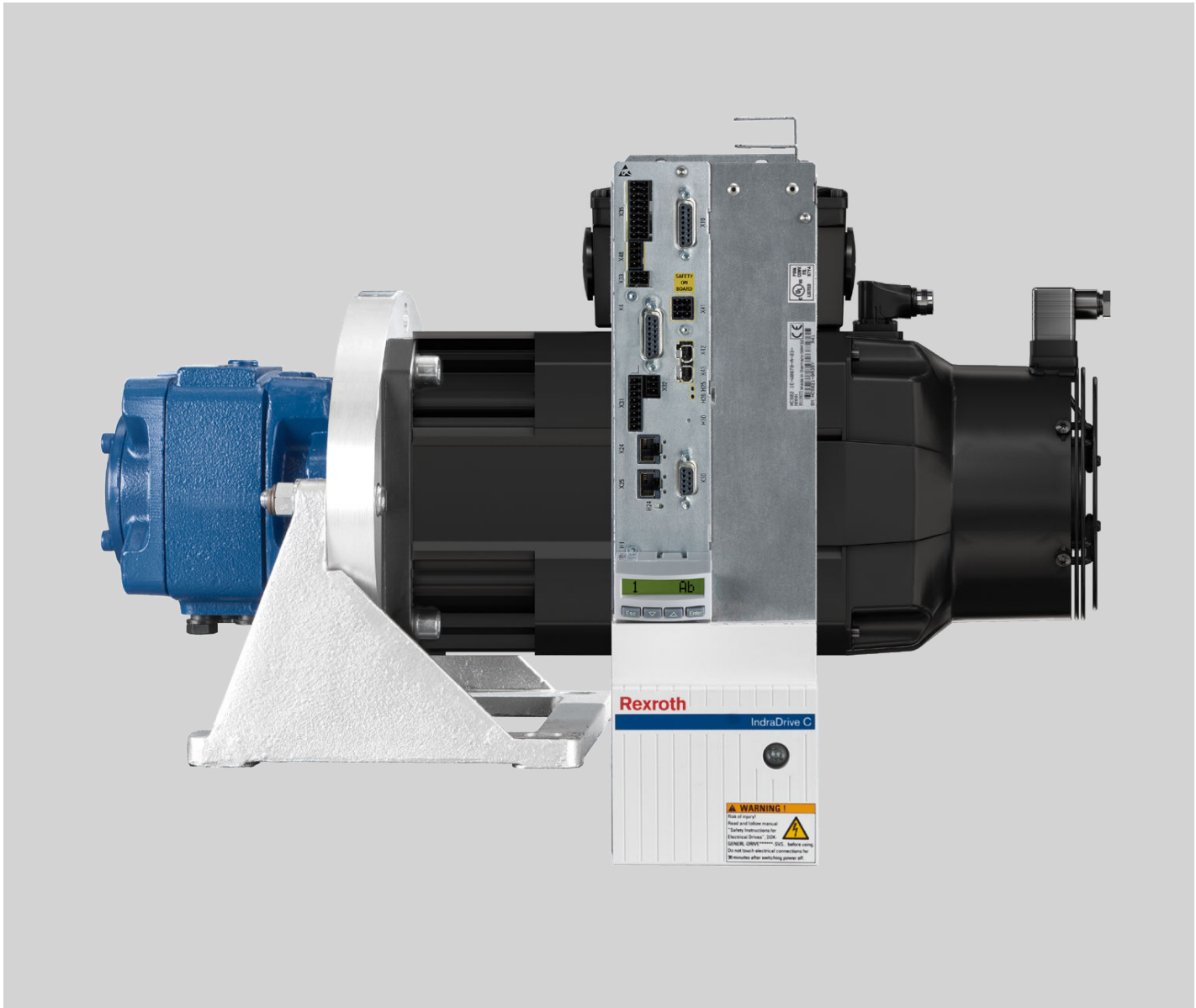
rexroth
A Bosch Company

Rexroth Sytronix

SvP 7020 PFC
Software/Parameter File for Drive Controllers

Release Notes
RD 62313-RN

Edition 05



Title	Rexroth Sytronix SvP 7020 PFC Software/Parameter File for Drive Controllers
Type of Documentation	Release Notes
Document Typecode Internal File Reference	RS-cf39710d9fddd8e3c0a8028669f5d58e-6-en-US-3
Purpose of Documentation	This document contains the release notes regarding the variable-speed pump system SvP 7020 PFC
Record of revisions	Edition 05, 2021-09 See tab. 1-1 "Record of revisions of software/parameter file FWS-MLDSYx-PFC" on page 1
Copyright	
Liability	The specified data is intended for product description purposes only and shall not be deemed to be a guaranteed characteristic unless expressly stipulated in the contract. All rights are reserved with respect to the content of this documentation and the availability of the product.
Editorial department	Dept. DC-IH/EBD1

Table of Contents

Page

Page

Page

1 General

1.1 Releases

Software/parameter file name	Release date	Change of version
FWS-MLDSYx-PFC-**03V02**-D0-**MP21**-NNNNNNNN-01	2021-03-15	02V08 → 03V02
FWS-MLDSYx-PFC-02**V08**-D0-MP20-NNNNNNNN-01	2020-04-20	02V06 → 02V08
FWS-MLDSYx-PFC-02**V06**-D0-MP20	2019-06-17	02V05 → 02V06
FWS-MLDSYx-PFC-02**V05**-D0-MP20	2018-03-15	02V04 → 02V05
FWS-MLDSYx-PFC-02**V04**-D0-MP20	2018-01-15	02V02 → 02V04

Tab. 1-1: Record of revisions of software/parameter file FWS-MLDSYx-PFC

Your Feedback

Your experience is important for our improvement processes of products and documentations.

If you discover mistakes in this documentation or suggest changes, you can send your feedback to the following e-mail address:

Dokusupport@boschrexroth.de

We need the following information to handle your feedback:

- The number indicated under "Internal File Reference".
- The page number.

Trademark information

sercos the automation bus	Sercos® is registered trademark of Sercos International e.V.
EtherCAT	EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
EtherNet/IP	EtherNet/IP™ is a trademark under license of Open DeviceNet Vendor Association, Inc.
PROFIBUS	PROFIBUS® is registered trademark of PROFIBUS Nutzerorganisation e. V.
PROFINET	PROFINET® (Process Field Network) is the open Industrial Ethernet standard of Profibus & Profinet International (PI) for automation. ProfiNet® is registered trademark of PROFIBUS Nutzerorganisation e. V.
CANopen	CANopen® is registered trademark of CAN in Automation e.V.
	TwinCAT® is registered and licensed trademark of Beckhoff Automation GmbH, Germany
	HIPERFACE® is registered trademark of SICK-STEGMANN GmbH
	EnDat® is registered trademark of Dr. Johannes Heidenhain GmbH
	MTS SENSORS® is registered trademark of MTS Sensor Technologie GmbH & Co. KG
	BALLUFF® is registered trademark of Balluff GmbH

Hydraulic system characteristics

Cylinder axes with the following system characteristics of the hydraulic components are supported.

1. Hydraulic system:
   - Direction input via pump (usually "closed oil circuit")
   - Direction input via valves ("open oil circuit")
2. Cylinders:
   - Double rod cylinder
   - Single rod cylinder
   - Double rod cylinder; cylinder with effective area switching
   - Single rod cylinder; cylinder with effective area switching
3. Pump types:
   - 4-quadrant operation; cylinder moved directly via pump
   - 2-quadrant operation; pump with only one direction of displacement, cylinder direction determined via valves
4. Pump volume:
   - Fixed displacement pump

- Pump system with 2-point control
- Pump with continuously variable displacement

5. On/off valves:
   - Enable valves for A-side and B-side
   - Rapid mode and press mode valve
   - Directional valves for retracting and extending
   - Decompression valve
     - Double rod cylinders: Decompression valve on B-side
     - Single rod cylinders: Decompression valves on A-side and B-side
   - Swivel angle control valve (2-point control)
6. Proportional valve:
   - Swivel angle control valve (continuously variable adjustment)
7. Sensors:
   - Encoder for cylinder position
   - Pressure sensors for A-side and B-side of cylinder
   - Pressure sensor for chamber C
   - Force sensor
   - Tank pressure sensor or switch
   - System pressure sensor or switch
   - Pilot oil pressure sensor or switch
   - Oil temperature sensor or switch
   - Swivel angle sensor

The sizing of the components and the hydraulic design are limiting elements of the operating points and the dynamics of the actuator.

Supported functions

The following functions are available:

- Operation modes:
  - Closed-loop position control
  - Velocity control
  - Closed-loop position control with alternating force control
- Active vibration damping (typically up to 15 Hz; depending on motor dynamics and encoder dead times)
- Output adjustment in the case of hydraulic change of actuator feed
- Decompression
- Protective/monitoring functions
- Parameter set switching
- Diagnostics/error handling

Functions that are not supported

The following functions are not or not yet available:

- Torque/force control mode
  - Shut-off and restarting function for "force holding operation"
- Hydraulic circuit
  - Rapid mode circuit for single-rod cylinder

Requirements/restrictions

There are the following requirements/restrictions:

- Precision of position control depends on:
  - Encoder resolution
  - Encoder precision/jitter
  - Freedom from interference in the encoder signal
- Precision of force control depends on:
  - Type of force acquisition (pressure sensors/force sensor)
  - Sensor resolution
  - Sensor precision/jitter
  - Freedom from interference in the sensor signals
- Accuracy of closed-loop swivel angle control depends on:
  - Encoder resolution
  - Encoder precision/jitter
  - Freedom from interference in the encoder signal
  - Pump leakage
  - Dynamic response the swivel angle adjustment
- Magnetostrictive position encoders:
  - have to be set to synchronization
  - by "BALLUFF®" can be used with measuring rod lengths up to 1100 mm
  - by "MTS SENSORS®" can be used with measuring rod lengths up to 2200 mm
  - by "MTS SENSORS®" with measuring rod lengths of more than 2200 mm can be used with the encoder firmware "396-06-10" and above, if they are reprogrammed to extrapolation and init delay "10". For reprogramming use the proprietary "Temposonics Sensors PC-Programming" programming adapter and the "MTS SSI-Configurator" software tool of version "5.3.7" and above. Otherwise, jumps in the velocity signal can occur due to oversampling (aliasing effects).
- When the "Drive Halt" (AH) mode is selected
  - PFC02V05: the function valves remain open and the pump is put to standstill with torque; closed-loop controlled standstill of the cylinder is not possible.
  - PFC02V06: the function valves are closed and the pump is put to standstill; closed-loop controlled standstill of the cylinder is not possible.
  - PFC02V08: the function valves remain open and the pump is put to standstill with torque; closed-loop controlled standstill of the cylinder is not possible.
  - PFC03V02: the function valves remain open and the pump is put to standstill with torque; closed-loop controlled standstill of the cylinder is not possible.
  -
- Open/closed-loop velocity control
  - The closed-loop velocity control mode controls the motor speed. The cylinder velocity is only open-loop controlled, taking the hydraulic advance into account.

  - During closed-loop velocity control, switching of controllers to force control is not possible.
  - During closed-loop velocity control, area switching has to be performed manually or externally via the switching control word. The automatism or validation of control is not supported.
- For controlling the swivel angle of a pump system with 2-point control, automatic operation and validation is only supported as of PFC version 02V04.

1.2 Software/parameter file version

These software/parameter file Release Notes relate to the following software variants:

Rexroth Sytronix Software for drive controllers **FWS-MLDSYx-PFC-02VRS-D0-MP20-NNNNNNNN-01** SvP 7020 PFC
Rexroth Sytronix Software for drive controllers **FWS-MLDSYx-PFC-03VRS-D0-MP21-NNNNNNNN-01** SvP 7020 PFC

Tab. 1-2: Software file variant

Material no.	Software/parameter file	Comment
R901533875	FWS-MLDSYX-PFC-02VRS-D0-MP20-NNNNNNNN-01	Boot project for microSD
R901547340	FWS-MLDSYX-PFC-03VRS-D0-MP21-NNNNNNNN-01	Boot project for microSD

FWS	Software/parameter file (compiled MLD project)
MLDSYx	IndraDrive MLD with SYTRONIX technology function
PFC	Position Force Control functionality for axis control
D0	German and English
MP20	FWA-INDRV*-MPx-20VRS-D5-x-SYX-xx
MP21	FWA-INDRV*-MPx-21VRS-D5-x-SYX-xx
NNNNNNNN	no applicative extension
01	Extension of functions, Field Data Acquisition (FDA)

Tab. 1-3: Type code of the supported software/parameter file

1.3 System overview

1.3.1 Requirements

The following components and requirements are needed for Ethernet communication with the drive controller:

- IndraDrive device
- MPx17VRS firmware or higher
- Standard Ethernet cable
- Unassigned Ethernet interface at PC or notebook

- IndraWorks Ds or IndraWorks D/MLD

1.3.2 Control section types

Examples The tables below show the most common control section types that can be used:

