DOC023.53.90447

RTC112 SD-Module
Real Time Control System for Sludge Dewatering

User manual

07/2013, Edition 1

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Section 1 Technical data

These are subject to change without notice.

Embedded PC (compact industrial PC)	
Processor	Pentium®[1], MMX compatible, 500 MHz clock rate
Flash memory	2 GB compact flash card
Internal working memory	256 MB DDR-RAM (not expandable)
Interfaces	1x RJ 45 (Ethernet), 10/100 Mbit/s
Diagnostic LED	1x power, 1x LAN speed, 1x LAN activity, TC status, 1x flash access
Expansion slot	1x CompactFlash type II slot with ejector mechanism
Clock	Internal, battery-buffered clock for time and date (battery can be replaced)
Operating system	Microsoft Windows®[2] CE or Microsoft Windows Embedded Standard
Control software	TwinCAT PLC Runtime or TwinCAT NC PTP Runtime
System bus	16 bit ISA (PC/104 standard)
Power supply	Via system bus (through power supply module CX1100-0002)
Max. power loss	6 W (including the system interfaces CX1010-N0xx)
Analog inputs	0/4 to 20 mA for input of the feed flow rate and the polymer flow rate
Number of inputs	One-channel: 2 (KL3011) Two-channel: 4 (KL3011)
Internal resistance	80 ohm + diode voltage 0.7 V
Signal current	0/4 to 20 mA
Common mode voltage (U_{CM})	35 V max.
Measurement error (for entire measurement range)	< ± 0.3% (from end value of measurement range)
Voltage surge resistance	35 V DC
Electrical isolation	500 V_{eff} (K-bus/signal voltage)
Analog outputs	Output of the polymer dosing, output of the feed flow rate
Number of outputs	One-channel: 2 (KL4012) Two-channel: 4 (KL4012)
Supply voltage	24 V DC via the power contacts (Alternatively, 15 V DC with bus termination KL9515)
Signal current	0/4 to 20 mA
Working resistance	<500 ohm
Measurement error	± 0.5 LSB linearity error ± 0.5 LSB offset error ± 0.1% (relative to the measuring range end value)
Resolution	12 bit
Conversion time	Approximately 1.5 ms
Electrical isolation	500 V_{eff} (K-bus/field voltage)

Digital outputs	Control of polymer pump: feed flow rate and fault messages
Number of outputs	One-channel: 4 (KL2134) Two-channel: 8 (KL2408)
Nominal load voltage	24 V DC (–15% / +20%)
Load type	ohmic, inductive lamp load
Max. output current	0.5 A (short-circuit proof) per channel
Reverse polarity protection	Yes
Electrical isolation	500 V_{eff} (K-bus/field voltage)
Equipment properties	
Dimensions (W x H x D)	One-channel: 191 x 120 x 96 mm (7.52 x 4.72 x 3.78 in) Two-channel: 227 x 120 x 96 mm (8.94 x 4.72 x 3.78 in)
Mass	Approximately 0.9 kg (approximately 1.98 lb)
Environmental conditions	
Working temperature	0 to 50 °C (32 to 122 °F)
Storage temperature	–25 to +85 °C (–13 to 185 °F)
Relative humidity	95%, non-condensing
Miscellaneous	
Pollution Degree **Protection Class** **Installation Category** **Maximum Altitude**	2 1 II 2000 m (6,562 ft.)
Protection class	IP20
Installation	DIN rail EN 50022 35 x 15.0

[1] Pentium is a registered trademark of the Intel Corporation.

[2] Microsoft Windows is a brand name for operating systems of the Microsoft Corporation.

Canadian Radio Interference-Causing Equipment Regulation, IECS-003, Class A:

Supporting test records reside with the manufacturer.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing

Equipment Regulations.

Cet appareil numèrique de la classe A respecte toutes les exigences du Rëglement sur le matériel brouilleur du Canada.

FCC Part 15, Class "A" Limits

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC

Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.

2. The equipment must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their expense. The following techniques can be used to reduce interference problems:

1. Disconnect the equipment from its power source to verify that it is or is not the source of the interference.
2. If the equipment is connected to the same outlet as the device experiencing interference, connect the equipment to a different outlet.
3. Move the equipment away from the device receiving the interference.
4. Reposition the receiving antenna for the device receiving the interference.
5. Try combinations of the above.

Section 2 General information

2.1 Safety information

Please read the entire manual carefully before unpacking, assembling or operating the instrument. Pay attention to all hazard and warning notices. Failure to do so could result in serious injury to the operator or damage to the instrument.

To prevent damage to or impairment of the device's protection equipment, the device may only be used or installed as described in this manual.

2.1.1 Hazard notices in this manual

⚠DANGER

Indicates a potentially or imminently hazardous situation that, if not avoided, can result in death or serious injury.

⚠WARNING

Indicates a potentially or imminently dangerous situation that, if it is not avoided, can lead to death or to serious injuries.

⚠CAUTION

Indicates a possible dangerous situation that can have minor or moderate injuries as the result.

NOTICE

Indicates a situation that, if it is not avoided, can lead to damage to the device. Information that requires special emphasis.

Note: *Information that supplements points in the main text.*

2.1.2 Warning labels

Observe all labels and tags attached to the instrument. Failure to do so may result in personal injury or damage to the instrument.

	This symbol may be attached to the device and refers to operation and/or safety notes in the user manual.
	This symbol may be found on an enclosure or barrier within the product and indicates a risk of electric shock and/or death by electrocution.
	Electrical equipment marked with this symbol may no longer be disposed of in unsorted domestic or industrial waste in Europe after August 12, 2005. In conformity with the provisions in force (EU Directive 2002/96/EC), consumers in the EU must return old electrical devices to the manufacturer for disposal from this date, at no charge to the consumer. ***Note:*** *You obtain instructions on the correct disposal of all (marked and not marked) electrical products that were supplied or manufactured by Hach-Lange at your relevant Hach-Lange sales office.*

2.2 Areas of application

The RTC112 SD-Module (Real Time Controller for Sludge Dewatering) is an open and closed-loop control unit for universal applications. It can be used by mechanical sludge dewatering devices, such as centrifuges in wastewater treatment plants.

The RTC112 SD-Module

- Optimizes polymer consumption
- Uniformly manages the concentration of solids in dewatered sludge

Table 1 Versions of the RTC112 SD-Module

1-channel	Open/closed-loop controller for one dewatering system
2-channel	Open/closed-loop controller for two dewatering systems

NOTICE

The use of an RTC Module does not release the operator from the responsibility of maintaining the system. No guarantees as to the functionality or operational safety of the system.

In particular, the operator must make sure that instruments connected to the RTC open/closed-loop controller are always fully functional.

To make sure these instruments supply correct, reliable measurement values, regular maintenance work (for example, cleaning of the sensor and laboratory comparative measurements) is essential! (Refer to the user manual for the relevant instrument.)

2.3 Scope of delivery

NOTICE

The combination of pre-assembled components supplied by the manufacturer does not represent a standalone functional unit. In accordance with EU guidelines, this combination of pre-assembled components is not supplied with a CE mark, and there is no EU declaration of conformity for the combination.

However, the conformity of the combination of components with the guidelines can be proved through technical measurements.

