 according to EN601131-2 Degree of contamination 2 according to EN 50178
EMC	2014/30/EU
Wiring length	< 30 m, overall braid shield
UL certification	Certified: E-File-No. E506274

11. Accessories

Modul type	Item number	Description
PLC	PAC120-XWX01-3X-00-01	PAC120 Controller
Accessories	43-026590-01	PACIO 2-Pole Connector
	43-026591-01	PACIO 18-Pole Connector
	43-026592-01	PACIO 36-pole Connector
	PACIO-412-01	PACIO Shield 2x8 mm
	PACIO-412-02	PACIO Shield 14 mm
Analogue	PACIO-441-01	PACIO AI4-mA 12 Bit
	PACIO-441-02	PACIO AI4/8-VDC 13 Bit
	PACIO-441-51	PACIO AI4-mA 12 Bit CoE
	PACIO-441-52	PACIO AI4/8-VDC 13 Bit CoE
	PACIO-442-02	PACIO AO4-VDC/mA 12 Bit
	PACIO-442-52	PACIO AO4-VDC/mA 16 Bit CoE
Counter	PACIO-454-01	PACIO Counter/Enc
Digital I/O modules	PACIO-450-02	PACIO DI16/DO8 1 A
	PACIO-450-03	PACIO DI16/DO16 1ms/0.5 A
	PACIO-450-05	PACIO DI8/DO8 1ms/0.5 A
	PACIO-450-13	PACIO DI16/DO16 1ms/0.5 A LS
	PACIO-451-02	PACIO DI32 1 ms
	PACIO-451-03	PACIO DI16 1 ms
	PACIO-452-01	PACIO DO16 0.5 A
	PACIO-452-02	PACIO DO8 1 A
Interfaces	PACIO-400-02	PACIO Extender 2 Port
	PACIO-400-00	PACIO Bus Coupler 3 A
Temperature	PACIO-443-01	PACIO AI4-Pt/Ni100 16 Bit
	PACIO-443-03	PACIO AI4-Pt/Ni1000 16 Bit
	PACIO-443-06	PACIO AI8 Thermocouple 16 Bit
	PACIO-443-57	PACIO AI4-Pt/Ni/Thermo 16 Bit CoE
	PACIO-443-58	PACIO AI8-Pt/Ni/Thermo 16 Bit CoE

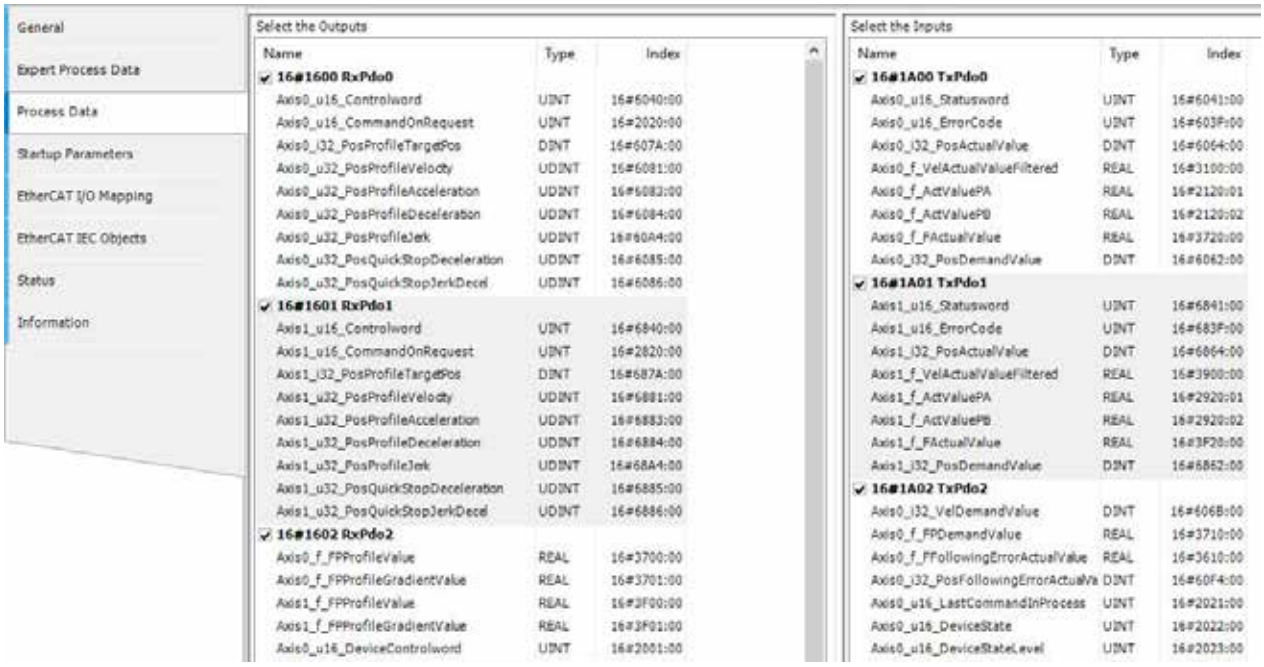
NOTE

The documentation for the Parker Automation Controller series PAC120 can be found on our homepage www.parker.com/ISDE under “Support”.

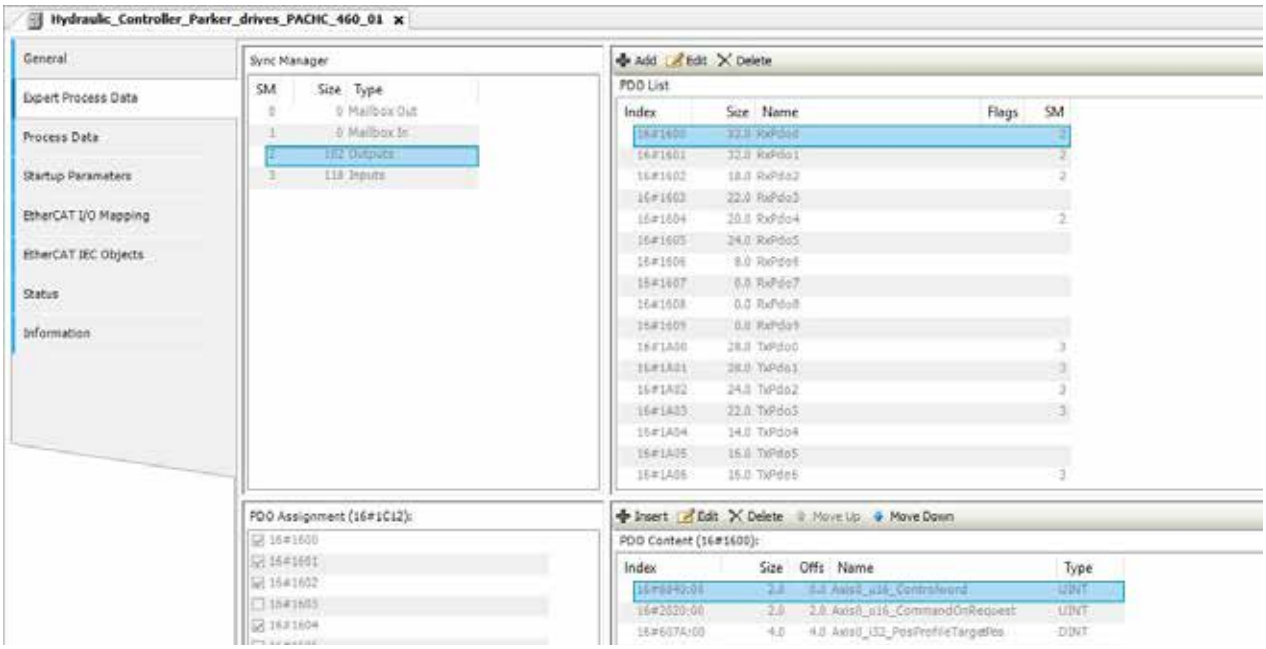
12. Appendix

Mapping

PACHC has a predefined mapping containing all necessary parameters for the function blocks of the PACHC library. Only those values included in the mapping are updated in the EtherCAT cycle. Those values which are not included can be read and written via the Service Data Objects (SDO). Additionally, parameters can be added to the EtherCAT mapping of the PACHC either via predefined PDOs under process data



or separately via the process data/expert mode.



The input and output data size of each 120 Bytes must not be exceeded.

Axis and Device Parameter

Parameter name	Data type	Default value	Unit	Description
Axis name				
AccActualValueFiltered	REAL	-	mm/s	Actual acceleration filtered
ActualValueP0	REAL	-	bar	Actual supply pressure
ActualValuePT	REAL	-	bar	Actual tank pressure
ActValueCondPosOffset	REAL	-	mm	Position offset (Homing) Demand value jerk
CommandOnRequest	UINT	-	-	Actual axis command
DriveID	UDINT	-		Axis number
FCtrlOut	REAL	-	%	Controller output force-/pressure controller
JerkDemandValue	DINT	-	mm/s^2	Demand value jerk
ModesOfOperation	USINT	-	-	
OpenloopSetpoint	REAL	-	%	Open loop set point
PosActualValueWOOffset	DINT	-	mm	Actual position without homing offset
PosCtrlActuatingSignalAccFeedback	REAL	-	%	Controller output acceleration feedback of position controller
PosCtrlActuatingSignalAccFeedForward	REAL	-	%	Controller output acceleration feed forward of position controller
PosCtrlActuatingSignalIPartYi	REAL	-	%	Controller output I-part of position controller
PosCtrlActuatingSignalPPartYp	REAL	-	%	Controller output P-part of position controller
PosCtrlActuatingSignalVelFeedback	REAL	-	%	Controller output velocity feedback of position controller
PosCtrlActuatingSignalVelFeedForward	REAL	-	%	Controller output velocity feed forward of position controller
PosCtrlOut	REAL	-	%	Controller output position controller
PosEncoderActualValueTrackABRef	USINT	-	-	Encoder signal (Bit0 A-Spur, Bit1 B-Spur, Bit2 Ref-Spur)
ProfileSegment	INT	-	-	Profile segment
RxCommandOnRequest	UINT	-	-	Command axis
RxControlWord	UINT	-	-	Control word of axis
RxFPProfileGradientValue	REAL	-	N/s o. bar/s	Gradient of target force /-pressure
RxFPProfileValue	REAL	-	N or bar	Target force/-pressure
RxModeOfOperation	USINT	-	-	Operation mode 3S soft motion
RxPosCtrlDisturbanceOffset	REAL	-	%	Disturbance offset position controller
RxPosCtrlKp	REAL	-	%/mm	Proportional gain position controller
RxPosCtrlVelFeedForwardKvs	REAL	-	%s/mm	Velocity feed forward position controller
RxPosProfileAcceleration	UDINT	-	mm/s^2	Target acceleration
RxPosProfileDeceleration	UDINT	-	mm/s^2	Target deceleration
RxPosProfileJerk	UDINT	-	mm/s^3	Target pressure
RxPosProfileTargetPos	DINT	-	0.001 mm	Target position
RxPosProfileVelocity	UDINT	-	0.01 mm/s	Target speed
RxPosQuickStopDeceleration	UDINT	-	mm/s^2	Target deceleration at Stop-command
RxPosQuickStopJerkDecel	UDINT	-	mm/s^3	Target jerk at Stop-command
RxTargetTorque	INT	-	N o. bar	Target force/-pressure
RxTargetVelocity	DINT	-	mm/s	Target velocity
RxTorqueSlope	UDINT	-	N/s o. bar/s	Target gradient of target force/pressure
SlaveAddr	UDINT	-	-	EtherCAT address
TxAccDemandValue	DINT	-	mm/s^2	Demand acceleration
TxActualValuePA	REAL	-	bar	Actual pressure pA
TxActualValuePB	REAL	-	bar	Actual pressure pB
TxDeviceState	UINT	-	-	Device state
TxDeviceStateLevel	UINT	-	-	Device state level
TxErrorCode	UINT	-	-	Error code
TxFPActualValue	REAL	-	N or bar	Actual force/-pressure
TxFPDemandValue	REAL	-	N or bar	Demand force/-pressure
TxFPFollowingErrorActualValue	REAL	-	N or bar	Following error force/pressure
TxJerkDemandValue	DINT	-	mm/s^3	Demand jerk
TxLastCommandInProcess	UINT	-	-	Last command in process
TxModeOfOperationDisplay	USINT	-	-	Active mode of operation 3S soft motion
TxPosActualValue	REAL	-	mm	Actual position

Parameter name	Data type	Default value	Unit	Description
Axis name				
TxPosDemandValue	REAL	-	mm	Demand position
TxPosFollowingErrorActualValue	REAL	-	mm	Following error position
TxStatusword	UINT	-	-	Status word of axis
TxTorqueActualValue	INT	-	N or bar	Actual force/pressure
TxVelActualValue	REAL	-	mm/s	Actual velocity
TxVelActualValueFiltered	REAL	-	mm/s	Actual velocity filtered
TxVelDemandValue	REAL	-	mm/s	Demand velocity
AccSignalFilter	UDINT	0	µs	Filter time constant of acceleration filter
ActValueCondPosOffset	REAL	0	mm	Position offset of feedback system
ApplicationMaxMass	REAL	0	kg	Moved mass of cylinder
ApplicationMaxSupplyPressure	REAL	0	bar	Max. supply pressure in the application
ApplicationType	UINT	0	-	Type of application
CylinderMaxSpeed	UDINT	2000	mm/s	Max. allowed cylinder speed
CylinderNumberCyl	UINT	1	-	Number of cylinders of same type which are use used to calculate the total area for force calculation
CylinderOrientation	INT	0	Degree	Orientation of cylinders
CylinderPistonDiameter	UDINT	80	mm	Piston diameter of cylinder
CylinderRodDiameterA	UDINT	0	mm	Rod diameter A (piston side) of cylinder. For differential cylinder the value is 0.
CylinderRodDiameterB	UDINT	25	mm	Rod diameter of cylinder B
CylinderTotalStroke	REAL	300	mm	Total stroke of cylinder
FCtrlDisturbanceOffset	REAL	0	%	Disturbance offset of force/pressure controller
FCtrlFeedForwardKfs	REAL	0	%/N or %/bar	Force feed forward of force/presure controller
FCtrlInnerWindowIPart	REAL	0	N or bar	Inner window I-part of force/pressure controller
FCtrlInversion	USINT	0	-	Inversion force/pressure controller output
FCtrlKd	REAL	0	%/N or %/bar	D-part of force/pressure controller
FCtrlKi	REAL	0	%/N or %/bar	I-part of force/pressure controller
FCtrlKp	UDINT	0	%/N or %/bar	P-part of force/pressure controller
FCtrlNegLimitIPart	REAL	0	%	Negative limit of controller output of I-part of force/pressure controller
FCtrlOuterWindowIPart	REAL	0	N or bar	Outer window of I-part of force/pressure controller
FCtrlOutFilter	UDINT	0	µs	Filter time constant of PT1 filter at force/pressure controller output
FCtrlPosLimitIPart	REAL	0	%	Positive limit of controller output of I-part of force/pressure controller
FCtrlTd	REAL	0	µs	Time constant of D-part of force/pressure controller
FCtrlVelFeedbackKv	REAL	0	%s/mm	Velocity feedback of force/pressure controller
FeedbackAIn	INT	0	-	Analogue interface of position transducer
FeedbackAInSignalType	INT	0	-	Signal type of output signals of position transducer
FeedbackBaudRate	UINT	1000	Kbit/s	Baud rate of position transducer
FeedbackBitLength	USINT	24	bit	Telegram length of position transducer
FeedbackInvertDirection	BOOL	0	-	Invert sense of direction of position transducer on/off
FeedbackMaxPosition	REAL	0	mm	Maximal position of position transducer
FeedbackMaxSignalPosition	REAL	0	V o. mA	Maximal output signal of position transducer
FeedbackMinPosition	REAL	0	mm	Minimal Position of position transducer
FeedbackMinSignalPosition	REAL	0	V o. mA	Minimal output signal of position transducer
FeedbackResolution	REAL	0.005	mm	Resolution of position transducer
FeedbackType	USINT	2	-	Type of position transducer
FeedbackUpdateRate	UINT	0	µs	Update rate of position feedback system