IndraDrive C, IndraDrive M

Equipment						Function/application					Operation mode				
Control section						Communication	Motor encoder (motor control)	Actuator encoder	Process control	Process monitoring	Positioning block mode	Drive-internal interpolation	Position control	Drive-controlled positioning	Velocity control
Multi-Ethernet, 2 encoders, 5 analog inputs (4x current/voltage, 1x voltage)															
CSH02.1B	ET	EC	EC	NN	DA	PROFINET ® EtherNet/ IP™	✓ (FOC)	✓	p_A - p_B or F_{act} [V] or [mA]	$p_{accumulator}$, T_{oil} [V] or [mA]	✓	✓	– 1)	✓	– 1)
CSH02.1B	ET	EC	EC	NN	DA	EtherCAT® Sercos®	✓ (FOC)	✓	p_A - p_B or F_{act} [V] or [mA]	$p_{accumulator}$,T_{oil} [V] or [mA]	✓	✓	✓	✓	✓
PROFIBUS®/CANopen®, 2 encoders, 3 analog inputs (2x current/voltage, 1x voltage)															
CSH02.1B	ET	EC	PB	NN	EC	PROFIBUS ®	✓ (FOC)	✓	p_A - p_B or F_{act} [V] or [mA]	$p_{accumulator}$ or T_{oil} [V]	✓	✓	– 1)	✓	– 1)
CSH02.1B	ET	EC	CN	NN	EC	CANopen®	✓ (FOC)	✓	p_A -p_B or F_{act} [V] or [mA]	$p_{accumulator}$ or T_{oil} [V]	✓	✓	✓	✓	✓
PROFIBUS®/CANopen®, 1 encoder, 5 analog inputs (4x current/voltage, 1x voltage)															
CSH02.1B	ET	EC	PB	NN	DA	PROFIBUS ®	– (FXC)	✓	p_A - p_B or F_{act} [V] or [mA]	$p_{accumulator}$, T_{oil} [V] or [mA]	✓	✓	– 1)	✓	– 1)
CSH02.1B	ET	EC	CN	NN	DA	CANopen®	– (FXC)	✓	p_A - p_B or F_{act} [V] or [mA]	$p_{accumulator}$, T_{oil} [V] or [mA]	✓	✓	✓	✓	✓
CCD master, 2 encoder, 5 analog inputs (4x current/voltage, 1x voltage)															
CSH02.1B	CC	EC	EC	NN	DA	Self-contained from MLD application	✓ (FOC)	✓	p_A - p_B or F_{act} [V] or [mA]	$p_{accumulator}$, T_{oil} [V] or [mA]	✓	✓	✓	✓	✓
CSH02.1B	CC	EC	EC	NN	DA	Digital inputs	✓ (FOC)	✓	p_A - p_B or F_{act} [V] or [mA]	$p_{accumulator}$, T_{oil} [V] or [mA]	✓	–	–	–	–

[V] Sensor signal as voltage
[mA] Sensor signal as current
1) Master communication is not real-time capable

Tab. 1-4: PFC device configuration (IndraDrive C, IndraDrive M)

1.4 Required and supplementary documentations

Please see the following documents for comprehensive information on the product, system overview, commissioning manual, etc.:

Title	Type of documentation	Documentation type[1)]	Material number
Sytronix Variable-Speed Pump Drives	Product catalog	R999000332	R999000332
Rexroth Sytronix SvP 70xx Motor-Pump Unit MPA01	Operating Instructions	DOK-SYTROX-MPA01******-ITxx-xx-P	R911339824
Rexroth Sytronix SvP 70xx Motor-pump unit MPA02	Operating instructions	DOK-SYTROX-MPA02******-ITRS-EN-P	R911387041
Rexroth Sytronix SvP 7020 IMC Variable-Speed Pump Drives	Operating instructions	DOK-SYTROX-SVP7020-I*C-ITxx-EN-P	R911377189
Rexroth Sytronix SvP 7020 PFC Variable-Speed Positioning of Hydraulic Axes	Operating instructions	DOK-SYTROX-SVP7020-PF*-ITxx-EN-P	R911377195
Rexroth Sytronix SvP 7020 PFC Variable-Speed Positioning of Hydraulic Axes	Commissioning Manual	DOK-SYTROX-SVP7020-PF*-CO	RE 62313-IB
Rexroth Sytronix SvP 7020 PFC 03 Variable-Speed Positioning of Hydraulic Axes	Functional description	DOK-SYTROX-SVP7020-PF*-CO03	RE 62314-FK
Rexroth Sytronix SvP 7020 IMC Variable-Speed Pump Drives	Commissioning Manual	DOK-SYTROX-SVP7020-I*C-CO	RE 62311-IB

1) In the document type codes, "xx" is a placeholder for the current edition of the documentation (e.g.: IT01 is the first edition of Operating Instructions)

Tab. 1-5: Supplementary documentations

2 Loading PFC project

2.1 General information

To access the PFC dialog, it is first of all necessary to load the software/parameter file. This is the case in the condition as supplied. For updating, the software/parameter file can be reloaded and is available as a ready-made solution (loadable compiled MLD project). No PLC programming knowledge is required, because the complete PFC function can be accessed via the dialogs in IndraWorks. In addition, it is possible to add your specific code to a user project. Depending on the application, different files have to be loaded.

Application	File	Storage location	Comment
Software/parameter file • Until PFC02V05 • PFC02V06 STANDARD	FWS_MLDSYx_PFC_02*.par	Internal FLASH	-
Boot application • PFC02V06 EXTENDED • As of PFC02V08 • PFC03VRS	Application.app + Application.crc	microSD card	Memory card is always included in the scope of supply
User project	FWS_MLDSYx_PFC_*.compiled-library + Application_4UserProject_PFC_*.iwx	microSD card	Memory card has to be ordered separately

Tab. 2-1: PFC applications and boot project formats

The individual handling is described in the following chapters.

2.2 Software/parameter file (*.par)

☞ As of 02V08 no longer available. Instead, use Boot Application (*.app + *.crc) and User Project (*.xiwp + *.compiled-library) (see chapters below).

To load the PFC software/parameter file in the STANDARD derivative as parameter file, follow the steps below:

1. To have the active MLD program and its status displayed, click "Project info" under the MLD branch in IndraWorks.
2. Here, the loaded software/parameter file can be verified and it can be made sure that the program is running ("RUN" status).
3. If necessary, a new program can be loaded (as a software/parameter file) via "Load project...".
4. When the identifier of the technology function "PFC02V..." is displayed (cf. P-0-1381), the "SYTRONIX (PFC)" dialog appears in the project tree.

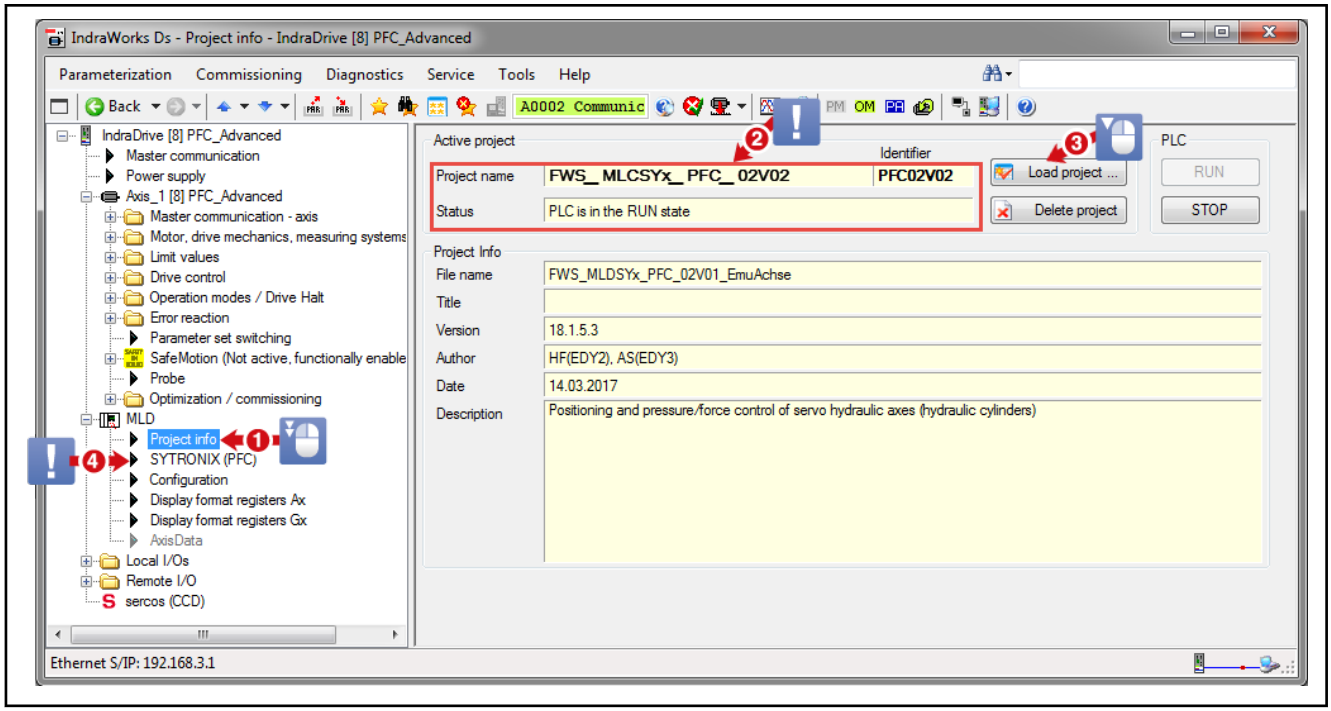


Fig. 2-1: Project info STANDARD

The technology function uses retain data. The retain data are overwritten when the program is loaded. This causes a runtime error of the drive-integrated PLC (F6010).

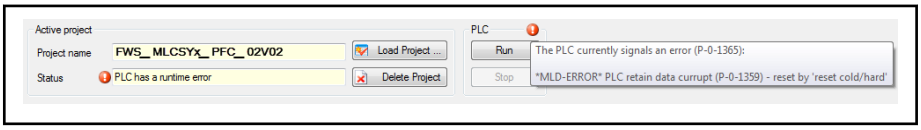


Fig. 2-2: Error F6010 when loading the program

Remedy:

1. Call MLD configuration
2. Execute "RESET cold"
3. Set MLD to "RUN"

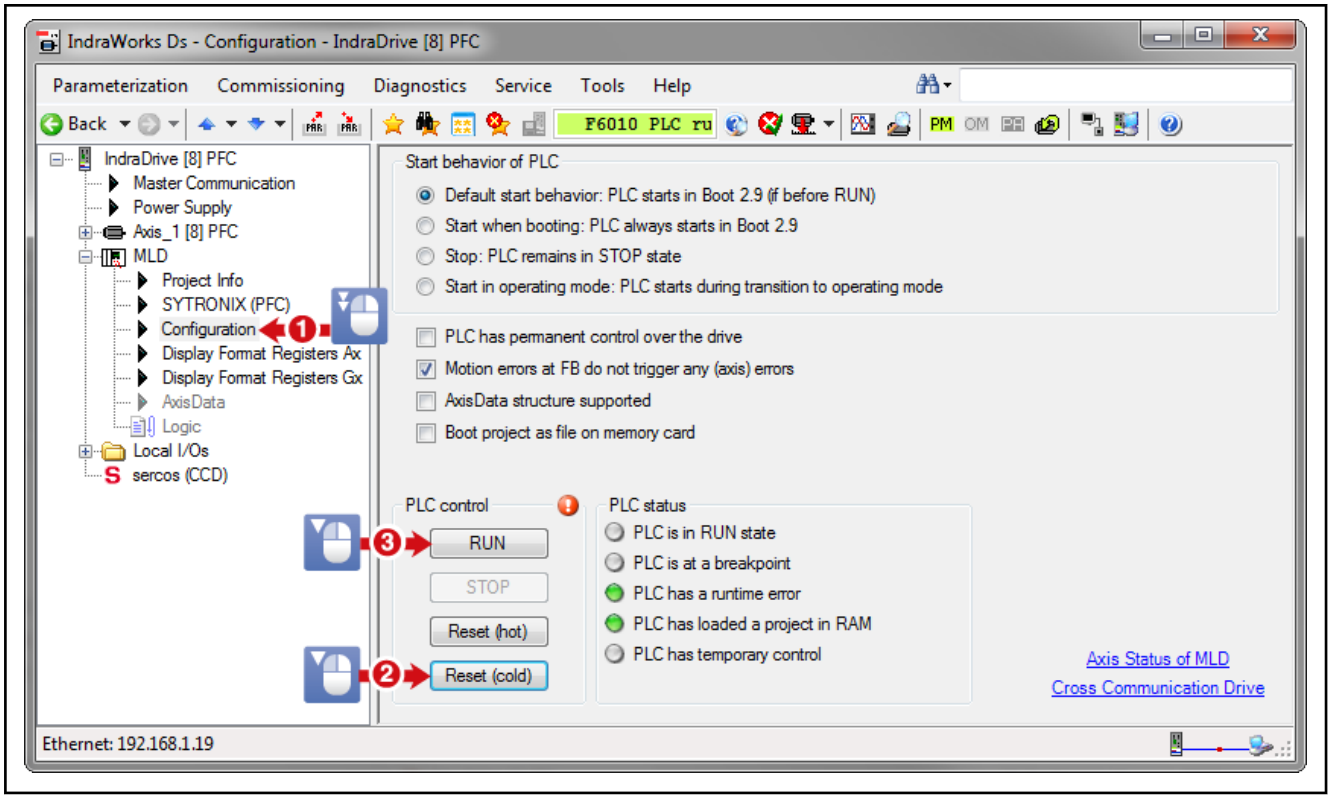


Fig. 2-3: Remedy for error F6010 when loading the program

PFC as parameter file comprises the scope of functions of the "STANDARD" derivative. For the enhanced scope of functions of the "EXTENDED" derivative, PFC has to be used as boot project file or as library in a user project. In both cases, the micro SD card, which is available as accessory item, is required as storage location.

2.3 Boot application (*.app + *.crc)

The boot application is stored on the microSD card.

