

Rexroth IndraMotion MLC 13VRS RegisterControl

R911336304
Edition 01

Application Manual



Title	Rexroth IndraMotion MLC 13VRS RegisterControl								
Type of Documentation	Application Manual								
Document Typecode	DOK-MLC***-REGI*CO*V13-AP01-EN-P								
Internal File Reference	RS-6dbfe9309c96358c0a6846a0018fe20a-1-en-US-7								
Purpose of Documentation	This documentation describes the application of the integrated register control for a rotogravure printing machine. The components of the mark stream sensor, the HMI application and the error recovery options are described. This application manual provides information on how to operate the register control, react to errors and query diagnostics.								
Record of Revision	<table><tr><th>Edition</th><th>Release Date</th><th>Notes</th></tr><tr><td>Edition 01</td><td>10.2012</td><td>First edition for 13VRS</td></tr></table>			Edition	Release Date	Notes	Edition 01	10.2012	First edition for 13VRS
Edition	Release Date	Notes							
Edition 01	10.2012	First edition for 13VRS							
Copyright	© Bosch Rexroth AG 2012 This document, as well as the data, specifications and other information set forth in it, are the exclusive property of Bosch Rexroth AG. It may not be reproduced or given to third parties without its consent.								
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.								
Published by	Bosch Rexroth AG Electric Drives and Controls P.O. Box 13 57 97803 Lohr, Germany Bgm.-Dr.-Nebel-Str. 2 97816 Lohr, Germany Phone +49 9352 18 0 Fax +49 9352 18 8400 http://www.boschrexroth.com/electrics System Development Automation Motion Logic Control, HoSc (KaWa/PiGe)								
Note	This document has been printed on chlorine-free bleached paper.								

Table of Contents

	Page
1 About this Documentation.....	5
1.1 Validity of the Documentation.....	5
1.2 Documentation Structure.....	5
1.3 Required and Supplementing Documentations.....	6
1.4 Information Representation.....	11
1.4.1 Safety Instructions.....	11
1.4.2 Symbols Used.....	11
1.4.3 Terms and Abbreviations.....	11
2 Intended Use.....	13
2.1 General Information.....	13
2.2 Explosion Protection	14
2.2.1 General Information.....	14
2.2.2 Safety Instructions/Special Conditions.....	14
3 Safety Instructions for Electric Drives and Controls.....	17
3.1 Definitions of Terms.....	17
3.2 General Information.....	18
3.2.1 Using the Safety Instructions and Passing Them on to Others.....	18
3.2.2 Requirements for Safe Use.....	18
3.2.3 Hazards by Improper Use.....	19
3.3 Instructions with Regard to Specific Dangers.....	20
3.3.1 Protection Against Contact With Electrical Parts and Housings.....	20
3.3.2 Protective Extra-Low Voltage as Protection Against Electric Shock	21
3.3.3 Protection Against Dangerous Movements.....	22
3.3.4 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting.....	23
3.3.5 Protection Against Contact With Hot Parts.....	24
3.3.6 Protection During Handling and Mounting.....	24
3.3.7 Battery Safety.....	24
3.3.8 Protection Against Pressurized Systems.....	25
3.4 Explanation of Signal Words and the Safety Alert Symbol.....	25
4 Introduction.....	27
4.1 General Information.....	27
4.2 Licensing and Available Variants.....	27
4.3 Brief Description.....	29
4.4 System Overview.....	29
5 Drive Parameterization.....	31
5.1 Parameterization of the Incremental Encoder Emulation.....	31
5.2 Checking the Correct Incremental Encoder Parameterization.....	32

Table of Contents

	Page
6 Commissioning the Mark Stream Sensor.....	33
6.1 General Information.....	33
6.2 Mounting the Evaluation Circuit of the Mark Stream Sensor.....	33
6.3 Mounting the Optics of the Mark Stream Sensor.....	34
6.4 Connections at the Mark Stream Sensor.....	42
6.4.1 Overview.....	42
6.4.2 Description of the Connections.....	43
General Information.....	43
Connection and Connector Types.....	43
24 V DC Power Supply X1S Power.....	43
Ethernet interface X7E ETH.....	44
Incremental Encoder Interface X8T TTL.....	45
Fiber Optic Interfaces X801 TX and X802 RX.....	46
6.5 Component Cabling.....	47
6.6 Display and Operating Components of the Mark Stream Sensor.....	48
6.6.1 General Information.....	48
6.6.2 Operating Mode and Error Displays.....	49
6.6.3 Electronic Type Plate.....	50
6.7 Technical Data of the Mark Stream Sensor.....	50
6.8 Ambient Conditions.....	51
6.9 Disassembly/Maintenance/Repairs.....	52
 7 Firmware Update.....	 55
7.1 General Information.....	55
7.2 Firmware Update Tool Description.....	55
7.3 Executing the Firmware Update.....	55
 8 Commissioning the HMI Interface.....	 59
8.1 General Information.....	59
8.2 WinStudio Licensing.....	59
8.2.1 Introduction.....	59
8.2.2 Overview on WinStudio Licenses.....	59
8.2.3 Activation of a WinStudio License.....	60
8.2.4 Effects of a Missing or Inadequate License.....	61
8.3 Preconditions to Use the Central Visualization for the RegisterControl.....	61
8.4 VPP, VPB/VDP.....	61
8.4.1 WinStudio Settings to be Selected.....	61
8.4.2 Installing Additional Files.....	62
8.4.3 Registering ActiveX-Controls.....	63
8.4.4 Starting Runtime.....	63
8.5 VEP with Operating System CE.....	63
8.5.1 WinStudio Settings to be Selected.....	63
8.5.2 Registering ActiveX-Controls.....	65
8.5.3 Transmitting the Application.....	66
8.5.4 Starting the CEView.....	67

Table of Contents

	Page
9 HMI Application Scenarios.....	69
9.1 General Information.....	69
9.2 Overview of all HMI Processes.....	69
9.3 Service.....	70
9.4 Production.....	71
9.5 Job Configuration.....	72
9.6 Diagnostics.....	73
10 HMI Dialog and Element Description.....	75
10.1 General Information.....	75
10.2 Navigation Structure.....	75
10.3 Dialog Structure.....	76
10.3.1 Header.....	76
10.3.2 Navigation Area.....	76
10.3.3 Arrow Wizard and Switching Panel of the Printing Unit.....	78
10.3.4 Sidebar.....	78
10.3.5 Content Area.....	80
10.4 Machine Configuration.....	80
10.4.1 Brief Description.....	80
10.4.2 Machine Configuration Dialog.....	80
10.4.3 Machine Configuration Dialog (Communication Settings of the Sensors).....	87
10.5 Job Configuration.....	89
10.5.1 Brief Description.....	89
10.5.2 Job Management.....	89
General Information.....	89
Format and Web Width.....	91
Print configuration.....	92
Mark Stream.....	105
Bar Code Definition.....	107
Sample Mark Stream.....	109
Material Selection.....	110
10.5.3 Preset Settings - Length.....	112
10.5.4 Preset Side.....	113
10.5.5 Preset Format.....	114
10.5.6 Acceleration Compensation.....	115
10.6 Production.....	117
10.6.1 Brief Description.....	117
10.6.2 Register Overview.....	117
10.6.3 Trend Overview.....	124
10.6.4 Register Single View.....	126
10.6.5 Histogram.....	128
10.7 Diagnostics.....	130
10.7.1 Brief Description.....	130
10.7.2 Diagnostics Overview.....	131
10.7.3 Oscilloscope.....	133
10.7.4 Logbook.....	136

Table of Contents

	Page
10.8 Service.....	137
10.8.1 Machine Configuration.....	137
10.8.2 Advanced Settings.....	137
10.8.3 Language.....	139
10.8.4 User Management.....	139
10.8.5 Auxiliary Function: 2 Sensors Behind a Printing Unit.....	140
11 Decentral HMI Dialog of the Decentral RegisterControl.....	143
11.1 General Information.....	143
11.2 Importing the Dialog of the Decentral RegisterControl.....	143
11.3 Operating the Dialog of the Decentral RegisterControl.....	147
12 Troubleshooting.....	151
12.1 General Information.....	151
12.2 Approach in Case of Error.....	151
12.3 Error Numbers and Troubleshooting.....	153
12.4 Problems with the 360° Display.....	161
12.5 Backing Up Data for the Remote Diagnostics.....	161
12.5.1 General Information.....	161
12.5.2 Backing Up the Oscilloscope Data.....	161
12.5.3 Backing Up the Current Job.....	162
13 Service and Support.....	163
Index.....	165

1 About this Documentation

1.1 Validity of the Documentation

This documentation is intended for users wanting to use the integrated register control. The components of the mark stream sensor, the HMI application and the error recovery options are described. This application manual provides information on how to operate the register control, react to errors and query diagnostics.

Target group This documentation is intended for the following groups:

- Process specialists
- Commissioning engineers
- Machine operators

Application phases This documentation supports the user during the following phases:

- Commissioning
- Operation

1.2 Documentation Structure

The first part of the document provides important instructions on use and safety ([chapter 2 "Intended Use" on page 13](#) and [chapter 3 "Safety Instructions for Electric Drives and Controls" on page 17](#)).

[chapter 4 "Introduction" on page 27](#) contains an introduction to the PY-MSS01.1-T1 mark stream sensor.

[chapter 5 "Drive Parameterization" on page 31](#) describes the drive parameterization.

[chapter 6 "Commissioning the Mark Stream Sensor" on page 33](#) describes the mark stream sensor system commissioning.

[chapter 7 "Firmware Update" on page 55](#) describes the firmware update procedure.

[chapter 8 "Commissioning the HMI Interface" on page 59](#) contains information about HMI interface commissioning.

[chapter 9 "HMI Application Scenarios" on page 69](#) describes the HMI use cases.

The elements and functionalities of the current HMI dialogs are explained in [chapter 10 "HMI Dialog and Element Description" on page 75](#).

[chapter 11 "Decentral HMI Dialog of the Decentral RegisterControl" on page 143](#) describes dialogs for remote register control.

[chapter 12 "Troubleshooting" on page 151](#) contains information about how to handle errors.

The [chapter 13 "Service and Support" on page 163](#) provides information on the customer service helpdesk.

About this Documentation

1.3 Required and Supplementing Documentations

Documentation titles with type codes and parts numbers

IndraWorks		MLC	XLC
/36/	Rexroth IndraWorks 13VRS Software Installation DOK-IWORKS-SOFTINS*V13-CORS-EN-P, R911336880 This documentation describes the IndraWorks installation.	X	X
/5/	Rexroth IndraWorks 13VRS Engineering DOK-IWORKS-ENGINEE*V13-APRS-EN-P, R911336870 This documentation describes the application of IndraWorks in which the Rexroth Engineering tools are integrated. It includes instructions on how to work with IndraWorks and how to operate the oscilloscope function.	X	X
/20/	Rexroth IndraMotion MLC 13VRS Functional Description DOK-MLC***-FUNC****V13-APRS-EN-P, R911336295 This documentation describes wizards, context menus, dialogs, control commissioning, device configuration and functionalities of the IndraMotion MLC.	X	
/20/	Rexroth IndraLogic XLC 13VRS Functional Description DOK-XLC***-FUNC****V13-APRS-EN-P, R911336352 This documentation describes wizards, context menus, dialogs, control commissioning, device configuration and functionalities of the IndraLogic XLC.		X
/7/	Rexroth IndraWorks 13VRS CamBuilder DOK-IWORKS-CAMBUIL*V13-APRS-EN-P, R911336291 This documentation describes the basic principles and operation of the CamBuilder, the cam editing tool.	X	X
/37/	Rexroth IndraLogic XLC IndraMotion MLC 13VRS Automation Interface DOK-XLCMLC-AUT*INT*V13-APRS-EN-P, R911336356 This documentation describes the script-based access to IndraWorks project data via the interface of the Automation Interface.	X	X
/38/	Rexroth IndraWorks 12VRS FDT Container DOK-IWORKS-FDT*CON*V12-APRS-EN-P, R911334398 This documentation describes the IndraWorks FDT Container functionality. It includes the activation of the functionality in the project and working with DTMs.	X	X
/29/	Rexroth IndraLogic XLC IndraMotion MLC 13VRS Project Conversion DOK-XLCMLC-PROCONV*V13-APRS-EN-P, R911336366 This documentation describes the project conversion of IndraLogic 04VRS and IndraMotion MLC04VRS on IndraWorks version 12 with IndraLogic 2G. Changes with regard to Motion and PLC are described in detail.	X	X
/28/	Rexroth IndraMotion MLC 13VRS Commissioning DOK-MLC***-STARTUP*V13-CORS-EN-P, R911336308 This documentation describes the steps to commission and service the IndraMotion MLC system. It includes checklists for frequent tasks and a detailed description of the steps.	X	

Fig. 1-1: XCL/MLC documentation overview

About this Documentation

Motion		MLC	XLC
/23/	Rexroth IndraLogic XLC IndraMotion MLC 13VRS PLCopen Libraries DOK-XLCMLC-FUNLIB**V13-LIRS-EN-P, R911336360 This documentation describes the function blocks, functions and data types of the RIL_Common-Types, ML_Base and ML_PLCopen libraries for the IndraLogic XLC/IndraMotion MLC. It also includes the error reactions of function blocks.	X	X
/27/	Rexroth IndraLogic XLC IndraMotion MLC 13VRS Generic Application Template DOK-XLCMLC-TF*GAT**V13-APRS-EN-P, R911336370 This documentation provides a structured template to the IndraLogic PLC programmer. This template can be used to add and edit the PLC programming code. It includes the template, the template wizard and example applications.	X	X
/31/	Rexroth IndraMotion MLC 13VRS RCL Programming Instruction DOK-MLC***-RCL*PRO*V13-APRS-EN-P, R911336297 This documentation provides information on the RobotControl. The programming language RCL (RobotControl Language) is focused. The program structure, variables, functions, motion statements and the required system parameters are described.	X	
/21/	Rexroth IndraLogic XLC IndraMotion MLC 13VRS Parameters DOK-XLCMLC-PARAM***V13-RERS-EN-P, R911336364 This documentation describes the parameters of the XLC/MLC systems as well as the interaction between parameterization and programming. It includes the axis parameters, control parameters, kinematic parameters, touch probe parameters and programmable limit switch parameters.	X	X
/10/	Rexroth IndraDrive Firmware for Drive Controllers MPH-, MPB-, MPD-, MPC-07 DOK-INDRV*-MP*-07VRS**-FKRS-EN-P, R911328670 This documentation describes all functional properties of the IndraDrive firmware in the variants MPH-07, MPB-07, MPD-07 and MPC-07.		
/11/	Rexroth IndraDrive MPx-17 Functions DOK-INDRV*-MP*-17VRS**-APRS-EN-P, R911331236 This documentation describes all functional properties of the IndraDrive firmware in the variants MPB-17, MPM-17, MPC-17 and MPE-17.		

Fig. 1-2: XCL/MLC documentation overview

Field Buses		MLC	XLC
/4/	Rexroth IndraWorks 13VRS Field Buses DOK-IWORKS-FB*****V13-APRS-EN-P, R911336872 This documentation describes the supported field buses and their diagnostic function blocks.	X	X
/4a/	Rexroth IndraWorks 13VRS Field Buses Libraries DOK-IWORKS-FB*LIB**V13-LIRS-EN-P, R911337857 This manual describes the field bus libraries: RIL_ProfibusDP_02, RIL_ProfibusDPSlave, RIL_ProfnetIO, RIL_ProfnetIODevice, RIL_EtherNetIPAdapter, RIL_MappingList, RIL_SERCOSIII, RIL_Inline including their diagnostics and error reactions of the function blocks.	X	X
/63/	SERCOS System Manual for I/O Devices DOK-CONTRL-ILS3*****-APRS-EN-P, R911333512 This documentation describes the configuration, parameterization, commissioning and diagnostics of I/O devices with a SERCOS interface.	X	X

Fig. 1-3: XCL/MLC documentation overview

About this Documentation

HMI		MLC	XLC
/8/	Rexroth IndraWorks 13VRS HMI DOK-IWORKS-HMI*****V13-APRS-EN-P, R911336874 This documentation describes the functions, configuration and operation of the user interfaces IndraWorks HMI Engineering and IndraWorks HMI Operation.	X	X
/6/	Rexroth IndraWorks 13VRS WinStudio DOK-IWORKS-WINSTUD*V13-APRS-EN-P, R911336882 This documentation describes the installation of the software, working with WinStudio and the creation and operation of applications.	X	X
/50/	Rexroth IndraLogic XLC IndraMotion MLC 13VRS HMI Connection DOK-XLCMLC-HMI*****V13-APRS-EN-P, R911336362 This documentation describes the visualization systems supported by the IndraLogic XLC and IndraMotion MLC and their connection.	X	X

Fig. 1-4: XCL/MLC documentation overview

PLC		MLC	XLC
/3/	Rexroth IndraWorks 13VRS IndraLogic 2G Programming Instruction DOK-IWORKS-IL2GPRO*V13-APRS-EN-P, R911336876 This documentation describes the PLC programming tool IndraLogic 2G and its use. It includes the basic use, first steps, visualization, menu items and editors.	X	X
/33/	Rexroth IndraWorks 13VRS Basic Libraries IndraLogic 2G DOK-IL*2G*-BASLIB**V13-LIRS-EN-P, R911336285 This documentation describes the system-comprehensive PLC libraries.	X	X

Fig. 1-5: XCL/MLC documentation overview

Technology		MLC	XLC
/30/	Rexroth IndraMotion MLC 13VRS Technology Libraries DOK-MLC***-TF*LIB**V13-LIRS-EN-P, R911336324 This documentation describes the function blocks, functions and data types of the "ML_TechInterface.library", "ML_TechMotion.library", "RMB_TechCam.library" and "ML_TechBase.library". It also includes libraries for the winder functionality, register controller functionality and CrossCutter functionality.	X	
/60/	Rexroth IndraMotion MLC 13VRS RegisterControl (Library) DOK-MLC***-REGI*CO*V13-LIRS-EN-P, R911336306 This documentation describes the inputs and outputs of the individual function blocks and provides notes on their use.	X	

About this Documentation

Technology		MLC	XLC
/62/	Rexroth IndraMotion MLC 13VRS RegisterControl (Application Manual) DOK-MLC***-REGI*CO*V13-APRS-EN-P, R911336304 This documentation describes the application of the integrated register control for a rotogravure printing machine. The components of the mark stream sensor, the HMI application and the error recovery options are described. This instruction provides information on how to operate the register control, react to errors and query diagnostics. This documentation is written for machine setters and machine operators.	X	
/49/	Rexroth IndraMotion MLC 13VRS Winder Function Application DOK-MLC***-TF*WIND*V13-APRS-EN-P, R911336326 This application-related system documentation describes the application of the winder technology functions.	X	

Fig. 1-6: XCL/MLC documentation overview

Hardware		MLC	XLC
/1/	Rexroth IndraControl L45/L65/L85 Control DOK-CONTRL-ICL45L65L85-PRRS-EN-P, R911332116 This documentation describes the IndraControl L45/L65/L85 controls.	X	X
/2/	Rexroth IndraControl L25 DOK-CONTRL-IC*L25*****-PRRS-EN-P, R911328474 This documentation describes the IndraControl L25 controls.	X	X
/24/	Rexroth IndraControl Lxx 13VRS Function Modules DOK-CONTRL-FM*LXX**V13-APRS-EN-P, R911336283 This documentation describes all function modules of the Lxx controls including engineering and diagnostics.	X	X
/12/	Rexroth IndraDrive Drive Controllers MPx-02 to MPx-07 DOK-INDRV*-GEN-**VRS**-PARS-EN-P, R911297317 This documentation describes all parameters implemented in the firmware for drive controllers of the IndraDrive family. It supports the parameterization of the drive controllers.		
/13/	Rexroth IndraDrive MPx-02 to MPx-07 and HMV DOK-INDRV*-GEN-**VRS**-WARS-EN-P, R911297319 This documentation describes all diagnostics implemented in the following firmwares: • Drive controller firmwares from MPx-02 to MPx-08 and • firmwares of the supply devices of the type "HMF". It supports the operating crew as well as the programmer at troubleshooting.		
/35/	Rexroth IndraDrive Drive Controller Control Sections CSB01, CSH01, CDB01 DOK-INDRV*-CSH*****-PRRS-EN-P, R911295012 This documentation is a project planning manual to select and use the control sections CSB01, CDB01 and CSH01 for drive controllers of the product families Rexroth IndraDrive M and Rexroth IndraDrive C.		

Fig. 1-7: XCL/MLC documentation overview

About this Documentation

Diagnostics and service		MLC	XLC
/26/	Rexroth IndraWorks 13VRS IndraMotion Service Tool DOK-IWORKS-IMST***V13-RERS-EN-P, R911337707 This documentation describes the IndraMotion Service Tool (IMST). It is a web-based diagnostic tool to access the control systems IndraMotion MLC L25, L45 or 65 as well as the MLP via an Ethernet high-speed connection. The IMST allows OEMs, end users and service engineers to access and remotely diagnose a system. A PC with Internet Explorer version 6 or 7 is required.	X	X
/22/	Rexroth IndraLogic XLC IndraMotion MLC 13VRS Diagnostics DOK-XLCMLC-DIAG***V13-RERS-EN-P, R911336358 This documentation includes all control parameters implemented in the control systems IndraLogic XLC and IndraMotion MLC.	X	X

Fig. 1-8: XCL/MLC documentation overview

System Overview		MLC	XLC
/48/	Rexroth IndraMotion for Printing 13VRS System Overview DOK-IM*PR*-SYSTEM**V13-PRRS-EN-P, R911336289 This documentation describes the product IndraMotion for Printing. It introduces the control systems, drive systems and I/O systems as well as the commissioning and programming.	X	
/48/	Rexroth IndraMotion for Packaging 13VRS System Overview DOK-IM*PA*-SYSTEM**V13-PRRS-EN-P, R911336287 This documentation describes the product IndraMotion for Packaging. It introduces the control systems, drive systems and I/O systems as well as the commissioning and programming.	X	
/9/	Rexroth IndraMotion MLC 13VRS System Overview DOK-MLC***-SYSTEM**V13-PRRS-EN-P, R911336310 This documentation provides an overview on the hardware/software components of the automation system IndraMotion MLC in the mentioned version. It helps assembling a system.	X	
/9/	Rexroth IndraLogic XLC 13VRS System Overview DOK-XLC***-SYSTEM**V13-PRRS-EN-P, R911336354 This documentation provides an overview on hardware/software components of the automation system IndraLogic XLC in the respective version. It helps assembling a system.		X

Fig. 1-9: XCL/MLC documentation overview

First Steps		MLC	XLC
/25/	Rexroth IndraMotion MLC 13VRS, First Steps DOK-MLC***-F*STEP**V13-CORS-EN-P, R911336293 This documentation describes the first steps of the IndraMotion MLC and the RobotControl. It includes the hardware and software prerequisites as well as the creation of a project.	X	
/25/	Rexroth IndraLogic XLC 13VRS, First Steps DOK-XLC***-F*STEP**V13-CORS-EN-P, R911336350 This documentation describes the first steps of the IndraLogic XLC. It includes the hardware and software prerequisites as well as the creation of a project.		X

Fig. 1-10: XCL/MLC documentation overview

1.4 Information Representation

1.4.1 Safety Instructions

If there are safety instructions, they contain certain signal words (Danger, Warning, Caution, Notice) and if applicable, signal alert symbols (acc. to ANSI Z535.6-2006).

The signal word draws attention to the safety instruction and indicates the risk potential.

The signal alert symbol (warning triangle with exclamation mark) positioned in front of the signal words Danger, Warning and Caution indicates hazards for individuals.

DANGER

In case of non-compliance with this safety instruction, death or serious injury **will** occur.

WARNING

In case of non-compliance with this safety instruction, death or serious injury **can** occur.

CAUTION

In case of non-compliance with this safety instruction, minor or moderate injury can occur.

NOTICE

In case of non-compliance with this safety instruction, material or property damage can occur.

1.4.2 Symbols Used

Note Notes are represented as follows:



This is a note for the user.

Tip Tips are represented as follows:



This is a tip for the user.

1.4.3 Terms and Abbreviations

Term	Explanation
Bar code	Sequence of at least 3 blocks that can be found automatically by the sensor
Ethernet	Communication interface
OWG	Optical waveguide

About this Documentation

Mark stream sensor	Evaluation unit, sampling a mark stream and measuring the mark positions
Measurement	Mark positions of the defined marks are determined and send to the control
OEM	Original Equipment Manufacturer
Runtime license	A check for the license is carried out at runtime. For each control, on which the function blocks are used, one license is required (runtime license)
S-curve	Jerk-limited acceleration phase
sercos	Field bus
Teach-In	Process during which the mark stream sensor measures the threshold values for the mark measurement

Fig. 1-11: Names and abbreviations used

2 Intended Use

2.1 General Information

The mark stream sensor PY-MSS01.1-T1 is intended for use together with a drive system and the corresponding software of the Bosch Rexroth company.

The mark stream sensor PY-MSS01.1-T1 has been checked by an external Technical Inspection Authority (German TÜV SÜD Product Service GmbH). The conformity of the PY-MSS01.1-T1 mark stream sensor has been confirmed with a test report and an official test number.



Only commission the product after you have thoroughly read, understood and complied with the documents and safety instructions contained in the product.

If documents in your national language are available, please contact your Bosch Rexroth distribution partner.

The PY-MSS01.1-T1 mark stream sensor can only be commissioned in explosive environment if

- all following instructions for commissioning as well as the application notes of the application manual have been understood and implemented
- the entire system, consisting of mark stream sensor, optic sensor, cable and accessories has been checked, approved and documented according to the relevant standard requirements



- Comply with the specific standards and directives of your country when mounting, installing and using the PY-MSS01.1-T1 mark stream sensor
- The following national/international statutory provisions apply to installation and use as well as commissioning and periodic technical inspections of the PY-MSS01.1-T1 mark stream sensor:
 - the Low Voltage Directive 2006/42/EC
 - the Machine Directive 2006/42/EC
 - the EMC Directive 2004/108/EC
 - the Use of Work Equipment Directive 89/655/EEC
 - the accident prevention regulations and safety rules

Inspections are to be carried out by qualified personnel.

This application description does not contain a guide for operating the machine, the PY-MSS01.1-T1 is or will be integrated in. For information on the operation, please refer to the operating instructions of the machine.

WARNING

Only use the PY-MSS01.1-T1 mark stream sensor in an industrial environment!

The PY-MSS01.1-T1 mark stream sensor meets the conditions of class A (industrial applications) according to the "emission" standard. Thus, the PY-MSS01.1-T1 mark stream sensor is only intended for use in an industrial environment.

Intended Use

2.2 Explosion Protection

2.2.1 General Information

DANGER

Danger to life, danger of explosion and considerable material damage!

All used components and accessories have to comply with the requirements for explosion protection according to Directive 94/9EC.

The application conditions mentioned in this documentation have to always be complied with during the configuration and during the operation.

The evaluation circuit PY-MSS01.1-T1 contains a power-limited white light source of type PR0138.

Explosion protection ID:

- Evaluation circuit PY-MSS01.1-T1:  II (2)G [Ex op is Gb] IIB X
- Sensor optics PY-MSS01.1-O1:  II 2G Ex op is IIB T4 Gb X
- Sensor optics PY-MSS01.2-O1/000.0:  II 2G Ex op is IIB T4 Gb X

2.2.2 Safety Instructions/Special Conditions

Information about the test number

The EC Type Examination Certificate Number for the mark stream sensor system specified in the conformity declaration and the type plate is labeled with an "X" at the end. This ID refers to the special conditions that have to be complied with in connection with the underlying standards of the specified safety and health requirements. The following special conditions have to be complied with for a safe operation of the mark stream sensors in the system:

White light source, type PR0138: II (2)G [Ex op is Gb] IIB X

- The white light source/evaluation circuit must not be installed in an explosive environment.
- The explosion protection can only be ensured in a combination of the white light source PR0138 or the evaluation circuit PY-MSS01.1-T1 and the optic sensors PY-MSS01.1-O1 or PY-MSS01.2-O1/000,0
- Only fiber optics manufactured by Bosch Rexroth can be used
- The two fiber optics must not be interchanged when connecting the fiber optics to the evaluation circuits. Additionally, please comply with the colored labeling (red, blue).
- The white light source PR0138/evaluation circuit PY-MSS01.1-T1 as well as the sensor optics PY-MSS01.1-O1 and PY-MSS01.2-O1/000,0, can only be opened by the manufacturer
- When using the sensor optics PY-MSS01.2-O1/000,0 a potential equalization has to be achieved between the evaluation circuit casing and the sensor optics installation area (e.g. through grounding). The metallic shrink sleeve of the optics must not be used for potential equalization
- Comply with the technical connections loads (see [chapter 6.4 "Connections at the Mark Stream Sensor" on page 42](#))
- Comply with the ambient conditions (see [chapter 6.8 "Ambient Conditions" on page 51](#))

Intended Use

- The evaluation circuit must only be operated in areas that have a degree of contamination 2 or better, as well as on networks of overvoltage category II or better

Sensor optics PY-MSS01.1-O1:  II 2G Ex op is IIB T4 Gb X

Sensor optics PY-MSS01.2-O1/000.0:  II 2G Ex op is IIB T4 Gb X

- Both sensor optics must only be operated with evaluation circuit PY-MSS01.1-T1 or with the power-limited white light source PR0138

Potential equalization

The system/sensors have to be integrated in the local potential equalization. All conductive parts have to be grounded or connected to conductive parts. The bleeder resistor has to be smaller than 10^6 ohm.

Appropriate action regarding the explosion protection (e.g. intrinsically safe electric circuits) has to be complied with for monitoring systems.

3 Safety Instructions for Electric Drives and Controls

3.1 Definitions of Terms

Application Documentation	Application documentation comprises the entire documentation used to inform the user of the product about the use and safety-relevant features for configuring, integrating, installing, mounting, commissioning, operating, maintaining, repairing and decommissioning the product. The following terms are also used for this kind of documentation: User Guide, Operation Manual, Commissioning Manual, Instruction Manual, Project Planning Manual, Application Manual, etc.
Component	A component is a combination of elements with a specified function, which are part of a piece of equipment, device or system. Components of the electric drive and control system are, for example, supply units, drive controllers, mains choke, mains filter, motors, cables, etc.
Control System	A control system comprises several interconnected control components placed on the market as a single functional unit.
Device	A device is a finished product with a defined function, intended for users and placed on the market as an individual piece of merchandise.
Electrical Equipment	Electrical equipment encompasses all devices used to generate, convert, transmit, distribute or apply electrical energy, such as electric motors, transformers, switching devices, cables, lines, power-consuming devices, circuit board assemblies, plug-in units, control cabinets, etc.
Electric Drive System	An electric drive system comprises all components from mains supply to motor shaft; this includes, for example, electric motor(s), motor encoder(s), supply units and drive controllers, as well as auxiliary and additional components, such as mains filter, mains choke and the corresponding lines and cables.
Installation	An installation consists of several devices or systems interconnected for a defined purpose and on a defined site which, however, are not intended to be placed on the market as a single functional unit.
Machine	A machine is the entirety of interconnected parts or units at least one of which is movable. Thus, a machine consists of the appropriate machine drive elements, as well as control and power circuits, which have been assembled for a specific application. A machine is, for example, intended for processing, treatment, movement or packaging of a material. The term "machine" also covers a combination of machines which are arranged and controlled in such a way that they function as a unified whole.
Manufacturer	The manufacturer is an individual or legal entity bearing responsibility for the design and manufacture of a product which is placed on the market in the individual's or legal entity's name. The manufacturer can use finished products, finished parts or finished elements, or contract out work to subcontractors. However, the manufacturer must always have overall control and possess the required authority to take responsibility for the product.
Product	Examples of a product: Device, component, part, system, software, firmware, among other things.
Project Planning Manual	A project planning manual is part of the application documentation used to support the sizing and planning of systems, machines or installations.
Qualified Persons	In terms of this application documentation, qualified persons are those persons who are familiar with the installation, mounting, commissioning and operation of the components of the electric drive and control system, as well as with the hazards this implies, and who possess the qualifications their work

Safety Instructions for Electric Drives and Controls

requires. To comply with these qualifications, it is necessary, among other things,

- 1) to be trained, instructed or authorized to switch electric circuits and devices safely on and off, to ground them and to mark them
- 2) to be trained or instructed to maintain and use adequate safety equipment
- 3) to attend a course of instruction in first aid

User A user is a person installing, commissioning or using a product which has been placed on the market.

3.2 General Information

3.2.1 Using the Safety Instructions and Passing Them on to Others

Do not attempt to install and operate the components of the electric drive and control system without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with these components. If you do not have the user documentation for the components, contact your responsible Bosch Rexroth sales partner. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the components.

If the component is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the component in the official language of the user's country.

Improper use of these components, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, could result in property damage, injury, electric shock or even death.

3.2.2 Requirements for Safe Use

Read the following instructions before initial commissioning of the components of the electric drive and control system in order to eliminate the risk of injury and/or property damage. You must follow these safety instructions.

- Bosch Rexroth is not liable for damages resulting from failure to observe the safety instructions.
- Read the operating, maintenance and safety instructions in your language before commissioning. If you find that you cannot completely understand the application documentation in the available language, please ask your supplier to clarify.
- Proper and correct transport, storage, mounting and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of the component.
- Only qualified persons may work with components of the electric drive and control system or within its proximity.
- Only use accessories and spare parts approved by Bosch Rexroth.
- Follow the safety regulations and requirements of the country in which the components of the electric drive and control system are operated.
- Only use the components of the electric drive and control system in the manner that is defined as appropriate. See chapter "Appropriate Use".
- The ambient and operating conditions given in the available application documentation must be observed.
- Applications for functional safety are only allowed if clearly and explicitly specified in the application documentation "Integrated Safety Technolo-

Safety Instructions for Electric Drives and Controls

gy". If this is not the case, they are excluded. Functional safety is a safety concept in which measures of risk reduction for personal safety depend on electrical, electronic or programmable control systems.

- The information given in the application documentation with regard to the use of the delivered components contains only examples of applications and suggestions.

The machine and installation manufacturers must

- make sure that the delivered components are suited for their individual application and check the information given in this application documentation with regard to the use of the components,
- make sure that their individual application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Commissioning of the delivered components is only allowed once it is sure that the machine or installation in which the components are installed complies with the national regulations, safety specifications and standards of the application.
- Operation is only allowed if the national EMC regulations for the application are met.
- The instructions for installation in accordance with EMC requirements can be found in the section on EMC in the respective application documentation.

The machine or installation manufacturer is responsible for compliance with the limit values as prescribed in the national regulations.

- The technical data, connection and installation conditions of the components are specified in the respective application documentations and must be followed at all times.

National regulations which the user must take into account

- European countries: In accordance with European EN standards
- United States of America (USA):
 - National Electrical Code (NEC)
 - National Electrical Manufacturers Association (NEMA), as well as local engineering regulations
 - Regulations of the National Fire Protection Association (NFPA)
- Canada: Canadian Standards Association (CSA)
- Other countries:
 - International Organization for Standardization (ISO)
 - International Electrotechnical Commission (IEC)

3.2.3 Hazards by Improper Use

- High electrical voltage and high working current! Danger to life or serious injury by electric shock!
- High electrical voltage by incorrect connection! Danger to life or injury by electric shock!
- Dangerous movements! Danger to life, serious injury or property damage by unintended motor movements!
- Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electric drive systems!

Safety Instructions for Electric Drives and Controls

- Risk of burns by hot housing surfaces!
- Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!
- Risk of injury by improper handling of batteries!
- Risk of injury by improper handling of pressurized lines!

3.3 Instructions with Regard to Specific Dangers

3.3.1 Protection Against Contact With Electrical Parts and Housings



This section concerns components of the electric drive and control system with voltages of **more than 50 volts**.

Contact with parts conducting voltages above 50 volts can cause personal danger and electric shock. When operating components of the electric drive and control system, it is unavoidable that some parts of these components conduct dangerous voltage.

High electrical voltage! Danger to life, risk of injury by electric shock or serious injury!

- Only qualified persons are allowed to operate, maintain and/or repair the components of the electric drive and control system.
- Follow the general installation and safety regulations when working on power installations.
- Before switching on, the equipment grounding conductor must have been permanently connected to all electric components in accordance with the connection diagram.
- Even for brief measurements or tests, operation is only allowed if the equipment grounding conductor has been permanently connected to the points of the components provided for this purpose.
- Before accessing electrical parts with voltage potentials higher than 50 V, you must disconnect electric components from the mains or from the power supply unit. Secure the electric component from reconnection.
- With electric components, observe the following aspects:
 - Always wait **30 minutes** after switching off power to allow live capacitors to discharge before accessing an electric component. Measure the electrical voltage of live parts before beginning to work to make sure that the equipment is safe to touch.
- Install the covers and guards provided for this purpose before switching on.
- Never touch electrical connection points of the components while power is turned on.
- Do not remove or plug in connectors when the component has been powered.
- Under specific conditions, electric drive systems can be operated at mains protected by residual-current-operated circuit-breakers sensitive to universal current (RCDs/RCMs).

Safety Instructions for Electric Drives and Controls

- Secure built-in devices from penetrating foreign objects and water, as well as from direct contact, by providing an external housing, for example a control cabinet.

High housing voltage and high leakage current! Danger to life, risk of injury by electric shock!

- Before switching on and before commissioning, ground or connect the components of the electric drive and control system to the equipment grounding conductor at the grounding points.
- Connect the equipment grounding conductor of the components of the electric drive and control system permanently to the main power supply at all times. The leakage current is greater than 3.5 mA.
- Establish an equipment grounding connection with a minimum cross section according to the table below. With an outer conductor cross section smaller than 10 mm² (8 AWG), the alternative connection of two equipment grounding conductors is allowed, each having the same cross section as the outer conductors.

Cross section outer conductor	Minimum cross section equipment grounding conductor	
	Leakage current ≥ 3.5 mA	
	1 equipment grounding conductor	2 equipment grounding conductors
1,5 mm ² (AWG 16)	10 mm ² (AWG 8)	2 × 1,5 mm ² (AWG 16)
2,5 mm ² (AWG 14)		2 × 2,5 mm ² (AWG 14)
4 mm ² (AWG 12)		2 × 4 mm ² (AWG 12)
6 mm ² (AWG 10)		2 × 6 mm ² (AWG 10)
10 mm ² (AWG 8)		-
16 mm ² (AWG 6)	16 mm ² (AWG 6)	-
25 mm ² (AWG 4)		-
35 mm ² (AWG 2)		-
50 mm ² (AWG 1/0)	25 mm ² (AWG 4)	-
70 mm ² (AWG 2/0)	35 mm ² (AWG 2)	-
...	...	...

Fig.3-1: Minimum Cross Section of the Equipment Grounding Connection

3.3.2 Protective Extra-Low Voltage as Protection Against Electric Shock

Protective extra-low voltage is used to allow connecting devices with basic insulation to extra-low voltage circuits.

On components of an electric drive and control system provided by Bosch Rexroth, all connections and terminals with voltages between 5 and 50 volts are PELV ("Protective Extra-Low Voltage") systems. It is allowed to connect devices equipped with basic insulation (such as programming devices, PCs, notebooks, display units) to these connections.

Safety Instructions for Electric Drives and Controls

Danger to life, risk of injury by electric shock! High electrical voltage by incorrect connection!

If extra-low voltage circuits of devices containing voltages and circuits of more than 50 volts (e.g., the mains connection) are connected to Bosch Rexroth products, the connected extra-low voltage circuits must comply with the requirements for PELV ("Protective Extra-Low Voltage").

3.3.3 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of connected motors. Some common examples are:

- Improper or wrong wiring or cable connection
- Operator errors
- Wrong input of parameters before commissioning
- Malfunction of sensors and encoders
- Defective components
- Software or firmware errors

These errors can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring functions in the components of the electric drive and control system will normally be sufficient to avoid malfunction in the connected drives. Regarding personal safety, especially the danger of injury and/or property damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

Dangerous movements! Danger to life, risk of injury, serious injury or property damage!

A **risk assessment** must be prepared for the installation or machine, with its specific conditions, in which the components of the electric drive and control system are installed.

As a result of the risk assessment, the user must provide for monitoring functions and higher-level measures on the installation side for personal safety. The safety regulations applicable to the installation or machine must be taken into consideration. Unintended machine movements or other malfunctions are possible if safety devices are disabled, bypassed or not activated.

To avoid accidents, injury and/or property damage:

- Keep free and clear of the machine's range of motion and moving machine parts. Prevent personnel from accidentally entering the machine's range of motion by using, for example:
 - Safety fences
 - Safety guards
 - Protective coverings
 - Light barriers
- Make sure the safety fences and protective coverings are strong enough to resist maximum possible kinetic energy.
- Mount emergency stopping switches in the immediate reach of the operator. Before commissioning, verify that the emergency stopping equip-

Safety Instructions for Electric Drives and Controls

ment works. Do not operate the machine if the emergency stopping switch is not working.

- Prevent unintended start-up. Isolate the drive power connection by means of OFF switches/OFF buttons or use a safe starting lockout.
- Make sure that the drives are brought to safe standstill before accessing or entering the danger zone.
- Additionally secure vertical axes against falling or dropping after switching off the motor power by, for example,
 - mechanically securing the vertical axes,
 - adding an external braking/arrester/clamping mechanism or
 - ensuring sufficient counterbalancing of the vertical axes.
- The standard equipment **motor holding brake** or an external holding brake controlled by the drive controller is **not sufficient to guarantee personal safety!**
- Disconnect electrical power to the components of the electric drive and control system using the master switch and secure them from reconnection ("lock out") for:
 - Maintenance and repair work
 - Cleaning of equipment
 - Long periods of discontinued equipment use
- Prevent the operation of high-frequency, remote control and radio equipment near components of the electric drive and control system and their supply leads. If the use of these devices cannot be avoided, check the machine or installation, at initial commissioning of the electric drive and control system, for possible malfunctions when operating such high-frequency, remote control and radio equipment in its possible positions of normal use. It might possibly be necessary to perform a special electromagnetic compatibility (EMC) test.

3.3.4 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated by current-carrying conductors or permanent magnets of electric motors represent a serious danger to persons with heart pacemakers, metal implants and hearing aids.

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electric components!

- Persons with heart pacemakers and metal implants are not allowed to enter the following areas:
 - Areas in which components of the electric drive and control systems are mounted, commissioned and operated.
 - Areas in which parts of motors with permanent magnets are stored, repaired or mounted.
- If it is necessary for somebody with a heart pacemaker to enter such an area, a doctor must be consulted prior to doing so. The noise immunity of implanted heart pacemakers differs so greatly that no general rules can be given.
- Those with metal implants or metal pieces, as well as with hearing aids, must consult a doctor before they enter the areas described above.

Safety Instructions for Electric Drives and Controls

3.3.5 Protection Against Contact With Hot Parts

Hot surfaces of components of the electric drive and control system. Risk of burns!

- Do not touch hot surfaces of, for example, braking resistors, heat sinks, supply units and drive controllers, motors, windings and laminated cores!
- According to the operating conditions, temperatures of the surfaces can be **higher than 60 °C (140 °F)** during or after operation.
- Before touching motors after having switched them off, let them cool down for a sufficient period of time. Cooling down can require **up to 140 minutes!** The time required for cooling down is approximately five times the thermal time constant specified in the technical data.
- After switching chokes, supply units and drive controllers off, wait **15 minutes** to allow them to cool down before touching them.
- Wear safety gloves or do not work at hot surfaces.
- For certain applications, and in accordance with the respective safety regulations, the manufacturer of the machine or installation must take measures to avoid injuries caused by burns in the final application. These measures can be, for example: Warnings at the machine or installation, guards (shields or barriers) or safety instructions in the application documentation.

3.3.6 Protection During Handling and Mounting

Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!

- Observe the relevant statutory regulations of accident prevention.
- Use suitable equipment for mounting and transport.
- Avoid jamming and crushing by appropriate measures.
- Always use suitable tools. Use special tools if specified.
- Use lifting equipment and tools in the correct manner.
- Use suitable protective equipment (hard hat, safety goggles, safety shoes, safety gloves, for example).
- Do not stand under hanging loads.
- Immediately clean up any spilled liquids from the floor due to the risk of falling!

3.3.7 Battery Safety

Batteries consist of active chemicals in a solid housing. Therefore, improper handling can cause injury or property damage.

Risk of injury by improper handling!

- Do not attempt to reactivate low batteries by heating or other methods (risk of explosion and cauterization).
- Do not attempt to recharge the batteries as this may cause leakage or explosion.
- Do not throw batteries into open flames.
- Do not dismantle batteries.

Safety Instructions for Electric Drives and Controls

- When replacing the battery/batteries, do not damage the electrical parts installed in the devices.
- Only use the battery types specified for the product.



Environmental protection and disposal! The batteries contained in the product are considered dangerous goods during land, air, and sea transport (risk of explosion) in the sense of the legal regulations. Dispose of used batteries separately from other waste. Observe the national regulations of your country.

3.3.8 Protection Against Pressurized Systems

According to the information given in the Project Planning Manuals, motors and components cooled with liquids and compressed air can be partially supplied with externally fed, pressurized media, such as compressed air, hydraulics oil, cooling liquids and cooling lubricants. Improper handling of the connected supply systems, supply lines or connections can cause injuries or property damage.

Risk of injury by improper handling of pressurized lines!

- Do not attempt to disconnect, open or cut pressurized lines (risk of explosion).
- Observe the respective manufacturer's operating instructions.
- Before dismantling lines, relieve pressure and empty medium.
- Use suitable protective equipment (safety goggles, safety shoes, safety gloves, for example).
- Immediately clean up any spilled liquids from the floor due to the risk of falling!



Environmental protection and disposal! The agents (e.g., fluids) used to operate the product might not be environmentally friendly. Dispose of agents harmful to the environment separately from other waste. Observe the national regulations of your country.

3.4 Explanation of Signal Words and the Safety Alert Symbol

The Safety Instructions in the available application documentation contain specific signal words (DANGER, WARNING, CAUTION or NOTICE) and, where required, a safety alert symbol (in accordance with ANSI Z535.6-2011).