Parameter name	Data type	Default value	Unit	Description
Axis name				
ForceForceMax	REAL	0	N oder bar	Maximal force of force transducer
ForceForceMin	REAL	0	N oder bar	Minimal force of force transducer
ForceInputsignalType	INT	0	-	Signal type of output signal of force transducer
ForceInterface	INT	0	-	Analogue interface of force transducer
ForcePressureCtrlType	USINT	0	-	Type of force/pressure controller
ForceSignalMax	REAL	0	V o. mA	Maximal output signal of force transducer
ForceSignalMin	REAL	0	V o. mA	Minimal output signal of force transducer
FPFollowingErrorReaction	USINT	0	-	Error reaction following error force/pressure controller
FPFollowingErrorWindow	REAL	0	N o. bar	Following error window force/pressure controller
FPFollowingErrorWindowTime	UDINT	0	µs	Following error window time force/pressure controller
FPForceLimitErrorReaction	USINT	0	-	Error reaction force too high
FPMaxForce	DINT	0	N	Max. allowed force
FPWindow	UDINT	0	N o. bar	In force/pressure window
FPWindowTime	UINT	0	µs	In force/pressure window time
HomingAcceleration	UDINT	0	mm/s^2	Target acceleration homing
HomingMethod	SINT	0	35	Homing type
HomingOffset	DINT	0	0.001 mm	New actual position at homing point
HomingSpeedDuringSearchForZero	UDINT	0	mm/s	Target velocity during homing
PosCtrlAccFeedbackKa	REAL	0	$\%s^2/mm$	Gain acceleration feedback of position controller
PosCtrlAccFeedForwardKva	REAL	0	$\%s^2/mm$	Gain acceleration feed forward of position controller
PosCtrlDisturbanceOffset	REAL	0	%	Disturbance offset of position controller
PosCtrlInnerWindowIPart	REAL	0	mm	Inner window I-part of position controller
PosCtrlKi	REAL	0	%/mms	I-part of position controller
PosCtrlKp	REAL	0	%/mm	P-part of position controller
PosCtrlNegLimitIPart	REAL	0	%	Negative limit of controller output of I-part of position controller
PosCtrlOuterWindowIPart	REAL	0	mm	Outer window I-part of position controller
PosCtrlPosLimitIPart	REAL	0	%	Positive limit of controller output of I-part of position controller
PosCtrlSpeedThresholdIPart	REAL	0	mm/s	Velocity limit of I-part of position controller
PosCtrlVelFeedbackKv	REAL	0	%s/mm	Gain velocity feedback of position controller
PosCtrlVelFeedForwardKvs	REAL	0	%s/mm	Gain velocity feed forward of position controller
PosFollowingErrorReaction	USINT	0	-	Error reaction following error position controller
PosFollowingErrorTimeOut	UINT	0	ms	Following error time position controller
PosFollowingErrorWindow	UDINT	0	0.001 mm	Following error window position controller
PosLimitErrorReaction	USINT	0	-	Error reaction position travel limit
PosLimitMax	DINT		0.001 mm	Upper position travel limit
PosLimitMin	DINT		0.001 mm	Lower position travel limit
PosWindow	DINT	0	0.001 mm	In-position window
PosWindowTime	UINT	0	ms	In-position window time
PressureAInactivePressure	REAL	0	bar	Constant pressure if no transducer for pA connected
PressureAInputsignalType	USINT	0	-	Signal type of output signal of pressure transducer pA
PressureAInterface	INT	0	-	Analogue interface of transducer
PressureAPressureMax	REAL	400	bar	Maximal pressure of transducer
PressureAPressureMin	REAL	0	bar	Minimal pressure of transducer
PressureASignalMax	REAL	10	V o. mA	Maximal output signal of transducer
PressureASignalMin	REAL	0	V o. mA	Minimal output signal of transducer
PressureBInputsignalType	INT	0	-	Signal type of output signal of transducer
PressureBInterface	INT	0	-	Analogue interface of transducer
PressureBPressureMax	REAL	400	bar	Maximal pressure of transducer
PressureBPressureMin	REAL	0	bar	Minimal pressure of transducer
PressureBSignalMax	REAL	10	V o. mA	Maximal output signal of transducer

Parameter name	Data type	Default value	Unit	Description
Axis name				
PressureBSignalMin	REAL	0	V o. mA	Minimal output signal of transducer
PressurePInactivePressure	REAL	0	bar	Constant pressure if no transducer for pP connected
PressurePInputsignalType	INT	0	-	Signal type of output signal of transducer
PressurePInterface	INT	0	-	Analogue interface of transducer
PressurePPressureMax	REAL	400	bar	Maximal pressure of transducer
PressurePPressureMin	REAL	0	bar	Minimal pressure of transducer
PressurePSignalMax	REAL	10	V o. mA	Maximal output signal of transducer
PressurePSignalMin	REAL	0	V o. mA	Minimal output signal of transducer
PressureTInactivePressure	REAL	0	bar	Constant pressure if no transducer pT connected
PressureTInputsignalType	INT	0	-	Signal type of output signal of transducer
PressureTInterface	INT	0	-	Analogue interface of transducer
PressureTPressureMax	REAL	400	bar	Maximal pressure of transducer
PressureTPressureMin	REAL	0	bar	Minimal pressure of transducer
PressureTSignalMax	REAL	10	V o. mA	Maximal output signal of transducer
PressureTSignalMin	REAL	0	V o. mA	Minimal output signal of transducer
SpeedtooHighErrorReaction	USINT	0	-	Error reaction velocity too high
Valve0PosCtrl	BOOL	0	-	Valve0 active in position control
Valve0PresCtrl	BOOL	0	-	Valve0 active in force/pressure control
Valve1PosCtrl	BOOL	0	-	Valve1 active in position control
Valve1PresCtrl	BOOL	0	-	Valve1 active in force/pressure control
Valve2PosCtrl	BOOL	0	-	Valve2 active in position control
Valve2PresCtrl	BOOL	0	-	Valve2 active in force/pressure control
Valve3PosCtrl	BOOL	0	-	Valve3 active in position control
Valve3PresCtrl	BOOL	0	-	Valve3 active in force/pressure control
VelSignalFilter	UDINT	0	µs	Filter time constant of velocity filters
DieCastingStartMonitoringON	UINT	0	-	Start-up monitoring on/off
DieCastingVelocityGainChanges0	REAL	0	-	
DieCastingVelocityGainChanges1	REAL	0	-	
DieCastingVelocityGainChanges2	REAL	0	-	
DieCastingVelocityGainChanges3	REAL	0	-	
DieCastingVelocityGainChanges4	REAL	0	-	
DieCastingVelocityGainChanges5	REAL	0	-	
DieCastingVelocityGainChanges6	REAL	0	-	
DieCastingVelocityGainChanges7	REAL	0	-	
DieCastingVelocityGainChanges8	REAL	0	-	
DieCastingVelocityGainChanges9	REAL	0	-	
DieCastingVelocityGainChanges10	REAL	0	-	
DieCastingVelocityGainChanges11	REAL	0	-	
DieCastingVelocityGainChanges12	REAL	0	-	
DieCastingVelocityGainChanges13	REAL	0	-	
DieCastingVelocityGainChanges14	REAL	0	-	
DieCastingVelocityGainChanges15	REAL	0	-	
DieCastingVelocityGainChangesON	UINT	0	-	Gain scheduling on/off

NamePACHC.					
	DeviceControlword	UINT	-	-	Device control word
	DeviceFWNumber	STRING	-	-	Version of firmware
	DeviceHWNumber	STRING	-	-	Version of hardware
	DeviceManufacturingDate	STRING	-	-	Manufacturing date
	DeviceSerialNumber	STRING	-	-	Serial number
	DeviceSetErrorNo	UINT	-	-	Error code
	DeviceSetErrorReaction	USINT	-	-	Error reaction
	DeviceStatusword	UINT	-	-	Device status word
	DeviceTemperatur	REAL	-	-	Device temperature
	DeviceType	STRING	-	-	Device type, item number
NamePACHC. AnalogInputs					
	AIn0_AInActualValue	REAL	0	V or mA	Unfiltered actual value of analogue input 0
	AIn0_AInActualValueFiltered	REAL	0	V or mA	Filtered actual value of analogue input 0
	AIn0_AInOffset	REAL	0	V or mA	Offset of analogue input 0
	AIn0_AInFilter	UDINT	0	µs	Filter time constant of input filter 0
	AIn1_AInActualValue	REAL	0	V or mA	Unfiltered actual value of analogue input 1
	AIn1_AInActualValueFiltered	REAL	0	V or mA	Filtered actual value of analogue input 1
	AIn1_AInOffset	REAL	0	V or mA	Offset of analogue input 1
	AIn1_AInFilter	UDINT	0	µs	Filter time constant of input filter 1
	AIn2_AInActualValue	REAL	0	V or mA	Unfiltered actual value of analogue input 2
	AIn2_AInActualValueFiltered	REAL	0	V or mA	Filtered actual value of analogue input 2
	AIn2_AInOffset	REAL	0	V or mA	Offset of analogue input 2
	AIn2_AInFilter	UDINT	0	µs	Filter time constant of input filter 2
	AIn3_AInActualValue	REAL	0	V or mA	Unfiltered actual value of analogue input 3
	AIn3_AInActualValueFiltered	REAL	0	V or mA	Filtered actual value of analogue input 3
	AIn3_AInOffset	REAL	0	V or mA	Offset of analogue input 3
	AIn3_AInFilter	UDINT	0	µs	Filter time constant of input filter 3
NamePACHC.AnalogOutputs					
	AOut0_CtrlOutDBCompASide	REAL	0	%	Dead band A-side analogue output 0
	AOut0_CtrlOutDBCompBSide	REAL	0	%	Dead band B-side analogue output 0
	AOut0_CtrlOutDBCompThreshold	REAL	0	%	Threshold of dead band analogue output 0
	AOut0_CtrlOutDBCompType	SINT	0	-	Dead band compensation analogue output 0 on/off
	AOut0_CtrlOutFCtrlDirDepGainFactorNeg	REAL	1	-	Gain neg. force controller analogue output 0
	AOut0_CtrlOutFCtrlDirDepGainFactorPos	REAL	1	-	Gain pos. force controller analogue output 0
	AOut0_CtrlOutInactiveChain	REAL	0	%	Controller output analogue output 0 if valve is not used in active control loop
	AOut0_CtrlOutInvertingSign	SINT	0	-	Inversion analogue output 0
	AOut0_CtrlOutLowerLimit	REAL	-100	%	Lower limit analogue output 0
	AOut0_CtrlOutPosCtrlDirDepGainFactorNeg	REAL	1	-	Gain neg. position controller analogue output 0
	AOut0_CtrlOutPosCtrlDirDepGainFactorPos	REAL	1	-	Gain pos. position controller analogue output 0
	AOut0_CtrlOutUpperLimit	REAL	100	%	Upper limit analogue output 0
	AOut0_CtrlOutZeroCorrectionOffset	REAL	0	%	Offset analogue output 0
	AOut0_LinOut	REAL	0	%	Output signal analogue output 0
	AOut0_ValveOpenLoopOnOff	USINT	0	-	Analogue output 0 open loop on/off
	AOut0_ValveOpenLoopSetpoint	REAL	0	%	Analogue output 0 open loop set point
	AOut1_CtrlOutDBCompASide	REAL	0	%	Dead band A-side analogue output 1
	AOut1_CtrlOutDBCompBSide	REAL	0	%	Dead band B-side analogue output 1
	AOut1_CtrlOutDBCompThreshold	REAL	0	%	Threshold of dead band analogue output 1
	AOut1_CtrlOutDBCompType	SINT	0	-	Dead band compensation analogue output 1 on/off
	AOut1_CtrlOutFCtrlDirDepGainFactorNeg	REAL	1	-	Gain neg. force controller analogue output 1
	AOut1_CtrlOutFCtrlDirDepGainFactorPos	REAL	1	-	Gain pos. force controller analogue output 1
	AOut1_CtrlOutInactiveChain	REAL	0	%	Controller output analogue output 1 if valve is not used in active control loop

	AOut1_CtrlOutInvertingSign	SINT	0	-	Inversion analogue output 1
	AOut1_CtrlOutLowerLimit	REAL	-100	%	Lower limit analogue output 1
	AOut1_CtrlOutPosCtrlDirDepGainFactorNeg	REAL	1	-	Gain neg. position controller analogue output 1
	AOut1_CtrlOutPosCtrlDirDepGainFactorPos	REAL	1	-	Gain pos. position controller analogue output 1
	AOut1_CtrlOutUpperLimit	REAL	100	%	Upper limit analogue output 1
	AOut1_CtrlOutZeroCorrectionOffset	REAL	0	%	Offset analogue output 1
	AOut1_LinOut	REAL	0	%	Output signal analogue output 1
	AOut1_ValveOpenLoopOnOff	USINT	0	-	Analogue output 1 open loop on/off
	AOut1_ValveOpenLoopSetpoint	REAL	0	%	Analogue output 1 open loop set point
	AOut2_CtrlOutDBCompASide	REAL	0	%	Dead band A-side analogue output 2
	AOut2_CtrlOutDBCompBSide	REAL	0	%	Dead band B-side analogue output 2
	AOut2_CtrlOutDBCompThreshold	REAL	0	%	Threshold of dead band analogue output 2
	AOut2_CtrlOutDBCompType	SINT	0	-	Dead band compensation analogue output 2 on/off
	AOut2_CtrlOutFCtrlDirDepGainFactorNeg	REAL	1	-	Gain neg. force controller analogue output 2
	AOut2_CtrlOutFCtrlDirDepGainFactorPos	REAL	1	-	Gain pos. force controller analogue output 2
	AOut2_CtrlOutInactiveChain	REAL	0	%	Controller output analogue output 2 if valve is not used in active control loop
	AOut2_CtrlOutInvertingSign	SINT	0	-	Inversion analogue output 2
	AOut2_CtrlOutLowerLimit	REAL	-100	%	Lower limit analogue output 2
	AOut2_CtrlOutPosCtrlDirDepGainFactorNeg	REAL	1	-	Gain neg. position controller analogue output 2
	AOut2_CtrlOutPosCtrlDirDepGainFactorPos	REAL	1	-	Gain pos. position controller analogue output 2
	AOut2_CtrlOutUpperLimit	REAL	100	%	Upper limit analogue output 2
	AOut2_CtrlOutZeroCorrectionOffset	REAL	0	%	Offset analogue output 2
	AOut2_LinOut	REAL	0	%	Output signal analogue output 2
	AOut2_ValveOpenLoopOnOff	USINT	0	-	Analogue output 2 open loop on/off
	AOut2_ValveOpenLoopSetpoint	REAL	0	%	Analogue output 2 open loop set point
	AOut3_CtrlOutDBCompASide	REAL	0	%	Dead band A-side analogue output 3
	AOut3_CtrlOutDBCompBSide	REAL	0	%	Dead band B-side analogue output 3
	AOut3_CtrlOutDBCompThreshold	REAL	0	%	Threshold of dead band analogue output 3
	AOut3_CtrlOutDBCompType	SINT	0	-	Dead band compensation analogue output 3 on/off
	AOut3_CtrlOutFCtrlDirDepGainFactorNeg	REAL	1	-	Gain neg. force controller analogue output 3
	AOut3_CtrlOutFCtrlDirDepGainFactorPos	REAL	1	-	Gain pos. force controller analogue output 3
	AOut3_CtrlOutInactiveChain	REAL	0	%	Controller output analogue output 3 if valve is not used in active control loop
	AOut3_CtrlOutInvertingSign	SINT	0	-	Inversion analogue output 3
	AOut3_CtrlOutLowerLimit	REAL	-100	%	Lower limit analogue output 3
	AOut3_CtrlOutPosCtrlDirDepGainFactorNeg	REAL	1	-	Gain neg. position controller analogue output 3
	AOut3_CtrlOutPosCtrlDirDepGainFactorPos	REAL	1	-	Gain pos. position controller analogue output 3
	AOut3_CtrlOutUpperLimit	REAL	100	%	Upper limit analogue output 3
	AOut3_CtrlOutZeroCorrectionOffset	REAL	0	%	Offset analogue output 3
	AOut3_LinOut	REAL	0	%	Output signal analogue output 3
	AOut3_ValveOpenLoopOnOff	USINT	0	-	Analogue output 3 open loop on/off
	AOut3_ValveOpenLoopSetpoint	REAL	0	%	Analogue output 3 open loop set point

Error Messages

Error Description	Error Number dez.	Error Number hex.
Module over temperature	16912	0x4210
Module under voltage	20754	0x5112
Power supply error Encoder feedback 0	20755	0x5113
Analogue input 0 signal below limit	21041	0x5231
Analogue input 1 signal below limit	21042	0x5232
Analogue input 2 signal below limit	21043	0x5233
Analogue input 3 signal below limit	21044	0x5234
Analogue input 0 signal above limit	21045	0x5235
Analogue input 1 signal above limit	21046	0x5236
Analogue input 2 signal above limit	21047	0x5237
Analogue input 3 signal above limit	21048	0x5238
Cycle time 500 µs task exceeded	24594	0x6012
Cycle time 250 µs task exceeded	24704	0x6080
Cylinder max speed 0 too high	29456	0x7310
Cylinder max speed 1 too high	29458	0x7312
Position tracking error 0	29472	0x7320
Position tracking error 1	29474	0x7322
Position 0 above software limit	29475	0x7323
Position 0 below software limit	29476	0x7324
Position 1 above software limit	29477	0x7325
Position 1 below software limit	29478	0x7326
Force tracking error 0	29648	0x73D0
Force tracking error 1	29649	0x73D1
EBUS error	29968	0x7510
Force 0 above force limit	33664	0x8380
Force 1 above force limit	33665	0x8381
Analogue output 0 fault	65282	0xFF02
Analogue output 1 fault	65283	0xFF03
Analogue output 2 fault	65284	0xFF04
Analogue output 3 fault	65285	0xFF05
SSI feedback 0 timeout	65417	0xFF89
SSI feedback 1 timeout	65424	0xFF90
SSI feedback 0 bad initialisation	65427	0xFF93
SSI feedback 1 bad initialisation	65428	0xFF94
EnDat2-2 feedback 0 timeout	65429	0xFF95
EnDat2-2 feedback 1 timeout	65430	0xFF96
EnDat2-2 feedback 0 crc error	65431	0xFF97
EnDat2-2 feedback 1 crc error	65432	0xFF98
EnDat2-2 feedback 0 bad initialisation	65434	0xFF9A
EnDat2-2 feedback 1 bad initialisation	65435	0xFF9B
EnDat2-2 feedback 0 generation error	65436	0xFF9C
EnDat2-2 feedback 1 generation error	65437	0xFF9D
Power supply error Encoder feedback 1	65438	0xFF9E
Homing 0 only in standstill allowed	65504	0xFFE0
Homing 1 only in standstill allowed	65512	0xFFE8

Object list

PACHC supports profil DS402 as well as hydraulic parameters of profil DS408.

