Operating Manual
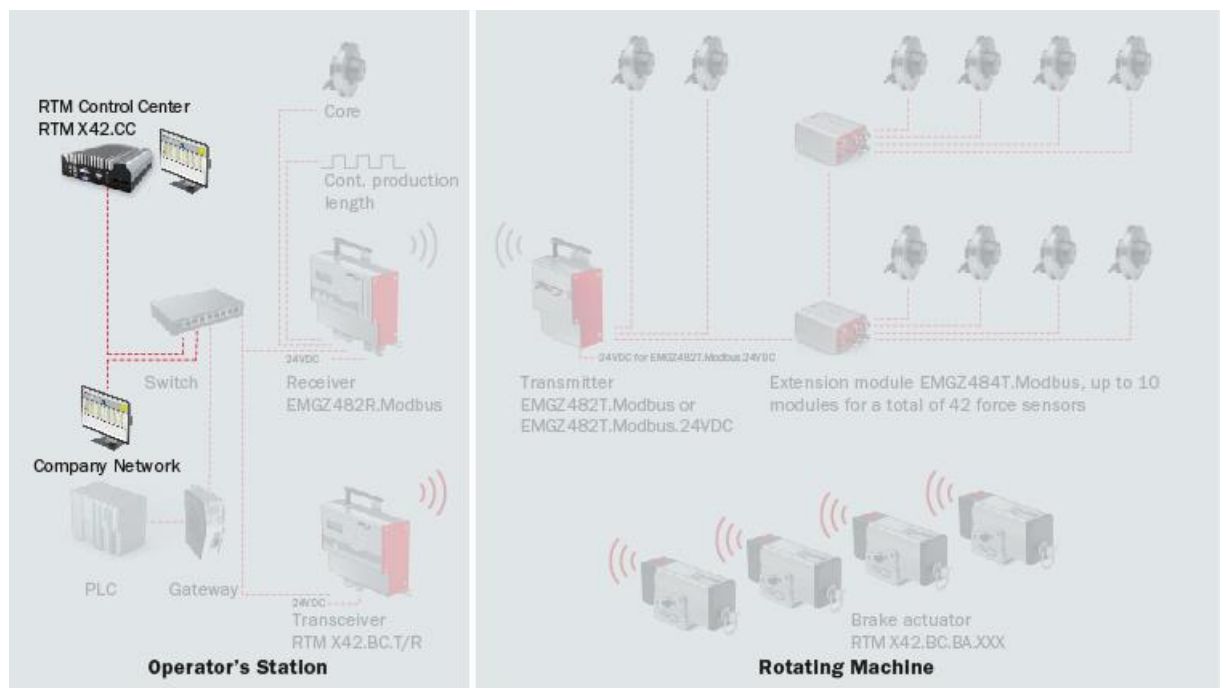# RTM X42.CC Control Center with
RTM Monitoring & Control Software

System extension for Telemetry System RTM X42

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Software Version	1.54

Diese Bedienungsanleitung ist auch in Deutsch erhältlich.

Bitte nehmen Sie Kontakt mit Ihrer FMS Vertretung auf.

1 Table of Contents

2 Safety instructions

All safety instructions, operating and installation instructions listed are designed to ensure the correct operation of the device. In any case, they must be always observed to ensure the safe operation of the systems. Failure to comply with the safety instructions and the use of the devices beyond their specified performance data may endanger the safety and health of persons.

Work relating to the operation, maintenance, conversion, repair or adjustment of the device described herein shall only be performed by qualified personnel.

2.1 Presentation of the safety instructions

2.1.1 A risk that could result in minor or moderate injury

Danger, Warning, Caution

Type of risk and its source

Possible consequences of disregard

Measures to avert the risk

2.1.2 Note for the proper functioning

Observation

Note on the correct operation

Simplification of the operation

Ensuring the functioning

2.2 General safety instructions

Loose components

If the battery is not properly attached, it may be ejected from rotating machines.

Secure the battery with the thumbscrews

Changes or modifications to this device that have not been expressly approved by **FMS AG** will result in the expiry of the FCC approval for the operation of this device.

This device complies with the FCC rules Part 15, as well as the approved RSS standard(s) issued by Canada. The operation is subject to the following two conditions:

- This device may not cause harmful interference; and
- This device must accept any received interference, including interferences which are liable of causing undesirable operation

Information on radio frequency radiation

This device complies with the FCC thresholds for an uncontrolled environment. This device should be installed and operated in such a way that a minimum distance of 20 cm between the radiation source and your body is maintained. This transmitter must not be operated near or in conjunction with any other antenna or transmitter

The function of the system is only guaranteed with the specified arrangement of the components to each other. Otherwise, severe malfunctions may occur. Therefore, the installation instructions on the following pages must be adhered to.

The local installation regulations are implemented to ensure the safety of electrical installations. They are not included in this Operating Manual. However, they must be observed in any case.

Inadequate grounding can cause electrical shocks to people, malfunctions of the entire system or damage to the control electronics! In any case, adequate grounding must be ensured.

It is crucial to compensate for the centrifugal forces generated by the rotation of the stranding machine. Force-measuring rollers which have not been compensated, result in incorrect measurements.

Electrical connections must be implemented by a skilled person.

All system components are sensitive components and may suffer damage in the event of improper installation! The installation must be performed by trained service personnel!

3 Product information

3.1 System Requirements

The telemetry system RTM X42 is required to measure the strand tension to use the RTM X42.CC Control Center.

3.2 Functional description

The RTM X42.CC Control Center is a central computer unit. It manages and controls all measurement results, as well as the corresponding control parameters of the RTM X42 telemetry system.

The pre-installed RTM Monitoring & Control software is a browser-based application and it can therefore run on any computer which supports a browser.

RTM X42.CC Control Center — System extension with central computer unit equipped with pre-installed RTM Monitoring & Control software

- Clear display of the measured values
- Storage, printing of measurement data, quality documentation for your customers
- Integrated solution a with user-friendly interface
- Recipe storage, quick setup / switchover to other products
- Extensive database for analysis, well-founded statements on plant performance as basis for process improvements

3.3 System extensions to the RTM X42 measuring system

- RTM X42.BC Brake Control — Brake actuators on each cradle
    - o Integrated solution, fully automatic control of the trigger force
    - o For belt and rope brakes, continuous production with the highest quality standard
    - o Easy to assemble, maintenance-free, robust, easy retrofitting, reliable
    - o Proven battery technology, easy operation, extensive life-cycle, the highest level of efficiency

3.4 Main components
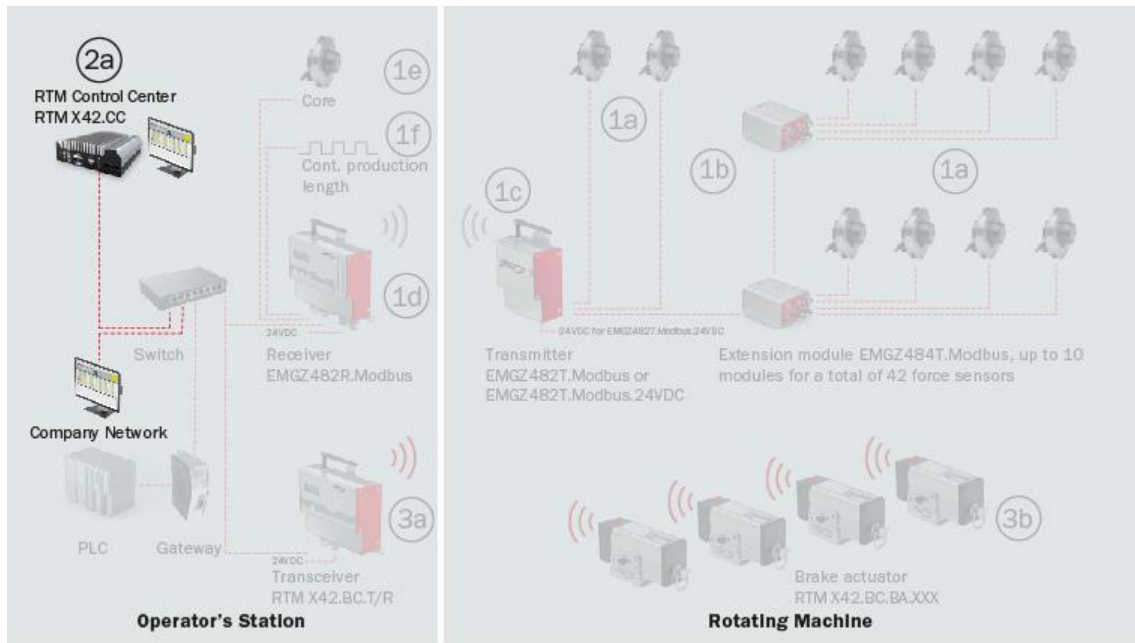
Figure 1: Main Components RTM X42.CC RTM_X42_Modbus_BA_Manual.ai

Designation of the main components	
Position	**Description**
Position 2	**System Extension RTM X42.CC Control Center**
2a	RTM X42.CC Control Center Central computer unit with pre-installed RTM Monitoring & Control software
o. Fig.	Monitor, keyboard and mouse, connection cable, etc.

Table 1: Main Components

3.5 Scope of supply

Scope of supply

Central computer unit, Linux operating system; power supply; monitor; mouse; keyboard (country-specific); operating manual

Software modules RTM Monitoring and RTM brake control

Options:

Additional software modules are in preparation

Not included in the scope of supply:

RTM X42 Telemetry System, RTM X42.BC Brake Control – system extension

Accessories:

Gateway; switch; patch cable for connecting the receiver module and the gateway, or PLC

4 Connections on the main computer
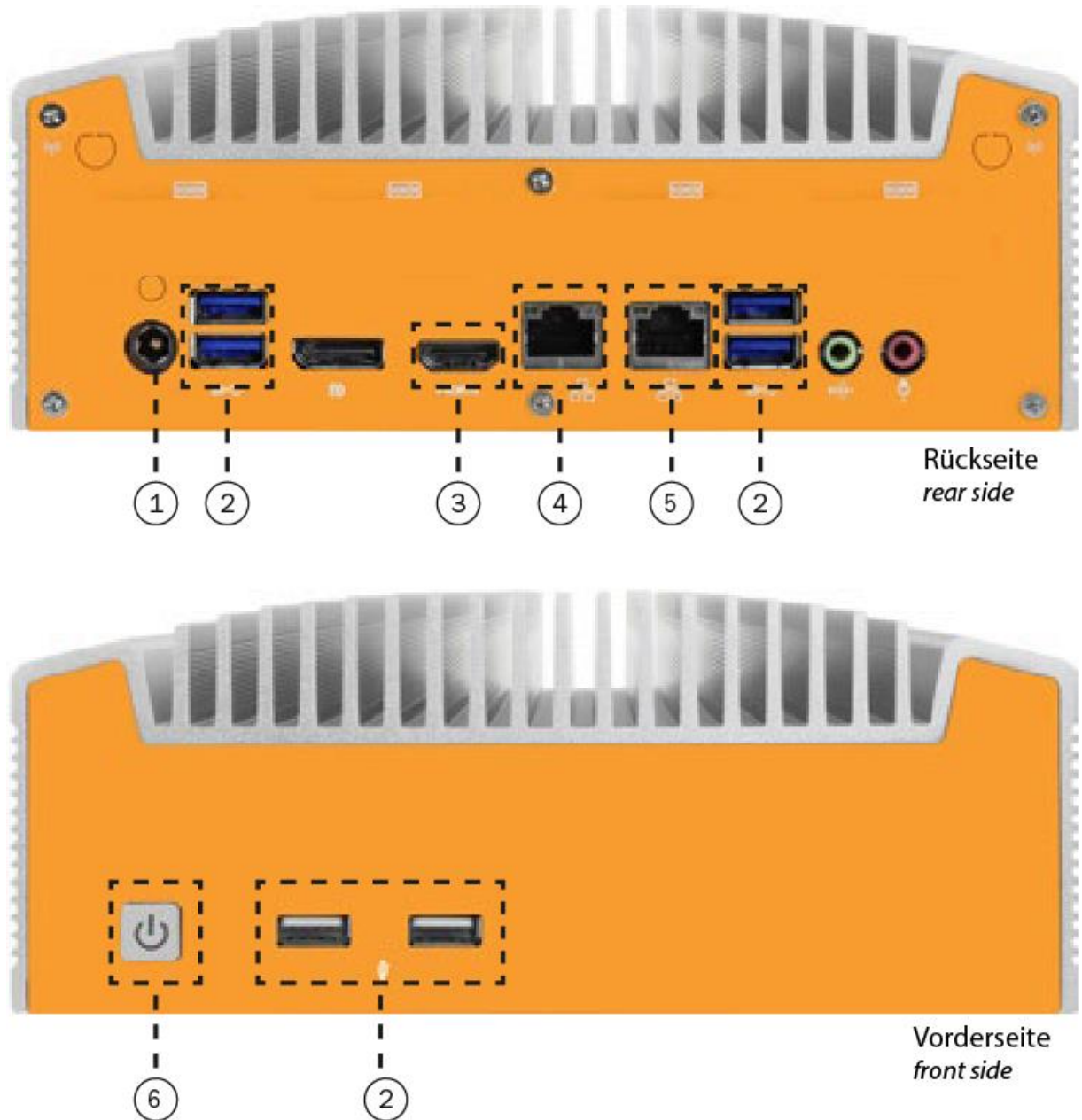
Figure 2: Main computer ports   RTM_X42_Modbus_BA_Manual.ai

Ports	
Position	*Description*
1	Power supply unit, mains adapter included in the scope of supply
2	USB ports For keyboard, mouse, data transfer via USB flash-drive (remove USP stick after use)

Ports	
Position	*Description*
3	HDMI connector For the monitor
4	Network port 2 "NET" Connect this port to your corporate or machine network. The IP address is automatically obtained from the network (DHCP).
5	Network port 1 "RTM" Connect this port to the switch to which the components of the RTM X42 system are connected. This connector may only be used for communication with the components of the RTM X42 system. Fixed IP address 192.168.21.95
6	Power switch With LED for status indication

Table 2: Main computer ports

5 Basic Configuration — Start-Up

5.1 Delivered condition

The system is pre-configured at the factory and adjusted to the installed components.

Telemetry System RTM X42

- The IP address of the EMGZ482R.Modbus reception module 192.168.21.90
- Unique radio channel and ID per receiver module
- Number of Expansion Modules

System Extension RTM X42.CC Control Center

- IP address of the central computer unit 192.168.21.95 (factory default)
- MAC address of the central computer unit
- Unlocked software licenses for ordered software modules

System extension RTM X42.BC brake control (if installed)

- IP address of the RTM X42.BC.T/R transceiver module(s) 192.168.21.91
- Radio channel and IDs of the RTM X42.BC.BA brake actuator(s)

The following configurations must be checked locally and adjusted if necessary.

- Network connection company network
- Adjustments of the IP addresses (directly on the respective devices)

5.2 Communication settings on system components

5.2.1 IP Address RTM X42 Receiver Module

Preconfigured to: 192.168.21.90

For configurations on the device, refer to the Operating Manual RTM X42.Modbus

5.2.2 IP Address RTM X42 T/R transceiver module

Preconfigured to: 192.168.21.91

For configurations on the device, refer to the Operating Manual RTM X42.BC Brake Control

5.3 Network settings in the FMS Monitoring & Control software

5.3.1 MAC addresses for the central computer unit on the stranding machine

Auto/Record mode during production can only be initiated from one computer. This is the central computer unit directly located on the stranding machine.

For this purpose, you must enter the MAC address of the central computer unit in the RTM Monitoring & Control software "Main Computer (control station)".

Refer to Global settings p. 18ff

This is already pre-configured at the factory.

How to verify the MAC address at the RTM X42.CC Control Center
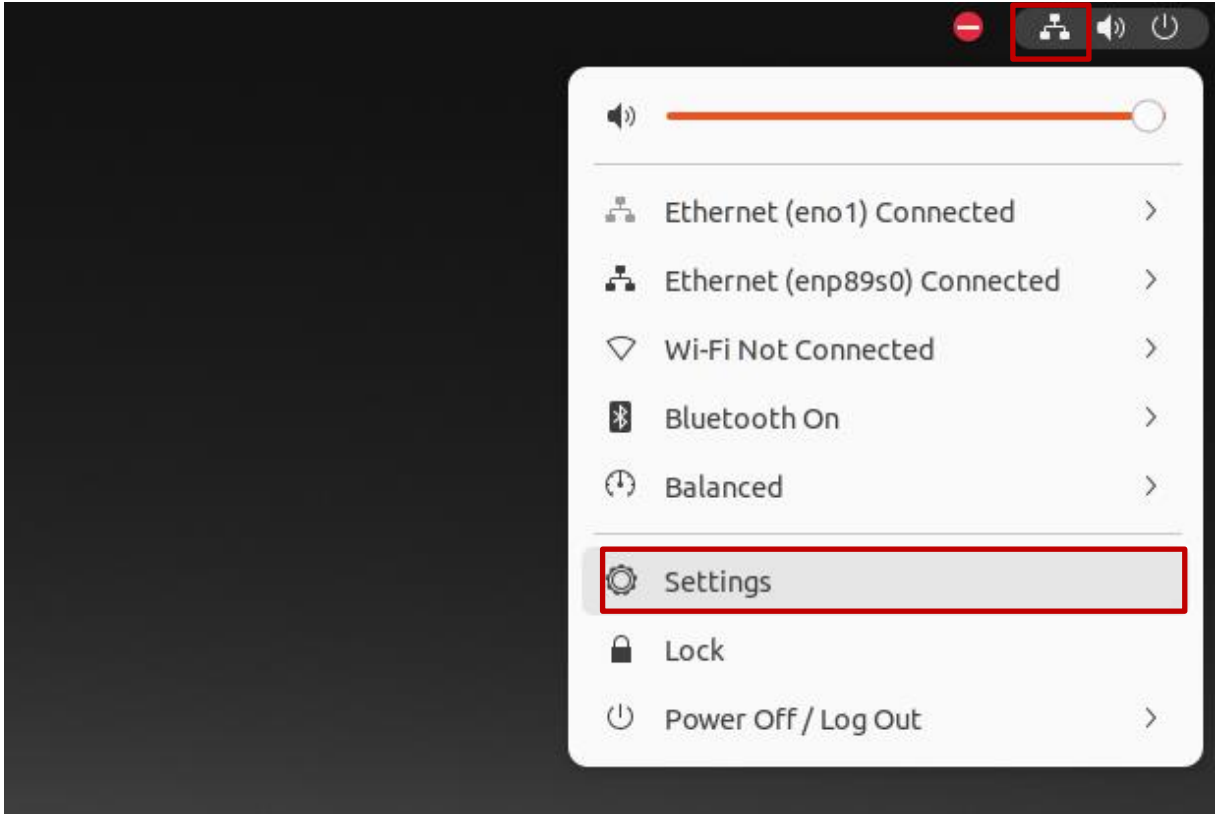
Figure 3 : Desktop, top right network icon, network settings
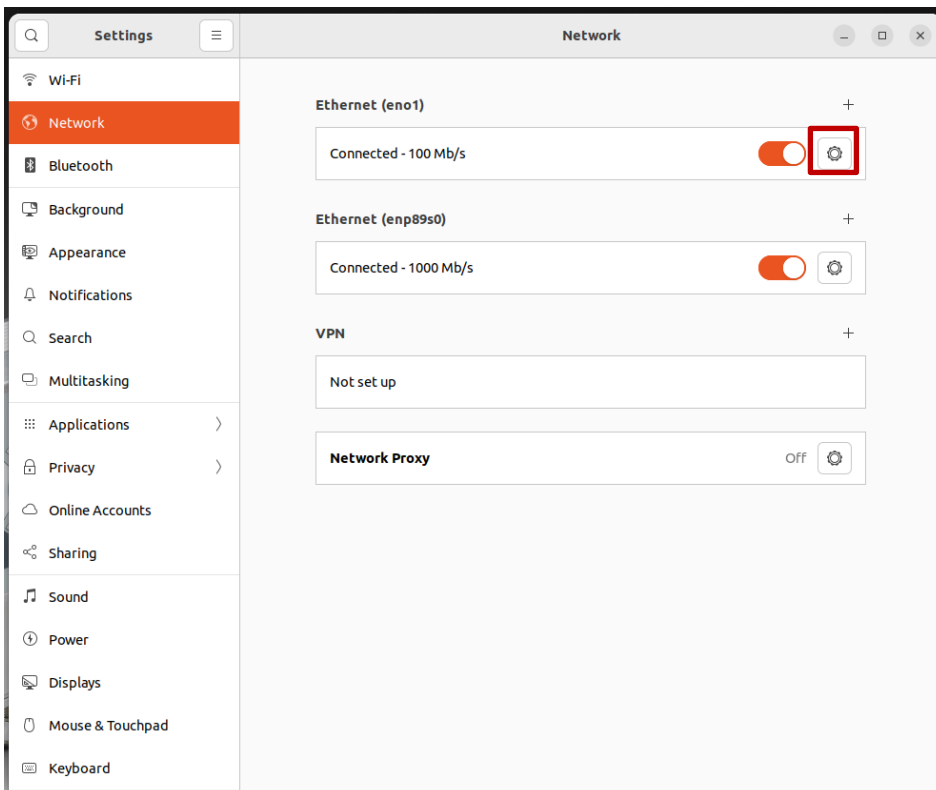
Figure 4 : Network settings, network
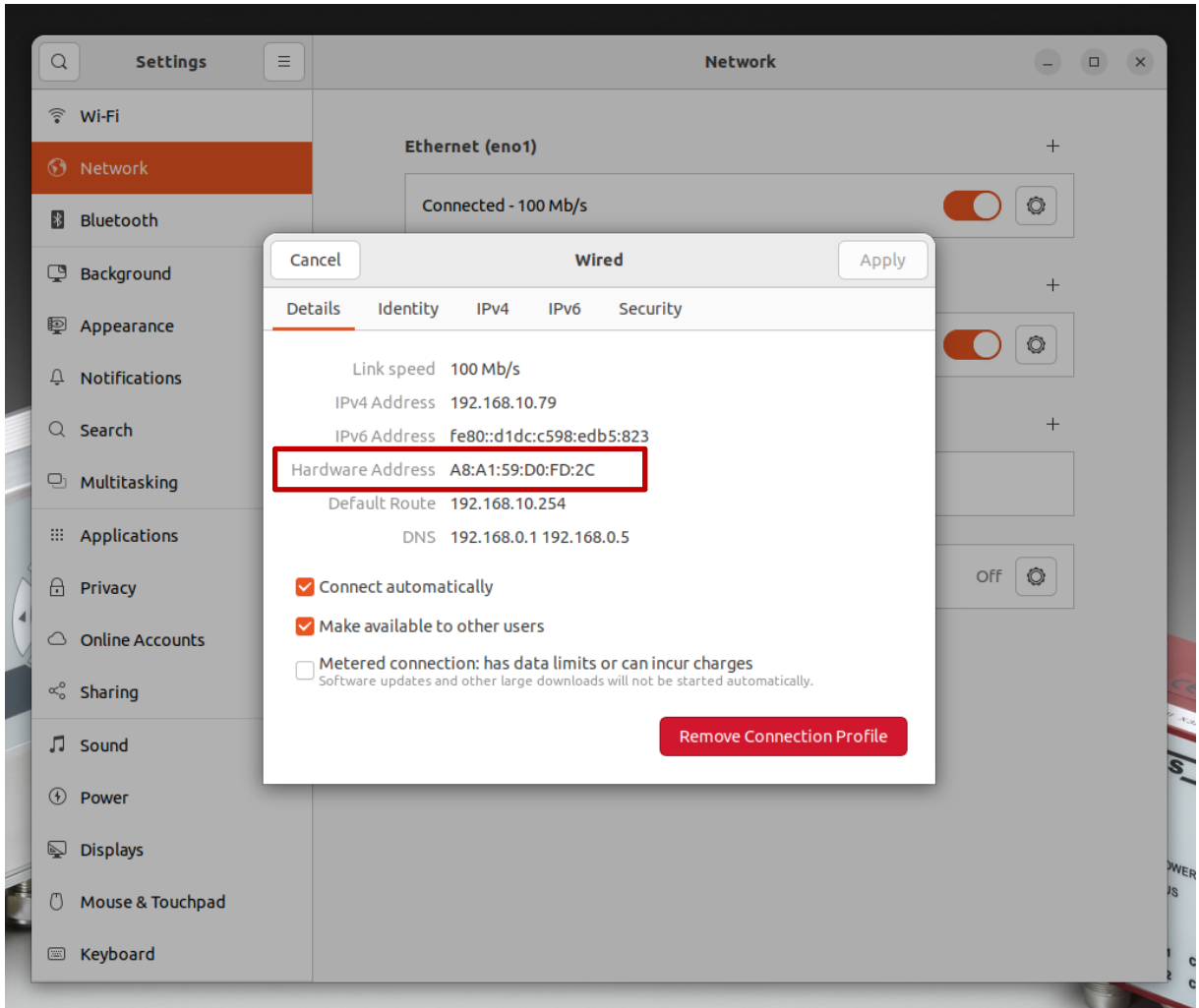
Figure 5: hardware address = MAC Address