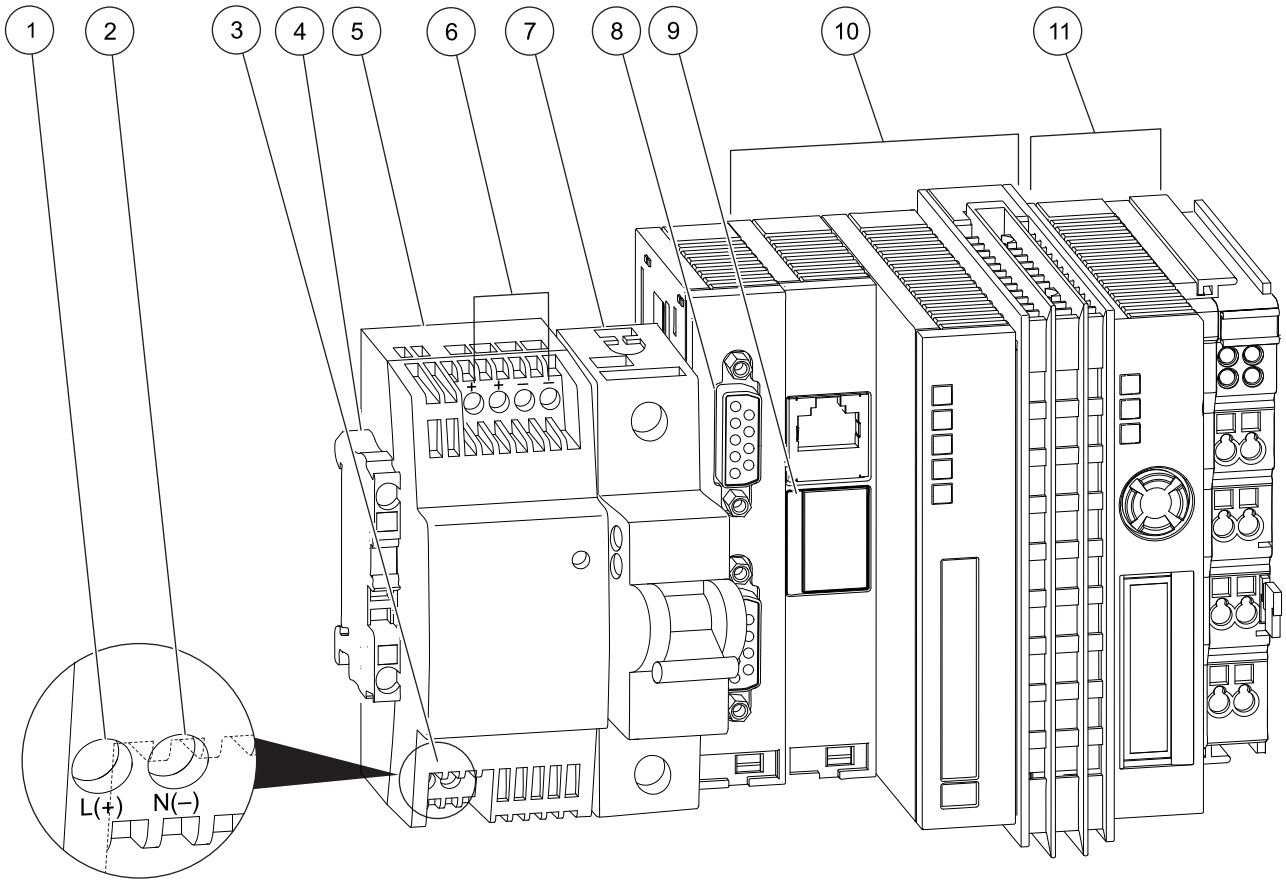
Each RTC Module is supplied with:

- SUB-D connector (9 pin)
- User manual
- Ferrite core

Check that the order is complete. All listed components must be present. If anything is missing or damaged, contact the manufacturer or distributor immediately.

2.4 Instrument overview

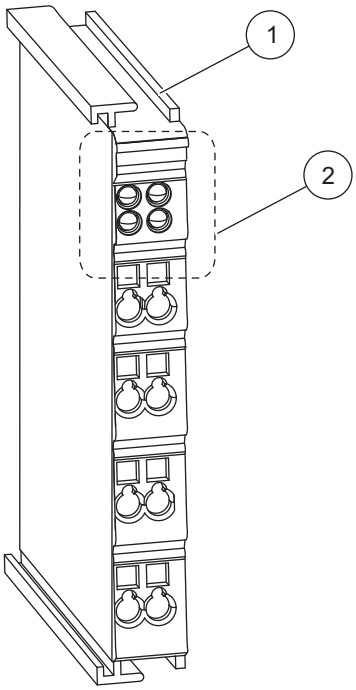
Figure 1 Base module RTC 100-240 V version



1	L(+)	**7**	Automatic circuit breaker (ON/OFF switch for item 10 and 11 without fuse function)
2	N(–)	**8**	sc1000 connection: RS485 (CX1010-N041)
3	Input AC 100–240 V / Input DC 95 V–250 V	**9**	Battery compartment
4	PE (protective earth)	**10**	CPU base module, consisting of Ethernet port with battery compartment (CX1010-N000), CPU module with CF card (CX1010-0021) and passive aeration element
5	24 V transformer (Specification section 3.1.1, page 17)	**11**	Power supply module, consisting of bus coupler (CX1100-0002) and terminal module 24V.
6	Output DC 24 V, 0,75 A		

Note: *All components are pre-wired.*

Figure 2 Design of the analog and digital input and output modules



1	Input- or Output- Module or Bus Termination Module analog or digital	**2**	LED area with installed LEDs or free LED installation spaces

Note: *The number of green LEDs indicates the number of channels.*

2.5 Theory of operation

2.5.1 Theory of operation of the RTC Module

The RTC112 SD-Module outputs analog (0/4–20 mA) and digital (0/24 V) signals for the polymer dosing rate or the feed flow rate of mechanical sludge dewatering devices. Digital fieldbus signals from sc1000 communication cards can also be used.

2.5.2 Input signals

The most important input signals are:

- Sludge influent TSS concentration (concentration of solids)
- Feed flow rate of the dewatering system
- Thickened sludge TSS concentration (optional)
- Status of the thickened sludge pump (on/off)

2.5.3 Parameters for configuration

The most important parameters for configuration are:

- The required specific polymer dosing [g polymer/kg TSS]
- The target TSS concentration in dewatered sludge or
- The target TSS concentration in centrate

NOTICE

In a closed-loop circuit, TSS measurement is required in centrate or dewatered sludge. The program of the RTC112 SD-Module has to be adjusted to the type of measurement location that is being used for the closed loop part of the RTC. This is done by executing *.bat files on the CF card of the RTC. Make_Filtrate.bat has to be executed for applications where centrate TSS is measured and Make_Effluent for applications where dewatered/thickened sludge is measured.

Note: *Never retrieve the CF-card from the RTC unit while power is on!*

2.5.4 Operating modes

The RTC112 SD-Module can be operated as a combined open-loop and closed-loop controller. Several variants can be configured.

1. Configuration of a fixed polymer rate [L/h] with a fixed feed flow rate [m^3/h].
2. Configuration of a specific polymer dosing rate [g polymer/kg TSS]. One of the following settings is adjusted:

   a. The polymer flow rate according to the TSS concentration and the feed flow rate (Figure 3).

   - Based on the actual feed flow rate [L/h] and TSS concentration [g/L] in the feed flow, the polymer dosing rate [L/h] is calculated for the required specific dosing rate.

   Or:

   b. The feed flow rate according to the specified polymer dosing rate and the measured TSS concentration of the influent (Figure 4).

   - Based on the measurement value of the TSS concentration from the influent [g/L] and the configurable specified polymer dosing rate [L/h], the feed flow rate [m^3/h] is calculated such that it corresponds to the pre-defined specific polymer dosing rate [g/kg].
3. Both variants 2a and 2b can be combined with one of the closed-loop controllers described below:

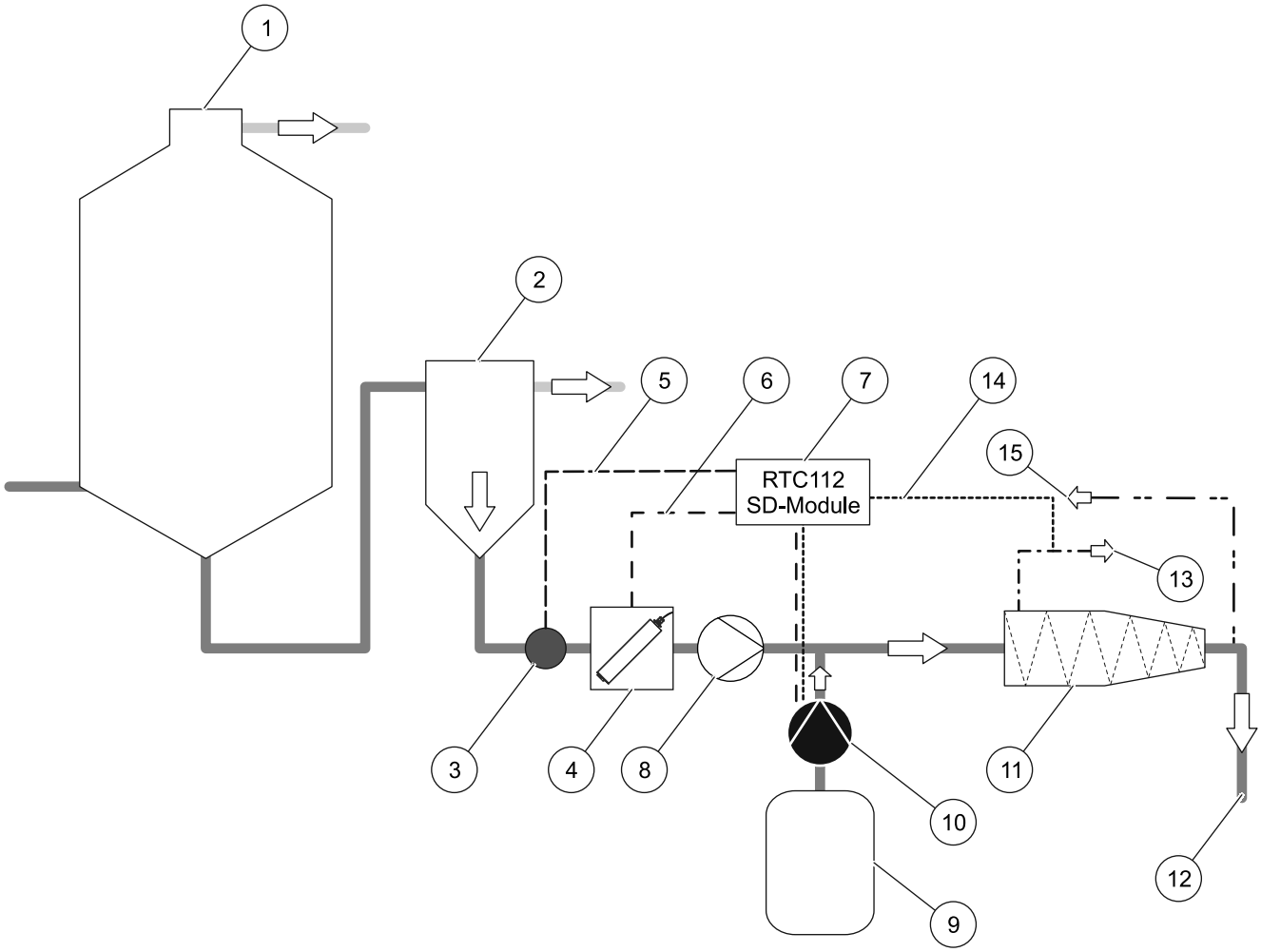
   a. Closed-loop control of the TSS concentration in the dewatered sludge

   - The specific polymer dosing rate is adjusted according to the difference between the target and actual TSS concentration in the dewatered sludge. Higher TSS concentrations lead to a reduction of the dose and lower concentrations will lead to higher dose rates than preset in the open-loop part of the RTC.

   b. Closed-loop control of the TSS concentration in the centrate or filtrate

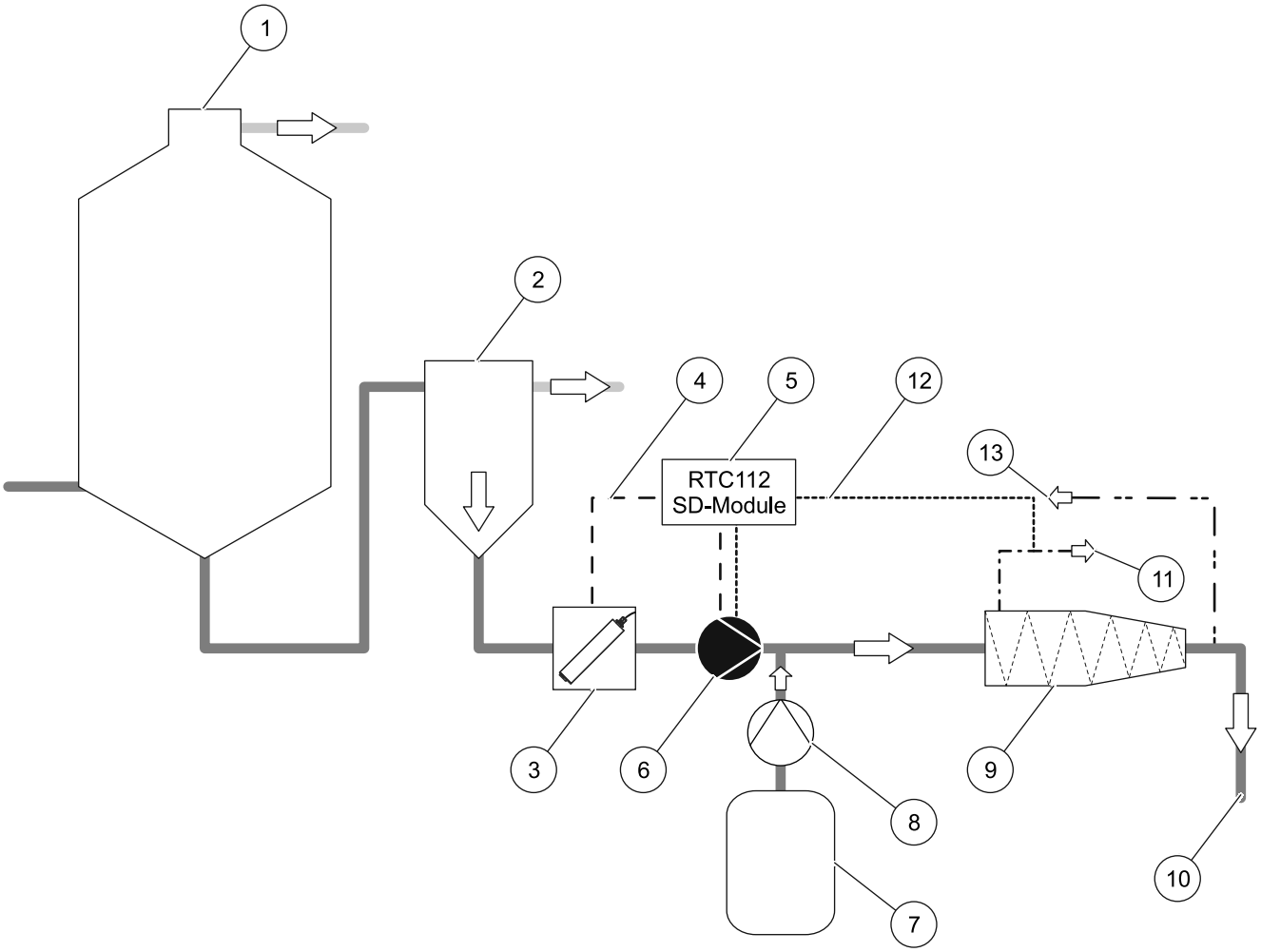
   - The specific polymer dosing rate is adjusted according to the difference between the target and actual TSS concentration in the centrate. Higher TSS concentrations lead to an increase of the dose and lower concentrations will lead to a decrease of the dose rates preset in the open-loop part of the RTC.