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
1008	0	device	Device Name	s_DeviceName	STRING	READ				Yes
1009	0	device	Device Hardware Version	s_DeviceHardwareversion	STRING	READ				Yes
100A	0	device	Device Firmware Version	s_DeviceFirmwareversion	STRING	READ				Yes
1010	1	device	Write Flash			READWRITE				
2000	0	device	Number of axes	u8_NumberOfAxes	UNSIGNED8	READWRITE	1		1..2	Yes
2001	0	device	Device controlword	u16_DeviceControlword	UNSIGNED16	READWRITE				No
2002	0	device	Device statusword	u16_DeviceStatusword	UNSIGNED16	READ				No
2003	0	device	Device set error number	u16_DeviceSetErrorNo	UNSIGNED16	READWRITE				No
2004	0	device	Device set error reaction	u8_DeviceSetErrorReac-tion	UNSIGNED8	READWRITE				No
2005	12	device	Error code 5		UNSIGNED16	READ				
2005	1	device	Error time 0							
2005	2	device	Error code 0		UNSIGNED16	READ				
2005	36	device	Error code 17		UNSIGNED16	READ				
2005	0	device	Error field with time		UNSIGNED8	CONST				
2005	3	device	Error time 1							
2005	45	device	Error time 22							
2005	5	device	Error time 2							
2005	7	device	Error time 3							
2005	8	device	Error code 3		UNSIGNED16	READ				
2005	9	device	Error time 4							
2005	24	device	Error code 11		UNSIGNED16	READ				
2005	11	device	Error time 5							
2005	39	device	Error time 19							
2005	13	device	Error time 6							
2005	14	device	Error code 6		UNSIGNED16	READ				
2005	15	device	Error time 7							
2005	16	device	Error code 7		UNSIGNED16	READ				
2005	17	device	Error time 8							
2005	18	device	Error code 8		UNSIGNED16	READ				
2005	19	device	Error time 9							
2005	20	device	Error code 9		UNSIGNED16	READ				
2005	21	device	Error time 10							
2005	22	device	Error code 10		UNSIGNED16	READ				
2005	23	device	Error time 11							
2005	10	device	Error code 4		UNSIGNED16	READ				
2005	59	device	Error time 29							
2005	46	device	Error code 22		UNSIGNED16	READ				
2005	47	device	Error time 23							
2005	48	device	Error code 23		UNSIGNED16	READ				
2005	49	device	Error time 24							
2005	50	device	Error code 24		UNSIGNED16	READ				
2005	51	device	Error time 25							
2005	52	device	Error code 25		UNSIGNED16	READ				
2005	53	device	Error time 26							
2005	54	device	Error code 26		UNSIGNED16	READ				
2005	55	device	Error time 27							
2005	56	device	Error code 27		UNSIGNED16	READ				
2005	37	device	Error time 18							
2005	58	device	Error code 28		UNSIGNED16	READ				
2005	38	device	Error code 18		UNSIGNED16	READ				
2005	60	device	Error code 29		UNSIGNED16	READ				
2005	61	device	Error time 30							
2005	62	device	Error code 30		UNSIGNED16	READ				

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
2005	63	device	Error time 31							
2005	64	device	Error code 31		UNSIGNED16	READ				
2005	44	device	Error code 21		UNSIGNED16	READ				
2005	43	device	Error time 21							
2005	42	device	Error code 20		UNSIGNED16	READ				
2005	41	device	Error time 20							
2005	40	device	Error code 19		UNSIGNED16	READ				
2005	6	device	Error code 2		UNSIGNED16	READ				
2005	57	device	Error time 28							
2005	33	device	Error time 16							
2005	4	device	Error code 1		UNSIGNED16	READ				
2005	25	device	Error time 12							
2005	34	device	Error code 16		UNSIGNED16	READ				
2005	32	device	Error code 15		UNSIGNED16	READ				
2005	31	device	Error time 15							
2005	30	device	Error code 14		UNSIGNED16	READ				
2005	26	device	Error code 12		UNSIGNED16	READ				
2005	35	device	Error time 17							
2005	29	device	Error time 14							
2005	28	device	Error code 13		UNSIGNED16	READ				
2005	27	device	Error time 13							
2006	0	device	Device time	s_DeviceTime	STRING	READWRITE				
2020	0	device0	Command on request 0	axis0_u16_CommandOn-Request	UNSIGNED16	READWRITE				no
2021	0	device0	Last command in pro-cess 0	axis0_u16_LastCommand-InProcess	UNSIGNED16	READ				No
2022	0	device0	device state 0	axis0_u16_DeviceState	UNSIGNED16	READ				No
2023	0	device0	Device state level 0	axis0_u16_DeviceState-Level	UNSIGNED16	READ				No
2040	0	cylinder config0	Actual value conditioning cylinder piston diameter 0	axis0_u32_ActValueCond-CylPistonDiameter	UNSIGNED32	READWRITE	0.001	mm		Yes
2041	0	cylinder config0	Actual value conditioning diameter A 0	axis0_u32_ActValueCond-CylDiameterA	UNSIGNED32	READWRITE	0.001	mm		Yes
2042	0	cylinder config0	Actual value conditioning diameter B 0	axis0_u32_ActValueCond-CylDiameterB	UNSIGNED32	READWRITE	0.001	mm		Yes
2043	0	cylinder config0	Actual value conditioning stroke 0	axis0_u32_ActValueCond-CylStroke	UNSIGNED32	READWRITE	0.001	mm		Yes
2044	0	cylinder config0	Actual value conditioning max speed 0	axis0_u32_ActValueCond-CylMaxSpeed	UNSIGNED32	READWRITE		mm/s		Yes
2046	0	cylinder config0	Actual value conditioning number 0	axis0_u8_ActValueCond-CylNumber	UNSIGNED16	READWRITE			1	Yes
2100	0	pressure sensor config0	Actual value conditioning min transducer signal pA 0	axis0_f_ActValueCondMin-TransducerSignalPA	FLOAT	READWRITE	0.001	mA or V		Yes
2101	0	pressure sensor config0	Actual value condition-ing max transducer sig-nal pA 0	axis0_f_ActValueCondMax-TransducerSignalPA	FLOAT	READWRITE	0.001	mA or V		Yes
2102	0	pressure sensor config0	Actual value conditioning min pressure pA 0	axis0_f_ActValueCond-MinPA	FLOAT	READWRITE	0.001	bar		Yes
2103	0	pressure sensor config0	Actual value conditioning max pressure pA 0	axis0_f_ActValueCond-MaxPA	FLOAT	READWRITE	0.001	bar		Yes
2104	0	pressure sensor config0	Actual value conditioning min transducer signal pB 0	axis0_f_ActValueCondMin-TransducerSignalPB	FLOAT	READWRITE	0.001	mA or V		Yes
2105	0	pressure sensor config0	Actual value condition-ing max transducer sig-nal pB 0	axis0_f_ActValueCondMax-TransducerSignalPB	FLOAT	READWRITE	0.001	mA or V		Yes

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
2106	0	pressure sensor config0	Actual value conditioning min pressure pB 0	axis0_f_ActValueCond-MinPB	FLOAT	READWRITE	0.001	bar		Yes
2107	0	pressure sensor config0	Actual value conditioning max pressure pB 0	axis0_f_ActValueCond-MaxPB	FLOAT	READWRITE	0.001	bar		Yes
2108	0	pressure sensor config0	Actual value conditioning min transducer signal pT 0	axis0_f_ActValueCondMin-TransducerSignalPT	FLOAT	READWRITE	0.001	mA or V		Yes
2109	0	pressure sensor config0	Actual value condition-ing max transducer sig-nal pT 0	axis0_f_ActValueCondMax-TransducerSignalPT	FLOAT	READWRITE	0.001	mA or V		Yes
2110	0	pressu-re sensor config0	Actual value conditioning const pressure pA 0	axis0_ActValueCondConst-TransducerSignalPA	FLOAT	READWRITE	1	bar		Yes
2111	0	pressu-re sensor config0	Actual value conditioning const pressure pB 0	axis0_ActValueCondConst-TransducerSignalPB	FLOAT	READWRITE	1	bar		Yes
2112	0	pressu-re sensor config0	Actual value conditioning const pressure pT 0	axis0_ActValueCondConst-TransducerSignalPT	FLOAT	READWRITE	1	bar		Yes
2113	0	pressu-re sensor config0	Actual value conditioning const pressure p0 0	axis0_ActValueCondConst-TransducerSignalP0	FLOAT	READWRITE	1	bar		Yes
210A	0	pressure sensor config0	Actual value conditioning min pressure pT 0	axis0_f_ActValueCond-MinPT	FLOAT	READWRITE	0.001	bar		Yes
210B	0	pressure sensor config0	Actual value conditioning max pressure pT 0	axis0_f_ActValueCond-MaxPT	FLOAT	READWRITE	0.001	bar		Yes
210C	0	pressure sensor config0	Actual value conditioning min transducer signal p0 0	axis0_f_ActValueCondMin-TransducerSignalP0	FLOAT	READWRITE	0.001	mA or V		Yes
210D	0	pressure sensor config0	Actual value condition-ing max transducer sig-nal p0 0	axis0_f_ActValueCondMax-TransducerSignalP0	FLOAT	READWRITE	0.001	mA or V		Yes
210E	0	pressure sensor config0	Actual value conditioning min pressure p0 0	axis0_f_ActValueCond-MinP0	FLOAT	READWRITE	0.001	bar		Yes
210F	0	pressure sensor config0	Actual value conditioning max pressure p0 0	axis0_f_ActValueCond-MaxP0	FLOAT	READWRITE	0.001	bar		Yes
2120	4	pressure sensor config0	Actual value p0 0	axis0_f_ActValueP0	FLOAT	READ	0.001	bar		No
2120	3	pressure sensor config0	Actual value pT 0	axis0_f_ActValuePT	FLOAT	READ	0.001	bar		No
2120	0	pressure sensor config0	Actual value subindex 0	axis0_u16_SubIndex0	UNSIGNED16	CONST				No
2120	1	pressure sensor config0	Actual value pA 0	axis0_f_ActValuePA	FLOAT	READ	0.001	bar		No
2120	2	pressure sensor config0	Actual value pB 0	axis0_f_ActValuePB	FLOAT	READ	0.001	bar		No
2200	0	force sensor0	Min transducer signal force 0	axis0_f_MinTransducer-SignalF	FLOAT	READWRITE		mA or V		Yes
2201	0	force sensor0	Max transducer signal force 0	axis0_f_MaxTransducer-SignalF	FLOAT	READWRITE		mA or V		Yes
2202	0	force sensor0	Min force range 0	axis0_f_MinFRange	FLOAT	READWRITE	1	N		Yes

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
2203	0	force sensor0	Max force range 0	axis0_f_MaxFRange	FLOAT	READWRITE	1	N		Yes
2300	0	Hydraulic system0	System pressure 0	Axis0_f_SystemPressure	FLOAT	READWRITE	1	bar		Yes
2301	0	Hydraulic system0	Max mass 0	Axis0_f_MaxMass	FLOAT	READWRITE	1	Kg		Yes
2302	0	Hydraulic system0	System type 0	Axis0_u8_SystemType	UNSIGNED16	READWRITE				Yes
2820	0	device1	Command on request 1	axis1_u16_CommandOn-Request	UNSIGNED16	READWRITE				no
2821	0	device1	Last command in pro-cess 1	axis1_u16_LastCommand-InProcess	UNSIGNED16	READ				No
2822	0	device1	device state 1	axis1_u16_DeviceState	UNSIGNED16	READ				No
2823	0	device1	Device state level 1	axis1_u16_DeviceState-Level	UNSIGNED16	READ				No
2840	0	cylinder config1	Actual value conditioning cylinder piston diameter 1	axis1_u32_ActValueCond-CylPistonDiameter	UNSIGNED32	READWRITE	0.001	mm		Yes
2841	0	cylinder config1	Actual value conditioning diameter A 1	axis1_u32_ActValueCond-CylDiameterA	UNSIGNED32	READWRITE	0.001	mm		Yes
2842	0	cylinder config1	Actual value conditioning diameter B 1	axis1_u32_ActValueCond-CylDiameterB	UNSIGNED32	READWRITE	0.001	mm		Yes
2843	0	cylinder config1	Actual value conditioning stroke 1	axis1_u32_ActValueCond-CylStroke	UNSIGNED32	READWRITE	0.001	mm		Yes
2844	0	cylinder config1	Actual value conditioning max speed 1	axis1_u32_ActValueCond-CylMaxSpeed	UNSIGNED32	READWRITE		mm/s		Yes
2846	0	cylinder config1	Actual value conditioning number 1	axis1_u8_ActValueCond-CylNumber	UNSIGNED16	READWRITE			1	Yes
2900	0	pressure sensor config1	Actual value conditioning min transducer signal pA 1	axis1_f_ActValueCondMin-TransducerSignalPA	FLOAT	READWRITE	0.001	mA or V		Yes
2901	0	pressure sensor config1	Actual value condition-ing max transducer sig-nal pA 1	axis1_f_ActValueCondMax-TransducerSignalPA	FLOAT	READWRITE	0.001	mA or V		Yes
2902	0	pressure sensor config1	Actual value conditioning min pressure pA 1	axis1_f_ActValueCond-MinPA	FLOAT	READWRITE	0.001	bar		Yes
2903	0	pressure sensor config1	Actual value conditioning max pressure pA 1	axis1_f_ActValueCond-MaxPA	FLOAT	READWRITE	0.001	bar		Yes
2904	0	pressure sensor config1	Actual value conditioning min transducer signal pB 1	axis1_f_ActValueCondMin-TransducerSignalPB	FLOAT	READWRITE	0			Yes
2905	0	pressure sensor config1	Actual value condition-ing max transducer sig-nal pB 1	axis1_f_ActValueCondMax-TransducerSignalPB	FLOAT	READWRITE	0			Yes
2906	0	pressure sensor config1	Actual value conditioning min pressure pB 1	axis1_f_ActValueCond-MinPB	FLOAT	READWRITE	0.001	bar		Yes
2907	0	pressure sensor config1	Actual value conditioning max pressure pB 1	axis1_f_ActValueCond-MaxPB	FLOAT	READWRITE	0.001	bar		Yes
2908	0	pressure sensor config1	Actual value conditioning min transducer signal pT 1	axis1_f_ActValueCondMin-TransducerSignalPT	FLOAT	READWRITE	0.001	mA or V		Yes
2909	0	pressure sensor config1	Actual value condition-ing max transducer sig-nal pT 1	axis1_f_ActValueCondMax-TransducerSignalPT	FLOAT	READWRITE	0.001	mA or V		Yes
2910	0	pressu-re sensor config1	Actual value conditioning const pressure pA 1	Axis1_ActValueCondConst-TransducerSignalPA	FLOAT	READWRITE	1	bar		Yes
2911	0	pressu-re sensor config1	Actual value conditioning const pressure pB 1	Axis1_ActValueCondConst-TransducerSignalPB	FLOAT	READWRITE	1	bar		Yes