The MAC address can be copied to the RTM Monitoring & Control software via copy & paste.

5.4 Software modules

Depending on the scope of supply, you will receive different software modules, refer to Software modules p. 90ff.

This Operating Manual covers the functions of all available modules. Depending on the scope of the order, you may only have limited functionality if not all software modules have been activated.

6 Software interface

6.1 Launch of the FMS Monitoring & Control Software

The FMS Monitoring & Control software can be started on all computers on which a browser is installed. The RTM X42.CC Control Center must be connected to the corporate network.

In the central computer unit, proceed as follows:

- Start the central computer unit
- Log on with user "RTM" and the password "rtm1"
- A shortcut "RTM Monitoring & Control Software" is already created on the desktop, which directly starts the browser, together with the software.

Tension monitoring without brake control components

This Operating Manual describes the full functionality of the software. If you have not installed brake actuators, the controls and input fields are displayed in grey.

The corresponding settings cannot be changed.

6.2 Login
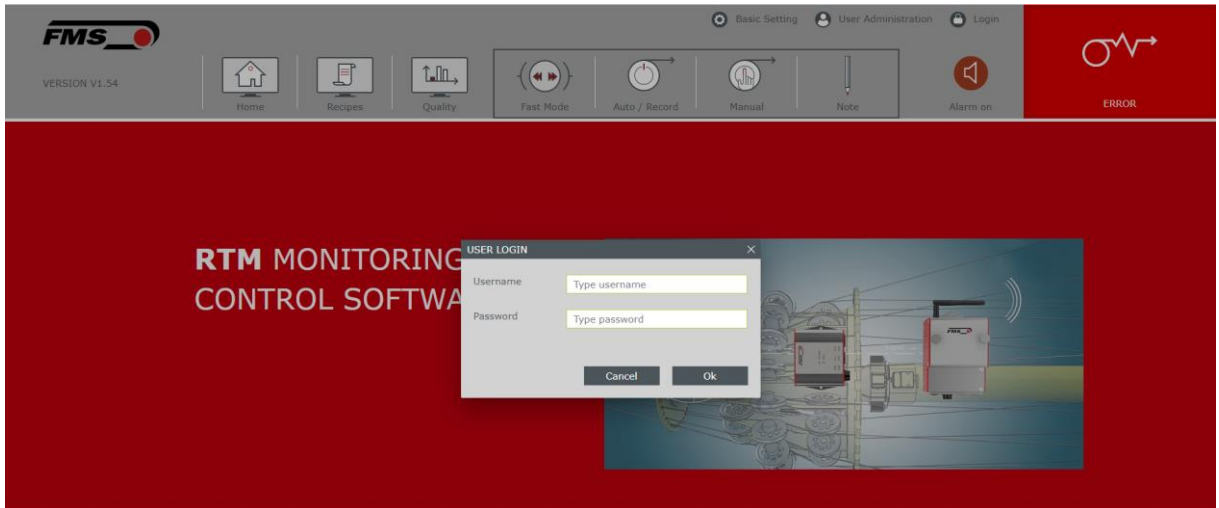
Figure 6: Login screen

After the start, the basic screen appears with information related to the software version and function.

To log in, click on "Login". On the first time you sign in, use

Login: administrator

Password: rtm1

6.3 Home Screen overview

Full-screen mode

To view the browser in full-screen mode, press **F11**. This will help you improve the display. To exit full-screen mode, press **F11** again.

Tooltips

If you hover over controls or input fields, you get hints related to the function or input.
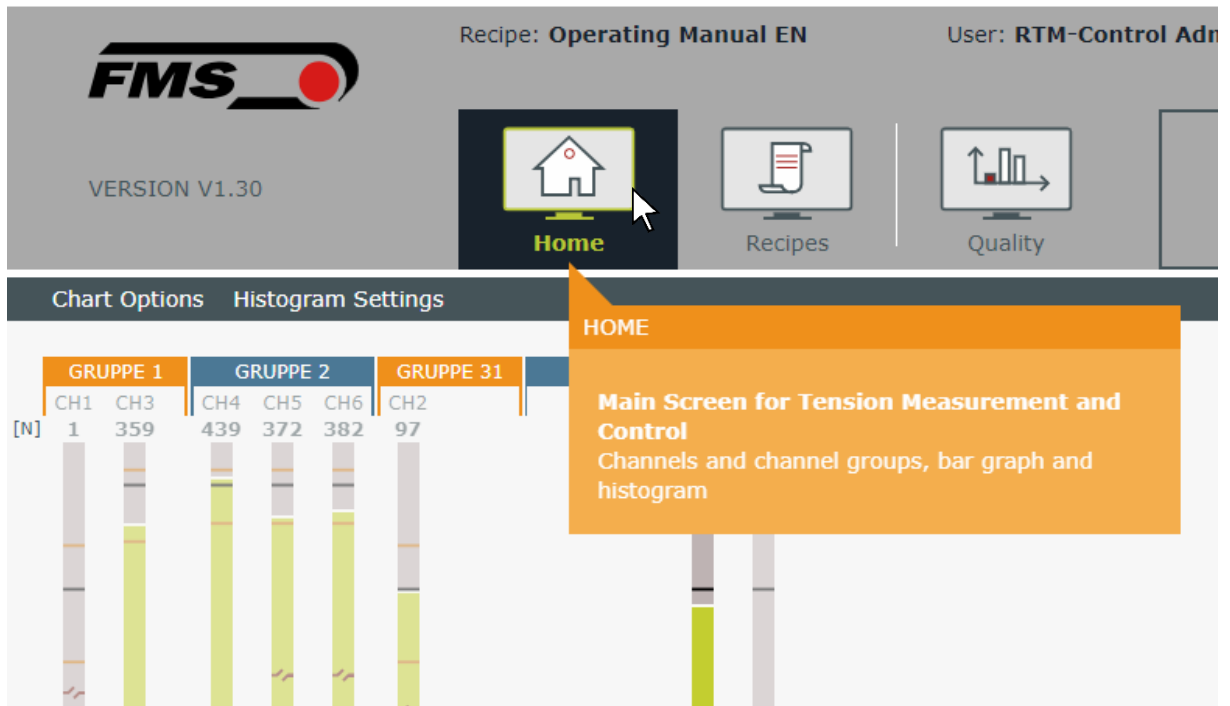
Figure 7: Tooltip - HOME
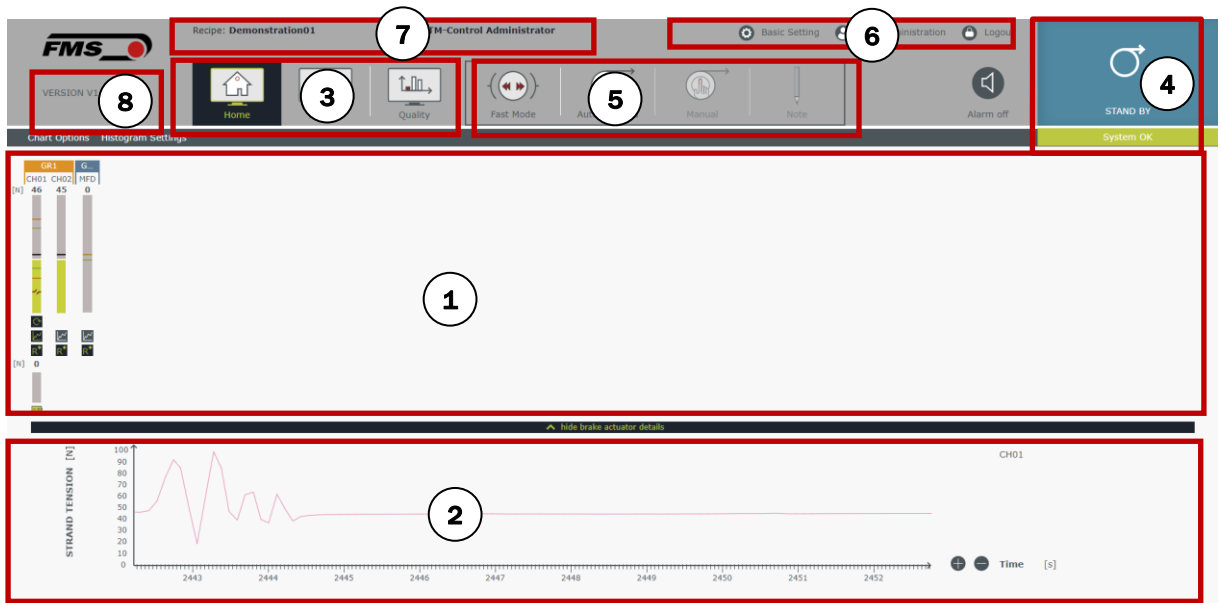
Figure 8: Home-screen overview

Surface	
Position	*Description*
1	Bar graph display of channels and channel groups
2	Histogram
3	Main navigation
4	Device status and status details
5	Auto/Record mode + Fast Mode
6	Basic settings, user management
7	Loaded recipe and logged-in user
8	Software version

Table 3: Overview start screen "Home"

6.4 Basic settings

6.4.1 Global settings
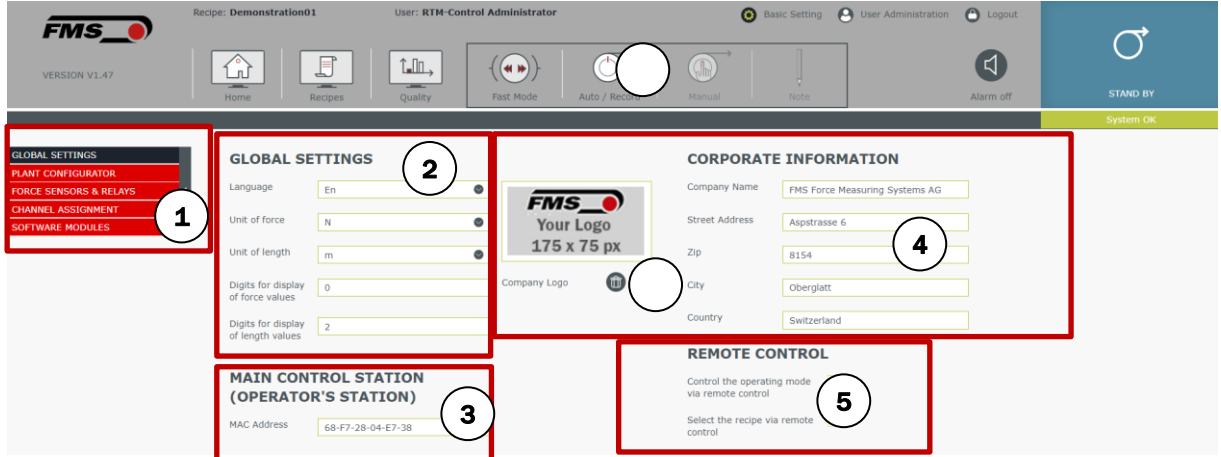
Figure 9: Basic settings - Global settings

You can display or hide page navigation by pressing ">" or "<".

Basic setting — Global settings	
Position	**Description**
1	Page navigation
2	**Global settings**
	Language — Setting the interface language (German or English)
	Force unit — Newton (N) or Pound force (lbf)
	Length unit — Meters (m) or Inches (in)
	Force gauge accuracy — Number of displayed decimals
	Length display accuracy — Number of displayed decimals
3	**Main computer (control station)**
	This is the MAC address of the only computer where Auto/Record mode can be started.
	Typically, the MAC address of the central computer unit of the RTM X42.CC Control Center is used, as it is usually located at the control station.
4	**Company information**
	These entries refer to your company. They will be used later in the creation of quality protocols.

Basic setting — Global settings	
Position	**Description**
5	**Remote Control** You can define here if you want to change settings of the RTM Software via your PLC. Set operating mode via PLC Select recipe via PLC

Table 4: Basic settings - Global settings

6.4.2 Plant Settings - System settings - Strander
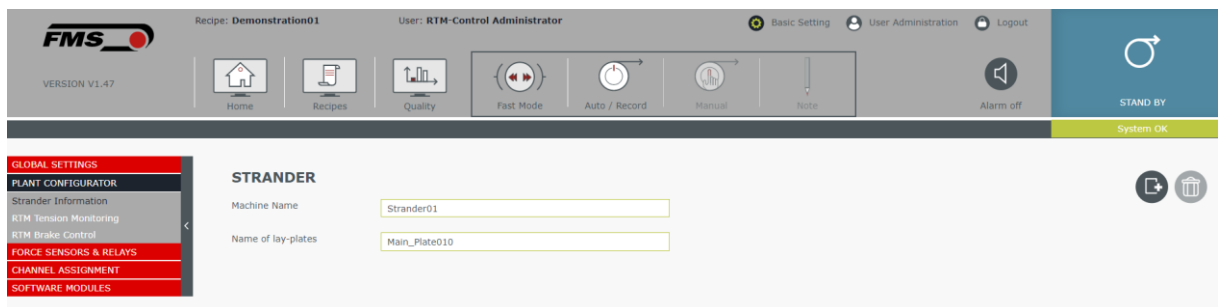
Figure 10: Basic setting - System settings - Strander

These settings refer to specific settings of the strander. You can assign a name for the plant here. It will be used, for example, when creating quality protocols.

At this point, you can also enter the name and number of the lay-plate(s). To add a new one, click the control. ⬚ and assign a unique name.

To delete a lay-plate from the list, select the row in the table and click 🗑.

6.4.3 Basic setting — System settings — RTM Tension monitoring
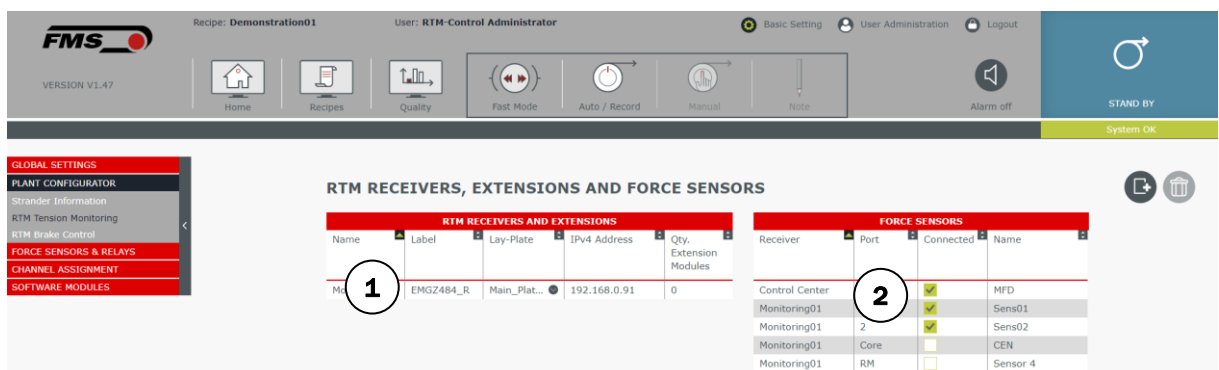
Figure 11: Basic setting - System settings - RTM Tension monitoring

In the "RTM Receivers and Extensions" table, you first define the number and name of the RTM X42 receiver modules. Additionally, you assign a lay-plate, an IP address and the number of connected extension modules to each receiver module.

In the "Force Sensors" table, you assign the corresponding force sensors to the lay-plates defined during the previous step.

The input is performed as in a traditional spreadsheet program. You do not need to save the input or change of a value. In the case of incorrect inputs, a corresponding notice will be displayed.

Basic setting — Global settings	
Position	Description
1	*Table "RTM Receiver/Extension Modules and Force Sensors"* *Name* Enter a unique name *Caption* Here you can enter your own label for the component. E.g., a line of the nameplate or its own name. This information will not be used otherwise. *Lay-plate* Select the pulley on which the receiver module is located. *IPv4 address* Enter the IP address of the receiver module in the format XXX.YYY.ZZZ.CCC. *Qty. Extension modules* "0" is registered here as default. You can observe that when additional receiver modules and channel extensions are inserted, the "Force Sensors" table is automatically added to the corresponding number of rows. The maximum number that can be entered per receiver module is "10"
2	*"Force Sensor" Table* *Receiver* This field displays the name of the corresponding receiver module to which the force sensor is assigned. The "Control Center" indicates a value that is automatically calculated in the central computer unit. This is not related to a receiver module. *Port* This value is automatically assigned. Please do not change RM: Designates the digital input on the receiver module used to record the running meters. If you activate it, the histogram displays the actually produced length. If you do not use it, the histogram takes the time as a reference. *Connected* It may occur that no force sensor is assigned to a channel. E.g. A channel extension with 4 channels, to which only 2 force sensors are connected. In this case, leave this field unchecked for the unused channels.