Figure 3 Adjustment of the polymer dosing rate to the influent TSS load



1	Digester	**9**	Polymer supply
2	Static thickener	**10**	Pump for open-loop control of the polymer dosing rate
3	Measurement of the feed flow rate	**11**	Mechanical sludge dewatering device
4	TSS measurement from the influent	**12**	Dewatered sludge
5	Open-loop control of the polymer dosing rate (feed flow rate measurement value)	**13**	Centrate
6	Open-loop control of the polymer dosing rate (influent TSS concentration measurement value)	**14**	Option: Measurement of the TSS concentration in the centrate
7	RTC112 SD-Module	**15**	Option: Measurement of the TSS concentration in the dewatered sludge instead of centrate
8	Pump for the feed flow rate (constant)		

Figure 4 Adjustment of the feed flow rate to fixed polymer dosing rate



1	Digester	**8**	Pump for polymer dosing (constant)
2	Static thickener or sludge storage	**9**	Mechanical sludge dewatering device
3	TSS measurement from the influent	**10**	Dewatered sludge
4	Open-loop control for the feed flow rate	**11**	Centrate
5	RTC112 SD-Module	**12**	Option: Measurement of the TSS concentration in the centrate
6	Pump for open-loop control of the feed flow rate	**13**	Option: Measurement of the TSS concentration in the dewatered sludge instead of centrate
7	Polymer supply		

⚠ DANGER

Only qualified experts may perform the tasks described in this section of the manual, while adhering to all locally valid safety regulations.

⚠ CAUTION

Always lay cables and hoses so that they are straight and do not pose a tripping hazard.

⚠ CAUTION

Before the power supply is switched on, refer to the instructions in the relevant manuals.

3.1 Installation of the RTC Module

Only install the RTC Module on a DIN rail. The module must be attached horizontally, with at least 30 mm (1.2 in.) space at the top and bottom to make sure that the passive aeration element can function correctly.

When used indoors, the RTC Module must be installed in a control cabinet. When used outdoors, the RTC Module requires a suitable enclosure that provides the technical specifications indicated in Section 1.

The RTC Module is operated via the sc1000 controller (see the user manual for the sc1000 controller).

Note: *The software version of the sc1000 controller must be V3.20 or above.*

3.1.1 Supply voltage of the RTC Module

Table 2 Supply voltage of the RTC Module

Voltage	24 V DC (–15% / +20%), max. 25 W
Recommended fuse	C2
With 110–230 V option	110–230 VAC, 50-60 Hz, approximately 25 VA

Note: *An external deactivation switch is recommended for all installations.*

3.2 Connection of process measurement instruments for the TSS concentration

The measurement signals of the sc sensors for the measurement of the concentration of solids (e. g. SOLITAX sc) are provided to the RTC112 SD-Module via the RTC communication card (YAB117) in the sc1000 probe module.

3.2.1 Power supply of the sc sensors and the sc1000 controller

See operating instructions of the respective sc sensors and the sc1000 controller.

3.3 sc1000 controller connection

Connect the SUB-D plug supplied to a dual-core, sheathed data cable (signal or bus cable). For additional information regarding the data cable connection, refer to the enclosed assembly instructions.

3.4 Connection to the automation unit on the plant side

The one-channel and two-channel versions of the RTC112 SD-Module are equipped with various modules that must be connected to the plant automation system.

- The feed flow rate must be provided to the RTC112 SD-Module as a 0/4 to 20 mA signal.
- The polymer flow rate must be provided (on both versions) to the RTC112 SD-Module as a 0/4 to 20 mA signal.
- The polymer pump can be operated in pulse/pause mode (PWM).
- The status signals and fault indications are output as 0 V/24 V signals.
- Measurement errors are shown 5 minutes after the error occurs. In the event of a new startup (return of power supply), the unit is set back to ON (24 V) after approximately 1 minute and 40 seconds if there are no measurement errors.
- In the event of a new startup (return of power supply), the RTC operating signal is set back to ON (24 V) after approximately 1 minute and 25 seconds.

Table 3 Connections for the 1-channel RTC112 SD-Module

Module	Name	Connection	Signal	Function
4x digital output[1]	KL2134	1	+24 V/0 V	Polymer pump on/off (24 V/0 V); (LED a)
		5	+24 V/0 V	Closed-loop control of the feed flow rate active/inactive (24 V/0 V); (LED c)
		4	+24 V/0 V	Input signals OK (24 V), input signal faulty (0 V); (LED b)
		8	+24 V/0 V	RTC operational (24 V), RTC faulty (0 V), (LED d)
2x analog output	KL4012	1(+) - 3(-)	0/4 to 20 mA	Output of the polymer pump flow rate
		5(+) - 7(-)	0/4 to 20 mA	Output of the feed flow rate
1x analog input	KL3011	1(+) - 2(-)	0/4 to 20 mA	Input of the feed flow rate
1x analog input	KL3011	1(+) - 2(-)	0/4 to 20 mA	Input of the polymer flow rate
Bus termination	KL9010			Bus termination

[1] Ground to connection 3 and 7 or to the supply voltage connections

Table 4 Connections for the 2-channel RTC112 SD-Module

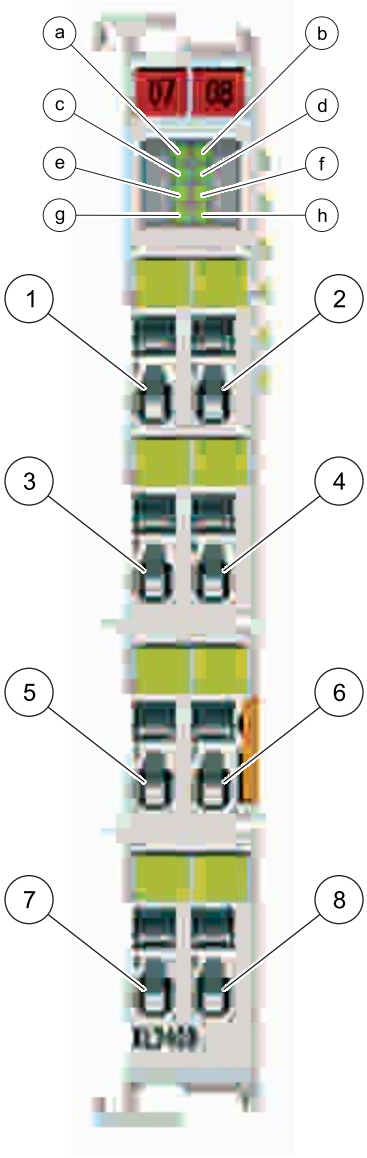
Module	Name	Connection	Signal	Channel	Function
8x digital output[1]	KL2408	1	+24 V/0 V	1	Polymer pump on/off (24 V/0 V) (LED a)
		5	+24 V/0 V	1	Closed-loop control of the feed flow rate active/inactive (24 V/0 V) (LED e)
		2	+24 V/0 V	1	Input signals OK (24 V), input signal faulty (0 V) (LED b)
		6	+24 V/0 V	1	RTC operational (24 V), RTC faulty (0 V) (LED f)
		3	+24 V/0 V	2	Polymer pump on/off (24 V/0 V) (LED c)
		7	+24 V/0 V	2	Closed-loop control of the feed flow rate active/inactive (24 V/0 V) (LED g)
		4	+24 V/0 V	2	Input signals OK (24 V), input signal faulty (0 V) (LED d)
		8	+24 V/0 V	2	RTC operational (24 V), RTC faulty (0 V) (LED h)
2x analog output	KL4012	1(+) - 3(-)	0/4 to 20 mA	1	Output of the polymer pump flow rate
		5(+) - 7(-)	0/4 to 20 mA	1	Output of the feed flow rate

Table 4 Connections for the 2-channel RTC112 SD-Module

Module	Name	Connection	Signal	Channel	Function
2x analog output	KL4012	1(+) - 3(-)	0/4 to 20 mA	2	Output of the polymer pump flow rate
		5(+) - 7(-)	0/4 to 20 mA	2	Output of the feed flow rate
1x analog input	KL3011	1(+) - 2(-)	0/4 to 20 mA	1	Input of the feed flow rate
1x analog input	KL3011	1(+) - 2(-)	0/4 to 20 mA	1	Input of the polymer flow rate
1x analog input	KL3011	1(+) - 2(-)	0/4 to 20 mA	2	Input of the feed flow rate
1x analog input	KL3011	1(+) - 2(-)	0/4 to 20 mA	2	Input of the polymer flow rate
Bus termination	KL9010				Bus termination

[1] Ground to connection to the supply voltage connections

Figure 5 Connections and corresponding LEDs for digital output card KL2408 (2 channel option only)



a	LED a	**e**	LED e
b	LED b	**f**	LED f
c	LED c	**g**	LED g
d	LED d	**h**	LED h
1	Connector 1	**9**	Connector 5
2	Connector 2	**10**	Connector 6
3	Connector 3	**11**	Connector 7
4	Connector 4	**12**	Connector 8

Section 4 Parameterization and operation

4.1 Operating the sc controller

The RTC Module can only be operated via the sc1000 controller in conjunction with the RTC communication card. Before the RTC Module is used, the user must be familiar with the functionality of the sc1000 controller. Learn how to navigate through the menu and perform the relevant functions.