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
2912	0	pressu-re sensor config1	Actual value conditioning const pressure pT 1	Axis1_ActValueCondConst-TransducerSignalPT	FLOAT	READWRITE	1	bar		Yes
2913	0	pressu-re sensor config1	Actual value conditioning const pressure p0 1	Axis1_ActValueCondConst-TransducerSignalP0	FLOAT	READWRITE	1	bar		Yes
290A	0	pressure sensor config1	Actual value conditioning min pressure pT 1	axis1_f_ActValueCond-MinPT	FLOAT	READWRITE	0.001	bar		Yes
290B	0	pressure sensor config1	Actual value conditioning max pressure pT 1	axis1_f_ActValueCond-MaxPT	FLOAT	READWRITE	0.001	bar		Yes
290C	0	pressure sensor config1	Actual value conditioning min transducer signal p0 1	axis1_f_ActValueCondMin-TransducerSignalP0	FLOAT	READWRITE	0.001	mA or V		Yes
290D	0	pressure sensor config1	Actual value condition-ing max transducer sig-nal p0 1	axis1_f_ActValueCondMax-TransducerSignalP0	FLOAT	READWRITE	0.001	mA or V		Yes
290E	0	pressure sensor config1	Actual value conditioning min pressure p0 1	axis1_f_ActValueCond-MinP0	FLOAT	READWRITE	0.001	bar		Yes
290F	0	pressure sensor config1	Actual value conditioning max pressure p0 1	axis1_f_ActValueCond-MaxP0	FLOAT	READWRITE	0.001	bar		Yes
2920	3	pressure sensor config1	Actual value pT 1	axis1_f_ActValuePT	FLOAT	READ	0.001	bar		No
2920	0	pressure sensor config1	Actual value subindex 1	axis1_u16_SubIndex0	UNSIGNED16	CONST				No
2920	4	pressure sensor config1	Actual value p0 1	axis1_f_ActValueP0	FLOAT	READ	0.001	bar		No
2920	2	pressure sensor config1	Actual value pB 1	axis1_f_ActValuePB	FLOAT	READ	0.001	bar		No
2920	1	pressure sensor config1	Actual value pA 1	axis1_f_ActValuePA	FLOAT	READ	0.001	bar		No
2A00	0	force sensor1	Min transducer signal force 1	axis1_f_MinTransducer-SignalF	FLOAT	READWRITE		mA or V		Yes
2A01	0	force sensor1	Max transducer signal force 1	axis1_f_MaxTransducer-SignalF	FLOAT	READWRITE		mA or V		Yes
2A02	0	force sensor1	Min force range 1	axis1_f_MinFRange	FLOAT	READWRITE	1	N		Yes
2A03	0	force sensor1	Max force range 1	axis1_f_MaxFRange	FLOAT	READWRITE	1	N		Yes
2B00	0	Hydraulic system1	System pressure 1	axis1_f_SystemPressure	FLOAT	READWRITE	1	bar		Yes
2B01	0	Hydraulic system1	Max mass 1	axis1_f_MaxMass	FLOAT	READWRITE	1	Kg		Yes
2B02	0	Hydraulic system1	System type 1	axis1_u8_SystemType	UNSIGNED16	READWRITE				Yes
3000	0	position control-ler0	Position controller Kp 0	axis0_f_PosCtrlKp	FLOAT	READWRITE	1e-6	%/mm		Yes
3001	0	position control-ler0	Position controller Ki 0	axis0_f_PosCtrlKi	FLOAT	READWRITE	1e-6	%/ (mm*s)		Yes
3002	0	position control-ler0	Position controller inner window I part 0	axis0_f_PosCtrlInnerWin-dowIPart	FLOAT	READWRITE	0.001	mm		Yes

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
3003	0	position control-ler0	Position controller outer window I part 0	axis0_f_PosCtrlOuterWin-dowIPart	FLOAT	READWRITE	0.001	mm		Yes
3004	0	position control-ler0	Position controller positive limit I part 0	axis0_f_PosCtrlPosLim-itIPart	FLOAT	READWRITE	0.001	%		Yes
3005	0	position control-ler0	Position controller nega-tive limit I part 0	axis0_f_PosCtrlNegLim-itIPart	FLOAT	READWRITE	0.001	%		Yes
3006	0	position control-ler0	Position controller speed threshold I part 0	axis0_f_PosCtrlSpeed-ThresholdIPart	FLOAT	READWRITE	0.1	mm/s		Yes
3007	0	position control-ler0	Position controller velocity feed forward Kvs 0	axis0_f_PosCtrlVelFeed-ForwardKvs	FLOAT	READWRITE	1e-6	(%*s)/ mm		Yes
3008	0	position control-ler0	Position controller acceler-ation feed forward Kva 0	axis0_f_PosCtrlAccFeed-ForwardKva	FLOAT	READWRITE	1e-9	(%*s^2) / mm		Yes
3009	0	position control-ler0	Position controller velocity feedback Kv 0	axis0_f_PosCtrlVelFeed-backKv	FLOAT	READWRITE	1e-6	(%*s)/ mm		Yes
300A	0	position control-ler0	Position controller acceler-ation feedback Ka 0	axis0_f_PosCtrlAccFeed-backKa	FLOAT	READWRITE	1e-9	(%*s^2) / mm		Yes
300B	0	position control-ler0	Position controller distur-bance offset 0	axis0_f_PosCtrlDisturban-ceOffset	FLOAT	READWRITE	0.001	%		No
300C	0	position control-ler0	Position controller output filter 0	axis0_u32_PosCtrlOutFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
3050	3	position control-ler0	Position controller actu-ating signal velocity feed-back 0	axis0_f_PosCtrlActuating-SignalVelFeedback	FLOAT	READ	0.001	%		No
3050	0	position control-ler0	Position controller actuat-ing signal subindex 0	axis0_u16_SubIndex0	UNSIGNED16	CONST				No
3050	4	position control-ler0	Position controller actu-ating signal acceleration feedback 0	axis0_f_PosCtrlActuating-SignalAccFeedback	FLOAT	READ	0.001	%		No
3050	5	position control-ler0	Position controller actuat-ing signal velocity feed for-ward 0	axis0_f_PosCtrlActuating-SignalVelFeedForward	FLOAT	READ	0.001	%		No
3050	1	position control-ler0	Position controller actuat-ing signal p part Yp 0	axis0_f_PosCtrlActuating-SignalPPartYp	FLOAT	READ	0.001	%		No
3050	2	position control-ler0	Position controller actuat-ing signal i part Yi 0	axis0_f_PosCtrlActuating-SignalIPartYi	FLOAT	READ	0.001	%		No
3050	6	position control-ler0	Position controller actu-ating signal acceleration feed forward 0	axis0_f_PosCtrlActuating-SignalAccFeedForward	FLOAT	READ	0.001	%		No
3051	0	position control-ler0	Position controller output 0	axis0_f_PosCtrlOut	FLOAT	READ	0.001	%		No
3100	0	position-ing0	Velocity actual value fil-tered 0	axis0_f_VelActualValue-Filtered	FLOAT	READ	1	mm/s		No
3101	0	position-ing0	Acceleration actual value filtered 0	axis0_f_AccActualValue-Filtered	FLOAT	READ	1	mm/s^2		No
3102	0	position-ing0	Position actual value with-out offset 0	axis0_i32_PosActualValue-WOOffset	INTEGER32	READ	0.001	mm		No
3103	0	position-ing0	Position actual value ex-tern without offset 0	axis0_i32_PosActualValue-ExternWOOffset	INTEGER32	READWRITE	0.001	mm		No

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
3104	0	position-ing0	Position encoder actual value track A/B/Ref 0	axis0_u8_PosEncoderAc-tualValueTrackABRef	UNSIGNED8	READ	1	0/1		No
3200	0	open loop0	Open loop setpoint 0	axis0_f_OpenLoopSetpoint	FLOAT	READWRITE	0.001	%		No
3500	0	pressure control-ler0	Pressure controller Kp 0	axis0_f_FCtrlKp	FLOAT	READWRITE	1e-6	%/bar		Yes
3501	0	pressure control-ler0	Pressure controller Ki 0	axis0_f_FCtrlKi	FLOAT	READWRITE	1e-6	(%*s)/ bar		Yes
3502	0	pressure control-ler0	Pressure controller inner window I part 0	axis0_f_FCtrlInnerWindow-IPart	FLOAT	READWRITE	0.001	bar		Yes
3503	0	pressure control-ler0	Pressure controller outer window I part 0	axis0_f_FCtrlOuterWin-dowIPart	FLOAT	READWRITE	0.001	bar		Yes
3504	0	pressure control-ler0	Pressure controller posi-tive limit I part 0	axis0_f_FCtrlPosLimitIPart	FLOAT	READWRITE	0.001	%		Yes
3505	0	pressure control-ler0	Pressure controller nega-tive limit I part 0	axis0_f_FCtrlNegLimitIPart	FLOAT	READWRITE	0.001	%		Yes
3506	0	pressure control-ler0	Pressure controller Kd 0	axis0_f_FCtrlKd	FLOAT	READWRITE	1e-9	(%*s)/ bar		Yes
3507	0	pressure control-ler0	Pressure controller Td 0	axis0_f_FCtrlTd	FLOAT	READWRITE	1e-6	s		Yes
3508	0	pressure control-ler0	Pressure controller feed forward 0	axis0_f_FCtrlFeedFor-wardKfs	FLOAT	READWRITE	0.001	%		Yes
3509	0	pressure control-ler0	Pressure controller veloci-ty feedback Kv 0	axis0_f_FCtrlVelFeed-backKv	FLOAT	READWRITE	1e-6	(%*s)/ mm		Yes
350A	0	pressure control-ler0	Pressure controller inver-sion 0	axis0_u8_FCtrlInversion	UNSIGNED8	READWRITE			0..1	Yes
350B	0	pressure control-ler0	Pressure controller distur-bance offset 0	axis0_f_FCtrlDisturban-ceOffset	FLOAT	READWRITE	0.001	%		No
350C	0	pressure control-ler0	Pressure controller out-put filter 0	axis0_u32_FCtrlOutFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
3550	3	pressure control-ler0	Pressure controller actuat-ing signal d part Yd 0	axis0_f_FCtrlActuatingSig-nalDPartYd	FLOAT	READ	0.001	%		No
3550	1	pressure control-ler0	Pressure controller actuat-ing signal p part Yp 0	axis0_f_FCtrlActuatingSig-nalPPartYp	FLOAT	READ	0.001	%		No
3550	5	pressure control-ler0	Pressure controller actu-ating signal velocity feed-back 0	axis0_f_FCtrlActuatingSig-nalVelFeedback	FLOAT	READ	0.001	%		No
3550	0	pressure control-ler0	Pressure controller actuat-ing signal subindex 0	axis0_u16_Subindex0	UNSIGNED	CONST				No
3550	4	pressure control-ler0	Pressure controller actu-ating signal force feed for-ward 0	axis0_f_FCtrlActuatingSig-nalForceFeedForward	FLOAT	READ	0.001	%		No
3550	2	pressure control-ler0	Pressure controller actuat-ing signal i part Yi 0	axis0_f_FCtrlActuatingSig-nalIPartYi	FLOAT	READ	0.001	%		No
3551	0	pressure control-ler0	Pressure controller out-put 0	axis0_f_FCtrlOut	FLOAT	READ	0.001	%		No

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3600	0	pressure monitor-ing0	Pressure window moni-toring 0	axis0_f_FWindow	FLOAT	READWRITE				Yes
3601	0	pressure monitor-ing0	Pressure window monitor-ing time 0	axis0_u16_FWindowTime	UNSIGNED16	READWRITE	0.001	s		Yes
3602	0	pressure monitor-ing0	Force monitoring max force 0	axis0_f_FMaxForce	FLOAT	READWRITE	1	N		Yes
3603	0	pressure monitor-ing0	Pressure following error window monitoring 0		FLOAT	READWRITE				Yes
3604	0	pressure monitor-ing0			UNSIGNED16	READWRITE	0.001	s		Yes
3610	0	pressure monitor-ing0	Pressure control following error 0	axis0_f_FFollowingErrorAc-tualValue	FLOAT	READ	0.001	bar		No
3700	0	pressure-force0	Pressure control setpoint 0	axis0_f_FPProfileValue	FLOAT	READWRITE	0.001	bar		No
3701	0	pressure-force0	Pressure control gradi-ent 0	axis0_f_FProfileGradient-Value	FLOAT	READWRITE	0.001	bar		No
3710	0	pressure-force0	Pressure demand value generator demand value 0	axis0_f_FPDemandValue	FLOAT	READ	0.001	bar		No
3720	0	pressure-force0	Pressure control actual value 0	axis0_f_FActualValue	FLOAT	READ	1	N		No
3800	0	position control-ler1	Position controller Kp 1	axis1_f_PosCtrlKp	FLOAT	READWRITE	1e-6	(%*s)/ mm		Yes
3801	0	position control-ler1	Position controller Ki 1	axis1_f_PosCtrlKi	FLOAT	READWRITE	1e-9	(%*s^2) /mm		Yes
3802	0	position control-ler1	Position controller inner window I part 1	axis1_f_PosCtrlInnerWin-dowIPart	FLOAT	READWRITE	0.001	mm		Yes
3803	0	position control-ler1	Position controller outer window I part 1	axis1_f_PosCtrlOuterWin-dowIPart	FLOAT	READWRITE	0.001	mm		Yes
3804	0	position control-ler1	Position controller positive limit I part 1	axis1_f_PosCtrlPosLim-itIPart	FLOAT	READWRITE	0.001	%		Yes
3805	0	position control-ler1	Position controller nega-tive limit I part 1	axis1_f_PosCtrlNegLim-itIPart	FLOAT	READWRITE	0.001	%		Yes
3806	0	position control-ler1	Position controller speed threshold I part 1	axis1_f_PosCtrlSpeed-ThresholdIPart	FLOAT	READWRITE	0.1	mm/s		Yes
3807	0	position control-ler1	Position controller velocity feed forward Kvs 1	axis1_f_PosCtrlVelFeed-ForwardKvs	FLOAT	READWRITE	1e-6	(%*s)/ mm		Yes
3808	0	position control-ler1	Position controller acceler-ation feed forward Kva 1	axis1_f_PosCtrlAccFeed-ForwardKva	FLOAT	READWRITE	1e-9	(%*s^2)/ mm		Yes
3809	0	position control-ler1	Position controller velocity feedback Kv 1	axis1_f_PosCtrlVelFeed-backKv	FLOAT	READWRITE	1e-6	(%*s)/ mm		Yes
380A	0	position control-ler1	Position controller acceler-ation feedback Ka 1	axis1_f_PosCtrlAccFeed-backKa	FLOAT	READWRITE	1e-9	(%*s^2)/ mm		Yes
380B	0	position control-ler1	Position controller distur-bance offset 1	axis1_f_PosCtrlDisturban-ceOffset	FLOAT	READWRITE	0.001	%		No

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380C	0	position control-ler1	Position controller output filter 1	axis1_u32_PosCtrlOutFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
3850	4	position control-ler1	Position controller actu-ating signal acceleration feedback 1	axis1_f_PosCtrlActuating-SignalAccFeedback	FLOAT	READ	0.001	%		No
3850	6	position control-ler1	Position controller actu-ating signal acceleration feed forward 1	axis1_f_PosCtrlActuating-SignalAccFeedForward	FLOAT	READ	0.001	%		No
3850	2	position control-ler1	Position controller actuat-ing signal i part Yi 1	axis1_f_PosCtrlActuating-SignalIPartYi	FLOAT	READ	0.001	%		No
3850	0	position control-ler1	Position controller actuat-ing signal subindex 1	axis1_u16_SubIndex1	UNSIGNED16	CONST				No
3850	5	position control-ler1	Position controller actuat-ing signal velocity feed for-ward 1	axis1_f_PosCtrlActuating-SignalVelFeedForward	FLOAT	READ	0.001	%		No
3850	3	position control-ler1	Position controller actu-ating signal velocity feed-back 1	axis1_f_PosCtrlActuating-SignalVelFeedback	FLOAT	READ	0.001	%		No
3850	1	position control-ler1	Position controller actuat-ing signal p part Yp 1	axis1_f_PosCtrlActuating-SignalPPartYp	FLOAT	READ	0.001	%		No
3851	0	position control-ler1	Position controller output 1	axis1_f_PosCtrlOut	FLOAT	READ	0.001	%		No
3900	0	position-ing1	Velocity actual value fil-tered 1	axis1_f_VelActualValue-Filtered	FLOAT	READ	1	mm/s		No
3901	0	position-ing1	Acceleration actual value filtered 1	axis1_f_AccActualValue-Filtered	FLOAT	READ	1	mm/s^2		No
3902	0	position-ing1	Position actual value with-out offset 1	axis1_i32_PosActualValue-WOOffset	INTEGER32	READ	0.001	mm		No
3903	0	position-ing1	Position actual value ex-tern without offset 1	axis1_i32_PosActualValue-ExternWOOffset	INTEGER32	READWRITE	0.001	mm		No
3904	0	position-ing1	Position encoder actual value track A/B/Ref 1	axis1_u8_PosEncoderAc-tualValueTrackABRef	UNSIGNED8	READ	1	0/1		No
3A00	0	open loop1	Open loop setpoint 1	axis1_f_OpenLoopSetpoint	FLOAT	READWRITE	0.001	%		No
3D00	0	pressure control-ler1	Pressure controller Kp 1	axis1_f_FCtrlKp	FLOAT	READWRITE	1e-6	%/bar		Yes
3D01	0	pressure control-ler1	Pressure controller Ki 1	axis1_f_FCtrlKi	FLOAT	READWRITE	1e-6	(%*s)/ bar		Yes
3D02	0	pressure control-ler1	Pressure controller inner window I part 1	axis1_f_FCtrlInnerWindow-IPart	FLOAT	READWRITE	0.001	bar		Yes
3D03	0	pressure control-ler1	Pressure controller outer window I part 1	axis1_f_FCtrlOuterWin-dowIPart	FLOAT	READWRITE	0.001	bar		Yes
3D04	0	pressure control-ler1	Pressure controller posi-tive limit I part 1	axis1_f_FCtrlPosLimitIPart	FLOAT	READWRITE	0.001	%		Yes
3D05	0	pressure control-ler1	Pressure controller nega-tive limit I part 1	axis1_f_FCtrlNegLimitIPart	FLOAT	READWRITE	0.001	%		Yes
3D06	0	pressure control-ler1	Pressure controller Kd 1	axis1_f_FCtrlKd	FLOAT	READWRITE	1e-9	(%*s)/ bar		Yes
3D07	0	pressure control-ler1	Pressure controller Td 1	axis1_f_FCtrlTd	FLOAT	READWRITE	1e-6	s		Yes