	If you deactivate a force sensor here, it loses all properties (offset, gain factor, reference value, min. max. thresholds, control parameters, etc.) If you reactivate it, the default values are used.
	Name Enter a unique name for the force sensor here.
	Seele/Core — tension of core strand (if installed) Assign a unique name here for the force sensor.
	RM – Production length, running meter (if installed) Assign a unique name here for the force sensor.

Table 5: Basic setting — System settings — RTM Tension monitoring

6.4.4 MFD - Maximum Feedback Difference

The Maximum Feedback Difference is an automatically calculated value. The output value can be described as a min-max range of actual values across all channels. It always displays the difference between the largest and smallest actual values across all channels.

The MFD thus illustrates, for example, a drifting of the actual values due to changing braking forces on the cradles. The use of this value only makes sense if all channels display the same reference value.

The MFD is displayed with a separate channel. It is not dependent on the reference value.
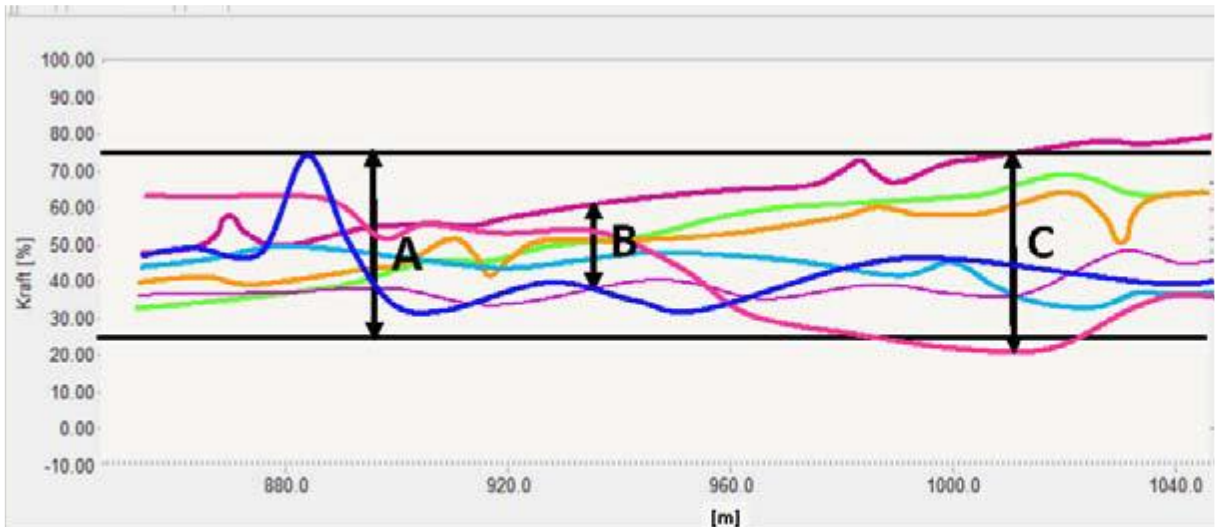
Figure 12: MFD, Maximum Actual Difference

A - The allowed bandwidth for the MFD at the set upper and lower thresholds.

B — current MFD at running metres, approx. 94m

C — current MFD at running metres, approx. 101m, threshold exceeded

6.4.5 Basic setting — System settings — RTM Brake Control
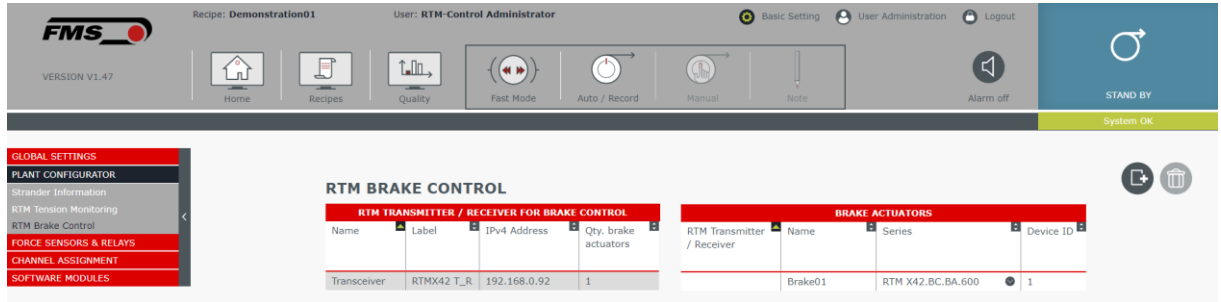
Figure 13: Basic setting - System settings - RTM Brake Control

In the table " RTM TRANSMITTER / RECEIVER FOR BRAKE CONTROL" you first define the number and names of the RTM X42 transceivers for the control of the brake actuators. Additionally, you assign each RTM X42 transceiver module its own IP address and the number of connected brake actuators.

You can observe that when inserting additional RTM X42 transceivers and increasing the number of Brake Actuators, the table "BRAKE ACTUATORS" is automatically added to the corresponding number of rows.

Basic setting — Global settings	
Position	Description
1	**Table "RTM Transceiver for Brake Control"** **Name** Enter a unique name **Label** Here you can enter your own label for the component. E.g., a line of the nameplate or its own name. This information will not be used otherwise. **IPv4 address** Enter the IP address of the transceiver in the format XXX.YYY.ZZZ.CCC. **Qty. Brake Actuators** You can observe that the corresponding number of lines is automatically added to the "Brake Actuators" table when inserting additional transceivers and increasing the number of Brake Actuators.
2	**"Brake actuators" table** **RTM Transceiver** Name of the respective RTM transceiver **Name** Enter a unique name for the brake actuator here. **Series** Select the exact series of the brake actuators in your machine here.

Basic setting — Global settings	
Position	**Description**
	Device ID The radio frequency of each brake actuator is clearly defined by the ID. You can find it on a sticker on the respective brake actuator. The ID is assigned at the factory. Refer to the Installation and Operating Manual RTMX42.BC Brake Control

Table 6: Basic setting - System settings - RTM Brake Control

6.4.6 Basic settings — force sensors and relays

This is where you perform the settings for the force sensors.

FORCE SENSORS AND RELAYS

FORCE SENSORS

Name	Lay Plate	Nominal Force [N]	Offset	Gain	Filter Bar Graph	Bar Graph Cut-off Frequency / Samples	Filter Histogram	Histogram Cut-off Frequency / Samples	Filter Wire Break	Wire Break Cut-off Frequency	Wire Break Threshold [N]	Wire Break Pending Time	Control Cut-off Frequency / Samples	Filter Control
Core	-	500	-5000	1	Non-linear	2	Non-linear	2	Disabled	2	50	0.3	Non-linear	2
Sensor 1	Cage1-6bays	100	1	0.208	Low pass	0.5	Non-linear	2	Non-linear	2	28	0.3	Non-linear	2
Sensor 2	Cage1-6bays	300	205	3.367	Disabled	0.2	Low pass	2	Disabled	2	15	0.3	Low pass	2
Sensor 3	Cage1-6bays	50	-5000	10	Low pass	2	Low pass	2	Disabled	2	17	0.3	Low pass	2
Sensor 4	Cage1-6bays	50	-4000	10	Low pass	2	Low pass	2	Disabled	2	23	0.3	Low pass	2
Sensor 5	Cage1-6bays	50	-5000	10	Low pass	2	Low pass	2	Disabled	2	100	0.3	Low pass	2

Figure 14: Basic setting - Force sensors and relays

Basic setting — Force sensor and relay	
Column	**Description**
Name	Name of the force sensor
Lay-plate	Name of the lay-plate
Nominal force	The nominal force of the deployed force sensor. The nominal force of a force sensor can be found on the nameplate. The input is performed in Newton
Offset	Free entry of zero shift or automatic calculation refer to Offset compensation p. 26f Min. -9999 Max. 9999

Basic setting — Force sensor and relay	
Column	**Description**
Gain	Free input of the gain or automatic calculation
	refer to Calibration p. 27f
	Min. 0.001
	Max. 20
Filter bar graph	This filter only affects the bar display in the home screen
	Disabled Filter disabled
	Low-pass low pass filter of 1st order
	Non-linear Low pass filter of 2nd order
	Moving average calculated average over number of samples
Bar graph cut-off frequency / samples	When selected Low-pass or non-linear of parameter "Filter bar graph" Cut-off frequency: Min. 0.01, Max. 2, Standard 1Hz
	When selected moving average of parameter "Filter bar graph" Samples: Min. 2, Max. 5000, Standard 2 cycle time is 100ms. Entering 100 will calculate the moving average over a time span of 100 x 100ms = 10s.
Filter histogram	This filter only affects the display of the histogram in the home screen
	Disabled Filter disabled
	Low-pass low pass filter of 1st order
	Non-linear Low pass filter of 2nd order
	Moving average calculated average over number of samples

Basic setting — Force sensor and relay	
Column	**Description**
Histogram Cut-off Frequency / Samples	When selected Low-pass or non-linear of parameter "Filter histogram" Cut-off frequency: Min. 0.01, Max. 2, Standard 1Hz

When selected moving average of parameter "Filter histogram" Samples: Min. 2, Max. 5000, Standard 2 cycle time is 100ms. Entering 100 will calculate the moving average over a time span of 100 x 100ms = 10s. |
| Filter Wire Break | This filter affects the response behavior of the wire break detection.

Disabled Filter disabled

Low-pass low pass filter of 1st order

Non-linear Low pass filter of 2nd order |
Wire Break Cut-off Frequency	Threshold frequency: Min. 0.01, Max. 2, Standard 1Hz
Wire break threshold	Threshold for the detection of a wire break. As soon as this value is undershot and remains undershot for the duration of the delay time, the "wire break" alarm is issued.
Wire break delay time	Specifies the time interval by which the threshold must be undershot to trigger an alarm.
Control Cut-off Frequency / Samples	This filter only affects the actual tension value input of the closed-loop control.

Disabled Filter disabled

Low-pass low pass filter of 1st order

Non-linear Low pass filter of 2nd order

Moving average Calculated average over number of samples |

Basic setting — Force sensor and relay	
Column	**Description**
Filter control unit	When selected Low-pass or non-linear of parameter "Control Cut-off Frequency / Samples" Cut-off frequency: Min. 0.01, Max. 2, Standard 1Hz When selected moving average of parameter "Control Cut-off Frequency / Samples" Samples: Min. 2, Max. 5000, Standard 2 cycle time is 100ms. Entering 100 will calculate the moving average over a time span of 100 x 100ms = 10s.

Table 7: Basic setting - Force sensor and relay

Copying values

To copy configurations from one force sensor to another, select the line of the force sensor whose values you want to copy and press the "copy" control ⬚ . Now select the line of the force sensor into which you want to insert the copied values and press "paste" ⬚

Copying values

All configurations except the name of the force sensor are copied.

Multiple selection

By simultaneously holding down the "Ctrl" key with the left-click, you can select several lines.

6.4.7 Offset compensation

You need to perform this procedure to compensate for the weight of the pulley.

Refer to the Installation and Operating Manual Telemetry System RTM X42.Modbus

- Select the line with the force sensor for which you want to define the zero point
- Ensure that the force sensor is perpendicular above the axis of rotation of the machine.
- Make sure that the force sensor is not loaded. There must be no wire on the pulley of the force sensor.
- Press "Offset"

- The calculated value is now written in the column "Offset" of the selected force sensor

6.4.8 Calibration

This procedure calculates the gain factor. This provides you with an objective tension value in the configured unit.

Refer to the Installation and Operating Manual Telemetry System RTM X42.Modbus

- Select the line with the Force Sensor for which you want to calculate the gain
- Ensure that the force sensor is perpendicular above the axis of rotation of the machine.
- Form the future path of the wire over the pulley of the force sensor. This is best done with a rope, wire or a string.
- Hang a defined weight (e.g. 10kg) on the rope
- In the "Enter Defined Weight" field, enter the attached, defined weight in the selected unit.
- Press "Calibrate"
- The calculated value is now entered in the column "Gain" of the selected force sensor. To check if the calibration has worked, go to the home screen. The channel bar display must now show the exact value of the weight force.

Copying values

The offset compensation must be performed separately for each force sensor.

For force sensors of the same type and with the same nominal force, it is sufficient to calculate the gain for a single force sensor. The same value may be entered for the other force sensors.

6.4.9 Production length, running meter

This information is used to indicate the actual length of the processed product in the histogram. Likewise, the values are used in the creation of the quality protocols.

If the "RM" port is enabled, you can enter the corresponding values here. If the port is not enabled, the histogram uses time as a reference.

Figure 15: Basic setting – production length

To use this function, we recommend installing a proximity switch in the capstan. Which is then connected directly to the RTM X42 receiver module. In the example, the proximity switch would be activated 10 times per rotation, for example, via spokes on the capstan.

If production runs slower than the "minimum data recording speed", the system assumes that the device is stationary. In this case, the Auto/Record mode is paused (it is not stopped) until the speed increases again.

The maximum speed is determined by the frequency of the input signal which the receiver module can process.

Refer to the Installation and Operating Manual RTM X42.Modbus

6.4.10   Relay outputs

Figure 16: Basic setting – Relay outputs

Each RTM X42 receiver module has four relay outputs to which individual trigger functions can be assigned. In the "Trigger function" selection list, you can select the appropriate conditions that trigger the switching of the relay.

In the column "Invert output signal" the function of the relay can be reversed. By default, the relay is disabled, when triggered, it is activated. The inversion activates it and the triggering de-activates it.

Refer to the Installation and Operating Manual RTM X42.Modbus

6.4.11   Basic setting — channel assignment

A channel consists of a force sensor and a brake actuator. This is where you configure this assignment.

A channel corresponds to a bar graph in the home screen. Each channel must be assigned a force sensor. Optionally, a brake actuator can also be assigned to a channel.

Attention

When you assign a brake actuator to a channel, you must ensure that the corresponding brake actuator also acts on the strand of the force sensor associated with the channel.

Otherwise, the automatic tension control will not function.

Basic setting — channel assignment	
Column	*Description*
Force sensor	List of configured and connected force sensors
Brake actuator	Selection list with the names of all configured brake actuators. Each brake actuator can only be used once.
Channel name	This name appears in both the bar graph and the histogram. This is where it makes sense to use a **maximum of four characters**.

Table 8: Basic Setting - Channel Assignment

Figure 17: Basic setting – Channel assignment

6.5 User administration

You manage users and user profiles on this page. A user profile can be assigned to each user. User profiles are usually assigned according to qualification and task during machine operation or data evaluation.

Different user profiles can contain different permissions. By assigning a specific user profile to a user, the user is granted the corresponding permissions.

6.5.1 User

An "Administrator" user is pre-configured at the factory.

A user profile "Administrator" is also set up. The latter covers all permissions.

It enables the creation of additional user profiles and users.
Login: Administrator
Password: rtm1

Figure 18: user administration - Users

User administration - Users	
Column	*Description*
Login	Login in the login window
First name	First name of the user
Last Name	Last name of the user
Password	If you enter a password here, you will be prompted to confirm it in a separate window. Passwords are not displayed. If a password is forgotten, you can only be assigned a new password.
Automatic logout	Time interval in minutes until automatic log-off, if no input occurs. No automatic logout occurs on "0".

User administration - Users	
Column	*Description*
User profile	Selection list with all configured user profiles
Tooltips	Show and hide help texts per user.
Default User	The default user settings apply when no user is logged in.
	We recommend that you choose a user who has very few or no permissions.

Table 9: User administration - Users

To add a new row, click on the control ⊕ and assign a unique name.

To delete a row from the list, select the row in the table and click 🗑.

Unable to delete the user "Administrator".

The password can be changed.

Locked functions and input fields

Depending on the user profile deployed, some features are not available. Controls or input fields that are not approved for this user profile are displayed in grey.

If the user nevertheless makes an entry or presses a locked control, a message appears prompting a change of the user.

6.5.2 User profiles and permissions

The "Administrator" user profile is pre-configured at the factory. This profile holds all permissions and cannot be changed or deleted.

Figure 19: User Administration – user profiles and permissions

The user profiles are listed in the columns. The possible permissions are listed in the rows. By checking the corresponding check-box, you assign the respective permissions to a user profile.

User Administration – user profiles and permissions	
Permissions	*Description*
User Administration Menu	Access to user management
Basic Setting Menu	Access to Basic Settings
Data Record	Starting and stopping Auto/Record mode and automatic brake control
Manual Brake Operation	Manual operation of the brakes in automatic mode, if this is also specified in the recipe.
Mute alarms	Mute the alarm
Generate quality reports	Creating Quality Log from Data Recording
Copy, delete recipe	Copying, deleting recipe
Load recipe	Load recipe
Recipe manager	Access recipe manager
Edit user	User data, changing passwords
Edit own password	Change your own password
Edit user profiles	Modifying user profiles
Edit recipe	Change recipe

Table 10: User administration - User profiles

To add a new column, click on the control and assign a unique name.

To delete a column from the list, select the column in the table and click .

7 Home screen

7.1 Display

In the home screen, the configured channels are displayed in two different ways by default.
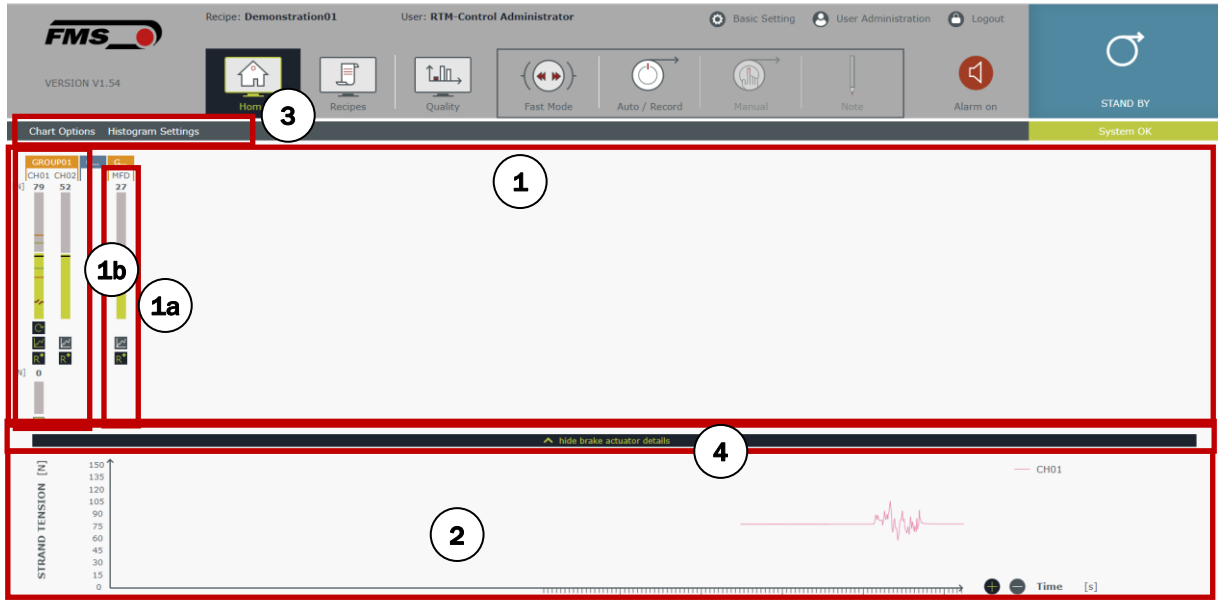
Figure 20: Home Screen - Channel indicators

Home screen	
Pos.	**Description**
1	Bar graph display (tension monitoring and brake control)
1a	Bar graph display of a channel
1b	Channel group
2	Histogram (tension monitoring)
3	Control for configuring the display in the home screen
4	Control for displaying and hiding the brake actuator indicators