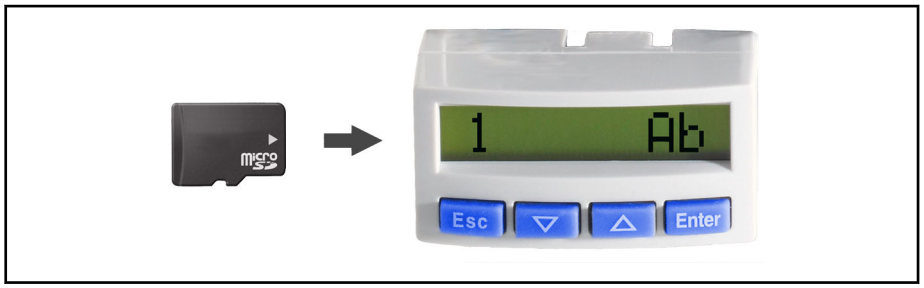


Fig. 2-4: ADVANCED control panel HAP01.1A

The files “Application.app” and “Application.crc” have to be stored in the folder "PLC" on the memory card. For this purpose, a card reader or an FTP connection to the IndraDrive may be used. In the condition as supplied the files are already stored on the memory card.

Using the memory card as storage location of the boot project has to be set in the MLD configuration. To activate the stored project the device has to be restarted.

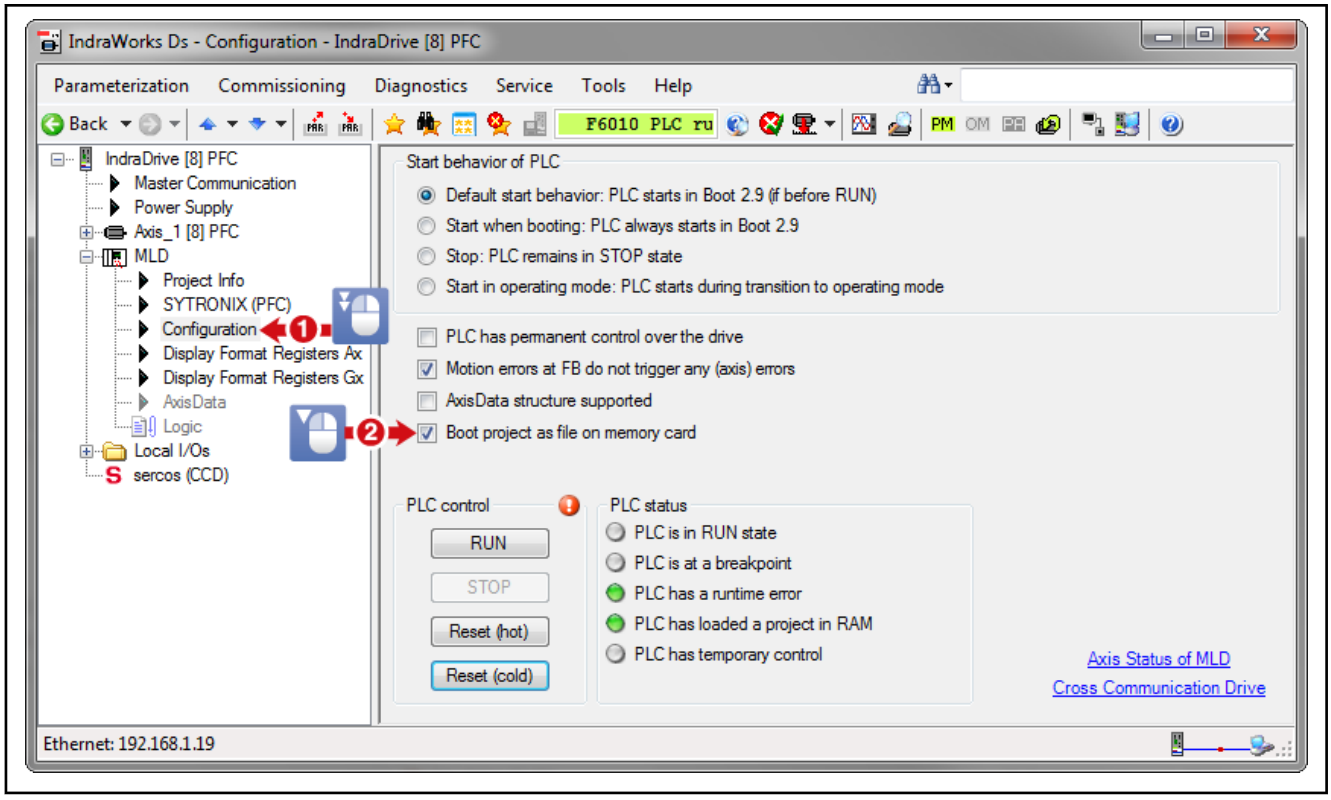


Fig. 2-5: Configuration for using the memory card as storage location of the boot project

The technology function uses retain data. The retain data are overwritten when the program is loaded. This causes a runtime error of the drive-integrated PLC (F6010).

Fig. 2-6: Error F6010 when loading the program

Remedy:

1. Call MLD configuration
2. Execute "RESET cold"
3. Set MLD to "RUN"

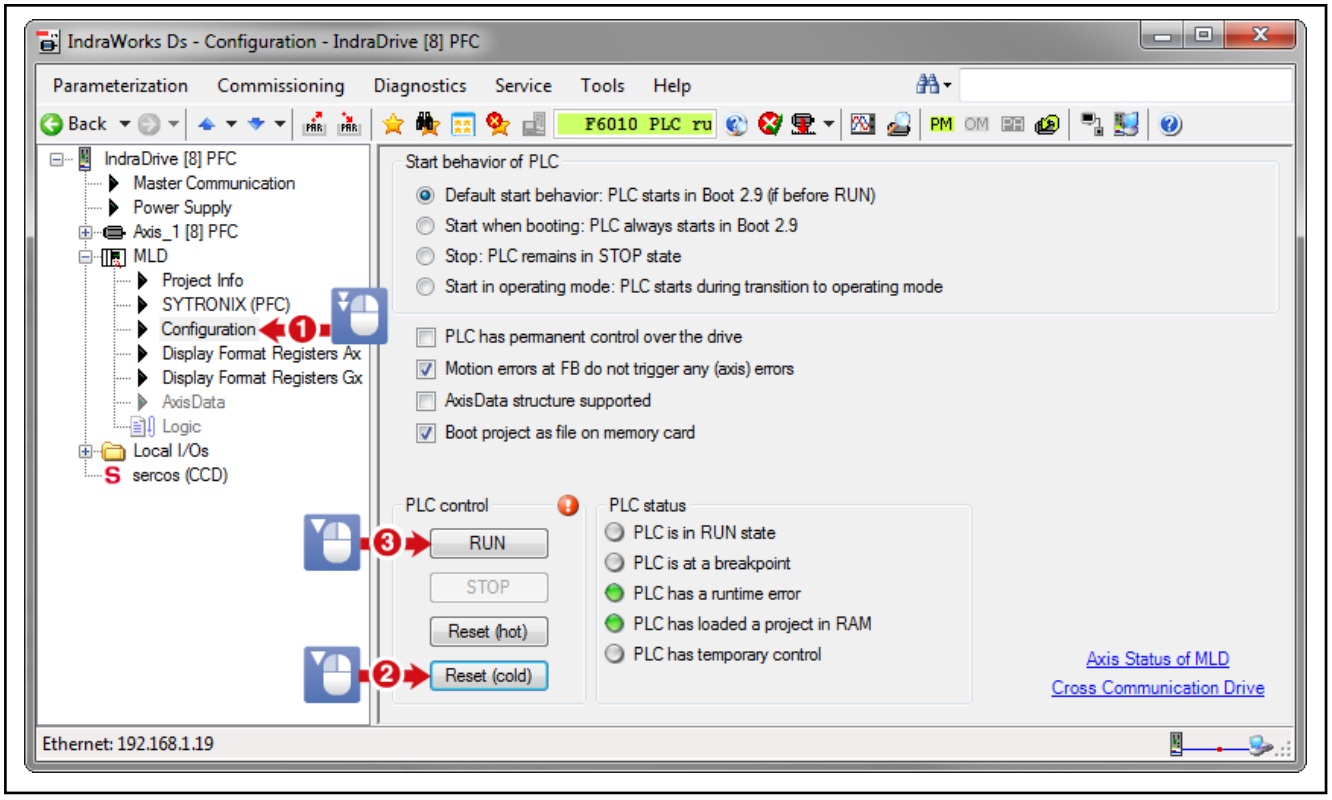


Fig. 2-7: Remedy for error F6010 when loading the program

Checking the loaded MLD program:

1. To have the active MLD program and its status displayed, click "Project info" under the MLD branch in IndraWorks.
2. Here, the loaded software/parameter file can be verified and it can be made sure that the program is running ("RUN" status).
3. When the identifier of the technology function "PFC02V..." or "PFC03V..." is displayed (cf. P-0-1381), the "SYTRONIX (PFC)" dialog appears in the project tree.

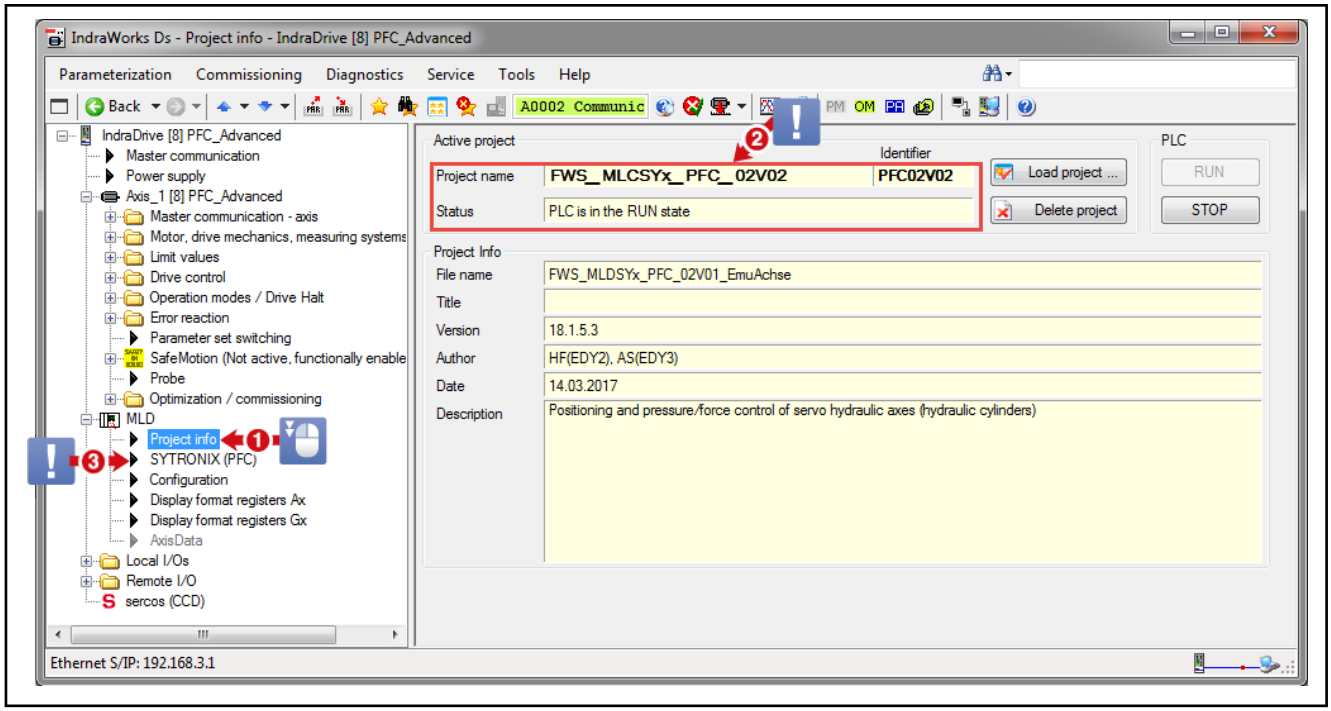


Fig. 2-8: Project info EXTENDED

When the boot application is used, the button “Load project ..." must not be selected.

PFC as boot project file comprises the full scope of functions. For the restricted scope of functions of the STANDARD derivative, PFC has to be used as parameter file or as library in a user project.

2.4 User project (*.xiwp + *.compiled-library)

A user project allows an application-related PLC code to be implemented that runs in parallel with the technology function. To be able to store the technology function and the extended application on the IndraDrive, a microSD card is required in the relevant slot of the control panel.

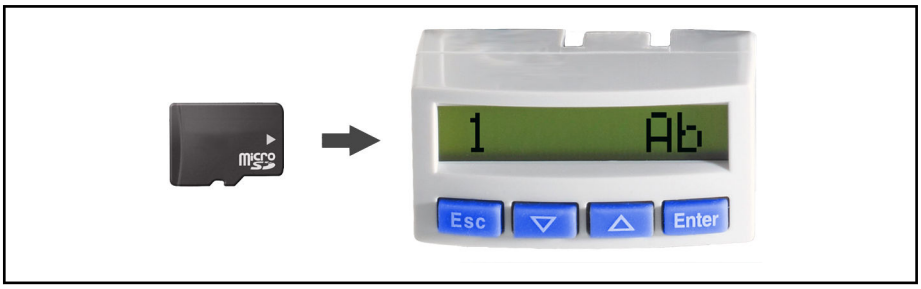


Fig. 2-9: ADVANCED control panel HAP01.1A

Using the memory card as storage location of the boot project has to be set in the MLD configuration. For activating, the device has to be restarted.