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3D08	0	pressure control-ler1	Pressure controller feed forward 1	axis1_f_FCtrlFeedFor-wardKfs	FLOAT	READWRITE	0.001	%		Yes
3D09	0	pressure control-ler1	Pressure controller velocity feedback Kv 1	axis1_f_FCtrlVelFeed-backKv	FLOAT	READWRITE	1e-6	(%*s)/mm		Yes
3D0A	0	pressure control-ler1	Pressure controller inversion 1	axis1_u8_FCtrlInversion	UNSIGNED8	READWRITE			0..1	Yes
3D0B	0	pressure control-ler1	Pressure controller disturbance offset 1	axis1_f_FCtrlDisturban-ceOffset	FLOAT	READWRITE	0.001	%		No
3D0C	0	pressure control-ler1	Pressure controller output filter 1	axis1_u32_FCtrlOutFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
3D50	0	pressure control-ler1	Pressure controller actuating signal subindex 1	axis1_u16_Subindex0	UNSIGNED	CONST				No
3D50	5	pressure control-ler1	Pressure controller actuating signal velocity feedback 1	axis1_f_FCtrlActuatingSig-nalVelFeedback	FLOAT	READ	0.001	%		No
3D50	4	pressure control-ler1	Pressure controller actuating signal force feed forward 1	axis1_f_FCtrlActuatingSig-nalForceFeedForward	FLOAT	READ	0.001	%		No
3D50	3	pressure control-ler1	Pressure controller actuating signal d part Yd 1	axis1_f_FCtrlActuatingSig-nalDPartYd	FLOAT	READ	0.001	%		No
3D50	1	pressure control-ler1	Pressure controller actuating signal p part Yp 1	axis1_f_FCtrlActuatingSig-nalPPartYp	FLOAT	READ	0.001	%		No
3D50	2	pressure control-ler1	Pressure controller actuating signal i part Yi 1	axis1_f_FCtrlActuatingSig-nalIPartYi	FLOAT	READ	0.001	%		No
3D51	0	pressure control-ler1	Pressure controller output 1	axis1_f_FCtrlOut	FLOAT	READ	0.001	%		No
3E00	0	pressure monitor-ing1	Pressure window monitoring 1	axis1_f_FWindow	FLOAT	READWRITE	0.001	bar		Yes
3E01	0	pressure monitor-ing1	Pressure window monitoring time 1	axis1_u16_FWindowTime	UNSIGNED16	READWRITE	0.001	s		Yes
3E02	0	pressure monitor-ing1	Force monitoring max force 1	axis1_f_FMaxForce	FLOAT	READWRITE	1	N		Yes
3E03	0	pressure monitor-ing1	Pressure following error window monitoring 1		FLOAT	READWRITE				Yes
3E04	0	pressure monitor-ing1	Pressure following error window monitoring time 1		UNSIGNED16	READWRITE	0.001	s		Yes
3E10	0	pressure monitor-ing1	Pressure control following error 1	axis1_f_FFollowingErrorAc-tualValue	FLOAT	READ	0.001	bar		No
3F00	0	pressure-force1	Pressure control setpoint 1	axis1_f_FPProfileValue	FLOAT	READWRITE	0.001	bar		No
3F01	0	pressure-force1	Pressure control gradient 1	axis1_f_FProfileGradient-Value	FLOAT	READWRITE	0.001	bar		No
3F10	0	pressure-force1	Pressure demand value generator demand value 1	axis1_f_FPDemandValue	FLOAT	READ	0.001	bar		No
3F20	0	pressure-force1	Pressure control actual value 1	axis1_f_FActualValue	FLOAT	READ	1	N		No

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4000	0	feedback config0	Actual value conditioning type 0	axis0_u8_ActValueCondType	UNSIGNED8	READWRITE				Yes
4001	1	feedback config0	Actual value conditioning min interface 0	axis0_f_ActValueCondMinInterface	FLOAT	READWRITE		mA or V		Yes
4001	0	feedback config0	Actual value conditioning subindex 0	axis0_u16_SubIndex0	UNSIGNED16	CONST				No
4001	2	feedback config0	Actual value conditioning min range 0	axis0_f_ActValueCondMinRange	FLOAT	READWRITE	0.0001	mm		Yes
4002	0	feedback config0	Actual value conditioning subindex 0	axis0_u16_SubIndex0	UNSIGNED16	CONST				No
4002	1	feedback config0	Actual value conditioning max interface 0	axis0_f_ActValueCondMaxInterface	FLOAT	READWRITE		mA or V		Yes
4002	2	feedback config0	Actual value conditioning max range 0	axis0_f_ActValueCondMaxRange	FLOAT	READWRITE	0.0001	mm		Yes
4003	0	feedback config0	Actual value conditioning position offset 0	axis0_f_ActValueCondPosOffset	FLOAT	READWRITE	0.0001	mm		Yes
4004	0	feedback config0	Actual value conditioning sign 0	axis0_i8_ActValueCondSign	INTEGER8	READWRITE		0..1		Yes
4006	0	feedback config0	Actual value conditioning bit size 0	axis0_u8_ActValueCondBitSize	UNSIGNED8	READWRITE	0			Yes
4007	0	feedback config0	Actual value conditioning resolution 0	axis0_f_ActValueCondResolution	FLOAT	READWRITE	0.0001	mm/inc		Yes
4008	0	feedback config0	Actual value conditioning baud rate 0	axis0_u16_ActValueCondBaudRate	UNSIGNED8	READWRITE	0	kBit/s		Yes
4009	0	feedback config 0	Actual value conditioning update rate 0	Axis0_u16_ActValueCondUpdateRate	UNSIGNED32	READWRITE		µs		Yes
4020	0	optimisation0	Velocity signal filter 0	axis0_u32_VelSignalFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
4021	0	optimisation0	Acceleration signal filter 0	axis0_u32_AccSignalFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
4050	3	Analogue inputs	Analogue input signal chain functions 1	AnalogInputs_u16_SCFunctions1	UNSIGNED16	READWRITE				Yes
4050	0	Analogue inputs	Analogue input subindex 0	AnalogInputs_u16_SubIndex0	UNSIGNED16	CONST				No
4050	1	Analogue inputs	Analogue input enable	AnalogInputs_u16_AInEnable	UNSIGNED16	READWRITE				Yes
4050	2	Analogue inputs	Analogue input signal chain functions 0	AnalogInputs_u16_SCFunctions0	UNSIGNED16	READWRITE				Yes
4150	0	Analogue input0	Analogue input subindex 0	Ain0_u16_SubIndex0	UNSIGNED16	CONST				No
4150	1	Analogue input0	Analogue input actual value 0	AIn0_f_AInActualValue	FLOAT	READ		mA or V		No
4150	2	Analogue input0	Analogue input actual value filtered 0	AIn0_f_AInActualValueFiltered	FLOAT	READ	1e-3	mA or V		No
4150	4	Analogue input0	Analogue input offset 0	AIn0_f_AInOffset	FLOAT	READWRITE	1e-3	mA or V		Yes
4150	5	Analogue input0	Analogue input source 0	AIn0_u8_AInInputSource	UNSIGNED8	READWRITE				Yes
4150	3	Analogue input0	Analogue input filter 0	AIn0_u32_AInFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
4250	1	Analogue input1	Analogue input actual value 1	AIn1_f_AInActualValue	FLOAT	READ	1e-3	mA or V		No
4250	3	Analogue input1	Analogue input filter 1	AIn1_u32_AInFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
4250	4	Analogue input1	Analogue input offset 1	AIn1_f_AInOffset	FLOAT	READWRITE	1e-3	mA or V		Yes
4250	0	Analogue input1	Analogue input subindex 1	Ain1_u16_SubIndex0	UNSIGNED16	CONST				No
4250	2	Analogue input1	Analogue input actual value filtered 1	AIn1_f_AInActualValueFiltered	FLOAT	READ	1e-3	mA or V		No
4350	1	Analogue input2	Analogue input actual value 2	AIn2_f_AInActualValue	FLOAT	READ	1e-3	mA or V		No

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4350	2	Analogue input2	Analogue input actual value filtered 2	AIn2_f_AInActualValue-Filtered	FLOAT	READ	1e-3	mA or V		No
4350	5	Analogue input2	Analogue input source 2	AIn2_u8_AInInputSource	UNSIGNED8	READWRITE				Yes
4350	3	Analogue input2	Analogue input filter 2	AIn2_u32_AInFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
4350	0	Analogue input2	Analogue input subin-dex 2	Ain2_u16_SubIndex0	UNSIGNED16	CONST				No
4350	4	Analogue input2	Analogue input offset 2	AIn2_f_AInOffset	FLOAT	READWRITE	1e-3	mA or V		Yes
4450	5	Analogue input3	Analogue input source 3	AIn3_u8_AInInputSource	UNSIGNED8	READWRITE				Yes
4450	4	Analogue input3	Analogue input offset 3	AIn3_f_AInOffset	FLOAT	READWRITE	1e-3	mA or V		Yes
4450	0	Analogue input3	Analogue input subin-dex 3	Ain3_u16_SubIndex0	UNSIGNED16	CONST				No
4450	1	Analogue input3	Analogue input actual value 3	AIn3_f_AInActualValue	FLOAT	READ	1e-3	mA or V		No
4450	3	Analogue input3	Analogue input filter 3	AIn3_u32_AInFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
4450	2	Analogue input3	Analogue input actual value filtered 3	AIn3_f_AInActualValue-Filtered	FLOAT	READ	1e-3	mA or V		No
4600	0	test move-ment0	Test movement posi-tion 1 0	axis0_f_TestMoveAbsPos1	FLOAT	READWRITE	0.001	mm		No
4601	0	test move-ment0	Test movement posi-tion 2 0	axis0_f_TestMoveAbsPos2	FLOAT	READWRITE	0.001	mm		No
4602	0	test move-ment0	Test movement velocity 0	axis0_f_TestMoveAbsVe-locity	FLOAT	READWRITE	0.1	mm/s		No
4603	0	test move-ment0	Test movement acceler-ation 0	axis0_f_TestMoveAbsAc-celeration	FLOAT	READWRITE	1	mm/s^2		No
4604	0	test move-ment0	Test movement deceler-ation 0	axis0_f_TestMoveAbsDe-celeration	FLOAT	READWRITE	1	mm/s^2		No
4605	0	test move-ment0	Test movement jerk 0	axis0_f_TestMoveAbsJerk	FLOAT	READWRITE	1	mm/s^3		No
4606	0	test move-ment0	Test movement jerk de-cel 0	axis0_f_TestMoveAbsJerk-Decel	FLOAT	READWRITE	1	mm/s^3		No
4607	0	test move-ment0	Test movement waiting time 0	axis0_u16_TestMoveWai-tingTime	UNSIGNED16	READWRITE	0.001	s		No
4608	0	test move-ment0	Test movement jog ve-locity 0	axis0_f_TestMoveJogVe-locity	FLOAT	READWRITE	0.1	mm/s		No
4609	0	test move-ment0	Test movement jog accel-eration 0	axis0_f_TestMoveJogAc-celeration	FLOAT	READWRITE	1	mm/s^2		No
460A	0	test move-ment0	Test movement jog jerk 0	axis0_f_TestMoveJogJerk	FLOAT	READWRITE	1	mm/s^3		No
4650	0	testmove-ment-force0	Test movement pressure/ force 1 0	axis0_f_TestMovePForce1	FLOAT	READWRITE	1	N		No
4651	0	testmove-ment-force0	Test movement pressure/ force 2 0	axis0_f_TestMovePForce2	FLOAT	READWRITE	1	N		No
4652	0	testmove-ment-force0	Test movement gradient 0	axis0_f_TestMovePF-Grad1	FLOAT	READWRITE	1	N/s		No
4800	0	feedback config1	Actual value conditioning type 1	axis1_u8_ActValueCond-Type	UNSIGNED8	READWRITE				Yes
4801	0	feedback config1	Actual value conditioning subindex 1	axis1_u16_SubIndex0	UNSIGNED16	CONST				No
4801	1	feedback config1	Actual value conditioning min interface 1	axis1_f_ActValueCondMin-Interface	FLOAT	READWRITE	0.001	mA or V		Yes
4801	2	feedback config1	Actual value conditioning min range 1	axis1_f_ActValueCondMin-Range	FLOAT	READWRITE	0.0001	mm		Yes
4802	2	feedback config1	Actual value conditioning max range 1	axis1_f_ActValueCond-MaxRange	FLOAT	READWRITE	0.0001	mm		Yes

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4802	0	feedback config1	Actual value conditioning subindex 1	axis1_u16_SubIndex0	UNSIGNED16	CONST				No
4802	1	feedback config1	Actual value conditioning max interface 1	axis1_f_ActValueCond-MaxInterface	FLOAT	READWRITE	0.001	mA or V		Yes
4803	0	feedback config1	Actual value conditioning position offset 1	axis1_f_ActValueCond-PosOffset	FLOAT	READWRITE	0.0001	mm		Yes
4804	0	feedback config1	Actual value condition-ing sign 1	axis1_i8_ActValueCond-Sign	INTEGER8	READWRITE		0..1		Yes
4806	0	feedback config1	Actual value conditioning bit size 1	axis1_u8_ActValueCond-BitSize	UNSIGNED8	READWRITE				Yes
4807	0	feedback config1	Actual value conditioning resolution 1	axis1_f_ActValueCon-dResolution	FLOAT	READWRITE	0.0001	mm/inc		Yes
4808	0	feedback config1	Actual value conditioning baud rate 1	axis1_u16_ActValueCond-BaudRate	UNSIGNED8	READWRITE	0	kBit/s		Yes
4809	0	feedback config 1	Actual value conditioning update rate 1	axis1_u16_ActValueCon-dUpdateRate	UNSIGNED32	READWRITE		µs		Yes
4820	0	optimisa-tion1	Velocity signal filter 1	axis1_u32_VelSignalFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
4821	0	optimisa-tion1	Acceleration signal filter 1	axis1_u32_AccSignalFilter	UNSIGNED32	READWRITE	1e-6	s		Yes
4E00	0	test move-ment1	Test movement posi-tion 1 1	axis1_f_TestMoveAbsPos1	FLOAT	READWRITE	0.001	mm		No
4E01	0	test move-ment1	Test movement posi-tion 2 1	axis1_f_TestMoveAbsPos2	FLOAT	READWRITE	0.001	mm		No
4E02	0	test move-ment1	Test movement velocity 1	axis1_f_TestMoveAbsVe-locity	FLOAT	READWRITE	0.1	mm/s		No
4E03	0	test move-ment1	Test movement acceler-ation 1	axis1_f_TestMoveAbsAc-celeration	FLOAT	READWRITE	1	mm/s^2		No
4E04	0	test move-ment1	Test movement deceler-ation 1	axis1_f_TestMoveAbsDe-celeration	FLOAT	READWRITE	1	mm/s^2		No
4E05	0	test move-ment1	Test movement jerk 1	axis1_f_TestMoveAbsJerk	FLOAT	READWRITE	1	mm/s^3		No
4E06	0	test move-ment1	Test movement jerk de-cel 1	axis1_f_TestMoveAbsJerk-Decel	FLOAT	READWRITE	1	mm/s^3		No
4E07	0	test move-ment1	Test movement waiting time 1	axis1_u16_TestMoveWai-tingTime	UNSIGNED16	READWRITE	0.001	s		No
4E08	0	test move-ment1	Test movement jog ve-locity 1	axis1_f_TestMoveJogVe-locity	FLOAT	READWRITE	0.1	mm/s		No
4E09	0	test move-ment1	Test movement jog accel-eration 1	axis1_f_TestMoveJogAc-celeration	FLOAT	READWRITE	1	mm/s^2		No
4E0A	0	test move-ment1	Test movement jog jerk 1	axis1_f_TestMoveJogJerk	FLOAT	READWRITE	1	mm/s^3		No
4E50	0	testmove-ment-force1	Test movement pressure/ force 1 1	axis1_f_TestMovePForce1	FLOAT	READWRITE	1	N		No
4E51	0	testmove-ment-force1	Test movement pressure/ force 1 1	axis1_f_TestMovePForce2	FLOAT	READWRITE	1	N		No
4E52	0	testmove-ment-force1	Test movement gradient 1	axis1_f_TestMovePF-Grad1	FLOAT	READWRITE	1	N/s		No
5050	0	analogue output	Output functions 0	AOut_u8_OutputFunc-tions0	UNSIGNED8	READWRITE				Yes
5100-5200		reserved	reserved for Kendrion							
5103	0	device	Device temperatur	f_DeviceTemperatur	FLOAT	READ	1	°C		No
5300	0	diecast-ing	DieCastingStartMonitor-ingON	axis0_u16_DieCasting-StartMonitoring	UNSIGNED16	READWRITE			0..1	Yes
5301	0	diecast-ing	DieCastingVelocityGain-Changes0	axis0_f_DieCastingVeloci-tyGainChanges0	FLOAT	READWRITE		mm/s		Yes
5302	0	diecast-ing	DieCastingVelocityGain-Changes1	axis0_f_DieCastingVeloci-tyGainChanges1	FLOAT	READWRITE		mm/s		Yes