Table 11: Home Screen - Channel display

7.1.1 Bar graph display of channels
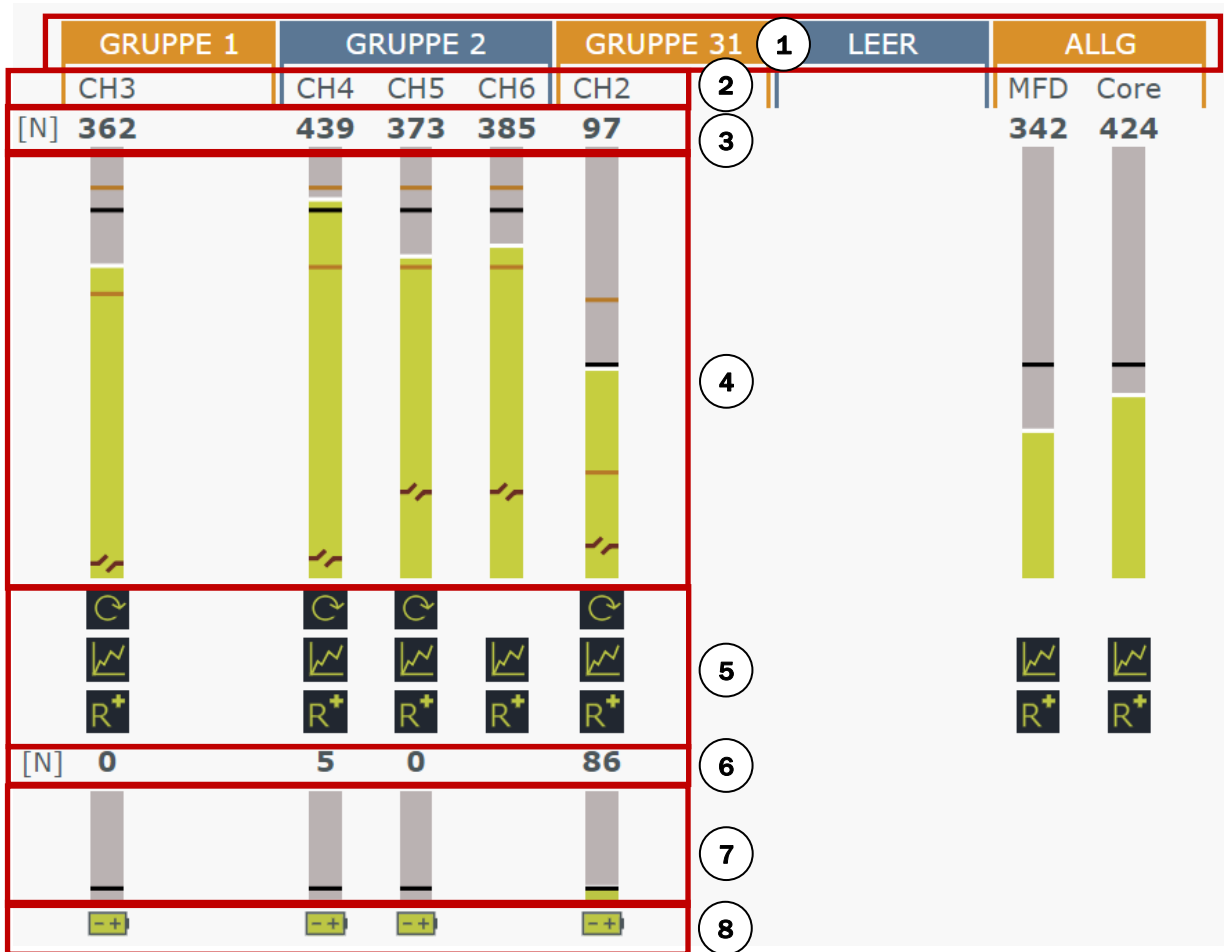
Figure 21: Home Screen - Bar graph display

Home Screen - Bar graph display	
Pos.	**Description**
1	Channel group
2	Channel name
3	Actual value of the tension monitoring, strand tension (in configured unit)
4	Actual value of the tension monitoring as a graphical display with different thresholds and reference value
5	Controls for adjusting the display and for automatic operation
6	Actual value of the braking force in the brake actuator
7	Braking force in the brake actuator as a graphic display
8	Status indication of the brake actuation

Table 12: Home display - Bar graph display

7.1.2 Channel group

Single channels can be grouped together in a channel group. This is useful for extensive systems with many channels, as it provides for a better overview.

For minor systems with a few channels, we recommend creating at least two channel groups. A channel group for measuring and controlling the strand tension and a separate channel group indicating the measurement and control parameters for the core.

A channel group with all (known) channels is implemented at the factory. To change the name of the existing channel group, simply click on the name and assign a unique name. If you click outside the input field, the changes will be applied.

To implement a new channel group, hover over the name of the existing channel group, right-click and select "Insert New Channel Group".

Drag & Drop - Channels and Channel Groups

To change the order of channels within a channel group or to transfer channels from one channel group to another, hover over the channel name, press and hold down the left mouse button. Now you can drag the channel and drop it in any place. For this purpose, simply release the mouse button.

Channel groups can also be moved according to the same principle.
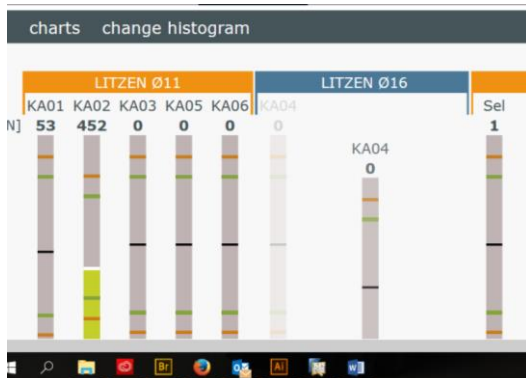
Figure 22: Drag & Drop - Channels
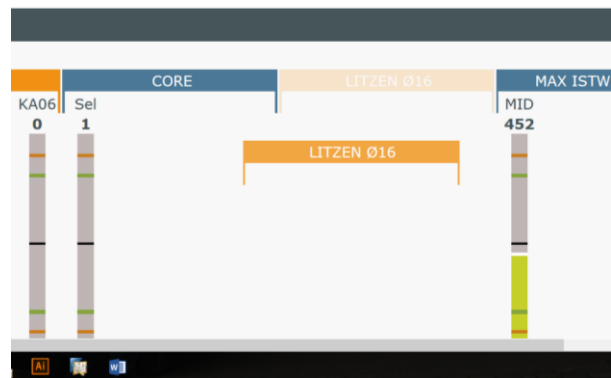
Figure 23: Drag & Drop - Channel group

7.1.3 Context menu channel group

Right-click the bar of a channel group to open the channel group context menu.
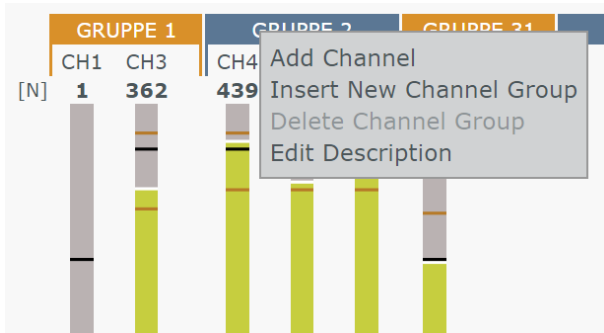
Figure 24: Channel group context menu

Add channel (to group)

You will initially see the "Channel selection list". Here you can observe all active channels that are not currently used in the Home screen.
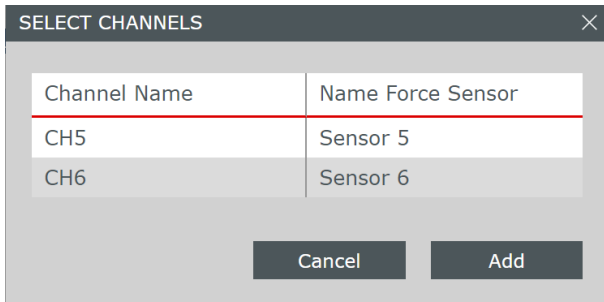
Figure 25: Select channels

Select the channel you wish to insert into the desired group and press "Add".

Multiple selection

To select multiple channels, press and hold the "Ctrl" key. Now you can select individual channels by clicking on them.

Insert new channel group

Inserts a new group designated as "Group 1" to the right of the existing group. Numbering is assigned consecutively and automatically.

Delete channel group

Deletes the selected group. A channel group can only be deleted if it contains no channels. If channels are contained, this function is displayed in grey. The channel group cannot be deleted.

Description Channel Group

An input window appears in which you can specify further information related to the channel group. This information will only be displayed here and will not be used for any other purpose.
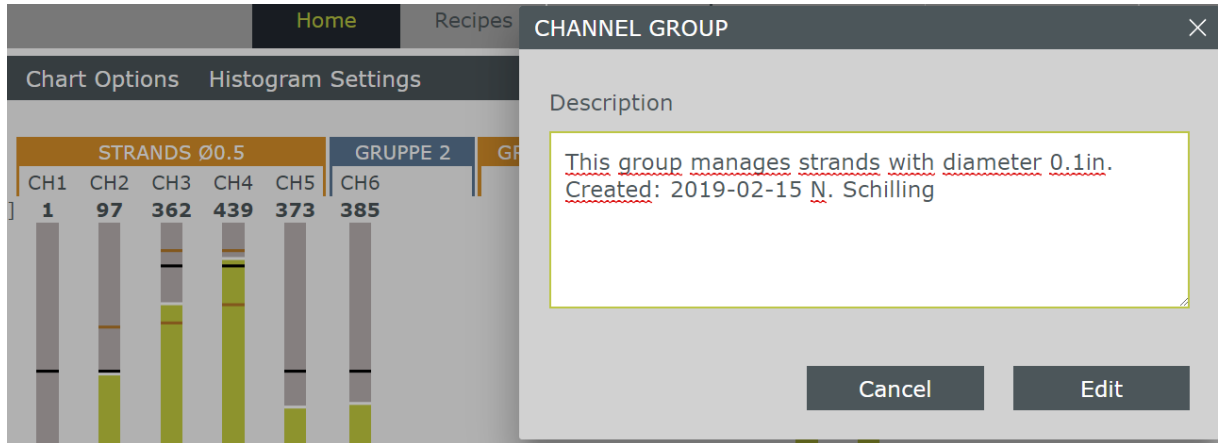
Figure 26: Description Channel group

7.1.4 Channel name

The displayed channel name cannot be changed in this view. You can customize the name in the basic settings.

7.1.5 Single channel context menu

Right-click the bar display of a channel to open the single channel context menu.

Figure 27: Single channel context menu, copy

Remove channel (from group)

The selected channel is removed from the group. It remains "active" and will also appear in the channel selection list if necessary, should you need it for another recipe. The characteristics of the channel are preserved.

Copy reduced properties

Copies all channel properties to the clipboard, except:
channel name, gain, offset, control parameters

Copy all properties

Copies all channel properties, including control parameters to the clipboard, except: channel name

Copy gain

Copies the value of the gain

If you have copied properties of a channel, you can paste them into one or more channels.

Paste into a single channel

Hover the mouse over the bar display of the target channel. Depending on the copied value, the following context menus open when you right-click
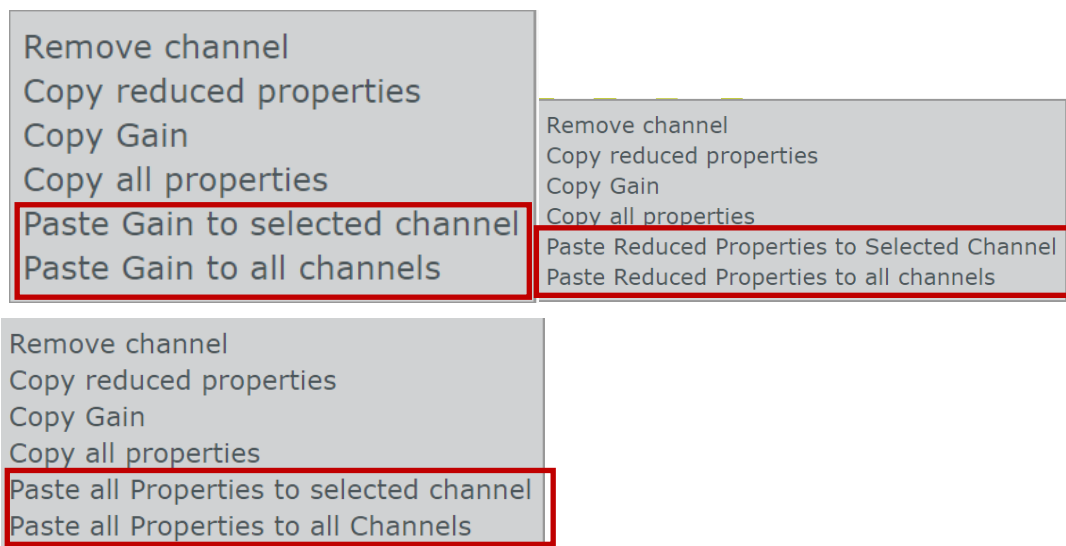
Figure 28: Insert context menus into single channel

Paste into a channel group

Hover the mouse over the name of a channel group. Depending on the copied value, the following context menus open when you right-click

Add Channel
Insert New Channel Group
Delete Channel Group
Edit Description
Paste Gain to Channel Group

Add Channel
Insert New Channel Group
Delete Channel Group
Edit Description
Paste Reduced Properties to Channel Group

Add Channel
Insert New Channel Group
Delete Channel Group
Edit Description
Paste all properties to group
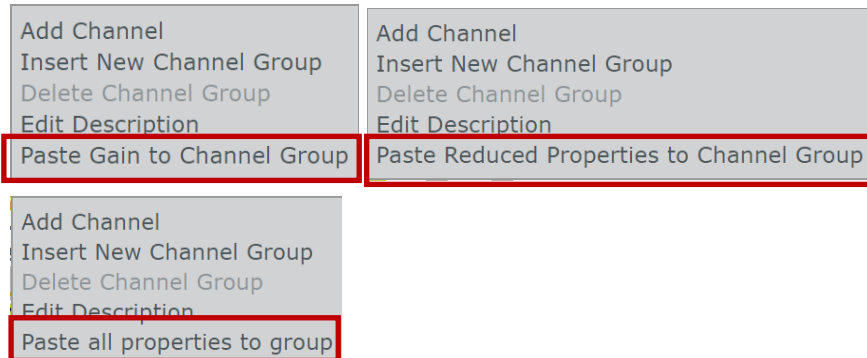
Figure 29: Pasting context menus into channel group

7.1.6 Actual value of the tension monitoring

This is the currently measured value of the strand tension in the channel. This value is affected by the display filter. See p. 23

7.1.7 Actual value of the tension monitoring as a graphic display
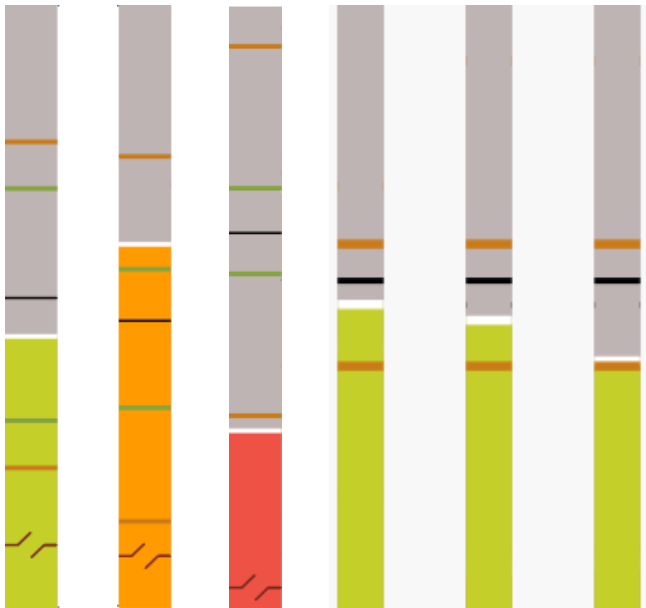
Figure 30: Bar graph display — Graphical display Actual value tension monitoring

The height of the colored bar corresponds to the current tension value. The color of the bar reflects the quality of the measurement result.

Green — measured value in the target range

Orange — measured value outside the target range, but still within the thresholds

Red — measured value beyond the thresholds

Refer to p. 45

7.1.8 Quick access to controls

Quick access controls are available below the bar display:

Quick access to controls	
Icon	**Name, Description**
	Activation of automatic tension control while Auto/Record mode is active.
	Active: The brake actuator automatically responds to deviations from the reference value of the strand tension. The control parameters are used for control.
	Inactive: Only the strand tension is measured and displayed. The brake actuator does not react if the thresholds are exceeded or undershot.
	Display histogram
	Active: The strand tension of the channel is displayed in the histogram.
	Inactive: The strand tension of the channel is not displayed in the histogram.
	This setting only affects the display in the home screen. It has no influence on Auto/Record mode.
	Display reference value (reference value)
	Active: The reference value is displayed as a black line in the bar display.

Table 13: Quick access to controls

7.1.9 Actual value of the braking force in the brake actuator

Each brake actuator has an integrated force sensor for the direct measurement of the braking force in the brake actuator.

Differentiation of braking force — strand tension

The two displayed force values "Braking force" and "Strand Tension" shall be considered independently.

The linking only occurs only when the automatic control is activated. Only when the machine is running and Auto/Record mode is activated, does a deviation of the strand tension from the reference value lead to a change in the braking force.

Figure 31: bar graph brake actuator

7.1.10   Braking force in the brake actuator as a graphic display

The current value of the braking force is displayed herein graphically. Depending on the configuration of the brake actuator, a maximum permitted braking force is automatically defined.
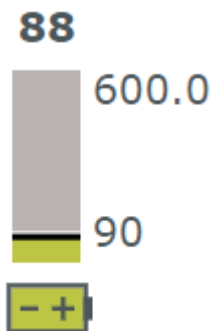
Figure 32: detail view brake actuator

7.1.11   Battery status of the brake actuator

The charge level of the battery in the brake actuator is displayed here. When the battery is draining, the color of the indicator changes.
Green: 11 — 100%

Orange: 6 — 10%

Red: less than 6%

In the event of failure, additional symbols are displayed, e.g., if the maximum braking force is exceeded or if the radio connection is lost.

Refer to System status, alarm messages, relay outputs p. 74ff.

7.1.12   Histogram

The histogram displays the strand tension of the selected channels. The tension values are displayed either over time or over the length of the produced product.

To activate the running meters/ production length, refer to p.27
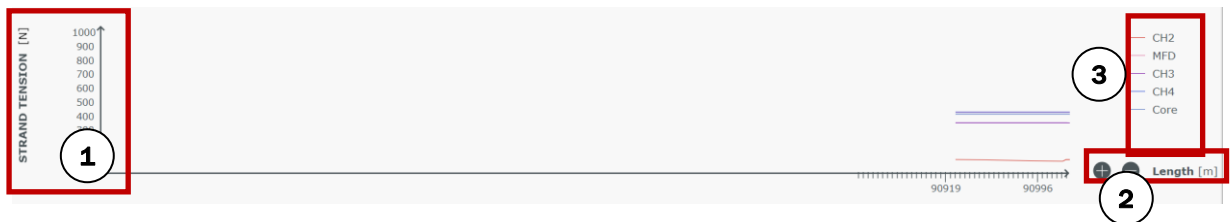
Figure 33: Histogram

Quick access to controls	
Pos.	***Name, Description***
1	y-axis This axis is scaled by means of the bar display. The maximum value of an active channel is also the maximum value of the y-axis.
2	Zoom x-axis with unit "+" Reduce the detail "-" Enlarge the detail We recommend the use of a proximity switch on the capstan to record the running meters.
3	Legend Only the selected channels are displayed. Refer to Histogram p. 43ff. The sequence of the channels in the legend is determined by the sequence in which the channels are assigned to each group. The sequence cannot be changed here.

Table 14: Histogram

7.1.13 Home-screen customization
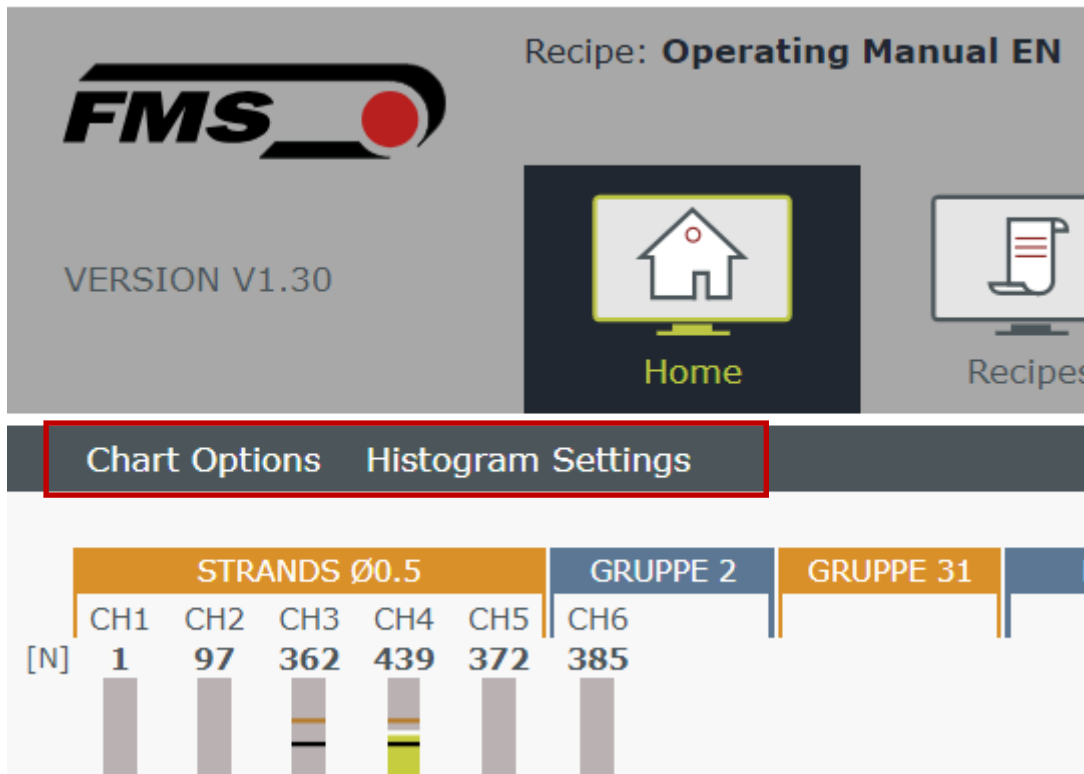
Figure 34: Home-screen customization

These two controls enable you to customize the structure and appearance of the home screen.