The signal word is meant to draw the reader's attention to the safety instruction and identifies the hazard severity.

The safety alert symbol (a triangle with an exclamation point), which precedes the signal words DANGER, WARNING and CAUTION, is used to alert the reader to personal injury hazards.



In case of non-compliance with this safety instruction, death or serious injury will occur.

Safety Instructions for Electric Drives and Controls

** WARNING**

In case of non-compliance with this safety instruction, death or serious injury **could** occur.

** CAUTION**

In case of non-compliance with this safety instruction, minor or moderate injury could occur.

NOTICE

In case of non-compliance with this safety instruction, property damage could occur.

4 Introduction

4.1 General Information

The mark stream sensor is intended for use together with a drive system and the corresponding software of Bosch Rexroth.

The description in [chapter 6 "Commissioning the Mark Stream Sensor" on page 33](#) is limited to the connection and the commissioning of the mark stream sensor.

The mark stream sensor system consists of the PY-MSS01.1-T1 evaluation circuit and optionally of the PY-MSS01.1-O1 or PY-MSS01.2-O1/000,0 sensor optics.

Electric as well as optic connecting leads are available as accessories. The corresponding types are listed in [chapter 6.5 "Component Cabling" on page 47](#).



This documentation does not explain the integration of the PLC program of the RegisterControl into the machine program.

4.2 Licensing and Available Variants



The use of the RegisterControl function is subject to license. Depending on the application, one of the following 3 licenses used on the RegisterControl has to be acquired per control:

- FWS-IM*MLC-TEC-NNVRS-NN-REGI*EXT
- FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV1
- FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV2

For each control on which the function blocks are used, one license is required each (runtime license).

Einzellizenz Technologiebibliothek
Berechtigt zur Verwendung mit einer einzigen Steuerungsfirmware.

Single licence for technology library
Authorize the use with exactly one controller firmware.

TechLib RegisterControl Extended		
TechLib RegisterControl Extended		
Licence key (MNR): R911xxxxxx	Serial number: 1234567	Type code: FWS-IM*MLC-TEC-NNVRS-NN-REGI*EXT
		
Registration key WAHOF2-FBJYZF-8CSB0F-9DQO0D-9E8ZER		

Fig. 4-1: FWS-IM*MLC-TEC-NNVRS-NN-REGI*EXT license key

Introduction

Einzellizenz Technologiebibliothek Berechtigt zur Verwendung mit einer einzigen Steuerungsfirmware.		
Single licence for technology library Authorize the use with exactly one controller firmware.		
TechLib RegisterControl Advanced 1 TechLib RegisterControl Advanced 1		
Licence key (MNR): R911xxxxxx	Serial number: 1234567	Type code: FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV1
		
Registration key WAHOF2-FBJYZF-8CSB0F-9DQO0D-9E8ZER		

Fig.4-2: FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV1 license key

Einzellizenz Technologiebibliothek Berechtigt zur Verwendung mit einer einzigen Steuerungsfirmware.		
Single licence for technology library Authorize the use with exactly one controller firmware.		
TechLib RegisterControl Advanced 2 TechLib RegisterControl Advanced 2		
Licence key (MNR): R911xxxxxx	Serial number: 1234567	Type code: FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV2
		
Registration key WAHOF2-FBJYZF-8CSB0F-9DQO0D-9E8ZER		

Fig.4-3: FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV2 license key

The figures show the corresponding license keys. One license certificate has to be acquired per control to use the RegisterControl on this control system.

The content, the functional scope and the application area and the respective licenses are listed in the following:

FWS-IM*MLC-TEC-NNVRS-NN-REGI*EXT

- HMI for narrow web applications (up to twelve printing units, no decoupling and acceleration compensation)
- Firmware update tool
- Documentations: Application manual and library description
- Libraries: RMB_TechRegiExtended and RMB_TechRegiAdvanced

FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV1

- HMI for applications with clamping units (such as gravure printing) (up to twelve printing units, with decoupling and acceleration compensation)
- Firmware update tool
- Documentations: Application manual and library description
- Libraries: RMB_TechRegiExtended and RMB_TechRegiAdvanced

*FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV2*

- HMI for applications with clamping units (such as rotogravure printing) (up to 24 printing units, with decoupling and acceleration compensation)
- Firmware update tool
- Documentations: Application Manual and Library Description
- Libraries: RMB_TechRegiExtended and RMB_TechRegiAdvanced

Scalable solutions are available for simple narrow web applications with up to 12 printing units, for more complex applications with clamping units with up to 12 printing units and for applications with 24 printing units. In this documentation, writing is executed identically for all variants during the HMI operation and differences between the variants are listed separately.

4.3 Brief Description

Controlling the printing machine, especially the rotogravure printing machine, is very challenging due to its long web distances, the dryer behind each printing unit, the following cooling roll with high inertia and the clamping units at each printing unit. Therefore, an intelligent and complex RegisterControl was designed. It can be operated via a visualization.

This document describes the commissioning of the sensors as well as of the side register controllers and length register controllers by configuring the machine and the current print job. The HMI application can now be used to configure the machine. That means the sensors with their network settings can be assigned to the respective printing units. The machine configuration is generally executed only once. Furthermore, the individual print jobs are defined. Up to 300 print jobs can be created. In each print job, the active printing units are selected, the settings for the length registers and side registers are made, the control strategy and the reference color are selected and the material to be printed on is defined.

The current status is monitored via the visualization during the print job. It is possible to display trends and statistics and jog command values. The current diagnostic data can also be queried. The complete printing process can be monitored and parameterized via the HMI.

4.4 System Overview

The following figure shows a 4-color rotogravure printing machine with its system components.

Introduction

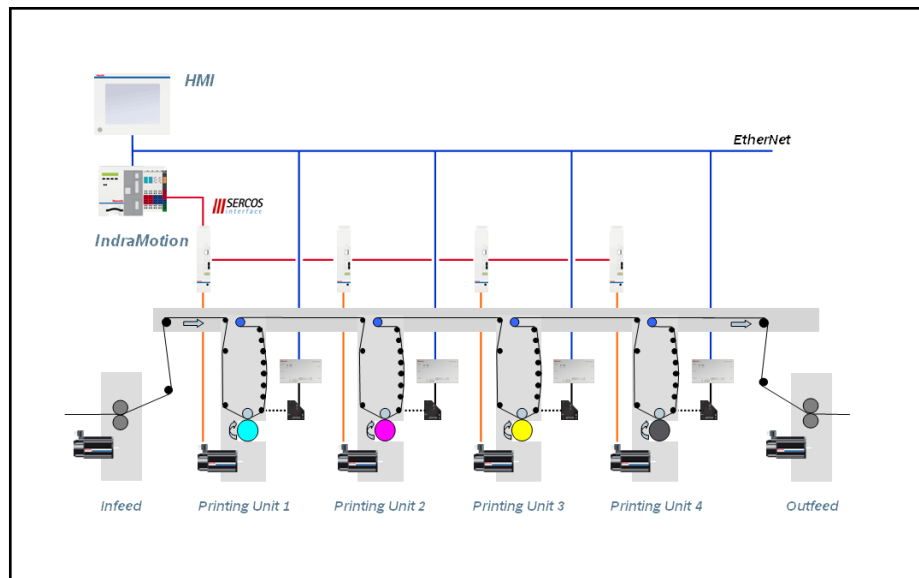


Fig. 4-4: System overview of the integrated RegisterControl

The rotogravure printing machine consists of an unwinder and an infeed, generally equipped with a tension controller or a dancer to control the web tension in the machine. At each printing unit, one color is printed on the material web, subsequently dried in the dryer and cooled via the cooling roll before the next color is printed.

Each printing unit prints a register mark on the border of the material web. This mark is measured by the mark stream sensor. For this purpose, a sensor system is located behind each printing unit. The sensor system measures the distance between the register marks. The measured values are sent to the control (IndraMotion MLC) via Ethernet. The RegisterControl is implemented in the control. The RegisterControl calculates the respective control variables and provides them to the respective drive system. Thus, the printing images are printed congruently on top of each other.

To parameterize the RegisterControl and to monitor the actual state, a visualization (HMI) is provided. A PC-based system (e.g. VPx,...) has to be used. The central visualization has to be realized on a 19" visualization device to be able to use the graphic display.

5 Drive Parameterization

5.1 Parameterization of the Incremental Encoder Emulation

The mark stream sensor requires information on velocity and position of the drive system to determine the measurement results and to detect the mark stream. Therefore, the drive has to be parameterized via IndraWorks and the corresponding Control Section Encoder Emulation Output card of the drive system has to be available. The drive has to be selected in IndraWorks and the **encoder emulation** can be parameterized via the axis name.

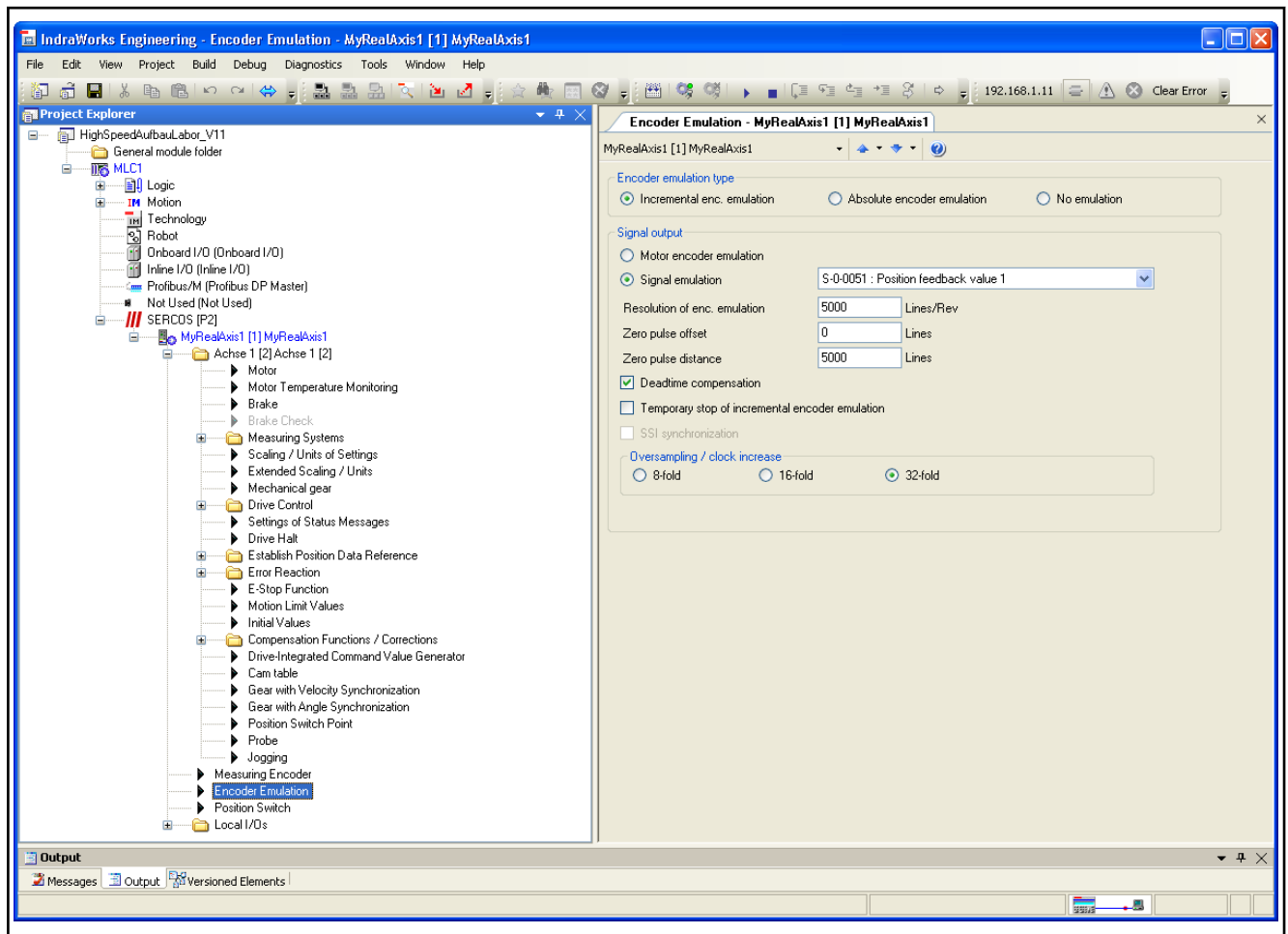


Fig.5-1: Parameterization of the incremental encoder emulation

For the encoder emulation type, the **incremental encoder emulation** and the emulation type **Signal emulation** has to be selected. Parameter S-0-0051 of the axis to be controlled should be used as signal selection. For a high accuracy, a resolution of the encoder emulation of 5000 lines/revolution is provided. The zero pulse distance has to correspond to the number of lines set. The dead time compensation and an oversampling rate of 32 has to be set. Due to these settings, a value of 5000 increments has to be transferred in the parameterization of the mark stream sensor. The mark stream sensor expects a 4-time internal evaluation of the increments.



Check the parameterization of the drive system since incorrect parameterizations can cause invalid measured values.

5.2 Checking the Correct Incremental Encoder Parameterization

The correct parameterization can be checked via the "Diag 1" LED of the mark stream sensor. For that purpose, the axis to be controlled has to rotate. A velocity of 60 rpm is recommended. The "Diag 1" LED flashes for 20ms each time there is a zero pulse of the incremental encoder emulation. That means that the LED flashes each second if the velocity is 60 rpm. Any other velocity can also be used. It has to be calculated for the respective interval. If the "Diag 1" LED does not flash in the desired interval, the parameterization has to be checked again. If the "Diag 1" LED does not flash, the correct cabling of the mark stream sensor with the drive system as well as the power supply has to be checked.



The correct parameterization of the increments can be checked via the displayed velocity in the visualization and via the actual value of the parameter A-0-0102 in IndraWorks. If the velocities deviate from each other, it has to be checked whether the transferred printing cylinder format and the number of increments at the mark stream sensor are correct.



If the LED does not flash, the direction of rotation of the emulated axis has to be checked as well.

6 Commissioning the Mark Stream Sensor

6.1 General Information

This chapter describes the technical data and the handling of the mark stream sensor. Including the

- mounting of the evaluation circuit
- mounting of the sensor optics PY-MSS01.1-O1 and PY-MSS01.2-O1/000.0
- connection assignment
- cabling components
- display and operating elements for diagnostic purposes
- technical data
- ambient conditions
- demounting, repairs and maintenance

The sensor optics PY-MSS01.2-O1/000,0 is available in different fiber optic lengths. The fiber optic length is specified in meters in the order description: e.g. PY-MSS01.2-O1/006,5 for 6.5 meters. PY-MSS01.2-O1/000,0 is used as general description in this document for all lengths.

6.2 Mounting the Evaluation Circuit of the Mark Stream Sensor

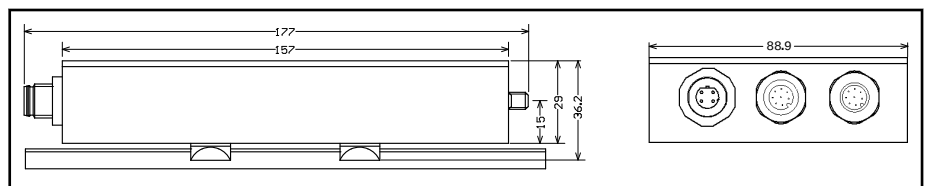
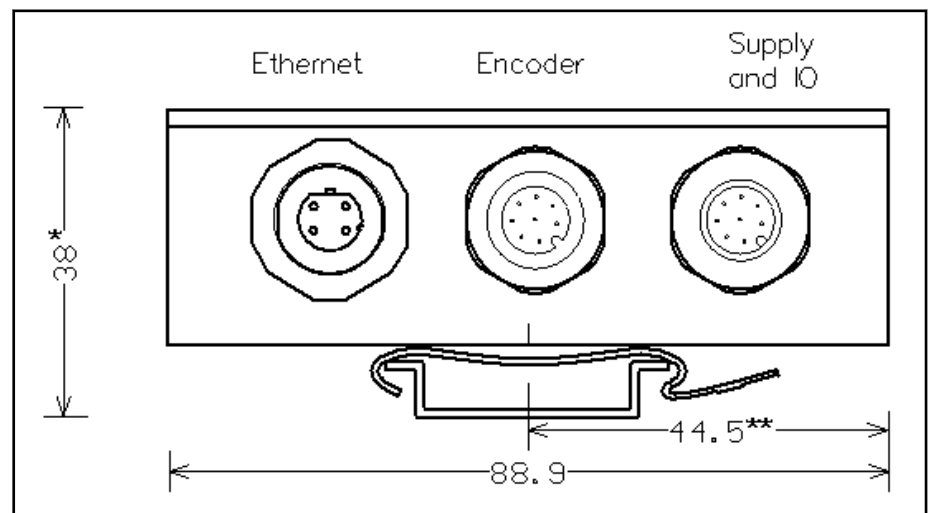


Fig. 6-1: Measurements of the evaluation circuit

The evaluation circuit is to be mounted on a mounting rail (standard C-rail 30 x 3.5 mm) with the clamp, as shown in the following figure.



* Approximate measurement, irrespective of the mounting rail

** Approximate measurement

Fig. 6-2: Evaluation circuit with mounting rail

Commissioning the Mark Stream Sensor

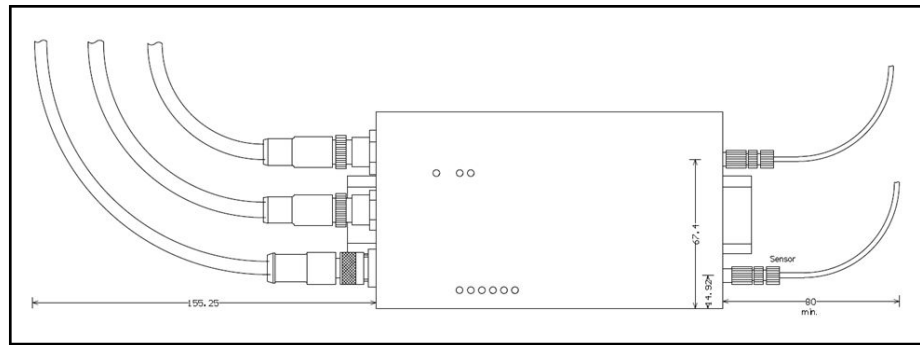


Fig.6-3: Lateral free space for connecting cables of the evaluation circuit

The evaluation circuit has to be outside the area exposed to explosion hazards. The mounting rail has to be grounded.

NOTICE
Electrostatic discharge sensitive devices!

Please note the required preventive measures when handling electrostatic discharge sensitive devices! (EN 61340-5-1, EN 61340-5-2)!

CAUTION
Glare by strong light source!

Mounting or exchanging the module may only be carried out by qualified personnel! The internal white light source is very powerful. Do not look directly into the light source or into the connected fiber optics!

6.3 Mounting the Optics of the Mark Stream Sensor

Two optic types are available. Differences of the two types: The mechanic measurements and mounting of the fiber optics.



A second optic type (PY-MSS01.2-O1/000.0) can be selected. The fiber optics are protected by a metallic sleeve bearing. The optic dimensions differ. This has to be taken into consideration during the mounting. The correct alignment has to be ensured by the protective cap.



If it is not differentiated between the optic types, the description is valid for both types.

Sensor optics PY-MSS01.1-O1

The optics of the mark stream sensor has to be mounted to a cross beam using mounting holes.

Commissioning the Mark Stream Sensor



Fig. 6-4: Sensor optics PY-MSS01.1-O1

NOTICE

The minimum bending radius must not be fallen below!

The valid bending radius of 50 mm must not be fallen below at any times for the fiber optics.

It should be possible to adjust the holder in lateral direction as well as in its distance by means of several adjusting screws. Furthermore, the sensor optics should be mounted at a position with the minimum amount of vibration to ensure a higher accuracy. The sensor optics PY-MSS01.1-O1 has the following dimensions.

Commissioning the Mark Stream Sensor

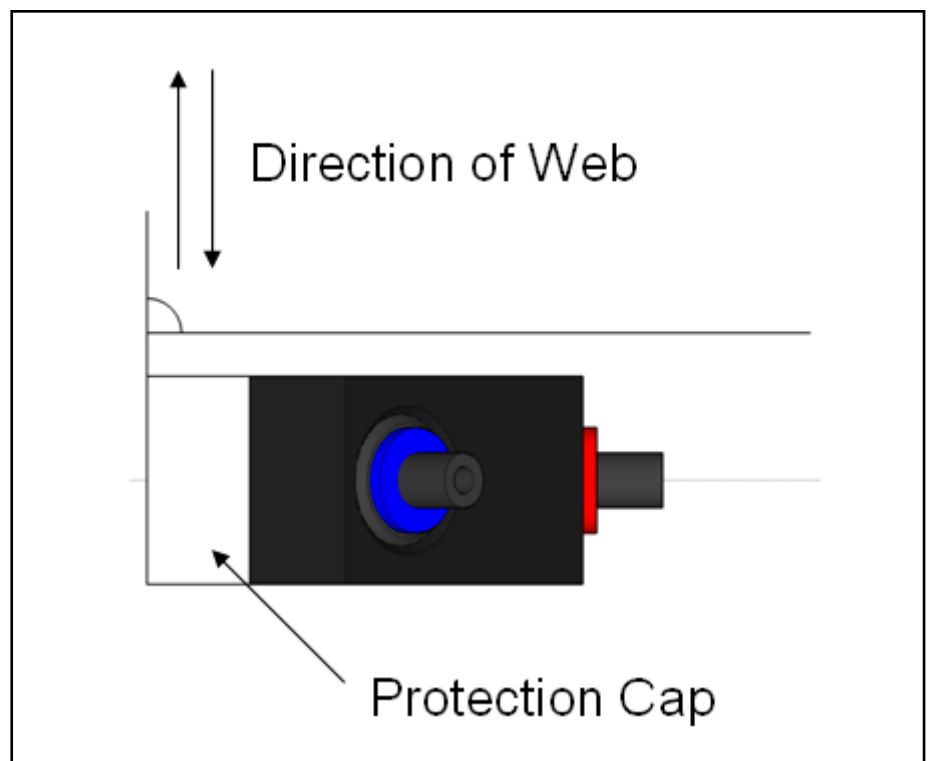


Fig.6-6: Parallel mounting of the optics

This can also be carried out with the protection cap when the protection cap has only a minimum contact with the material web. The following figure shows the mounting of the sensor optics using the protection cap.

Commissioning the Mark Stream Sensor

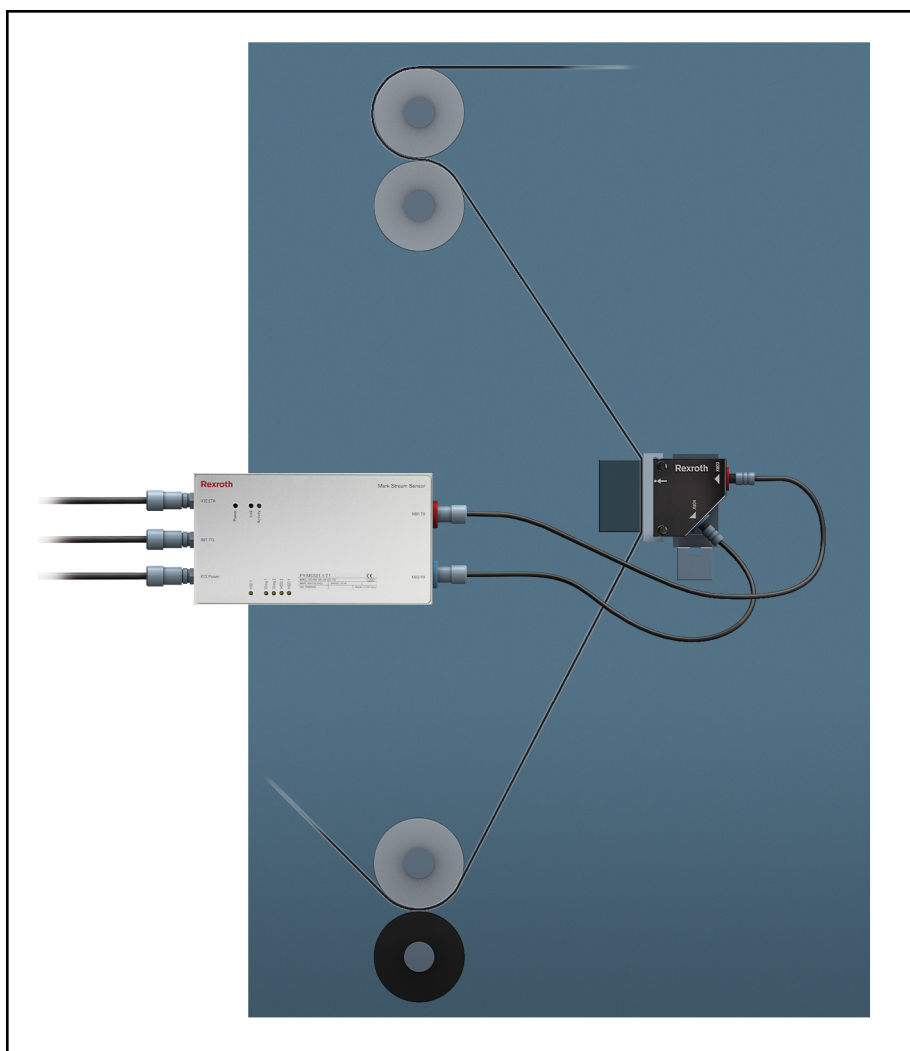


Fig.6-7: Mounting of the optics at the material web using the protection cap



Mount the optic horizontally to the traverse.

The protection cap defines the exact distance between the optics and the material web. After the optics has been correctly aligned, the protection cap may be carefully removed.



Please ensure that the optics is not displaced when removing the protective cap, as a change in distance might result in incorrect measurement signals.

After the protection cap has been removed, the sensor is in a correct distance to the material web and a highly-precise measurement can be guaranteed:

Commissioning the Mark Stream Sensor

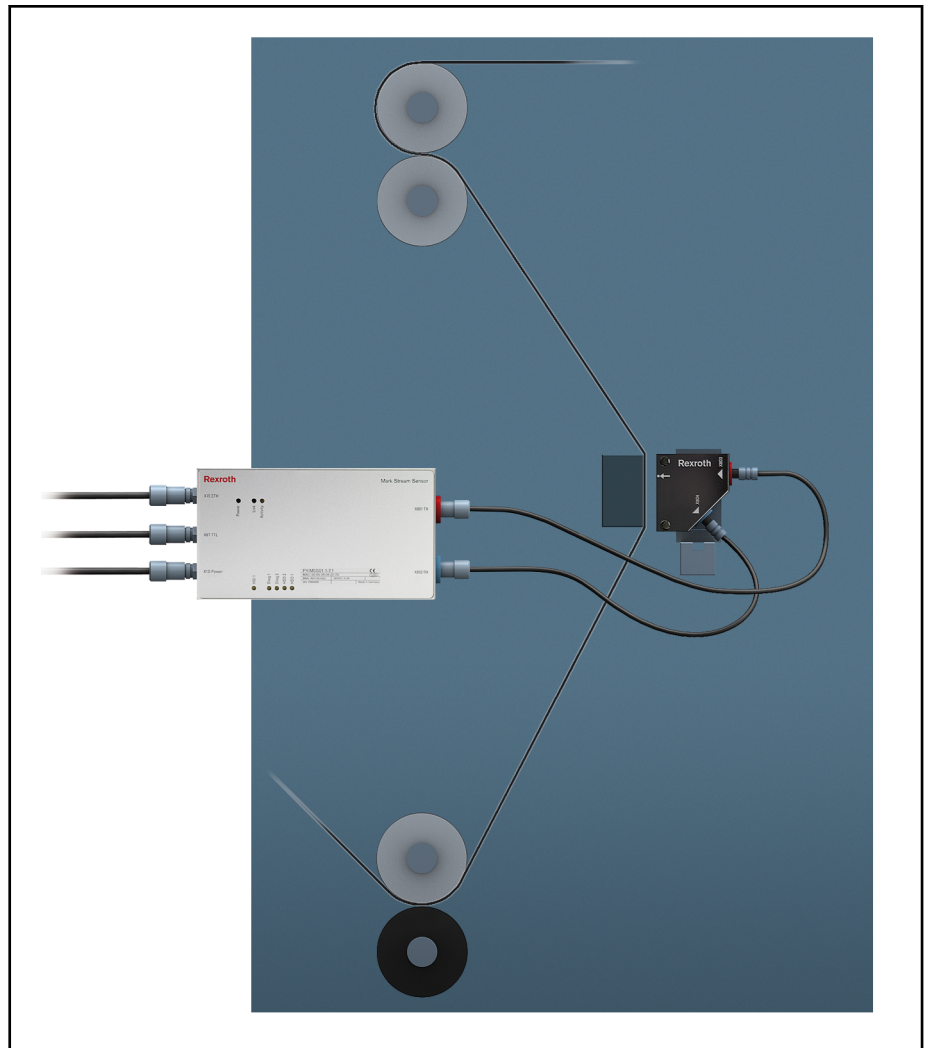


Fig.6-8: Mounting the optics after removal of the protection cap



If the position of the sensor optics is displaced in a new production, it is strongly recommended to place the protection cap again and to use it for the optimum alignment of the optics.



The protection cap should be fixed again if the optics is not used (e.g. when cleaning the machine) to protect the optics from pollution.

Sensor optics PY-MSS01.2-
O1/000.0

The optics of the mark stream sensor has to be mounted to a cross beam using mounting holes.

Commissioning the Mark Stream Sensor

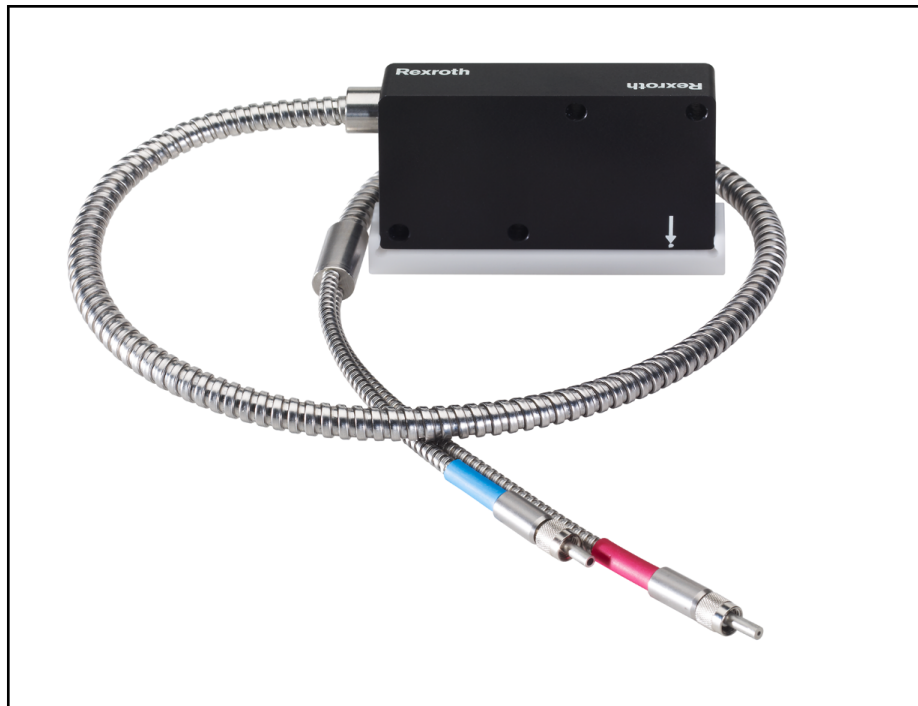


Fig. 6-9: Sensor optics PY-MSS01.2-O1/000.0

NOTICE

The minimum bending radius must not be fallen below!

The permissible bending radius of 50 mm must not be fallen below at any times for the fiber optics.

The holder used should be adjustable in lateral direction as well as in its distance via several adjusting screws. Furthermore, the sensor optics should be mounted at a low vibration position to ensure a higher accuracy. The fiber optic is firmly attached to the optics and protected by a protective sleeve. The fiber optics are only connected to the evaluation box in the sensor optics PY-MSS01.2-O1/000.0. The sensor optics PY-MSS01.2-O1/000.0 has the following dimensions.

Commissioning the Mark Stream Sensor

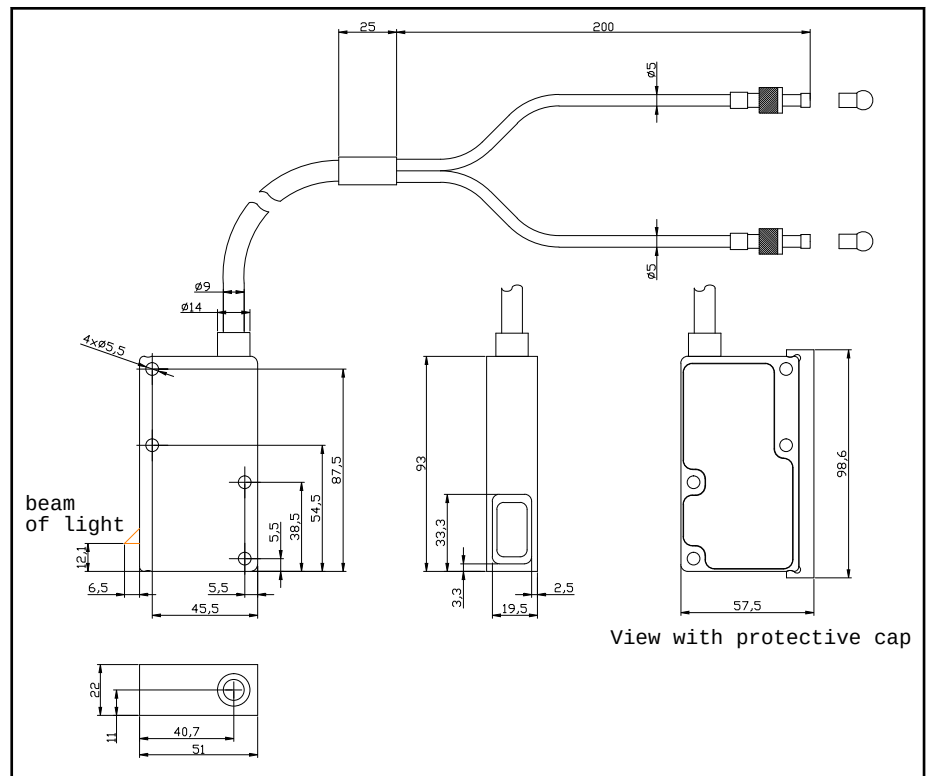


Fig. 6-10: Sensor optic dimensions PY-MSS01.2-O1/000.0



The optics should be mounted on an area that is electrically conducting and connected to a grounding conductor!



The background the light spot is focusing on has to be single-colored and should not reflect. A matt background is recommended. To optimize the background, a background with color information is recommended.

The fiber optic spiral hose is available in lengths of 2 m - 6 m, in steps of 0.5. The fiber hose cannot be separated from the optics.

The material web with the marks to be detected has to have with a fixedly defined distance to the optics that corresponds exactly to the distance of the protection cap. The sensor optics has to be mounted parallel to the material web. The sensor optics can be mounted by means of the protective cap. The protective cap has only minimum contact with the material web (see [fig. 6-7 "Mounting of the optics at the material web using the protection cap" on page 38](#)).

The protection cap defines the exact distance between the optics and the material web. After the optics has been correctly aligned, the protection cap may be carefully removed.



Please ensure that the optics is not displaced when removing the protective cap, as a change in distance might result in incorrect measurement signals.

After the protective cap has been removed, the sensor is positioned in a correct distance to the material web and a high-precision measurement can be

Commissioning the Mark Stream Sensor

guaranteed (see [fig. 6-8 "Mounting the optics after removal of the protection cap" on page 39](#)).



If the position of the sensor optics is displaced in a new production, it is strongly recommended to place the protection cap again and to use it for the optimum alignment of the optics.



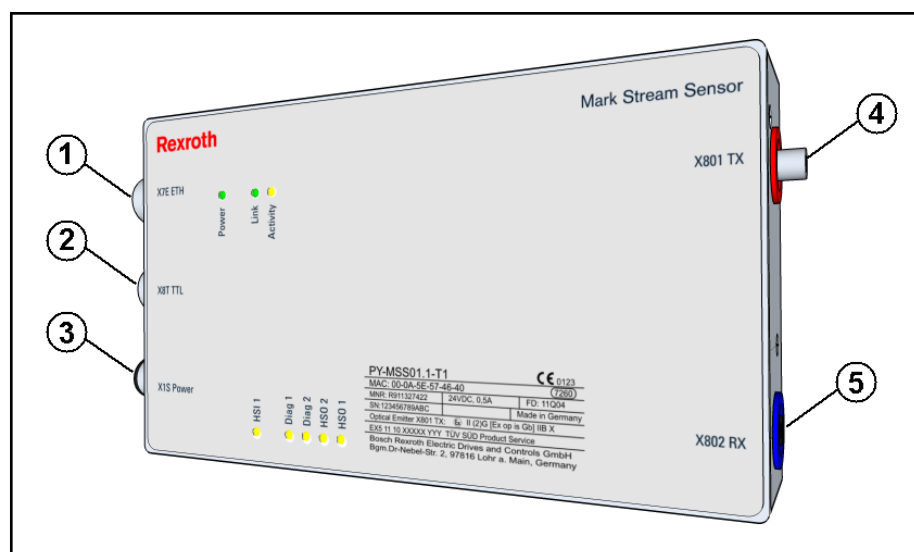
The protection cap should be fixed again if the optics is not used (e.g. when cleaning the machine) to protect the optics from pollution.

Additional mounting instructions

- Mount the mark stream sensor to ensure an ergonomic operation. The operator has to be able to see the machine parts at all times!
- Avoid positions of installation that are exposed to direct sunlight, as this can result in additional warming
- Mount the optics so that it can be displaced and aligned at a right angle to the material web
- Stay away as far as possible from interference sources.
- Install all connecting cables in loops and use strain reliefs for all cables
- Provide sufficient space for mounting, demounting, plug connectors and the cable length

6.4 Connections at the Mark Stream Sensor

6.4.1 Overview



- ① Ethernet connection, X7E ETH
- ② Incremental encoder connection, X8T TTL
- ③ Power supply connector, X1S Power
- ④ Fiber optic connection, X801 TX
- ⑤ Fiber optic connection, X802 RX

Fig.6-11: Overview of the connections at the mark stream sensor PY-MSS01.1-T1

Commissioning the Mark Stream Sensor

6.4.2 Description of the Connections

General Information

⚠ CAUTION

Malfunctions due to insufficient shielding!

Only use shielded cables and metallic, conductive plug connectors or coupling housing with a large shield connection.

Connection and Connector Types

Housing label	Connection type	Connector type (installed)	Mating connector or connection (external)
X7E ETH	Network connection: Ethernet 10Base T or 100Base TX	4-pin circular connector, M12	4-pin circular connector M12 x 1, straight
X8T TTL	Incremental encoder connection	8-pin circular connector, M12	8-pin circular connector M12 x 1, straight
X1S Power	Power supply 24 V DC	8-pin circular connector, M12	8-pin circular connector, M12 x 1, straight
X801 TX	Fiber optic output of evaluation circuit	SMA connector for fiber optics	SMA connector for fiber optics
X802 RX	Fiber optic input of evaluation circuit	SMA connector for fiber optics	SMA connector for fiber optics

Fig.6-12: Connection and connector types

NOTICE

Plugging or removing connections under voltage can damage the mark stream sensor!

Disconnect the power supply before attaching or loosening connections!



Only cables provided by Bosch Rexroth can be used to connect the mark stream sensor.

24 V DC Power Supply X1S Power

All internally required voltage is generated with galvanic isolation via a DC/DC converter. The connection is an 8-pin M12 circular connector.

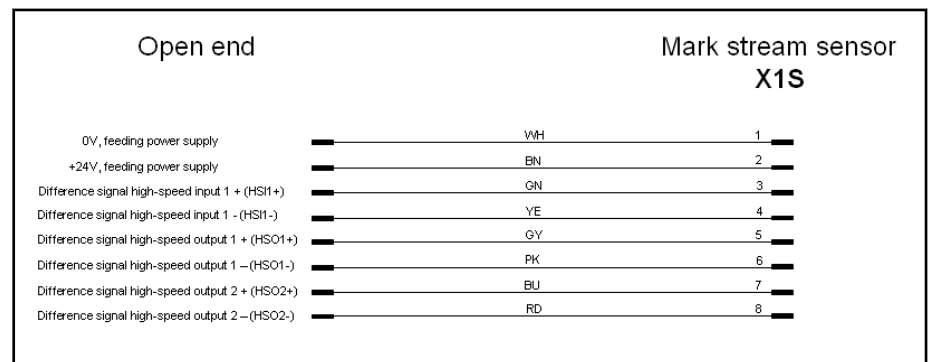


Fig.6-13: Feeding power supply at X1S Power

Commissioning the Mark Stream Sensor

Pin	Color	Function
1	White	0 V, feeding power supply
2	Brown	+24 V, feeding power supply
3	Green	Difference signal high-speed input 1 + (HSI1+)
4	Yellow	Difference signal high-speed input 1 - (HSI1-)
5	Grey	Difference signal high-speed output 1 + (HSO1+)
6	Pink	Difference signal high-speed output 1 - (HSO1-)
7	Blue	Difference signal high-speed output 2 + (HSO2+)
8	Red	Difference signal high-speed output 2 - (HSO2-)

Fig.6-14: Pin assignment: X1S Power

 CAUTION

Damaging the mark stream sensor by reverse polarity and input voltages that are too high!

The mark stream sensor is reverse polarity protected. A reverse polarity of the 24-V power supply to X1S Power does not damage the device. Overvoltages higher than 35 V for more than 500 ms results in damaged components in the power supply area of the device.

Ethernet interface X7E ETH

The mark stream sensor can be connected to an Ethernet network via the Ethernet interface. The interface is a 4-pin M12 circular connector.

M12 circular connector, 4-pin	
Type	Ethernet 10Base T/100Base TX
Cable length	Max. 100 m
Cable type	Shielded, twisted pair, Cat 5
Transmission rate	10 or 100 MBit/s

Fig.6-15: Technical data of the Ethernet interface

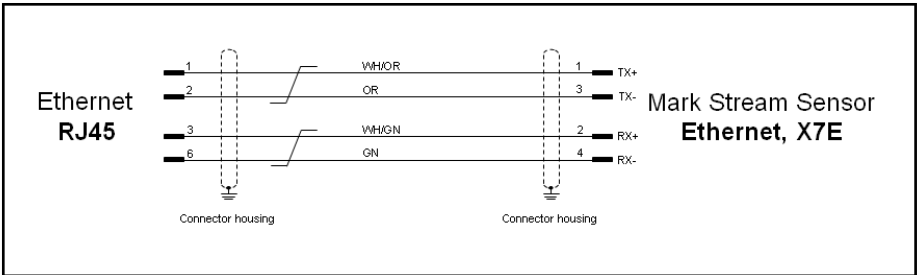


Fig.6-16: Connecting lead at X7E ETH

Pin	Function
1	TX+
2	RX+

Commissioning the Mark Stream Sensor

Pin	Function
3	TX-
4	RX-

Fig.6-17: Pin assignment X7E ETH

NOTICE

The PY-MSS01.1-T1 mark stream sensor is not intended for connection to telecommunications networks!

Do not connect the device to a telecommunications network.

Incremental Encoder Interface X8T TTL

Via the incremental encoder interface, the mark stream sensor can be connected to a drive of Bosch Rexroth via the control unit option encoder emulation output card to transmit the velocity information to the mark stream sensor.

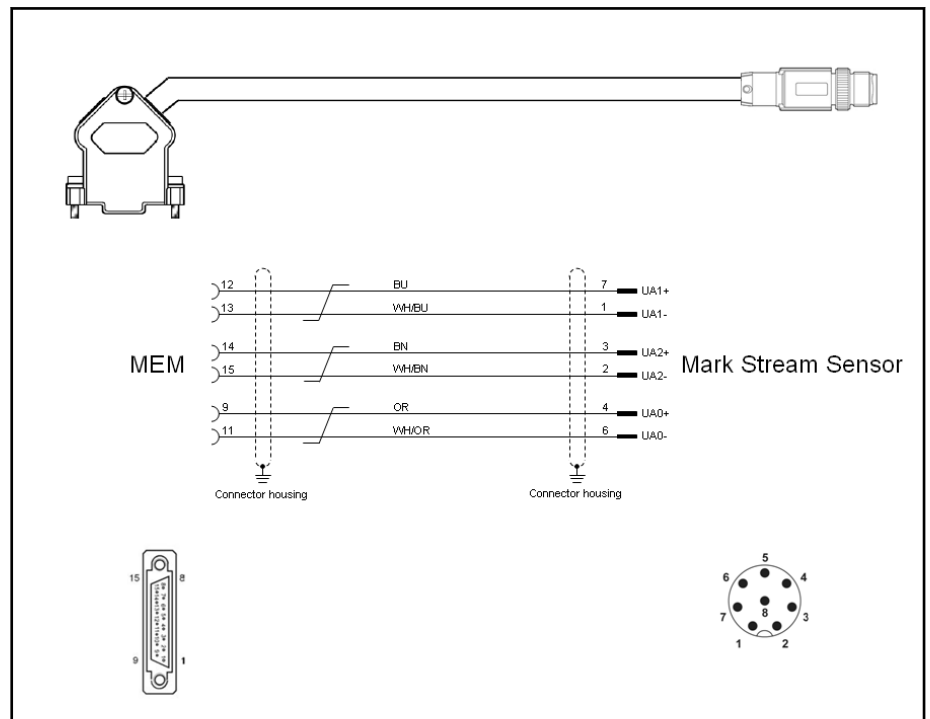


Fig.6-18: Connection lead to X8T TTL

PIN	Color	Function
1	White / blue	Incremental encoder track A (A-)
2	White / brown	Incremental encoder track B (B-)
3	Brown	Incremental encoder track B (B+)
4	Orange	Incremental encoder reference track C (C+)
5	White / green	Not connected

Commissioning the Mark Stream Sensor

PIN	Color	Function
6	White / orange	Incremental encoder reference track C (C-)
7	Blue	Incremental encoder track A (A+)
8	Green	Not connected

Fig.6-19: X8T TTL pin assignment



Only connect the incremental encoder interface to the control unit option encoder emulation output card of the drive system provided by Bosch Rexroth.