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5303	0	diecast-ing	DieCastingVelocityGain-Changes2	axis0_f_DieCastingVeloci-tyGainChanges2	FLOAT	READWRITE		mm/s		Yes
5304	0	diecast-ing	DieCastingVelocityGain-Changes3	axis0_f_DieCastingVeloci-tyGainChanges3	FLOAT	READWRITE		mm/s		Yes
5305	0	diecast-ing	DieCastingVelocityGain-Changes4	axis0_f_DieCastingVeloci-tyGainChanges4	FLOAT	READWRITE		mm/s		Yes
5306	0	diecast-ing	DieCastingVelocityGain-Changes5	axis0_f_DieCastingVeloci-tyGainChanges5	FLOAT	READWRITE		mm/s		Yes
5307	0	diecast-ing	DieCastingVelocityGain-Changes6	axis0_f_DieCastingVeloci-tyGainChanges6	FLOAT	READWRITE		mm/s		Yes
5308	0	diecast-ing	DieCastingVelocityGain-Changes7	axis0_f_DieCastingVeloci-tyGainChanges7	FLOAT	READWRITE		mm/s		Yes
5309	0	diecast-ing	DieCastingVelocityGain-Changes8	axis0_f_DieCastingVeloci-tyGainChanges8	FLOAT	READWRITE		mm/s		Yes
530A	0	diecast-ing	DieCastingVelocityGain-Changes9	axis0_f_DieCastingVeloci-tyGainChanges9	FLOAT	READWRITE		mm/s		Yes
530B	0	diecast-ing	DieCastingVelocityGain-Changes10	axis0_f_DieCastingVeloci-tyGainChanges10	FLOAT	READWRITE		mm/s		Yes
530C	0	diecast-ing	DieCastingVelocityGain-Changes11	axis0_f_DieCastingVeloci-tyGainChanges11	FLOAT	READWRITE		mm/s		Yes
530D	0	diecast-ing	DieCastingVelocityGain-Changes12	axis0_f_DieCastingVeloci-tyGainChanges12	FLOAT	READWRITE		mm/s		Yes
530E	0	diecast-ing	DieCastingVelocityGain-Changes13	axis0_f_DieCastingVeloci-tyGainChanges13	FLOAT	READWRITE		mm/s		Yes
530F	0	diecast-ing	DieCastingVelocityGain-Changes14	axis0_f_DieCastingVeloci-tyGainChanges14	FLOAT	READWRITE		mm/s		Yes
5310	0	diecast-ing	DieCastingVelocityGain-Changes15	axis0_f_DieCastingVeloci-tyGainChanges15	FLOAT	READWRITE		mm/s		Yes
5311	0	diecast-ing	DieCastingVelocityGain-ChangesON	axis0_u16_DieCastingVe-locityGainChangesON	UNSIGNED16	READWRITE			0..1	Yes
5400	0	diecast-ing	DieCastingProfileON	axis0_u16_DieCastingPro-fileON	UNSIGNED16	READWRITE			0..1	Yes
5401	0	diecast-ing	DieCastingProfilePos0_0	axis0_f_DieCastingPos0_0	FLOAT	READWRITE				Yes
5402	0	diecast-ing	DieCastingProfilePos0_1	axis0_f_DieCastingPos0_1	FLOAT	READWRITE				Yes
5403	0	diecast-ing	DieCastingProfilePos0_2	axis0_f_DieCastingPos0_2	FLOAT	READWRITE				Yes
5404	0	diecast-ing	DieCastingProfilePos0_3	axis0_f_DieCastingPos0_3	FLOAT	READWRITE				Yes
5405	0	diecast-ing	DieCastingProfilePos0_4	axis0_f_DieCastingPos0_4	FLOAT	READWRITE				Yes
5406	0	diecast-ing	DieCastingProfilePos0_5	axis0_f_DieCastingPos0_5	FLOAT	READWRITE				Yes
5407	0	diecast-ing	DieCastingProfilePos0_6	axis0_f_DieCastingPos0_6	FLOAT	READWRITE				Yes
5408	0	diecast-ing	DieCastingProfilePos0_7	axis0_f_DieCastingPos0_7	FLOAT	READWRITE				Yes
5409	0	diecast-ing	DieCastingProfilePos0_8	axis0_f_DieCastingPos0_8	FLOAT	READWRITE				Yes
5410	0	diecast-ing	DieCastingProfileVel0_0	axis0_f_DieCastingVel0_0	FLOAT	READWRITE				Yes
5411	0	diecast-ing	DieCastingProfileVel0_1	axis0_f_DieCastingVel0_1	FLOAT	READWRITE				Yes
5412	0	diecast-ing	DieCastingProfileVel0_2	axis0_f_DieCastingVel0_2	FLOAT	READWRITE				Yes
5413	0	diecast-ing	DieCastingProfileVel0_3	axis0_f_DieCastingVel0_3	FLOAT	READWRITE				Yes
5414	0	diecast-ing	DieCastingProfileVel0_4	axis0_f_DieCastingVel0_4	FLOAT	READWRITE				Yes
5415	0	diecast-ing	DieCastingProfileVel0_5	axis0_f_DieCastingVel0_5	FLOAT	READWRITE				Yes

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5416	0	diecast-ing	DieCastingProfileVel0_6	axis0_f_DieCastingVel0_6	FLOAT	READWRITE				Yes
5417	0	diecast-ing	DieCastingProfileVel0_7	axis0_f_DieCastingVel0_7	FLOAT	READWRITE				Yes
5418	0	diecast-ing	DieCastingProfileVel0_8	axis0_f_DieCastingVel0_8	FLOAT	READWRITE				Yes
5419	0	diecast-ing	DieCastingProfileVel0_9	axis0_f_DieCastingVel0_9	FLOAT	READWRITE				Yes
5420	0	diecast-ing	DieCastingProfileAcc0_0	axis0_u32_Die-CastingAcc0_0	UNSIGNED	READWRITE				Yes
5421	0	diecast-ing	DieCastingProfileAcc0_1	axis0_u32_Die-CastingAcc0_1	UNSIGNED	READWRITE				Yes
5422	0	diecast-ing	DieCastingProfileAcc0_2	axis0_u32_Die-CastingAcc0_2	UNSIGNED	READWRITE				Yes
5423	0	diecast-ing	DieCastingProfileAcc0_3	axis0_u32_Die-CastingAcc0_3	UNSIGNED	READWRITE				Yes
5424	0	diecast-ing	DieCastingProfileAcc0_4	axis0_u32_Die-CastingAcc0_4	UNSIGNED	READWRITE				Yes
5425	0	diecast-ing	DieCastingProfileAcc0_5	axis0_u32_Die-CastingAcc0_5	UNSIGNED	READWRITE				Yes
5426	0	diecast-ing	DieCastingProfileAcc0_6	axis0_u32_Die-CastingAcc0_6	UNSIGNED	READWRITE				Yes
5427	0	diecast-ing	DieCastingProfileAcc0_7	axis0_u32_Die-CastingAcc0_7	UNSIGNED	READWRITE				Yes
5428	0	diecast-ing	DieCastingProfileAcc0_8	axis0_u32_Die-CastingAcc0_8	UNSIGNED	READWRITE				Yes
5429	0	diecast-ing	DieCastingProfileAcc0_9	axis0_u32_Die-CastingAcc0_9	UNSIGNED	READWRITE				Yes
5430	0	diecast-ing	DieCastingProfileDec0_0	axis0_u32_Die-CastingDec0_0	UNSIGNED	READWRITE				Yes
5431	0	diecast-ing	DieCastingProfileDec0_1	axis0_u32_Die-CastingDec0_1	UNSIGNED	READWRITE				Yes
5432	0	diecast-ing	DieCastingProfileDec0_2	axis0_u32_Die-CastingDec0_2	UNSIGNED	READWRITE				Yes
5433	0	diecast-ing	DieCastingProfileDec0_3	axis0_u32_Die-CastingDec0_3	UNSIGNED	READWRITE				Yes
5434	0	diecast-ing	DieCastingProfileDec0_4	axis0_u32_Die-CastingDec0_4	UNSIGNED	READWRITE				Yes
5435	0	diecast-ing	DieCastingProfileDec0_5	axis0_u32_Die-CastingDec0_5	UNSIGNED	READWRITE				Yes
5436	0	diecast-ing	DieCastingProfileDec0_6	axis0_u32_Die-CastingDec0_6	UNSIGNED	READWRITE				Yes
5437	0	diecast-ing	DieCastingProfileDec0_7	axis0_u32_Die-CastingDec0_7	UNSIGNED	READWRITE				Yes
5438	0	diecast-ing	DieCastingProfileDec0_8	axis0_u32_Die-CastingDec0_8	UNSIGNED	READWRITE				Yes
5439	0	diecast-ing	DieCastingProfileDec0_9	axis0_u32_Die-CastingDec0_9	UNSIGNED	READWRITE				Yes
5440	0	diecast-ing	DieCastingProfileJerk0_0	axis0_u32_Die-CastingJerk0_0	UNSIGNED	READWRITE				Yes
5441	0	diecast-ing	DieCastingProfileJerk0_1	axis0_u32_Die-CastingJerk0_1	UNSIGNED	READWRITE				Yes
5450	0	diecast-ing	DieCastingProfileJerk-Dec0_0	axis0_u32_Die-CastingJerkDec0_0	UNSIGNED	READWRITE				Yes
5451	0	diecast-ing	DieCastingProfileJerk-Dec0_1	axis0_u32_Die-CastingJerkDec0_1	UNSIGNED	READWRITE				Yes
5600	0	modelba-sedfeed-forward0	u16_MbffwON	axis0_u16_MbffwON	UNSIGNED16	READWRITE				No
5601	0	modelba-sedfeed-forward0	f_MbffwCNullOut	axis0_f_MbffwCNullOut	FLOAT	READWRITE	0.001	%/ mm/s		No

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5602	0	modelba-sedfeed-forward0	f_MbffwCoefA1	axis0_f_MbffwCoefA1	FLOAT	READ	0.001	%/ mm/s		No
5603	0	modelba-sedfeed-forward0	f_MbffwCoefA2	axis0_f_MbffwCoefA2	FLOAT	READ	0.001	%/mm/ s^2		No
5604	0	modelba-sedfeed-forward0	f_MbffwCoefA3	axis0_f_MbffwCoefA3	FLOAT	READ	0.001	%/mm/ s^3		No
5605	0	modelba-sedfeed-forward0	f_MbffwCtrlOut	axis0_f_MbffwCtrlOut	FLOAT	READ	0.001	%		No
5606	0	modelba-sedfeed-forward0	f_MbffwCtrlOutVelocity	axis0_f_MbffwCtrlOutVe-locity	FLOAT	READ	0.001	%		No
5607	0	modelba-sedfeed-forward0	f_MbffwCtrlOutAcceler-ation	axis0_f_MbffwCtrlOutAc-celeration	FLOAT	READ	0.001	%		No
5608	0	modelba-sedfeed-forward0	f_MbffwCtrlOutJerk	axis0_f_MbffwCtrlOutJerk	FLOAT	READ	0.001	%		No
5609	0	modelba-sedfeed-forward0	i16_MbffwRecState	axis0_i16_MbffwRecState	INTEGER16	READ				No
560A	0	modelba-sedfeed-forward0	i16_MbffwLastRecState	axis0_i16_MbffwLastRec-State	INTEGER16	READ				No
560B	0	modelba-sedfeed-forward0	i16_MbffwStartRecFlag	axis0_i16_MbffwStartRec-Flag	INTEGER16	READ				No
560C	0	modelba-sedfeed-forward0	i32_MbffWDataGridRec-TargetPosMax	axis0_i32_MbffWDa-taGridRecTargetPosMax	FLOAT	READWRITE	0.001	mm		No
560D	0	modelba-sedfeed-forward0	i32_MbffWDataGridRec-TargetPosMin	axis0_i32_MbffWDa-taGridRecTargetPosMin	FLOAT	READWRITE	0.001	mm		No
560E	0	modelba-sedfeed-forward0	u32_MbffWDataGridRec-TargetVelocity	axis0_u32_MbffWDa-taGridRecTargetVelocity	UNSIGNED32	READWRITE	0.1	mm/s		No
560F	0	modelba-sedfeed-forward0	u32_MbffWDataGridRec-TargetAcceleration	axis0_u32_MbffWDa-taGridRecTarget-Acceleration	UNSIGNED32	READWRITE	1	mm/s^2		No
5610	0	modelba-sedfeed-forward0	u32_MbffWDataGridRec-TargetDeceleration	axis0_u32_MbffWDa-taGridRecTarget-Deceleration	UNSIGNED32	READWRITE	1	mm/s^2		No
5611	0	modelba-sedfeed-forward0	u32_MbffWDataGridRec-TargetJerk	axis0_u32_MbffWDa-taGridRecTargetJerk	UNSIGNED32	READWRITE	1	mm/s^3		No
5612	0	modelba-sedfeed-forward0	u32_MbffWDataGridRec-TargetJerkDecel	axis0_u32_MbffWDa-taGridRecTargetJerkDecel	UNSIGNED32	READWRITE	1	mm/s^3		No
5613	0	modelba-sedfeed-forward0	i16_MbffwSystemChoice	axis0_i16_MbffwSystem-Choice	INTEGER16	READWRITE				No
5614	0	modelba-sedfeed-forward0	f_MbffwVelocityChange-Phases	axis0_f_MbffwVeloci-tyChangePhases	FLOAT	READWRITE	0.1	mm/s		No
5615	0	modelba-sedfeed-forward0	f_MbffwDampingCyl	axis0_f_MbffwDampingCyl	FLOAT	READWRITE				No
5616	0	modelba-sedfeed-forward0	f_MbffwResFrequCyl	axis0_f_MbffwRes-FrequCyl	FLOAT	READWRITE	0.001	1/s		No

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5617	0	model-based-feedfor-ward0	f_MbffwResFrequValve	axis0_f_MbffwResFrequ-Valve	FLOAT	READWRITE	0.001	1/s		No
5850	0	analogue output	Output functions 1	AOut_u8_OutputFunc-tions1	UNSIGNED8	READWRITE				Yes
5A50	0	valve config 0	Valve input source 0	AOut0_u8_ValveInput-Source	UNSIGNED8	READWRITE				Yes
5A51	0	valve config 0	Valve type 0	AOut0_u8_ValveType	UNSIGNED8	READWRITE			0..2	Yes
5A52	0	valve config 0	Valve signal type 0	AOut0_u8_ValveSignal-Type	UNSIGNED8	READWRITE			0..3	No
5A53	0	valve config 0	Valve actuation range po-sition controller 0	AOut0_u8_ValveActuation-RangePosCtrl	UNSIGNED8	READWRITE			0..3	Yes
5A54	0	valve config 0	Valve actuation range pressure/force controller 0	AOut0_u8_ValveActuation-RangeFCtrl	UNSIGNED8	READWRITE			0..3	Yes
5A55	0	valve config 0	Valve open loop 0	AOut0_u8_ValveOpen-Loop	UNSIGNED8	READWRITE			0..1	No
5A56	0	valve config 0	Valve open loop set-point 0	AOut0_f_ValveOpenLoop-Setpoint	FLOAT	READWRITE		%		No
5A80	0	output chain0	Output chain input source 0	AOut0_u8_CtrlOutChainIn-putSource	UNSIGNED8	READWRITE				Yes
5A81	0	output chain0	Position controller direc-tion dependent gain factor positive 0	AOut0_f_CtrlOutPosC-trlDirDepGainFactorPos	FLOAT	READWRITE				Yes
5A82	0	output chain0	Position controller direc-tion dependent gain factor negative 0	AOut0_f_CtrlOutPosC-trlDirDepGainFactorNeg	FLOAT	READWRITE				Yes
5A83	0	output chain0	Pressure controller direc-tion dependent gain factor positive 0	AOut0_f_CtrlOutFCtrlDirD-epGainFactorPos	FLOAT	READWRITE				Yes
5A84	0	output chain0	Pressure controller direc-tion dependent gain factor negative 0	AOut0_f_CtrlOutFCtrlDirD-epGainFactorNeg	FLOAT	READWRITE				Yes
5A85	0	output chain0	Controller output invert-ing sign 0	AOut0_i8_CtrlOutInvert-ingSign	INTEGER8	READWRITE			0..1	Yes
5A86	0	output chain0	Controller output dead band compensation type 0	AOut0_i8_CtrlOutDB-CompType	INTEGER8	READWRITE			0..2	Yes
5A87	0	output chain0	Controller output dead band compensation threshold 0	AOut0_f_CtrlOutDBComp-Threshold	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5A88	0	output chain0	Controller output dead band compensation A side 0	AOut0_f_CtrlOutDB-CompASide	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5A89	0	output chain0	Controller output dead band compensation B side 0	AOut0_f_CtrlOutDB-CompBSide	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5A8A	0	output chain0	Controller output zero cor-rection offset 0	AOut0_f_CtrlOutZeroCor-rectionOffset	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5A8B	0	output chain0	Default value inactive chain 0	AOut0_f_CtrlOutInactive-Chain	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5AAA	0	output chain0	Controller output lower limit 0	AOut0_f_CtrlOutLower-Limit	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5AAB	0	output chain0	Controller output upper limit 0	AOut0_f_CtrlOutUpper-Limit	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5AB0	0	output chain0	Linearisation out 0	AOut0_f_LinOut	FLOAT	READWRITE	0.1	%	-1000. 1000	No
5AB1	0	output chain 0	ECAT out 0	AOut0_i16_ECATOut	INTEGER16	READWRITE			-16384 +16384	No
5B50	0	valve config 1	Valve input source 1	AOut1_u8_ValveInput-Source	UNSIGNED8	READWRITE				Yes
5B51	0	valve config 1	Valve type 1	AOut1_u8_ValveType	UNSIGNED8	READWRITE			0..2	Yes