Diagram selection: Here you can select whether only the bar graph display, only the histogram or both displays appear simultaneously on the home screen.

Histogram settings: Here you can select whether, in addition to the actual value, the reference value or the upper and lower threshold of the displayed channel should also be displayed.

7.2 Detail view channel

By clicking on a channel in the area of the bar display for the strand tension, you open the detail view of the channel.

Additionally, to the graphical display and the controls for quick access, you obtain access to reference value, thresholds, alarm settings, parameters for the control operation, as well as the control of the brake actuator.

Save in open recipe

Changes you implement here are automatically saved in the opened recipe.
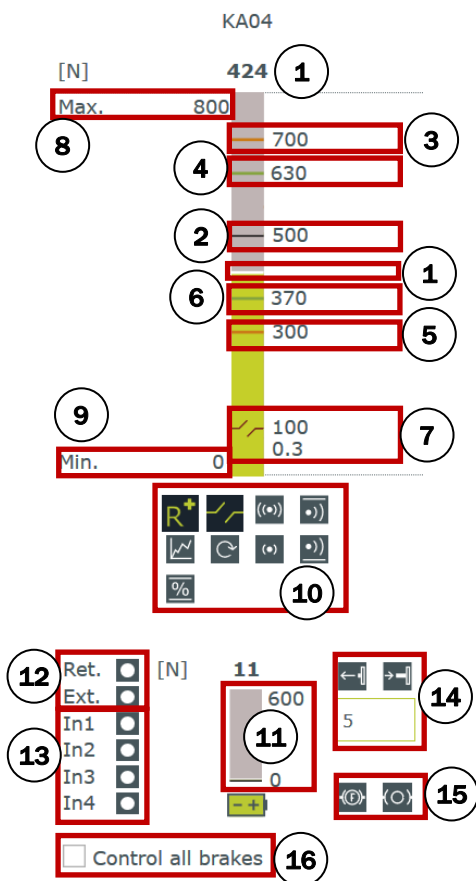
Figure 35: detail view channel

Detail view channel	
Pos.	Description
1	Actual value of the strand tension (graphically, this corresponds to the height of the colored bar)

Detail view channel	
Pos.	**Description**
2	Reference value of the strand tension, black line Adjusting the value via drag and drop or direct input.
3	Upper threshold, orange line Adjusting the value via drag and drop or direct input.
4	Upper pre-alarm, green line This value cannot be changed here. It is defined in the recipe manager as a percentage deviation from the upper threshold.
5	Lower threshold, orange line Adjusting the value via drag and drop or direct input.
6	Lower pre-alarm, green line This value cannot be changed here. It is defined in the recipe manager as a percentage deviation from the upper threshold.
7	Wire-break detection consisting of two parameters Threshold for force (herein 100N) and time interval (herein 0.3s). If the threshold is exceeded by more than 0.3s, the wire break alarm is triggered. Adjusting the value (force only) via drag & drop or direct input.
8; 9	Lower and upper limits of the bar display This is where you can define the visible area of the bar display. By entering values directly, you can freely scale the display area, limiting the view to the required section. Adjusting the values with direct input. If your input is not accepted and an error message "Enter a valid value" appears, thresholds or reference value are in a range that would no longer be displayed. Initially, change this value. E.g. The upper threshold is 800N and the upper end of the bar display is at 1000N. The top end needs to be changed to 750N. In this case, you must first adjust the upper threshold to less than 750N, in order to perform the change. This also applies if the value blocking the input, such as thresholds, is not displayed in the bar display.

Detail view channel	
Pos.	**Description**
10	Controls for tension monitoring and adjustment
	R⁺ Display of the reference value in the bar graph display as a black line
	⌁ wire break Display of the two parameters force and time interval. The wire break can be used as a trigger function for relay outputs only when the icon is active.
	((•)) Use alarm messages for relay outputs. Only when alarm messages are activated, can relays also be switched by threshold violations. Threshold violations, violation of the pre-alarm, wire-break
	(•) delay time alarm messages Once the conditions for an alarm are met, this time interval must elapse until the relay is actually triggered.
	•)) Upper threshold Display of the upper threshold as an orange line in the bar chart. Activation of the upper threshold for the output as an alarm message. If the upper pre-alarm is activated in the recipe, it is also displayed and used as an alarm message for the output.
	•)) Lower threshold Display of the lower threshold as an orange line in the bar chart. Activate the lower threshold for the output as an alarm message. If the lower pre-alarm is activated in the recipe, it is also displayed and used as an alarm message for the output.
	⩘ Display actual value in histogram
	↻ Enable automatic tension control This channel is automatically controlled when Auto/Record mode is started.

Detail view channel	
Pos.	**Description**
%	**Control parameters** These parameters are used to control the strand tension in the closed loop. **dead-band** percentage value in relation to the reference value of the strand tension. If the actual value is within the dead-band range, no control occurs. The control takes place via the brake actuators only when the strand tension is above or below the dead-band thresholds. E.g. If the reference value is 100N and the target value range is 10%, this results in a lower dead-band value of 90N and an upper dead-band value of 110N. No regulation occurs in this area. **Correction angle in degrees** When the brake actuator receives a pulse for automatic tension control, the spindle rotates in the appropriate direction by the specified number of degrees. On input of 360, the spindle performs 1 turn or a stroke of 2mm. **Delay time (default 30s)** If you enter a value here, the pulse will only be sent for regulation when the violation of the dead-band is still pending after this time interval.
11	**Graphic display braking force** The maximum braking force is determined by the size of the deployed brake actuator. The black bar indicates the reference braking force. Adjusting the value via drag and drop or direct input. The reference braking force can be approached via the control element. This force value is automatically approached at each start of the Auto/Record mode. To avoid this, set this value as "0".
12	**Brake actuator limit switch** ⬤ Active ⬜ Inactive **Ext.** The brake actuator is fully extended. **Retr.** The brake actuator is fully retracted.

Detail view channel	
Pos.	**Description**
13	Digital inputs on the brake actuator Up to 4 digital inputs can be connected via the connector on the brake actuator. The dot indicates the current state of the corresponding switch. 🟡 Active ⚪ Inactive The relay outputs are configured directly in the RTM X42.BC.T/R transceiver via the integrated web interface. Refer to the Operating Manual RTM X42.BC Brake Control
14	Controls for manual operation of the brake actuator ⬅️ Extraction of the brake actuator ➡️ retraction of the brake actuator. The manual operation of the brake actuators is not performed continuously, however, gradually. A click triggers the operation pursuant to the number of entered rotations. When entering 360, the spindle performs 1 rotation or a stroke of 2mm
14	(F) Reference braking force The brake actuator continues until the reference braking force is reached. (O) Brake release The brake actuator extracts completely.
16	Master brake actuators All activated brake actuators can be controlled simultaneously by way of this checkbox. - Manual retracting and extending - Extend the brake actuator completely - Approaching the reference braking force

Table 15: detail view channel

8 Recipe manager

With the recipe manager, you can create measurement and control parameters for different products, save them and reload them at a later time.

Some parameters that you change and save in the recipe manager also affect the display in the home screen.

- Use of upper, lower pre-alarm
- Dialogue window for alarm messages

There is always a recipe loaded. You cannot work without a recipe. The "Base Settings" recipe is pre-configured at the factory and cannot be deleted.
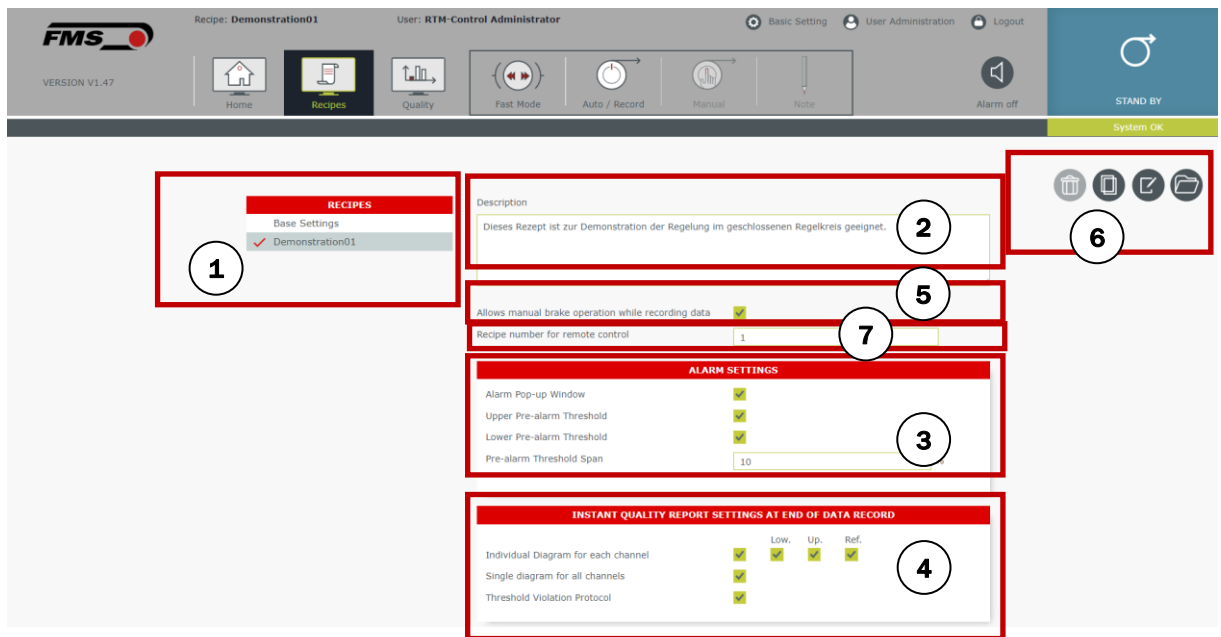
Figure 36: Recipe manager

Recipe manager	
Pos.	Description
1	Recipe list with all created recipes.

Recipe manager	
Pos.	**Description**
	Recipe "Base Settings" cannot be deleted or renamed.
	Red check marks the currently loaded/selected recipe.
2	Recipe description
	You can enter free text here. This is only displayed here and is not used otherwise.
3	Alarm settings
	Alarm Pop-up Window If you have activated this check-box, a dialogue window will appear on each error. If more than one alarm message is pending simultaneously, only a single dialogue window appears.
	Pre-alarm Thresholds To receive an indication of faulty strand tensions before the actual triggering of an alarm message, you can activate the so-called pre-alarm. This alarms you before the actual threshold is reached and allows you to react before the alarm message is triggered and to take the appropriate countermeasures.
	Upper pre-alarm threshold This alarms you before the upper threshold is reached. When you activate the check-box, the value appears as a green line in the bar chart.
	Lower pre-alarm threshold This alarms you before the lower threshold is reached. When you activate the check-box, the value appears as a green line in the bar chart.
	Pre-alarm threshold span (in % of the upper threshold) Use this information to define the distance between the pre-alarm and the alarm.
	E.g. Upper threshold 950N, lower threshold 650N, pre-alarm range 10%. Upper pre-alarm: 950N — 95N (10% of 950N) = 855N Lower pre-alarm: 650N + 95N (10% of 950N) = 745N

4	**INSTANT QUALITY REPORT SETTINGS AT END OF DATA RECORD**
	Settings for the protocol that is created when Auto/Record mode is stopped.
	The settings determine the parameters that are displayed in the quality protocol. These settings do not affect the displays on the Home screen.
	Individual Diagram for each channel If you select this check-box, you will receive a separate diagram with the respective strand tension for each channel. You can also record further details of the channel. "Low" — Indication of the lower threshold and highlighting of violations of the lower thresholds. "Up" — Display of the upper threshold highlighting of violations of the upper threshold The "Ref." - reference value is displayed as a line on the chart.
	Single diagram for all channels If you select this check-box, you will receive a diagram in which the strand tensions of all channels are displayed together.
	Threshold Violation Protocol If you select this check-box, you will receive a table in which the threshold violations of all channels are displayed in relation to the running meters.

5	Allow manual brake operation while recording data (Auto/Record mode) if this checkbox is enabled – and if the logged-in user has the permission – you will be able to toggle into "manual mode" during data recording.
	
	   - Disable automatic control
	   - Readjust reference value, thresholds are not affected
	   - Manual operation for the brake actuator
	   - Manual operation of all brake actuators "MASTER"
	
	Refer to
	"Manual" Mode 71
	
	⚠️ **CAUTION**
	
	Manual operation of the brakes has immediate impact on the strand tension and can lead to wire break!
	
	You can disable the permission for this function in the user administration menu.
	
	Refer to User profiles and permissions p. 32

6	Buttons to modify recipes
	
	Select a recipe from list on the left-hand side and press the respective button.
	
	🗑️ Delete recipe
	
	   - The recipe base settings cannot be deleted
	   - The open/active recipe cannot be deleted

	🔲 Copy recipe An identical copy of the selected recipe is created with the name "NameOrignalRecipe-copy1". ✏️ Edit recipe Independent of the operating mode or computer you are using you can modify existing recipes at any time if the operator holds the respective rights in the user administration. That means that one may edit a recipe while the system is in Auto/Record mode with a different recipe. When editing a recipe the program will automatically switch to the Home screen and indicate "editing recipe" in the top left corner of the software. All modifications that you do, will be stored directly in the recipe. As soon as you leave the Home screen, the recipe editing mode will also be determined. 📂 Open recipe The name of the selected recipe will be displayed on the top left corner of the software.
7	Recipe number for remote control There is no content if the software comes with factory settings. If you activate the remote control functionality in the base setting, you will have to assign individual numbers (1 to 65535) to each recipe.

Table 16: Recipe manager

9 Quality manager

The FMS Monitoring & Control software handles data recording separately from the actual quality protocols. Data is recorded during the production process in Auto/Record mode. The recorded data is stored and can be accessed at any later date. This means that quality protocols of older production runs can be retrieved at any time.

A data recording cannot be deleted. The stored data cannot be edited subsequently.

Quality protocols are compiled in .pdf format. Alternatively the data recordings can be downloaded in hdf5 format.

Figure 37: Quality manager

Quality manager	
Pos.	**Description**
1	Search mask, filter Here you can search for data records. Search criterion is the date on which a recording was terminated.
2	PROCESS DATA RECORDINGS This list contains all recorded datasets The data of the individual columns are queried in a mask at the start of the recording and can be entered pursuant to customer and product requirements. Recipe Name of the applied recipe. The entry is performed automatically and displays the loaded recipe at the start of the recording. Data Record Note These notes can be inserted during data recording, for example, to document, special occurrences. Production notes are only displayed here. They are not printed on quality logs. User name First- and surname of the user who was logged in when the recording was initiated.
3	SETTING FOR QUALITY REPORT HARDCOPY You can create a quality log from any data recording. Here you define the type and content of the quality log to be created.
4	Addition buttons Select a line with the respective data that you like. 🖶 to print quality protocols in .pdf format ⬇ to download data recordings in .hdf5 format

Table 17: Quality manager

9.1 Quality protocols

You have the possibility to create quality protocols from past production runs.

Settings for creating a quality protocol
- **Select the appropriate settings.**

The settings are the same as in the recipe manager, refer to

- Protocol Tension Force Protocol per Channel p. 58ff.
- Select one set from the list of data records by clicking on the corresponding row.
- Press
- The quality log is created in the background as a .pdf file and is automatically displayed, as well as saved in the Downloads folder.

Quality protocols always present the same structure.
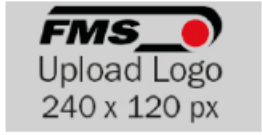
FMS Upload Logo 240 x 120 px	Order Number: 04 Product: 04 Customer Name: 04 Length correction: 0.00m	Data Recorded on: 20.02.2019 Applied Recipe: Base Settings Recipe Revision Status: 4 Machine Name: RTM24bays Operator: RTM-Control Date: _____ Signature: _____

Figure 38: Quality protocol - header

9.2 Protocol Tension Force Protocol per Channel

Generates a document with one chart per channel.
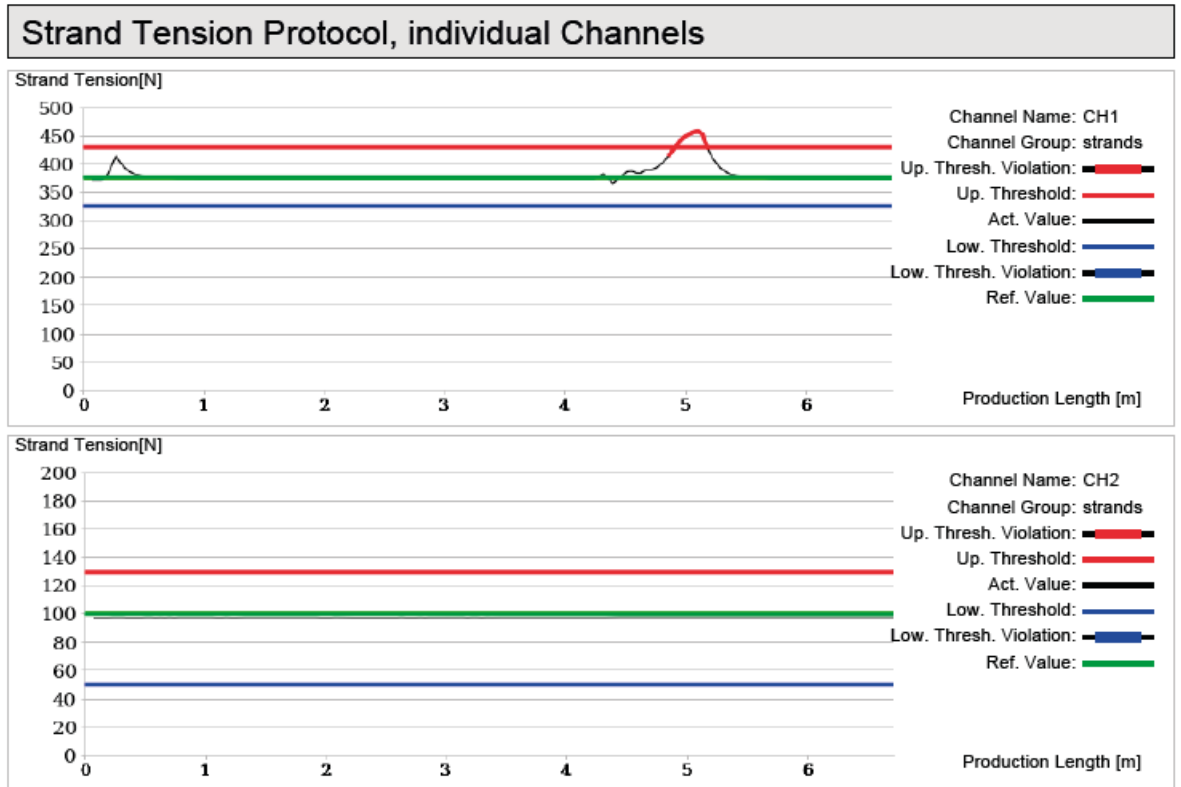
Figure 39: Quality protocol - strand tension per channel

9.3 Protocol Combined Tension Force Protocol of all Channels

Generates a document with a chart that contains all channels.
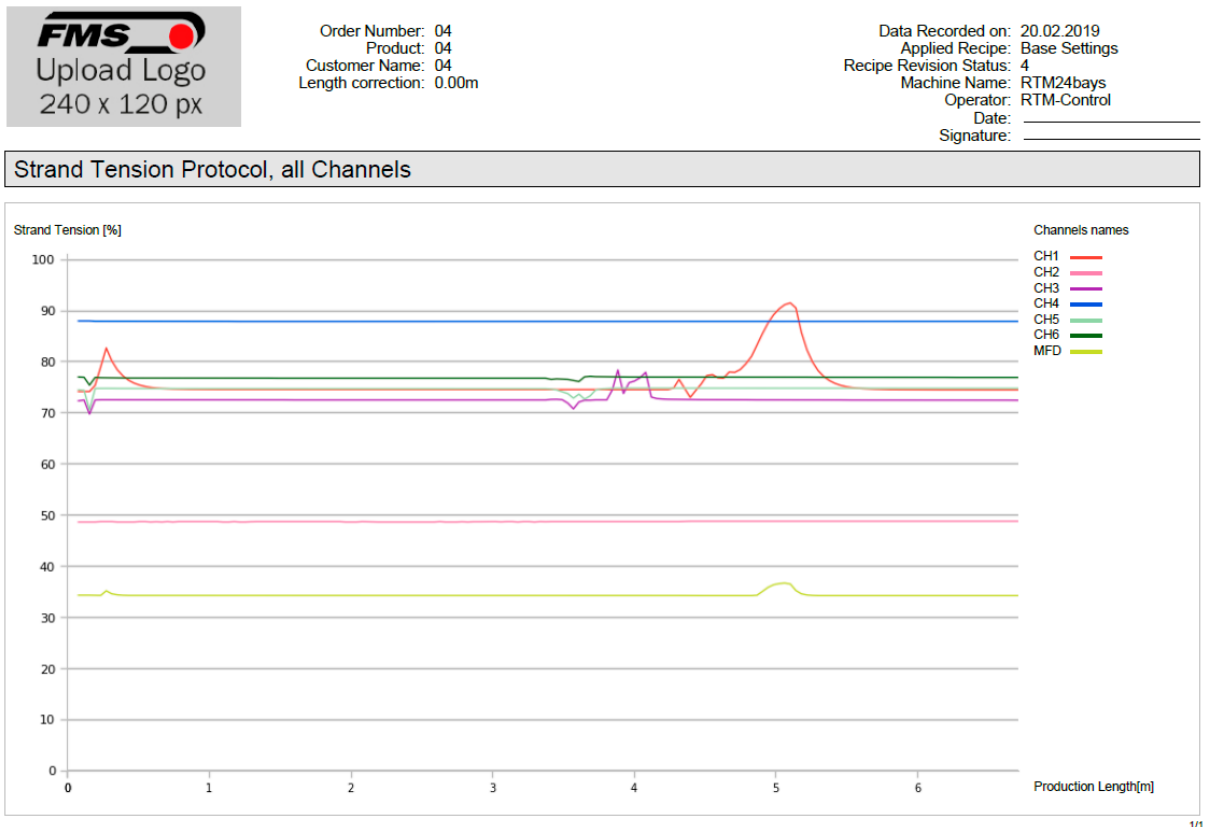
Figure 40: Quality protocol - strand tension of all channels

9.3.1 Protocol Limit Violation Protocol

A document with a table that contains the threshold violations of all channels.