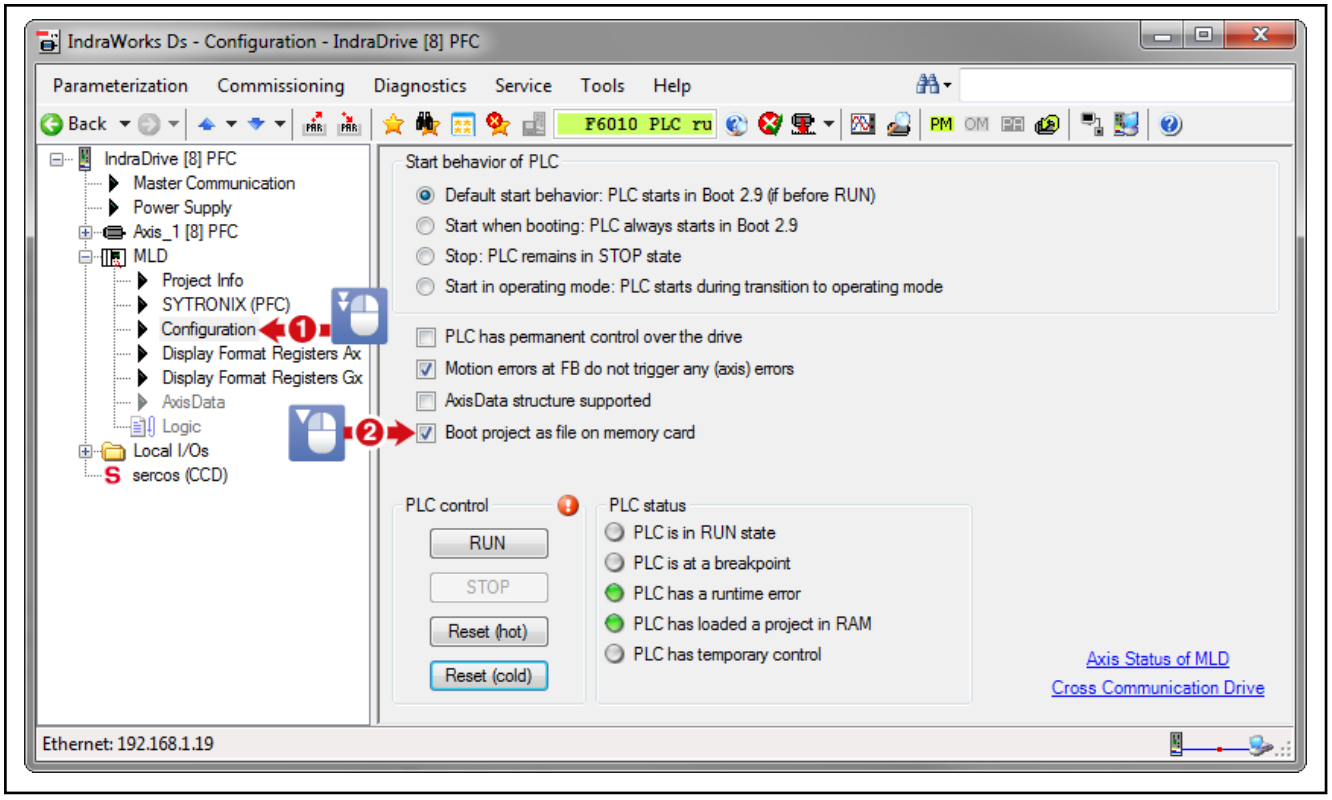


Fig. 2-10: Configuration for using the memory card as storage location of the boot project

To have a freely available interface to IndraDrive, some MLD registers as well as inputs and outputs have been reserved for application-related purposes. These registers are not overwritten by the technology function.

Free, volatile MLD registers:

- A25...A29 (P-0-1295...P-0-1299)

Free, non-volatile MLD registers:

- G25...G30 (P-0-1325...P-0-1329)

Free MLD inputs (volatile):

- %IB30...%IB38 (P-0-1405...P-0-1409)
- %IB104...%IB120 (P-0-1441...P-0-1445)

Free MLD outputs (volatile):

- %QB30...%QB38 (P-0-1425...P-0-1429)

The structure of the user program is described in the following steps. The IndraWorks MLD commissioning software (at least version 14V18) is required.

To begin with, the "Logic" branch has to be created.

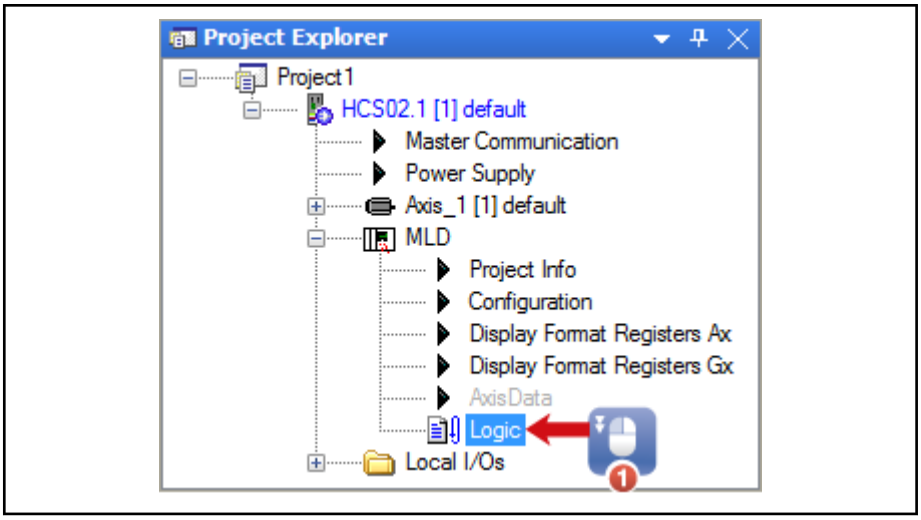


Fig. 2-11: Creating the logic branch

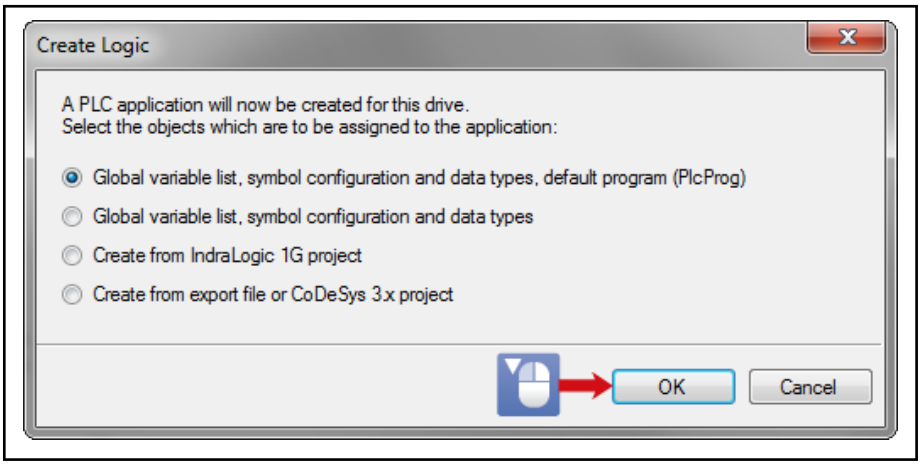


Fig. 2-12: Creating the logic

Libraries

Add the **Position Force Control** library to the library manager.

PFC	Library
FWS-MLDSYx-PFC-02V**-D0-MP20-NNNNNNNN-01	Position Force Control (20.2.x.x)
FWS-MLDSYx-PFC-03V**-D0-MP21-NNNNNNNN-01	Position Force Control (21.3.x.x)

Tab. 2-2: PFC library identifier

For this purpose, first install the required library "Position Force Control" via the library repository.

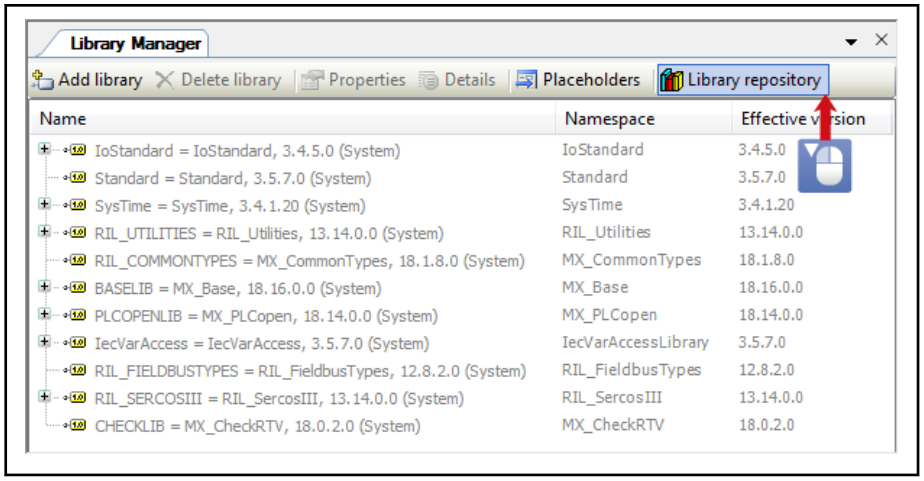


Fig. 2-13: Installing via library repository

Specify the repository path of the file "FWS-MLDSYx-PFC-**V**-D0-MP2*-**.compiled-library" in the installation dialog.

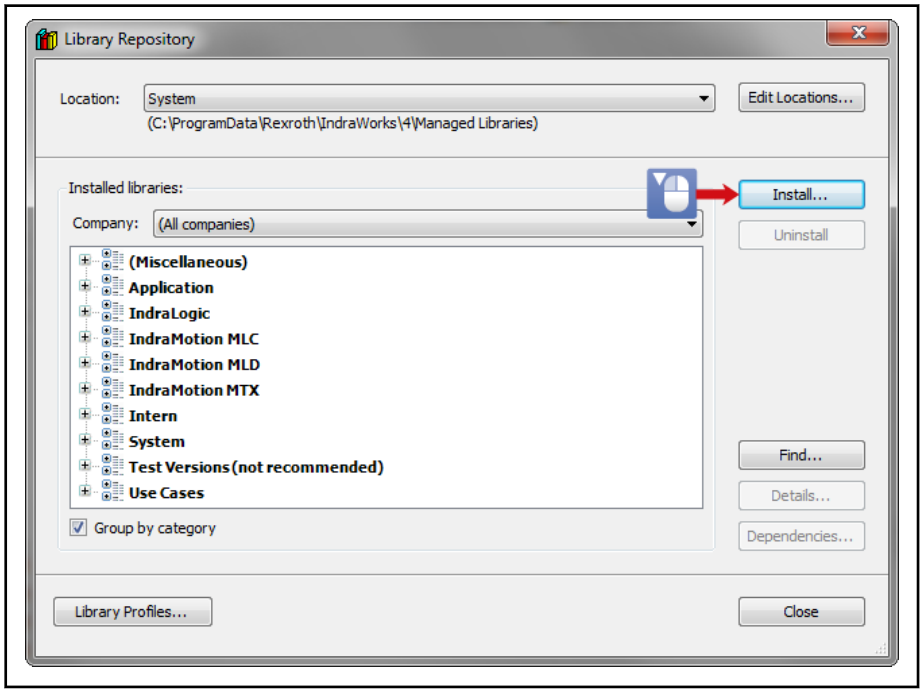


Fig. 2-14: Installing via library repository

Upon successful installation, the "Position Force Control" library is listed in the library repository.

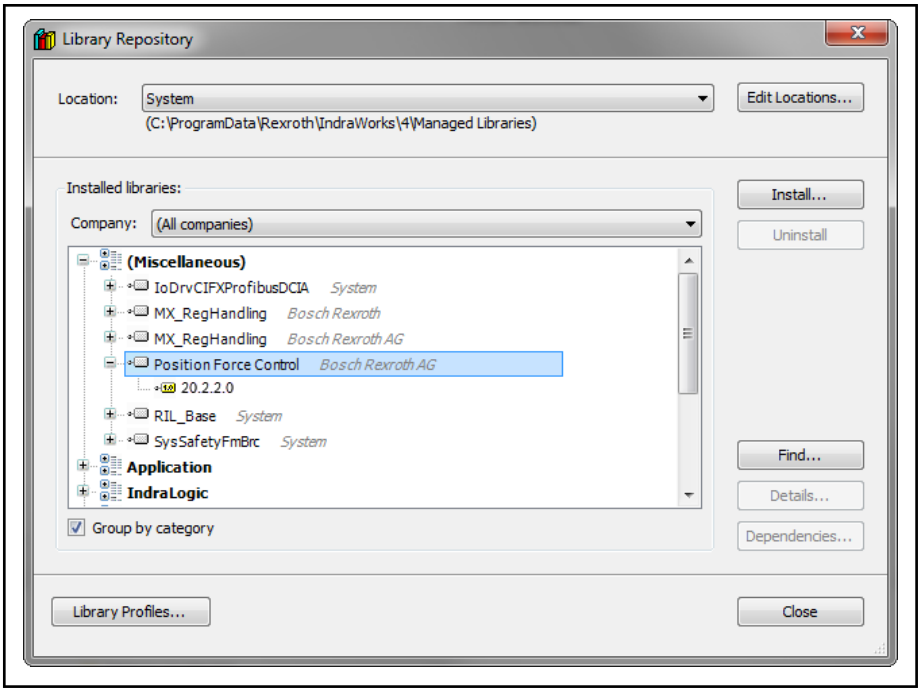


Fig. 2-15: "Position Force Control" library listed in the library repository

It is now possible to include all the additionally required libraries in the library manager.