4.2 sc1000 setup

1. Open the **MAIN MENU**.
2. Select **RTC MODULES / PROGNOSYS** and confirm.
3. Select **RTC MODULES** and confirm.
4. Select **RTC** and confirm.

4.3 Menu structure

4.3.1 DIAGNOSIS

DIAGNOSIS		
RTC		
ERROR LIST	Possible error messages: **RTC MISSING, RTC CRC, CHECK CONFIG, RTC FAILURE**	
WARNING LIST	Possible warning messages: **MODBUS ADDRESS, PROBE SERVICE**	
REMINDER LIST		

Note: *Refer to Section 6 Troubleshooting, page 39 for a list of all possible error and warning messages together with a description of all necessary countermeasures to be taken.*

4.4 Configuration of RTC112 SD-Module parameters on the sc1000 controller

The following menu items are in the SC1000 SETUP menu.

4.4.1 RTC112 SD-Module open and closed-loop controller

RTC MODULES / PROGNOSYS		
RTC MODULES		
RTC		
CONFIGURE		
SELECT SENSOR	Select the sensors installed for the open/closed-loop controller (refer to section 4.5, page 26).	

4.4.1 RTC112 SD-Module open and closed-loop controller (Continued)

RTC MODULES / PROGNOSYS		
RTC MODULES		
RTC		
PRESELECT PROG.		
CHANNEL 1		
POLYMER DOSING CONTROL	Based on the feed flow rate [m³/h] and measured TSS concentration [g/L] from the influent, the polymer dosing rate [L/h] is calculated such that it corresponds to the target specific polymer dosing rate [g/kg].	Activation/ deactivation
FEED FLOW CONTROL	Based on the measured TSS concentration [g/L] and a fixed polymer dosing rate [L/h], the feed flow [m^3/h] is calculated such that it corresponds to the specific polymer dosing rate [g/kg].	Activation/ deactivation
CLOSED-LOOP EFFLUENT CONTROL	If activated, the specific polymer dosing rate FACTOR POLYMER DOSING is adjusted based on the difference between the target and actual TSS concentration in the dewatered sludge. The change in the specific dosing rate affects the polymer dosing rate [L/h] in the POLYMER DOSING CONTROL module or affects the feed flow rate in the FEED FLOW CONTROL module.	Activation/ deactivation
CLOSED-LOOP FILTRATE CONTROL	If activated, the specific polymer dosing rate FACTOR POLYMER DOSING is adjusted based on the difference between the target and actual TSS concentration in the filtrate/centrate. The change in the specific dosing rate affects the polymer dosing rate [L/h] in the POLYMER DOSING CONTROL module or affects the feed flow rate in the FEED FLOW CONTROL module. ***Note:*** *Activation and deactivation of CLOSED-LOOP EFFLUENT CONTROL and CLOSED-LOOP FILTRATE CONTROL have to be prepared by executing the relevant *bat-files on the RTC CF-card (see section 2.5.3).*	Activation/ deactivation
CHANNEL 2	As per channel one	
CONTROL PARAMETER		
CHANNEL 1		
FACTOR POLYMER DOSING	Required specific polymer dosing [g/kg]. This parameter determines how many grams of polymer per kilogram of TSS are fed by the machine.	g/kg
POLYMER CONCEN-TRATION	Polymer concentration [g/L] fed via the polymer pump.	g/L
MANUAL POLYMER DOSING	The RTC outputs the polymer flow rate [L/h] if • FEED FLOW CONTROL is activated • No open-loop control mode (see above) is activated • The TSS measurement from the influent reports an error, or • The flow measurement from the influent reports an error.	L/h
MANUAL FEED FLOW	The RTC outputs the feed flow rate [m³/h] if • POLYMER DOSING CONTROL is activated • No open-loop control mode (see above) is activated • The TSS measurement from the influent reports an error, or • The flow measurement from the influent reports an error	m³/h

4.4.1 RTC112 SD-Module open and closed-loop controller (Continued)

RTC MODULES / PROGNOSYS

RTC MODULES

RTC

MAX DECREASE CLOSED L	This value defines the maximum decrease of the specific polymer dosing rate FACTOR POLYMER DOSING [g/kg] if CLOSED-LOOP EFFLUENT CONTROL is selected.	g/kg
MAX INCREASE CLOSED L	This value defines the maximum increase of the specific polymer dosing rate FACTOR POLYMER DOSING [g/kg] if CLOSED-LOOP EFFLUENT CONTROL is selected.	g/kg
SET-POINT TSS	Required setpoint of the TSS concentration in the thickened sludge. ***Note:*** *This parameter is only considered if CLOSED-LOOP EFFLUENT CONTROL is activated.*	g/L
P GAIN TSS	Proportional gain for the PID closed-loop controller for the TSS concentration in the thickened sludge. ***Note:*** *This parameter is only considered if CLOSED-LOOP EFFLUENT CONTROL is activated.P GAIN TSS [L/g] is divided by 100 before it is multiplied by the deviation of the actual TSS concentration [g/L] from the required TSS setpoint [g/L] .*	L/g
INTEGRAL TIME TSS	Integral time for the PID closed-loop controller for the TSS concentration in the thickened sludge. ***Note:*** *This parameter is only considered if CLOSED-LOOP EFFLUENT CONTROL is activated. INTEGRAL TIME TSS is set to "0" to deactivate the integral part of the PI open-loop controller.*	min
DERIVATIVE TIME TSS	Derivative time for the PID closed-loop controller for the TSS concentration in the thickened sludge. ***Note:*** *This parameter is only considered if CLOSED-LOOP EFFLUENT CONTROL is activated.*	min
SET-POINT FILT	Required setpoint of the TSS concentration in the centrate/filtrate. ***Note:*** *This parameter is only considered if CLOSED-LOOP FILTRATE CONTROL is activated.*	g/L
P GAIN FILT	Proportional gain for the PID closed-loop controller for the TSS concentration in the centrate/filtrate. ***Note:*** *This parameter is only considered if CLOSED-LOOP EFFLUENT CONTROL is activated.* *P GAIN FILT [L/g] is divided by 100 before it is multiplied by the deviation of the actual TSS concentration from the required TSS setpoint.*	L/g
INTEGRAL TIME FILT	Integral time for the PID closed-loop controller for the TSS concentration in the centrate/filtrate. ***Note:*** *This parameter is only considered if CLOSED-LOOP EFFLUENT CONTROL is activated.* *INTEGRAL TIME TSS is set to "0" to deactivate the integral part of the PID open-loop controller.*	min