Channel Name	Production Length [m]	Reference Value [N]	Lower Threshold Violation [N]	Upper Threshold Violation [N]	Upper / Lower Threshold [N]
CH1	0.0	375.0		413.0 ↑	430.0
	0.0			400.0 ↓	327.0
CH1	5.0	375.0		416.0 ↑	430.0
	5.0			428.0 ↓	327.0
Channel Name	Production Length [m]	Reference Value [N]	Lower Threshold Violation [N]	Upper Threshold Violation [N]	Upper / Lower Threshold [N]
CH5	0.0	429.0	352.0 ↑		455.0
	0.0		373.0 ↓		363.0
CH5	4.0	429.0	363.0 ↑		455.0
	4.0		366.0 ↓		363.0

Figure 41: Quality log - threshold violations

9.4 Data recordings in HDF5 format

The record file is separated into the two main parts headers and samples. The headers define the data structure of the common data. There are structures for general information about the operator, the product, how the product was produced, recipe and the channel definition. In addition to that is a description of the sample value structure included. The samples part includes all data (samples). The chapter Header structure definition shows in detail the structure of the recording file. The sample value structure depends on the recipe. It will be defined every time a recording is started. The sample structure is optimally organized that way that as low storage space is wasted as possible. They span all measuring and state values in the given cycle time of 100ms.
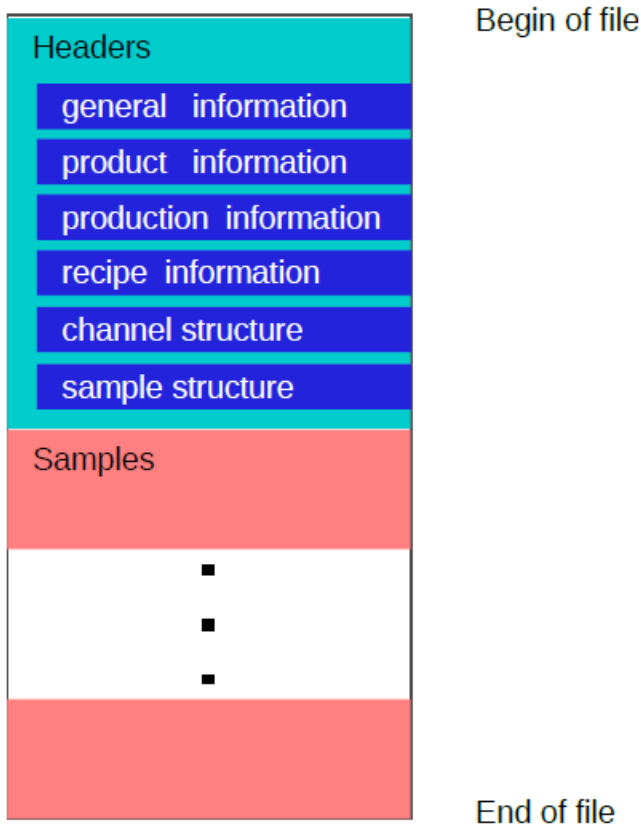
Figure 42: File structure HDF5

HDF5 File structure			
	Field name	*Data Type*	*Description*
General	FirstNameUser	String 40	User's first name at the time of the production (Logged in user)
General	LastNameUser	String 40	User's last name at the time of the production (Logged in user)

HDF5 File structure			
	Field name	*Data Type*	*Description*
General	MachineName	String 80	Denotes the machine uniquely with a name.
Product	ID_ProductionRecord	uint32	This ID identifies the production uniquely for a particular machine. It is the primary key of produced material in the database and is not relevant for data analysis.
Product	NumOfFollowingCompParam	uint32	Number of following company parameters. This will be determined by the number of database entries.
Product	NameParameter 1	String 40(3)	Name of the first company parameter if any.
Product	ValueCompanyParameter 1	String 255	The value of the first company defined parameter if any.
Product	n other company defined parameters		
Product	NameParameter n	String 40	Name of the last company parameter if any.
Product	ValueCompanyParameter n	String 255	The value of the last company defined parameter if any.
Pro-duction	ProductionStartedAt	UNIX Timestamp in seconds[2]	Date and time when the production started in UTC without considering daylight saving.
Pro-duction	ProductionCompletedAt	UNIX Timestamp in seconds[2]	Date and time when the production was completed in UTC without considering daylight saving.
Pro-duction	ProductionEventNotes	String 255	Gives the operator the ability to report unforeseen events during the production.
Pro-duction	LengthCorrectionRunningMeter	double	

HDF5 File structure			
	Field name	*Data Type*	*Description*
Recipe	999.99 to 999.99 [m]	Length correction of the running meter of the produced wire.	
Recipe	ID_RevisionRecipe	uint32	This ID identifies the recipe uniquely. This field can be ignored as it is not relevant for analysis.
Recipe	NameRecipe	String 40	Denotes the recipe uniquely with a name.
Recipe	LowerPreAlarmEnabled	byte (bool)	Shows if the lower pre-alarms were active for channels.
Recipe	UpperPreAlarmEnabled	byte (bool)	Shows if upper pre-alarms were active for channels.
Recipe	ManualBrakeAdjustmentPermitted	byte (bool)	Shows if it was allowed that the operator could manually adjust the brake force while in production mode.
Recipe	NumberOfChannels	uint32	This parameter defines how many channels are contained in the channel's structure. The number of channels is configured over the recipe definition.
Channel	NameChannelGroup	String 40	Denotes a channel group uniquely with a name.
Channel	ColumnPositionChannelGroup	uint32	The column position of a channel group, starting from the left, on the web page.
Channel	NumberChannel	String 40	A unique channel number over all receivers. The number is generated by the system and cannot be changed.

HDF5 File structure			
	Field name	*Data Type*	*Description*
Channel	BarGraphBaseValue	float 32bit	The minimum force value of the bar graph.
Channel	BarGraphPeakValue	float 32bit	The maximum force value of the bar graph.
Channel	AlarmEnabled	byte (bool)	Shows if the channel alarm is enabled.
Channel	AlarmUpperLimit	float 32bit	Upper limit threshold for the force value alarm.
Channel	AlarmLowerLimit	float 32bit	Lower limit threshold for the force value alarm.
Channel	AlarmUpperLimitEnabled	float 32bit (bool)	Shows if the channel upper alarm limit is enabled.
Channel	AlarmLowerLimitEnabled	float 32bit (bool)	Shows if the channel lower alarm limit is enabled
Channel	AlarmDelay	float 32bit	The alarm delay postpones the alarm of an occurring event to the specified time.
Channel	ReferenceValue	float 32bit	The reference value determines the acting force on the
Channel	Material.		
Channel	ShowReferenceValueEnabled	byte (bool)	Shows if the reference value will be shown on the bar graph.
Channel	InitialBrakeForce	float 32bit	The initial brake force is set when starting the production.
Channel	ClosedLoopEnabled	byte (bool)	Shows if the force is controlled automatically by feedback.
Channel	WireBrakeEnabled	byte (bool)	Shows if the wire break detection is enabled for the channel.
Channel	NumOfSamplesMAController	uint32	The number of samples for the moving average filter for the Brake Actuator filter. Only relevant when the moving average filter is selected.

HDF5 FIle structure			
	Field name	*Data Type*	*Description*
Channel	AllowedPosRefDeviation	float 32bit	Allowed positive reference value deviation from the feedback value in Nowton.
Channel	AllowedNegRefDeviation	float 32bit	Allowed negative reference value deviation from the feedback value in Nowton.
Channel	PeriodUntilPosDeviationViolation	uint32	Period until positive deviation violation in seconds.
Channel	PeriodUntilNegDeviationViolation	uint32	Period until negative deviation violation in seconds.
Channel	PosCorrectionSteps	uint32	Steps to correct in case of a positive deviation violation.
Channel	NegCorrectionSteps	uint32	Steps to correct in case of a negative deviation violation.
Channel	MaximumDriveSpeed	uint32	The maximum allowed speed with relative drive
Channel	commands. Always 4000 steps. Reserved for future use.		
Channel	ReleaseBrakeWithN_Steps	uint32	Driven steps on one release brake event.
Channel	PressBrakeWithN_Steps	uint32	Driven steps on one press brake event.
Channel	NameBrakeActuator	String 80	Name of the brake controller.
Channel	FilterModeWireBreak	uint32	Mode of the wire break filter. 0 = Disabled; 1 = Low Pass;
Channel	2 = Nonlinear		
Channel	FilterCutOffFreqWireBreak	float 32bit	Cut-off frequency of the wire break filter.
Channel	FilterModeDisplay	uint32	Mode of the display filter. 0 = Disabled; 1 = Low Pass;
Channel	2 = Nonlinear; 3 = Moving Average		
Channel	FilterCutOffFreqDisplay	float 32bit	Cut-off frequency of the display filter.

HDF5 File structure			
	Field name	*Data Type*	*Description*
Channel			
Channel	NumOfSamplesMADisplay	uint32	Number of samples for the moving average of the display values.
Channel	FilterModeChart	uint32	Mode of the chart filter. 0 = Disabled; 1 = Low Pass;
Channel	2 = Nonlinear; 3 = Moving Average.		
Channel	FilterCutOffFreqChart	float 32bit	Cut-off frequency of chart filter.
Channel	NumOfSamplesMAChart	uint32	Number of samples for the moving average of the chart values.
Channel	FilterModeBrakeActuator	uint32	Mode of the Brake Actuator filter. 0 = Disabled; 1 = Low Pass;
Channel	2 = Nonlinear; 3 = Moving Average		
Channel	FilterCutOffFreqBrakeActuator	float 32bit	Cut-off frequency of the Brake Actuator filter.
Channel	NameChannel	String 40	Channel name.
Channel	NominalForce	float 32bit	Is the nominal force of the load cell sensor.
Channel			

Table 18: HDF5 data structure

3) Company parameters with identical names also have the same value. That are duplicates. Use only the first occurrence.

2) The base UNIX timestamp is the 1st January 1970 at 00:00:00.

9.4.1 Sample Structure Definition

Sample structure definition			
	Field name	*Data Type*	*Description*
Properties	SampleOccurrenceTime	uint32	The current sample timestamp since the recording has started in ms.

Sample structure definition			
	Field name	*Data Type*	*Description*
Properties	ActualRunningMeter (4)	float 32bit	The actual running meter since the production has started.
Properties	ReferenceValue 1	float 32bit	The current reference values for all channels in the recipe. A new entry is generated when the user changes one of the reference values in automatic mode.
Properties	n other Reference Values as channels defined in the recipe		The channel's order is determined by the parameter NumberChannel in the structure Channels.
	SampleOccurrenceTime	uint32	The current sample timestamp since the recording has started in ms.
	ActualRrunningMeter (4)	float 32bit	The actual running meter since the production has started.
	CalibratedActualValue	float 32bit	This value is the actual value in N/one ADC digit. Therefore, the N/one ADC digit must be calculated first. That is done with the formula Nominal Force / 5898. The get the actual value in N the result must be multiplied by the value in the field Current CalibratedActualValue.
	MaximumLimitViolation	bit 0	The bit is set if the maximum limit has been violated.
	MinimumLimitViolation	bit 1	The bit is set if the minimum limit has been violated.
	WireBroken	bit 2	The wire broken is set when the filtered actual

Sample structure definition			
	Field name	*Data Type*	**Description**
			value falls below the specified limit value.
	ClosedLoopControlEnabled (1)	bit 3	The bit is set if the closed-loop control was activated.
	BrakeActuatorInSynch (1)	bit 4	The bit is set if the brake actuator is synchronized. That means the system is connected to the device over the radio.
	CurrentBrakeForce (1)	float 32bit	The current brake force of a brake actuator in mN (**1000.0 = 1N**)
	CurrentDrivePosition (1)	int16	Current absolute drive position (steps).
	InitialBrakeForce (1)	float 32bit	The initial brake force in N is set when starting the production.
	n other channels as defined in the recipe		The channel's order is determined by the parameter NumberChannel in the structure Channels.

Table 19: Sample Structure definition

(**1**) Only present if a brake actuator is assigned to that channel.

10 Auto/Record

AUTOMATIC TENSION CONTROL

With the start of the Auto/Record mode, you also start the automatic strand tension control in a closed loop.

This control element is used to start data recording and the closed-loop tension control.
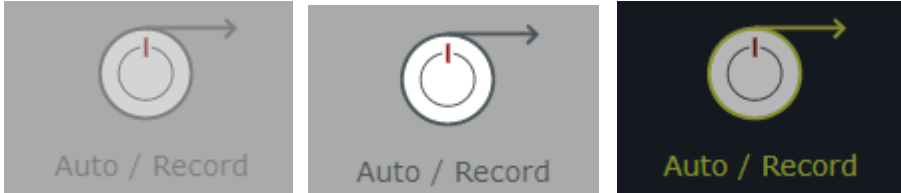
Figure 43: Auto/Record mode locked, inactive and activated
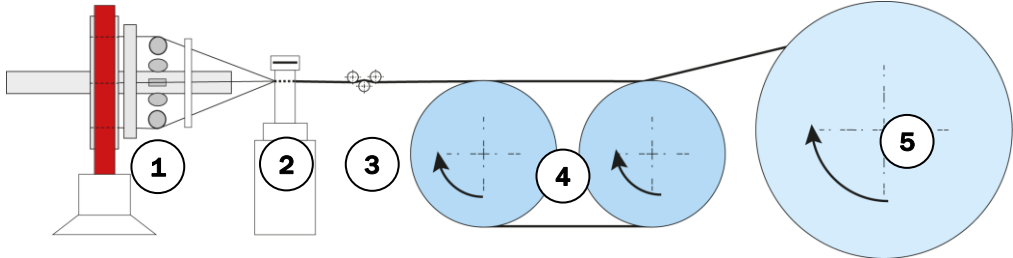
After starting the Auto/Record mode, the following dialogue window appears. These data appeared in the section "Quality" as properties of data recording. They can also partially be found in the header of the quality log.

Figure 44: Auto/Record mode - Dialogue window "Details Data Recording"

Dialogue window Details Auto/Record mode	
Pos.	***Description***
1	Basic data These cannot be edited. Recipe Name of the currently used recipe. Username First- and surname of the logged-in user.
2	Length correction for production length (only if running meter recording is activated) *Figure 45: Correction running meters* Correction running meters | Pos.	Description
1	Measurement point
2	stranding point
3	Post-forming head
4	Capstans
5	Reel end product | *Table 20: Correction running metres* Here you can enter the length of the material from the measuring point (1) or from the strand point (2) to the reel (5). The value is displayed in the quality protocol. When rewinding, this length can then be separated from the end product. Note that the display stops in the histogram as soon as you stop the stranding machine. However, the measurement (and control) continues. The Auto/Record mode is paused (not stopped) as soon as the value "Minimum speed for data recording" (refer p. 23) is undershot. If the machine is restarted and production continues and the speed threshold is exceeded again, the Auto/Record mode also continues.
3	Order number (internal or external)
4	Product

Dialogue window Details Auto/Record mode	
Pos.	**Description**
5	Customer Name Name of your customer for the final product

Table 21: Dialogue window Details Data recording

Press the Auto/Record mode control again to stop the data recording.
The data is automatically saved in the background.

Additionally, an initial quality log is automatically generated and displayed immediately. You set the configurations for the quality log that is displayed here, in the recipe manager. Refer to p. 50ff.

10.1 "Manual" Mode
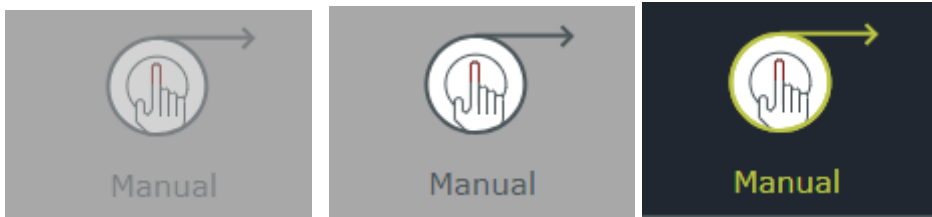
Figure 46: Manual control, locked, accessible, enabled

⚠️ ATTENTION WIRE-BREAK

Manual manipulation of the brake control has immediate effects on the strand tension and can lead to wire breaks!

This function should only be enabled for experienced system operators.

Manual control can be enabled when Auto/Record mode is active and if this function is enabled in the recipe.

This allows the operator to perform the following interventions in the detail channel view:

- Disabling of the automatic control
- Manual operation of the brake actuator of the selected channel
- Manual operation of all (active) brake actuators via the control "Master brake actuators"
- Adjust the reference value of the strand tension. The thresholds cannot be changed.

10.2 Note

During Auto/Record mode, notes can be added, for example, to the production history.
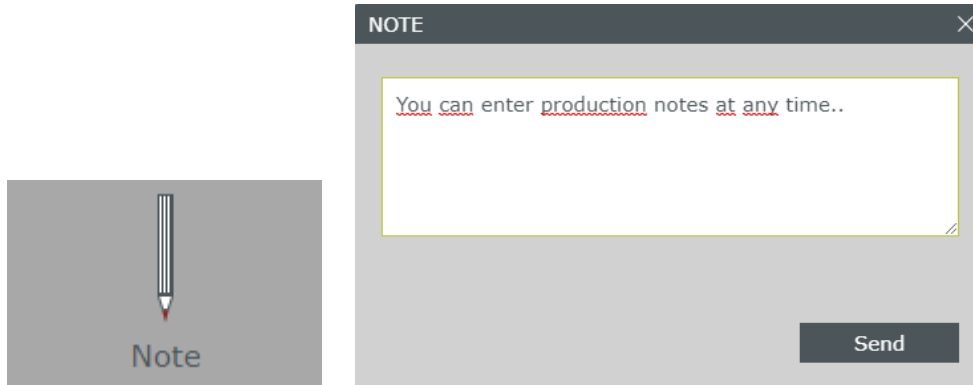
Figure 47: Activated control Note and input mask

The notes appear in the list of records in a separate column.