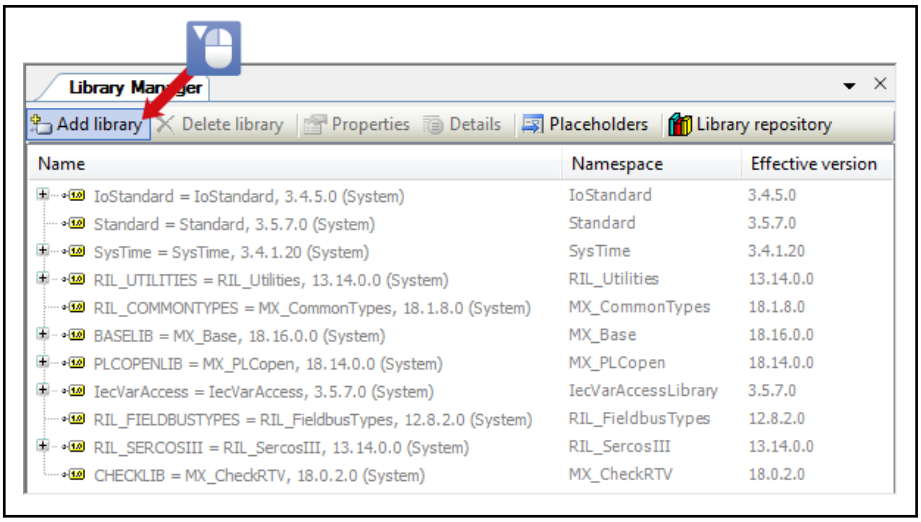


Fig. 2-16: Adding a library

Task configuration

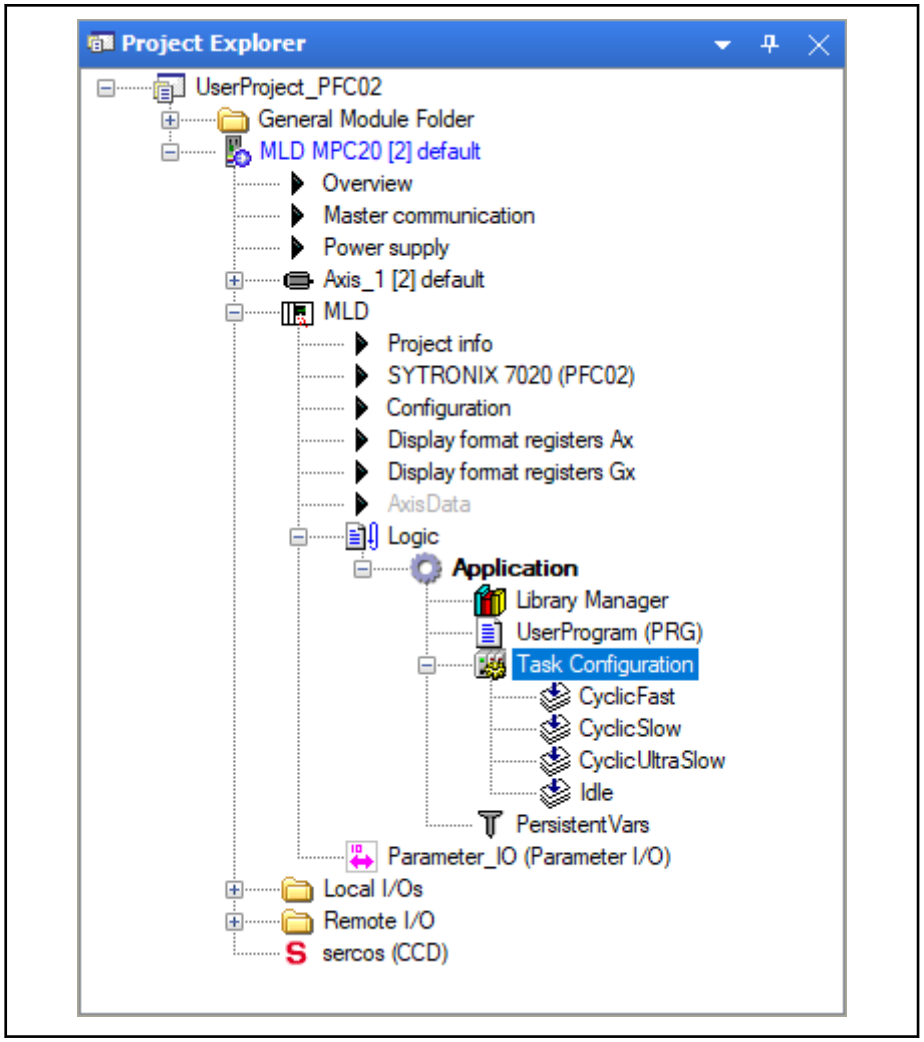


Fig. 2-17: Task configuration

The task configuration has to have the following structure for **PFC02VRS**:

Task	Priority	Type	Interval	Watchdog (sensitivity)	Appended POUs
CyclicFast	0	Cyclic	2 ms	2 ms (3)	TaskCyclicFast prgEventHandler
CyclicSlow	1	Cyclic	20 ms	20 ms (3)	TaskCyclicSlow
CyclicUltraSlow	2	Cyclic	200 ms	200 ms (3)	RegisterMapping TaskCyclicUltraSlow
Idle	3	Freewheeling	Acyclic	-	TaskIdle

Tab. 2-3: Task configuration structure for PFC02VRS

The task configuration has to have the following structure for **PFC03VRS**:

Task	Priority	Type	Interval	Watchdog (sensitivity)	Appended POUs
CyclicFast	0	Cyclic	1 ms	1 ms (3)	TaskCyclicFast prgEventHandler
CyclicSlow	1	Cyclic	20 ms	20 ms (3)	TaskCyclicSlow
CyclicUltraSlow	2	Cyclic	200 ms	200 ms (3)	RegisterMapping TaskCyclicUltraSlow
Idle	3	Freewheeling	Acyclic	-	TaskIdle

Tab. 2-4: Task configuration structure for PFC03VRS

Persistent variables

☞ The task configuration, persistent variables and the library manager can also be imported from the file “Application_4UserProject_PFC_**V**.iwx”.

☞ **PFC02VRS:** If the cycle time of the fast task (CyclicFast) is changed, this also has to be specified in "P-0-1311[177], Fast task, cycle time".

PFC03VRS

- In the case of PLC cycle time of 1 ms: Determination of the controller cycle time via "P-0-1311[177], PFC cycle time"
- In the case of PLC cycle time > 1 ms: The PLC cycle time has to be indicated in "P-0-1311[177], PFC cycle time"; this corresponds to the controller cycle time

☞ When the PFC library is compiled, all functions are made available.

Valid only for PFC02V06: If this is not desired, the scope of functions can be reduced to that of the STANDARD derivative via the compiler definition (conditional pragmas) “standard”.

3 FWS_MLDSYx_PFC_03V02_D0

3.1 Bug fixing

3.1.1 Alternating control responds with a delay of one clock cycle in the case of a jump from a negative to a positive position value

TFS-ID: 128257

Severity: K3 malfunction (no workaround)

Description: If the position command value jumps from a negative to a positive value (can be realized via an additive position command value), alternating control responds with a delay of one clock cycle, since it assumes a negative alternation in the first clock cycle after the jump and carries out alternation in the positive direction only in the second clock cycle.

Bug fixing: The direction of alternation is accepted directly in the first clock cycle.

3.1.2 MLD runtime error, when MLD is started in AF

TFS-ID: 128212

Severity: K4 malfunction (workaround exists)

Description: If the MLD is started, e.g. after a "RESET cold", while the drive is in AF, a runtime error occurs.

Bug fixing: "D5075: Init not completed, check config data" is signaled, since the drive is in AF, but PFC has not yet completed initializing.

3.1.3 With a negative input, "S-0-0553, Torque/force command value 2 ramp" results in erratic behavior

TFS-ID: 128273

Severity: K4 malfunction (workaround exists)

Description: With a negative input for the slope in "S-0-0553, Torque/force command value 2 ramp" ramping takes place in the wrong direction and jumps in the command value input may occur.

Bug fixing: Internally, "S-0-0553, Torque/force command value 2 ramp" is considered in absolute terms, i.e. the slope is calculated internally in a correct manner, positively or negatively, irrespective of the sign.

3.1.4 In the case of force control via force transducer, pressures A/B are not always read

TFS-ID: 157191

Severity: K3 malfunction (no workaround)

Description: If force control is to be used on the basis of a pressure transducer, the pressure in cylinder chambers A and B is still required, e.g. in order to clearly recognize the load situation or to perform decompression. The number of normalizations is not sufficient for the additional input. Moreover, reading of pressures A and B is switched off when pressure monitoring is deactivated. The information required for the function mentioned before is therefore not available.

Bug fixing: The cylinder chamber pressures A and B can be read via decentralized extensions, e.g. via S20 modules. The cylinder chamber pressures A and B are read independently of the force acquisition configuration.

3.1.5 When a variable displacement pump is used, the change in the direction of displacement is not updated

TFS-ID: 202856

Severity: K4 malfunction (workaround exists)

Description: If a variable displacement pump is used and the direction of displacement is inverted in PM via "P-0-1370, Axis structure configuration" bit 10, this change is not properly initialized when switching to OM takes place. Advancing is again calculated with the old direction of displacement.

Bug fixing: The change of the pump's direction of displacement is accepted directly.

3.1.6 When the directional valve is used, the effective cylinder areas are assigned to the pump ports

TFS-ID: 202861

Severity: K3 malfunction (no workaround)

Description: When the directional valve is used, the effective cylinder areas are assigned to the pump ports in order to calculate the advance rate. Since the pressure transducers are usually integrated in the cylinder and not installed on the pump side, the force is not correctly calculated in the retracting direction. Moreover, the A-side of the pump is always connected to the relevant effective area.

Bug fixing: The assignment of the effective area in the retracting direction was corrected and the chamber connected to the B-side of the pump or the to tank is now considered when calculating the force.

3.1.7 If the command value box is used, the decompression valves of the single rod cylinder are not activated

TFS-ID: 227528

Severity: K3 malfunction (no workaround)

Description: If the command value box is used, the electrical decompression valves for a single rod cylinder are not activated, since neither internal command value provision ("P-0-0115, Device control: Status word" bit 6) nor external command value provision ("P-0-0115, Device control: Status word" bit 3) is active.

Bug fixing: When the command value box is used, the decompression valves are activated without internal or external command value provision.

3.1.8 Command value box with active force controller limits actuating variable

TFS-ID: 243922

Severity: K4 malfunction (workaround exists)

Description: When the command value box is used in the position controlled operation mode with alternating force control activated, the force controller is not calculated while alternation is active, and the actuating variable is therefore limited.

Bug fixing: With internal enable the position and the force controller are fully active.

3.1.9 In the case of a switching sequence without sequence closing "-1", improper valve activation

TFS-ID: 246586

Severity: K4 malfunction (workaround exists)

Description: If all segments of the valve switching sequence OFF are utilized, the internal logic does not correctly determine the final state of the valve switching sequence. This results in the fact that the OFF state is not reached in Ab.

Bug fixing: The final state of the valve switching sequence is correctly determined. The OFF state is reached in Ab.

3.1.10 In open-loop velocity control and with command value box in position control, the command velocity is improperly determined

TFS-ID: 251330

Severity: K3 malfunction (no workaround)

Description: For the automatic modes of rapid/press mode switching, the command velocity is determined according to the current operation mode. This is carried out incorrectly in the following applications:

- In closed-loop velocity control and when using the easy startup mode, the command velocity is determined from the derivative of "P-0-0434, Position command value of controller".
- When the command value box is used, the variant of the last operation mode is used.

Bug fixing:

- In closed-loop velocity control and when using the easy startup mode, the command velocity is taken from "P-0-0563, Velocity command value input for adjustment".
- When the command value box is used, the command velocity is taken from "P-0-0171, Drive optimization, velocity".

3.1.11 Torque has not been properly scaled for field data acquisition

TFS-ID: 251827

Severity: K5 - non-critical problem

Description: When scaling of torque/force data has been changed, the process data for field data acquisition are not adapted.

Bug fixing: The scaling mechanism is taken into account.

3.1.12 Inversion of the actuating variable when a directional valve is used

TFS-ID: 257468

Severity: K2 malfunction (workaround exists)

Description: When a directional valve is used, the actuating variable is not inverted at the motor.

Bug fixing: The actuating variable is inverted via "P-0-0562, Actuator infeed/gear ratio", when reversing of the flow is activated by the directional valve.

3.1.13 After the state OFF has been cleared, it is no longer reset

TFS-ID: 263715

Severity: K3 malfunction (no workaround)

Description: In the state bb/Ab the final state of the valve switching sequence OFF is obtained. When all columns of the state OFF are cleared in bb/Ab, the state already reached is not reset. This happens because it is not the state reached that is reset, but the state currently set (in which no valves are switched).

Bug fixing: The state reached is stored and is reset when switching to AF takes place, not the current state of “OFF”.

3.1.14 Warnings B5045 and B5069 are redundant

TFS-ID: 268627

Severity: K5 - non-critical problem

Description: Warnings B5045 and B5069 have the same root cause.

Bug fixing: The warning B5096 was removed.

3.1.15 Warnings B501A and B5082 are redundant

TFS-ID: 269601

Severity: K5 - non-critical problem

Description: Warnings B501A und B5082 are redundant.

Bug fixing: The warning B5082 was removed.

3.1.16 Diagnostic messages are obsolete

TFS-ID: 269640

Severity: K5 - non-critical problem

Description: The following diagnostic messages are obsolete:

- B5018
- B57D0
- B57D1

Bug fixing: The diagnostic messages were removed.