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5B52	0	valve config 1	Valve signal type 1	AOut1_u8_ValveSignal-Type	UNSIGNED8	READWRITE			0..3	Yes
5B53	0	valve config 1	Valve actuation range po-sition controller 1	AOut1_u8_ValveActuation-RangePosCtrl	UNSIGNED8	READWRITE			0..3	Yes
5B54	0	valve config 1	Valve actuation range pressure/force controller 1	AOut1_u8_ValveActuation-RangeFCtrl	UNSIGNED8	READWRITE			0..3	Yes
5B55	0	valve config 1	Valve open loop 1	AOut1_u8_ValveOpen-Loop	UNSIGNED8	READWRITE			0..1	No
5B56	0	valve config 1	Valve open loop set-point 1	AOut1_f_ValveOpenLoop-Setpoint	FLOAT	READWRITE		%		no
5B80	0	output chain1	Output chain input source 1	AOut1_u8_CtrlOutChainIn-putSource	UNSIGNED8	READWRITE				Yes
5B81	0	output chain1	Position controller direc-tion dependent gain factor positive 1	AOut1_f_CtrlOutPosC-trlDirDepGainFactorPos	FLOAT	READWRITE				Yes
5B82	0	output chain1	Position controller direc-tion dependent gain factor negative 1	AOut1_f_CtrlOutPosC-trlDirDepGainFactorNeg	FLOAT	READWRITE				Yes
5B83	0	output chain1	Pressure controller direc-tion dependent gain factor positive 1	AOut1_f_CtrlOutFCtrlDirD-epGainFactorPos	FLOAT	READWRITE				Yes
5B84	0	output chain1	Pressure controller direc-tion dependent gain factor negative 1	AOut1_f_CtrlOutFCtrlDirD-epGainFactorNeg	FLOAT	READWRITE				Yes
5B85	0	output chain1	Controller output invert-ing sign 1	AOut1_i8_CtrlOutInvert-ingSign	INTEGER8	READWRITE			0..1	Yes
5B86	0	output chain1	Controller output dead band compensation type 1	AOut1_i8_CtrlOutDB-CompType	INTEGER8	READWRITE			0..2	Yes
5B87	0	output chain1	Controller output dead band compensation threshold 1	AOut1_f_CtrlOutDBComp-Threshold	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5B88	0	output chain1	Controller output dead band compensation A side 1	AOut1_f_CtrlOutDBCom-pASide	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5B89	0	output chain1	Controller output dead band compensation B side 1	AOut1_f_CtrlOutDB-CompBSide	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5B8A	0	output chain1	Controller output zero cor-rection offset 1	AOut1_f_CtrlOutZeroCor-rectionOffset	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5B8B	0	output chain1	Default value inactive chain 1	AOut1_f_CtrlOutInactive-Chain	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5BAA	0	output chain1	Controller output lower limit 1	AOut1_f_CtrlOutLower-Limit	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5BAB	0	output chain1	Controller output upper limit 1	AOut1_f_CtrlOutUpper-Limit	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5BB0	0	output chain1	Linearisation out 1	AOut1_f_LinOut	FLOAT	READWRITE	0.1	%	-1000.. 1000	No
5BB1	0	output chain 1	ECAT out 1	AOut1_i16_ECATOut	INTEGER16	READWRITE			-16384 +16384	No
5C50	0	valve config 2	Valve input source 2	AOut2_u8_ValveInput-Source	UNSIGNED8	READWRITE				Yes
5C51	0	valve config 2	Valve type 2	AOut2_u8_ValveType	UNSIGNED8	READWRITE			0..2	Yes
5C52	0	valve config 2	Valve signal type 2	AOut2_u8_ValveSignal-Type	UNSIGNED8	READWRITE			0..3	Yes
5C53	0	valve config 2	Valve actuation range po-sition controller 2	AOut2_u8_ValveActuation-RangePosCtrl	UNSIGNED8	READWRITE			0..3	Yes
5C54	0	valve config 2	Valve actuation range pressure/force controller 2	AOut2_u8_ValveActuation-RangeFCtrl	UNSIGNED8	READWRITE			0..3	Yes
5C55	0	valve config 2	Valve open loop 2	AOut2_u8_ValveOpen-Loop	UNSIGNED8	READWRITE			0..1	No

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5C56	0	valve config 2	Valve open loop set-point 2	AOut2_f_ValveOpenLoop-Setpoint	FLOAT	READWRITE		%		No
5C80	0	output chain2	Output chain input source 2	AOut2_i8_CtrlOutChainIn-putSource	UNSIGNED8	READWRITE				Yes
5C81	0	output chain2	Position controller direc-tion dependent gain factor positive 2	AOut2_f_CtrlOutPosC-trlDirDepGainFactorPos	FLOAT	READWRITE				Yes
5C82	0	output chain2	Position controller direc-tion dependent gain factor negative 2	AOut2_f_CtrlOutPosC-trlDirDepGainFactorNeg	FLOAT	READWRITE				Yes
5C83	0	output chain2	Pressure controller direc-tion dependent gain factor positive 2	AOut2_f_CtrlOutFCtrlDirD-epGainFactorPos	FLOAT	READWRITE				Yes
5C84	0	output chain2	Pressure controller direc-tion dependent gain factor negative 2	AOut2_f_CtrlOutFCtrlDirD-epGainFactorNeg	FLOAT	READWRITE				Yes
5C85	0	output chain2	Controller output invert-ing sign 2	AOut2_i8_CtrlOutInvert-ingSign	INTEGER8	READWRITE			0..1	Yes
5C86	0	output chain2	Controller output dead band compensation type 2	AOut2_i8_CtrlOutDB-CompType	INTEGER8	READWRITE			0..2	Yes
5C87	0	output chain2	Controller output dead band compensation threshold 2	AOut2_f_CtrlOutDBComp-Threshold	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5C88	0	output chain2	Controller output dead band compensation A side 2	AOut2_f_CtrlOutDBCom-pASide	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5C89	0	output chain2	Controller output dead band compensation B side 2	AOut2_f_CtrlOutDB-CompBSide	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5C8A	0	output chain2	Controller output zero cor-rection offset 2	AOut2_f_CtrlOutZeroCor-rectionOffset	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5C8B	0	output chain2	Default value inactive chain 2	AOut2_f_CtrlOutInactive-Chain	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5CAA	0	output chain2	Controller output lower limit 2	AOut2_f_CtrlOutLower-Limit	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5CAB	0	output chain2	Controller output upper limit 2	AOut2_f_CtrlOutUpper-Limit	FLOAT	READWRITE	0.1	%	-1000.. 1000	Yes
5CB0	0	output chain2	Linearisation out 2	AOut2_f_LinOut	FLOAT	READWRITE	0.1	%	-1000.. 1000	No
5CB1	0	output chain 2	ECAT out 2	AOut2_i16_ECATOut	INTEGER16	READWRITE			-16384 +16384	No
5D50	0	valve config 3	Valve input source 3	AOut3_u8_ValveInput-Source	UNSIGNED8	READWRITE				Yes
5D51	0	valve config 3	Valve type 3	AOut3_u8_ValveType	UNSIGNED8	READWRITE			0..2	Yes
5D52	0	valve config 3	Valve signal type 3	AOut3_u8_ValveSignal-Type	UNSIGNED8	READWRITE			0..3	Yes
5D53	0	valve config 3	Valve actuation range po-sition controller 3	AOut3_u8_ValveActuation-RangePosCtrl	UNSIGNED8	READWRITE			0..3	Yes
5D54	0	valve config 3	Valve actuation range pressure/force controller 3	AOut3_u8_ValveActuation-RangeFCtrl	UNSIGNED8	READWRITE			0..3	Yes
5D55	0	valve config 3	Valve open loop 3	AOut3_u8_ValveOpen-Loop	UNSIGNED8	READWRITE			0..1	No
5D56	0	valve config 3	Valve open loop set-point 3	AOut3_f_ValveOpenLoop-Setpoint	FLOAT	READWRITE		%		No
5D80	0	output chain3	Output chain input source 3	AOut3_i8_CtrlOutInput-Source	UNSIGNED8	READWRITE				Yes
5D81	0	output chain3	Position controller direc-tion dependent gain factor positive 3	AOut3_f_CtrlOutPosC-trlDirDepGainFactorPos	FLOAT	READWRITE				Yes
5D82	0	output chain3	Position controller direc-tion dependent gain factor negative 3	AOut3_f_CtrlOutPosC-trlDirDepGainFactorNeg	FLOAT	READWRITE				Yes

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5D83	0	output chain3	Pressure controller direction dependent gain factor positive 3	AOut3_f_CtrlOutFCtrlDirDepGainFactorPos	FLOAT	READWRITE				Yes
5D84	0	output chain3	Pressure controller direction dependent gain factor negative 3	AOut3_f_CtrlOutFCtrlDirDepGainFactorNeg	FLOAT	READWRITE				Yes
5D85	0	output chain3	Controller output inverting sign 3	AOut3_i8_CtrlOutInvertingSign	INTEGER8	READWRITE			0..1	Yes
5D86	0	output chain3	Controller output dead band compensation type 3	AOut3_i8_CtrlOutDBCompType	INTEGER8	READWRITE			0..2	Yes
5D87	0	output chain3	Controller output dead band compensation threshold 3	AOut3_f_CtrlOutDBCompThreshold	FLOAT	READWRITE	0.1	%	-1000..1000	Yes
5D88	0	output chain3	Controller output dead band compensation A side 3	AOut3_f_CtrlOutDBCompASide	FLOAT	READWRITE	0.1	%	-1000..1000	Yes
5D89	0	output chain3	Controller output dead band compensation B side 3	AOut3_f_CtrlOutDBCompBSide	FLOAT	READWRITE	0.1	%	-1000..1000	Yes
5D8A	0	output chain3	Controller output zero correction offset 3	AOut3_f_CtrlOutZeroCorrectionOffset	FLOAT	READWRITE	0.1	%	-1000..1000	Yes
5D8B	0	output chain3	Default value inactive chain 3	AOut3_f_CtrlOutInactiveChain	FLOAT	READWRITE	0.1	%	-1000..1000	Yes
5DAA	0	output chain3	Controller output lower limit 3	AOut3_f_CtrlOutLowerLimit	FLOAT	READWRITE	0.1	%	-1000..1000	Yes
5DAB	0	output chain3	Controller output upper limit 3	AOut3_f_CtrlOutUpperLimit	FLOAT	READWRITE	0.1	%	-1000..1000	Yes
5DB0	0	output chain3	Linearisation out 3	AOut3_f_LinOut	FLOAT	READWRITE	0.1	%	-1000..1000	No
5DB1	0	output chain 3	ECAT out 3	AOut3_i16_ECATOut	INTEGER16	READWRITE			-16384 +16384	No
5E00	0	modelbasedfeedforward1	u16_MbffwON	axis1_u16_MbffwON	UNSIGNED16	READWRITE				No
5E01	0	modelbasedfeedforward1	f_MbffwCNullOut	axis1_f_MbffwCNullOut	FLOAT	READWRITE	0.001	%/mm/s		No
5E02	0	modelbasedfeedforward1	f_MbffwCoefA1	axis1_f_MbffwCoefA1	FLOAT	READ	0.001	%/mm/s		No
5E03	0	modelbasedfeedforward1	f_MbffwCoefA2	axis1_f_MbffwCoefA2	FLOAT	READ	0.001	%/mm/s^2		No
5E04	0	modelbasedfeedforward1	f_MbffwCoefA3	axis1_f_MbffwCoefA3	FLOAT	READ	0.001	%/mm/s^3		No
5E05	0	modelbasedfeedforward1	f_MbffwCtrlOut	axis1_f_MbffwCtrlOut	FLOAT	READ	0.001	%		No
5E06	0	modelbasedfeedforward1	f_MbffwCtrlOutVelocity	axis1_f_MbffwCtrlOutVelocity	FLOAT	READ	0.001	%		No
5E07	0	modelbasedfeedforward1	f_MbffwCtrlOutAcceleration	axis1_f_MbffwCtrlOutAcceleration	FLOAT	READ	0.001	%		No
5E08	0	modelbasedfeedforward1	f_MbffwCtrlOutJerk	axis1_f_MbffwCtrlOutJerk	FLOAT	READ	0.001	%		No
5E09	0	modelbasedfeedforward1	i16_MbffwRecState	axis1_i16_MbffwRecState	INTEGER16	READ				No

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
5E0A	0	model-based-feedfor-ward1	i16_MbffwLastRecState	axis1_i16_MbffwLastRec-State	INTEGER16	READ				No
5E0B	0	model-based-feedfor-ward1	i16_MbffwStartRecFlag	axis1_i16_MbffwStartRec-Flag	INTEGER16	READ				No
5E0C	0	model-based-feedfor-ward1	i32_MbffWDataGridRec-TargetPosMax	axis1_i32_MbffWDa-taGridRecTargetPosMax	FLOAT	READWRITE	0.001	mm		No
5E0D	0	model-based-feedfor-ward1	i32_MbffWDataGridRec-TargetPosMin	axis1_i32_MbffWDa-taGridRecTargetPosMin	FLOAT	READWRITE	0.001	mm		No
5E0E	0	model-based-feedfor-ward1	u32_MbffWDataGridRec-TargetVelocity	axis1_u32_MbffWDa-taGridRecTargetVelocity	UNSIGNED32	READWRITE	0.1	mm/s		No
5E0F	0	model-based-feedfor-ward1	u32_MbffWDataGridRec-TargetAcceleration	axis1_u32_MbffWDa-taGridRecTarget-Acceleration	UNSIGNED32	READWRITE	1	mm/s^2		No
5E10	0	model-based-feedfor-ward1	u32_MbffWDataGridRec-TargetDeceleration	axis1_u32_MbffWDa-taGridRecTarget-Deceleration	UNSIGNED32	READWRITE	1	mm/s^2		No
5E11	0	model-based-feedfor-ward1	u32_MbffWDataGridRec-TargetJerk	axis1_u32_MbffWDa-taGridRecTargetJerk	UNSIGNED32	READWRITE	1	mm/s^3		No
5E12	0	model-based-feedfor-ward1	u32_MbffWDataGridRec-TargetJerkDecel	axis1_u32_MbffWDa-taGridRecTargetJerkDecel	UNSIGNED32	READWRITE	1	mm/s^3		No
5E13	0	model-based-feedfor-ward1	i16_MbffwSystemChoice	axis1_i16_MbffwSystem-Choice	INTEGER16	READWRITE				No
5E14	0	model-based-feedfor-ward1	f_MbffwVelocityChange-Phases	axis1_f_MbffwVeloci-tyChangePhases	FLOAT	READWRITE	0.1	mm/s		No
5E15	0	model-based-feedfor-ward1	f_MbffwDampingCyl	axis1_f_MbffwDampingCyl	FLOAT	READWRITE				No
5E16	0	model-based-feedfor-ward1	f_MbffwResFrequCyl	axis1_f_MbffwRes-FrequCyl	FLOAT	READWRITE	0.001	1/s		No
5E17	0	model-based-feedfor-ward1	f_MbffwResFrequValve	axis1_f_MbffwResFrequ-Valve	FLOAT	READWRITE	0.001	1/s		No