4.4.1 RTC112 SD-Module open and closed-loop controller (Continued)

RTC MODULES / PROGNOSYS			
RTC MODULES			
RTC			
	DERIVATIVE TIME FILT	Derivative time for the PID closed-loop controller for the TSS concentration in the centrate/filtrate. ***Note:*** *This parameter is only considered if CLOSED-LOOP FILTRATE CONTROL is activated.*	min
	CHANNEL 2	As per channel one	
	INPUT/OUTPUT LIMITS		
	CHANNEL 1		
	FEED FLOW LOW	Feed flow rate input signals below this value [m^3/h] are set to this value (to avoid low flow peaks).	m^3/h
	FEED FLOW HIGH	Feed flow rate input signals above this value [m^3/h] are set to this value (to avoid high flow peaks).	m^3/h
	FEED FLOW SMOOTHING	Feed flow measurement values are smoothed in line with this parameter.	min
	LIMIT TSS IN LOW	TSS measurement values from the influent that are below this value [g/L] are set to this value (to avoid low peaks).	g/L
	LIMIT MAX TSS IN HIGH	TSS measurement values from the influent that are above this value [g/L] are set to this value (to avoid high peaks).	g/L
	TSS IN SMOOTHING	The TSS measurement values from the influent are smoothed in line with this parameter.	min
	LIMIT TSS OUT LOW	The TSS values of the dewatered sludge or centrate sludge that are below this value [g/L] are set to this value (to avoid low peaks).	g/L
	LIMIT TSS OUT HIGH	The TSS values of the dewatered sludge or centrate sludge that are above this value [g/L] are set to this value (to avoid high peaks).	g/L
	TSS OUT SMOOTHING	The TSS measurement values from the effluent are smoothed in line with this parameter.	min
	POLYMER DOSING MINIMUM	When FEED FLOW CONTROL is activated, measurement values for the polymer dosing rate that are below this value [m^3/h] are set to this value (to avoid low peaks in the dosing flow).	L/h
	POLYMER DOSING MAXIMUM	Any RTC calculation above this value [g/L] is set to this value and delivered to the polymer pump. When FEED FLOW CONTROL is activated, measurement values for the polymer dosing rate that are above this value [m^3/h] are set to this value (to avoid high peaks in the dosing flow).	L/h
	CHANNEL 2	As per channel one	

4.4.1 RTC112 SD-Module open and closed-loop controller (Continued)

RTC MODULES / PROGNOSYS		
RTC MODULES		
RTC		
INPUTS		
CHANNEL 1		
MIN FEED FLOW	Minimum flow rate [m³/h] from the influent in accordance with the 0/4 mA measurement signal.	m³/h
MAX FEED FLOW	Maximum flow rate [m³/h] from the influent in accordance with the 20 mA measurement signal.	m³/h
0/4...20mA	Transfer range of 0/4 to 20 mA current loop (as set in connected flow measuring instrument).	
MIN POLYMER FLOW	Minimum polymer dosing in [L/h] in accordance with the 0/4 mA measurement signal.	L/h
MAX POLYMER FLOW	Maximum polymer dosing in [L/h] in accordance with the 20 mA measurement signal.	L/h
0/4...20mA	Transfer range of 0/4 to 20 mA current loop (as set on connected flow measuring instrument).	
CHANNEL 2	As per channel one	
OUTPUTS		
CHANNEL 1		
MIN FEED FLOW	Minimum feed flow rate [m³/h] in accordance with 0/4 mA.	m³/h
MAX FEED FLOW	Maximum feed flow rate [m³/h] in accordance with 20 mA.	m³/h
0/4...20mA	Transfer range of 0/4 to 20 mA current loop (as set on connected flow measuring instrument).	
MIN POLYMER FLOW	Minimum polymer pump delivery rate in accordance with 0/4 mA.	L/h
MAX POLYMER FLOW	Maximum polymer pump delivery rate in accordance with 20 mA.	L/h
0/4...20mA	Transfer range of 0/4 to 20 mA current loop (as set on connected flow measuring instrument).	
CONTROL CYCLE	Pulse/pause mode for the polymer pump open-loop control for dosing rates beneath the minimum polymer flow rate (MIN POLYMER FLOW). The on/off duration in pulse/pause mode can be affected by the duration of the CONTROL CYCLE. For example, with a CONTROL CYCLE of 100 seconds and a dosing control value of 60%, the polymer pump is regularly switched on for 60 seconds and switched off for 40 seconds. Short cycle times increase the switching frequency but enable more precise adaptation to individual requirements. CONTROL CYCLE should be divisible by MIN RUNTIME and produce a whole number.	s
MIN RUNTIME	The minimum ON time in pulse/pause dosing mode. The pump is not activated for periods shorter than this. The MIN RUNTIME must be shorter than the duration of the CONTROL CYCLE.	s
CHANNEL 2	As per channel one	

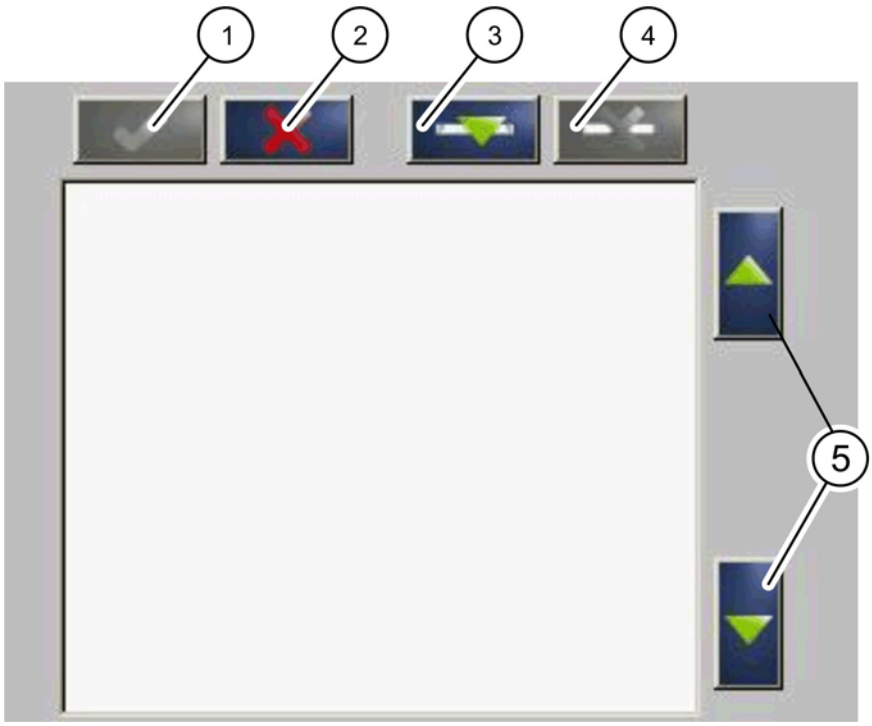
4.4.1 RTC112 SD-Module open and closed-loop controller (Continued)

RTC MODULES / PROGNOSYS			
RTC MODULES			
RTC			
	MODBUS		
		ADDRESS	Start address of an RTC within the MODBUS network. Default setting: 41–61
		DATA ORDER	Specifies the register order within a double word. Presetting: NORMAL
	DATALOG INTRVL		Indicates the interval in which the data is saved in the log file. [min]
	SET DEFAULTS		Restores the factory settings.
	MAINTENANCE		
	RTC DATA		
		RTC MEASUREMEN	Specifies the value measured by the RTC, e. g. the influent measurement.
		RTC ACTUAT VAR	Specifies the variable calculated by the RTC, e. g. whether the aeration should be switched on or off.
	DIAG/TEST		
		EEPROM	Hardware test
		RTC COMM TO	Communication time-out
		RTC CRC	Communication check sum
		MODBUS ADDRESS	Address displayed where the communication actually takes place. Presetting: 41

4.5 Select sensors

1. To select sensors and their sequence for the RTC Module, press RTC > CONFIGURE > SELECT SENSOR.

Figure 6 Select sensor



1	**ENTER** — Saves the setting and returns to the CONFIGURE menu.	4	**DELETE** — Removes a sensor from the selection.
2	**CANCEL** — Returns to the CONFIGURE menu without saving.	5	**UP/DOWN** — Moves the sensors up or down.
3	**ADD** — Adds a new sensor to the selection.		

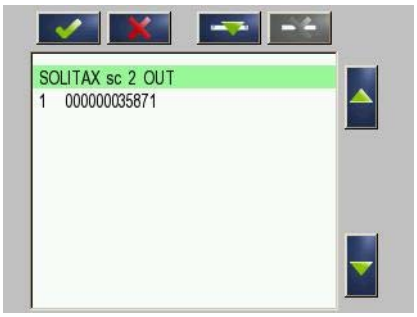
2. Press **ADD** (Figure 6, item 3).

   A selection list of all subscribers to the sc1000 network opens.