3.2 Functional enhancements

3.2.1 Pulsation compensation for axial piston pump

TFS-ID: 74439, 199132

Severity: K6 functional enhancement

Description: A function is to be made available, which allows non-linear displacement characteristics of axial piston pumps to be compensated.

IRQA:

- REQ-00064099: Pulsation compensation for axial piston pump
- REQ-00079576: Pulsation compensation for axial piston pump, amplitude of speed feedforward can be set via register/parameter

Extension: Pulsation compensation of axial piston pumps is available. Pulsation results from the fact that the high pressure side and the low pressure side of the pump are short-circuited via the pump pistons.

IRQA: FEAT-00080416: Pulsation compensation for axial piston pump

3.2.2 Support of a free assignment of functional software inputs and outputs to local and decentralized hardware inputs and outputs

TFS-ID: 80021

Severity: K6 functional enhancement

Description: It should be possible to configure the assignment between the inputs and outputs to functions independently of the physical source.

IRQA: REQ-00079206: Support of a free assignment of IO to local and decentralized IO

Extension: For analog input variables a signal selection is made available. Apart from external provision (assignment of analog inputs in firmware, value via master communication, etc.), analog inputs 1 - 5 as well as a PLC variable associated to the signal can be read. If the analog signal value is not required in terms of function but merely monitored, digital signals from temperature or pressure switches may also be read in order to generate associated warnings and errors.

To allow a bit access to digital output signals, these are no longer created as WORD, but as UNION of type WORD_BIT_ACCESS. This UNION contains an element "w" for access as WORD and an element "b" for accessing individual bits.

IRQA:

- FEAT-00080198: Selection of signal source of input variables
- FEAT-00080322: Digital output variables

3.2.3 Monitoring of system pressure

TFS-ID: 85609, 199128

Severity: K6 functional enhancement

Description: A monitoring function for system pressure is to be provided at two levels for high and low values.

IRQA:

- REQ-00075143: Low pressure monitoring
- REQ-00079406: Reading and evaluating a low pressure signal

Extension: The system pressure (also often referred to as low pressure) can be monitored for too high and too low values. Monitoring for too low values is only active in the state AF. The monitoring functions for too high and too low values can be activated/deactivated separately. Moreover, you can select between monitoring of the analog system pressure "P-0-0813, System pressure" and the evaluation of digital signals from pressure switches. The function generates a warning or an error when the system pressure exceeds or falls below the warning/error thresholds for the duration of a monitoring interval.

IRQA: FEAT-00077684: System pressure monitoring

3.2.4 Control clock cycle 1 ms

TFS-ID: 94447

Severity: K6 functional enhancement

Description: A higher control clock cycle is to be made available in order to be able to dampen axes up to approx. 20 Hz.

IRQA: REQ-00079208: Control clock cycle <= 1 ms

Extension: A cycle time von 1 ms is supported. In the boot project, the fast task is always called with 1 ms. The control clock cycle to be used can be set in parameter P-0-1311[177].

IRQA: FEAT-00080903: Realization of different cycle times

Restriction:

With control clock cycle settings < 2 ms, operation with the function of field data acquisition is not permitted for runtime reasons.

3.2.5 Continuous control of a variable pump with adjustable swivel angle

TFS-ID: 199119, 199122

Severity: K6 functional enhancement

Description: Continuous control of a variable displacement pump with swivel angle adjustment is to be made available

IRQA:

- REQ-00071832: Swivel angle control
- REQ-00079403: Reading the swivel angle feedback value (analog)

Extension: A load-dependent command value generator for a swivel angle command value as well as a controller for a pump with swivel angle adjustment are provided.

IRQA: FEAT-00080205: Swivel angle adjustment

3.2.6 Reading and monitoring chamber pressure A, B, C

TFS-ID: 128159

Severity: K6 functional enhancement

Description: In conjunction with multiple-area cylinders, it should be possible to read chamber pressures A, B, and C. For the extension by chamber pressure C, monitoring for high pressures is to be provided.

IRQA: REQ-00079407: Reading the pressures in chambers A1, A2, and A3.

Extension: Monitoring of "P-0-1282, Pressure feedback value C" for excessively high values is provided. Monitoring can be activated/deactivated. The functions generate a warning or an error, respectively, when the pressure feedback value C exceeds the warning/error threshold for the duration of a monitoring interval.

The effective process variable is always displayed in "P-0-1271, Effective pressure/force command value". The process force can be specified as either force or pressure ("P-0-1370, Axis structure configuration" bit 15). Various analog sensor data are available for this purpose: "S-0-0803, Pressure feedback value A", "S-0-0804, Pressure feedback value B", "P-0-1282, Pressure feedback value C", "P-0-2937.0.3, Input of force feedback value".

IRQA:

- FEAT-00080097: Overpressure monitoring of pressure feedback value C
- FEAT-00080110: Force calculation

3.2.7 Monitoring of oil temperature switch

TFS-ID: 128171

Severity: K6 functional enhancement

Description: A monitoring function for high and low values of the oil temperature is to be provided on the basis of digital signals.

IRQA: REQ-00079404: Reading and evaluating the temperature switch

Extension: The oil temperature can be monitored for too high or too low values. Monitoring for too low values is only active in the state AF. The monitoring functions for too high and too low values can be activated/deactivated separately. Moreover, you can select between monitoring of the analog value of "P-0-1284, Oil temperature" and the evaluation of digital signals from temperature switches. The function generates a warning or an error when the oil temperature exceeds or falls below the warning/error thresholds for the duration of a monitoring interval.

IRQA: FEAT-00080115: Temperature monitoring

3.2.8 Operating state via RGB LED

TFS-ID: 149193

Severity: K6 functional enhancement

Description: It should be possible to activate an RGB LED indicator lamp via three separate digital outputs (red, green, blue) in dependence on the operating/system state.

IRQA: REQ-00076801: Activation of LED

Extension: The function for activating an RGB LED indicator lamp via "P-0-1412, Activation of special functions" bit 0..2 (red, green, blue) in dependence on the operating/system state is made available.

IRQA: FEAT-00080114: Activation of LED

3.2.9 Monitoring of pilot oil pressure

TFS-ID: 199131

Severity: K6 functional enhancement

Description: A monitoring function for pilot oil pressure is to be provided at two levels for high and low values.

IRQA: REQ-00079405: Reading and evaluating the high pressure level

Extension: The pilot oil pressure (also often referred to as high pressure) can be monitored for too high and too low values. Monitoring for too low values is only active in the state AF. The monitoring functions for too high and too low values can be activated/deactivated separately. Moreover, you can select between monitoring of the analog "P-0-1288, Pilot oil pressure" and the evaluation of digital signals from pressure switches. The function generates a warning or an error when the pilot oil pressure exceeds or falls below the warning/error thresholds for the duration of a monitoring interval.

IRQA: FEAT-00079903: Pilot oil pressure monitoring

3.2.10 Operating mode of the external x/F control

TFS-ID: 199134

Severity: K6 functional enhancement

Description: The PFC software is to provide merely the protective and monitoring functions as well as the calculation of the compensation of "P-0-0562, Active geed/gear factor". It should be possible to set "velocity control" as operation mode so that the "S-0-0036, Velocity command value" becomes active via master communication in the clock cycle of master communication. This is to enable the realization of an independent x/F control via a higher-level control.

IRQA: REQ-00079196: Providing merely protective, monitoring and block logic functions, x/F control external, S-0-0036/S-0-0037 active in the master communication clock cycle.

Extension: When the position/force controller of PFC is used, the position control loop of the IndraDrive firmware has to be opened via "P-0-0556, Config word of axis controller" bit 8 = 1. PFC then supports all position and velocity operation modes. Position operation modes as alternating position/force control and velocity operation modes as open-loop velocity control. For the use of external controllers it is possible to close the position control loop of the IndraDrive firmware via "P-0-0556, Config word of axis controller" bit 8 = 0 in velocity operation modes. As a result the velocity command value is adopted in the position controller clock cycle of the firmware (e.g. 500 ms) and not in the controller clock cycle of PFC (e.g. 2 ms). However, to this end the control loop in

PFC has to be opened via "P-0-1370, Axis structure configuration" bit 31 = 1. It is also possible to open both control loops and to feed forward an external actuating variable, e.g. via "P-0-0690, Additive velocity command value, process loop".

IRQA: FEAT-00079797: Open PFC position/force control loop

3.2.11 Displaying symbol variables via PLC patch function

TFS-ID: 240983

Severity: K6 functional enhancement

Description: A function is to be made available, with which symbol variables can be transmitted directly to the PLC patch function so that detailed analyses become possible using the drive-internal oscilloscope.

IRQA: REQ-00080774: Displaying internal variables via the PLC patch function

Extension: To be able to display the content of symbol variables from PFC in parameters and record it via the oscilloscope in IndraWorks Ds, the symbol-based patch functions 1 - 4 are used. The symbol variables can be selected via the parameters P-0-1311[380] - P-0-1311[383]. The instance path of the individual symbol variables is entered in the associated data source parameters and then the value of the variable is shown in the display parameter.

IRQA: FEAT-00080819: Displaying internal variables via the PLC patch function

3.3 Changes in functions

3.3.1 Parameter interface

TFS-ID: 255820

Severity: K8 product modification

Description: For SYTRONIC PFC, enabled parameters of HDx are used. Moreover, redundant parameters (HDx and PLC parameters) are reduced to the use of HDx parameters.

PFC02VRS	PFC03VRS	Function
P-0-1270	P-0-2842	Force control deviation
P-0-1272	P-0-2846.0.2	Correction value: force controller integrator
P-0-1273	P-0-2843	Output of force controller
P-0-1278	P-0-2831.0.3	Output position controller I-part
P-0-1279	P-0-2831.0.4	Output of position controller
P-0-1382 P-0-2853	P-0-2853	Alternating control, control word 1
P-0-1274 P-0-2855	P-0-2855	Alternating control, status word

PFC02VRS	PFC03VRS	Function
P-0-1286	P-0-1382	Locking of safety configuration
P-0-1370 bit 18..16	P-0-2937.0.1	Force acquisition control word

Tab. 3-1: Change of parameter interface

Extension:

- S-0-0813, System pressure
- S-0-0865, Positive spool limit value
- S-0-0866, Negative spool limit value
- S-0-0880, Swivel angle command value
- P-0-2831.0.1, Output position controller Kv-part
- P-0-2831.0.5, Correction value: velocity feedforward control
- P-0-2846.0.1, Output force controller P-part
- P-0-2914, Effective valve command value

4 FWS-MLDSYx-PFC-02V08-D0-MP20-NNNNNNNN-01

4.1 Bug fixing

4.1.1 Controlling of a single-rod cylinder is not robust

TFS-ID: 99148

Severity: K3 malfunction (no workaround)

Description: Pressure-related feed switching does not work, since the pressure differential measured is very small. If a small pressure differential is selected, incorrect switching of the feed often takes place as a result of noise and the small pressure differential during extending. If too large a value is selected for the pressure differential, the feed is not switched over.

Bug fixing: The feed is determined on the basis of the scaled pressure differential and the effective direction of flow. Moreover, apart from the use of hydraulically pilot operated check valves as decompression valves, electrical activation of decompression valves is provided.

4.1.2 No controller output when the command value box is used

TFS-ID: 111824

Severity: K2 malfunction (workaround exists)

Description: When the command value box is used in a position-controlled operation mode under PFC, the axis cannot be operated in closed-loop control. The motor/pump group comes to a standstill with torque at a speed of 0 rev/min.

Bug fixing: Closed-loop controlling is performed with internal and external enable of the axis (AF). This also holds true for commanding from the command value box.

4.1.3 Incorrect parameter name of P-0-1271 in English language, which leads to misinterpretation

TFS-ID: 112846

Severity: K3 malfunction (no workaround)

Description: The name of parameter P-0-1271 displayed in English language is "effective pressure/force feedback value" although it refers to the command value.

Bug fixing: The name of P-0-1271 was changed to "effective pressure/force command value".

4.1.4 Some diagnostic texts for the diagnostic trace are not displayed

TFS-ID: 114863

Severity: K3 malfunction (no workaround)

Description: For events newly added in PFC02V06 the diagnostic trace of PFC02V06 does not show error texts as supplementary information to the event number.

Bug fixing: The error texts are displayed as supplementary information as of IndraWorks 15VRS.

4.1.5 Issuing an error takes 100 ms until it becomes active in the firmware

TFS-ID: 128292

Severity: K3 malfunction (no workaround)

Description: Errors are signaled to the drive firmware only 100 ms after the cause of error occurred to ensure that the diagnostic messages that are displayed are correctly updated.

Bug fixing: The delay time of 100 ms is now only active after an error acknowledgement. The delay time is not active with drive enable (AF). If the drive enable is set within 100 ms following an error message and an error is directly present, incorrect diagnostic messages are possible.

4.1.6 No initialization of hydraulic functions after PLC download/reset in OM

TFS-ID: 159176

Severity: K4 malfunction (workaround exists)

Description: If the hydraulic function is activated by default (= 0) via the control word (P-0-1283) and if a PLC download or PLC reset is carried out in OM, the hydraulic function is not initialized. The reason for this is that the initial value of the internal status variable is 0, and hence no change is recognized.

Bug fixing: After starting of the PLC the hydraulic function OFF (no. 13) is started first and then the function selected via the control word is activated.

4.1.7 Events of stop1 category without corresponding handling

TFS-ID: 169440

Severity: K5 - non-critical problem

Description: Events D404E, D4051, D4055, D4057, D4059, D406A, D406B, and D4084 are of category stop1 (D4) without corresponding stop1 handling.