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
603F	0	device0	Error code 0	axis0_u16_ErrorCode	UNSIGNED16	READ				Last 32 errors
6040	0	device0	Controlword 0	axis0_u16_Controlword	UNSIGNED16	READWRITE				No
6041	0	device0	Statusword 0	axis0_u16_Statusword	UNSIGNED16	READ				No
6052	0	device	Device serial number	s_DeviceSerialNumber	STRING	READ			fixed	Yes
6053	0	device	Device date of production	s_DeviceManufacturing-Date	STRING	READ			fixed	Yes
6060	0	device0	Modes of operation 0	axis0_i8_ModesOfOpe-ration	UNSIGNED8	READWRITE				No
6061	0	device0	Modes of operation dis-play 0	axis0_i8_ModesOfOperati-onDisplay	UNSIGNED8	READ				No
6062	0	positio-ning0	Position demand value 0	axis0_i32_PosDemand-Value	INTEGER32	READ	0.001	mm		No
6064	0	positio-ning0	Position actual value 0	axis0_i32_PosActualValue	INTEGER32	READ	0.001	mm		No
6065	0	position monito-ring0	Following error window 0	axis0_u32_PosFollowin-gErrorWindow	UNSIGNED32	READWRITE	0.001	mm		Yes
6066	0	position monito-ring0	Following error time out 0	axis0_u16_PosFollowin-gErrorTimeOut	UNSIGNED16	READWRITE	0.001	s		Yes
6067	0	position monito-ring0	Position window 0	axis0_u32_PosWindow	UNSIGNED32	READWRITE	0.001	mm		Yes
6068	0	position monito-ring0	Position window time 0	axis0_u16_PosWindow-Time	UNSIGNED16	READWRITE	0.001	s		Yes
606B	0	positio-ning0	Velocity demand value 0	axis0_i32_VelDemand-Value	INTEGER32	READ	0.01	mm/s		No
606C	0	positio-ning0	Velocity actual value 0	axis0_i32_VelActualValue	INTEGER32	READ	0.1	mm/s		No
606D	0	positio-ning0	Jerk demand value 0	axis0_i32_JerkDemand-Value	INTEGER32	READ	1	mm/s^3		No
606E	0	positio-ning0	Acc Demad Value 0	axis0_i32_AccDemand-Value	INTEGER32	READ	1	mm/s²		No
6071	0	pressure-force0	Target torque 0	axis0_i16_TargetTorque	INTEGER16	READWRITE	0.001	rated unit		no
6074	0	pressure-force0	Torque demand 0	axis0_i16_TorqueDemand	INTEGER16	READWRITE	0.001	rated unit		no
6077	0	pressure-force0	Torque actual value 0	axis0_i16_TorqueActual-Value	INTEGER16	READ	0.001	rated unit		no
607A	0	positio-ning0	Target Position 0	axis0_i32_PosProfileTar-getPos	INTEGER32	READWRITE	0.001	mm		No
607C	0	positio-ning0	Home offset 0	axis0_i32_HomingOffset	INTEGER32	READWRITE	0.001	mm		Yes
607D	2	positio-ning0	Max position limit 0	axis0_i32_PosLimitMax	INTEGER32	READWRITE	0.001	mm		Yes
607D	0	positio-ning0	Software position limit 0	axis0_u16_SubIndex0	UNSIGNED16	CONST				Yes
607D	1	positio-ning0	Min position limit 0	axis0_i32_PosLimitMin	INTEGER32	READWRITE	0.001	mm		Yes
6081	0	positio-ning0	Profile velocity 0	axis0_u32_PosProfileVe-locity	UNSIGNED32	READWRITE	0.01	mm/s		No
6083	0	positio-ning0	Profile acceleration 0	axis0_u32_PosProfileAc-celeration	UNSIGNED32	READWRITE	1	mm/s^2		No
6084	0	positio-ning0	Profile deceleration 0	axis0_u32_PosProfileDe-celeration	UNSIGNED32	READWRITE	1	mm/s^2		No
6085	0	positio-ning0	Quick stop deceleration 0	axis0_u32_PosQuickStop-Deceleration	UNSIGNED32	READWRITE	1	mm/s^2		No
6086	0	positio-ning0	Quick stop jerk decelera-tion 0	axis0_u32_PosQuick-StopJerkDecel	UNSIGNED32	READWRITE	1	mm/s^2		No

Index		Group	Plain Text	Variable name	Data type	Access rights	Resolution	Unit	Value range	Save to flash
6087	0	pressure-force0	Target slope 0	axis0_u32_TorqueSlope	UNSIGNED32	READWRITE	0.001	rated unit/s		no
6098	0	positio-ning0	Homing method 0	axis0_i8_HomingMethod	INTEGER8	READWRITE				Yes
6099	1	positio-ning0	DUMMY	axis0_DUMMY	UNSIGNED32	READ				Yes
6099	0	positio-ning0	Homing speeds 0 subin-dex0	axis0_u16_SubIndex0	UNSIGNED16	CONST				Yes
6099	2	positio-ning0	Speed during search for zero 0	axis0_u32_HomingSpeed-DuringSearchForZero	UNSIGNED32	READWRITE	0.1	mm/s		Yes
609A	0	positio-ning0	Homing acceleration 0	axis0_u32_HomingAcce-leration	UNSIGNED32	READWRITE	1	mm/s^2		Yes
609B	4	positio-ning0	Jog profile jerk 0	axis0_u32_JogProfileJerk	UNSIGNED32	READWRITE	1	mm/s^3		No
609B	1	positio-ning0	Jog profile velocity 0	axis0_u32_JogProfileVe-locity	UNSIGNED32	READWRITE	0.1	mm/s		No
609b	3	positio-ning0	DUMMY	axis0_DUMMY	UNSIGNED32	READ				Yes
609B	2	positio-ning0	Jog profile acceleration 0	axis0_u32_JogProfileAc-celeration	UNSIGNED32	READWRITE	1	mm/s^2		No
609B	0	positio-ning0	Jog profile subindex 0	axis0_u16_SubIndex0	UNSIGNED16	CONST				No
60A4	0	positio-ning0	Profile jerk 0	axis0_u32_PosProfileJerk	UNSIGNED32	CONST				No
60F4	0	positio-ning0	Following error actual va-lue 0	axis0_i32_PosFollowin-gErrorActualValue	INTEGER32	READ	0.001	mm		No
60F5	0	positio-ning0	Profile segment 0	axis0_i16_ProfileSegment	INTEGER16	READ				No
60F6	0	positio-ning0	Profile time 0	axis0_f_TimeProfile	FLOAT	READ				No
60FF	0	positio-ning0	Target velocity 0	axis0_i32_TargetVelocity	INTEGER32	READWRITE	0.1	mm/s		No
6502	0	device0	Supported drive modes 0	axis0_u32_SupportedDri-veModes	UNSIGNED32	READ			fixed	No
683F	0	device1	Error code 1	axis1_u16_ErrorCode	UNSIGNED16	READ				Last 32 errors
6840	0	device1	Controlword 1	axis1_u16_Controlword	UNSIGNED16	READWRITE				No
6841	0	device1	Statusword 1	axis1_u16_Statusword	UNSIGNED16	READ				No
6860	0	device1	Modes of operation 1	axis1_i8_ModesOfOpe-ration	UNSIGNED8	READWRITE				No
6861	0	device1	Modes of operation dis-play 1	axis1_i8_ModesOfOperati-onDisplay	UNSIGNED8	READ				No
6862	0	positio-ning1	Position demand value 1	axis1_i32_PosDemand-Value	INTEGER32	READ				No
6864	0	positio-ning1	Position actual value 1	axis1_i32_PosActualValue	INTEGER32	READ				No
6865	0	position monito-ring1	Following error window 1	axis1_u32_PosFollowin-gErrorWindow	UNSIGNED32	READWRITE	0.001	mm		Yes
6866	0	position monito-ring1	Following error time out 1	axis1_u16_PosFollowin-gErrorTimeOut	UNSIGNED16	READWRITE	0.001	mm		Yes
6867	0	position monito-ring1	Position window 1	axis1_u32_PosWindow	UNSIGNED32	READWRITE	0.001	s		Yes
6868	0	position monito-ring1	Position window time 1	axis1_u16_PosWindow-Time	UNSIGNED16	READWRITE	0.001	s		Yes
686B	0	positio-ning1	Velocity demand value 1	axis1_i32_VelDemand-Value	INTEGER32	READ	0.01	mm/s		No
686C	0	positio-ning1	Velocity actual value 1	axis1_i32_VelActualValue	INTEGER32	READ	0.1	mm/s		No
686D	0	positio-ning1	Jerk demand value 1	axis1_i32_JerkDemand-Value	INTEGER32	READWRITE	1	mm/s^3		No

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
686E	0	positio-ning1	Acc Demad Value 1	axis1_i32_AccDemand-Value	INTEGER32	READ	1	mm/s²		No
6871	0	pressure-force1	Target torque 1	axis1_i16_TargetTorque	INTEGER16	READWRITE	0.001	rated unit		no
6874	0	pressure-force1	Torque demand 1	axis1_i16_TorqueDemand	INTEGER16	READWRITE	0.001	rated unit		no
6877	0	pressure-force1	Torque actual value 1	axis1_i16_TorqueActual-Value	INTEGER16	READ	0.001	rated unit		no
687A	0	positio-ning1	Target Position 1	axis1_i32_PosProfileTar-getPos	INTEGER32	READWRITE	0.001	mm		No
687C	0	positio-ning1	Home offset 1	axis1_i32_HomingOffset	INTEGER32	READWRITE	0.001	mm		Yes
687D	1	positio-ning1	Min position limit 1	axis1_i32_PosLimitMin	INTEGER32	READWRITE	0.001	mm		Yes
687D	0	positio-ning1	Software position limit 1	axis1_u16_SubIndex0	UNSIGNED16	CONST				Yes
687D	2	positio-ning1	Max position limit 1	axis1_i32_PosLimitMax	INTEGER32	READWRITE	0.001	mm		Yes
6881	0	positio-ning1	Profile velocity 1	axis1_u32_PosProfileVe-locity	UNSIGNED32	READWRITE	0.01	mm/s		No
6883	0	positio-ning1	Profile acceleration 1	axis1_u32_PosProfileAc-celeration	UNSIGNED32	READWRITE	1	mm/s^2		No
6884	0	positio-ning1	Profile deceleration 1	axis1_u32_PosProfileDe-celeration	UNSIGNED32	READWRITE	1	mm/s^2		No
6885	0	positio-ning1	Quick stop deceleration 1	axis1_u32_PosQuickStop-Deceleration	UNSIGNED32	READWRITE	1	mm/s^2		No
6886	0	positio-ning1	Quick stop jerk decelera-tion 1	axis1_u32_PosQuick-StopJerkDecel	UNSIGNED32	READWRITE	1	mm/s^2		No
6887	0	pressure-force1	Target slope 1	axis1_u32_TorqueSlope	UNSIGNED32	READWRITE	0.001	rated unit/s		no
6898	0	positio-ning1	Homing method 1	axis1_i8_HomingMethod	INTEGER8	READWRITE				Yes
6899	1	positio-ning1	DUMMY	axis1_DUMMY	UNSIGNED32	READ				Yes
6899	2	positio-ning1	Speed during search for zero 1	axis1_u32_HomingSpeed-DuringSearchForZero	UNSIGNED32	READWRITE	0.1	mm/s		Yes
689A	0	positio-ning1	Homing acceleration 1	axis1_u32_HomingAcce-leration	UNSIGNED32	READWRITE	1	mm/s^2		Yes
689B	4	positio-ning1	Jog profile jerk 1	axis1_u32_JogProfileJerk	UNSIGNED32	READWRITE	1	mm/s^3		No
689b	3	positio-ning1	DUMMY	axis1_DUMMY	UNSIGNED32	READ				Yes
689B	1	positio-ning1	Jog profile velocity 1	axis1_u32_JogProfileVe-locity	UNSIGNED32	READWRITE	0.1	mm/s		No
689B	0	positio-ning1	Jog profile subindex 1	axis1_u16_SubIndex1	UNSIGNED16	CONST				No
689B	2	positio-ning1	Jog profile acceleration 1	axis1_u32_JogProfileAc-celeration	UNSIGNED32	READWRITE	1	mm/s^2		No
68A4	0	positio-ning1	Profile jerk 1	axis1_u32_PosProfileJerk	UNSIGNED32	CONST				No
68F4	0	positio-ning1	Following error actual va-lue 1	axis1_i32_PosFollowin-gErrorActualValue	INTEGER32	READ	0.001	mm		No
68F5	0	positio-ning1	Profile segment 1	axis1_i16_ProfileSegment	INTEGER16	READ				No
68F6	0	positio-ning1	Profile time 1	axis1_f_TimeProfile	FLOAT	READ				No
68FF	0	positio-ning1	Target velocity 1	axis1_i32_TargetVelocity	INTEGER32	READWRITE	0.1	mm/s		No
6C02	0	device1	Supported drive modes 1	axis1_u32_SupportedDri-veModes	UNSIGNED32	READ			fixed	Yes

Index		Group	Plain Text	Variable name	Data type	Access rights	Reso-lution	Unit	Value range	Save to flash
7000	11	scope	Scope channel data		FLOAT	READ				
7000	12	scope	Scope channel data		FLOAT	READ				
7000	13	scope	Scope channel data		FLOAT	READ				
7000	14	scope	Scope channel data		FLOAT	READ				
7000	15	scope	Scope channel data		FLOAT	READ				
7000	16	scope	Scope channel data		FLOAT	READ				
7000	17	scope	Scope channel data		FLOAT	READ				
7000	18	scope	Scope channel data		FLOAT	READ				
7000	21	scope	Scope channel data		FLOAT	READ				
7000	20	scope	Scope channel data		FLOAT	READ				
7000	27	scope	Scope channel data		FLOAT	READ				
7000	25	scope	Scope channel data		FLOAT	READ				
7000	8	scope	Scope channel data		FLOAT	READ				
7000	22	scope	Scope channel data		FLOAT	READ				
7000	23	scope	Scope channel data		FLOAT	READ				
7000	24	scope	Scope channel data		FLOAT	READ				
7000	26	scope	Scope channel data		FLOAT	READ				
7000	19	scope	Scope channel data		FLOAT	READ				
7000	1	scope	Scope channel data		FLOAT	READ				
7000	10	scope	Scope channel data		FLOAT	READ				
7000	0	scope	Scope channel data	ScopeChannelData	UNSIGNED16	CONST				
7000	2	scope	Scope channel data		FLOAT	READ				
7000	3	scope	Scope channel data		FLOAT	READ				
7000	4	scope	Scope channel data		FLOAT	READ				
7000	5	scope	Scope channel data		FLOAT	READ				
7000	6	scope	Scope channel data		FLOAT	READ				
7000	7	scope	Scope channel data		FLOAT	READ				
7000	9	scope	Scope channel data		FLOAT	READ				
7001	0	scope	Scope data index	ScopeDataIndex	UNSIGNED16	READWRITE				No
7002	0	scope	Scope data channel	ScopeDataChannel	UNSIGNED8	READWRITE				No
7003	0	scope	Trigger channel	ScopeSettings_u8_Trig-gerChannel	UNSIGNED8	READWRITE			0..3	No
7004	0	scope	Trigger edge	ScopeSettings_u8_Trig-gerEdge	UNSIGNED8	READWRITE			0..1	No
7005	0	scope	Trigger level	ScopeSettings_f_Trigger-Level	FLOAT	READWRITE				No
7006	0	scope	Pre trigger	ScopeSettings_f_PreT-rigger	FLOAT	READWRITE				No
7007	0	scope	Channel 0 index	ScopeSettings_u16_Chan-nel0Index	UNSIGNED16	READWRITE				No
7008	0	scope	Channel 0 subindex	ScopeSettings_u16_Chan-nel0SubIndex	UNSIGNED16	READWRITE				No
7009	0	scope	Channel 1 index	ScopeSettings_u16_Chan-nel1Index	UNSIGNED16	READWRITE				No
7010	0	scope	Channel 1 subindex	ScopeSettings_u16_Chan-nel1SubIndex	UNSIGNED16	READWRITE				No
7011	0	scope	Channel 2 index	ScopeSettings_u16_Chan-nel2Index	UNSIGNED16	READWRITE				No
7012	0	scope	Channel 2 subindex	ScopeSettings_u16_Chan-nel2SubIndex	UNSIGNED16	READWRITE				No
7013	0	scope	Channel 3 index	ScopeSettings_u16_Chan-nel3Index	UNSIGNED16	READWRITE				No
7014	0	scope	Channel 3 subindex	ScopeSettings_u16_Chan-nel3SubIndex	UNSIGNED16	READWRITE				No
7015	0	scope	Start_Stop	ScopeSettings_u8_Start-Stop	UNSIGNED8	READWRITE				No
7016	0	scope	Measurement interval	ScopeSettings_u32_Mea-surementIntervall	UNSIGNED32	READWRITE		ms		No

Start parameters

The start parameter list is independent of the configuration steps described above and is not generated automatically during configuration, but must be created manually.

The start parameter list is automatically transferred to the PACHC when the EtherCAT changes from the status Pre-Operational to Safe-operational. This function can be used to ensure that the same drive parameters are always used even when the device is replaced.

Since the parameters from the commissioning interface are converted into internal parameters during configuration, it is not recommended to use the start parameter list.

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