PROCESS DATA RECORDINGS						
Record Date (End)	Order Number	Product	Customer Name	Recipe	Data Record Note	User Name
2019-02-20 14:52:47				Operating Manual EN	You can enter production notes at any time..	RTM-Control Administrator

Figure 48: Extract of data recording with a note

11 Fast Mode

The cycle time for communication with the brake actuators is set to 8.4 sec. which is quite slow, but sufficient for the regular tension control operation. The Fast Mode will reduce this interval to 840 msec. and allow quick and direct movement of the actuators. This behavior can be used in two operation cases

11.1 Fast Mode during machine setup

While you are setting up the machine for production, it can be useful to have a direct response form the brake actuators. The individual actuators can be controlled as usual via the control buttons in the detail view of each channel.

11.2 Fast Mode at start of Auto/Record mode

After the complete setup of the machine, it may happen that the reference and actual tension values differ dramatically. If you start the Auto/Record mode in this situation, the Fast Mode will be initiated automatically as well.

If the offset between actual and reference value is larger than the defined deadband (detail view channel), the Fast Mode is automatically enabled. It stays activated until the actual tension values of all active and controlled channels have reached the reference values or are within the deadband of the control. Then, the Fast Mode is automatically disabled and the cycle time will be reset to 8.4 sec.

If you have completed the setup, you can directly start Auto/Record mode with the Fast Mode also enabled.

⚠️ ***Reduced battery life***

The reduced cycle time will require more battery capacity and therefore reduce battery life dramatically.

Avoid unnecessary activation of the Fast Mode.

This control element is used to start data recording and the closed-loop tension control.
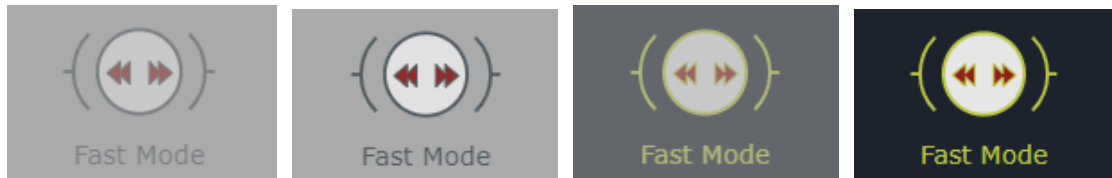
Figure 49: Fast Mode locked, inactive, during activation and activated

The activation of the Fast Mode will require a few seconds. During this time the button will be indication this process by showing "during activation". At this time the operation mode cannot be changed.

The Fast Mode can be disable by pressing the button once again.

12 System status, alarm messages, relay outputs

12.1 System status
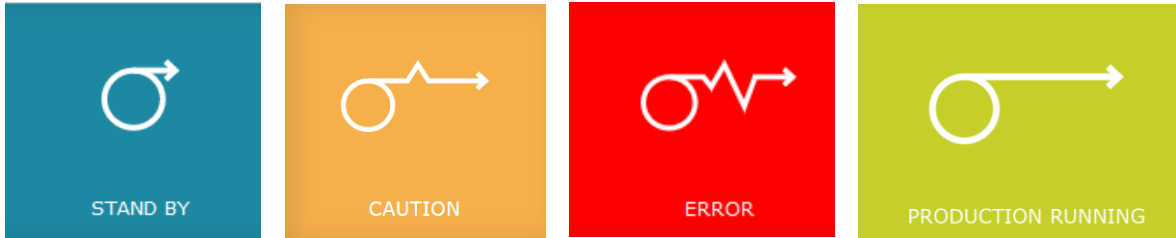
Figure 50: System status OK; alarm; Error, production running
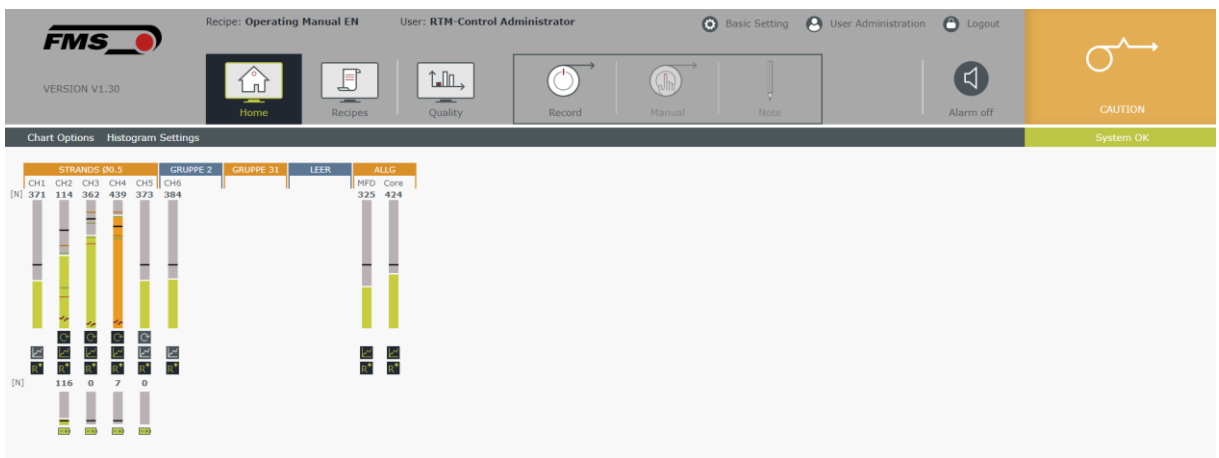
Figure 51: system status

System status OK; alarm; error	
Display	Description
OK	All ok, fault-free functioning
CAUTION	Violation of threshold, pre-alarm ...
ERROR	Threshold violation Battery Communication

Table 22: System status OK; alarm; Error

The status window is a "collective display" for measurement and control values and all system components so that the overall status of the system can be quickly identified.

The faults are classified according to their significance for the functioning of the system.

Importance Error Messages

Priority	Description
1	Communication
2	Threshold violation
3	Pre-alarm Batteries ... Battery Communication

Table 23: Importance of errors

12.2 Status details

The attached status details display shows the exact reason for an error notification.

System OK	Low Battery	No connection

Figure 52: Status details - System OK-green, alarm-orange, Error-red

The text already provides you with a first hint regarding the cause of a possible error.

Clicking on the display will expand it and you can view all components and their status.

- Receiver modules (tension monitoring)
- Transmitter and receiver modules (brake actuator control)
- Brake actuators

Charge level indicator Brake actuator

Green: 11 — 100%

Orange: 6 — 10%

Red: less than 6%

Charge status indicator RTM transmitter module

green: 31 — 100%

orange: 11 — 31%

red: less than 11%

Figure 53: Status details

Clicking a component in the status details takes you to a dialogue window

Figure 54: Component details

If there are several errors in a component, only the error with the highest priority is displayed in the status details.

Additional errors related to this component can be examined in this dialogue window.

12.3 Alarm messages, warnings

You can activate or deactivate alarm messages or the display of alarm messages in a dialogue box in the recipe manager.

Additionally, the alarm messages can be forwarded to the PLC, e.g., via relay outputs on the RTM reception module

Refer to p. 23
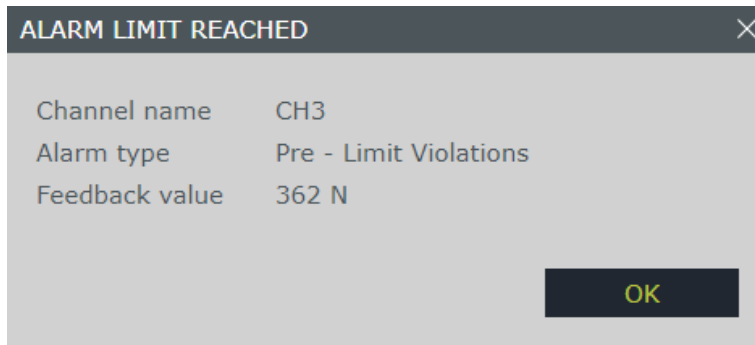
Figure 55: Dialogue window alarm message, alarm
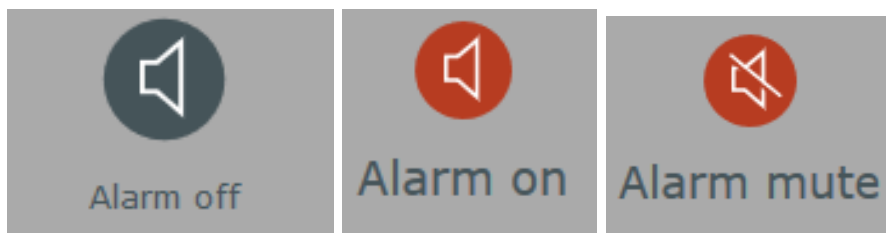
Figure 56: alarm off, alarm on, alarm mute

If you have activated relay outputs, these are switched pursuant to the corresponding settings. If you have also simultaneously activated the display of a dialogue window, it will appear at the same time as the relay is switched.

Alarm off
No alarm has been configured.

Alarm on
The conditions for at least one alarm message have been activated. At least one relay is switched. The system status changes...

Alarm mute
If the warning dialogue window does not appear permanently during the solution of the issue, you have the option to mute the alarm. For this purpose, click on the control "alarm on". The display then switches to "alarm Mute".

The relay drops when you switch to mute, even if the alarm condition is still pending. If a further error occurs in the meantime, it will not be displayed again as an "alarm on". The "alarm Mute" display remains active until all conditions for a warning / alarm event are removed. Only then does a new alarm event trigger the "alarm on" display again.

alarm events must be ""acknowledged"". i.e. As soon as "alarm on" is displayed, you need to press the icon to "Acknowledge".

12.4 Warnings, brake actuator alarm

Figure 57: Brake actuator alarm - Communication lost, battery status

alarms related to the brake actuators are also displayed separately.

Battery status

green: 11 – 100%

Orange: 6 — 10%

Red: less than 6%

Communication lost
 Interruption of the radio connection between the brake actuator and the transmitter-/receiver module.

These errors can be used for triggering the relay outputs of the RTM X42.BC.T/R transceiver

Refer to the Operating Manual RTM X42.BC Brake Control

13 Modbus/TCP Interface

Some information of the RTM Monitoring Control Software is available on the intetrated Modbus/TCP protocol.

Input Registers (read only)					
Offset	**Type**	**Parameter**	**Bit**	**Description**	
1	INT16	Last error		0 = No error	
				1 = Auto/Record cannot be set because the Control Center is in Fast mode.	
				2 = Fast Mode cannot be set because the Control Center is in Auto/Record mode.	
				3 = Recipe number does not exist.	
				4 = The recipe cannot be changed because Control Center is in Auto/Record mode.	
2	INT16	System status		0 = System ok	
				1 = One of the Brake Actuators in the recipe has the maximum brake force reached.	
				2 = Low battery	
				3 = Empty battery	
				5 = No connection	
3	INT16	Operating status	0	Auto/Record running	
			1	Below minimum speed	
			2	Brake Setup mode	
			3	Closed-loop control	
			15	Remote control enabled	
4	INT16	Recipe Number		No. of currently opened recipe	
5	INT16	Number of defined Receivers		This determines the number of defined Receivers but not more than 5.	
6	INT16	Connection status	0	No connection	
			1	Radio lost	

Input Registers (read only)				
Offset	*Type*	*Parameter*	*Bit*	*Description*
			2	Connection ok
		Battery charge level	3 to 4	0 = Empty battery (red) 1 = Low battery (orange) 2 = Battery ok (green)
		Relays status	5	Status of relay 1
			6	Status of relay 2
			7	Status of relay 3
			8	Status of relay 4
7 to 10	INT16			Here follow additional information blocks for the other Receivers.
11	INT16	Quantity of Brake Actuators		
12	INT16	Battery charge level	0 to 1	0 = Empty battery (red) 1 = Low battery (orange) 2 = Battery ok (green)
		Synchronized	2	Brake Actuator is synchronized
		Digital input states	3	Digital input 1
			4	Digital input 2
			5	Digital input 3
			6	Digital input 4
		Hall sensor states	7	At the fully retracted position (maximum brake force applies)
			8	At the fully extended position (no brake force applies)
		Ready	9	The Brake Actuator is ready to do something
		Driving	10	The Brake Actuator is in movement
13 to 53	INT16			Here follow additional information blocks for the other Brake Actuators.

Table 24: Modbus/TCP – Input Registers

14   Remote Control

Some functions can be controlled remotely via the Modbus/TCP protocol.

14.1   Input register

The input registers return global system information. They also used for the feedback when using the remote control ability. The input registers are read-only. The data is updated roughly every 100ms.

Last error

The last error indicates a problem with the remote control. A possible error could be choosing a recipe number that doesn't exist. The parameter is set to 0 as soon as no more errors are present. If more than one error is pending, then the last error is shown.

Fast mode

The brake actuators are switched into a fast response mode. But the recording and the closed-loop functions are inactive. Thus manual operations are handled within one second.

Recording running

The operating status Recording Running indicates obviously that the recording is active.

Input Registers (read only)				
Offset	*Type*	*Parameter*	*Bit*	*Description*
1	INT16	Last error		0 = No error
				1 = Recording cannot be set because the Control Center is in fast mode.
				2 = Fast mode cannot be set because the Control Center is in recording mode.
				3 = Recipe number does not exist.
				4 = The recipe cannot be changed because a recording is running.
				6 = The remote control of the operating mode is disabled.
				7 = The remote control of the recipe selection is disabled.

Input Registers (read only)				
Offset	*Type*	*Parameter*	*Bit*	*Description*
2	INT16	System status		0 = System ok
				1 = One of the Brake Actuators in the recipe has the maximum brake force reached.
				2 = Low battery
				3 = Empty battery
				5 = No connection
3	INT16	Operating status	0	Auto/Record running
			1	Below minimum speed
			2	Brake Setup mode
			3	Closed-loop control
			15	Remote control enabled
4	INT16	Recipe Number		The currently opened recipe
5	INT16	Number of definded Receivers		This determines the number of defined Receivers but not more than 5.
6	INT16	Connection Status	0	Connection ok
			1	Radio lost
			2	not used
		Battery Level	3 to 4	0 = Empty battery (red)
				1 = Low battery (orange)
				2 = Battery ok (green)
		Relays status	5	Status of relay 1
			6	Status of relay 2
			7	Status of relay 3
			8	Status of relay 4
7 to 10	INT16	Additional blocks from other receivers		
11	INT16	Quantity of brake actuators		
12	INT16	Battery charge level	0 to 1	0 = Empty battery (red)
				1 = Low battery (orange)
				2 = Battery ok (green)

Input Registers (read only)				
Offset	*Type*	*Parameter*	*Bit*	*Description*
		Synchronized	2	Brake Actuator is synchronized
			3	Digital input 1
			4	Digital input 2
			5	Digital input 3
			6	Digital input 4
		Hall sensor status	7	At the fully retracted position (maximum brake force applies)
			8	At the fully extended position (no brake force applies)
		Ready	9	The Brake Actuator is ready to do something.
		Driving	10	The Brake Actuator is in movement.

Table 25: Modbus/TCP Input Register

14.2 Holding Registers

The holding registers are used for the remote control of the control center only. If the remote control is not needed, then they can be ignored.

It is important to know, that those items which are remotely controlled cannot be changed over the GUI anymore. On the other hand, only one superior device may be responsible for monitoring remote control. That is the principle of only one device can be the master.

The interface offers the ability to determine what items are remotely controlled. That gives bigger flexibility in the implementation of an application.

Holding Registers (Output)				
Offset	*Type*	*Parameter*	*Bit*	*Description*
			1	Recording
			2	Fast Mode
			3	Reset Last Error
2	INT16	Recipe Number		The recipe number determines the open recipe (always the latest version) V85.

Table 26: Modbus/TCP – Holding Registers

14.3 Modbus/TCP Interface

The RTM Control Center acts as a Slave/Server. Therefore, a gateway on the Modbus/TCP interface acts as a Master/Client and on the PROFINET, PROFIBUS or EtherNet/IP interface acts as a Slave/Server. Hence, a PLC must be the Master/Client.
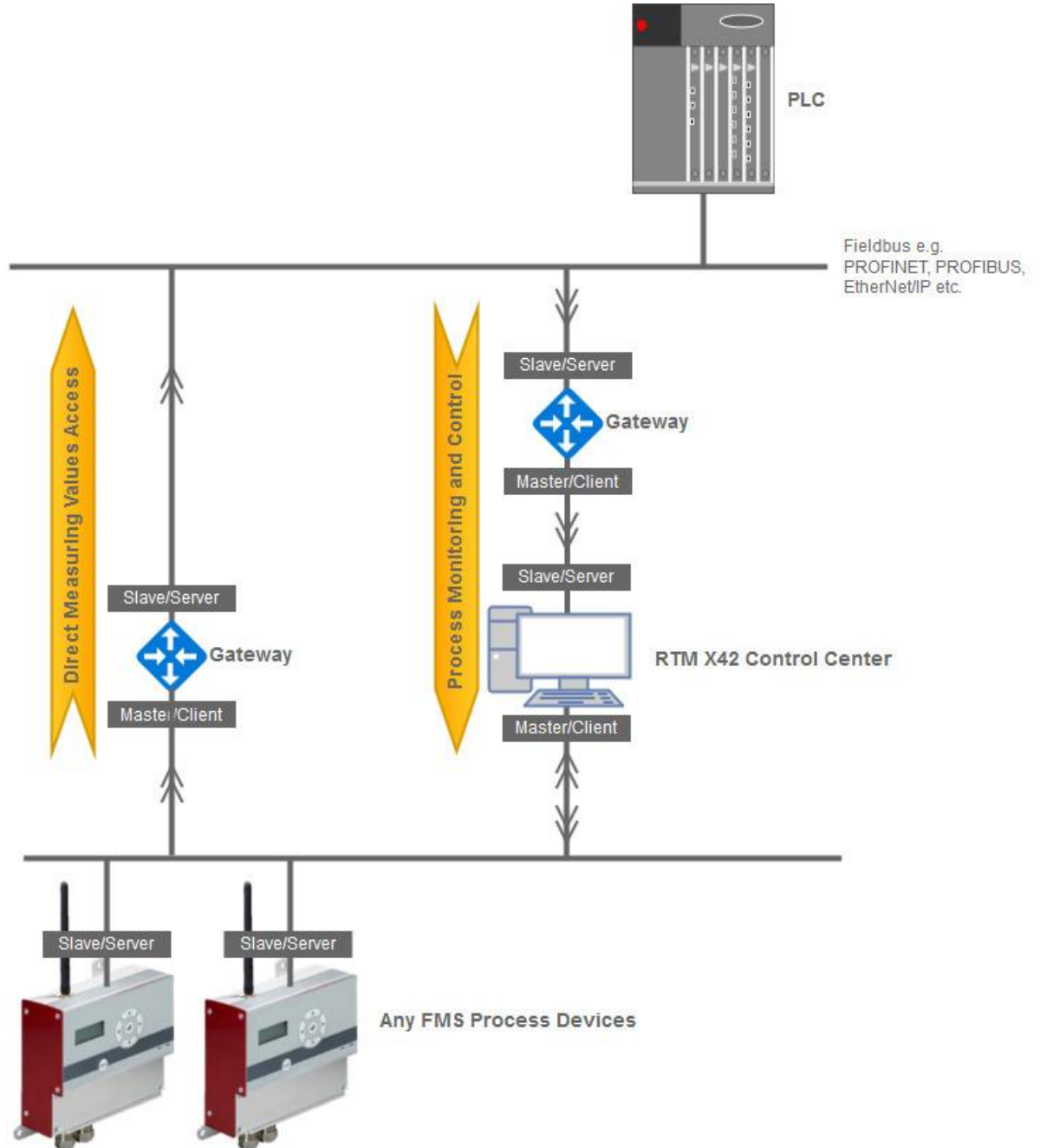
Figure 58: network scheme

You have to enable the functionality in the basic settings menu.
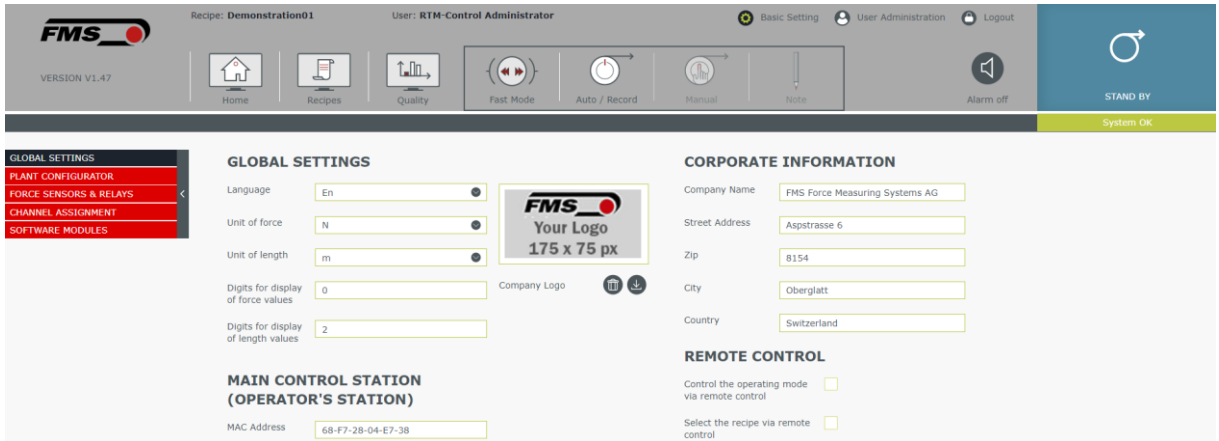
Figure 59: - Basic Settings – Remote Control

14.4 Set operating mode

If you have activated this checkbox, the access to activate Fast Mode or Auto/Record via the RTM Monitoring & Control Software is disabled. These controls are deactivated

14.5 Select recipe

Before activating this checkbox, you should assign an individual number to each existing recipe. The recipe number is stated in the recipe menu.
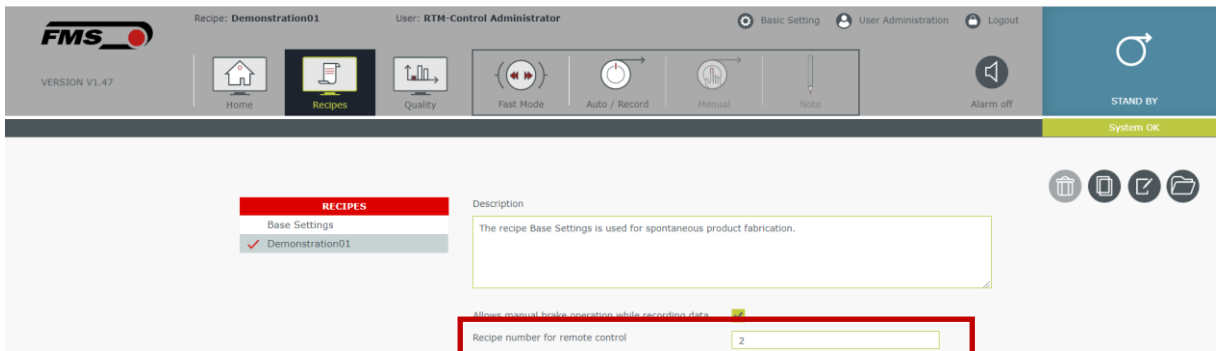
Figure 60: - Recipe – number for remote control

In General, new recipes do not get a number assigned automatically. Only if the remote control is activated, you should assign an individual number to all recipes.