3. Press the required sensor for the RTC Module and confirm by pressing **ENTER** below the selection list.

   Sensors in black type are available for the RTC Module. Sensors in red type are not available for the RTC Module.

   Note: *Sensors marked (p) are available for PROGNOSYS if these sensors have been selected in conjunction with an RTC (refer to the PROGNOSYS user manual).*



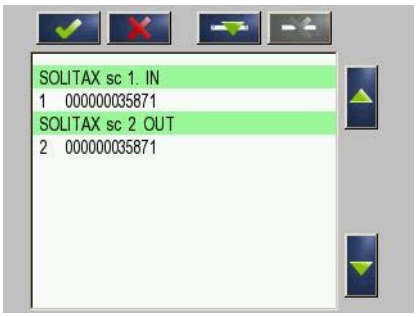
4. The selected sensor is shown in the sensor list.
Press **ADD** (Figure 6, item 3) to open the selection list again.

5. Select the second sensor for the RTC Module and confirm by pressing **ENTER** below the selection list.

Note: *Previously selected sensors are shown in gray.*

The selected sensors are shown in the sensor list.

6. To sort the sensors in the order specified for the RTC Module, press the sensor and use the arrow keys to move it (Figure 6, item 5).
Press **DELETE** (Figure 6, item 4) to remove an incorrect sensor from the sensor list again.



7. Press ENTER (Figure 6, item 1) to confirm the list once it is finished.

4.6 PRESELECT PROG

4.6.1 POLYMER DOSING CONTROL

Based on the measured feed flow rate [m³/h] and the measured TSS concentration [g/L] from the influent, the polymer dosing rate [L/h] is calculated such that the setpoint corresponds to the specific polymer dosing rate [g/kg].

Note: *This open-loop control mode can only be activated if FEED FLOW CONTROL is deactivated.*

Note: *The polymer flow rate is controlled via the RTC.*

4.6.2 FEED FLOW CONTROL

Based on the measured TSS concentration [g/L] and the specified polymer dosing rate [L/h], the feed flow rate is calculated such that it corresponds with the specific polymer dosing rate [g/kg] (FACTOR POLYMER DOSING).

Note: *This open-loop control mode can only be activated if POLYMER DOSING CONTROL is deactivated.*

Note: *The feed flow rate is controlled via the RTC.*

4.6.3 CLOSED-LOOP EFFLUENT CONTROL

If activated, the specific polymer dosing rate FACTOR POLYMER DOSING is adjusted based on the difference between the target and actual TSS concentration in the dewatered sludge.

If FEED FLOW CONTROL is activated, the TSS load fed with the sludge thickening is adjusted based on the difference between the target and actual TSS concentration in the filtrate.

Note: *This closed-loop control can only be activated if POLYMER DOSING CONTROL (section 4.6.1) or FEED FLOW CONTROL (section 4.6.2) is activated.*

4.6.4 CLOSED-LOOP FILTRATE CONTROL

If activated, the specific polymer dosing rate FACTOR POLYMER DOSING is adjusted based on the difference between the target and actual TSS concentration in the filtrate/centrate.

The change in the specific dosing rate affects the polymer dosing rate [L/h] in the POLYMER DOSING CONTROL module or affects the feed flow rate in the FEED FLOW CONTROL module.

Note: *Activation and deactivation of CLOSED-LOOP EFFLUENT CONTROL and CLOSED-LOOP FILTRATE CONTROL have to be prepared by executing the relevant *bat-files on the RTC CF-card (see section 2.5.3).*

4.7 CONTROL PARAMETER

4.7.1 FACTOR POLYMER DOSING

Required specific polymer dosing [g/kg]. This parameter determines how many grams of polymer per kilogram of TSS are fed by the system.

4.7.2 POLYMER CONCENTRATION

Polymer concentration [g/L] fed via the polymer pump.

4.7.3 MANUAL POLYMER DOSING

The RTC outputs the polymer dosing rate [L/h] if

- FEED FLOW CONTROL is activated
- No open-loop control mode (section 4.6.1 to section 4.6.3) is activated
- The TSS measurement from the influent reports an error, or
- The flow measurement from the influent reports an error.

4.7.4 MANUAL FEED FLOW

The RTC outputs the feed flow rate [m^3/h] if

- POLYMER DOSING CONTROL is activated
- No open-loop control mode (section 4.6.1 to section 4.6.3) is activated
- The TSS measurement at the inlet reports an error, or
- The flow measurement from the influent reports an error.

4.7.5 MAX DECREASE CLOSED L

This value defines the maximum decrease of the specific polymer dosing rate FACTOR POLYMER DOSING [g/kg] if CLOSED-LOOP EFFLUENT CONTROL is selected.

4.7.6 MAX INCREASE CLOSED L

This value defines the maximum increase of the specific polymer dosing rate FACTOR POLYMER DOSING [g/kg] if CLOSED-LOOP EFFLUENT CONTROL is selected.

4.7.7 SET-POINT TSS

Required setpoint of the TSS concentration in the dewatered sludge.

Note: *· This parameter is only considered if CLOSED-LOOP EFFLUENT CONTROL (section 4.6.3) is activated.*

4.7.8 P GAIN TSS

Proportional gain for the PID closed-loop controller for the TSS concentration in the dewatered sludge.

Note: *P GAIN TSS [L/g] is divided by 100 before it is multiplied by the deviation of the actual TSS concentration from the required TSS setpoint.*

4.7.9 INTEGRAL TIME TSS

Integral time for the PID closed-loop controller for the TSS concentration in the dewatered sludge.

Note: *INTEGRAL TIME TSS is set to "0" to deactivate the integral part of the PI open-loop controller.*

4.7.10 DERIVATIVE TIME TSS

Derivative time for the PID closed-loop controller for the TSS concentration in the dewatered sludge.

4.7.11 SET-POINT FILT

Required setpoint of the TSS concentration in the centrate/filtrate.

Note: *This parameter is only considered if CLOSED-LOOP FILTRATE CONTROL is activated.*

4.7.12 P GAIN FILT

Proportional gain for the PID closed-loop controller for the TSS concentration in the centrate/filtrate.

Note: *This parameter is only considered if CLOSED-LOOP EFFLUENT CONTROL is activated.*
P GAIN FILT [L/g] is divided by 100 before it is multiplied by the deviation of the actual TSS concentration from the required TSS setpoint.

4.7.13 INTEGRAL TIME FILT

Integral time for the PID closed-loop controller for the TSS concentration in the centrate/filtrate.

Note: *This parameter is only considered if CLOSED-LOOP EFFLUENT CONTROL is activated.*
INTEGRAL TIME TSS is set to "0" to deactivate the integral part of the PID open-loop controller.

4.7.14 DERIVATIVE TIME FILT

Derivative time for the PID closed-loop controller for the TSS concentration in the centrate/filtrate.

Note: *This parameter is only considered if CLOSED-LOOP FILTRATE CONTROL is activated.*

4.8 INPUT/OUTPUT LIMITS

4.8.1 FEED FLOW LOW

Feed flow rate input signals below this value [m^3/h] are set to this value. This means that very low feed flow rates can be avoided.

4.8.2 FEED FLOW HIGH

Feed flow rate input signals above this value [m^3/h] are set to this value. This avoids load peaks.

4.8.3 FEED FLOW SMOOTHING

Feed flow measurement values are smoothed in line with this parameter.

SMOOTHING = 1: The signal for the flow rate measurement is not smoothed.

SMOOTHING = 2: Smoothing is performed over 3 minutes.

SMOOTHING = 3: Smoothing is performed over 5 minutes.

SMOOTHING = 5: Smoothing is performed over 12 minutes.

SMOOTHING = 10: Smoothing is performed over 25 minutes.

Example:

With the setting SMOOTHING = 2, it takes 3 minutes for the smoothed value to reach 95% of the final value after an abrupt change in the feed flow rate.

4.8.4 LIMIT TSS IN LOW

TSS measurement values from the influent that are below this value [g/L] are set to this value (to avoid low peaks).