Fiber Optic Interfaces X801 TX and X802 RX

The fiber optics are connected with an SMA connector. A transmission starts at the sender output and ends at the recipient input. The transmission distance consists of fiber optics. Plastic fiber optics are used. The cable lengths are available in steps of 0.5 and can be freely configured. The minimum cable length is 2 m, the maximum cable length is 6 m. The fiber optic output of the evaluation circuit X801 TX is connected to the fiber optic input of the X803 optics using an fiber optic connection (in red). The fiber optic input of the evaluation circuit X802 RX is connected to the fiber optic output of the X804 optics using an fiber optic connection (in blue).

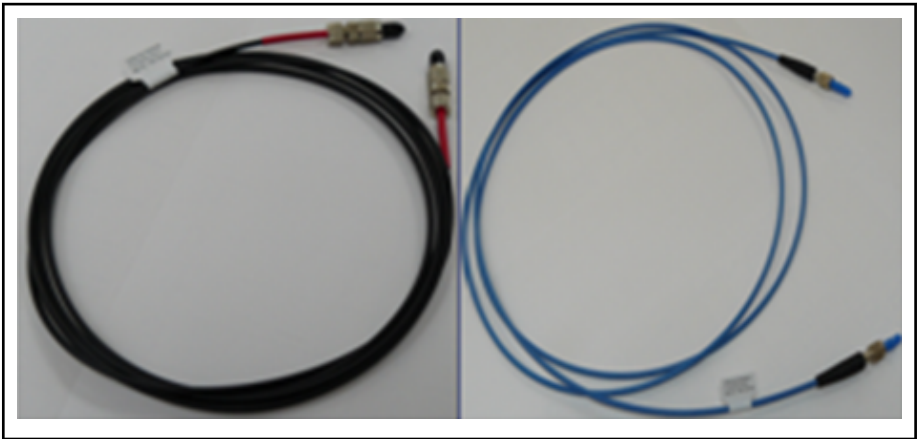


Fig.6-20: Fiber optics for use with PY-MSS01.1-O1



When using the PY-MSS01.2-O1/000,0 optics, both fiber optics are attached to the optics and is protected by a protective sleeve. The length of the fiber optic connection is selected when ordering the optics. Blue and red labeling at the fiber optics and the evaluation circuit is used for assignment at the evaluation circuit.

 **WARNING**

Light with high energy.
Danger of blindness and eye injuries.

Do not look into the ray of light (sender output or end of fiber optic).

Commissioning the Mark Stream Sensor

NOTICE

Error in handling and mounting.

The fiber optic components can be mechanically destroyed.

Do not tighten the fiber optic connector too tightly.

NOTICE

Error in handling and mounting.

The fiber optic can be damaged.

Comply with valid mechanic limit values.

6.5 Component Cabling

First, connect the sensor optics and the evaluation circuit by means of cables. Connect the blue fiber optic to the blue labeling of the sensor optics and the evaluation circuit. The fiber optics have to be firmly and completely mounted to ensure the transmitting power. The fibre optic with the red labeling has to be mounted on the red-labeled ports of the evaluation circuit and the sensor optics.

⚠ WARNING

The explosion protection can be compromised by interchanging the two fibre optics!

Check for color coding.

NOTICE

The minimum bending radius must not be fallen below!

The valid bending radius of 50 mm cannot be fallen below at any times for the fibre optics.



The fibre optics only have to be connected to the evaluation circuit in the PY-MSS01.2-O1/000,0 sensor optics as it is attached to the optics and protected by a protective sleeve.

The correct distance between the sensor optics has to be checked and only then the protection cap can be removed from the sensor optics. Finally, connect the evaluation circuit to the control and the drive system using cables. The cabling has to be carried out as shown in the following:

Commissioning the Mark Stream Sensor

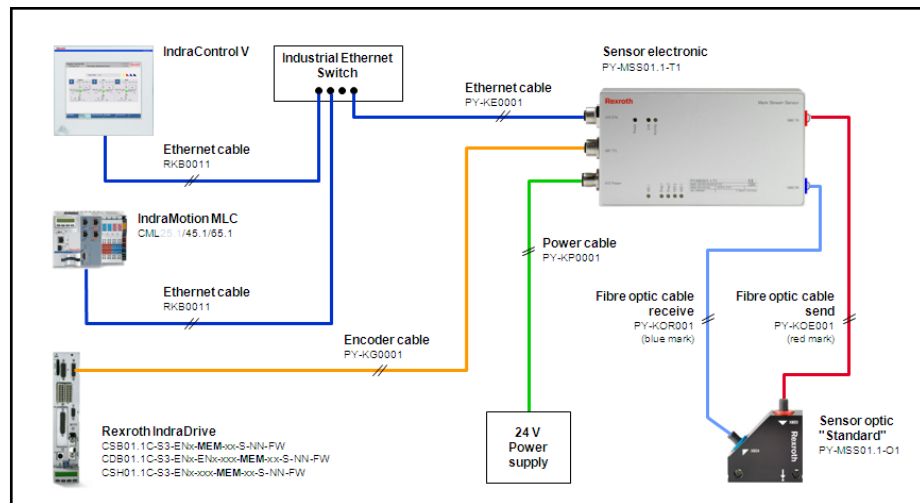


Fig.6-21: Cabling of the mark stream sensor system with the sensor optics PY-MSS01.1-O1

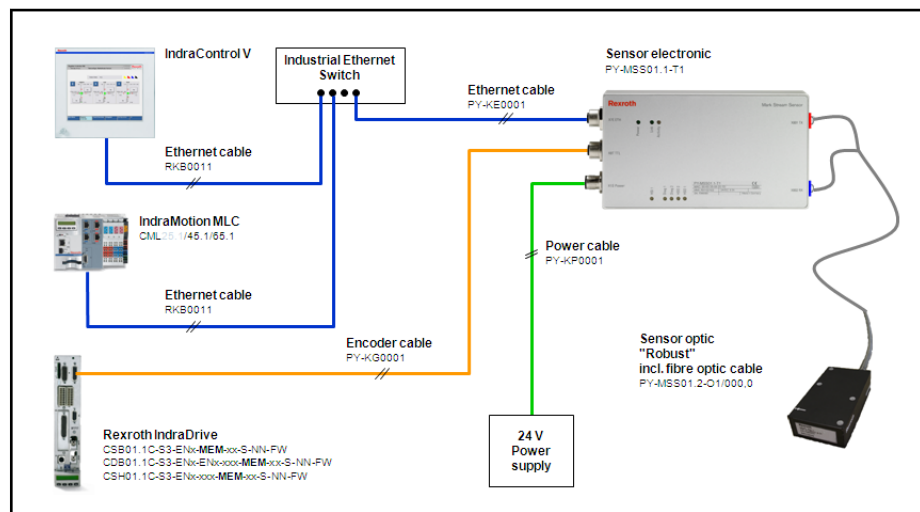


Fig.6-22: Cabling of the mark stream sensor system with the sensor optics PY-MSS01.2-O1/000,0

Connect the incremental encoder port to the control option encoder emulation output card of the respective drive. It should be the drive that is to be controlled with the measured values of the mark stream sensor. The Ethernet connection to the control is now to be established. This is generally carried out via an industrial Ethernet switch. Subsequently, a 24 V power supply has to be applied. Thus, the green "Power" LED and the "Link" LED flash if an Ethernet connection is established. All sensors have to be cabled again and subsequently be checked.

6.6 Display and Operating Components of the Mark Stream Sensor

6.6.1 General Information

Several LEDs can be used to display and diagnose the current status of the mark stream sensor on top of the evaluation circuit. The LEDs can still be used to diagnose errors.

Commissioning the Mark Stream Sensor

6.6.2 Operating Mode and Error Displays

Two LED rows to display the device status and errors are contained on the evaluation circuit.

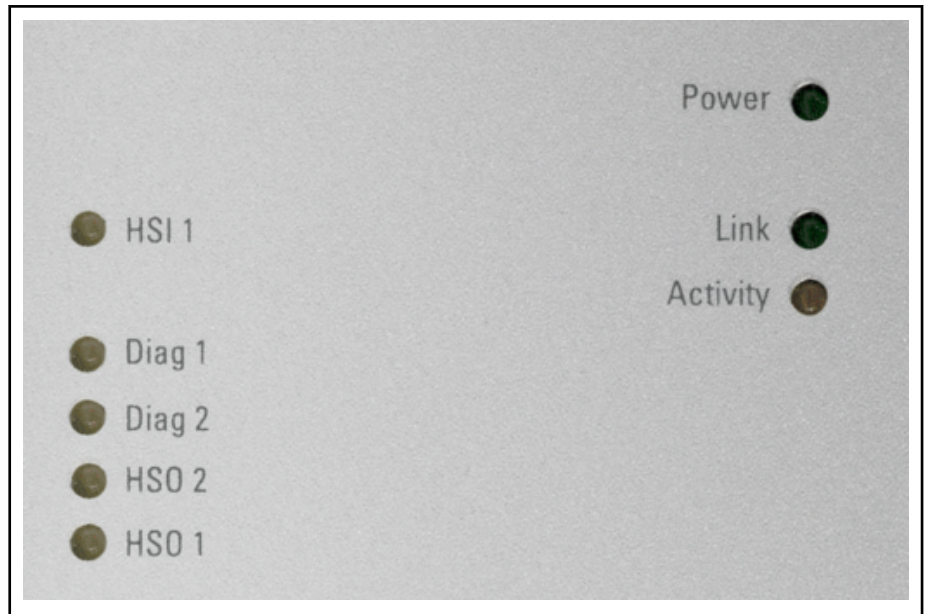


Fig.6-23: LEDs of the evaluation circuit

The description of the display devices as well as actions in case of errors are listed in the following table (fig. 6-24 "LEDs for operation and error display on the evaluation circuit" on page 49).

Symbol or LED	Display	Description	Actions
Power	LED green ON	Normal mode	–
	LED green OFF	No power supply DC 24 V	Check supply voltage at the power supply!
Link	LED green ON	Ethernet connection established	–
	LED green OFF	No Ethernet connection	Check Ethernet connection!
Activity	LED flashing in yellow	Ethernet data traffic	–
	LED yellow off	No Ethernet data traffic	–
HSI 1	Reserved	Reserved	–
Diag 1	LED flashing in yellow	The LED flashes for 20 ms if the sensor receives a zero pulse from the incremental encoder emulation	–
	LED yellow off	No zero pulse by the incremental encoder simulation	Check, if the axis is rotating! Check the incremental encoder connection! Check the parameterization of the incremental encoder emulation

Commissioning the Mark Stream Sensor

Symbol or LED	Display	Description	Actions
Diag 2	LED yellow on	The sensor sends a measuring package with at least one valid measurement result	–
	LED yellow off	The sensor does not send any measurement results or no valid measured data is available.	Check, if the measurement has been started. Check if the configuration is correct
HSO 2	Reserved	Reserved	–
HSO 1	LED yellow on	The LED flashes if the sensor generates a 24 V signal.	–
	LED yellow off	Sensor does not generate a 24 V signal	Check, if 24 V is activated in the sensor

Fig.6-24: LEDs for operation and error display on the evaluation circuit

The "HSO 1" LED is only required if the path/cylinder measurement method has been parameterized with 24 V for the sensor. Otherwise, this LED can be ignored. "Diag 1" has to flash if the referenced axis is rotating and a correct configuration has been transmitted to the sensor. "Diag 2" indicates that valid measurement packages have been send after the start of the measurement.

6.6.3 Electronic Type Plate

The device has an electronic type plate. The device data is stored zero voltage proof in this type plate. The plate contains the following device data:

1. operation hour counter
2. Serial number
3. Index
4. Parts number
5. Type designation code

The data is entered in the electronic type plate during manufacturing. The content of the electronic type plate can be displayed via the "MB_RegiSensor01ReadDiagType01" function block of the "RMB_TechRegiExtended" library.

6.7 Technical Data of the Mark Stream Sensor

The following table shows the important data of the mark stream sensor:

Sampling frequency	250 kHz
Resolution	16 bit per channel
Sensitivity	8 amplifying stage in the ratio 2:1
Light source	Power-limited white light source PR0138, current-controlled operation
Interfaces	Incremental encoder connection, M12 8-pin circular connector Ethernet interface, M12 4-pin circular connector Power supply, M12 8-pin circular connector Connecting the optics via 2 fibre optics with SMA port

Commissioning the Mark Stream Sensor

Digital interface	1 differential input for a signal level of 24 V 2 differential outputs for high speed signals with levels of 24 V. Current-limitation of 30 mA, suitable for connection lengths for up to 5 m and an edge steepness of < 2 µs
Weight	0.3 kg
Protection class	IP 54
Power supply	DC 24 V (19 V to 30 V)
Manufacturing date	The manufacturing data is specified as quarter FD on the type place after the label "FD:" according to DIN ISO 8601. Structure of the 5-digit alphanumerical quarter FD: Year (2 digits), quarter (1 digit) and quarter of the current year (2 digits) = YYQqq Example: 11Q04 = 4. quarter 2011
Maximum path velocity	1200 m/min (= 20m/s)
Setting up velocity	At least 10 m/min (0.17 m/s)
Format length	0.3 m – 1.5 m
Printing materials	Cardboard (folding carton), plastic foil (BOPP, PET, LDPE,...) and aluminum foil, laminate and paper
Number of colors	12 registration marks max. at the same time
Colors	Solvent colors, watercolors, UV colors, varnishes (ethyl acetate and ethanol)
Length of the mark sample	Results from the number of colors and mark distances
Other printing	Printing before and after the mark pattern is possible, but not during the mark pattern

Fig. 6-25: Technical data of the Rexroth mark stream sensor

6.8 Ambient Conditions

	In operation	Storage/transport
Ambient temperature	+5 ... +55 °C	-25°C to +70 °C Fibre optic, max. 60 °C
Relative humidity	RH-2; 5% up to 95% acc. to DIN EN 61131-2, be-dewing not permissible.	RH-2; 5% up to 95% acc. to DIN EN 61131-2, be-dewing not permissible.
Air pressure	Up to 2000 m above NN according to EN 61131-2	Up to 3000 m above NN according to EN 61131-2
Mechanical strength	Maximum vibration: Frequency range: 10...150 Hz Displacement: 0.075 mm at 10...57 Hz Acceleration: 1 g for 57...150 Hz According to EN 60068-2-6	Maximum shock: 15 g according to EN 60068-2-27, no malfunction

Commissioning the Mark Stream Sensor

Degree of pollution	2	2
Overvoltage category	2	–

Fig.6-26: Ambient conditions

6.9 Disassembly/Maintenance/Repairs

Disassembly

WARNING

Personal injuries and material damages during installation works!

- Do not work at running or unsecured machines
- Prior to start working at the machines, secure the machines against unpredictable movements and against operation by unauthorized personnel
- Secure the mark stream sensor, the sensor optics and the supply lines against falling before releasing mechanical connections

Execute the following steps in case of malfunctions/interferences, maintenance work or disassembly of the mark stream sensor:

1. Set machine to standstill
2. Disconnect the power supply of the mark stream sensor
3. Switch off the main switch of the machine
4. Secure the machine against unpredicted movements and against operation by unauthorized personnel
5. Wait for the discharging time of the electric systems
6. Disconnect all electric connections
7. Prior to the disassembly, secure the mark stream sensor, the sensor optics and the supply lines against falling or movements before releasing mechanical connections
8. Remove the mark stream sensor and/or the optics from the machine
9. Log all implemented measures in the machine servicing report

Maintenance

The running time is increased by regular, preventive service efforts. Please comply with the specifications of the machine manufacturer in the machine service schedule as well as with the specifications regarding service efforts and service intervals at the mark stream sensor.

Measure	Interval
Check mechanic and electric connections	According to machine service schedule specification. However, at least every 1000 operating hours
Remove dust, chips and other dirt from the mark stream sensor, the optics and the connections	According to degree of pollution. However, at least after one year of operation

Fig.6-27: Maintenance measures

Repairs

Mark stream sensors can exclusively be repaired at the manufacturer's plant or in a workshop authorized by Bosch Rexroth. The following repairs can be executed in authorized workshops:

- Exchanging the mark stream sensor
- Exchanging the optics

Commissioning the Mark Stream Sensor

• ...

7 Firmware Update

7.1 General Information

In some cases it is required to update the firmware of the mark stream sensor. For these use cases, a tool available on the CD can be used to update the firmware.



The firmware only has to be updated in some cases. The update should only be executed after checking with your contact person at Bosch Rexroth.



The tool is only available in English.

7.2 Firmware Update Tool Description

A link to the tool for updating the firmware is contained on the RegisterControl CD under "Tools". The file is available as ".zip". Save this file and unpack the file on your PC. Open the folder. A dll, the tool (BRMSSFWUpdateTool.exe) as well as another folder for the firmware is contained in the folder. The folder is empty. If a firmware update is required, your contact person at Bosch Rexroth will provide you with the firmware file. This file has the extension ".fuf". Copy the file content to the "firmware" folder.



The file for the firmware update is exclusively provided by your contact person at Bosch Rexroth. Thus, the firmware folder is empty.

7.3 Executing the Firmware Update

Execute the following steps to update the firmware:



The 24V power supply voltage cannot be switched off during the firmware update.



In the screenshots, a sensor firmware update from version 11.0 to version 11.1 is described.

1. Copy the "FWUpdateTool_BRMSS" folder to your Engineering computer.
2. Contact your Bosch Rexroth contact person. He will provide the new firmware file. Copy this file to the "firmware" folder.
3. Open the firmware update tool "BRMSSFWUpdateTool.exe".

Firmware Update

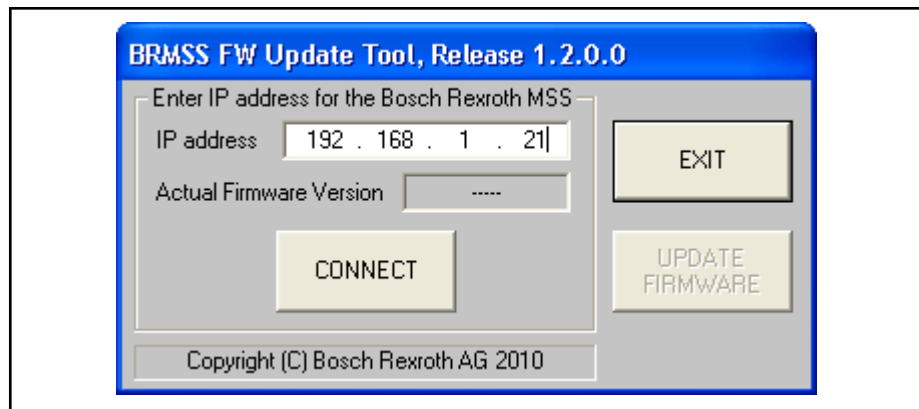


Fig.7-1: Start screen of firmware update tool

4. Enter the IP address of the sensor on which you want to execute the firmware update and click on **Connect**. A connection to the sensor is established and the current firmware (in this example: firmware version 11.0) is displayed.

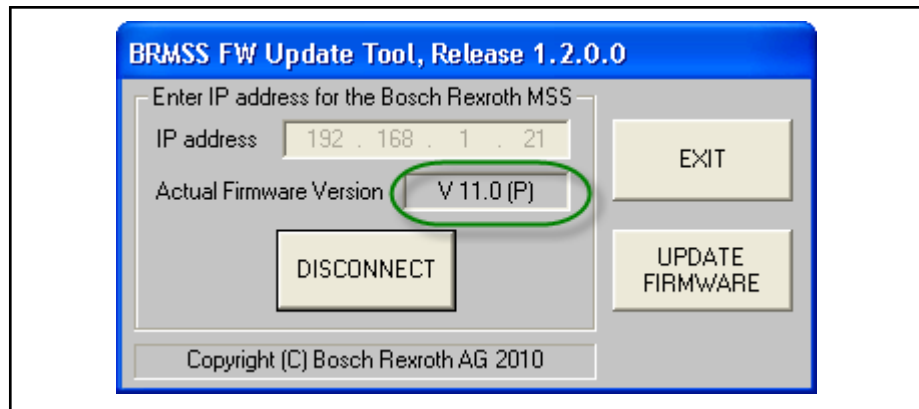


Fig.7-2: The current firmware after the connection has been established

5. Press **Update Firmware**. All valid firmware files contained in the "firmware" folder are displayed.

Firmware Update

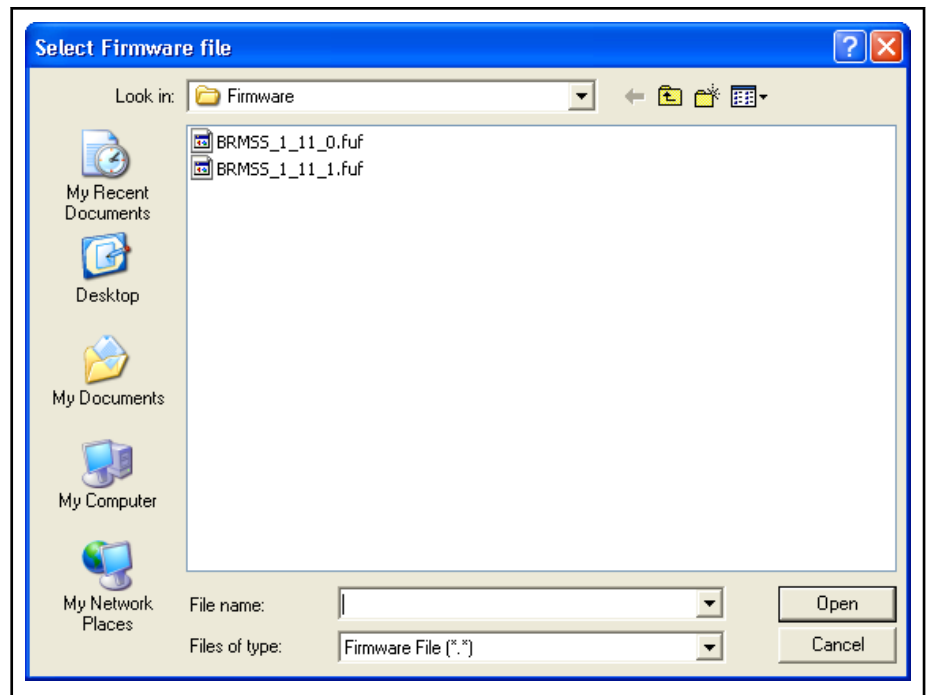


Fig.7-3: Selecting the firmware

In this example, the sensor firmware versions 11.0 and 11.1 are contained in the folder.

6. Select the corresponding firmware and start the firmware update.



The 24V power supply voltage cannot be switched off during the firmware update.

7. After the firmware has been updated successfully, you are prompted to restart the sensor. Temporarily interrupt the power supply of the mark stream sensor.

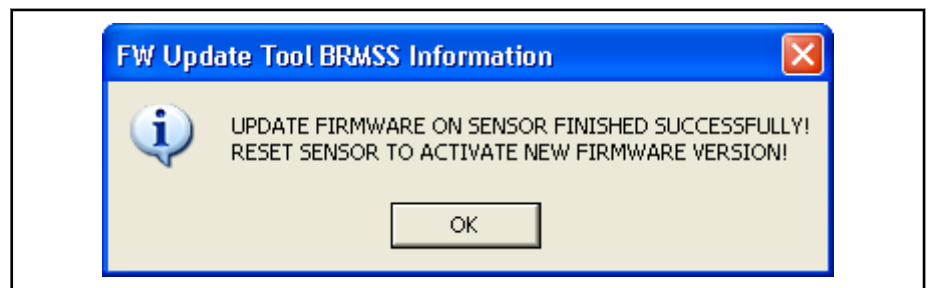


Fig.7-4: Restarting the sensor after the firmware has been updated successfully

8. The firmware has been updated successfully. By connecting to the sensor with the firmware update tool, it can be checked if the new firmware is contained on the sensor.

Firmware Update

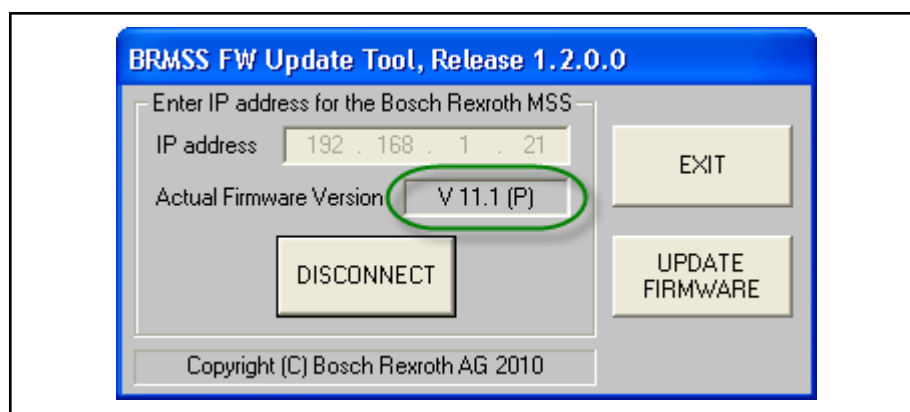


Fig. 7-5: Reconnecting to the sensor

The graphic shows that the sensor is updated to firmware version 11.1.

9. Please start with step 3 for all other sensors on which you want to update the firmware.

After the firmware has been updated successfully, a valid configuration can be transferred to the sensor to execute the required measurements.

8 Commissioning the HMI Interface

8.1 General Information

When commissioning the HMI interface, it has to be differentiated between a PC-based visualization device and a CE-based visualization device. First, general instructions for licensing are given to show the differences between the commissioning of an HMI application of WinStudio in case of a PC-based visualization device and CE-based visualization device in the following sections.

The central HMI only runs on a PC-based 19" visualization device. The following devices are available in connection with the central HMI:

- Panel-PC 19" Touch (VPP 60.3)
- Display 19" Touch (VDP 60.3) and compact PC (VPB 40.3)

The printing unit dialog is available for decentral visualization. The dialog can be integrated into the decentral machine operation on an VEP 40.4. Windows XP Embedded is recommended.

8.2 WinStudio Licensing

8.2.1 Introduction

The graduated licensing model allows an optimal adjustment to the required number of variables and the necessary scope of functions. In this process, the larger licensing package covers the scope of functions of the smaller package. An upgrade to the next licensing version is possible without a problem.

The WinStudio licensing process has been changed with the introduction of WinStudio 7.x (IndraWorks 09VRS and higher). The following describes the new license management system.

8.2.2 Overview on WinStudio Licenses

The following licenses are available:

- **WinStudio Lite**

This license is part of the IndraWorks installation and allows the creation and execution of WinStudio projects with a maximum of 500 variables (tags). Furthermore, all CE devices are equipped with a Lite license for the execution of Lite Runtime projects. In case of this license, alarms, recipes, reports, trends as well as TCP/IP driver screens and DDE driver screens are not executed and can neither be created nor edited

- **WinStudio Runtime 1K5 / 4K / 64K / 512K (RUN licenses)**

For the execution of WinStudio Runtime projects, licenses with a maximum of 1,500, 4,000, 64,000 and 512,000 WinStudio variables (tags) are available.

- **WinStudio Engineering and Runtime 1K5 / 4K / 64K / 512K (RUD licenses)**

This license allows the creation and execution of WinStudio projects with a maximum of 1,500, 4,000, 64,000 or 512,000 WinStudio variables (tags).

- **WinStudio Demo license**

Commissioning the HMI Interface

This license allows the testing of the entire scope of functions of WinStudio for a period of 30 days. After the expiration of the test period, the last valid license (e.g. Lite license) is active

The demo license may only be activated once.



For the activation of an IndraControl VEx device, only 1K5 and 4K runtime licenses are available.

8.2.3 Activation of a WinStudio License

The individual "WinStudio Runtime" and "WinStudio Engineering and Runtime" licenses are subject to a charge and must be activated by entering a licensing key. You find your personal license key on the licensing screen.

To activate a license, open the licensing dialog in IndraWorks Engineering via **Tools ▶ Options ▶ General ▶ Software Licenses** and select the entry "WinStudio". Use the **Licensing...** button to open the activation dialog and enter the activation key.

After activation of the license, it may be necessary to restart WinStudio Engineering or IndraWorks Operation.

Saving the license on a dongle

The activation key is generally only valid for one PC. In order to use one license on several PCs one after the other, you can transfer the license to a dongle. The license is valid as long as the dongle is plugged into the USB port of the PC. Windows CE licenses (VEx) cannot be transferred to a dongle.

Activation of licenses on VEx devices

To activate the WinStudio license on a VEx device using the Windows CE operating system, open the licensing dialog on the VEx device in the Windows Start menu via **Programs ▶ Rexroth ▶ WinStudio ▶ License Management** and enter the activation key. The licensing software is preinstalled on new VEx devices. If you have already a VEx device without preinstalled licensing software, install the IndraWorks visualization software on the VEx device and then activate the WinStudio license.

To save the license settings, start IndraWorks Operation on the VEx device and save the Windows Registry.



It is no longer possible to activate the license using the WinStudio Remote Agent with the introduction of the new licensing process. Use the IndraWorks licensing dialog (see above) to activate the license.



It is no longer possible to transfer the license key using the integrated WinStudio function with the introduction of the new licensing process. The license key must be entered directly on the VEx device.



IndraWorks license components for Windows CE are already pre-installed on new devices. If you wish to update an existing VEx device with the new software, install the runtime components on the VEx device via the context menu of the VEx device in IndraWorks Engineering via **Install software**. The link might not exist. If this is the case, start the licensing dialog using `\StorageCard\Rexroth\WinStudio\bin\IndraWorks.LicenseImport.CE.exe`. The licensing component requires .Net CompactFramework 2.0 so that the firmware can be updated if required.

8.2.4 Effects of a Missing or Inadequate License

If you open a project with the WinStudio Editor which has been created on another computer with a higher WinStudio license, the elements subject to license conditions in WinStudio Engineering are deactivated, i.e. in this case, it is not possible to create or edit these elements.

When you start IndraWorks Operation, a message appears if the WinStudio license is not adequate for the current project. In the event of an inadequate or missing licenses, no WinStudio screens is displayed.



If you still want to use the current project, you can activate the demo license. Use the IndraWorks licensing dialog (see above) to activate the license.

8.3 Preconditions to Use the Central Visualization for the RegisterControl

The central visualization has been developed for a PC-based 19" visualization device.

Thus, the central HMI can be executed on the following devices:

- Panel-PC 19" Touch (VPP 60.3)
- Display 19" Touch (VDP 60.3) and compact PC (VPB 40.3)

A 64k license is required to use the central HMI register controller.



Only chapter [chapter 8.4 "VPP, VPB/VDP" on page 61](#) is relevant to integrate the central HMI register controller. Chapter [chapter 8.5 "VEP with Operating System CE" on page 63](#) is relevant for future decentral visualizations on CE devices.

8.4 VPP, VPB/VDP

8.4.1 WinStudio Settings to be Selected

The target system has to be set to "WinStudio 4k" under **Project ► Settings...** in WinStudio.

Commissioning the HMI Interface

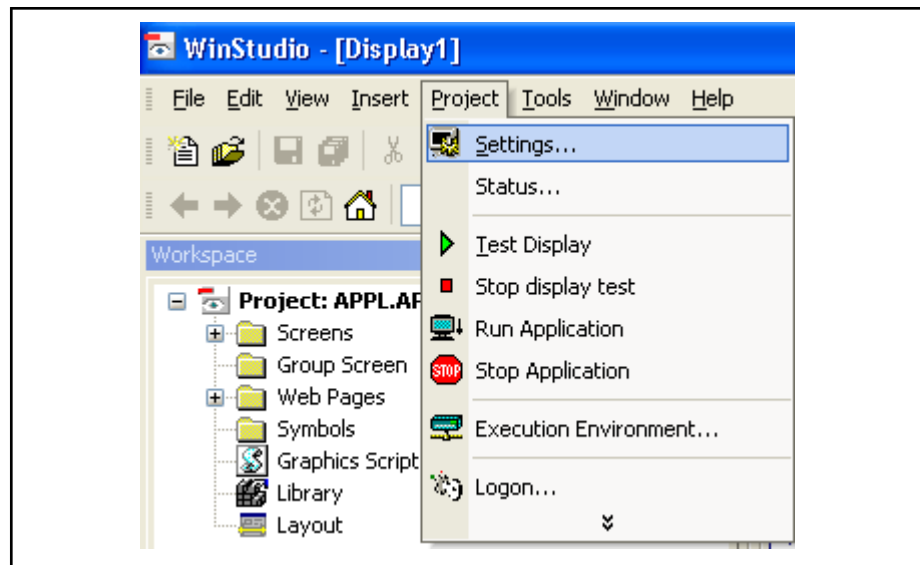


Fig.8-1: WinStudio settings

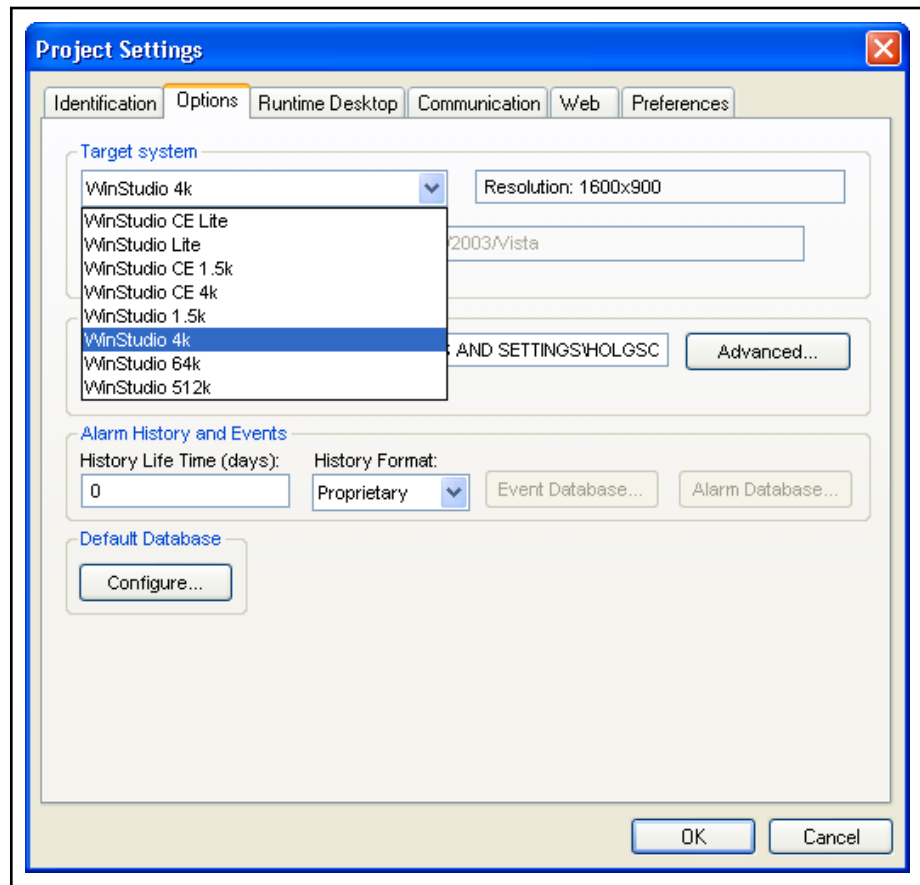


Fig.8-2: Project settings VSP

8.4.2 Installing Additional Files

To successfully register the ActiveX-Control of the oscilloscope, the files "VCRedist_2008" and "VCRedist_SP1" have to be installed first. These files are contained on the installation CD of the HMI application in the "UpdateIW_HMI_ActiveX" folder.

8.4.3 Registering ActiveX-Controls

Copy the folder containing the ActiveX-Control to the device and first execute the "WIN32_UnRegister_OCX.bat" file and subsequently the "WIN32_Register_OCX.bat" file. A popup window is displayed for each file which confirms the successful execution.

8.4.4 Starting Runtime

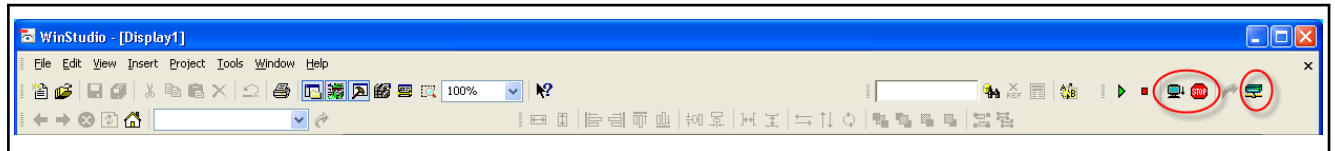


Fig. 8-3: Starting "Runtime"

Before "Runtime" is started, ensure that the execution platform is set to "Local".

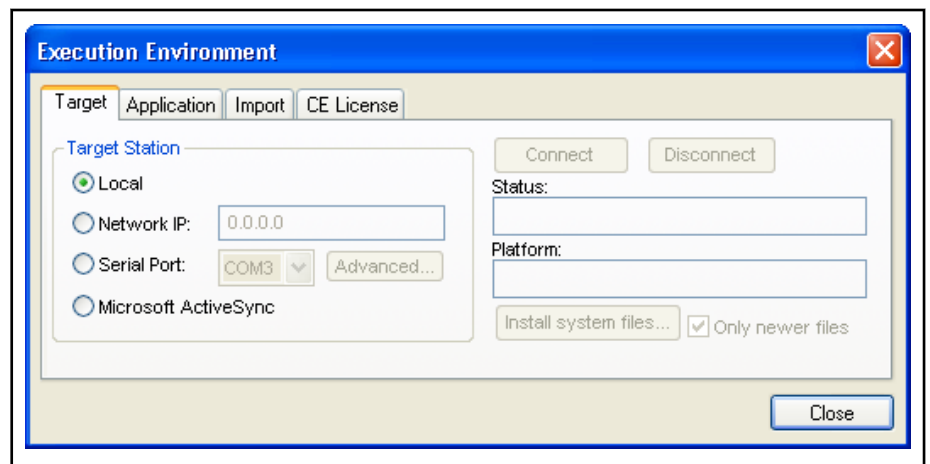


Fig. 8-4: Setting the development environment VPP



This symbol starts the application in a separate window.

8.5 VEP with Operating System CE

8.5.1 WinStudio Settings to be Selected

The target system has to be set to "WinStudio CE 4k" under **Project ► Settings...** in WinStudio.

Commissioning the HMI Interface

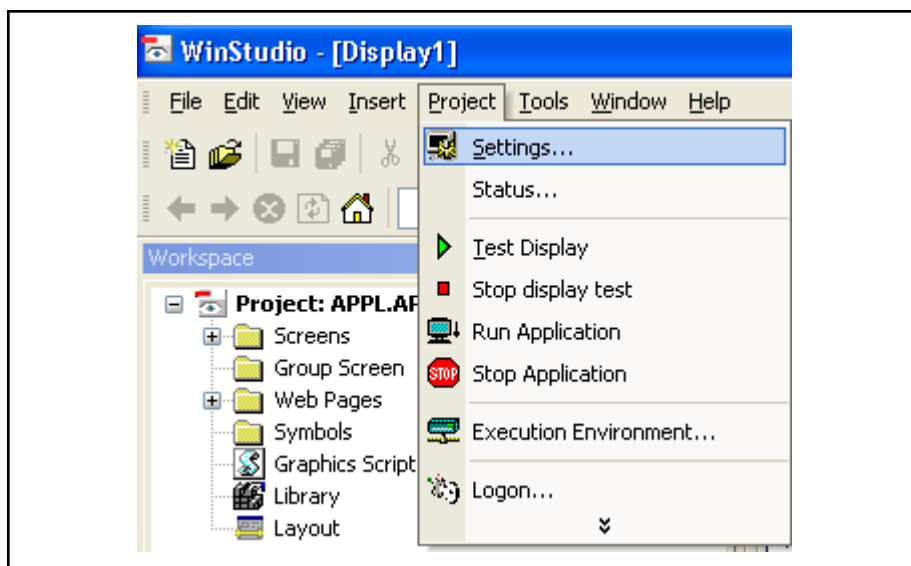


Fig.8-5: WinStudio settings

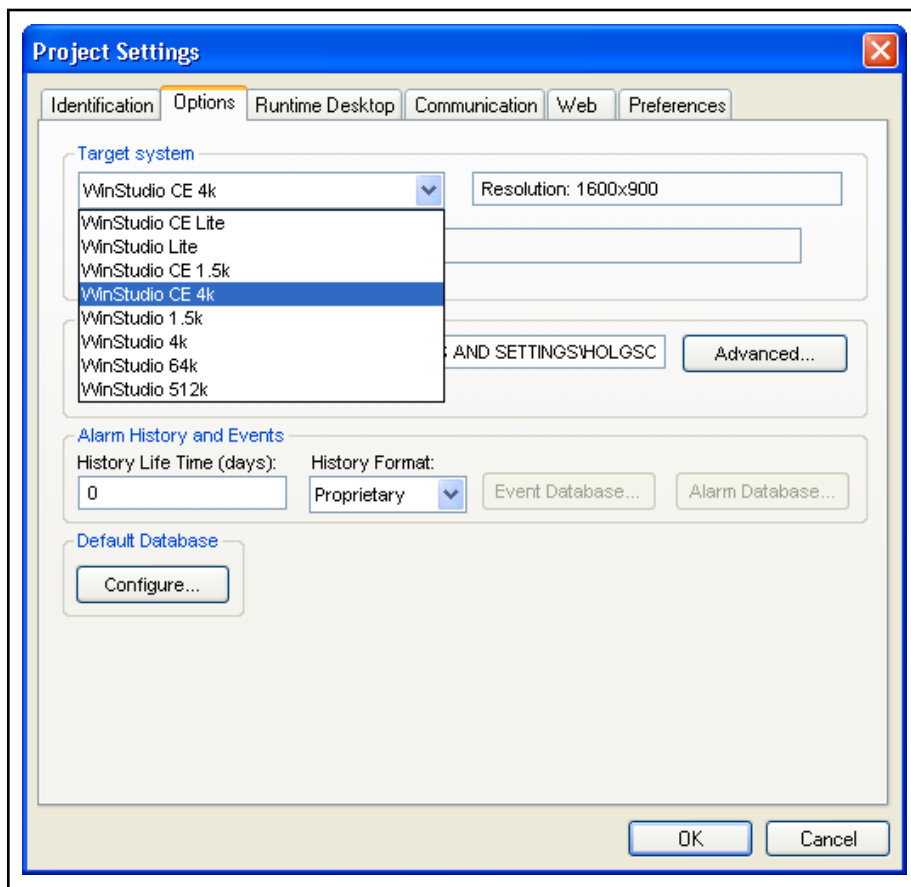


Fig.8-6: Project settings VEP

8.5.2 Registering ActiveX-Controls

The ActiveX-Control has to be added under \StorageCard\CE\Profile\Windows.

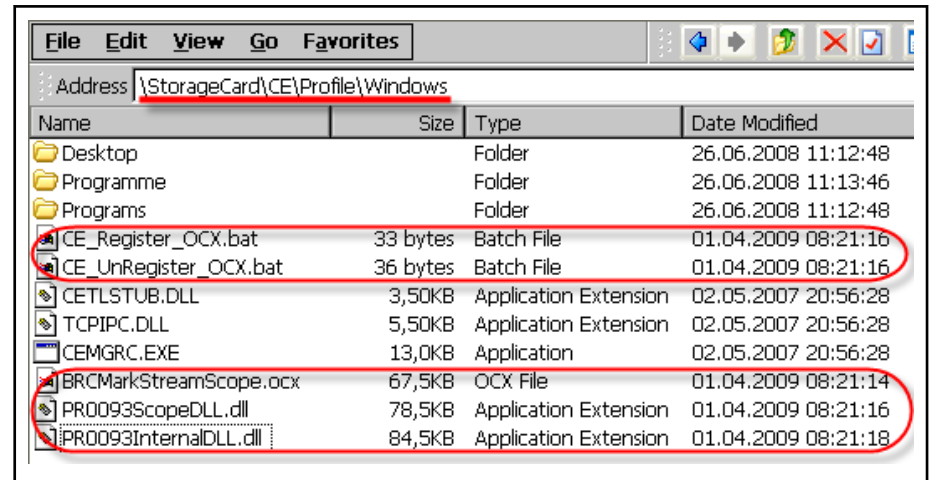


Fig. 8-7: Adding the ActiveX-Control VEP



Depending on the CE operating system, the path name can optionally also be **StorageCardx > CE > Profile > SpecialFolders > Windows**.

After restarting the VEP, execute "CE_UnRegister_OCX" and "CE_Register_OCX" under My Workspace -> Windows.

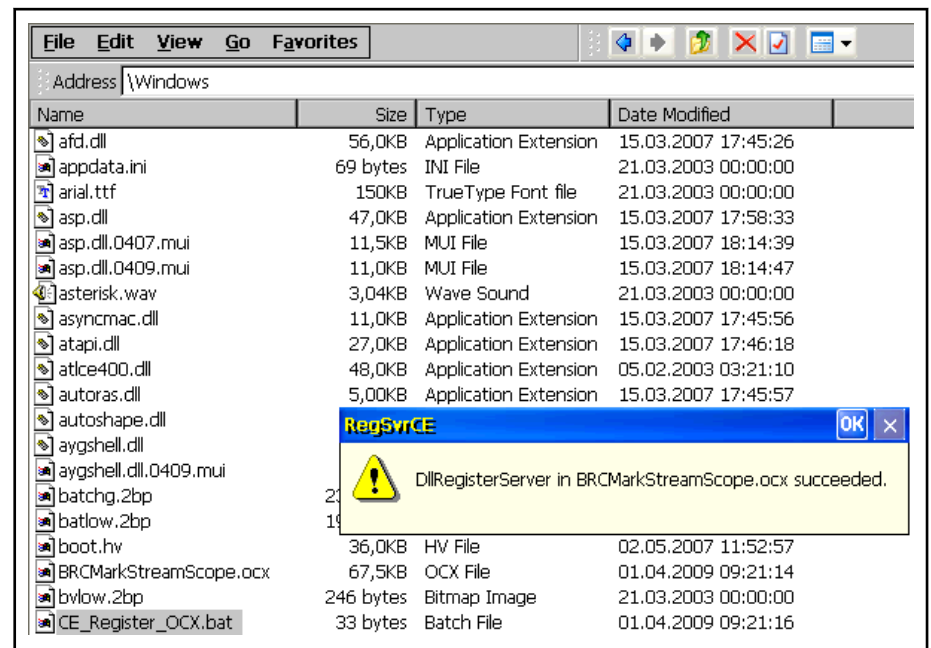


Fig. 8-8: Registering the ActiveX-Control VEP

Restart the VEP after having registered ActiveXControls.