Bug fixing: The events listed in the description are changed to category stop0 (D5). This results in the following new event numbers:

D504E, D5051, D5055, D5057, D5059, D506A, D506B, and D5084

4.1.8 Function valves closed without internal or external commanding during AF

TFS-ID: 179957

Severity: K2 - serious malfunction (danger to mechanical system)

Description: If a rotary movement of the motor/pump group is performed without internal or external commanding, the function valves are closed. This may happen, for example, during an emergency stop. As a result, high pressures can occur between the displacer and the relevant, non-activated valve.

Bug fixing: Function valves are activated depending on the holding brake status word (P-0-0539 bit 0). Depending on whether the holding brake is configured as self-locking or self-releasing brake, the signal level is inverted accordingly in P-0-0539 bit 0.

Note:

The function of the holding brake must always be activated. Otherwise, the function valves are not operated. To ensure this, the correct activation (P-0-0525 bit 2 = TRUE) is monitored and, if required, signaled by an event.

4.2 Functional enhancements

4.2.1 Differentiated warning in the case of emergency stop and oil filter monitoring response

TFS-ID: 138059

Severity: K6 functional enhancement

Description: In the event of an emergency stop, filter monitoring may erroneously respond due to pressure peaks that can occur within the system.

IRQA: REQ-00076507: Adaptation of oil filter monitoring

Extension: In the case of an emergency stop, filter clogging is no longer signaled. If 100 % filter clogging is detected within the framework of an emergency stop, event B5091 is reported. It indicates that filter clogging was signaled by mistake and that the visual indicator on the filter may be reset.

IRQA: FEAT-00077858: Filter monitoring

4.2.2 Velocity command value interface

TFS-ID: 138066

Severity: K6 functional enhancement

Description: A velocity command value interface with additive effect is to be made available, which is to become effective before alternating control.

IRQA: REQ-00077335: Closed-loop control

Extension: An additive velocity command value is provided as cyclically writable interface:

- P-0-1287, Additive velocity command value, unit velocity (S-0-0044/ S-0-0045/S-0-0046)

IRQA: FEAT-00077338: Position controller

4.2.3 Electrical control for decompression valves with single rod cylinder

TFS-ID: 142046

Severity: K6 functional enhancement

Description: Electrical controlling of decompression valves in dependence on load and direction is to be provided in conjunction with a single rod cylinder.

IRQA: REQ-00077431: Electrical activation of decompression valves in conjunction with single rod cylinders

Extension: Electrically controllable decompression valves on the piston side (cylinder A-side) and annular side (cylinder B-side) of a single rod cylinder are activated in dependence on the load and the direction of flow.

IRQA: FEAT-00077454: Electrical activation of decompression valves in conjunction with single rod cylinder

4.2.4 Extending the support of hydraulic systems - valve switching logic for "multi-axis" applications

TFS-ID: 142053

Severity: K6 functional enhancement

Description: The block logic is to be extended from a maximum of four effective areas of a cylinder to up to eight effective areas.

IRQA: REQ-00077339: Supported of hydraulic systems

Extension: In the hydraulic circuits of the block logic, up to eight effective areas may be used.

IRQA: FEAT-00077895: IL_BlockLogicType02: Feed and valve position

4.2.5 Monitoring of summated pressure

TFS-ID: 159133

Severity: K6 functional enhancement

Description: Monitoring of the summated pressure of the pump on side A and side B is to be provided. In case the summated pressure is exceeded, a corresponding reaction is to be triggered.

IRQA: REQ-00078186: Monitoring of summated pressure

Extension: Monitoring of the summated pressure is provided to protect the displacer. The function generates a warning or an error when the sum of the chamber pressures of pressure feedback value A (S-0-0803) and pressure feedback value B (S-0-0804) exceeds a threshold value for the duration of a monitoring interval.

Note: Since the pressures are mostly measured at the cylinder and not at the pump, this message may also be generated when, for example, a chamber is isolated by enable or safety valves.

IRQA: FEAT-00078207: Monitoring of summated pressure

5 FWS_MLDSYx_PFC_02V06_D0

5.1 Bug fixing

5.1.1 Malconfiguration in PM is not corrected when switching to OM and results in inconsistency

T&R-ID: MLDSYX-215

Severity: K4 malfunction (workaround exists)

Description: With a certain order of reconfiguration and phase switching between PM and OM the setting of parameters and dialogs did not correspond to the setting/ configuration internally active.

Bug fixing: The bug was fixed with the programming of "MLDSYX-103 Do not issue errors/warnings in PM!".

5.1.2 Jog mode in positioning block mode

T&R-ID: MLDSYX-247

Severity: K4 malfunction (workaround exists)

Description: While jogging in the positioning block mode, instead of the positioning velocity, the velocity of the positioning block mode processed last was used for the logic of the automatic rapid mode/press mode mechanism. As a result, the rapid mode might have been activated although the press mode would have been correct.

Bug fixing: For the selection of the command velocity the jog mode for drive-controlled positioning and positioning block mode was added. Furthermore, a minimum value comparator was added for the positioning block mode with limitation to the positioning velocity.

5.1.3 Force control outside traversing range limits

T&R-ID: MLDSYX-248

Severity: K4 malfunction (workaround exists)

Description: As soon as a traversing range limit is exceeded in force control, an error reaction is triggered. After the error was cleared and the controller enable was granted again, the system switches immediately to force control and the axis continues to move in the prohibited direction to the limit switch or mechanical limit stop without any further error reaction. The firmware mechanisms which allow movements to be performed only in the permitted direction are not effective in force control.

Bug fixing: Inclusion of evaluation of the travel range limit switches (S-0-0478) while monitoring is active and deactivation of force control added as soon as a traversing range limit is reached. Consequently, the known mechanisms of the IndraDrive firmware for monitoring in position control are available.

Effect: If a non-useful force command value was provided and the error was acknowledged in position control, the axis can only be moved out of the limit range. However, when it reaches the permitted operating range it will again switch to force control and again move into the limit range, where it will come to a standstill with an error reaction.

5.1.4 Consideration of force data in kN and MN

T&R-ID: MLDSYX-250

Severity: K4 malfunction (workaround exists)

Description: The unit of force data can be scaled in kilonewton or meganewton via the exponent (>"0"). This was not taken into account in PFC.

Bug fixing: Decimal prefixes (k, M) for force data are considered. Exponents of pressure and flow data are considered as well.

5.1.5 Scaling factors are not taken into account

T&R-ID: MLDSYX-251

Severity: K4 malfunction (workaround exists)

Description: With the help of parameters

- S-0-0077 (position)
- S-0-0045 (velocity)
- S-0-0045 (velocity)
- S-0-0161 (acceleration)
- S-0-0093 (torque/force)
- S-0-0846 (flow)
- S-0-0807 (pressure)

the scaling of the individual parameter values can be adjusted (value of LSBs). This was, however, not taken into account by PFC so that incorrect values were written, e.g. in the controller output (P-0-0690), if the relevant scaling factor (S-0-0045) was unequal to "1".

Bug fixing: Changes in the scaling factors (unequal to "1") are prevented by means of an error message and thus ruled out as source of error.

5.1.6 Pressure scaling is not taken into account

T&R-ID: MLDSYX-257

Severity: K4 malfunction (workaround exists)

Description: When certain machine data were read or written, the scaling setting of pressure data (e.g. "psi") was not considered and the unit "bar" was always assumed instead.

Bug fixing: Scaling queries for machine data were extended by pressure scaling: The unit "psi" is supported.

5.1.7 Controller limitation warnings active for controller, which is not active

T&R-ID: MLDSYX-263

Severity: K3 malfunction (no workaround)

Description: In alternating control warnings were generated in conjunction with the limitation of controller outputs of the position and force controller (B403F, B4034, ...), although the relevant controller might not have been active at this point in time.

Warning "position controller in limitation", although force control was active at that moment.

Bug fixing: Query integrated on the current activity so that warnings can only be generated in states, in which this makes sense.

5.1.8 S-0-0123 is reset after reboot

T&R-ID: MLDSYX-264

Severity: K4 malfunction (workaround exists)

Description: Following a restart of the IndraDrive the feed constant (S-0-0123) might have taken a value, which was not provided for it. The value was only corrected after phase switching OM → PM.

The value was not written to a buffer and was therefore reset after the restart.

Bug fixing: The parameter is written to a buffer when a deviation from the provided value occurs.

5.1.9 Delay when switching from position → force control, if feed is ramped

T&R-ID: MLDSYX-265

Severity: K3 malfunction (no workaround)

Description: If during the transition from position to force control the feed rate is to be ramped (rapid/press mode switching), the changeover to force control is delayed (ca. 20 ms). After switching to force control the feed factor to be ramped jumps to its target value and the ramp is aborted.

Bug fixing: Change of internal structure and streamlining of the ramp behavior.

5.1.10 Areas for calculating the actual force is incorrect for single rod cylinders with area switching

T&R-ID: MLDSYX-266

Severity: K3 malfunction (no workaround)

Description: When "single rod cylinders with area switching" and "feed switching with delay and/or ramp" are configured, incorrect values are assumed for the areas for calculating the actual force from pressures. As a result, the system gain is incorrect and alternating control may not work under certain circumstances.

Bug fixing: Change of internal structure, correction of determination of areas and ramp behavior.

5.1.11 Inversion of actual force value is rejected after reboot or reset

T&R-ID: MLDSYX-269

Severity: K4 malfunction (workaround exists)

Description: After the control section was restarted or the MLD was reset, the configuration for inverting the actual force value was rejected; bit 2 in P-0-2937.0.1 was always "0". Problem lay in the comparison of the 2 configuration parameters (P-0-1370 and P-0-2937.0.1) and mutual updating.

Bug fixing: Comparison and updating corrected.

5.1.12 Inversion of force scaling results in axis running away

TFS-ID: 95632

Severity: K2 - serious malfunction (danger to mechanical system)

Description: As torque/force scaling is inverted (S-0-0085 bit 0 = "1") the internal actual force value is also inverted in the standard axis reference. This results in positive feedback in the force controller and the axis runs away.

Bug fixing: Incorrect change of sign corrected.

5.1.13 Wrong unit for P-0-1272 "Integral term of pressure/force controller"

TFS-ID: 98574

Severity: K4 malfunction (workaround exists)

Description: Parameter P-0-1272 "Integral term of pressure/force controller" indicates the unit N. However, being an output of the force controller, the value is a velocity

and has to be displayed with the corresponding velocity unit and decimal places.

Bug fixing: Unit corrected to velocity scaling.

5.1.14 Abs. switching threshold x->F can be set to max. 214 kN

TFS-ID: 98110

Severity: K4 malfunction (workaround exists)

Description: Due to the use of register parameters with 4 decimal places in the case of 4-byte parameters with sign, the absolute switching threshold for alternating control is limited to ca. 214 kN. Entering “N” with 4 decimal places does not make sense and, at this point, wastes resources for the input of greater values. The application of SHA for ZF reaches up to 800 kN.

Bug fixing: Unit changed to scaling setting of torque/force data. Thus, it is possible to switch to "kN" or "MN" so that the value range is sufficient.

5.2 Functional enhancements

5.2.1 Integrating parameters for controller outputs of the position controller and the force controller

T&R-ID: MLDSYX-37

Severity: K6 functional enhancement

Description: For the controller outputs of position controller and force controller no display parameters were provided, which would be very helpful and extremely useful for commissioning.

Extension: Display parameters with a refresh time of 20 ms introduced:

- P-0-1273, Force controller output, unit velocity (S-0-0044/S-0-0045/ S-0-0046)
- P-0-1279, Position controller output, unit velocity (S-0-0044/S-0-0045/ S-0-0046)

5.2.2 Defined feed factors from block logic for standby and user-defined operation modes

T&R-ID: MLDSYX-134

Severity: K6 functional enhancement

Description: The feed factors were issued in dependence on the active function (rapid mode and press mode). If, however, another function is active, the feed factor last valid continues to be output without being assigned to a function. For this reason, the loop gain may be incorrect. Defined, effective feed factors should be output.

Extension: Change of the internal structure and calculation of effective areas/feed factors via internal mapping of the valve circuit and connections of the cylinder chambers.

5.2.3 Safety valves monitoring

T&R-ID: MLDSYX-236

Severity: K6 functional enhancement

Description: In most of the enquiries regarding SHA the safety function of safe standstill is demanded. For this purpose, an STO and additionally position control of the safety valves is required for blocking the A2 chamber by means of SBC. To

comply with the requirement from the standard, monitoring of the feedback contacts is required. PFC is to support this function. So far this has been implemented in the application, see REQ-00067503.

Extension: IRQA: FEAT-00073923, Monitoring of restraint valves A2.x

5.2.4 Displaying/resetting maximum value following error model

T&R-ID: MLDSYX-211

Severity: K6 functional enhancement

Description: To simplify setting of following error monitoring, the maximum following error since the last reset should be displayed.

Extension: Display parameter introduced:

- P-0-1285, Max. model deviation, unit position (S-0-0076/S-0-0077/ S-0-0078)

Can be reset by entering "0".

5.2.5 Decompression in closed-loop control

T&R-ID: MLDSYX-239

Severity: K6 functional enhancement

Description: The decompression function is required to feed the compression volume from the force build-up phase back to the accumulator. If this is not executed, the pressure in the chambers increasingly goes up and components could suffer damage, and the performance of the axis not be utilized to its full extent, since a pressure differential across the cylinder chambers, which may be required, cannot be built up. The decompression of chamber A1 is handled by/via the pump, which displaces fluid from chamber A1 to path A2/A3, from where it is fed via the decompression valve to the accumulator.