15 Processes, events

The following notes apply only to the RTM Monitoring & Control software. Machine-specific activities, such as coil change, adjustment of the pre-forming and post-forming heads, etc., are not mentioned.

15.1 Measurement and control parameters for a new product

Operate the RTM Monitoring & Control software from the central computer unit or from the computer at the machine.

| Work steps and notes	
Step	*Observation*
RECIPE MANAGER	
New recipe	Copy the "Base Settings" recipe.
Rename the newly created recipe	Assign a unique recipe name, for example, with the name of the end customer, product name, number of strands, etc.
Open the new, renamed recipe	Important, otherwise you change the already opened recipe
Manual operation	Be sure to enable it to intervene during Auto/Record mode
Upper, lower pre-alarm	Do not activate for setup for the time being
HOME-SCREEN	
Remove channels	Remove all unnecessary channels for a better overview
Move channels	Shift the channels for a better overview
Shift the channel groups	Shift the channel groups for a better overview
Target tensile value	In the absence of an experience value, apply a slightly lower value.
Upper, lower threshold	First, set as wide a range as possible in order to start the machine without alarm messages
Wire break	Disable this alarm first
Alarm output, threshold violations	Initially disable this alarm, until experience values are available.
automatic control for channel	Activate to enable the control operation

Work steps and notes	
Step	*Observation*
Control parameters	Initially, define a narrow dead-band (±2%) with a short delay time (1 second) and a large correction angle (180°) in order to quickly reach the reference value of the strand tension and to be able to respond quickly to changes in the reference value during setup.
Reference braking force	Initially, set a lower value here to avoid wire breakage. Start up the reference braking force immediately with all brake actuators.

Table 27: Set up a new product

15.2 Set up a new product

The following steps are for guidance:

- Start Auto/Record mode — for example, enter "Setup" in the product name, which helps to sort and find the correct data recording later.
- Start-up the system
- Enable manual operation
- Adjust reference values
- Manually adjust the brakes
- Note down the braking forces at full coils
- Adjust the reference braking force in the recipe
- Stop system
- Stop Auto/Record mode
- Check product

Following the final product review (with approval), you can set the remaining parameters:

- Customize control parameters
    - o Wider dead-band ± 10 % (hint: adjust to pre-alarm thresholds),
    - o small correction angle 60°
    - o longer delay time 20 sec.
    - o Note that fast regulation always results in reduced battery life.
- Activate the pre-alarm
- Set the pre-alarm thresholds on the dead-band of the control parameter, so that the control unit is also triggered when the pre-alarm thresholds are reached.
- Upper and lower thresholds with as narrow a range as possible to achieve high product quality.
- Enabling alarm output
- Do not deactivate "Allow manual brake operation while recording data" until you are satisfied with the product quality and no further manual intervention in automatic control is necessary.

15.3 Production, data recording with automatic control

Note the following points:

- All batteries have sufficient voltage for the production run
- Correct recipe loaded
- Enable data Auto/Record mode and enter product information correctly
- Observe alarm messages

15.4 Conversion from one product to another (existing recipes)

Operate the RTM Monitoring & Control software from the central computer unit or from the computer at the machine.

- Stop data Auto/Record mode
- If changes to the currently open recipe are necessary, they must now be performed or noted.
- Open a new recipe (and equip the system accordingly)
- Reconfigure the system if changes have been made to the current recipe in the meantime.
- Settings control
  - o Reference values
  - o Thresholds
  - o Rule parameters
  - o Settings of the alarm messages
- Checking the charging status of batteries
- Start production, data Auto/Record mode

15.5 Create quality protocol

Quality protocols can also be created on computers other than the central computer unit. You can access all records that have already been created while data is being recorded.

- Start the browser and access the RTM Monitoring & Control software (enter the IP address of the central computer unit into the browser)
- To log in, select a user who has the appropriate permission to create quality protocols.
- Select the navigation item "Quality" in the software to access the quality manager
- You can search for the desired data recording based on the date or the corresponding sorting.
- Select the appropriate line
- In the lower section, you can select the content for the quality protocol
- In the top right corner of the quality manager, press "Print"
- The protocol with the corresponding content is created in the background and displayed as a file in the .pdf format and automatically saved in the Downloads folder.

15.6 Modifying a recipe, parallel to production runs

Recipes can also be created or modified on computers other than on the central computer unit. You can access recipes during data recording.

- Start the browser and access the RTM Monitoring & Control software (enter the IP address of the central computer unit into the browser)
- To sign in, select a user who has the appropriate permission to create or modify recipes
- In the software, select the navigation item "Recipes"
- In the recipe manager, you can select any recipe from the list
- You can change properties such as the description or alarm messages directly here
- Press "Edit" in the top right corner of the recipe manager
- "Editing Recipe" appears in the software header line and at the same time, the program changes to the home screen.
- On the home screen, you can perform any changes to individual channels or channel groups
- Changes are saved automatically.
- When you leave the home screen, you also exit the editing mode for recipes.
- The change of a recipe is documented by the system in the background with the date and user with its own revision level. The revision status of a recipe is printed on the quality record.

16 Software modules

The functions of the RTM Monitoring & Control software are divided into several software modules. You can observe which modules are currently installed and activated in the menu item "Basic setting — Software modules".
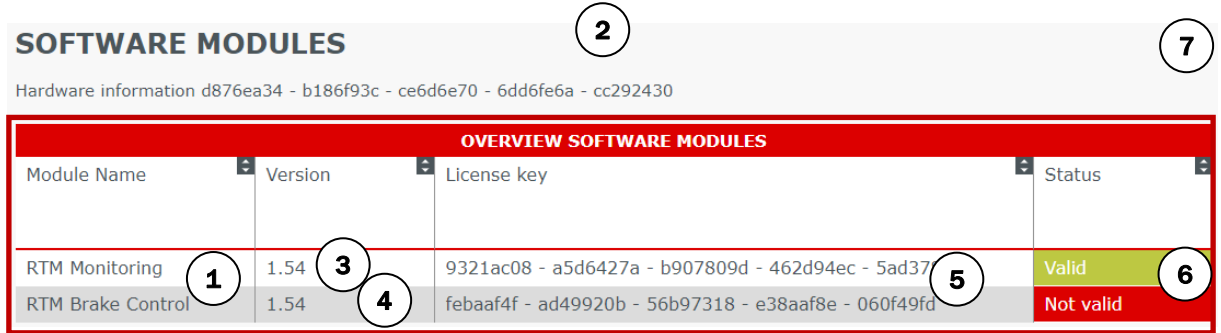
Figure 61: Software Modules Basic Setting

Software modules	
Position	**Description**
1	**RTM Monitoring**
	Measure, display and record the strand tension, including the recipe manager and the quality manager.
	RTM Brake control
	Control of the strand tension in the closed control circuit
	Additional rows
	Further modules are in preparation
2	**Hardware Information**
	Automatically generated key for special applications.
3 and 4	**Version**
	Current revision number of the software module
5	**License key**

Software modules	
Position	*Description*
6	**Status**
	Valid — Software module is installed and released with the appropriate license key.
	Invalid - Software module is installed, however, an invalid license key has been entered.
	Not valid — Software module installed, no license key was entered.
7	Download
	For example, a file can be opened here to install a software update.

Table 28: Module overview

To enable the function of the individual modules on the RTM Control Centre, a license key assigned by FMS is required.

16.1 Unlocking a (new) software module

If you have ordered an additional software module, we will send you a file with the update. Save it to the RTM Control Centre.

Then, in the "Software modules" menu select this file with the "Download" control, and confirm with "Open". The new software module is installed automatically.

- To activate the new software module, you need a license key, which you also received by email. You can transfer the license key code via "copy & paste" from the email to the "License key" field.
- (in case of an existing PC, the specification of the "hardware information" must first be sent to FMS

16.2 Software update

In case of a software update, we will send you a file with the update. Save this file to the central computer unit.

Then, in the "Software modules" menu select this file with the "Download" control, and confirm with "Open". The update will be installed automatically. The progress of the update is displayed in a dialogue window.

As a rule, you do not need a new license key to activate an update. If this is the case, we will also send it to you by email. You can then transfer the code via "copy & paste" from the email to the field "License key".

17 Data backup

If you do a regular backup, we recommend that you back up the following folders on the main computer.

Software modules		
Content	*File path*	*Description*
Data records	Always on the FMS Main Computer Computer/home/rtm/desktop/recording	.hdf5 files
Quality protocols	If FMS computer is the main computer Computer/home/rtm/desktop/downloads If another computer is the main computer usually (Windows) C:\Users\benutzername\Downloads	.pdf. Files

Table 29: Data Backup

18 HDF5 to CSV Converter

Software version 2.0.0

Install the tool on any PC with a Windows operating system.

With this tool you convert HDF5 files to CSV files. You can then conveniently open and edit them in conventional spreadsheet programs.

This simple tool is also included in the optional software package.
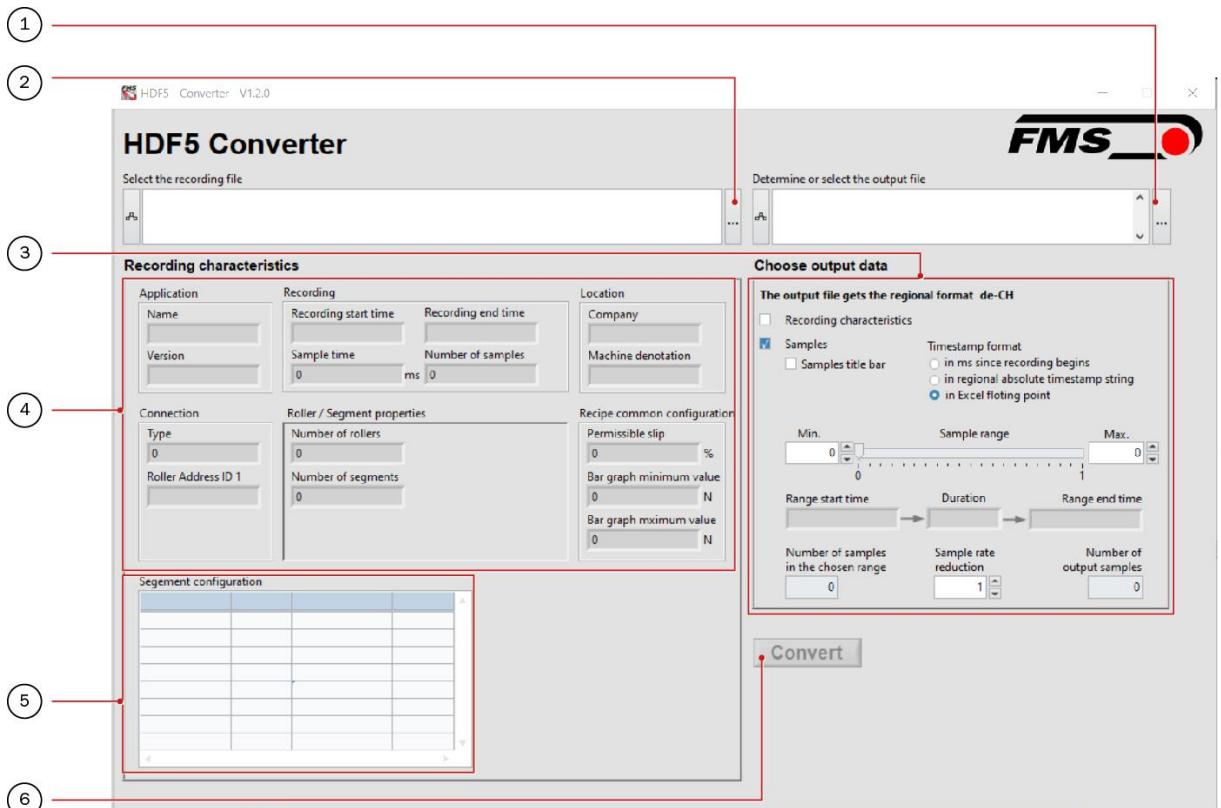
Start the program by double-clicking on:

Figure 62: HDF5 to CSV converter   FMS-segFORCE_BA_Manual.ai

Designations	
Item	*Description*
1	Path for the input file
2	Path for the output file
3	Output file configuration
4	Display of the system settings
5	Display of the segment settings
6	Button to start the conversion

Table 30: HDF5 to CSV converter

Sample-title: provides header in the cvs file - recommended for better overview.

A 7-hour recording of 40 segments generates about 8 million records for this interval.

To generate manageable data for Excel, the file size / number of records of the cvs file should not be too large.

To adjust the size you can use the following settings

Min. and max. sample range - you can select the start and end point of the output file. If you need only a small interval and not the whole production batch.

Start time, end time and duration indicate the actual time set in the capture PC.

Sample rate reduction - is a factor you can use to reduce the total amount of records - factor 3 reduces the sample divided by 3.

18.1 Time stamp format

To ensure that the time information is correct when you later import it into Excel, proceed as follows:

1. Before the export, select the Time stamp format "in Excel floating point"

2. Press convert

3. Open the .cvs file in Excel

4. Currently there is a multi-digit number in the first column "timestamp

5. Select all values in the first column "timestamp

6. Right click "Format cells

7. Select user defined, scroll down and select dd.mm.yyyy hh

8. Add :ss.000 to the expression in the input window, so that the following expression appears in the input window DD.MM.YYYY hh:ss.000 - the last 3 digits indicate the milliseconds.

19 Technical data of the main controller

Front I/O	2 USB 2.0 ports Power button
Rear I/O	1 HDMI port 1 DisplayPort 2 Gb LAN ports
	4 USB 3.0 ports 2 Audio jacks; line-out, mic-in
Processor	Intel Celeron, Pentium, Core i3/i5/i7
Processor Speed	2.3 ~ 3.3 GHz
Processor Generation	Kaby Lake, Skylake
Processor Cores	2 ~ 4
Graphics/GPU	Intel HD Graphics
Memory Type	DDR4 SO-DIMM (non-ECC)

Memory Capacity	Up to 32 GB
Memory Speed	2133 MHz
LAN Controller	Intel I210 GbE Intel I219 GbE
Input Voltage	12 V
Power Input	DC jack
Operating Temp. Range	0 ~ 50 °C
Dimensions (WxHxD)	197 x 79.2 x 202 mm 7.76" x 3.12" x 7.95"
Case Material	Steel With Aluminum Extrusion
Mounting Options	DIN-mount Wall-mount
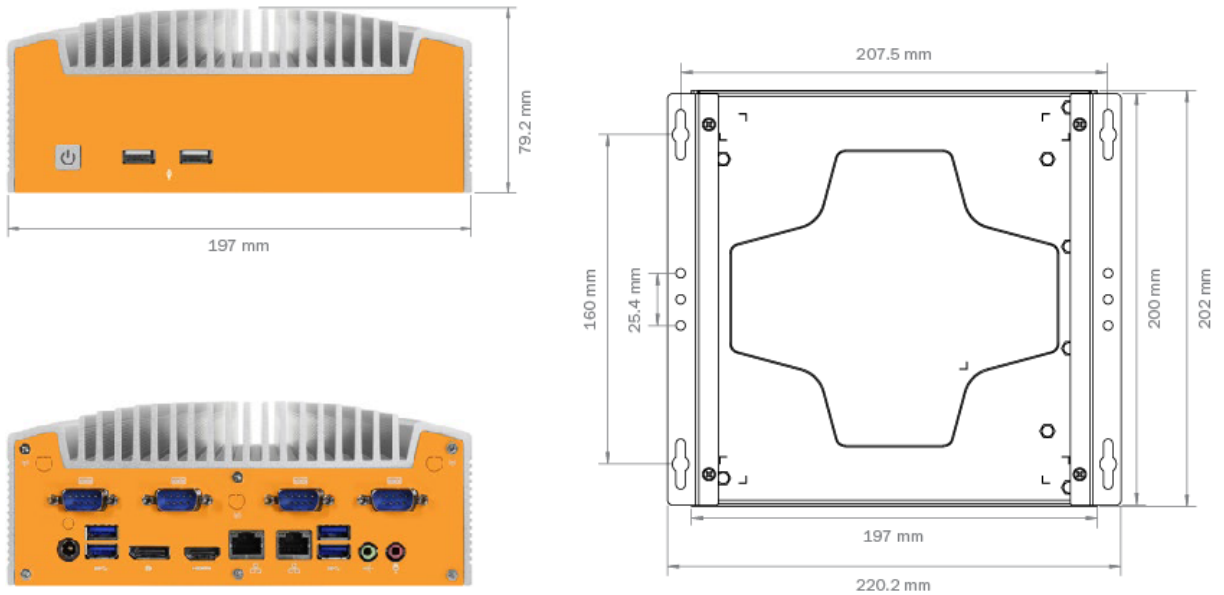
Figure 63: dimensions master controller

20 Troubleshooting FAQ

Errors and Solutions	
Error image	Solution
Battery brake actuator weak Brake actuator indicator Display in the system status	Battery weak, replace
Communication lost with brake actuator Brake actuator indicator Display in system status	Battery weak, replace
No connection between the RTMX42BC.T/R transceiver and the central computer unit	IP address is not correct, RJ45 cable is not plugged in
No connection between reception module EMGZ482.R and central computer unit	IP address is not correct, RJ45 cable is not plugged in
The strand tension is beyond the thresholds despite activated control	Rupture of the brake cable, replacement of the brake cable is necessary Fully-retracted brake actuator would actually have to retract even further. Wear/length of the brake cable, replacement or adjusting of the brake cable is necessary Unintentional lubrication of the brake cable, e.g. with grease, has reduced friction to the extent that the brake stops working. Cleaning or replacement of the brake cable is necessary
The computer does not restart correctly after a reboot	USP Stick on Port When restarting, the computer first searches for boot software on a USB flash drive. If such a stick is connected in a port (perhaps for backup or from a software update, etc.), an error message appears. Remove the USB flash drive and restart the computer.

Table 31: trouble shooting

21 Certificates

21.1 Lloyd's Register Type Approval

Certificate available on request.