Commissioning the HMI Interface



Restart the VEP by calling **CE Rexroth Settings** ► **OK**. The **OK** button can be found in the menu bar (upper right side). You are now prompted to restart the system to activate the new settings. Confirm by clicking on **Yes**. The system is restarted and the registration is saved. All files of the ActiveX Controls have to be in the "Windows" folder after the restart.

8.5.3 Transmitting the Application

To transfer an application from a PC to a VEP via network, it has to be loaded in WinStudio.

Select "Network IP" in the execution platform and enter the IP address of the VEP. A connection to the VEP can now be established using the **Connect** button.



Note: To establish a connection, the CEView has to run on the VEP.

In case the VEP runs on a different CEView version, the latest version can be downloaded via "Install. System".

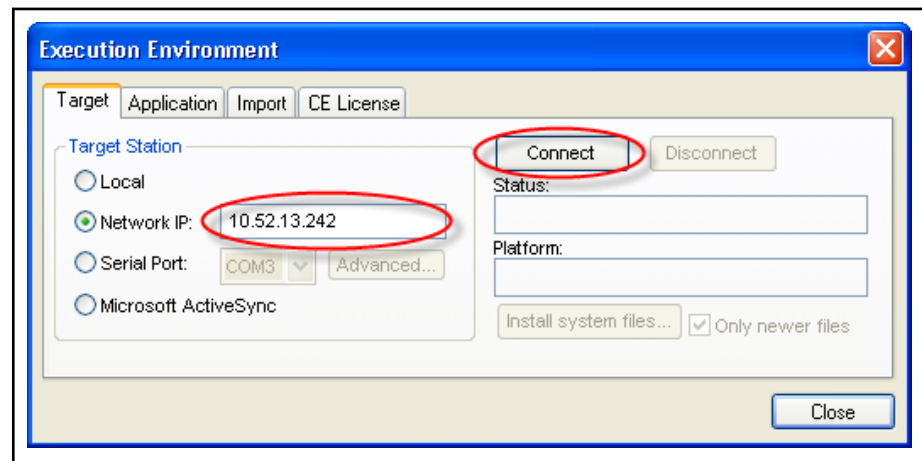


Fig.8-9: Setting the execution environment

Under "Application", only the application with **Send To Target** can be transferred to the VEP.

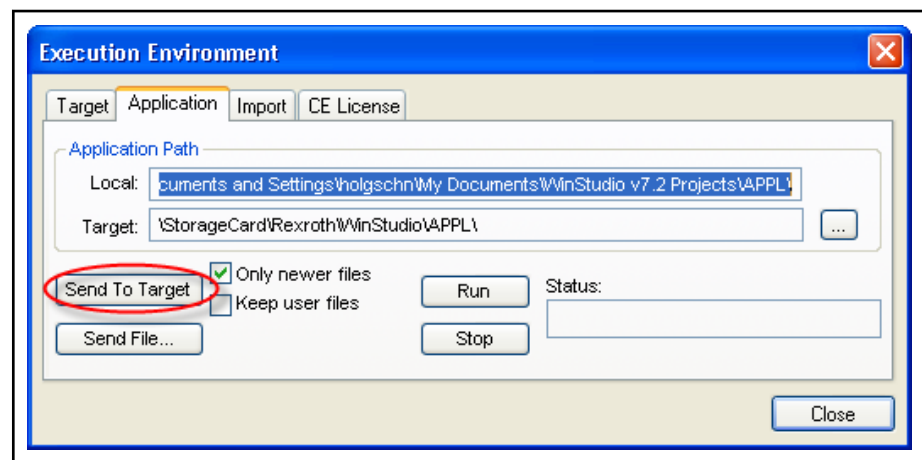


Fig.8-10: Loading a VEP application

8.5.4 Starting the CEMview

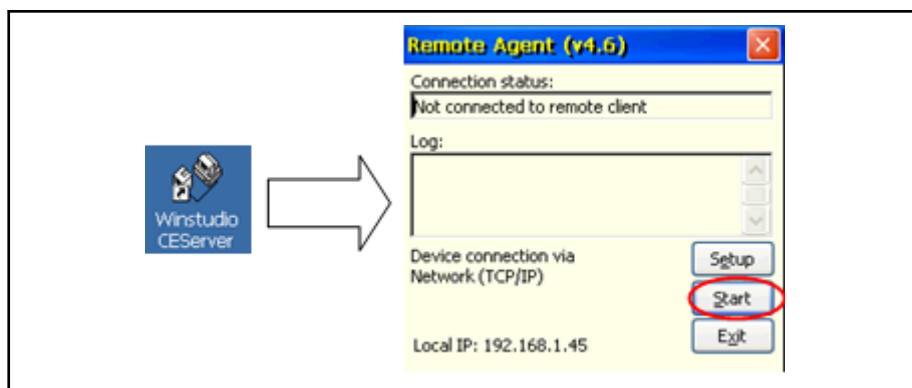


Fig. 8-11: Starting the VEP application

To start the application, open the WinStudio CEMServer and click on **Start**.

9 HMI Application Scenarios

9.1 General Information

This chapter describes the different HMI use cases. It is distinguished between the configuration dialogs and the running operation. This chapter provides an overview on the interrelation of the individual dialogs. First of all, the machine has to be configured. The machine is usually configured once upon the initial commissioning of the machine. The individual jobs can subsequently be configured. One job usually corresponds to one production. During the production, the running process is monitored via the HMI and the diagnostics are queried.

9.2 Overview of all HMI Processes

The flow diagram in [chapter 9.2 "Overview of all HMI Processes" on page 69](#) shows the main areas of application of the user dialogs for the RegisterControl. All dialogs can be roughly divided into two areas:

1. The configuration dialogs are used to
 - adjust the HMI dialogs to the existing hardware configuration and
 - configure the sensors and controllers via the PLC structure for the print job.
2. The dialogs for the running operation are used to
 - monitor and visualize the running controller functions and measurement results.
 - to adjust controller settings during runtime.
 - to graphically represent data, to evaluate quality and to visualize measurement results over a specified period of time.

Additionally, there are dialogs to map concurrent processes that are active during the configuration and while the system is running. Processes:

1. User Management to restrict the authorizations on user group level
2. Diagnostics: to analyze error states and the error history
3. Logbook: to record user activities and process activities

HMI Application Scenarios

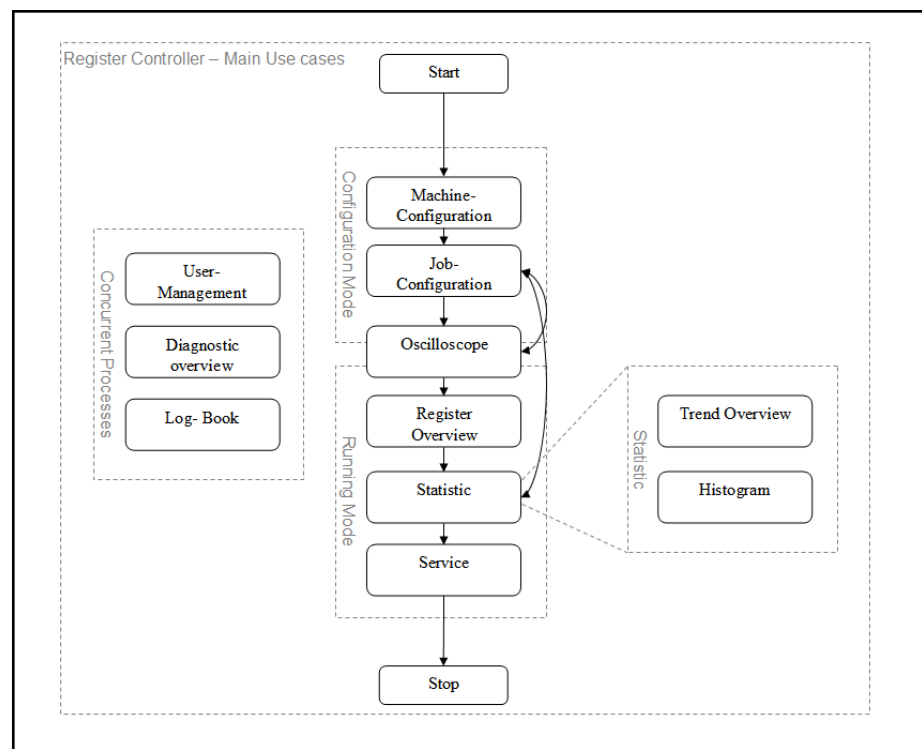


Fig.9-1: General structure

9.3 Service

The service contains the machine configuration with advanced settings, the language selection and the user management.

The machine configuration forms the basis for the following configuration steps and has to be processed first in an SFC during a commissioning. Generally, the machine has to be configured only once. In the machine configuration dialogs, all specific features of the printing machines are mapped in the software modules.

The basic information is the number of configurable printing units and the respective sensors.

For each machine unit, the respective register settings (length register and side register available) can be selected during the machine configuration depending on the control request.

Another focus is on the communication settings of the control and the sensors in the machine configuration. The IP addresses, the port numbers to transfer the configuration data and the measured values are to be defined.

In the advanced settings, the switch on and switch off thresholds that switch the velocity of the machine on/off, can be changed. The decoupling can also be enabled.

The desired language can be selected using the language selection.

All users of the HMI application are divided into special groups. Authorizations for different areas and functions can be given to and revoked from the groups depending on their tasks. The authorizations are managed during run-time via special dialogs.

HMI Application Scenarios

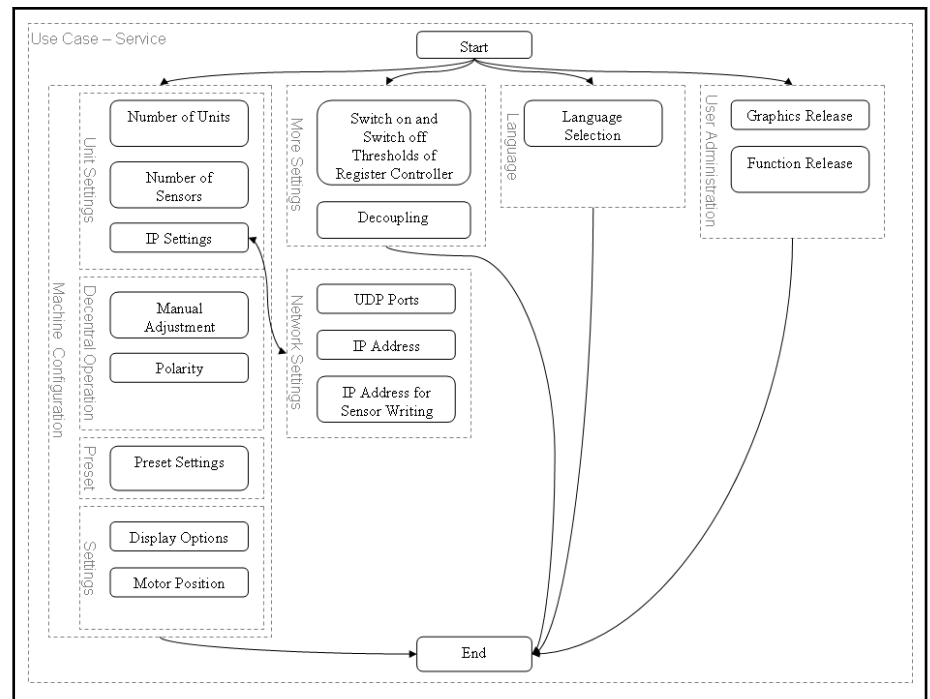


Fig.9-2: Service

9.4 Production

The dialogs for the production are used to visualize the process variables of the register errors for the user. These process variables are provided for each printing unit or other processing units with register controller. The length register error as well as the side register error are displayed. Printed paper waste can be displayed by a color change via a defined alarm area.

Apart from the visualization of the current register deviation, dialogs are provided in the running operation which allow statistic analyses of the process variables over a certain period of time. In the following:

- Trend overview: Displays register errors over a defined period of time.
- Histogram: Categorizes measurands (deviations) and can thus be used for the quality assurance.

The display of the mark status and the sensor status as well as the functionality to switch on / off the register controller are also part of the running operation.

Furthermore, the individual overview of a control station can be accessed from the register overview as well as from the trend overview. A continuous oscilloscope display is shown in which an expectation window can be set.

HMI Application Scenarios

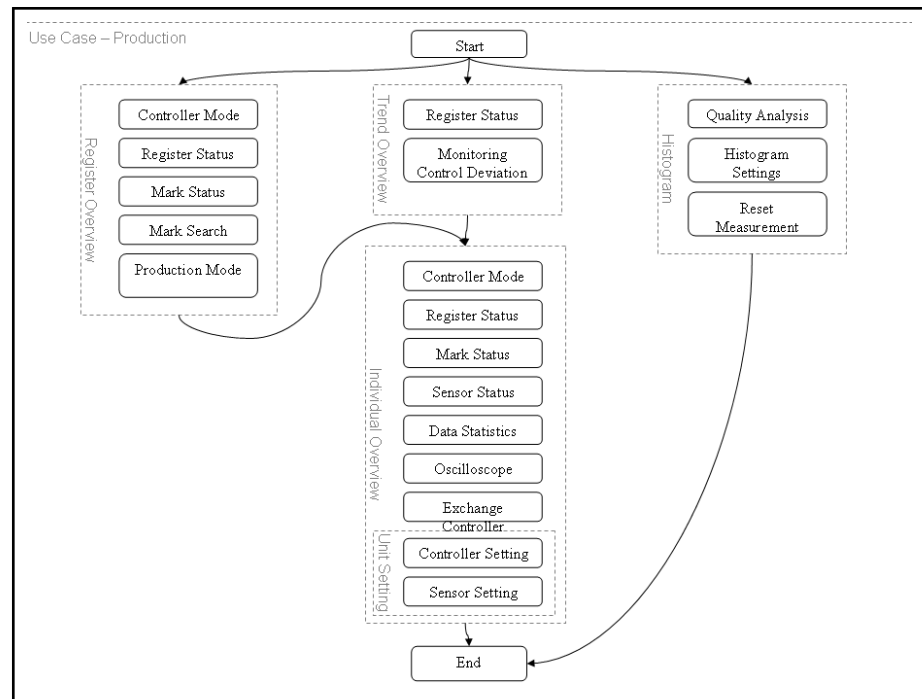


Fig.9-3: Production

9.5 Job Configuration

The job configuration covers an extensive framework consisting of job management and material management as well as dialogs to configure the machine units and their control structures. They are performed using a Wizard by the configuration dialogs of a print job.

The job management allows loading, editing and deleting the existing job or to create a new one. Up to 300 print jobs can be created. A job configuration contains the following data:

- The format and the web width are globally entered for all sensors.
- In the **print configuration**, the individual mark and the reference mark are assigned depending on the machine design and the measuring principle (reference color, previous color). In case of deviations from the command value, the controlling element behavior is specified in the controller parameters for length register and side register that are also part of the print configuration.
- In the **mark stream configuration**, the mark geometry and the mark alignment can be defined. These settings apply globally for all sensors of the printing machine. Furthermore, a barcode can be defined.
- The **material data** of the printing web is used to calculate the acceleration compensation (elasticity, grammage) and as input parameter for the mark stream sensor (color scaling, intensity scaling). A maximum of the 16 material data records can be preconfigured and saved.

The settings for fine adjustment for the automatic format correction are contained on the left side of the preset. The drive position of the length register is contained on the right side.

The dialog for the side register preset contains the data of the drive position for the adjusting unit of the side register.

The methods for precontrol during the acceleration phase can be configured in the acceleration dialog.

HMI Application Scenarios

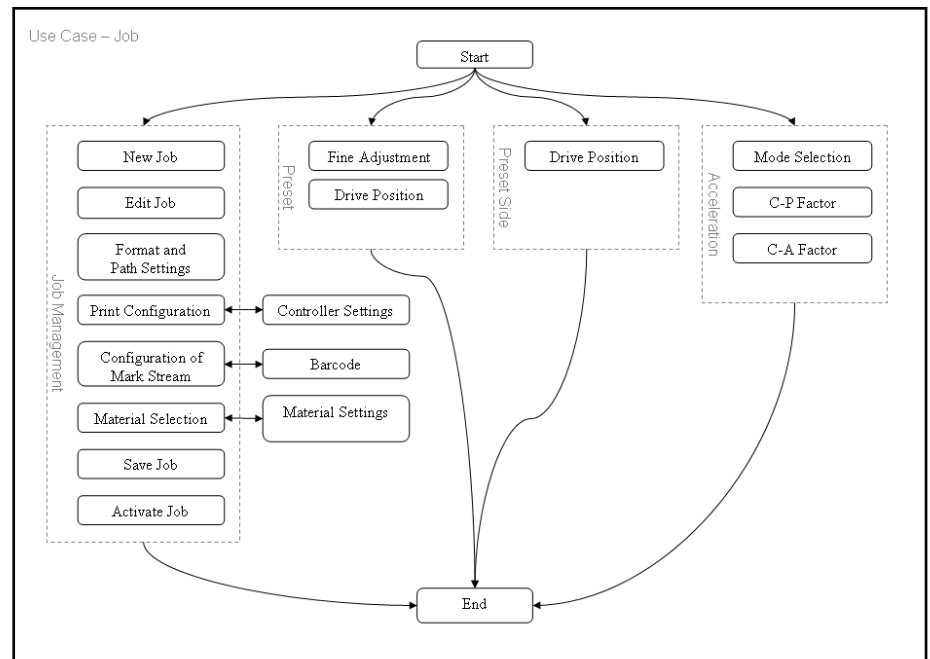


Fig. 9-4: Job

9.6 Diagnostics

The diagnostic overview ensures the analysis of error states during the run-time of the application. It is distinguished between diagnostic data of the HMI (e.g. driver status) and data of the PLC function block outputs. Only the current error states are listed as default setting. Additionally, the analysis of historical data is possible.

An expectation window can be set in the oscilloscope function of a continuous display to analyze the marks of the individual controllers.

The logbook functionality provides the option to record user actions as well as system warnings for a later analysis.

HMI Application Scenarios

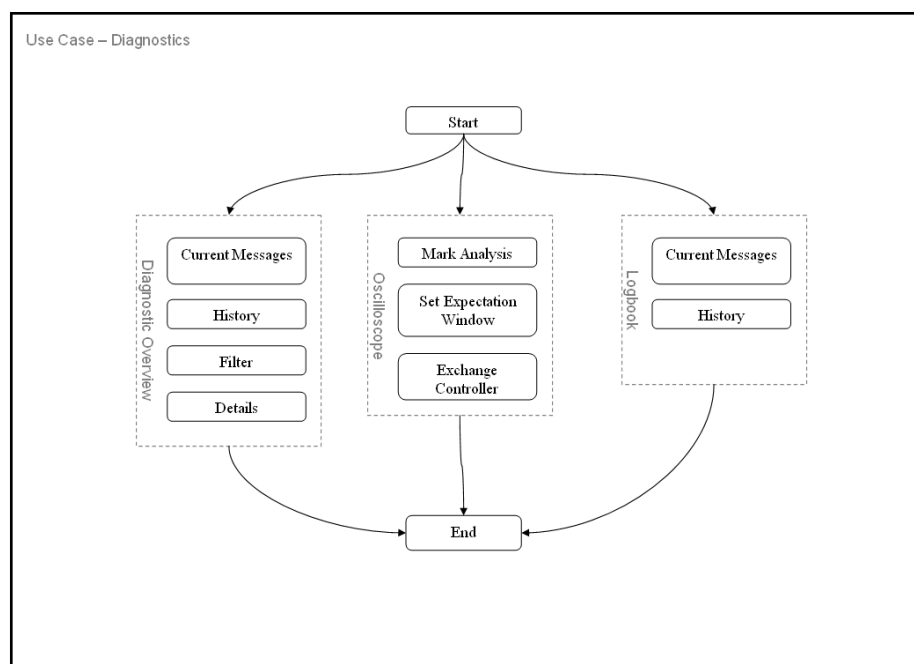


Fig.9-5: Diagnostics

10 HMI Dialog and Element Description

10.1 General Information

This chapter describes the current HMI dialogs, their elements and functionalities. The general dialog structure consisting of the following components is described:

- Header
- Navigation line
- Arrow wizard or the shift bar of the printing unit
- Right sidebar
- Content area

Subsequently, the individual dialogs of the machine configuration and the job configuration are described.

10.2 Navigation Structure

The navigation is divided into 2 levels. Other menu items can exist in a dialog that are not shown in the navigation frame. The "main navigation bar" is the main feature of the navigation structure. It contains individual main topics of the user guidance. Topics:

- Production
- Job
- Quality
- Diagnostics
- Service

Each main topic has its own "subnavigation" in which all topic-related sub-items are contained.

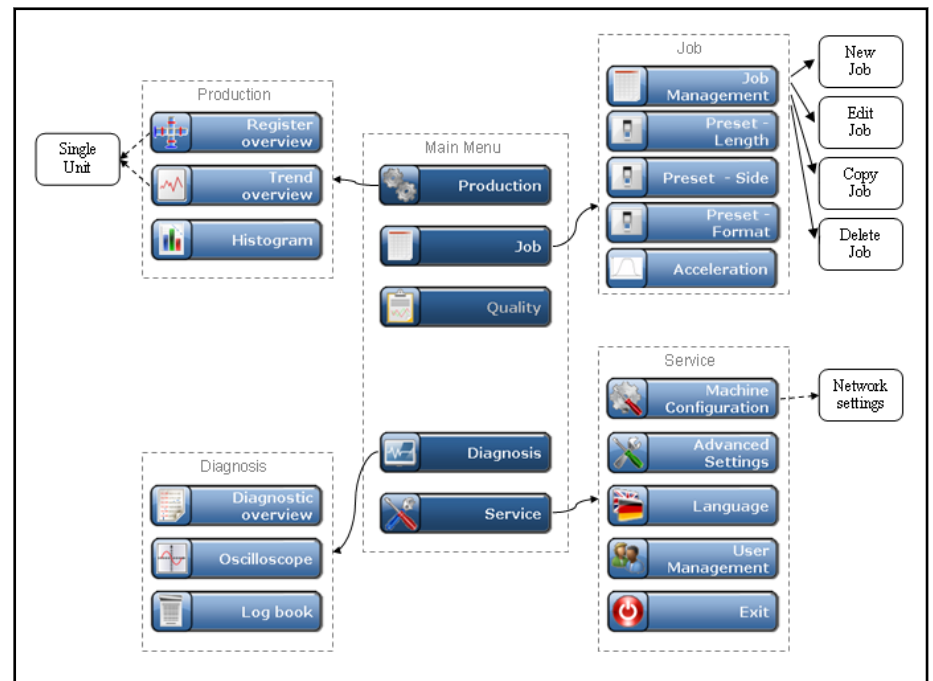


Fig. 10-1: Navigation structure

HMI Dialog and Element Description

10.3 Dialog Structure

10.3.1 Header

The header shows important information during runtime and is available on each page.

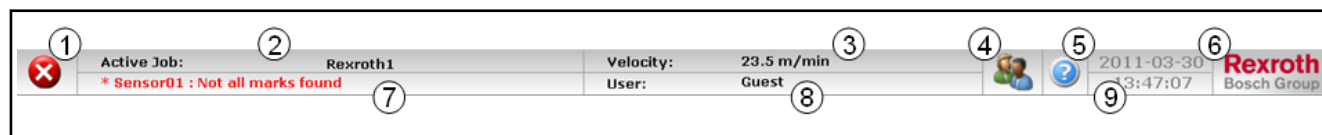


Fig. 10-2: Header

1. Error signal

The Error button is enabled as long as a global error state is TRUE or at least one unacknowledged error is reported. Clicking on the Error button acknowledges all existing errors

2. Indicates the name of the currently active print job

3. Velocity

The velocity indicates the current production velocity (web velocity) in m/min

4. It opens the Login/Logout dialog to change the user

5. Online help (currently not implemented)

6. Current system date

7. Error status

The Error Status line shows the latest error in the list. By selecting the status line, it can be changed to the Diagnostic overview

8. Indicates the name of the currently logged in user

9. Current system time

10.3.2 Navigation Area

The double-spaced navigation area is used to switch the screens of the configured HMI dialogs. The main navigation can be found in the lower bar. Switching between the individual subnavigation bars is possible. An individual subnavigation with topic-specific menu items is displayed for each main topic.



Fig. 10-3: Double-spaced navigation bar



The interfaces **Tab 13-24 overview**, **Trend 13-24 overview** and **Bar chart 13-24** are only available for license FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV2, if more than 12 printing units have been defined.

Representation variants of the navigation button

It is differentiated between three different representation variants of the navigation buttons:

HMI Dialog and Element Description

Deactivated dialog

	Graph color: dark blue Font color: white
Description: The dialog is available, but currently not selected/activated	

Activated dialog

	Graph color: light blue Font color: black
Description: The dialog is opened/activated	

Locked dialog

	Graph color: dark blue Font color: gray
Description: The dialog is only locked for the currently logged in user. Screen switching is not executed while clicking	

Exit application

Exit application function


--

Fig. 10-4: Exit

The subnavigation item "Exit" can be found at the right in the main menu under **Service**. This function is used to exit the HMI application. A dialog opens and the user has to confirm to exit the application.

HMI Dialog and Element Description

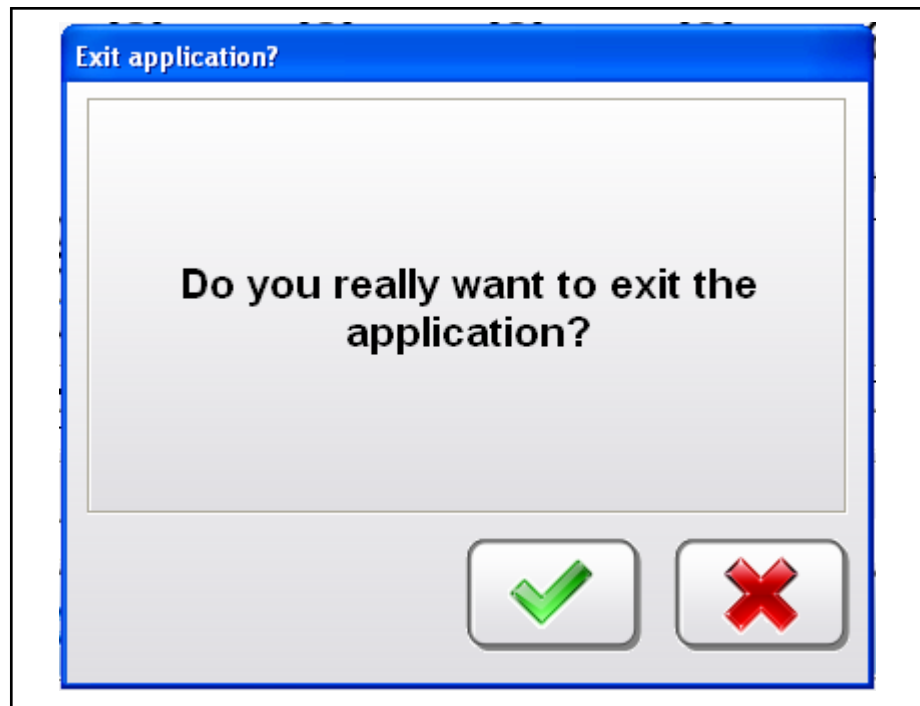


Fig. 10-5: Exit dialog

10.3.3 Arrow Wizard and Switching Panel of the Printing Unit

The arrow wizard and the switching panel of the printing unit are located above the navigation area.

The arrow wizard is used to run the machine and job wizard. It can be canceled by clicking on **Exit**. The changes can be saved before exiting the wizard.



Fig. 10-6: Arrow wizard

The switching panel of the printing unit is displayed for dialogs requiring a switching of the printing units. The printing units that are defined are displayed in their respective color.

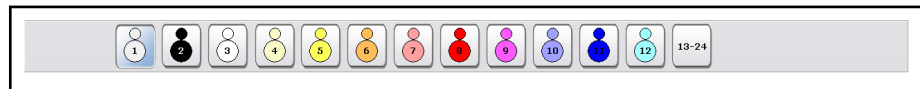


Fig. 10-7: Shift bar for printing units



The **13-24** interface is only available for license FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV2, if more than 12 printing units have been defined. Thus, toggling between the printing units 1-12 and 13-24 is possible.

10.3.4 Sidebar

The right sidebar is used for "Editing". All important dialog functions can be found in the sidebar. The functions can be executed by clicking on the respective button.

HMI Dialog and Element Description

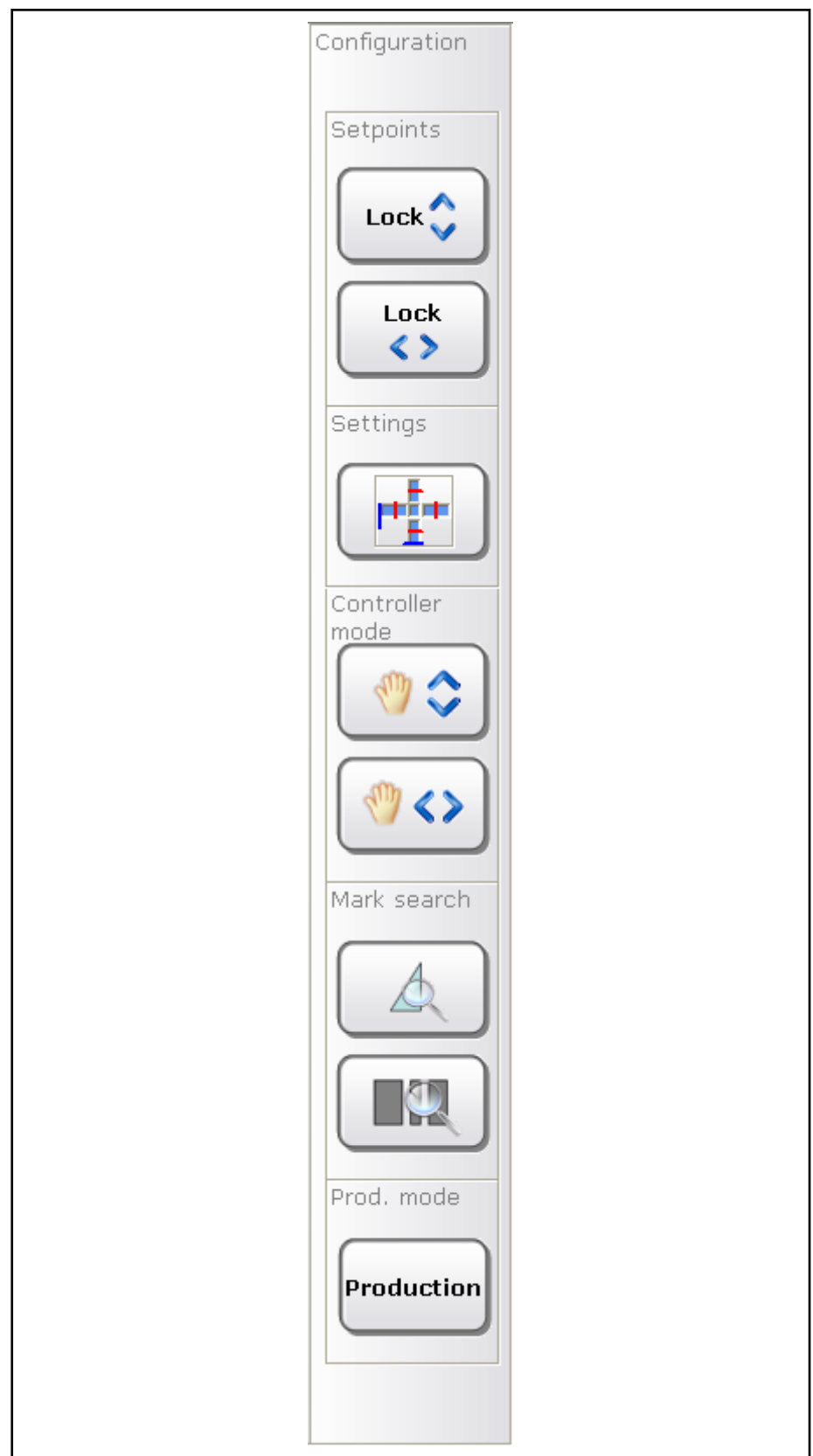


Fig. 10-8: Sidebar

HMI Dialog and Element Description

10.3.5 Content Area

The content area is the largest part of the dialog and displays the screen contents via navigation. The content area is located between header and arrow wizard, i.e. switching panel of the printing unit. Additional elements to switch screens can also be contained in the content area. These are used to divide a dialog into subareas.

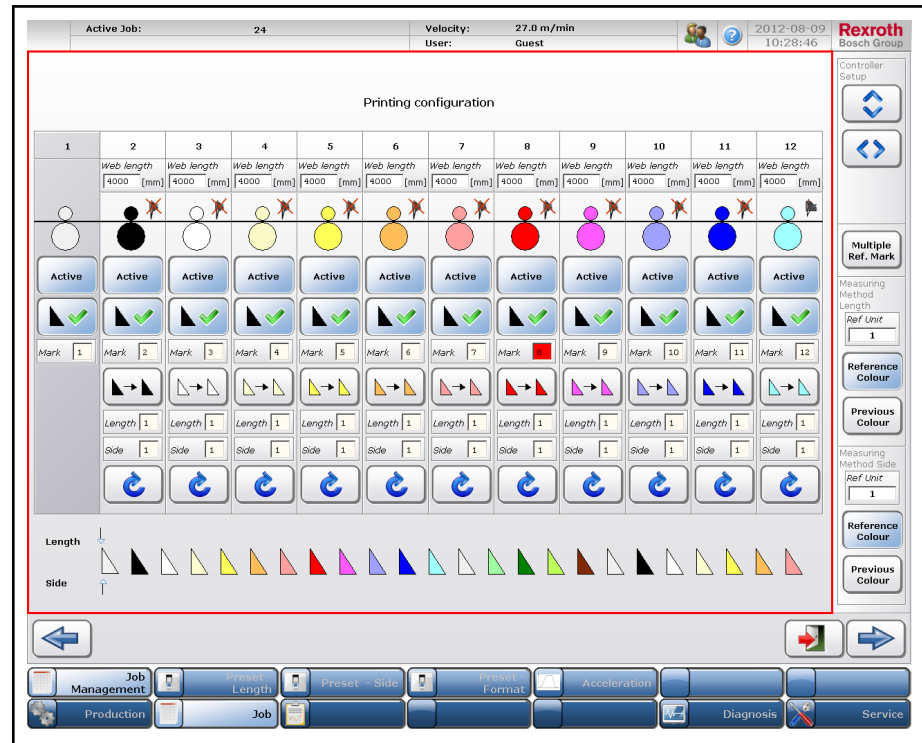


Fig.10-9: Content area

10.4 Machine Configuration

10.4.1 Brief Description

In the machine configuration dialogs (main menu: "Service"), the hardware-dependent machine characteristics are specified when configuring the machine. The dialogs can be divided into the configuration of the processing units (printing units) and the sensors.



The machine is usually configured once when commissioning the machine. When subsequently changing the machine configuration, already defined jobs can sporadically not be used anymore.

The machine is configured via a wizard consisting of four dialogs.

10.4.2 Machine Configuration Dialog

The following can be entered in the **Service ► Machine configuration** dialog:

HMI Dialog and Element Description

Active Job:

24

Velocity:

27.0 m/min

User:

Guest

2012-08-07 08:44:01

Rexroth

Bosch Group

Unit settings

Web length	Web length	Web length	Web length	Web length	Web length	Web length	Web length	Web length	Web length	Web length	Web length
2000 [mm]	4000 [mm]	4000 [mm]	4000 [mm]	4000 [mm]	4000 [mm]	4000 [mm]	4000 [mm]	4000 [mm]	4000 [mm]	4000 [mm]	4000 [mm]

Unit: 1

Unit: 2

Unit: 3

Unit: 4

Unit: 5

Unit: 6

Unit: 7

Unit: 8

Unit: 9

Unit: 10

Unit: 11

Unit: 12

Unit 1

Unit 2

Unit 3

Unit 4

Unit 5

Unit 6

Unit 7

Unit 8

Unit 9

Unit 10

Unit 11

Unit 12

Unit 1

Unit 2

Unit 3

Unit 4

Unit 5

Unit 6

Unit 7

Unit 8

Unit 9

Unit 10

Unit 11

Unit 12

Number of units

24

Side register

Speed motor

1.0000 [mm/s]

Sensor Settings

Increments/revolution

5000

Network settings

Load Machine Config

Load on startup

Machine Configuration

Advanced Settings

Language

User Management

Exit

Production

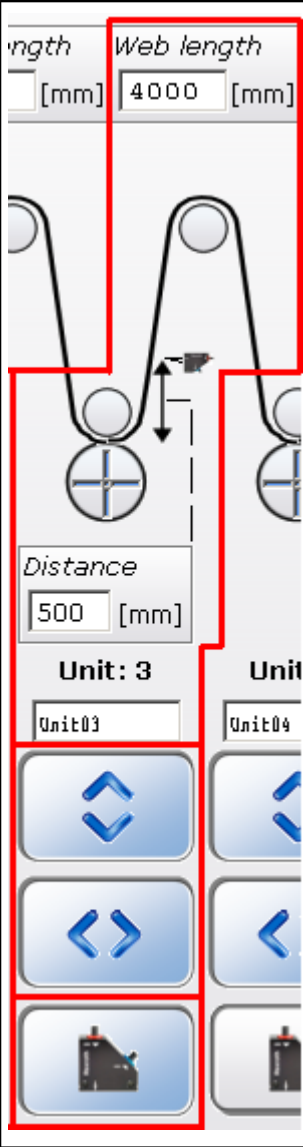
Job

Diagnosis

Service

Fig.10-10: Unit settings

HMI Dialog and Element Description

	The length register and the side register can be enabled using the cursor keys. By means of the sensor interface it can be defined if a sensor is located behind the respective printing unit.
Web length [mm]	Web length to the printing unit located in front
Distance to the sensor [mm]	Distance of the sensor optics to the assigned printing unit in [mm]
Unit name	Specifies a unit name (default: unit x)
Number of units	Number of available machine units (depending on the license, a maximum of 12 or 24 machine units can be defined)
Speed motor 1.0000 [mm/s]	Regulating velocity of the side register regulating unit in [mm/s]
Increments/revolution 5000	Increments per cylinder revolution (cf. chapter 5.1 "Parameterization of the Incremental Encoder Emulation" on page 31)

HMI Dialog and Element Description

	Opens another dialog to set the communication parameters for each sensor (cf. chapter 10.4.3 "Machine Configuration Dialog (Communication Settings of the Sensors)" on page 87)
	Opens a file browser dialog to load a complete machine configuration from a receipt file (xxx_machine.DAT)



If more than 12 printing units are defined for license FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV2, a dialog with the machine units 13-24 is subsequently opened in the wizard.

The second dialog of the machine configuration wizard allows configuring decentralized control elements. It can be selected whether decentrally executed adjustments via joystick or a decentralized HMI have an effect on the command value or the motor position and their respective polarity.

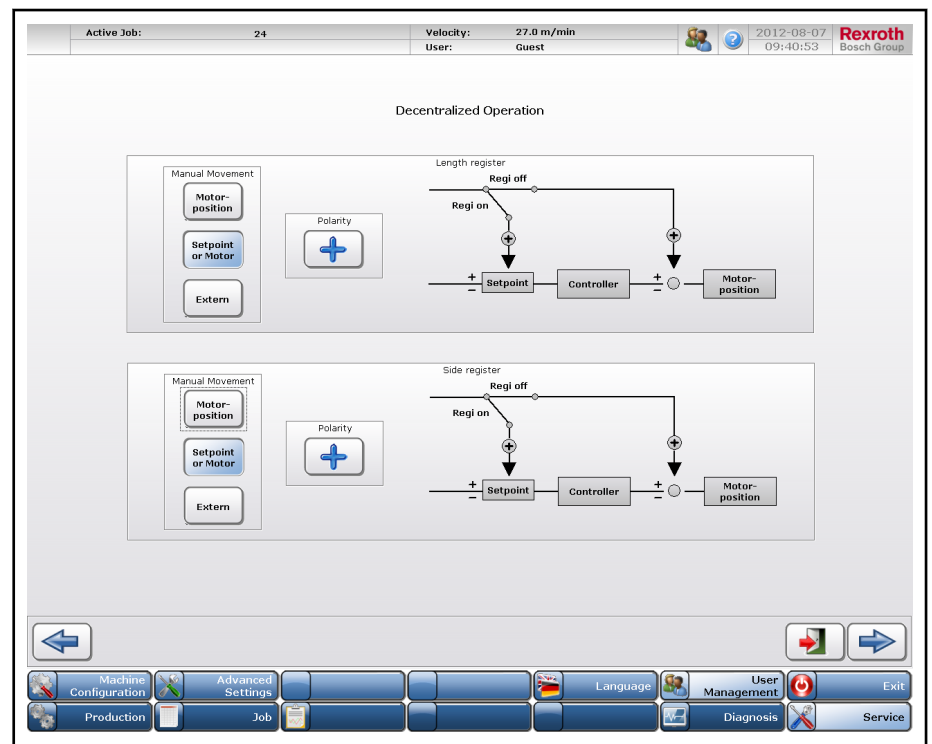


Fig.10-11: Decentral operation

HMI Dialog and Element Description

	Changes joystick polarity or adjustment of decentralized HMI
	The motor position is always jogged during the production process using the arrow keys, irrespective of whether the control is enabled or disabled
	The motor position is jogged with the arrow keys if the RegisterController is disabled. The command value is jogged with the arrow keys if the RegisterController is enabled
	Via the machine interface it can be selected whether the command value or the motor position is to be jogged

In the third wizard dialog, the user can select if he wants to preset the fine adjustment, the drive position and the side register via the RegisterControl or if this is to be done externally, e.g. via the machine program.

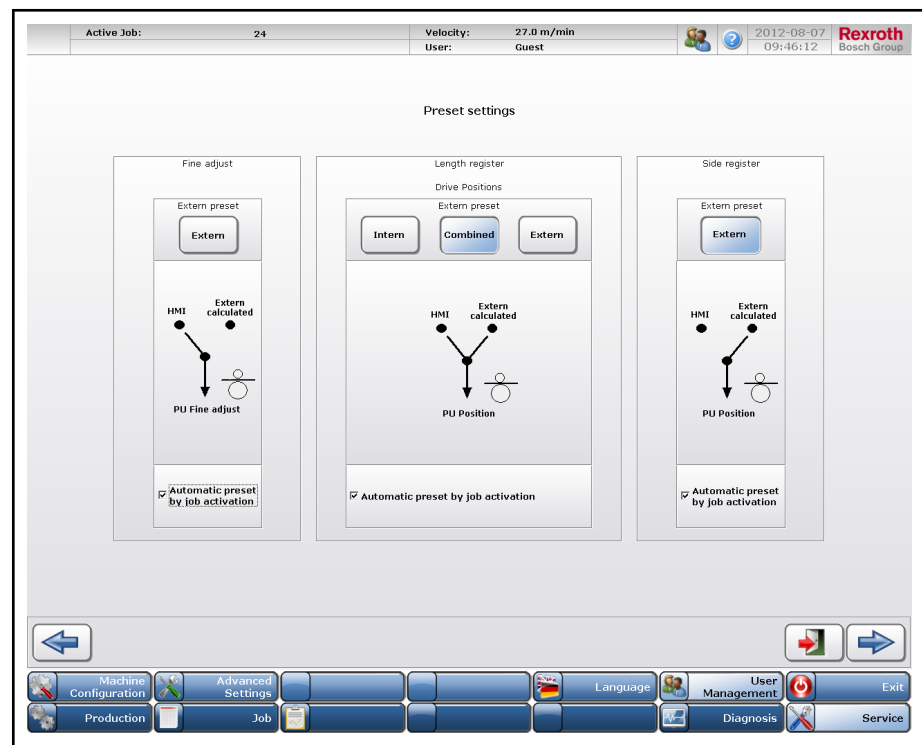


Fig.10-12: Preset settings

HMI Dialog and Element Description

	If the button is activated, the Preset is executed externally via the machine interface. Individual settings can be selected for fine adjustment, drive position (length register) and the side register
	If this interface is enabled, the preset can be executed via the internal Preset dialog as well as via the machine interface
	If this interface is enabled, the preset can only be executed via the internal Preset dialog
	If the checkbox is enabled, an automatic preset is executed when activating the job. This is only possible if the preset handling was not done externally.

The fourth dialog of the machine configuration allows configuring the display direction of the deviations, the control direction of the controller and the definition of the machine position.