Extension: IRQA: FEAT-00073314, Decompression in closed-loop control

5.3 Changes in functions

5.3.1 Issuing no errors/warnings in PM

T&R-ID: MLDSYX-103

Severity: K8 product modification

Description: No errors or warnings may be issued while the drive is in PM. In PM warnings have to be withdrawn.

In the case of malconfiguration of the IndraDrive, which prevents switching to OM, the command error might be masked by a diagnostic MLD message. The drive cannot be stepped up. Usually, the user can recognize the cause by the command error (C02... + S-0-0423), but this may be masked by "F2016, D4055: system pressure falls below lower alarm level”, for example.

Extension: Is staved off in error handling.

5.3.2 Restructuring of block logic

T&R-ID: MLDSYX-186

Severity: K8 product modification

Description: At present, the internal block logic is a monolithic block, which is difficult to develop further and which does not allow a clear separation between various hydraulic concepts. Restructuring is therefore required, which provides a division into individual functionalities and thus makes PFC flexibly adjustable.

Extension: IRQA: FEAT-00071169, Block logic - feed and valve position

☞ Downward compatibility is provided with one single exception: Due to the correction in determining the loop gain in the force controller, the controller output of the force controller will be smaller as long as no filling of the passive chamber is recognized. This may result in a change in dynamics in the force controller and thus in the time when switching to force control takes place. See "System gain for force control with one-sided refilling" (MLDSYX-204)

5.3.3 System gain for force control with one-sided filling

T&R-ID: MLDSYX-204

Severity: K8 product modification

Description: To determine the loop gain in force control, merely one chamber used to be considered in calculations in the past. However, as long as oil can be recovered from the passive chamber, that is, it is not at low pressure level, both chambers are active in building up force. Thus, in real terms, the system gain is higher than the value considered in the loop gain. A detection feature for filling of the chambers is therefore to be implemented, on the basis of which the loop gain can be correctly calculated.

Extension: IRQA: FEAT-00072487, calculation of feed constant in the modular block logic

6 FWS_MLDSYx_PFC_02V05_D0

6.1 Bug fixing

6.1.1 F6010 PLC runtime error in the case of timer overflow

T&R-ID: MLDSYX-253

Severity: K3 malfunction (no workaround)

Description: About fifty days after the last IndraDrive booting process (switching on) a timer overflows in the diagnostic handling. If an event is present during the overflow (cf. P-0-1300 or P-0-1387), an invalid pointer access occurs and the internal PLC generates a runtime error.

Bug fixing: Data type modified to 64 bits so that overflow only occurs after more than 500,000 years.

7 FWS_MLDSYx_PFC_02V04_D0

7.1 Resolved defects

7.1.1 Automatic swivel angle adjustment to be corrected

T&R-ID: MLDSYX-93

Severity: K4 malfunction (workaround exists)

Description: For controlling binary swivel angle adjustment (swiveling in - swiveling out), the actual velocity was not taken into account in the logic. As a workaround the complete logic can be implemented in the application.

Bug fixing: Actual velocity with adaptation factor (P-0-1311[135]) and debounce time (P-0-1311[127]) are taken into account.

7.1.2 Gear factors incorrectly taken into account for electromechanics

T&R-ID: MLDSYX-155

Severity: K4 malfunction (workaround exists)

Description: The gear settings are incorrectly taken into account for the conversion of position and velocity data between actuator reference and standard axis reference. Thus, velocity limit values sometimes are incorrectly converted which causes the controller outputs to be limited too early.

Is only relevant to electromechanics with a simple actuator. As a workaround the gear can be taken into account for calculating the feed constant.

Bug fixing: Adapted generation of the conversion factors.

7.1.3 Error when reading nonexistent parameters

T&R-ID: MLDSYX-160

Severity: K3 malfunction (no workaround)

Description: If nonexistent parameters are read for internal calculations (e.g., because functional package SYX is not active), division by zero can occur.

Bug fixing: Division by zero is prevented.

7.1.4 Incorrect acceleration feedforward unit

T&R-ID: MLDSYX-192

Severity: K4 malfunction (workaround exists)

Description: The unit for time values always ought to be milliseconds [ms]. The unit of P-0-1384, Acceleration feedforward is displayed correctly in milliseconds [ms]. However, the parameter is read in the “seconds” unit and internally takes effect in the wrong way.

Bug fixing: Corrected conversion factor.

7.1.5 Controller limitation not converted online in the case of feed switching

T&R-ID: MLDSYX-197

Severity: K3 malfunction (no workaround)

Description: To limit the (position and force) controllers, the rotary limit values S-0-0113 and P-0-0113, amongst others, are used and converted into linear values for the internal limitation. P-0-0562 is used for this purpose. The problem is that P-0-0562 is only read in as a machine datum here. Thus, the converted values in the case of feed switching (rapid mode/press mode) are wrong initially until the machine data are read in. Therefore, the controller output at first is

limited to the wrong value. If feedforward is used, this usually is not a problem, because feedforward is not affected by limitation and the controller in this case does not need to adjust so much.

Bug fixing: P-0-0562 is no longer handled as a machine datum. If P-0-0562 changes, the controller limitations are updated online.

7.1.6 Category incorrectly generated of internal errors without drive error

T&R-ID: MLDSYX-208

Severity: K3 malfunction (no workaround)

Description: Test versions are not displayed in the software identifier P-0-1381.

Bug fixing: Displaying test versions was made possible.

7.1.7 Force acquisition and scaling

T&R-ID: MLDSYX-214

Severity: K3 malfunction (no workaround)

Description:

1. For electromechanical axes it is impossible to adjust the direction of force correctly to the internal standard axis.
2. Negating velocity scaling is not part of actuator mapping, but of process data adjustment. Thus, this negation has to appear in the controller output P-0-0690 and not in the factor for compensating the actuator feed (P-0-0562).
3. The negation of the force data also has to change the internal reference of the negative and the positive force command value. The operating principle has to be identical with that of HDx.
4. An interface other than that for HDx is used for selecting the source of the actual force value.

Bug fixing:

1. Inverting the actual force value using P-0-2937.0.1, bit 2, to adjust a force sensor's direction of force to the direction of the standard axis.
2. Velocity data negation cleaned up.
3. Operating principle of force data negation adjusted to HDx.
4. Interface for the selection of the actual force value source implemented like for HDx: P-0-2937.0.1, bits 1..0. Downward compatibility with PFC02V02 ensured by P-0-1370, bits 18...16.

7.1.8 Irrelevant pressure command value check

T&R-ID: MLDSYX-216

Severity: K4 malfunction (workaround exists)

Description: Pressure command value is checked for compliance with limit values even if pressure control has not been configured and the command value is not written.

Bug fixing: Configuration is queried during the check.

7.1.9 Wrong parameters in diagnostic texts

T&R-ID: MLDSYX-223

Severity: K3 malfunction (no workaround)

Description: In the course of the implementation and use of HDx parameters in IndraDrive, some diagnostic texts were not updated in view of the new parameter numbers.

Bug fixing: Updated diagnostic texts

7.1.10 Error in threshold value calculation for automatic swivel angle adjustment

T&R-ID: MLDSYX-228

Severity: K3 malfunction (no workaround)

Description: The threshold values for velocity and pressure differential for the automatic or validated swivel angle adjustment are incorrectly calculated or not calculated.

Bug fixing: Corrected calculation

7.1.11 Swivel angle adjustment: Ramp increment incorrectly calculated

T&R-ID: MLDSYX-229

Severity: K4 malfunction (workaround exists)

Description: Swivel angle adjustment: Ramp increment incorrectly calculated; increment is determined per second, but has to be determined per clock cycle. As a workaround the ramp value can be adjusted.

Bug fixing: Corrected calculation

7.1.12 Threshold values for rapid mode/press mode switching are incorrectly calculated

T&R-ID: MLDSYX-231

Severity: K3 malfunction (no workaround)

Description: The ranges for calculating the threshold values for rapid mode/press mode switching (automatic or validation) are determined depending on the signs of the position and force controller outputs. There are problems with the threshold value calculation, if force control is not used and, consequently, no force command value is commanded (force command value = 0). Thus, the wrong range is used for the rapid mode/creep mode logic.

Bug fixing: Ranges for calculating the threshold values for rapid mode/press mode switching are now exclusively determined on the basis of the sign of the controller output from alternating control. The corresponding input was added to the block logic.

7.1.13 Rapid mode/press mode switching with simultaneous change in direction causes inadmissible feed factors

T&R-ID: MLDSYX-232

Severity: K3 malfunction (no workaround)

Description: If a simultaneous change in direction happens during rapid mode/press mode switching (with delay and ramping), the feed factor jumps to inadmissible (partly negative) values before the ramp reaches the correct target value.

Bug fixing: Change in direction is prevented:

- During switching debouncing, the current ranges and feeds are correctly set and the values to be ramped are recalculated.
- During switching ramping, ramping is aborted so that ranges and feeds are set to the final value.

7.1.14 Ramp for change in controller output of alternating control might be incorrectly calculated

T&R-ID: MLDSYX-233

Severity: K3 malfunction (no workaround)

Description: The maximum velocity as reference to the ramping time of the controller outputs of alternating control is calculated using the speed and the feed factor, amongst others. The factor can change cyclically. The changed factor, however, is not necessarily transmitted to the alternating control. This causes the wrong ramp to be calculated for the transition of the controller outputs.

Using the speed and the feed factor for the ramp reference velocity is questionable, because the user does not change the velocity or speed limit values.

Bug fixing: Now, only the velocity limit values are taken into account for calculating the ramp reference velocity. Speed limit value and feed factor are no longer relevant here.

7.1.15 Configuration of alternating force control is not applied in the case of negation

T&R-ID: MLDSYX-234

Severity: K3 malfunction (no workaround)

Description: In case the torque/force data (S-0-0085, bit 0 = 1) are inverted, the configuration of the alternating force control in positive and negative direction (P-0-1372, bits 14/15) is not applied correctly.

Bug fixing: Fixed and included in version PFC02V04.01.

7.2 Functional enhancements

7.2.1 SHA A1 to be supported

T&R-ID: MLDSYX-188

Severity: K4 malfunction (workaround exists)

Description: The hydraulics of SHA Basic with single rod cylinder and load-dependent check valve has to be natively supported.

Extension: IRQA: FEAT-00069722, selecting the active areas of a single rod cylinder.

7.2.2 Using hydraulics parameters for commanding alternating control

T&R-ID: MLDSYX-193

Severity: K4 malfunction (workaround exists)

Description: The new hydraulics parameters are to be used for commanding alternating control.

- P-0-2853, Alternating control, control word 1
- P-0-2855, Alternating control, status word

Extension: Implemented together with P-0-2937.0.1, Force acquisition control word. Everything downward compatible with PFC02V02.

7.2.3 Electromechanical axes to be supported

T&R-ID: MLDSYX-196

Severity: K3 malfunction (no workaround)

Description: PFC is to support electromechanical axes.

Extension: IRQA: FEAT-00070399, supporting electromechanical axes.

7.2.4 Filter monitoring

T&R-ID: MLDSYX-203

Severity: K3 malfunction (no workaround)

Description: Filter monitoring is required for SHA Basic A1: irqalite://id=69729/

Level 1: two digital inputs 75 % and 100 % clogging → maintenance information is output

Level 2: differential pressure across filter element is read in → maintenance information is output

Monitoring has to depend on the cycle, since the signal is only generated if delta p is present. This can only happen if there is flow through the filter. In the case of short pressure peaks, the signal might be briefly generated, but should not cause any warning. The system is not supposed to switch off due to the filter signal. Maybe a time stamp invisible to the customer should be saved.

Extension: IRQA: FEAT-00070621, IL_OilFilterMonitoring - filter monitoring.

7.2.5 Preventing inconsistent rotary/linear settings

T&R-ID: MLDSYX-218

Severity: K4 malfunction (workaround exists)

Description: It should be impossible to make different settings with regard to the scaling of rotary/linear for velocity and position.

Extension: This will be checked:

- If the position is linear, the scaling of velocity, acceleration and torque/force cannot be rotary.
- If the position is rotary, the scaling of velocity, acceleration and torque/force cannot be linear.

Acceleration as time (in relation to the velocity) and torque/force in percent are not forbidden.

Severity description

Defect class severity

This term refers to the "severity" of a defect, i.e. it describes how critical the defect can be (e.g., danger to life and limb, breakdown of machinery, ...). There are the following defect classes:

K1

Safety relevant function (danger to life and limb)

Accidental axis motion or malfunction in the safety technology which causes the drive to be unsafe and thereby **endangers persons**

K2

Serious malfunction (danger to mechanical system)

Accidental axis motion can cause **breakdown of machinery** because the command value processing does not work correctly, for example

K3

Malfunction (no workaround)

Malfunction of the drive for which there is **no** workaround

K4

Malfunction (workaround exists)

Malfunction of the drive for which there is **a** workaround

K5

Non critical problem

"Non critical problem" that does not affect the function of the drive

K6

Functional enhancement

Requirement for existing version or generation; can be implemented as a **downward compatible functional enhancement** in the current series

K7

Product idea

Requirement for next version or generation; cannot be implemented in the current series

K8

Product modification

Modifications of existing functions based on field know-how or new requirements

Index

Notes

Notes

Notes

Notes

rexroth
A Bosch Company

Bosch Rexroth AG
Industrial Hydraulics
Zum Eisengießer 1
97816 Lohr a.Main, Germany
Phone +49 9352 403020
my.support@boschrexroth.de
www.boschrexroth.com

RD 62313-RN