HMI Dialog and Element Description

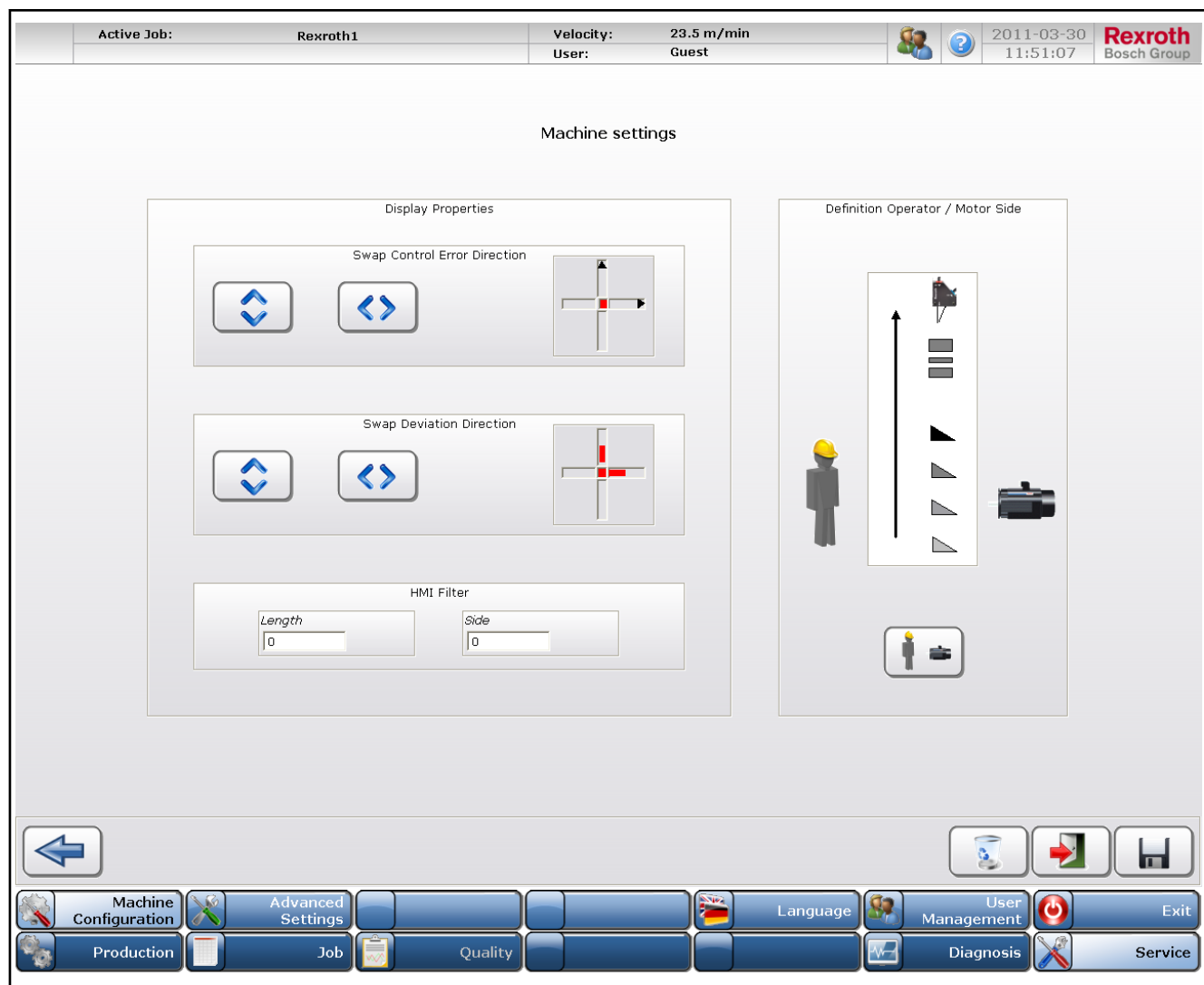


Fig. 10-13: Machine settings

	Opens a dialog to save a complete machine configuration into a recipe file. A new receipt file is created or an existing file is overwritten with
	A recipe file can now be deleted
	Exiting the machine configuration without saving the modified data
Loading upon start	The checkbox allows the automatic loading of the currently selected recipe file when starting the HMI application. Can be set when saving the recipe

HMI Dialog and Element Description

Change direction of deviation	Changes the polarity of the displayed register deviation
Invert display	Changes the polarity of the arrows for the control direction
	Changes the position of the machine operator with regard to the machine. It is required to correctly define the mark stream in the job configuration

10.4.3 Machine Configuration Dialog (Communication Settings of the Sensors)

The configuration settings of the sensors are selected in this dialog. Each sensor requires an IP address and 2 ports for the measured data and the configuration. The settings can be opened in the first dialog of the machine configuration via "IP settings".



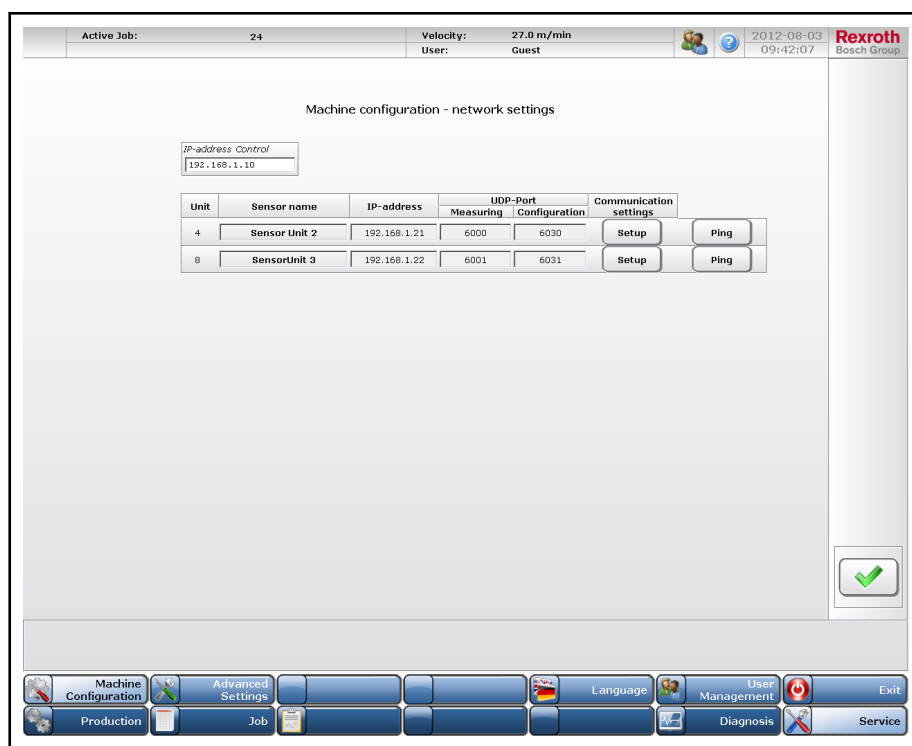
Each port and each IP address can only be assigned once. The specified ports are ports on the control and not on the sensor. Port 6099 is used for internal purposes and cannot be entered.



The UDP ports have to be selected in the range of 6001-6098.



Multiple assigned IP addresses and ports are highlighted in red and have to be changed.



Unit	Sensor name	IP-address	UDP-Port Measuring	UDP-Port Configuration	Communication settings
4	Sensor Unit 2	192.168.1.21	6000	6030	Setup Ping
8	SensorUnit 3	192.168.1.22	6001	6031	Setup Ping

Fig.10-14: Overview on the sensor communication settings

The table lists all configured sensors and their communication parameters.

The parameters of the sensor are edited via  in the respective

HMI Dialog and Element Description

line of the sensor to be configured. The IP address for the sensor can also be



selected in this dialog. Press , to check the network connection to the sensor.

 If more than 12 sensors are defined in the FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV2 license, another button **13-24** is displayed above confirmation button. By means of this button, it can be changed to the sensors 13-24.

Active Job:Rexroth1Velocity:23.5 m/minUser:Guest2011-03-30 11:52:39Rexroth Bosch Group

Machine configuration - network settings

Sensor2Sensor nameSensor02

UDP-Port setupMeasuring port6002Configuration port6002

Sensor IP setupSensor MAC-address (e.g.: 2A-08-48-01-00-FF)192.168.1.22Write IP to sensor

Machine ConfigurationAdvanced SettingsLanguageUser ManagementExit

ProductionJobQualityDiagnosisService

Fig. 10-15: Sensor network settings

The following table lists the settings that can be selected for each sensor:

 The MAC address name is case sensitive. Setting the IP address is only possible when complying with the case sensitivity.

Sensor	Displays the number of the currently selected sensor
Sensor name	Input field for the sensor name

HMI Dialog and Element Description

Measuring port	UDP port to transfer measurement results from the sensor to the control
Settings port	UDP port to transfer the configuration data from the control to the sensor (measuring port and settings port have to be unique)
Sensor MAC address	MAC address to transfer a new IP address to the sensor (format: XX-XX-XX-XX-XX-XX)
IP address of the sensor	IP address of the sensor (format: XXX.XXX.XXX.XXX)
	Writes the IP address to the sensor specified via the MAC address



If the IP address is changed, it has to be ensured that the correct MAC address of the respective sensor was entered. The sensor has to be reset after setting the IP address. That means that the power supply of the sensor has to be interrupted.

10.5 Job Configuration

10.5.1 Brief Description

All product-specific parameters containing different features according to their type of print job are specified in the job configuration. Product-specific data:

- Print format – Setting the print cylinder format and the material web width
- Mark properties – Setting the mark geometry and the mark alignment
- Bar code - Activating and defining the bar code
- Control method – Presenting the individual mark and the reference mark
- Register controller data – Setting the reaction of the register controller in case of a register deviation
- Material data – Setting the specific properties of the material to be printed

The different job features are contained in the "Job Management" dialog

10.5.2 Job Management

General Information

The "Job Management" dialog is used to manage existing job recipes or to create new ones. A wizard guides you through all print job settings that have to be selected. In the overview dialog, it can be selected whether a new job should be created or an existing job should be copied, edited or deleted. Furthermore, the selected job can be enabled.

Up to 300 jobs can be created in the job list.

HMI Dialog and Element Description

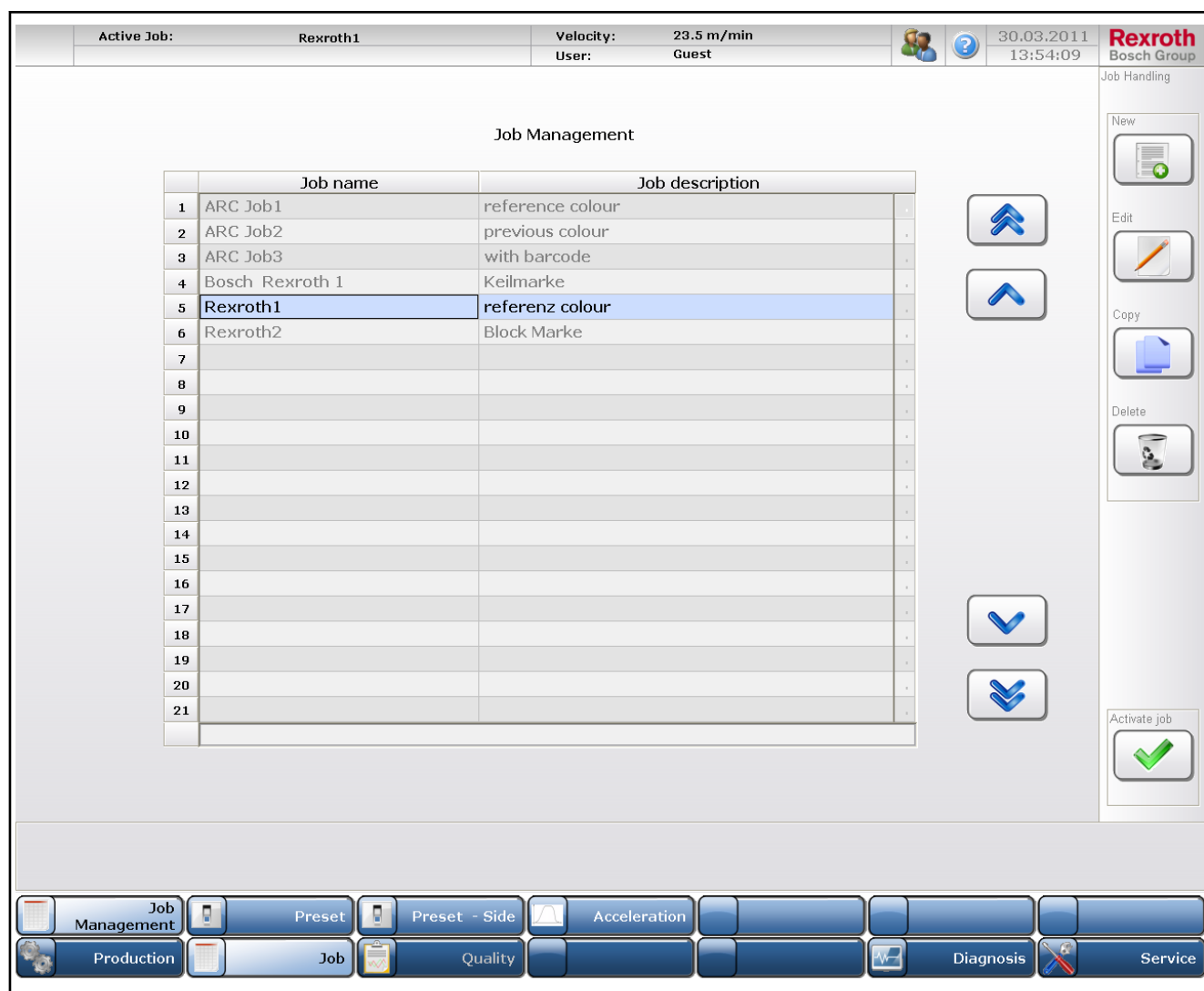


Fig. 10-16: Job management

The following entries can be made in the "Job Management" dialog:

	Enabling the job - Transmitting the selected job to the PLC and the sensors
	A new job is created
	The selected job is edited

HMI Dialog and Element Description

	The selected job is copied. When copying, a default job can additionally be copied; that means that an existing job is created as default job. This default job is always loaded when creating a new job. Therefore, the respective user rights have to be specified
	The selected job is deleted

If a new job is selected or edited, the job is run through the respective dialogs for the job configuration

Format and Web Width

The printing cylinder format and the material web width have to be specified globally for all printing units. It also has to be specified if the material is pre-printed and thus a register mark has already been set.

Active Job: Rexroth1		Velocity: 23.5 m/min			2011-03-30 11:54:10	Rexroth Bosch Group
		User: Guest				

Job Settings

Job

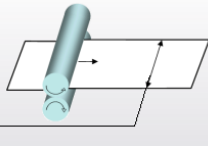
Name
Rexroth1

Description
referenz colour

Format and Web settings

Format length
470.00 [mm]

Web width
1010 [mm]



Preprinted Material







 Job Management	 Preset	 Preset - Side	 Acceleration			
 Production	 Job	 Quality			 Diagnosis	 Service

Fig. 10-17: Format and web width

HMI Dialog and Element Description

Name	Displays the current job name
Description	Description specification of the current job
Format length [mm]	Specifying the format, i.e. the printing cylinder circumference
Web width [mm]	Specifying the web width
	Selection if material is preprinted

Subsequently, the dialog to define the printing unit properties opens.

Print configuration

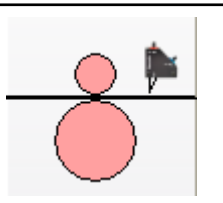
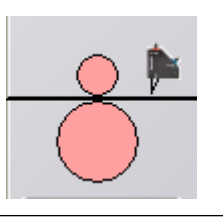
The printing units participating in the production are defined in the Unit configuration. Furthermore, the printed color can be defined, the control strategies for the length register and the side register can be selected and their settings can be selected.



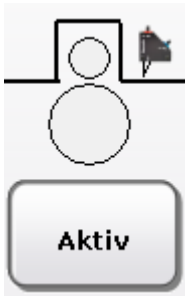
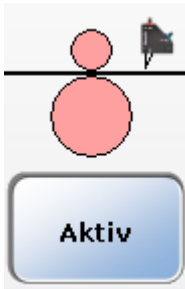
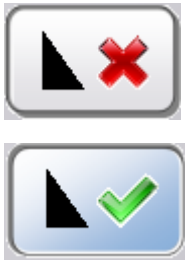
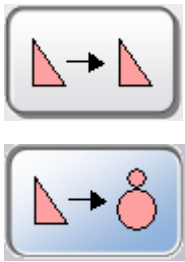
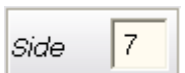
If more than 12 printing units are defined for the "FWS-IM*MLC-TEC-NNVRS-NN-REGI*ADV2" license, the print configuration overview dialog for printing units 13-24 is subsequently opened in the wizard.



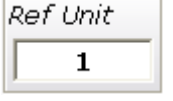
One mark stream sensor can only measure 12 marks simultaneously. This has to be taken into consideration when defining the mark stream. To avoid that more than 12 marks are measured by a sensor, print or measure the multiple reference mark or set the relevant settings via the advanced settings.

 	The selected printing unit is highlighted in gray
Web length 7200 [mm]	The material web length to the active printing unit in the front in [mm]

HMI Dialog and Element Description

 	Activating the individual printing unit: Setting and displaying the color by enabling the lower loop of the printing unit If the sensor is enabled, the dialog for advanced sensor settings is opened. The respective user rights have to be assigned
	Select, if the printing unit prints a register mark: Top: Printing unit does not print any visible mark Down: Printing unit prints a visible mark
	Specifies the position of the printed mark in the mark stream
	Selecting between web/web and web/cylinder control: Top: Web/web control. This means, a register mark to be controlled is compared to another register mark Down: Web/cylinder control. This means, the printed register mark is compared to a cylinder position
	Reference mark for length RegisterControl
	Reference mark for side RegisterControl. Is only available in case of a web/web control

HMI Dialog and Element Description

 	Enable/disable the automatic format correction Enables a controller (also called inset controller) that controls the fine adjustment
	Opens the dialog to define reference marks that have been printed multiple times
	Entering a reference color (the entered number is only effective for a reference color. The entry is ignored for the previous color since the reference color results from the active printing unit at the front). The entered number is automatically corrected if the selected printing unit does not print any mark
 	Selecting the reference color as measurement procedure
 	Selecting the previous color as measurement procedure

By selecting the buttons for the length register or the side register, the dialog to configure the register controller for the activated printing unit is opened.

Multiple reference marks dialog



This feature is only available if no preprinted material is printed and the multiple reference mark is the first mark that has been printed. This function has to be enabled by Bosch Rexroth.

In this dialog it can be selected if several reference marks are printed and how many marks are located in between. If the button is enabled, multiple reference colors are printed. The number of the marks located in between specifies after how many register marks the reference mark is printed again.

HMI Dialog and Element Description

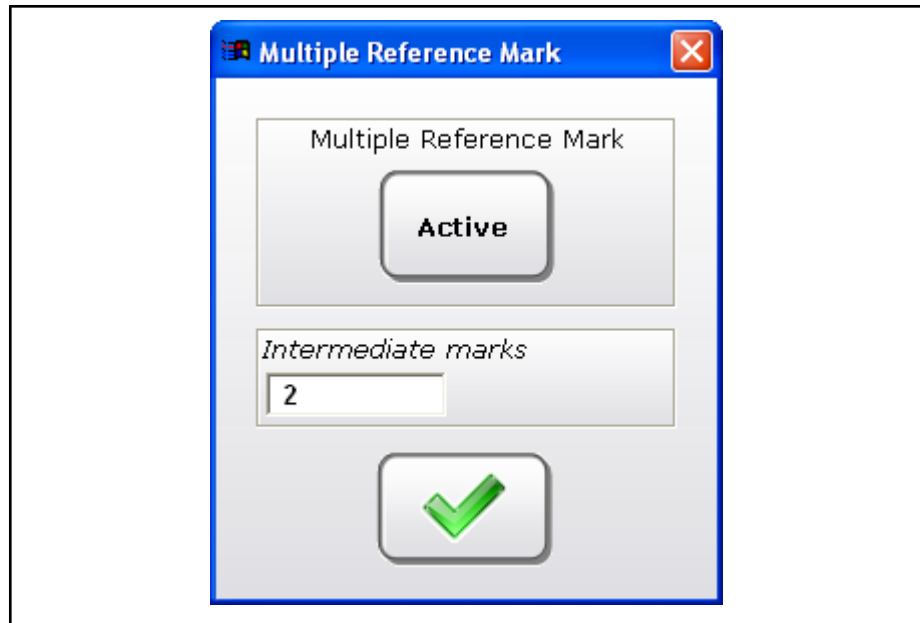


Fig. 10-19: Multiple reference mark dialog

Subsequently, the resulting mark stream is displayed. The first mark is the reference mark. Subsequently, 4 marks of printing units follow until subsequently, the reference mark is printed.

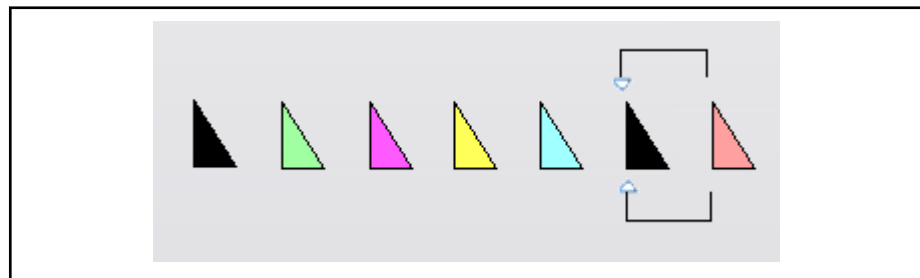


Fig. 10-20: Sample mark stream for multiple reference marks

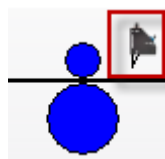
The printing unit sensor printing the turquoise mark (to the left of the second multiple reference color) detects 5 marks in this case. The sensor behind the printing unit printing the mark to the far right detects 2 marks in this case, as the multiple reference mark defines a new section. For example, if 24 printing units are available in which each printing unit prints a mark, a multiple reference mark has to follow after 11 marks. Thus, it can be ensured that each sensor smaller or equal to 12 register marks is measuring at the same time.

Advanced sensor settings dialog



The advanced settings should only be selected in special cases, if the automatic calculation of the mark stream is not sufficient. This function has to be enabled by Bosch Rexroth.

The "Sensor" dialog is displayed when selecting the small sensor image to the right of the printing unit symbol.



HMI Dialog and Element Description

The automatic calculation can be disabled in this dialog. If "fixed" is enabled, no automatic calculation takes place. The entered values are transmitted without conversion to the sensor or the control.



The button in the next dialog used to define the direction of the mark stream does not change the entered mark positions.

Furthermore, it has to be entered how many marks the sensor can see.



By entering the visible marks, it is selected via how many marks the expectation window is set. If this setting is selected, the automatic bar code search can sporadically not be used anymore. The expectation window has to be set manually.

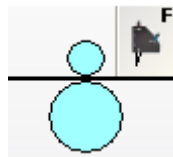
Fig.10-21: "Advanced sensor settings" dialog

The position of the individual mark is specified under mark for marks visible to the sensor. The reference marks for length and side RegisterControl are specified under Length and Side.

HMI Dialog and Element Description

Visible marks	Specify the number of marks to be displayed to and to be measured by the sensor
Own mark	Specifies the position of the own mark within the visible marks
Reference mark length	Specifies the position of the own mark for the length register within the visible marks
Reference mark side	Specifies the position of the individual mark for the side register within the visible marks
Distance of bar code to EWF	This input field is only active if a bar code is printed. Specifies in which distance the expectation window containing the visible register marks starts from the end of the bar code
EWF size	This input field is only active if a bar code is printed. Specifies the expectation window size containing the visible register marks
	If "fixed" is selected, no automatic calculations are executed for this printing unit. The data entered in this dialog is transmitted to the sensor.

If the button is pressed continuously (fixed), an "F" is displayed in the print configuration overview.

**Sample mark stream:**

A printing machine with processing unit is described as use case. The printing units print a bar code and six register marks. Additionally, an individual register mark is printed for the processing unit. As the processing unit does not print an own mark, it has to be path-/cylinder-controlled. Therefore, not all register marks have to be measured but only a reference mark placed at another position. The sample mark stream displays the bar code, six register marks and finally the reference mark to which the processing unit is to be controlled to.

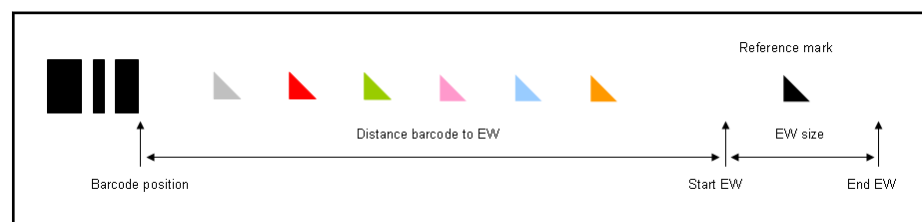


Fig. 10-22: Definition of only one mark to be measured, including the advanced settings

This mark stream can be defined as follows via the advanced processing unit settings:

HMI Dialog and Element Description

Sensor - Extended settings

Unit: 9 (Unit09)

Number of visible marks
1

Own Mark
0

Reference mark length
1

Dist. Barcode Exp. Win.
150 mm

Exp. Win. Size
30 mm

Fixed

Fig. 10-23: Definition of the sample mark stream

A visible mark is defined for the processing unit. Consequently, a path/cylinder control is executed, as a register mark to be measured has to be the reference mark. As no individual register mark is printed, a 0 is entered. A printed mark has been selected as reference mark for the length register.

No side register control is available for path/cylinder control. Therefore, this input field is hidden. The reference mark is only printed after the mark stream. The distance of this reference mark to the end position of the bar code is 150 mm.

As only one register mark has to be measured, the expectation window is defined with 30 mm. The reference mark has to be in this range. To prevent overwriting of these entries by the automatic calculation, the settings can be fixed.

After the job has been enabled, a bar code search can now also be executed for this processing unit, after which the mark measurement of the reference mark is started automatically. The expectation window can also be set manually via the reference mark.

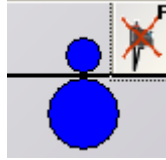


If the bar code search fails, the configuration has to be checked or the expectation window has to be manually set via the number of visible register marks.

HMI Dialog and Element Description



If a sensor is available for several printing units, the printing unit without sensor also features an icon showing a crossed out sensor if the advanced sensor settings are enabled for the subsequent sensor.



The visible marks are highlighted in gray in the dialog. The value corresponds to the visible marks of the sensor. Furthermore, the position of the individual mark, visible to the sensor, as well as the reference mark for the length and side register has to be specified for this control station.

Configuring the length register

The length register controller for the selected printing unit can be configured in this dialog. During the parameterization, it is differentiated between a length register controller in web/web or in web/cylinder.

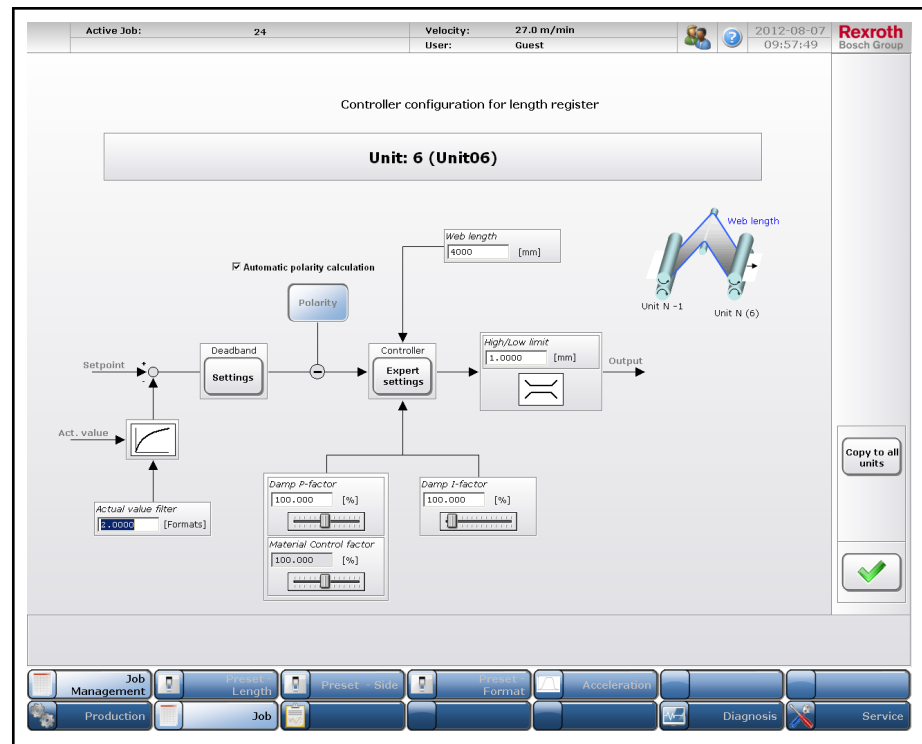
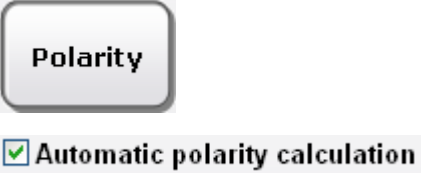
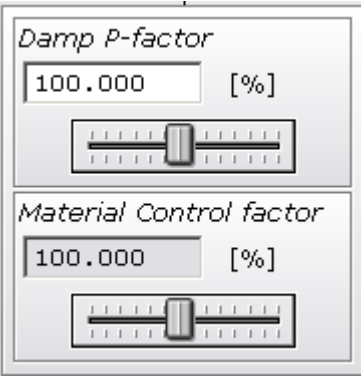
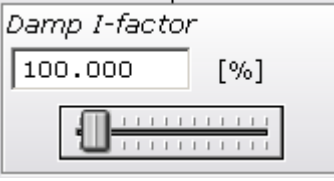


Fig. 10-24: Controller configuration length register



Please check that it is set in the expert setup, whether it is a printing process with or without clamping unit. The dynamics of the calculated controller parameter depends on this fact.

HMI Dialog and Element Description

	Filter constant for the measurands
	Parameterizing the dead zone or resetting to default values
	Setting the polarity If the automatic polarity calculation is active, the polarity is automatically calculated depending on the defined mark stream. Otherwise, the polarity calculation can be set manually
	Indicates how the optimally calculated controller parameters should be scaled. The input size can vary from 1% to 200%. The slide control effects the P-factor of the calculated controller parameter. 100 % signifies that the exact and precisely calculated P-factor is used. 50 % means that half the P-factor is used. The control factor "Material" is entered in the material settings and can be calculated with the P-factor. It cannot be changed in this dialog
	Indicates how the optimally calculated controller parameters should be scaled. The input size can vary from 1% to 1000%. The slide control effects the I-factor of the calculated controller parameter. 100 % means that the exact calculated I-factor is used. 50 % signifies that half the I-factor is used. The control loop dynamics is thus increased
	Opens another dialog where the controller mode can be selected. In this setting, it has to be specified if it is a control station with clamping unit (e.g. gravure printing) or without clamping unit (e.g. screen printing)
	Length of the material web to the previously active printing unit

HMI Dialog and Element Description

 High/Low limit 1.0000 [mm] [Limit icon]	Box to enter the maximum length register adjustment within a printing cylinder revolution
 Copy to all units	Copies the data of the currently selected printing unit to all other printing units. The data of a web/web register controller are only copied to control stations with web/web register controllers. If the path/cylinder controller is not defined as processing unit, the data is only copied to the path/cylinder controllers that are no processing units. If the path/cylinder controller is defined as processing unit, the data is only copied to the path/cylinder controllers that are processing units

 If the web/cylinder control mode is selected, the material factor and the expert setup is not needed with the setting with or without clamping unit.

 The automatic polarity calculation can be enabled and disabled per printing unit.

Side register configuration

The side register controller of the selected printing unit can be configured in this dialog.

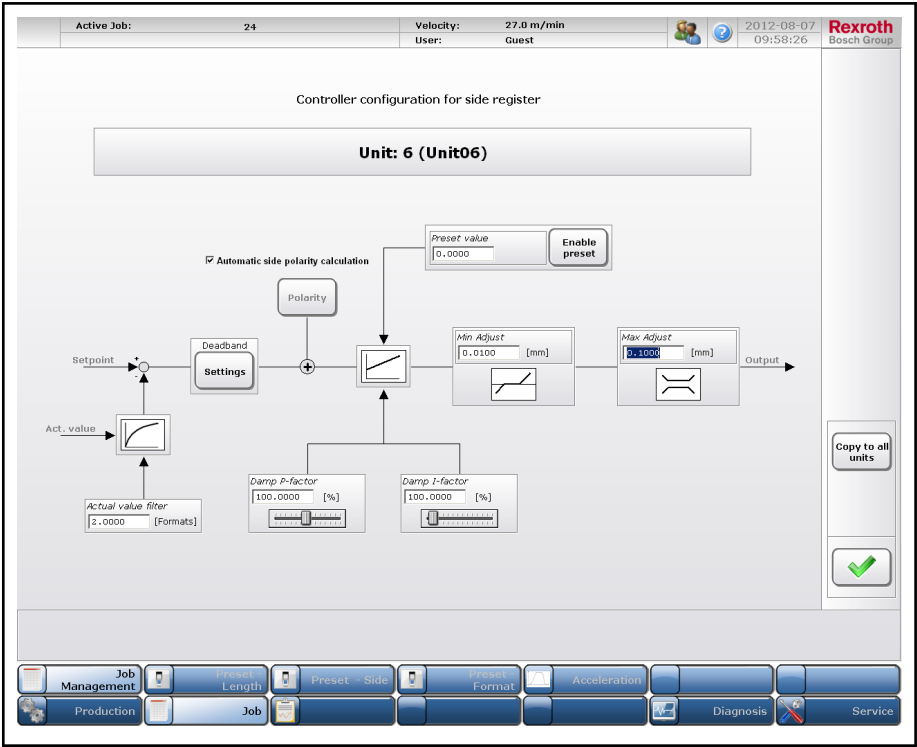
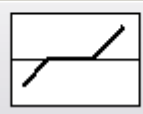


Fig. 10-25: Controller configuration of side register

HMI Dialog and Element Description

Actual value filter 2.0000 [Formats]	Filter constant for the measurands
Setup	Parameterizing the dead zone or resetting to default values
Polarity ☒ Automatic polarity calculation	Setting the polarity If the automatic polarity calculation is active, the polarity is automatically calculated depending on the defined mark stream. Otherwise, the polarity calculation can be set manually
Damp P-factor 100.000 [%] 	Indicates how the optimally calculated controller parameters should be scaled. The input size can vary from 1% to 200%. The slide control effects the P-factor of the calculated controller parameter. 100 % signifies that the exact and precisely calculated P-factor is used. 50 % signifies that half the P-factor is used
Damp I-factor 100.000 [%] 	Indicates how the optimally calculated controller parameters should be scaled. The input size can vary from 1% to 1000%. The slide control effects the I-factor of the calculated controller parameter. 100 % means that the exact calculated I-factor is used. 50 % signifies that half the I-factor is used. The control loop dynamics is thus increased
Preset value 0.0000 Enable preset	Preset of the controlled variable of the controller
Min Adjust 0.0010 [mm] 	Input for the minimum adjustment of the side register (the value should correspond to at least the minimum adjustment of the side register adjustment device)
Max Adjust 0.2000 [mm] 	Box to enter the maximum side register adjustment in one printing unit revolution
Copy to all units	Copies the side register controller data of the currently selected printing unit to all other printing units

HMI Dialog and Element Description

 The automatic polarity calculation can be enabled and disabled per printing unit.

Automatic format correction

In this dialog, the automatic format correction (insetter) can be configured for the selected printing unit.

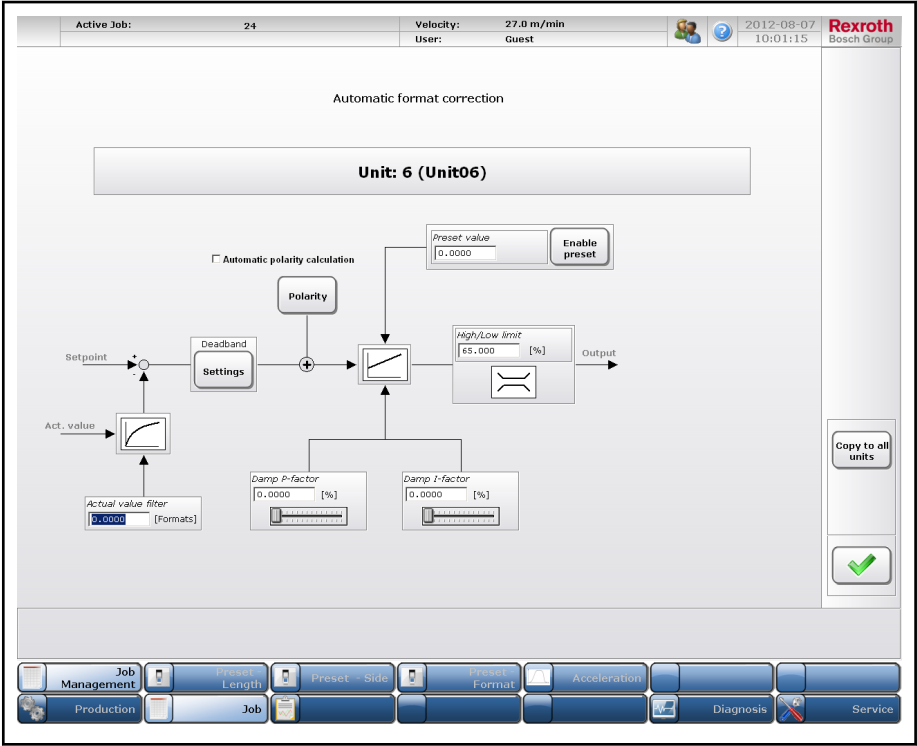
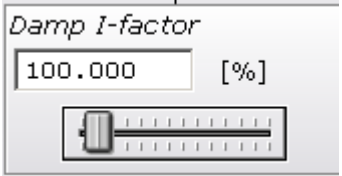
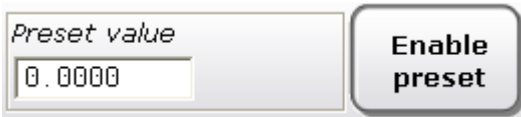
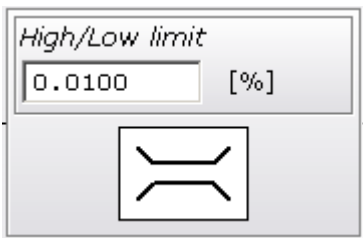


Fig. 10-26: Automatic format correction

Actual value filter 2.0000 [Formats]	Filter constant for the measurands
Setup	Parameterizing the dead zone or resetting to default values
Polarity ☒ Automatic polarity calculation	Setting the polarity If the automatic polarity calculation is active, the polarity is automatically calculated depending on the defined mark stream. Otherwise, the polarity calculation can be set manually
Damp P-factor 100.000 [%] 	Indicates how the optimally calculated controller parameters should be scaled. The input size can vary from 1% to 200%. The slide control effects the P-factor of the calculated controller parameter. 100 % signifies that the exact and precisely calculated P-factor is used. 50 % signifies that half the P-factor is used

HMI Dialog and Element Description

	Indicates how the optimally calculated controller parameters should be scaled. The input size can vary from 1% to 1000%. The slide control effects the I-factor of the calculated controller parameter. 100 % means that the exact calculated I-factor is used. 50 % signifies that half the I-factor is used. The control loop dynamics is thus increased
	Preset of the controlled variable of the controller
	Limit for the maximum permissible fine adjustment in [%]
	Copies the data of the automatic format correction of the currently selected printing unit to all other printing units with active controller for the automatic format correction. If the automatic format correction is not defined as processing unit, the data is only copied to controllers of the automatic format correction that are no processing units. If the automatic format correction is defined as processing unit, the data is only copied to controllers of the automatic format correction that are processing units

After the parameterization of all register controllers has been completed, you can go to the next dialog for the configuration of the mark stream using the "arrow" keys.



The automatic polarity calculation can be enabled and disabled per printing unit.

Mark Stream

To define the mark stream, the mark geometry and the mark stream features have to be specified. Furthermore, it has to be specified whether a bar code is active.



The bar code is printed in front of the mark stream by the first printing unit. The sensor can detect the bar code and use this information to calculate the expectation window. The bar code has to be printed in front of the mark stream and has to be correctly defined.

HMI Dialog and Element Description

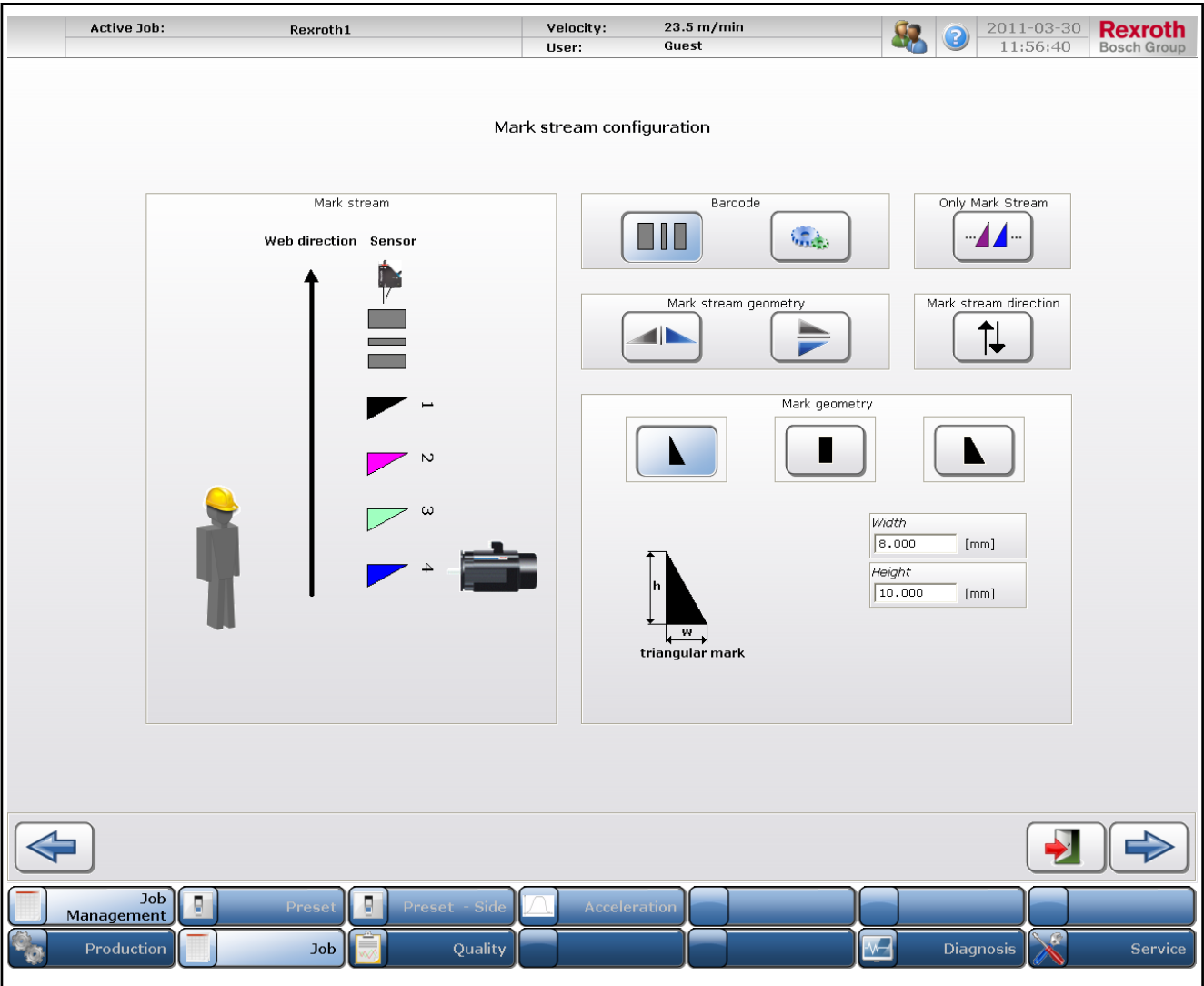
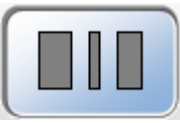


Fig. 10-27: Mark stream configuration

	Indicates that a bar code is available
	Opens the configuration dialog of the bar code. This button is only visible if a bar code is available
	Specifies that only register marks are contained in a 360° cylinder revolution. The remaining area does not contain any register crosses, arrows, etc. The sensor can then find the mark stream (without bar code) and start the measurement as soon as the mark stream search is started.

HMI Dialog and Element Description

	Selecting the geometry of the printed marks
Width [mm]	Width of the selected mark
Height [mm]	Height of the selected mark
	Selecting the mark orientation
	Selecting the mark sequence. It is specified, whether the registration mark printed by the first printing unit should be on the first or on the last position of the mark stream
	Selects which mark edge is the first to be detected by the sensor

The mark stream can be completely defined using the 3 buttons. The mark stream has to be exactly graphically displayed in the characteristics it is printed on the material web and measured by the sensor.

The dialog to define the material properties is opened after the mark stream has been defined.



The mark stream has to be correctly defined for the sensor optics to detect it. If the mark stream is not correctly defined, a correct length register control and side RegisterControl cannot be guaranteed.

Bar Code Definition



This dialog can only be opened if a bar code is printed and activated.

The technical requirements for the bar code are as follows:

- The bar code has to be **unambiguous** within one revolution
- The bar code has to be printed in front of or behind the mark stream
- Optionally, a second bar code can also be printed indicating the end of the mark stream. This bar code may not be identical to the first bar code. A mirror-inverted bar code is recommended
- The bar code can consist of 3 - 10 blocks
- A printing-free area of 20 mm has to be in front of the bar code

HMI Dialog and Element Description

- A printing-free area of 20 mm has to be behind the mark stream
- The size of the bar code blocks has to be 2 - 10 mm
- The distance between the bar code blocks has to be 2 - 10 mm each



A bar code search can only be started if the bar code can be measured under the corresponding sensor. If a bar code search is started without a bar code being printed, an incorrect bar code position can sporadically be returned.



The bar code detection can only be ensured if it is complied with the listed specifications.

The bar code dialog is structured as follows:

Active Job: Rexroth1

Velocity: 23.5 m/min
User: Guest

2011-03-30 11:57:55

Bosch Group

Barcode configuration

Barcode location

Free space in front of markstream
 [mm]

Mark distance
 [mm]

Size of Expectation Window
 [mm]

Number of barcode blocks

	Block 1	Block 2	Block 3
Width	9.0	6.0	3.0
	W1	W2	W3
Distance	3.0	3.0	20.0
	D1	D2	D3

Job Management

Preset

Preset - Side

Acceleration

Production

Job

Quality

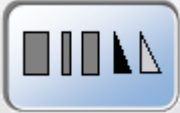
Diagnosis

Service

Fig. 10-28: Bar code configuration

Individual elements description:

HMI Dialog and Element Description

	Defining the bar code position. It can be defined whether the bar code is in front of or behind the mark stream
Free area in front of the first block [mm]	It indicates the printing-free area in front of the bar code
Mark distance [mm]	Specifies the mark distance of the register marks
Size of the expectation window [mm]	Indicates the size of the expectation window behind the bar code. The size is defined directly after the bar code, if the bar code is in front of the mark stream. Marks can only be found if the mark stream is located behind the bar code in the area defined by this value. If the bar code is behind the mark stream, the size of the expectation window has to be defined from the start of the mark stream plus half a print-free area up to the start of the bar code (see figure above)
Number of bar code blocks	Indicates the number of bar code blocks. The number can vary from 3 to 10
Width [mm]	Indicates the width of the respective bar code block
Distance [mm]	Indicates the distance between the respective bar code blocks. The last value to be entered is the distance between the bar code and the first mark



If the bar code search with a subsequent measurement was not successful, the cause might be an incorrectly defined bar code or an incorrect size of the expectation window. In this case, open the oscilloscope of the respective sensor and get the current data displayed. The current data will tell you whether the expectation window was selected too small (marks are missing) or too large (the expectation window is larger than the printing-free area). Correct your entry if required.

Sample Mark Stream

This section describes the sample structure of a recommended mark stream.

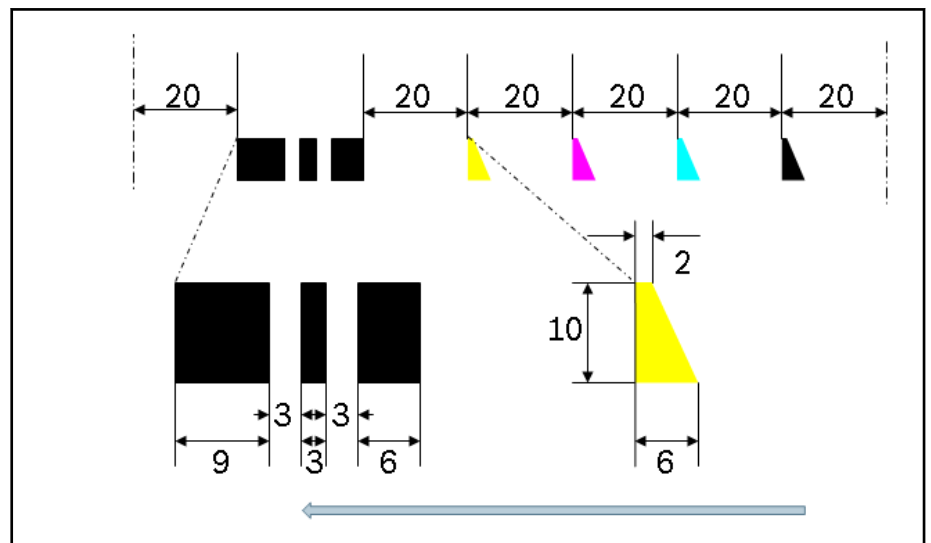


Fig. 10-29: Recommended sample mark stream

The blue arrow points into the direction of the path, i.e. the bar code is displayed as first entry below the sensor optics.

HMI Dialog and Element Description

The following general requirements for a mark stream with trapezoidal marks have to be complied with:

- The recommended printed mark distance is 20 mm. The minimum distance between the marks should not be less than 15 mm as the area to be controlled by the marks is considerably limited
- The trapezoid marks top width should not be less than 2 mm
- The height depends on the required control area of the side register. 10 mm is recommended
- The order of the vertical and the inclined mark edge to the printing direction is user-defined, however, the direction has to be used in the entire mark stream

The bar code requirements are described in the previous section (cf. [chapter 10.5.2 "Job Management" on page 89](#)).

Material Selection

General Information

In the "Material selection" dialog, up to 16 material data blocks can be created/edited and selected, if required.



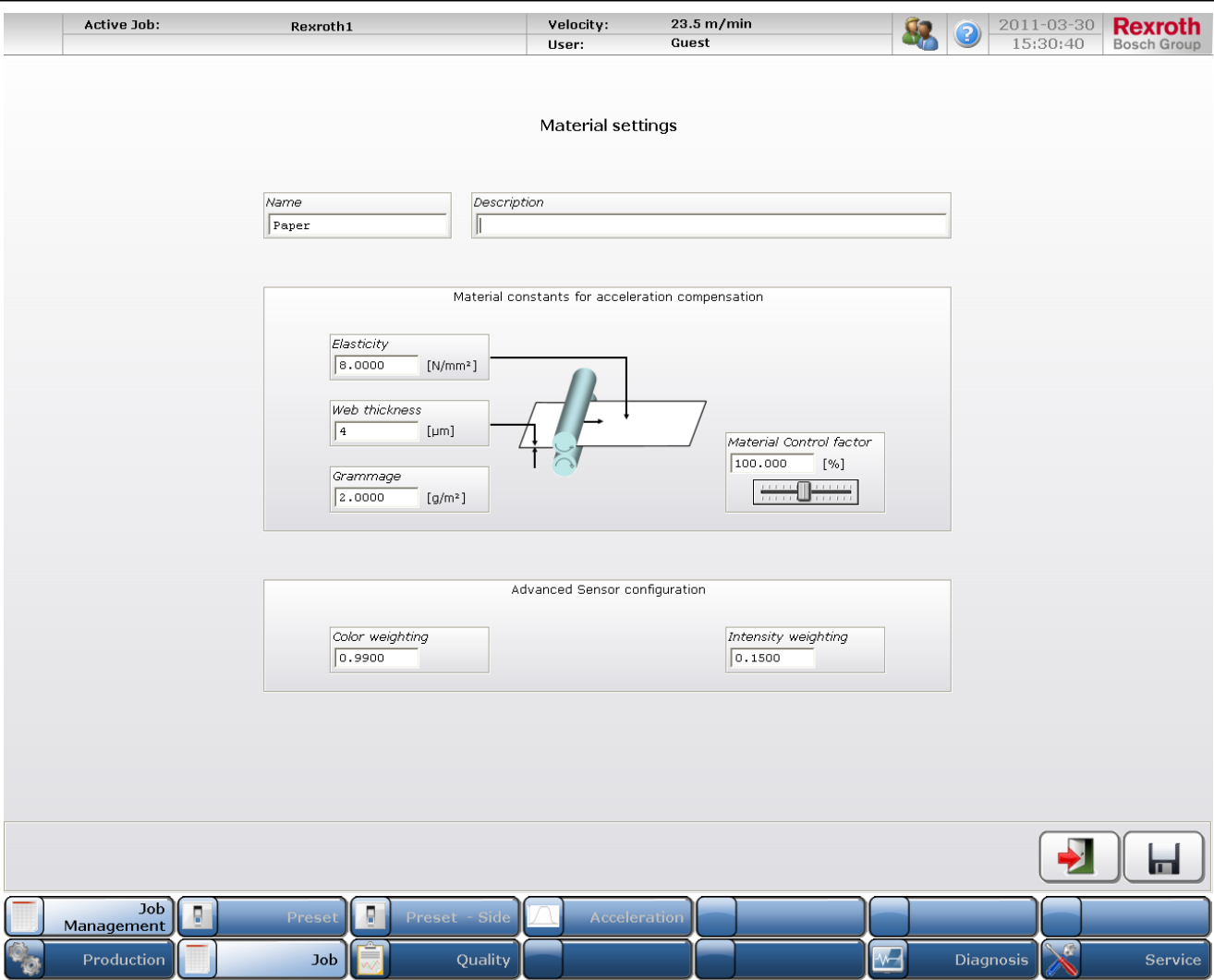
Fig. 10-30: Material selection

HMI Dialog and Element Description

Material	Selecting the material data block
	Linking to the configuration dialog to enter the material-specific constants

Material settings

The material-specific properties can be entered in this subdialog.



Active Job: Rexroth1 Velocity: 23.5 m/min User: Guest 2011-03-30 15:30:40 Rexroth Bosch Group

Material settings

Name: Paper Description:

Material constants for acceleration compensation

Elasticity: 8.0000 [N/mm²]
Web thickness: 4 [μm]
Grammage: 2.0000 [g/mm²]
Material Control factor: 100.000 [%]

Advanced Sensor configuration

Color weighting: 0.9900 Intensity weighting: 0.1500

Job Management Production Preset Job Preset - Side Quality Acceleration Diagnosis Service

Fig. 10-31: Material settings

Material name	Material name specification. The name describes the material data block in the "Material selection" dialog
Material description	Material data record description
Elasticity [N/mm ²]	Modulus of elasticity of the material
Web thickness [μm]	Material thickness
Grammage [g/mm ²]	Grammage of the material (paper)

HMI Dialog and Element Description

Control factor Material	Factor that influences the P-factor of the length register independent of the material. 100 % signifies that the exact calculated P-factor is used
Color scaling	Material-specific color scaling for the sensor measurement
Intensity scaling	Material-specific intensity scaling for the sensor measurement
	Canceling the material configuration (changes are discarded)
	Saving the material configuration

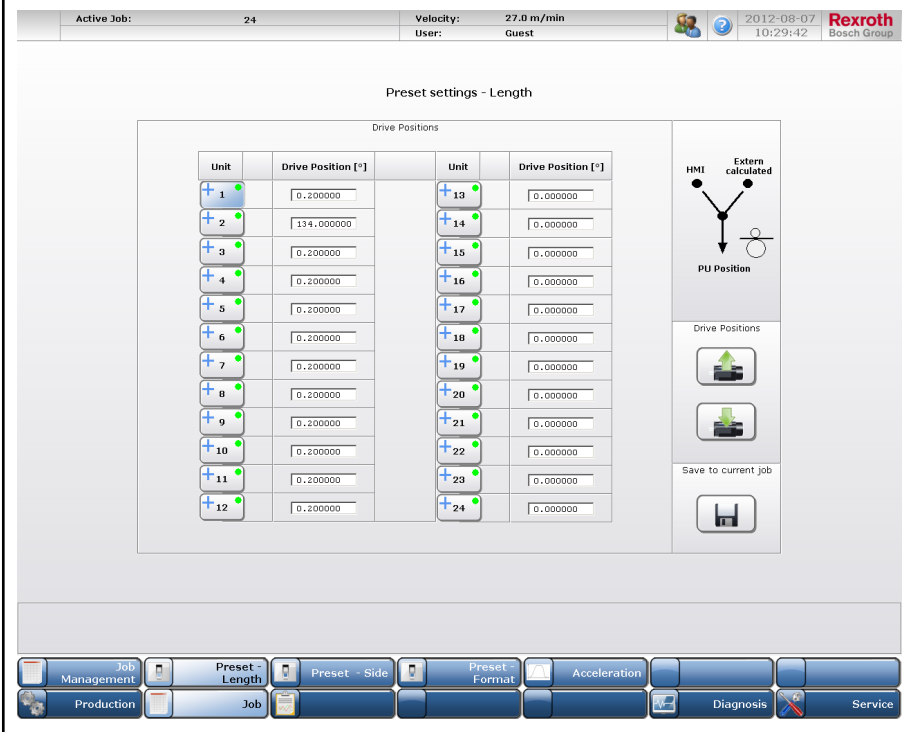
After the material has been configured, the changed job has to be saved. If this job should now be directly used, the job can be additionally activated in the job overview. Due to the activation, the job is transferred from the HMI to the control and to the sensors. The job configuration is now completed.

10.5.3 Preset Settings - Length



If it has been defined in the machine configuration that the preset is executed externally, the input windows are disabled

The "Preset settings - Length" preregisters the length register.



Active Job: 24 Velocity: 27.0 m/min User: Guest 2012-08-07 10:29:42 Rexroth Bosch Group

Preset settings - Length

Drive Positions

Unit	Drive Position [°]	Unit	Drive Position [°]
1	0.200000	13	0.000000
2	134.000000	14	0.000000
3	0.200000	15	0.000000
4	0.200000	16	0.000000
5	0.200000	17	0.000000
6	0.200000	18	0.000000
7	0.200000	19	0.000000
8	0.200000	20	0.000000
9	0.200000	21	0.000000
10	0.200000	22	0.000000
11	0.200000	23	0.000000
12	0.200000	24	0.000000

HMI Extern calculated
PU Position

Drive Positions

Save to current job

Job Management Production Preset - Length Preset - Side Preset - Format Acceleration Diagnosis Service

Fig.10-32: Preset settings - Length register

HMI Dialog and Element Description

Drive position [°]	Specifies preset values for the drive position
 	Top: Read drive position Down: Write drive position
	Saves the data in the current job configuration



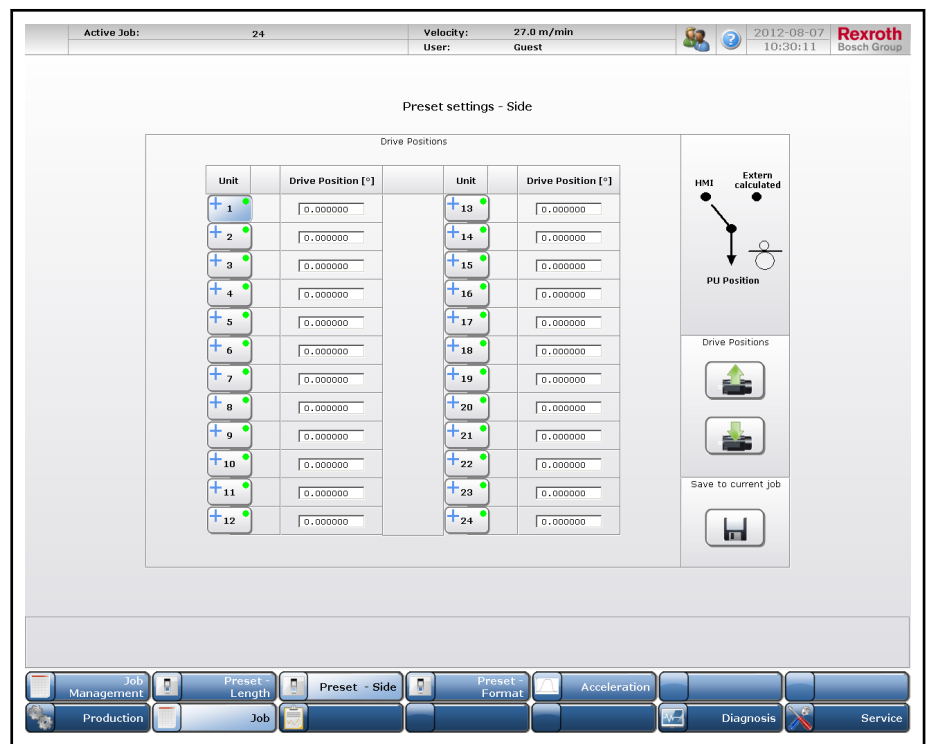
If preset values have been found, it is recommended to download the values from the control and save them in the job. These values can be written directly upon a new job activation if the preset is activated in the machine configuration upon the job activation.

10.5.4 Preset Side



If it has been defined in the machine configuration that the preset is executed externally, the dialog is disabled.

The "Preset side" dialog is used to preregister the page register. The dialog structure is adjusted to the length register preset (preset dialog: right side).



Active Job: 24 Velocity: 27.0 m/min User: Guest 2012-08-07 10:30:11 Rexroth Bosch Group

Preset settings - Side

Drive Positions

Unit	Drive Position [°]	Unit	Drive Position [°]
1	0.000000	13	0.000000
2	0.000000	14	0.000000
3	0.000000	15	0.000000
4	0.000000	16	0.000000
5	0.000000	17	0.000000
6	0.000000	18	0.000000
7	0.000000	19	0.000000
8	0.000000	20	0.000000
9	0.000000	21	0.000000
10	0.000000	22	0.000000
11	0.000000	23	0.000000
12	0.000000	24	0.000000

HMI Extern calculated
PU Position

Drive Positions

Save to current job

Job Management Preset Length Preset - Side Preset Format Acceleration Production Job Diagnosis Service

Fig. 10-33: Preset settings - Side register

HMI Dialog and Element Description

Fine adjustment [%]	Specifies preset values for the fine adjustment
 	Top: Read side register position Down: Write side register position
	Saves the data in the current job configuration

 If preset values have been found, it is recommended to download the values from the control and save them in the job. These values can be written directly upon a new job activation if the preset is activated in the machine configuration upon the job activation.

10.5.5 Preset Format

 If it has been defined in the machine configuration that the preset is executed externally, the input windows are disabled

The preset values for fine adjustment can be entered in the "Preset" dialog.

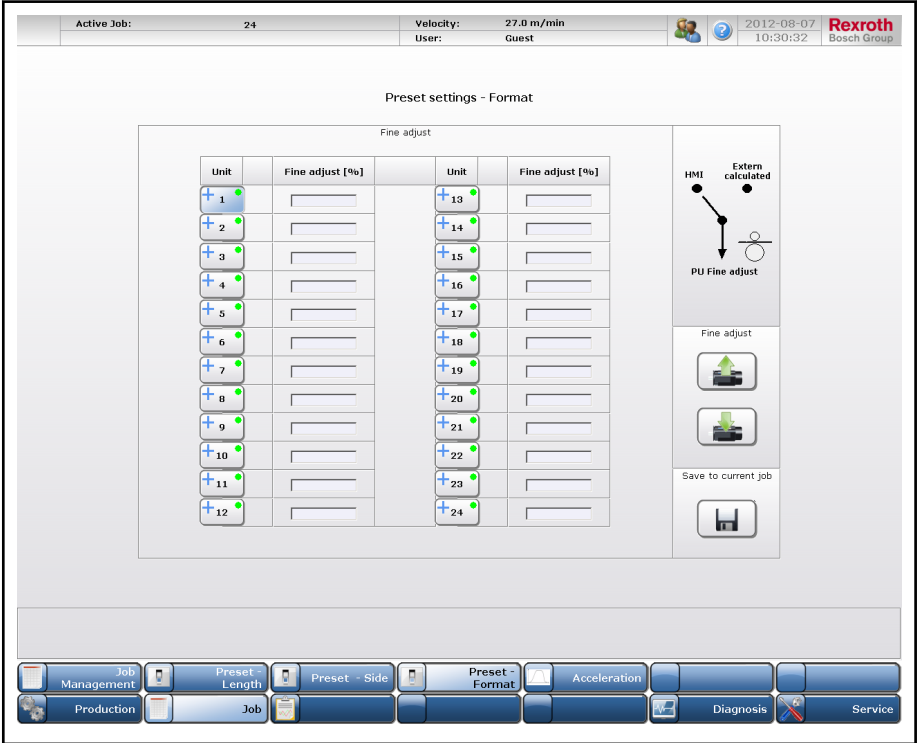


Fig.10-34: Preset settings for fine adjustment

HMI Dialog and Element Description

Drive position [°]	Specifies preset values for the fine adjustment
 	Top: Read fine adjustment Down: Write fine adjustment
	Saves the data in the current job configuration



If preset values have been found, it is recommended to download the values from the control and save them in the job. These values can be written directly upon a new job activation if the preset is activated in the machine configuration upon the job activation.

10.5.6 Acceleration Compensation

To calculate the acceleration compensation, the required constants can be entered and saved in the "Acceleration dialog".

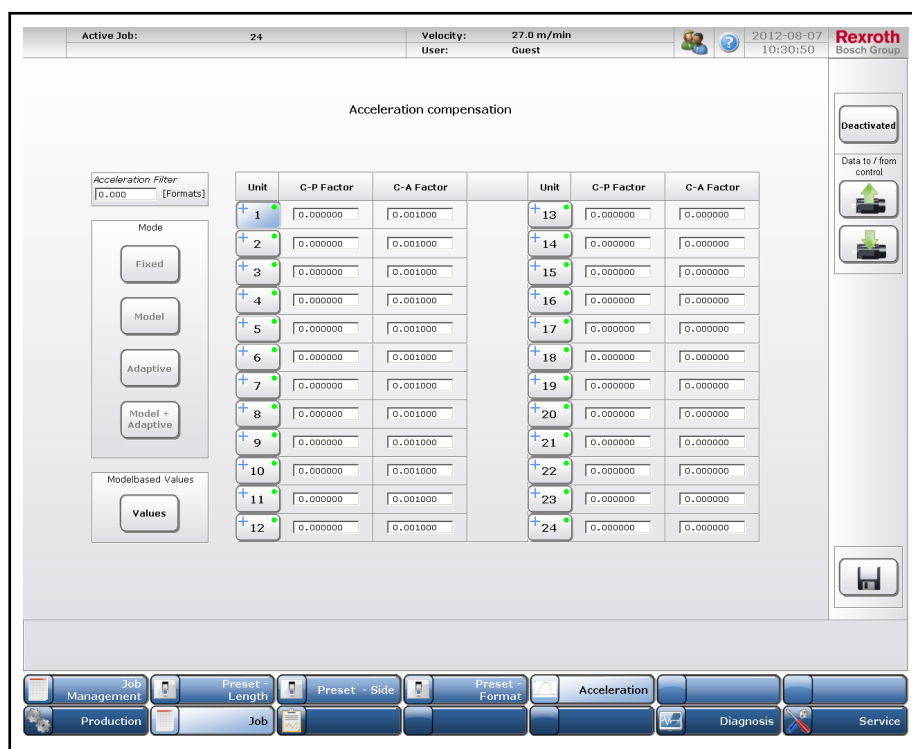
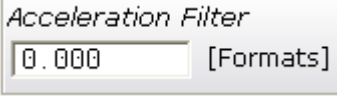


Fig.10-35: Acceleration

C-P factor	Calculation value of the velocity compensation
C-A factor	Calculation value of the acceleration compensation

HMI Dialog and Element Description

 	Activating the acceleration compensation
	The calculation values C-A and C-P are not updated. The specified values are applied
	A model-based calculation of the compensation values is now executed. The inputs of the material settings are used to execute the model-based calculation
	An adaptive adjustment of the C-A and C-P values is carried out after each acceleration phase
	The model-based communication and the adaptive communication are carried out simultaneously
	Filter for the input variables of the acceleration compensation
 	Top: Read C-P / C-A control data Down: Write C-P / C-A control data
	Opens the dialog for model-based acceleration values
	Saves the data in the current job configuration

HMI Dialog and Element Description



Ideally, a model-based and adaptive compensation is used. Furthermore, values already determined can be read from the control and saved in the job. If subsequently the fixed setting is used, the values are not changed anymore. This can be useful if the determined compensation values are sufficient and measuring signals degraded by a high noise level exist.

Dialog model-based acceleration values

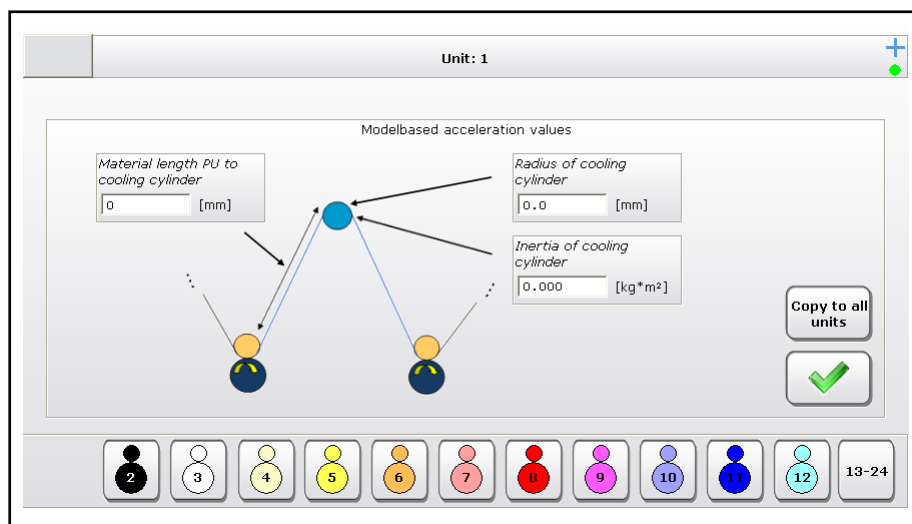


Fig. 10-36: Settings for model-based acceleration values

Material lengths printing unit to cooling roll	Specifies the material path lengths in [mm] between the preceding printing unit and the preceding cooling roll
Cooling roll radius	Specifies the radius of the preceding cooling roll in [mm]
Cooling roll inertia	Inertia torque of the preceding cooling roll in [kg*m²]
	Copies data of acceleration values to all printing units

10.6 Production

10.6.1 Brief Description

The dialogs for the production are used to visualize register errors and to monitor the status of the configured sensors and printing units.

10.6.2 Register Overview

In the Register overview, the register deviations of all printing units are clearly represented. In this dialog, the sensors and controllers can be controlled after the job has been configured. For example, a global bar code search can be started, the command values are applied and the controllers can be switched on or off.

HMI Dialog and Element Description

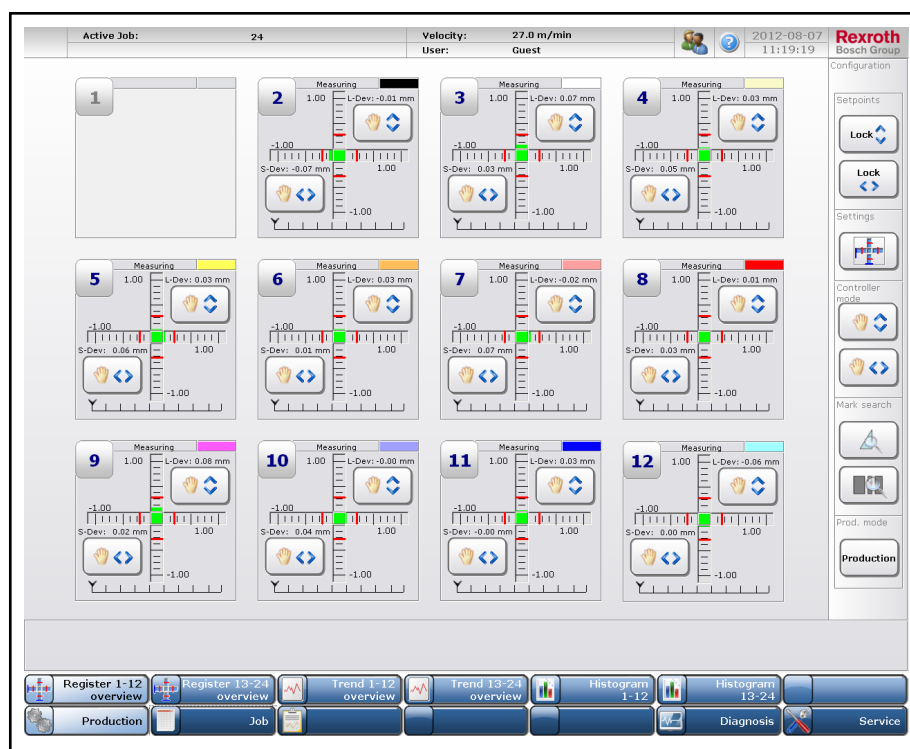


Fig.10-37: Register overview

The register error is represented as bar charts whose size and color correspond to the respective deviation. The bar charts are aligned as cross hair (register cross) which visualizes the deviation in the positive as well as in the negative direction for the length register and the side register.

Register cross

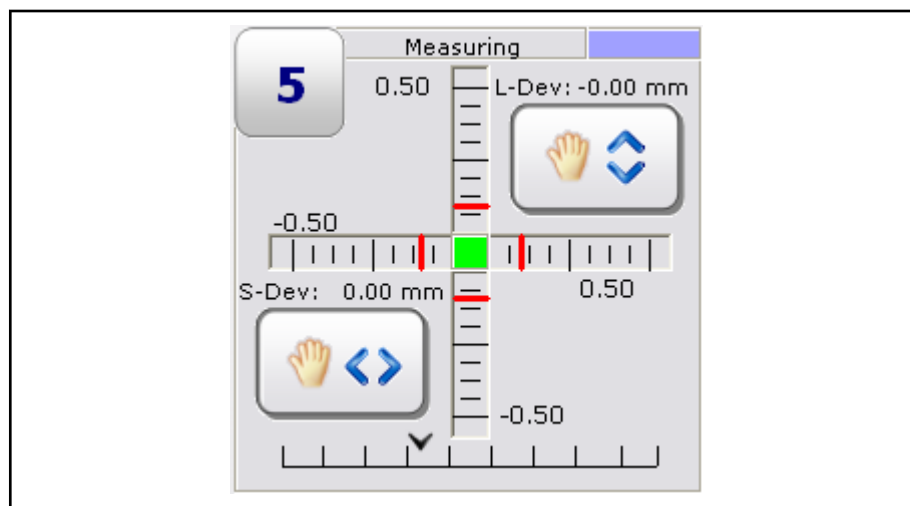
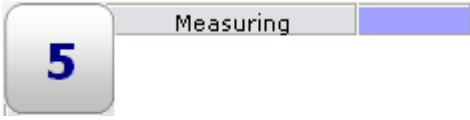


Fig.10-38: Register cross

- Functions of the register cross element

HMI Dialog and Element Description

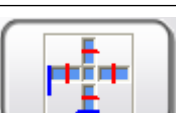
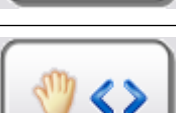
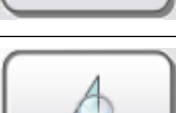
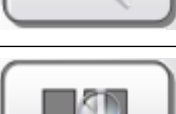
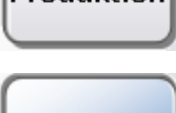
	Logic number of the printing unit with linking to single view (register single view). A red color change is executed (flashing) if the marks assigned to the printing unit are not detected by the sensor
	Toolbar with: • Display of the current sensor status • Field with selected printing unit color
	The numeric value (MaxScale) of the scaling for the maximum visualization of the register error in [mm]. If the complete chart is displayed, there is a register $\geq$ MaxScale. The MaxScale value is valid for the side register as well as for the length register (positive and negative). This is specified in the HMI settings and can be set individually for each printing unit
	Bar chart to visualize the register deviation. The height of the bar corresponds to the percentage value of the register deviation with regard to MaxScale
	The alarm limit can be defined in [mm] via the "HMI Settings" dialog. It is specified as absolute value and can be individually set for the side register and for the length register. If a register error is reported for the side register or for the length register within the alarm limits, the register error is visualized with a green bar. If it is above the alarm limit, a color change results and the register deviation is visualized with a red bar
L-Dev: xx.xx mm S-Dev: xx.xx mm	Display of the register deviation as numeric value of length register and side register
	Display/selection whether the register controller works for the side or length register in Automatic mode (display: circle with arrows), i.e. that the register controller works, or in Manual (display: hand) mode (for manual jogging of the control variable)
	Actual value of the mark width in relation to the defined total width of the mark. This display can be used to orient the sensor. Without control, the arrow should be in the middle of the display, as the scan spot of the sensor samples the mark exactly in its middle

Toolbar • Toolbar

HMI Dialog and Element Description



HMI Dialog and Element Description

	Adding the current deviation of the length register to the command value of the length register. This function can be used when manually setting the machine and if the RegisterController is not enabled yet.
	Adding the current deviation of the side register to the command value of the side register
	Opening the "HMI Settings" dialog
	Function to activate/deactivate all register controllers for the length register
	Function to activate/deactivate all register controllers for the side register
	It starts the automatic teach-in for all printing units with the expectation window saved last. This action can only be executed for printing units for which a valid expectation window is already available (e.g. from the bar code search or the manual setting of the expectation window)
	Bar code search if configured
 	At runtime, the Production button can be used to simultaneously set the operating modes of all register controllers Production = Enabled ► Production Mode Production = Disabled ► Setup Mode Switching the production mode should be executed if: - the register controller of all printing units are activated, - the printing image has the desired quality (after manual adjustment of the command value if required) or - the acceleration phase is to be started Note: If the button is activated, the controller parameters are designed for higher control loop dynamics. Thus, switching after the setup phase has to occur in any case to minimize the paper waste during the acceleration phase and the production phase

HMI settings • "HMI Settings" dialog

HMI Dialog and Element Description

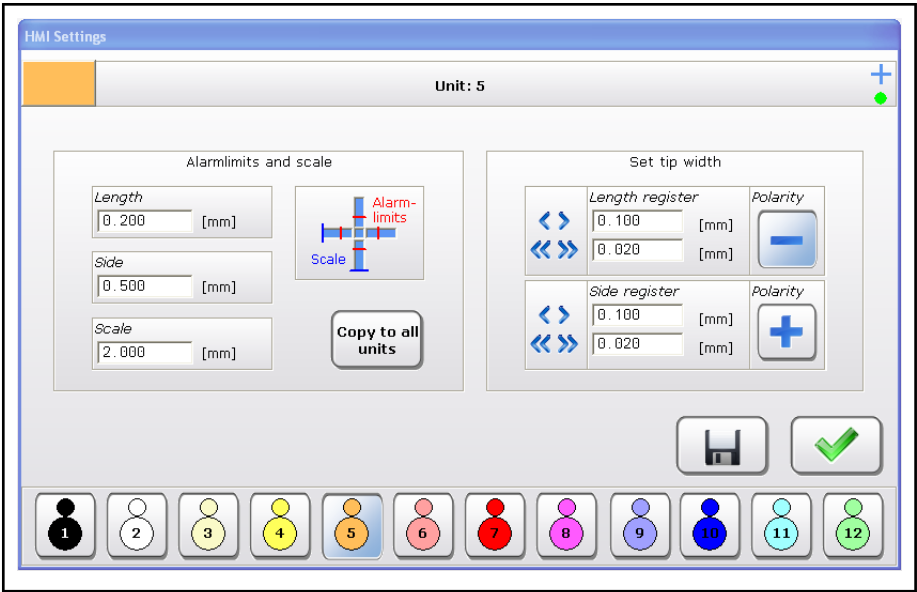


Fig.10-39: HMI settings

Unit: 5

+

- Printing unit name display
- Length and side register status

+
- Printing unit status

●●
- Selection of printing ink from color palette

1

2

3

4

5

6

7

8

9

10

11

12

Switching bar for the printing unit to be edited

Length

0.200 [mm]

Side

0.500 [mm]

Scale

2.000 [mm]

Alarm-limits

Scale

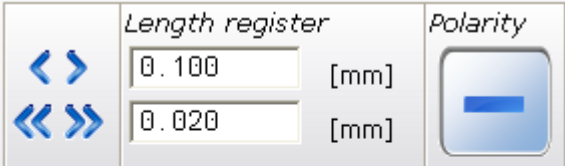
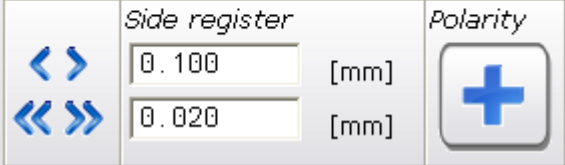
Copy to all units

Specification of:

- Alarm limits for length registers and side registers
- Value range for bar charts (amount)

Button function to copy the current HMI settings to all available printing units (except function/color and color selection)

HMI Dialog and Element Description

 	Setting the jog parameters for manual command value correction • Specification of the jog width for the manual jogging of the command value [mm] • The settings are globally valid for all configurable printing units
	Saving the settings for the currently selected print job
	Closing the dialog

"Settings" tab

- "Settings tab" dialog

This dialog is opened by activating the button on the lower right next to the register error cross of the printing unit to be modified.

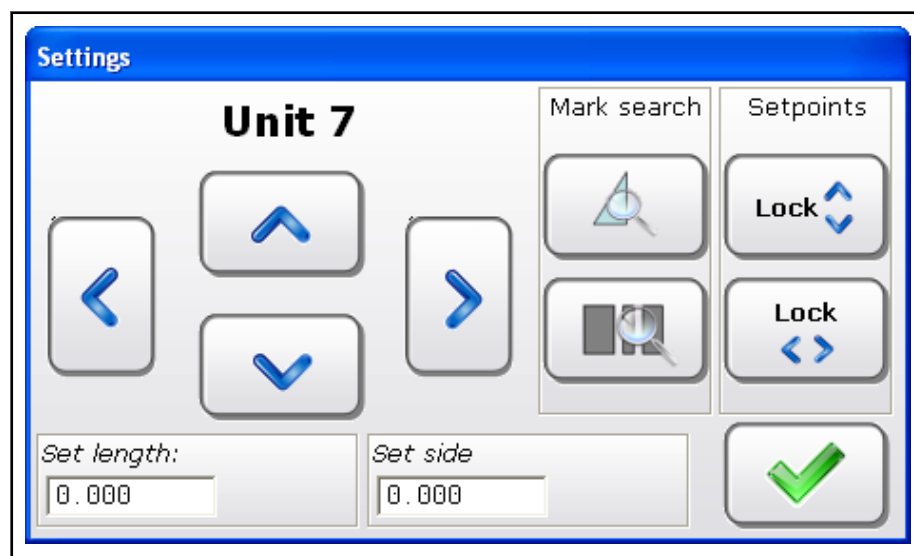


Fig. 10-40: Settings tab

HMI Dialog and Element Description

Unit 7	Displays the currently selected printing unit
	Jog buttons for command value change in case of enabled activated controller and the motor position in case of deactivated controller
Set length: 0.000 Set side 0.000	Display and input option for the command value of the length register and side register for the selected printing unit
	Adds the current deviation of the length register to the command value of the length register of the selected printing unit
	Adds the current deviation of the side register to the command value of the side register of the selected printing unit
	Starts the automatic teach-in for the selected printing unit with the last valid expectation window. This option is only enabled if there is a valid expectation window for this print job
	Bar code search if configured
	Closing the dialog

10.6.3 Trend Overview

The objects in the trend overview are used to visualize statistic measurands of register deviations of different printing units in operation. The deviation of the length and the side register are graphically displayed in a time slot of two minutes. The representation allows to analyze the register deviation of different printing units during that time and to understand control processes.

HMI Dialog and Element Description

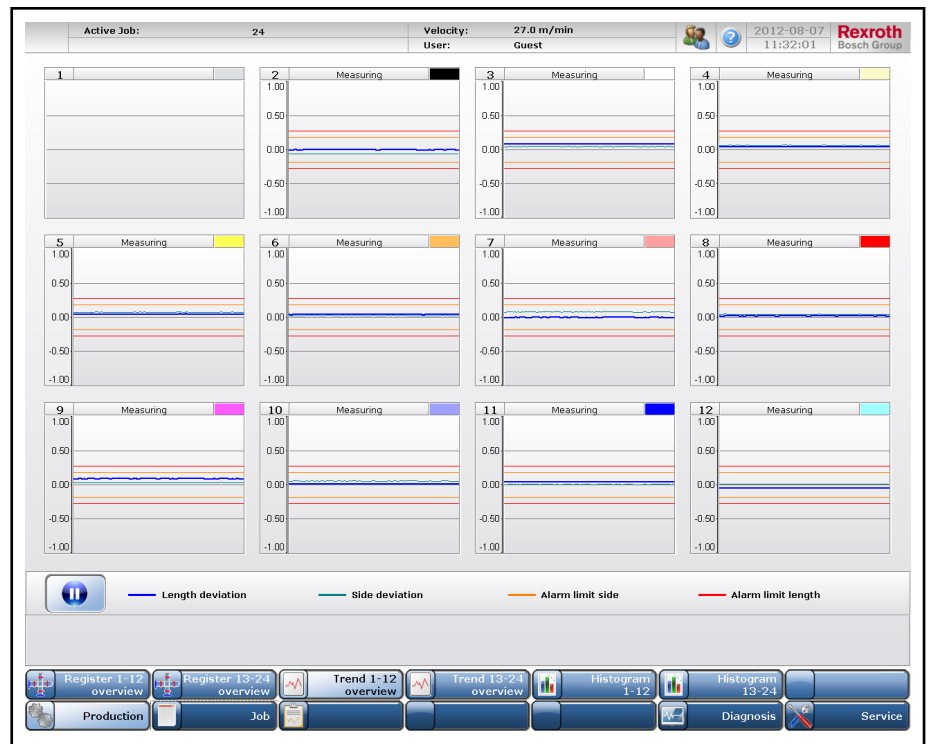
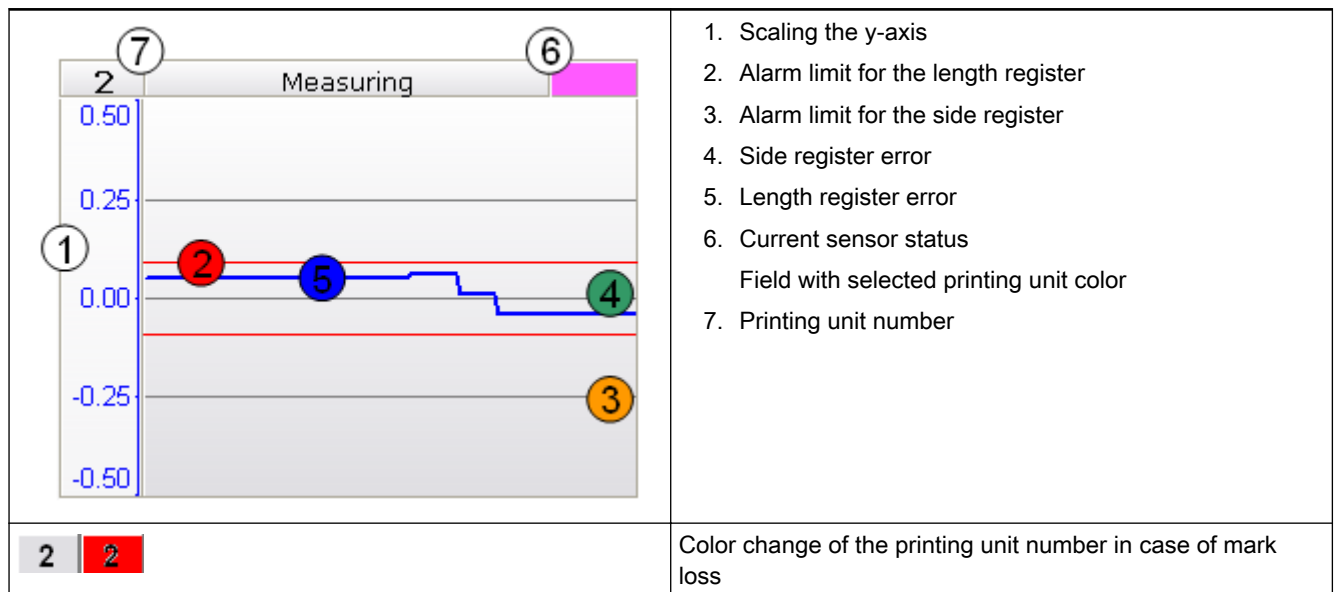


Fig.10-41: Trend overview

The register error is recorded in a line chart. The side register errors or the length register errors are continuously read with a sample rate of 1s and shown in lines of different colors.

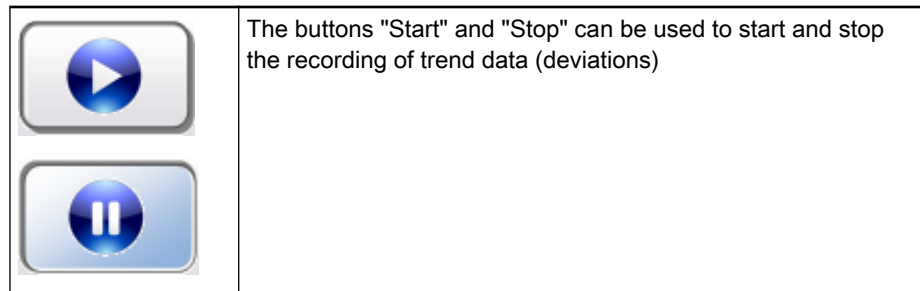


By clicking on the trend object in the overview, it can be switched to the register single view.



Start/stop recording

HMI Dialog and Element Description



If the recording has been started once, it continues to run in the background. Switching to the trend overview is possible. The register error history can be found in the trend overview.

10.6.4 Register Single View

By selecting a printing unit number in the "register overview" dialog or by clicking on an object in the "trend overview", it can be switched to the single view of the selected printing unit.



The oscilloscope display is started upon opening the dialog. If the sensor is currently measured, the content of the expectation window is displayed. Otherwise, the analog data of the 360° recording is displayed. The expectation window can be set and the transition to the measurement can be started.



To the left above the oscilloscope it is displayed how many register marks the sensor expects and over how many register marks the expectation window has to be set to start a valid measurement.

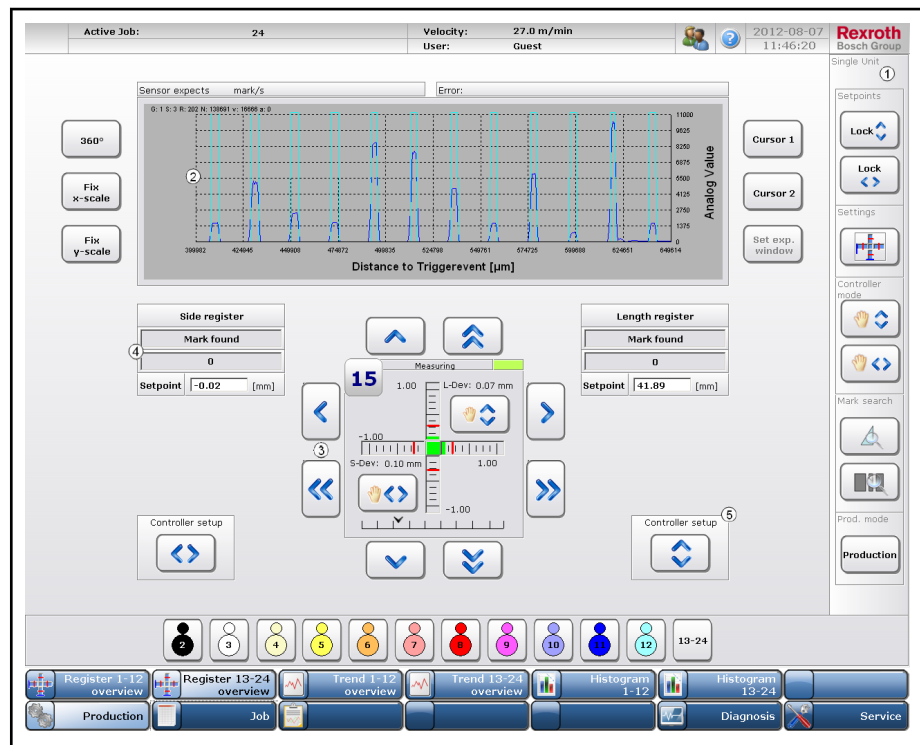


Fig.10-42: Single view tab

HMI Dialog and Element Description

1. Symbol bar with corresponding HMI setting dialog is applied from the register overview.
2. Oscilloscope display.
 - **Show 360°**
The function stops the measurement and shows the analog data of a 360° recording
 - **Cursor 1 / Cursor 2**
The cursors are used to set the expectation window. An area in which the mark stream is searched for is defined via the starting point (Cursor 1) and the end point (Cursor 2)
 - **Set expectation window**
The function transfers the start and the size of the expectation window to the PLC and subsequently starts the teaching and the measurement
 - **Fix y-scale**
Fixes the y-axis scaling
 - **Fix x-scale**
Fixes the x-axis scaling
3. Jog buttons for the manual command value correction of side register and length register.

The command value is jogged in case of an enabled register controller. In case of a disabled register controller, the motor position is jogged.

 - Two freely-configurable jog modes are provided for length register and side register
4. Status display of the sensor assigned to the printing unit.
 - Current sensor status display
 - Current mark status display:
"Mark found" if the marks have been found
"Mark lost" if the marks have been lost
 - Number of lost marks display
 - Display and manual input of the command value in [mm] for side register and length register
5. Link to parameterize the automatic format correction and the length and side register controllers. The following controller settings become active immediately:
 - Damp P-factor
 - Damp I-factor
 - Dead zone
 - Actual value filter
 - Polarity
 - Upper/lower limit
 - Min. displacement
 - Max. displacement

HMI Dialog and Element Description



It is strongly recommended to save the selected settings in the corresponding dialog. If the controller parameters are not saved, the job management is opened and the parameters are overwritten with the saved settings in the job.

Colorimetry Optionally, a bar with a colorimetry can be displayed in the register single view. The bar has to be activated separately by Bosch Rexroth.

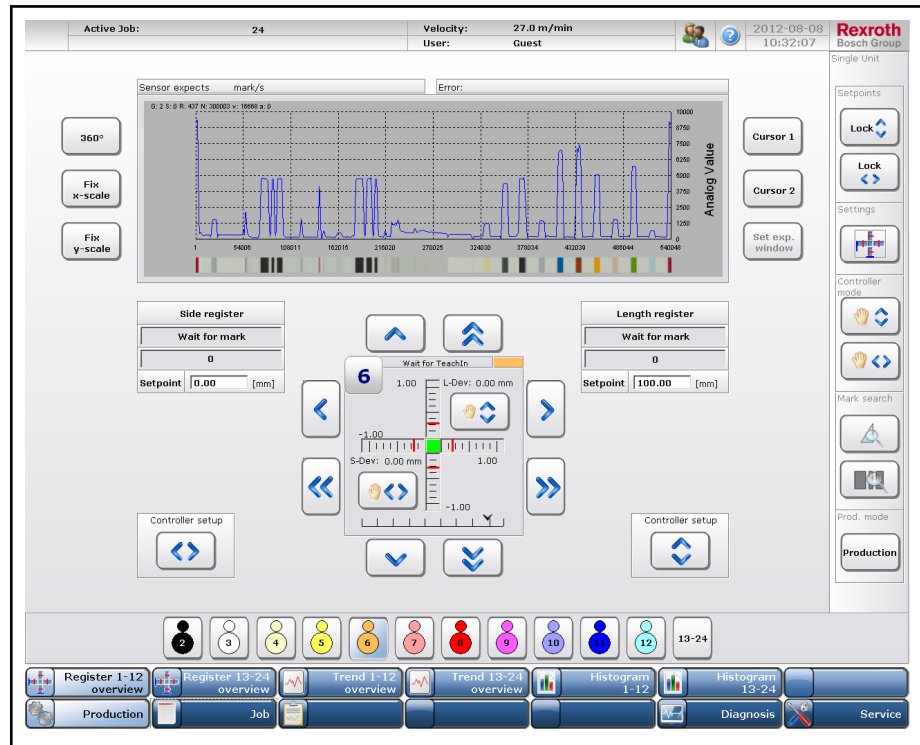


Fig.10-43: Color-bar in the single dialog

The color-bar is located below the oscilloscope display in the ActiveX control. The background and the printed objects are displayed in color in the 360° recording (e.g. marks of the mark stream or bar code blocks).

The register marks to be measured as well as the background are displayed in the color-bar during the measurement.

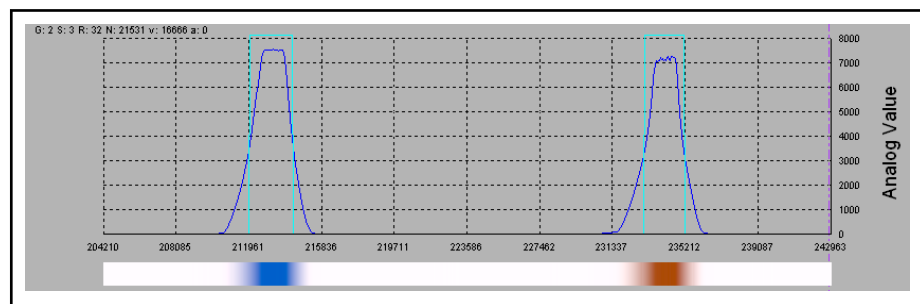


Fig.10-44: Color-bar during measurement

In this example, a blue and a red mark are measured on white paper.

10.6.5 Histogram

The histogram is used to statistically evaluate and represent the measured register errors of the side register and length register per printing unit in three

HMI Dialog and Element Description

categories. The categories correspond to value ranges that can be defined via the "limit" at runtime.

Calculation formula:

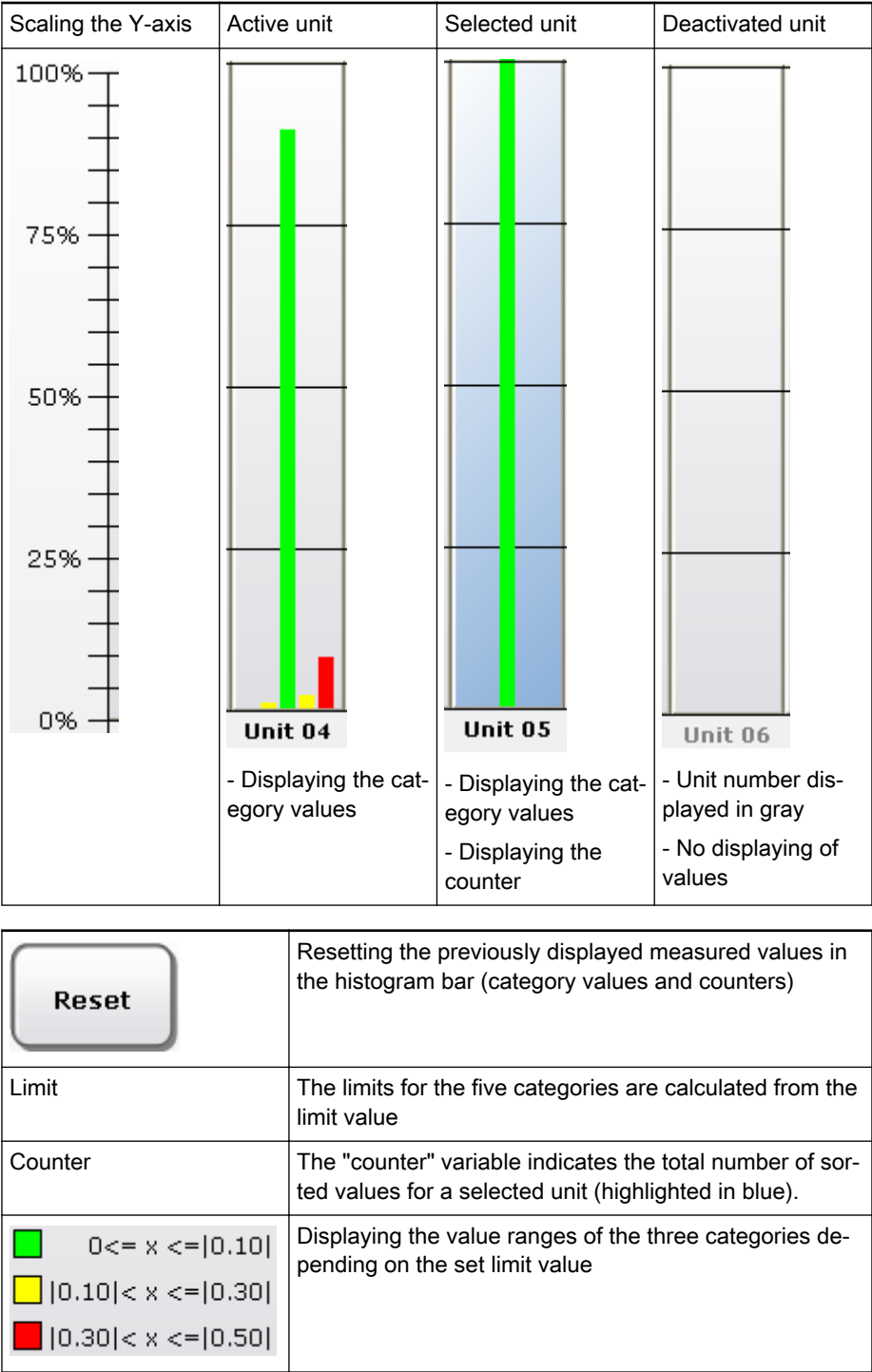
  	Category 1: $0 \leq X \leq \lfloor \text{limit}/5 \rfloor$ Category 2: $\lfloor \text{limit}/5 \rfloor < X \leq \lfloor 3 * (\text{limit}/5) \rfloor$ Category 3: $\lfloor 3 * (\text{limit}/5) \rfloor < X \leq \lfloor \text{limit} \rfloor$
---	--



Fig.10-45: Histogram

The individual elements have the following meaning:

HMI Dialog and Element Description



10.7 Diagnostics
10.7.1 Brief Description

The dialogs for error handling are used to analyze and trace errors during the configuration and during the running operation.

10.7.2 Diagnostics Overview

The dialog "Diagnostic Overview" facilitates the analysis and the acknowledgement of error messages at runtime of the HMI application. The active error messages are chronologically ordered. The latest error always ranks first. Each diagnostic list is automatically written to a file. These files (history) can be evaluated at a later point in time.

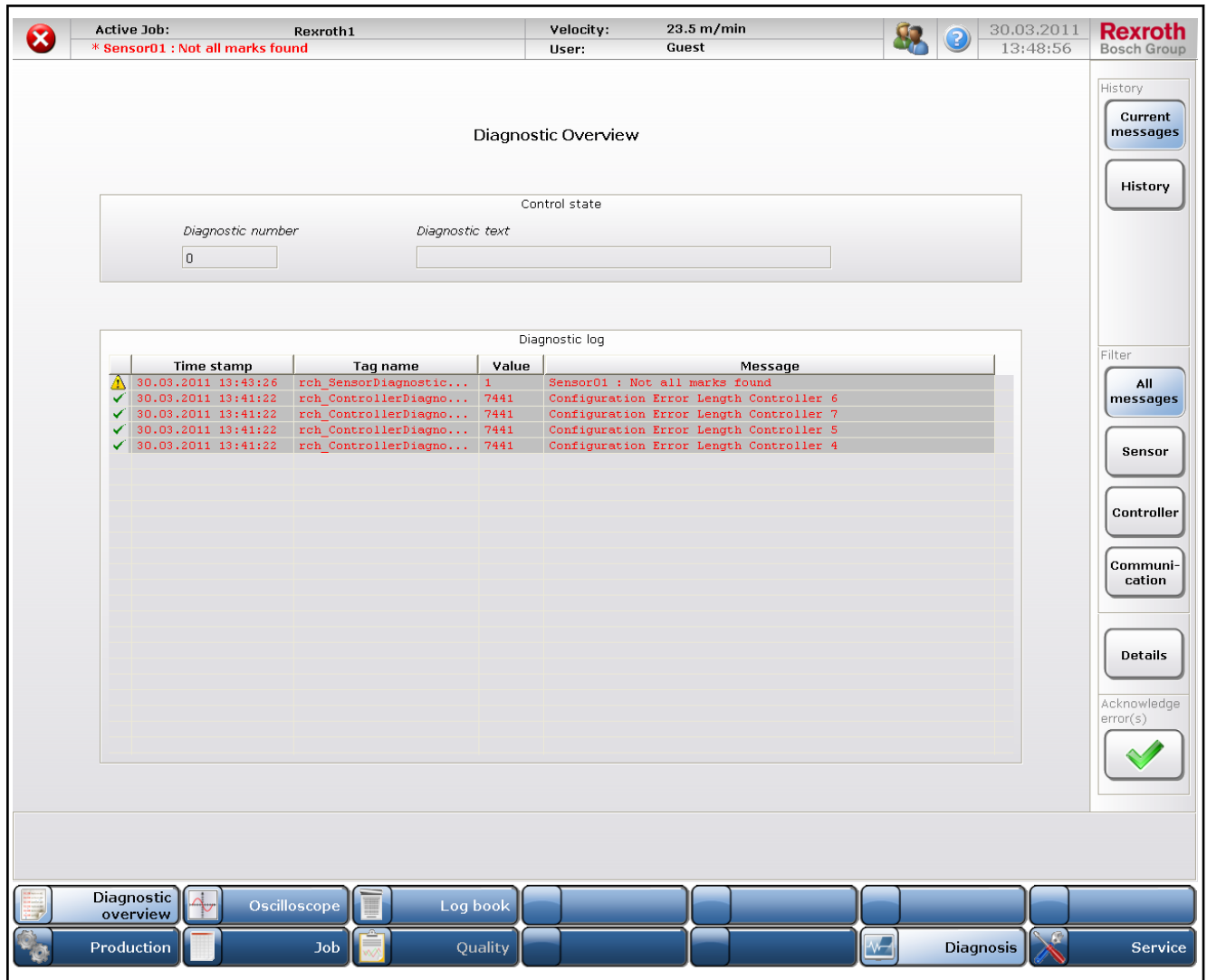


Fig.10-46: Diagnostic overview

1. Status message/StatusID of the control.
2. Error table.

The error table lists all current errors. There are three different representation variants:

Active unconfirmed errors:

- Errors whose error status has not changed since their detection. The font color is red and there is a yellow exclamation mark in the left column

	2011-03-25 10:45:55	rch_BRWS_Write_Diag[9]	1005	BRWS-Error - Write Job Length Controller Configuration
--	---------------------	------------------------	------	--

Fig.10-47: Active unconfirmed errors

HMI Dialog and Element Description

Active confirmed errors:

- Errors acknowledged by the user (acknowledge errors). The font color is red and there is a green checkmark in the left column

✓	2011-03-25 10:45:55	rch_BRWS_Write_Diag[10]	1005	BRWS-Error - Write Job Side Controller Configuration
---	---------------------	-------------------------	------	--

Fig. 10-48: Active confirmed errors

Inactive errors:

- Errors whose error status has changed since their detection or which are not active anymore. The font color is blue and there is a yellow exclamation mark in the left column

⚠	21.07.2010 13:47:09	rch_SensorDiagnostic...	0	Configuration Error SensorUnit05
---	---------------------	-------------------------	---	----------------------------------

Fig. 10-49: Inactive errors

3. Sidebar.

Current messages History	Switching between the current messages and the history
 	The history function loads the entries of all history files into the error list. Two more interfaces are displayed: • Filtering historical error list The filter function displays the historical error data limited to a certain period in time • Deleting all historical entries
All messages Sensor Controller Communication	• The filter function can be used to select a certain error type that should be displayed in the error table • It is distinguished between three different types of errors: – Sensor error: Displays error messages read by the sensor configuration function block (PLC) – Controller error: Displays error messages read by the register controller function block (PLC) – Connection error: The driver status is read during each writing and reading process between the HMI and the PLC. If errors occur, they are listed under "Communication"

	Active Job: Rexroth1 * Sensor01 : Not all marks found	Velocity: 23.5 m/min User: Guest		2011-03-30 13:47:07	Rexroth Bosch Group
--	---	---	--	------------------------	-------------------------------

Service diagnostic details

Register Controller		Side		Length	
Unit	Name	Error ID1	Error ID2	Error ID1	Error ID2
1	Unit01				
2	Unit02				
3	Unit03				
4	Unit04			00001D11	00000045
5	Unit05			00001D11	00000045
6	Unit06			00001D11	00000045
7	Unit07			00001D11	00000045
8	Unit08				

Sensor			
Sensor	Name	Error ID1	Error ID2
1	Sensor01	00001D12	0C000108
2	Sensor02		
3	Sensor03		
4	Sensor04		
5	Sensor05		
6	Sensor06		
7	Sensor07		
8	Sensor 8		

In this figure, a warning is displayed for Sensor 1 and an error is reported at Sensor 2.

The dialog is used to diagnose possible error causes. An incorrect orientation of the sensor can be detected. The expectation window can still be set. How-

HMI Dialog and Element Description

ever, the window should be set in the single view register. The expectation window is set via the "Oscilloscope" dialog.

Procedure:

Select Sensor ► Establish Connection ► Read 360° ► Set Start and End Cursor ► Set Expectation Window

After a correct configuration, first teaching and then the measurement is started after setting the expectation window.

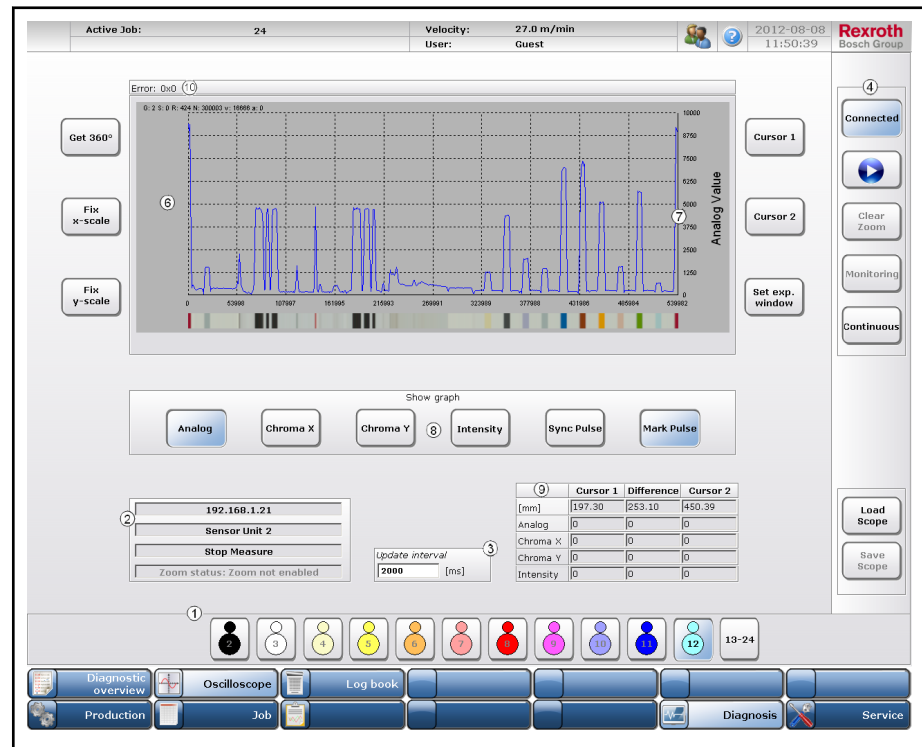


Fig.10-51: Oscilloscope

1. Switching bar for the printing unit to be edited.

2. Sensor status information.

- IP address
- Sensor name (see Machine Configuration)
- Sensor status
- Zoom status

3. Update interval.

Specification of the update interval for the cyclic display of oscilloscope data in [ms]

4. Sidebar.

- **Connect**

A connection to the sensor can be established via the "Connect" button. Except when loading oscilloscope data from a file, a connection has to be established to the sensor to use the oscilloscope

- **Start / Stop**

Function to manually start and stop the measurement

- **Reset zoom**

Function to reset the zoom level

HMI Dialog and Element Description

- **Monitoring**
Monitoring is an operating state guaranteeing a simple error analysis. If this state is activated, the sensor checks whether all marks are correctly detected in the expectation window. If this is not the case, the graphs of the incorrect message are transferred and graphically represented for analysis
 - **Continuous**
Starts the cyclic display of the analog values of the currently selected sensor during the measurement. The interval time can be specified by (3)
 - **Load screen**
Allows loading of the oscilloscope data
 - **Save screen**
Allows saving the currently indicated oscilloscope data.
5. Button.
- **Show 360°**
The function starts recording oscilloscope data for a complete cylinder revolution of 360°
 - **Fix x-scale**
Fixes the x-axis scaling during the cyclic measurement
 - **Fix y-scale**
Fixes the y-axis scaling during the cyclic measurement
 - **Cursor 1 / Cursor 2**
The cursors are used to set the expectation window. An area in which the mark stream is searched for is defined via the starting point (Cursor 1) and the end point (Cursor 2)
 - **Set expectation window**
The function transfers the start and the size of the expectation window to the PLC and subsequently starts the teaching and the measurement
6. Cursor 1 (yellow).
7. Cursor 2 (violet).
8. List of the available oscilloscope graphs.
- Analog: Analog sensor signal
 - Chroma X: Color signal 1 of the sensor
 - Chroma Y: Color signal 2 of the sensor
 - Intensity: Intensity signal of the sensor
 - Sync pulse: Zero pulse
 - Mark pulse: Recorded mark, is only displayed during the measurement
9. Tabular representation of the cursor values of the activated graphs (8).
The line [mm] indicates the distance of the cursors measured to the zero pulse as well as the distances of the cursors to each other.
10. Diagnostic messages of the oscilloscope element.
The possible error numbers are represented in [chapter 12.3 "Error Numbers and Troubleshooting" on page 153](#).

HMI Dialog and Element Description

10.7.4 Logbook

The logbook is used to log and request the events and to list the events chronologically. Events that are logged:

- Log in and log off users
- Loading saved jobs
- Saving jobs
- Activating a job

The screenshot displays the Logbook HMI interface. At the top, a status bar shows 'Active Job: no job activated', 'Velocity: 23.5 m/min', 'User: Guest', and the date/time '2011-03-30 12:09:51'. The 'Event configuration' section is visible, with a table titled 'Event log' containing two columns: 'Time stamp' and 'Message'. The table lists various events such as 'Error by activating Sensor FB - (Sensor01)', 'Job Activation is running', and 'Job: [Rexroth1] wurde erfolgreich geladen'. On the right side, there are buttons for 'History', 'Current messages', and 'History'. At the bottom, a navigation bar includes buttons for 'Diagnostic overview', 'Oscilloscope', 'Log book', 'Production', 'Job', 'Quality', 'Diagnosis', and 'Service'.

Time stamp	Message
2011-03-30 12:05:40	Error by activating Sensor FB - (Sensor01)
2011-03-30 12:05:32	Job Activation is running
2011-03-30 12:05:14	Error by activating Sensor FB - (Sensor01)
2011-03-30 12:05:04	Job Activation is running
2011-03-30 11:53:55	Job: 'Rexroth1' was loaded in edit mode
2011-03-30 11:16:22	Set expectation window for sensor 2 failed - acknowledge timeout!
2011-03-30 11:15:09	Set expectation window for sensor 2 failed - acknowledge timeout!
2011-03-30 11:13:27	Job: [Rexroth1] wurde erfolgreich geladen
2011-03-30 11:13:21	Job Activation is running
2011-03-30 11:13:16	Job 'Rexroth1' was saved
2011-03-30 11:09:40	Job: 'Rexroth1' was loaded in edit mode
2011-03-30 11:09:12	Set expectation window for sensor 1 failed - acknowledge timeout!
2011-03-30 11:08:05	Job: [Rexroth1] wurde erfolgreich geladen
2011-03-30 11:07:57	Job Activation is running
2011-03-30 11:07:55	Job 'Rexroth1' was saved
2011-03-30 11:07:38	Job: 'Rexroth1' was loaded in edit mode
2011-03-30 11:06:40	Job: [Rexroth1] wurde erfolgreich geladen
2011-03-30 11:06:33	Job Activation is running
2011-03-30 11:06:17	Job 'Rexroth1' was saved
2011-03-30 11:05:52	Job: 'Rexroth1' was loaded in edit mode
2011-03-30 11:04:16	Job: [Rexroth1] wurde erfolgreich geladen
2011-03-30 11:04:08	Job Activation is running
2011-03-30 11:04:05	Job 'Rexroth1' was saved
2011-03-30 11:03:55	Job: 'Rexroth1' was loaded in edit mode
2011-03-30 11:00:26	Job: [Rexroth1] wurde erfolgreich geladen
2011-03-30 11:00:18	Job Activation is running
2011-03-30 10:58:43	Job: 'Rexroth1' was loaded in edit mode
2011-03-30 10:56:28	Job: 'Rexroth1' was loaded in edit mode
2011-03-30 10:53:35	Job: 'Rexroth1' was loaded in edit mode
2011-03-30 10:53:28	Job: [Rexroth1] wurde erfolgreich geladen

Fig. 10-52: Logbook

HMI Dialog and Element Description

 The image shows two rectangular buttons stacked vertically. The top button is blue with the text 'Current messages' in white. The bottom button is grey with the text 'History' in black.	Switching between the Current Messages and the History
 The image shows two rectangular buttons stacked vertically. The top button features a funnel icon over a clock face. The bottom button features a trash can icon with a recycling symbol inside.	The history function loads the entries of all history files into the logbook. Two more interfaces are displayed: • Filter historical error list • Delete all historical entries

10.8 Service

10.8.1 Machine Configuration

The machine configuration has already been described in an individual chapter [chapter 10.4 "Machine Configuration" on page 80](#).

10.8.2 Advanced Settings

In the "Advanced settings" dialog, velocities can be specified and the respective controllers can be automatically added and removed. Furthermore, the decoupling can be deactivated and data can be saved in a file.

HMI Dialog and Element Description

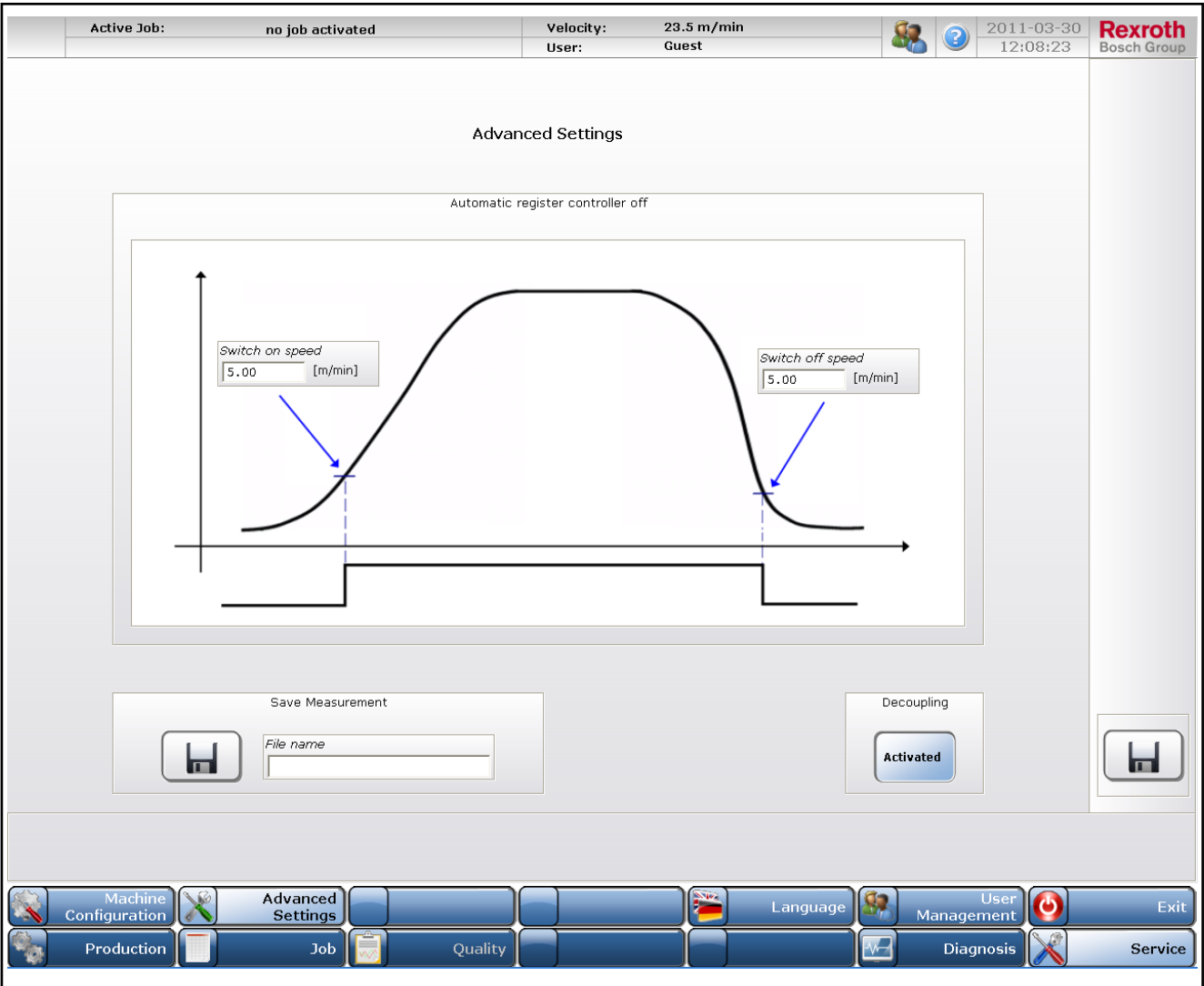


Fig. 10-53: Advanced settings

Switch-on velocity	Minimum velocity, control starts automatically (0 disables an automatic start)
Switch-off velocity	If the velocity falls below, the control is automatically disabled (0 disables automatic switch-off)
	Disables the decoupling
Save measure-ments	The current measured values are saved in a one second cycle in the HMI folder under "file name".csv, if the the button Saving is pressed
	Saves the data in the current machine configuration

10.8.3 Language

Under "Language", the required language can be selected and saved by



clicking on



Fig.10-54: Language selection



Only German and English can be selected. More languages can be added by the user by extending the Excel file.

10.8.4 User Management

Via "User Management", the authorizations of individual user groups at run-time can be changed. Two authorization categories are distinguished:

- Screen switching
- Executing functions

Each category contains individual authorizations that can be determined for four user groups. The fifth group, the administrators, are not restricted in their authorizations.



The user can register via the little men symbol in the header. By default, the user is registered as guest.

HMI Dialog and Element Description

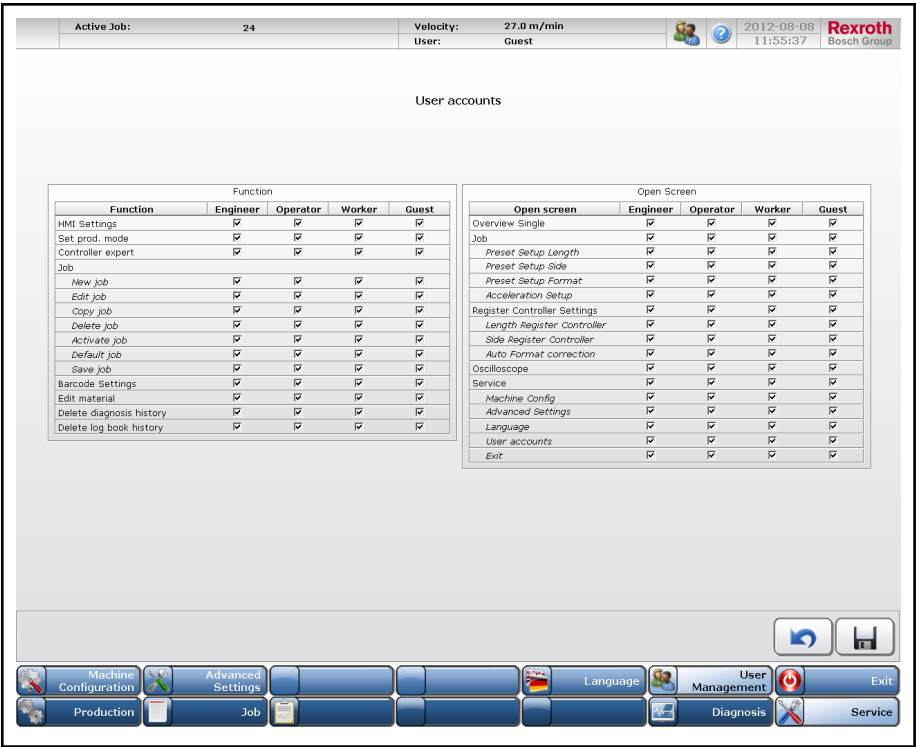


Fig.10-55: User management

	Discards all changes made in the User Management
	Saves the current User Management settings

10.8.5 Auxiliary Function: 2 Sensors Behind a Printing Unit

 The function "2 sensors behind a printing unit" is only intended for special hardware-specific characteristics. This function has to be enabled by Bosch Rexroth.

This function has exclusively been developed in case it is not possible to position a sensor behind each printing unit due to structural reasons. For example, this can be the case if two printing units are positioned very closely together and if the sensors for printing unit 1 and printing unit 2 are positioned behind the second printing unit.

 The function has been exclusively implemented for this constellation and cannot be used for other characteristics.

If the function is enabled, 2 sensors can be defined graphically in the machine configuration.

HMI Dialog and Element Description

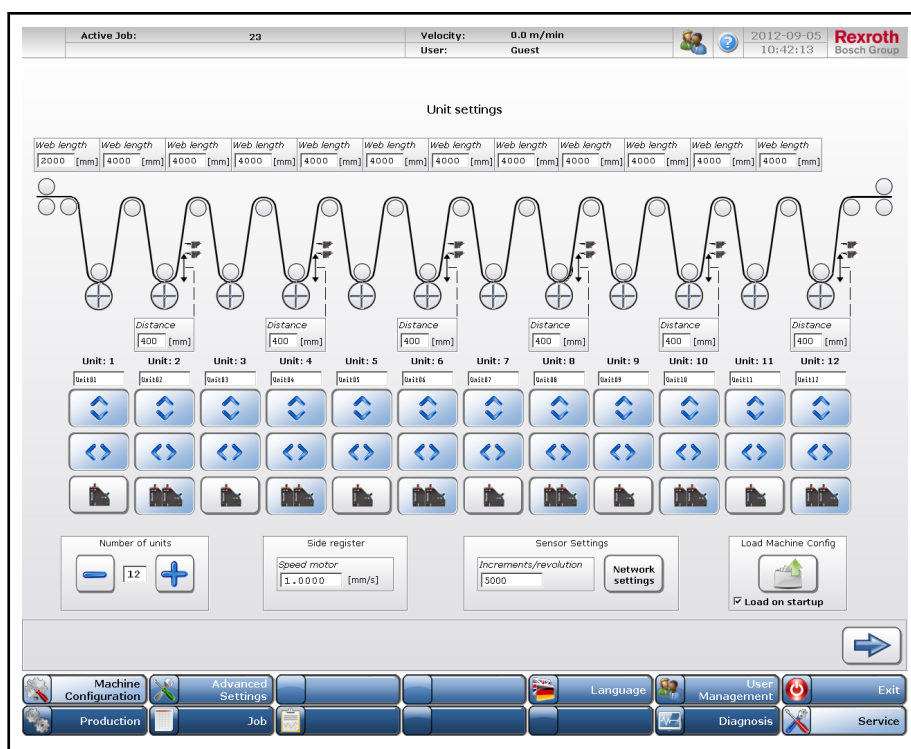


Fig.10-56: Defining 2 sensors behind a printing unit in the machine configuration

chapter 10.8.5 "Auxiliary Function: 2 Sensors Behind a Printing Unit" on page 140 shows that two sensors can be defined behind a printing unit. The largest distance from sensor to printing unit has to be specified as sensor distance. Generally, it is the distance of the first printing unit to the relevant sensor. To be able to define two sensors behind a printing unit, no sensor can be defined for the printing unit located at the front. If a sensor is defined at the printing unit located at the front, only one sensor can be defined at the next printing unit.

The entry is required to be able to correctly calculate the number of visible marks for a sensor. In case one mark is printed by each printing unit:

If the sensor is located behind printing unit 3, the printing unit would detect three marks. If the sensor of printing unit 3 is located behind printing unit 4, it would detect four marks. The correct configuration of two sensors behind a printing unit is automatically taken into consideration.

The defined machine configuration is mapped as follows in the job configuration.

HMI Dialog and Element Description

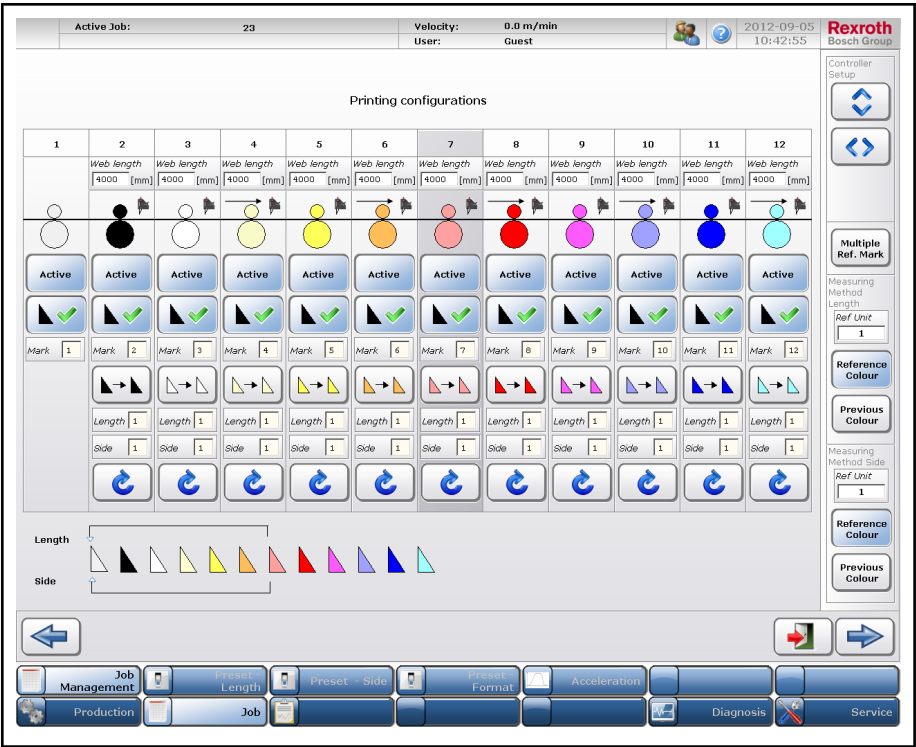


Fig.10-57: Two sensors behind a printing unit in the job configuration

An arrow indicates that the sensor of this printing unit is located behind the next printing unit. Thus, the sensor also detects the register marks - if printed - of the subsequent printing unit.

11 Decentral HMI Dialog of the Decentral RegisterControl

11.1 General Information

Decentral visualizations are used for decentral operation at a printing machine. A decentral overview dialog is available for RegisterControl. Using this dialog, all important RegisterControl operations of the printing unit can be executed decentrally. The decentral HMI dialog can be integrated in the decentral machine operation. The following conditions apply for using the decentral HMI:

- VEP 40.4 or higher
- Operating system: Windows CE 6.0 or Windows XP Embedded
- WinStudio license $\geq 1.5k$
- Per sensor, only one dialog of the decentral RegisterControl can be used

The decentral RegisterControl dialog uses 420 variables. This has to be taken into consideration when calculating the WinStudio license size when the dialog is integrated in the decentral machine visualization. If a 1.5 license is used, $1500 - 420 = 1080$ variables are available for the machine visualization.

The dialog has a size of 800x500 pixel. Consequently, 800x50 pixel is available for header and footer.



The dialog has been scaled for a 12.1" device. The user can scale this dialog to a different display size. No commands can be changed in the background script as well as in dialog elements.

11.2 Importing the Dialog of the Decentral RegisterControl

The decentral dialog is saved on the CD under "VEP_SingleScreen" as .zip file. Save this file on your local commissioning PC and unzip it.

A sample framework containing header, footer and main screen has been added to the dialog. The framework can be extended or applied.

Up to 2 RegisterControl dialogs can be integrated on a decentral HMI in a project.

The import wizard is used to import the decentral dialog. It is recommended to manually check the imported elements.



It is recommended to create a backup of the application in which the decentral dialog is to be imported to.



Please ensure that the decentral visualization device has been licensed (cf. [chapter 8 "Commissioning the HMI Interface" on page 59](#)).

1. Call the import wizard in WinStudio in the decentral machine operation project via **File ► Import Wizard**.
2. Select **WinStudio Database** and click on **Next**.
3. Select **Import the whole application** and optionally **Do not import duplicate tags and files**. Subsequently, select the "VEP_SingleScreen_1_0_0_0.app" file at the local storage location of the decentral HMI.

Decentral HMI Dialog of the Decentral RegisterControl

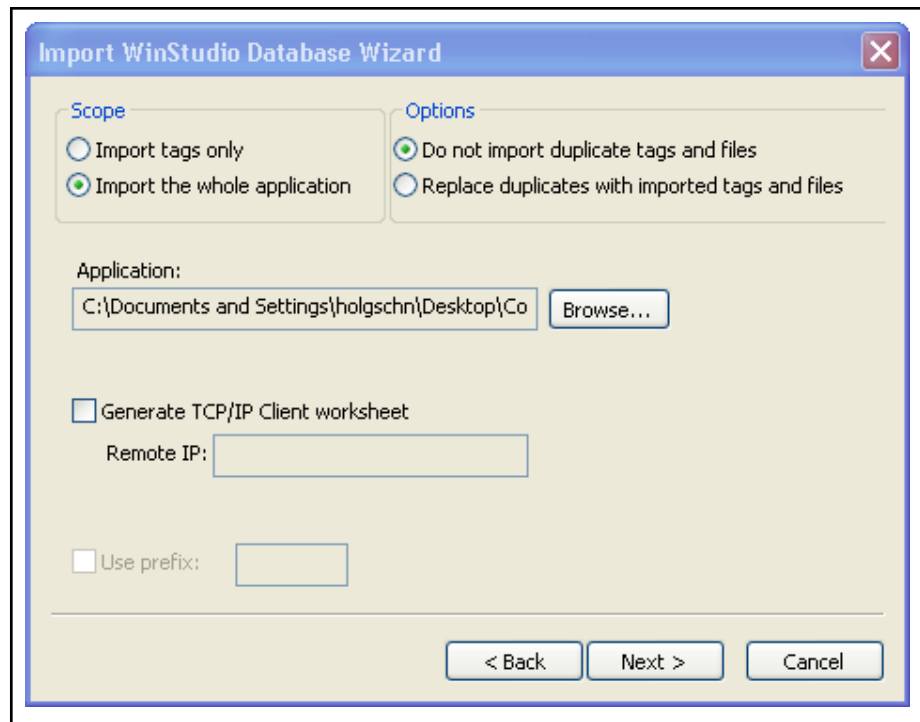


Fig. 11-1: Import wizard

4. The variables to be imported are displayed in the following dialog. All variables and classes have to be highlighted in blue.

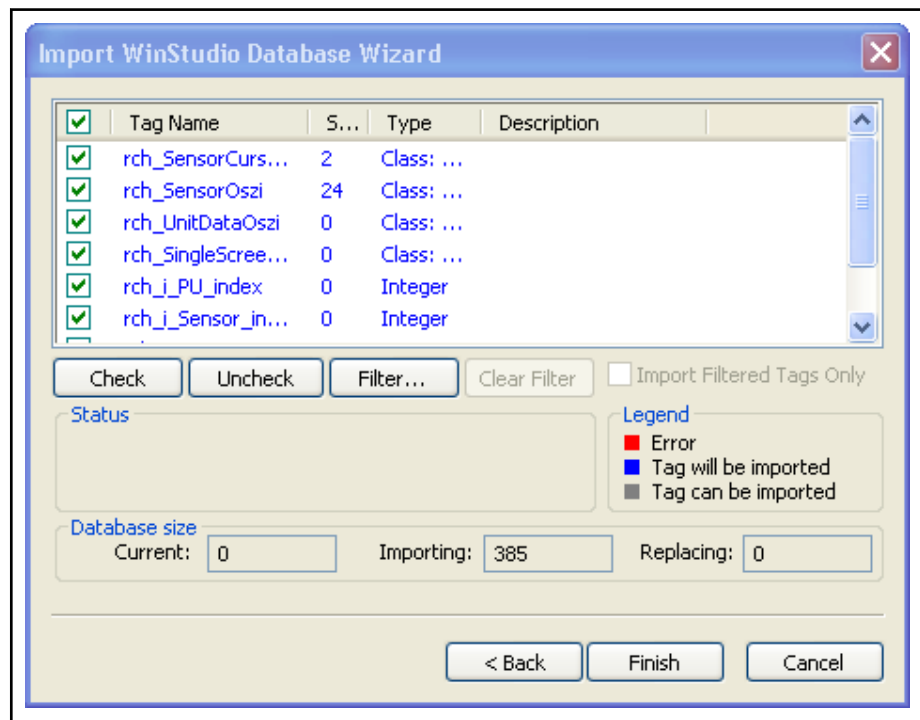


Fig. 11-2: Import variables

If a variable or class is highlighted in red, the variable name already exists in your project. Rename the variable highlighted in red and check this variable again. Subsequently, close the dialog.

Decentral HMI Dialog of the Decentral RegisterControl

The automatic import of the decentral dialog has been completed successfully. The imported elements have to be checked and manual operations have to be executed.

5. Copy the ".sym" elements to the "Symbol" folder of your application from the "VEP_SingleScreen/Symbol" folder.
6. Open the startup script under **Tasks ▶ Scripts ▶ Startup Script** in WinStudio. If a startup script is used in the application, no data has been imported. Insert the following lines in your startup script:

```
$rch_str_IP_Main_HMI = {"xxx.xxx.xxx.xxx"}
```

Replace the IP address "xxx.xxx.xxx.xxx" with a variable or IP address of the central HMI.

If only one RegisterController dialog's is used, enter the printing unit for this RegisterController:

```
$rch_i_PU_index_dialog1 = {x}
```

Replace printing unit x with a variable or the printing unit number for whose printing unit the decentral HMI is used.

This entry is part of the RegisterController dialog "rch_RegisterController.scr".

Do you want to integrate a second RegisterController dialog in the decentral RegisterController visualization, please specify the printing unit number:

```
$rch_i_PU_index_dialog1 = {x}
```

Replace printing unit x with a variable or the printing unit number for whose printing unit the decentral HMI is used.

This entry is part of the RegisterController dialog "rch_RegisterController_Dialog2.scr".

The subsequent assignment has to be available irrespective of the number of used RegisterController dialogs in the startup script.

```
$rch_i_PU_index = $rch_i_PU_index_dialog1
```



More than two RegisterController dialogs cannot be imported in a decentral visualization.

If no startup script has been defined in your application, the following startup scrip has been imported:

Decentral HMI Dialog of the Decentral RegisterControl

```

"Variables available for all Script groups from the Script task can be declared and initialized here.

"Procedures available for all Script groups from the Script task can be implemented here.

//Insert the IP of the main HMI
$rch_str_IP_Main_HMI = "192.168.1.235"

//Insert the number for the printing unit
$rch_i_PU_index_dialog1 = 2
$rch_i_PU_index_dialog2 = 19

$rch_i_PU_index = $rch_i_PU_index_dialog1

//Insert the language name of the translation file
//$SetTranslationFile(($GetAppPath() & "Config\Translation.csv"), "Deutsch")
//$SetDateFormat( " ", "DMY" )

//$SetTranslationFile(($GetAppPath() & "Config\Translation.csv"), "Original")
//$SetDateFormat( "-", "YMD" )

```

Fig. 11-3: Startup script

Change the IP address of the decentral HMI as well as the printing unit number. Ideally, variables are assigned in this script that have been defined and saved in the machine configuration.

7. Register the ActiveX Control depending on the used operating system. Use XPe and register the ActiveX Control as described in [chapter 8.4 "VPP, VPB/VDP" on page 61](#). Execute the following steps as described in [chapter 8.5 "VEP with Operating System CE" on page 63](#) under WinCE.
8. The source language of the decentral RegisterController dialog is English. The German translation is provided in an Excel sheet. If language switching is available in the decentral machine project, the English and German columns can be copied from the Excel sheet to your Excel file. Thus, language switching of the decentral dialog is possible. More languages can be inserted. Copy the German and English terms from the "VEP_SingleScreen/Config/TRANSLATION.CSV" file to your translation file.
9. Verify under **Tasks ► Scheduler** that the scheduler "OszilloscopeHandling" has been created.
If this is not the case, copy the scheduler from "VEP_SingleScreen/Config/SCHED001.SCH" to the "Config" folder.
10. Verify under **Comm ► TCP/IP** that the driver sheets have been created.
11. Verify under **Graphics ► Images** that the corresponding dialogs are available. The images "rch_Footframe_Example.scr", "rch_Header_Example.scr" and "rch_MainScreen_Example.scr" are a sample framework that can be edited by the user. If the sample framework is not used, the 3 images can be deleted after the "rch_RegisterController.scr" dialog has been integrated.

Integrate the "rch_RegisterController.scr" dialog in your machine framework via "Open". When exiting this dialog, the dialog has to be closed first. The "rch_MsgBox_Decision.scr" dialog does not have to be called explicitly. It is automatically opened during the query if the ActiveX Control is to be closed on the decentral HMI.

Decentral HMI Dialog of the Decentral RegisterControl



The "rch_RegisterController.scr" dialog always has to be closed when exiting the dialog. It cannot be open in the background as the ActiveX Control cannot be lock so that the central HMI cannot access it anymore.

If two RegisterController dialogs are used at a decentral visualization, additionally use the "rch_RegisterController_Dialog2.scr" dialog.



If only one RegisterController dialog is used, the "rch_RegisterController.scr" dialog has to be used. The "rch_RegisterController_Dialog2.scr" dialog can only be used as 2. RegisterController position at a decentral HMI.



Please note that the correct assignment for the RegisterController dialog has been selected in the startup script.



If two RegisterController dialogs are used at a decentral HMI, the dialog of the first RegisterController has to be closed before the dialog of the second RegisterController can be opened. Otherwise, problems with the different ActiveX Controls can occur. For example, it can be checked if another dialog is opened with an ActiveX Control before opening the RegisterController dialog:

```
If(#CloseActiveXScreen: <> "",Close(#CloseActiveXScreen:)).
```

In "#CloseActiveXScreen:" the other RegisterController dialog is entered. Only after the first RegisterController dialog is entered, the second RegisterController dialog can be opened:

```
Open(#strScreenName:).
```

Subsequently, the RegisterController dialog can be opened on the decentral visualization device.



If there are connection errors in this dialog, check the connection to the central HMI. The application has to be started and the IP address of the central HMI has to be entered in the startup script.

11.3 Operating the Dialog of the Decentral RegisterControl

The dialog of the decentral RegisterControl is based on the register single view structure. Therefore, it is recommended to refer to the relevant section ([chapter 10.6.4 "Register Single View" on page 126](#)).

A special feature of this dialog is that the ActiveX Control can only run on a visualization. Thus, it cannot be executed simultaneously on the central as well as on the decentral HMI. That is why the ActiveX Control of decentral and the central HMI of a sensor are interlocked.

If the ActiveX Control is opened for the defined printing unit of the central HMI, e.g. in the "Single View Dialog" and the dialog of the decentral RegisterControl is opened, the message window is displayed, informing the user that the ActiveX Control is opened on the central HMI.

Decentral HMI Dialog of the Decentral RegisterControl

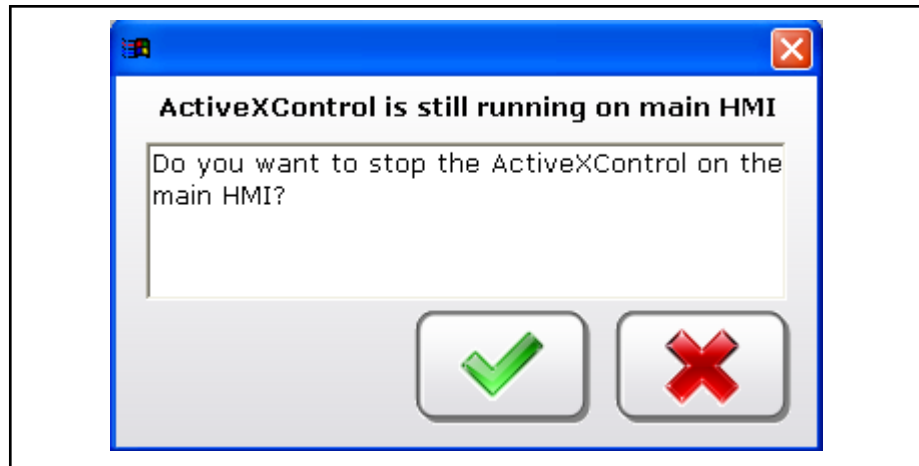


Fig.11-4: Warning message of the decentral HMI

Now, it can be decided whether or not the ActiveX Control has to be stopped on the central HMI. If stopping is confirming, the ActiveX Control is stopped on the central HMI and is automatically started on the decentral HMI. If the query is negated, the ActiveX Control is not yet started on the decentral HMI. An ActiveX Control restart can only be executed by closing (exiting) and re-starting the dialog.

The dialog functionality of the decentral RegisterControl is described in the following.

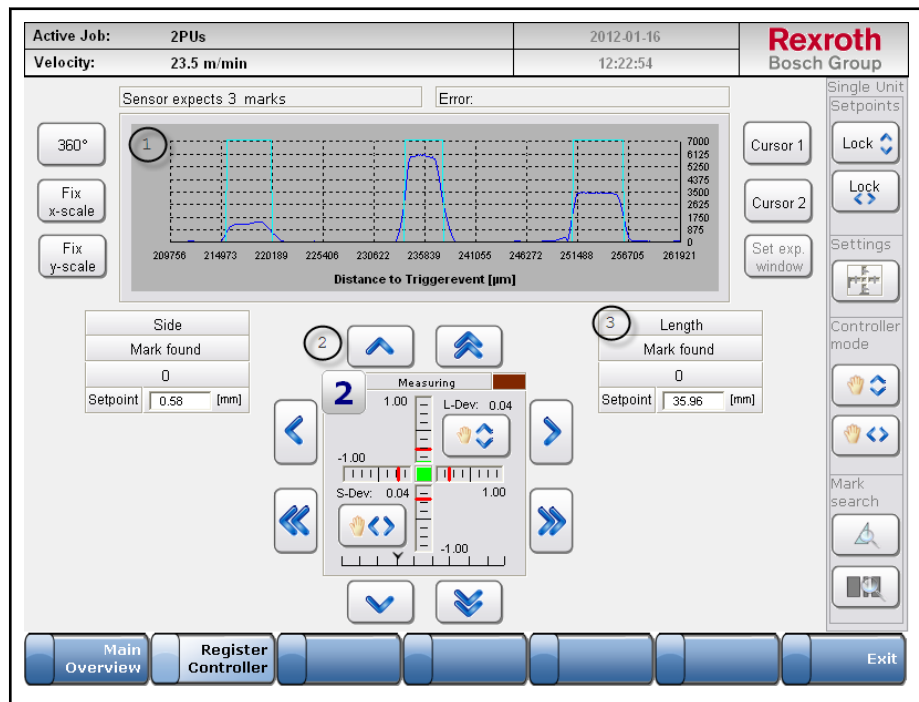


Fig.11-5: Decentral HMI



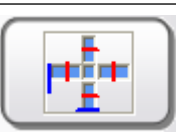
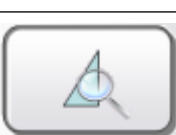
When opening the dialog, the oscilloscope display is automatically started as long as the ActiveX Control is not started on the central HMI. If the sensor is currently measured, the content of the expectation window is displayed. Otherwise, the analog data of the 360° recording is displayed. The expectation window can be set and the transition to the measurement can be started.

Decentral HMI Dialog of the Decentral RegisterControl



To the left above the oscilloscope it is displayed how many register marks the sensor expects and over how many register marks the expectation window has to be set to start a valid measurement.

The symbol bar on the right side has following functionality for the defined printing unit:

	Adding the current deviation of the length register to the command value of the length register. This function can be used when manually setting the machine and if the RegisterController is not enabled yet.
	Adding the current deviation of the side register to the command value of the side register
	Always inhibited as the HMI settings can only be selected via the central HMI
	Function to activate/deactivate all RegisterControllers for the length register of the printing unit
	Function to activate/deactivate all RegisterControllers for the side register of the printing unit
	Starts the automatic teach-in for the selected printing unit with the last saved expectation window. This action is only executed if an expectation window has determined once before for the defined printing unit
	Barcode search if configured

Other elements are described in the following:

1. Oscilloscope display.

- **Show 360°**
The function stops the measurement and shows the analog data of a 360° recording
- **Cursor 1 / Cursor 2**
The cursors are used to set the expectation window. An area in which the mark stream is searched for is defined via the starting point (Cursor 1) and the end point (Cursor 2)
- **Set expectation window**
The function transfers the beginning and the size of the expectation window to the PLC and subsequently starts the teaching and the measurement

Decentral HMI Dialog of the Decentral RegisterControl

- **Fix y-scale**
Fixes the y-axis scaling
 - **Fix x-scale**
Fixes the x-axis scaling
2. Jog buttons for the manual command value correction of side register and length register.
The command value is jogged in case of an enabled register controller. In case of a disabled register controller, the motor position is jogged.
 3. Status display of the sensor assigned to the printing unit.
 - Current sensor status display
 - Current mark status display:
"Mark found" if the marks have been found
"Mark lost" if the marks have been lost
 - Number of lost marks display
 - Display and manual input of the command value in [mm] for side register and length register

12 Troubleshooting

12.1 General Information

Errors can occur during the application. This chapter describes how to proceed in case of error using an example. Subsequently, the error numbers are specified and possible solutions are suggested.

12.2 Approach in Case of Error

An error at the expectation window is simulated in this example. Six marks are defined for the mark stream sensor "Sensor02" at "Unit 6". The expectation window is set above three marks. That means that the mark stream sensor does not detect six marks and sends an error message as shown below.

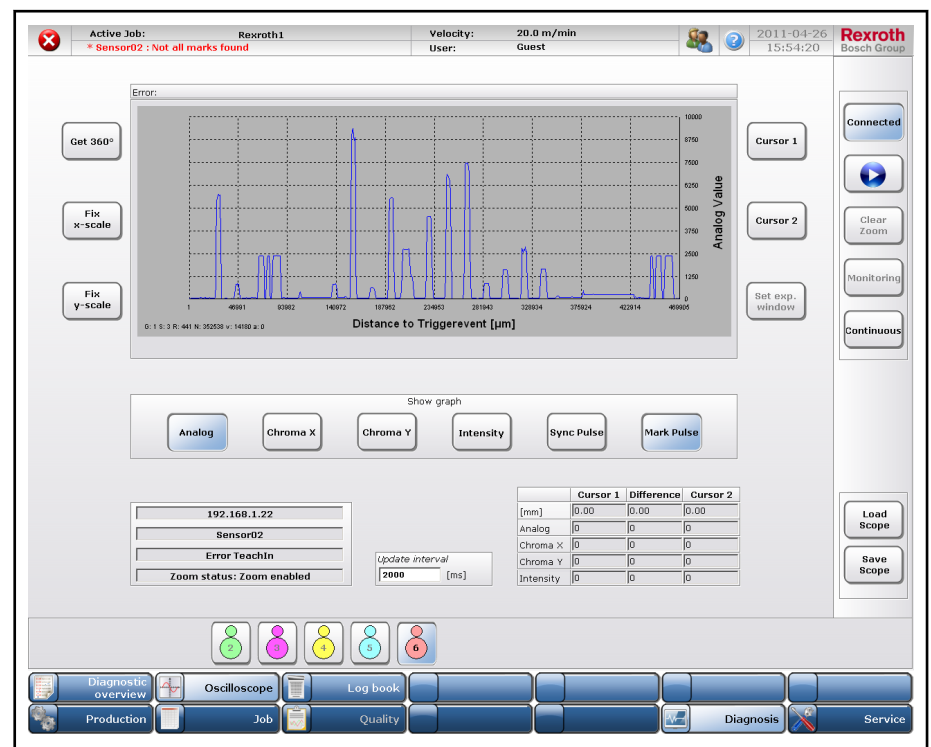


Fig. 12-1: Error during teach-in

An error message at "Sensor02" is displayed in the header. Furthermore, the left side indicates a "teach-in error". To get a more detailed error diagnostics, the "Service" area has to be opened. Optionally, click on the error in the header. The "Diagnostic overview" opens:

Troubleshooting

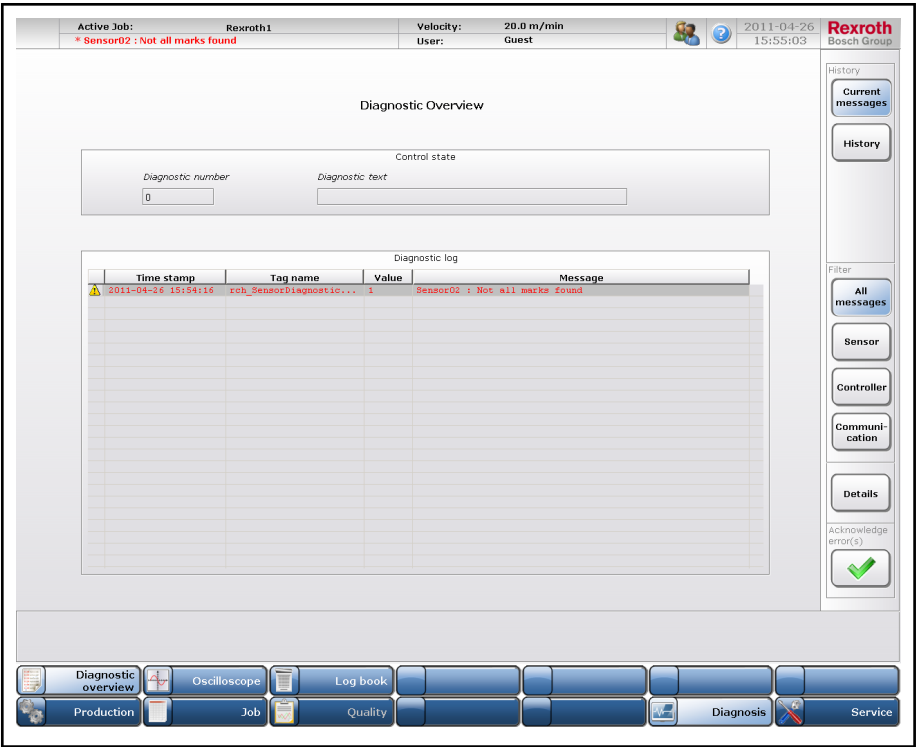


Fig.12-2: Diagnostic overview

This "Diagnostics" dialog indicates the time stamp and an error "message". To get a detailed diagnostics, click on **Details**. The following detailed diagnostics is displayed:

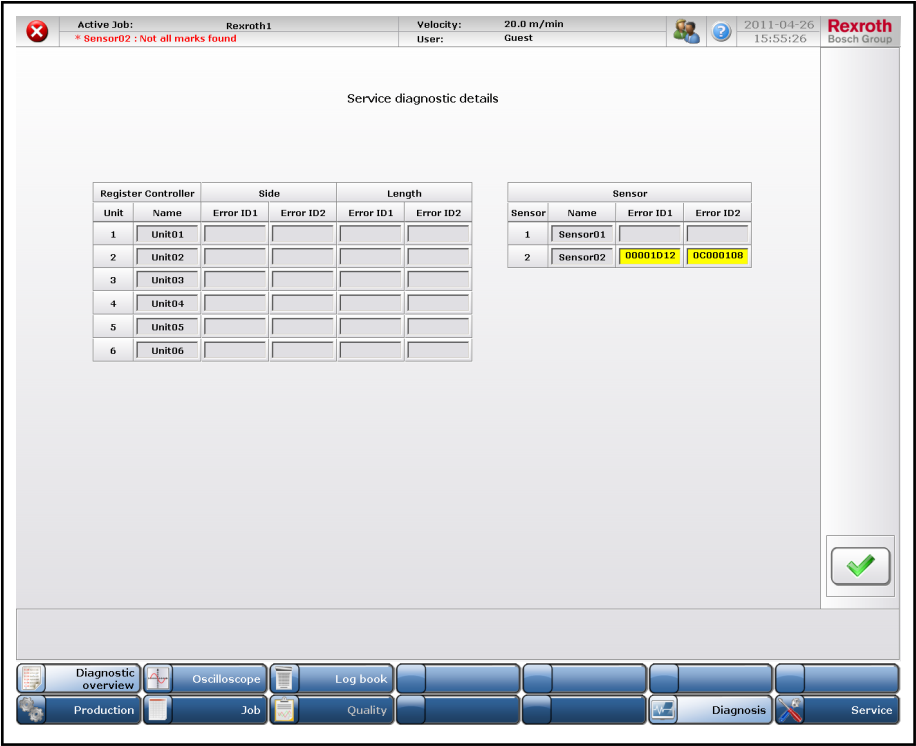


Fig.12-3: Display of the detailed diagnostics

The detailed diagnostics indicates an error at "Sensor02". Furthermore, a 4-byte error number is displayed. These error numbers are listed in the following tables. In this case, not all marks are detected by the sensor. A possible

option is to check whether the expectation window was set correctly. The user has to set the expectation window again. This time, the expectation window is set above six marks. Since the mark stream sensor can now find six marks, the teaching is successfully completed and the measurement can be started.

12.3 Error Numbers and Troubleshooting

The error numbers are listed. These numbers have either been directly generated by the mark stream sensor or by the communication function blocks with the mark stream sensor. Subsequently, the error numbers created by the control components on the printing units are specified and implemented by the S curve function block integrated into the machine program. For all errors, notes on problem solving are given.

- Error numbers and communication function blocks with the mark stream sensor (error table F_RELATED_TABLE):

Error number Additional 1	Error number Additional 2	Error	Problem recovery
16#00000006	16#00000000	Internal error	Internal error
16#00001D10	16#00000000	Timeout when receiving data	• Check whether the Ethernet cables are connected correctly • Check whether the power supply is applied to the sensor • Check whether the network settings of the sensor are correct • Try to execute a new ping on the sensor
16#00001D10	16#00000001	Timeout while teaching	• Check the entered configuration • Check whether the expectation window was set correctly • Check whether the zero pulse display flashes at the sensor.
16#00001D10	16#00000002	Timeout during barcode search	Check the barcode configuration
16#00001D10	16#00000003	Timeout while establishing a connection	• Check whether the Ethernet cables are connected correctly • Check whether the power supply is applied to the sensor • Check whether the network settings of the sensor are correct • Try to contact the sensor using a ping
16#00001D10	16#00000004	Timeout while sending	• Sending the package failed • Check the connection to the sensor • Check whether the power supply is applied to the sensor • Try to contact the sensor using a ping

Troubleshooting

Error number Additional 1	Error number Additional 2	Error	Problem recovery
16#00001D10	16#00000005	Timeout while receiving	- Receiving the package failed - Check the connection to the sensor - Check whether the power supply is applied to the sensor - Try to contact the sensor using a ping
16#00001D10	16#00000006	Timeout while receiving data	- Receiving the package failed - Check the connection to the sensor - Check whether the power supply is applied to the sensor - Try to contact the sensor using a ping
16#00001D11	16#00000000	Invalid printing cylinder format	Check the entered printing cylinder format.
16#00001D11	16#00000001	Invalid mark type	Check the entered mark type.
16#00001D11	16#00000002	Invalid mark geometry	Check the entered mark geometry in the job configuration.
16#00001D11	16#00000003	Invalid number of barcode blocks	Enter a valid number of barcode blocks
16#00001D11	16#00000004	Invalid number of marks	Check the number of printed marks
16#00001D11	16#00000005	Invalid mark distances	Check the entered mark distances
16#00001D11	16#00000006	Invalid length register mode	Internal error
16#00001D11	16#00000007	Invalid properties for the length RegisterControl	Internal error
16#00001D11	16#00000008	Invalid side register mode	Internal error
16#00001D11	16#00000009	Invalid sensor IP address	Check the IP address of the sensor in the machine configuration
16#00001D11	16#0000000A	Invalid IP address of the PLC	Check the IP address of the PLC in the machine configuration
16#00001D11	16#0000000B	Invalid port for the measurement	Check the "Measuring Port" in the machine configuration
16#00001D11	16#0000000C	Invalid port for the configuration	Check the "Configuration Port" in the machine configuration
16#00001D11	16#0000000D	Invalid number of increments	Check the entered number of increments per revolution in the machine configuration
16#00001D11	16#0000000E	Invalid measurement tolerances	Internal error
16#00001D11	16#0000000F	Invalid teach tolerances	Internal error
16#00001D11	16#00000010	Invalid tolerance to the zero pulse	Internal error
16#00001D11	16#00000011	Invalid beginning of expectation window	Internal error
16#00001D11	16#00000012	Invalid size of the expectation window	Internal error
16#00001D11	16#00000013	Invalid tolerance for mark width	Internal error

Troubleshooting

Error number Additional 1	Error number Additional 2	Error	Problem recovery
16#00001D11	16#00000014	Invalid tolerance for mark height	Internal error
16#00001D11	16#00000015	Invalid position tolerance	Internal error
16#00001D11	16#00000016	Internal error	Internal error
16#00001D11	16#00000017	Invalid color scaling	Check the entered color scaling in the material settings
16#00001D11	16#00000018	Invalid intensity scaling	Check the entered intensity scaling in the material settings
16#00001D11	16#00000019	Invalid measurement mode	Check the entered "MeasureMode"
16#00001D11	16#0000001A	Invalid gain	Check the entered gain.
16#00001D11	16#0000001B	Invalid port for the measurement data	Check the "Measuring Port" in the machine configuration
16#00001D11	16#0000001C	Invalid sensor IP address	Check the IP address of the sensor in the machine configuration
16#00001D11	16#0000001D	Invalid reference color	Check the entered mark geometry in the job configuration
16#00001D11	16#0000001E	Invalid individual mark	Check the entered individual mark in the job configuration
16#00001D11	16#0000001F	Reference color is equal to the individual mark	Change the individual mark or the reference mark
16#00001D11	16#00000020	No valid configuration found	Internal error
16#00001D11	16#00000021	The specified mark does not correspond to the maximum number of marks seen at the printing unit	Change the individual mark or the reference mark since it is not within the interval.
16#00001D11	16#00000022	Invalid time interval	Internal error
16#00001D11	16#00000023	Invalid cycle time	Internal error
16#00001D11	16#00000026	Invalid PLC port	Invalid PLC port when setting the IP address
16#00001D11	16#00000027	Invalid MAC address	Check the format of the entered MAC address
16#00001D11	16#00000029	Invalid mode	Select the reading mode or the writing mode
16#00001D11	16#00000028	Invalid pointer	Apply a valid pointer
16#00001D11	16#0000003B	Invalid free space in front of the barcode	Check the barcode configuration
16#00001D13	16#00000001	Mark stream search failed	Check the configuration Check that nothing except for the mark stream is visible to the sensor on the 360° rotation
16#00001D13	16#00000002	Measurement has already been started	Stop the measurement
16#00001D13	16#00000003	Measurement has already been stopped	Start the measurement

Troubleshooting

Error number Additional 1	Error number Additional 2	Error	Problem recovery
16#00001D13	16#00000004	"Send velocity information" has already been started	Stop sending
16#00001D13	16#00000005	"Send velocity information" has already been stopped	Start sending

- Error numbers of the mark stream sensor are always labeled with the error table NO_TABLE_USED and **Additional 1 16#00001D12**:

Error number Additional 2	Error	Problem Recovery
0x0C000001	No new configuration opened	Internal error
0x0C000002	Configuration was not closed	Internal error
0x0C000003	Configuration data missing	Enter a new configuration for the sensor
0x0C000004	Configuration was opened with different numbers	Internal error
0x0C000005	Time was not initialized	Internal error
0x0C000006	Invalid parameters	Check the configured parameters
0x0C000007	Invalid command	Check the configured parameters
0x0C000008	Teach mode has already been started	Wait till teaching is completed
0x0C000009	Measurement has already been started	Stop the measurement
0x0C00000A	Measurement has not yet been started	Start the measurement
0x0C00000B	Initialization of the mark stream sensor has not yet been completed	Wait for longer. In case of error, upload the configuration again
0x0C00000C	Teach mode has not been started	First, start the teaching
0x0C00000D	Measurement start and stop was not executed	Start or stop the measurement again
0x0C00000E	Tolerances were not transferred	• Internal error • Check the connection to the PLC program
0x0C000100	Teach error; not all marks have been found	• Set the expectation window again • Check whether the number of the defined marks corresponds to the marks in the expectation window • Check whether you are at the correct mark stream sensor
0x0C000101	Teaching has not yet been completed	Wait before starting the next action
0x0C000102	Unknown teach error occurred	• Repeat teaching • Check the sensor settings and the selection of the expectation window
0x0C000103	Teach error; too many marks defined	• Too many marks defined for the printing unit/sensor • Define the correct number of marks.
0x0C000104	Teach error; no marks defined	• No marks defined for the printing unit / sensor. • Define the correct number of marks.

Troubleshooting

Error number Additional 2	Error	Problem Recovery
0x0C000105	Teach error; mark type not supported	Select a different mark type
0x0C000106	No teach data available	• Repeat teaching • Check the sensor settings and the selection of the expectation window
0x0C000107	Teach data invalid	• Repeat teaching • Check the sensor settings and the selection of the expectation window
0x0C000108	Teach error; not all marks could be found	• Set the expectation window again • Check whether the number of the defined marks corresponds to the marks in the expectation window • Check whether you are at the correct mark stream sensor
0x0C000109	Teach error; no analog data available	• Repeat teaching • Check the sensor settings and the selection of the expectation window
0x0C00010A	Teach error; amplification have to be reduced	• Amplification too high • Check the mounting of the optics
0x0C00010B	Teach error; no valid teach data	No valid teach data. Check the optics and the existence of the zero pulse
0x0C00010C	Teach error; too many marks defined	• Too many marks defined for the printing unit/sensor • Define the correct number of marks.
0x0C00010D	Teach error; no marks defined	• No marks defined for the printing unit/sensor • Define the correct number of marks.
0x0C00010E	Teach error; mark type not supported	Select a different mark type
0x0C00010F	Teach error; error for some marks	• Set the expectation window again • Check whether the number of the defined marks corresponds to the marks in the expectation window • Check whether you are at the correct mark stream sensor
0x0C000110	Teach error, the background cannot be determined	• No uniform background • Minimize the expectation window so that only the expected reference marks are located within this window
0x0C000111	Teach error; barcode search not yet completed	• Complete the barcode search before the next action is triggered
0x0C000112	Teach error; no barcode active	• Check the barcode configuration • A correct barcode has to be defined for the barcode search

Troubleshooting

Error number Additional 2	Error	Problem Recovery
0x0C000113	Teach error; no barcode defined	- Check the barcode configuration - A correct barcode has to be defined for the barcode search
0x0C000114	Teach error; too many barcode blocks defined	- Check the barcode configuration - A correct barcode has to be defined for the barcode search
0x0C000115	Teach error, barcode configuration invalid	- Check the barcode configuration - A correct barcode has to be defined for the barcode search
0x0C000200	No analog data available for display	- Check the sensor configuration - Check the sensor optics - Check the existence of the zero pulse
0x0C000201	Analog data has not yet been prepared	- Check the sensor configuration - Check the sensor optics - Check the existence of the zero pulse
0x0C000202	No analog data available for the 360° recording	- Check the sensor configuration - Check the sensor optics - Check the existence of the zero pulse
0x0C000203	Analog data for the 360° recording has not yet been prepared	- Check the sensor configuration - Check the sensor optics - Check the existence of the zero pulse
0x0C000204	No analog data could be recorded for 360°	- Check the sensor configuration - Check the sensor optics - Check the existence of the zero pulse
0x0C000300	No measured data available	- Check the sensor configuration - Check the current sensor status

- Error numbers of the control (error table F_RELATED_TABLE):

Error number Additional 1	Error number Additional 2	Error	Problem Recovery
16#00000006	16#00000000	Internal error	Internal error
16#0000000D	16#00000000	The created axis is not within the limits allowed	Check the axis created
16#00001D11	16#00000000	Invalid printing cylinder format	Check the entered printing cylinder format.
16#00001D11	16#0000002A	Invalid damping factor	Check the slider at the respective controller. The slider has to be between 1 and 200
16#00001D11	16#0000002B	Invalid web length	Check the entered length of the material web
16#00001D11	16#0000002C	Invalid control mode	Check the mode entered into the control
16#00001D11	16#0000002D	Invalid material web velocity	Check the current material web velocity
16#00001D11	16#0000002E	Invalid "Response Mode"	Internal error

Troubleshooting

Error number Additional 1	Error number Additional 2	Error	Problem Recovery
16#00001D11	16#0000002F	Invalid sensor distance to the printing unit	Check the entered sensor distance to the printing in the machine configuration
16#00001D11	16#00000030	Invalid delay time	Check the entered delay time in the machine configuration
16#00001D11	16#00000031	Invalid web length	Check the entered length of the material web
16#00001D11	16#00000032	Invalid radius of the cooling roll	Check the entered radius of the cooling roll
16#00001D11	16#00000033	Invalid inertia of the cooling roll	Check the entered inertia of the cooling roll
16#00001D11	16#00000034	Invalid modulus of elasticity	Check the entered modulus of elasticity of the material web
16#00001D11	16#00000035	Invalid cross section of the material web	Check the entered cross section of the material web
16#00001D11	16#00000036	Invalid cycle time	Internal error
16#00001D11	16#00000037	Invalid compensation mode	Check the selected compensation mode in the "Acceleration, Preset" dialog.
16#00001D11	16#00000038	Invalid "normal speed"	Check the entered "normal speed"
16#00001D11	16#00000039	Invalid "reduced speed"	Check the entered "reduced speed"
16#00001D11	16#0000003A	Invalid decoupling mode	Internal error
16#00001D11	16#00000045	Invalid integral damping factor	Check the entered integral damping factor
16#00001D11	16#00000046	Invalid measured value filter	Check the entered measured value filter

- Error numbers of the S-curve function blocks (error table F_RELATED_TABLE):

Error number Additional 1	Error number Additional 2	Error	Problem Recovery
16#00001D11	16#00000000	Invalid printing cylinder format	Check the entered printing cylinder format.
16#00001D11	16#00000024	Invalid acceleration period	Check the entered acceleration period
16#00001D11	16#00000025	Invalid jerk limitation value	Check the entered value for the jerk limitation
16#0000000D	16#00000000	Invalid axis reference	Check the axis created
16#00000006	16#00000000	Internal error	Internal error

- Error numbers of the oscilloscope/ActiveXControls

Error code	Error description
0x0C001000	IP address is invalid
0x0C001001	Connection cannot be established
0x0C001002	Connection to the internal sensor port cannot be established
0x0C001003	Network connection to the sensor not established
0x0C001004	No socket connection to the sensor
0x0C001005	Maximum buffer size is not set
0x0C001006	Maximum buffer size is set

Troubleshooting

0x0C001101	Requesting new oscilloscope data from sensor failed
0x0C001102	Requesting status oscilloscope data from sensor failed
0x0C001103	Requesting status oscilloscope data from sensor caused timeout
0x0C001104	Requesting analog values from sensor failed
0x0C001105	Requesting analog values from sensor failed; no oscilloscope data available
0x0C001106	Requesting the mark margins of sensor failed
0x0C001107	Reading further oscilloscope data (1) of sensor failed
0x0C001108	Reading of more oscilloscope data (2) of sensor failed
0x0C001109	Reading of more oscilloscope data (3) of sensor failed
0x0C00110A	Reading further oscilloscope data (4) of sensor failed
0x0C00110B	Reading further oscilloscope data (5) of sensor failed
0x0C001200	Oscilloscope data not prepared on the sensor
0x0C001201	No oscilloscope data with full resolution available
0x0C001202	Error when reading full resolution.
0x0C001203	Reading oscilloscope data by the sensor in case full resolution not completed
0x0C001300	Parameter for "RGBColor" is not available
0x0C001301	Parameter for "GraphID" is not within the limit values
0x0C001302	Parameter for "ValueID" is not within the limit values
0x0C001303	Parameter for "CursorID" is not within the limit values
0x0C001304	No cursor active
0x0C001305	Parameter for "ValueID" is not available
0x0C001306	Value for Cursor 1 is not available
0x0C001307	Value for Cursor 2 is not available
0x0C001308	New cursor position is smaller than the minimum coordinate
0x0C001309	New cursor position is larger than the maximum coordinate
0x0C001400	Zoom window is not available
0x0C001401	Zoom coordinates X1 are smaller than the minimum coordinate
0x0C001402	Zoom coordinates X2 are larger than the maximum coordinate
0x0C001403	Zoom window error in diagram data
0x0C001500	Error since continuous oscilloscope display is started
0x0C001501	Error since monitoring is started
0x0C001502	Error when starting/stopping the continuous oscilloscope display
0x0C001503	Error when starting/stopping the monitoring
0x0C001504	Error when reading the oscilloscope data from a file
0x0C001600	Error when opening the oscilloscope file for reading
0x0C001601	Error when opening the oscilloscope file for writing
0x0C001602	Error when opening the oscilloscope debug data for writing

0x0C001603	Error when reading the oscilloscope data from the file
0x0C001604	Error when writing the oscilloscope data into the file
0x0C001605	Error when writing the oscilloscope debug data into a file
0x0C001F00	Internal error: Init handling failed
0x0C001F01	Internal error: Init failed

12.4 Problems with the 360° Display

A common error source is the error parameterization of the drive or the sensor using the data of the incremental encoder emulation. This section describes possible diagnostic options such as how to find error parameterizations. Corresponding approaches are given. The "Oscilloscope" dialog indicates the scaling of a plate cylinder in μm at the bottom right after displaying a revolution of 360° (cf. chapter [12.5.2 Backing Up Oscilloscope Data](#), page [161](#)). This value must approximately correspond to the defined printing cylinder format. If this is not the case, a wrong number of increments was configured in the drive or sensor. If the 360° revolution indicates the mark stream more than one time, it can be assumed that the zero pulse was not correctly returned. The parameterization of the incremental encoder emulation is to be executed according to [chapter 5 "Drive Parameterization" on page 31](#).

12.5 Backing Up Data for the Remote Diagnostics

12.5.1 General Information

Problems at the machine can occur that have to be checked via a remote diagnostics. Please consult your contact person at Bosch Rexroth first. Two different data records are required for the remote diagnostics: On the one hand the oscilloscope data that can be used to diagnose problems when teaching and measuring and on the other hand the currently parameterized job configuration and machine configuration.

12.5.2 Backing Up the Oscilloscope Data

The oscilloscope data can be saved as follows: Open the "Oscilloscope" dialog. Connect to the printing unit or to the respective sensor with which problems occurred (cf. figure below).

Troubleshooting

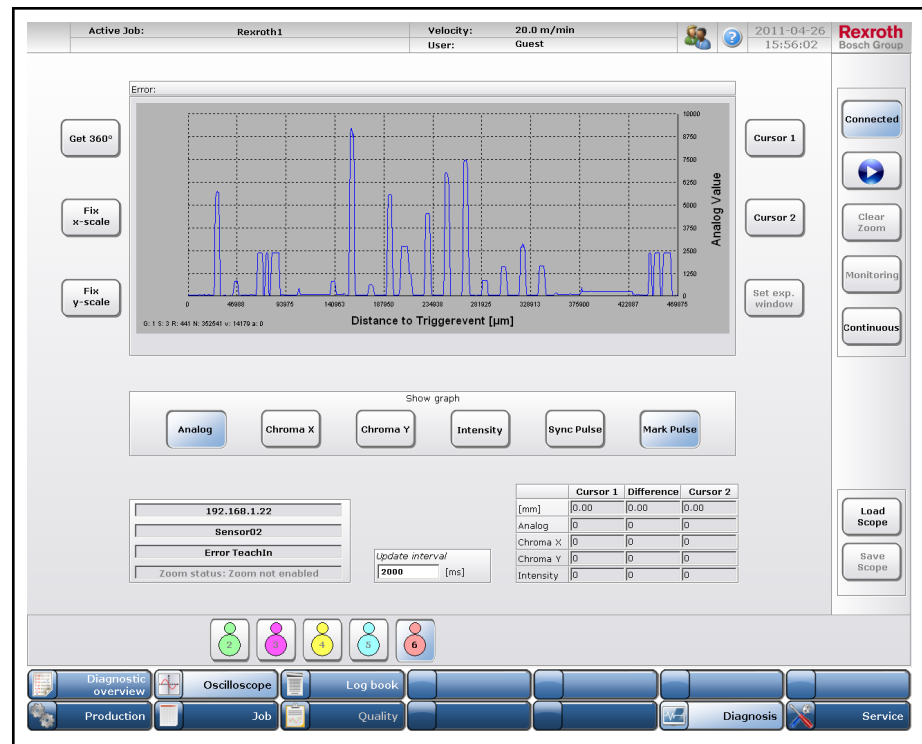


Fig. 12-4: Saving an oscilloscope recording

Press the "Get 360°" button and wait till the oscilloscope data is displayed. Subsequently, wait until "Save Scope" is enabled. Press this button, select a path and specify a respective file name. Two files (.bin, .txt) with these file names are saved under the specified path. Zip these two files using the password "ARC". Rename the ".zip" file into a ".zap" file and send it to your contact person.

If a measurement has already been started, the oscilloscope data of the measurement can be saved by activating the "Continuous" button and deactivating it after the new data is displayed. You can now also save this displayed oscilloscope data.

12.5.3 Backing Up the Current Job

Back up the current job. Change to the project directory of your HMI application. The "Web" folder is located there. Zip this folder using the password "ARC". Rename the ".zip" file into a ".zap" file. Send this file together with the oscilloscope data to your contact person and specify the last job used.

13 Service and Support

Our worldwide service network provides an optimized and efficient support. Our experts offer you advice and assistance should you have any queries. You can contact us **24/7**.

Service Germany Our technology-oriented Competence Center in Lohr, Germany, is responsible for all your service-related queries for electric drive and controls.

Contact the **Service Helpdesk & Hotline** under:

Phone: **+49 9352 40 5060**
Fax: **+49 9352 18 4941**
E-mail: service.svc@boschrexroth.de
Internet: <http://www.boschrexroth.com>

Additional information on service, repair (e.g. delivery addresses) and training can be found on our internet sites.

Service worldwide Outside Germany, please contact your local service office first. For hotline numbers, refer to the sales office addresses on the internet.

Preparing information To be able to help you more quickly and efficiently, please have the following information ready:

- Detailed description of malfunction and circumstances resulting in the malfunction
- Type plate name of the affected products, in particular type codes and serial numbers
- Your contact data (phone and fax number as well as your email address)

Index

A

Abbreviations.....	11
About this documentation.....	5
ActiveX-Control.....	63
Application phases.....	5

B

Backing up data for the remote diagnostics	
Backing up the current job	162
Backing up the oscilloscope data	161
General information	161
Bar code.....	107

C

Commissioning the HMI interface.....	59
General information	59
Preconditions to use the central visualization for the RegisterControl	61
VEP	63
VPP, VPB/VDP	61
Commissioning the mark stream sensor.....	33
Ambient conditions	51
Component cabling	47
Connections at the mark stream sensor	42
Display and operating components of the mark stream sensor	48
General information	33
Mounting the evaluation circuit of the mark stream sensor	33
Mounting the optics of the mark stream sensor	34
Technical data of the mark stream sensor ...	50
Connection assignment	
Description of the connections	43
Connections at the mark stream sensor.....	42
Content area.....	80
Control Section Encoder Emulation Output card	31

D

Decentral HMI.....	143
General information	143
Importing the dialog	143
Operation	147
Describing HMI dialogs and HMI elements	
Navigation structure	75
Describing the HMI dialogs and HMI elements	
Diagnostics	130
Production	117
Service	137
Describing the HMI Dialogs and HMI Elements	
Machine configuration	80
Description of HMI dialogs and elements	
Dialog structure	76

D

Description of the HMI Dialogs and HMI Elements	
Job configuration	89
Diagnostics	
Brief description	130
Diagnostics overview	131
Logbook	136
Oscilloscope	133
Dialog structure	
Arrow wizard and switching panel of the printing unit	78
Content area	80
Header	76
Navigation area	76
Sidebar	78
Display and operating components of the mark stream sensor	
Electronic type plate	50
General information	48
Operating mode and error displays	49
Documentation structure.....	5
Drive parameterization.....	31
Checking the correct incremental encoder parameterization	32
Parameterization of the incremental encoder emulation	31
Drive system.....	17

E

Electric drive system.....	17
Error numbers.....	153
Explosion protection	14

F

Firmware update.....	55
Format.....	91

H

Header.....	76
Histogram.....	128
HMI application scenarios.....	69
Diagnostics	73
General information	69
Job configuration	72
Overview of all HMI processes	69
Production	71
Service	70
HMI dialog and element description.....	75
General information	75

I

Incremental encoder emulation.....	31
Information representation.....	11

Index

I

Intended use.....	13
Introduction.....	27
Brief description	29
System overview	29

J

Job configuration.....	89
Acceleration compensation	115
Brief description	89
Job management	89
Preset format	114
Preset settings - Length	112
Preset side	113
Job management.....	89

L

Length register controller.....	100
Logbook.....	136

M

Machine configuration	
Brief description	80
Machine configuration dialog	80
Machine configuration dialog (communication settings of the sensors)	87
Mark stream.....	105
Material selection.....	110

N

Navigation.....	75
-----------------	----

O

Optics.....	34, 39
-------------	--------

P

PELV.....	21
Production	
Brief description	117
Histogram	128
Register overview	117
Register single view	126
Trend overview	124
Protective extra-low voltage.....	21

R

Register overview.....	117
Register single view	
Printing unit	126
Running operation.....	117

S

Safety instructions.....	11
--------------------------	----

S

Safety instructions/Special conditions.....	14
Safety instructions for electric drives and controls.....	17
Sensor communication.....	87
Service	
Advanced settings	137
Language	139
Machine configuration	137
User management	139
Set IP address.....	88
Setting the expectation window	
Oscilloscope	126
Side register controller.....	102
Support	
See service hotline	163
Symbols used.....	11

T

Terms and abbreviations.....	11
Trend.....	124
Troubleshooting.....	151
Approach in case of error	151
Backing up data for the remote diagnostics	161
Error numbers and troubleshooting	153
General information	151
Problems with the 360° display	161

U

Unit configuration	92
Use, intended.....	13
User Management.....	139

V

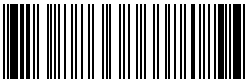
Validity of the documentation.....	5
VEP.....	63
Registering ActiveX-Controls	65
Starting the CEView	67
Transmitting the application	66
WinStudio settings to be selected	63
VPP, VPB/VDP	
Installing additional files	62
Registering ActiveX-Controls	63
Starting runtime	63
WinStudio settings to be selected	61

W

Web width.....	91
WinStudio licensing.....	59

Notes

Bosch Rexroth AG
Electric Drives and Controls
P.O. Box 13 57
97803 Lohr, Germany
Bgm.-Dr.-Nebel-Str. 2
97816 Lohr, Germany
Tel. +49 9352 18 0
Fax +49 9352 18 8400
www.boschrexroth.com/electrics



R911336304

DOK-MLC***-REGI*CO*V13-AP01-EN-P