4.8.5 LIMIT MAX TSS IN HIGH

Measurement values from the influent that are above this value [g/L] are set to this value (to avoid high peaks).

4.8.6 TSS IN SMOOTHING

TSS measurement values from the influent are smoothed in line with this parameter.

SMOOTHING = 1: The signal is not smoothed.

SMOOTHING = 2: Smoothing is performed over 3 minutes.

SMOOTHING = 3: Smoothing is performed over 5 minutes.

SMOOTHING = 5: Smoothing is performed over 12 minutes.

SMOOTHING = 10: Smoothing is performed over 25 minutes.

4.8.7 LIMIT TSS OUT LOW

TSS measurement values for the dewatered sludge or centrate that are below this value [g/L] are set to this value (to avoid low peaks).

4.8.8 LIMIT TSS OUT HIGH

TSS measurement values for the dewatered sludge or centrate that are above this value [m^3/h] are set to this value (to avoid high peaks).

4.8.9 TSS OUT SMOOTHING

TSS measurement values from the effluent are smoothed in line with this parameter.

SMOOTHING = 1: The signal is not smoothed.

SMOOTHING = 2: Smoothing is performed over 3 minutes.

SMOOTHING = 3: Smoothing is performed over 5 minutes.

SMOOTHING = 5: Smoothing is performed over 12 minutes.

SMOOTHING = 10: Smoothing is performed over 25 minutes.

4.8.10 POLYMER DOSING MINIMUM

RTC calculations below this value [g/L] are set to this value and transferred to the polymer pump.

Note: *When FEED FLOW CONTROL is activated, measurement values for the polymer dosing rate that are below this value [m^3/h] are set to this value (to avoid low peaks in the dosing flow).*

4.8.11 POLYMER DOSING MAXIMUM

RTC calculations above this value [g/L] are set to this value and transferred to the polymer pump.

Note: *When FEED FLOW CONTROL is activated, measurement values for the polymer dosing rate that are above this value [m^3/h] are set to this value (to avoid high peaks in the dosing flow).*

4.9 INPUTS

4.9.1 MIN FEED FLOW

Minimum flow rate [m^3/h] from the influent in accordance with the 0/4 mA measurement signal.

4.9.2 MAX FEED FLOW

Maximum flow rate [m^3/h] from the influent in accordance with the 20 mA measurement signal.

4.9.3 0/4...20 mA

Transfer range of the 0/4 to 20 mA current loop (as set in connected flow measuring instrument).

4.9.4 MIN POLYMER FLOW

Minimum polymer dosing in [L/h] in accordance with the 0/4 mA measurement signal.

4.9.5 MAX POLYMER FLOW

Maximum polymer dosing in [L/h] in accordance with the 20 mA measurement signal.

4.9.6 0/4...20 mA

Transfer range of the 0/4 to 20 mA current loop (as set in connected flow measuring instrument).

4.10 OUTPUTS

4.10.1 MIN FEED FLOW

Minimum feed flow rate [m³/h] in accordance with 0/4 mA.

4.10.2 MAX FEED FLOW

Maximum feed flow rate [m³/h] in accordance with 20 mA.

4.10.3 0/4...20 mA

Transfer range of 0/4 to 20 mA current loop (as set in connected flow measuring instrument).

4.10.4 MIN POLYMER FLOW

Minimum polymer pump delivery rate in accordance with 0/4 mA.

4.10.5 MAX POLYMER FLOW

Maximum polymer pump delivery rate in accordance with 20 mA.

4.10.6 0/4...20 mA

Transfer range of 0/4 to 20 mA current loop (as set in connected flow measuring instrument).

4.10.7 CONTROL CYCLE

Pulse/pause mode for the polymer pump open-loop control for dosing rates beneath the minimum polymer flow rate (MIN POLYMER FLOW). The on/off duration in pulse/pause mode can be affected by the duration of the CONTROL CYCLE. For example, with a CONTROL CYCLE of 100 seconds and a dosing control value of 60%, the polymer pump is switched on for 60 seconds and switched off for 40 seconds. Short cycle times increase the switching frequency but enable more precise adaptation to individual requirements.

Note: *CONTROL CYCLE must be divisible by MIN RUNTIME and produce a whole number.*

4.10.8 MIN RUNTIME

Minimum ON time in pulse/pause dosing mode. The pump is activated for this runtime at the very least. The MIN RUNTIME must be shorter than the duration of the CONTROL CYCLE.

4.11 Displayed measurement values and variables

The following measurement values and variables are shown on the sc1000 display and transferred via fieldbus (refer to section Appendix B).

RTC112 SD-Module, one-channel	Parameter	Unit	Description
Measurement 1	Qin 1	m^3/h	Flow rate from the influent
Measurement 2	Qavg 1	m^3/h	Average flow rate
Measurement 3	Qdos1	L/h	Polymer flow rate
Measurement 4	TSin 1	g/L	TSS concentration from the influent
Measurement 5	TSef 1	g/L	TSS concentration from the effluent
Actuat var 6	Pdos1	L/h	Polymer dosing
Actuat var 7	Fact 1	g/kg	Specific polymer dosing
Actuat var 8	Feed 1	m^3/h	Feed flow rate

RTC112 SD-Module, two-channel	Parameter	Unit	Description
Measurement 1	Qin 1	m^3/h	Flow rate from the influent 1
Measurement 2	Qavg 1	m^3/h	Average flow rate
Measurement 3	Qdos 1	L/h	Polymer flow rate 1
Measurement 4	TSin 1	g/L	TSS concentration from the influent 1
Measurement 5	TSef 1	g/L	TSS concentration in the effluent 1
Measurement 6	Qin 2	m^3/h	Flow rate from the influent 2
Measurement 7	Qavg 2	m^3/h	Average flow rate
Measurement 8	Qdos 2	L/h	Polymer flow rate 2
Measurement 9	TSin 2	g/L	TSS concentration from the influent 2
Measurement 10	TSef 2	g/L	TSS concentration in the effluent 2
Actuat var 11	Pdos 1	L/h	Polymer dosing 1
Actuat var 12	Fact 1	g/kg	Specific polymer dosing 1
Actuat var 13	Feed 1	m^3/h	Feed flow rate 1
Actuat var 14	Pdos2	L/h	Polymer dosing 2
Actuat var 15	Fact 2	g/kg	Specific polymer dosing 2
Actuat var 16	Feed 2	m^3/h	Feed flow rate 2

Section 5 Maintenance

⚠ DANGER

Multiple hazards

Only qualified personnel must conduct the tasks described in this section of the manual.

5.1 Maintenance schedule

	Interval	Maintenance task
Visual inspection	Application-specific	Check for contamination and corrosion
Battery	5 years	Replacement by manufacturer's service department (Section 8, page 43)

Section 6 Troubleshooting

6.1 Error messages

Possible RTC errors are displayed by the sc controller.

Displayed errors	Cause	Resolution
RTC MISSING	No communication between RTC and RTC communication card	Supply RTC with voltage Test connection cable Reset the sc1000 and the RTC (switch so it is completely voltage free and switch back on)
RTC CRC	Interrupted communication between RTC and RTC communication card	Make sure +/- connections of the connector cable between RTC and RTC communication card in the sc1000 are installed correctly.
CHECK CONFIG	The sensor selection of the RTC was deleted by deleting or selecting a new sc1000 participant.	From **MAIN MENU > RTC MODULES / PROGNOSYS > RTC MODULES > RTC > CONFIGURE > SELECT SENSOR**, select the correct sensor for the RTC again and confirm.
RTC FAILURE	Brief general read/write error on the CF card, mostly caused by a brief interruption to the power supply.	Acknowledge error. If this message is shown frequently, eliminate the cause of the power disruptions. If necessary, inform the service team of the manufacturer (Section 8, page 43).
INFLOW1 NOT G.	Influent measurement signal faulty	Test sensor, check cable connections
INFLOW2 NOT G.	Influent measurement signal faulty	Test sensor, check cable connections

6.2 Warnings

Possible RTC sensor warnings are displayed by the sc controller.

Displayed warnings	Cause	Resolution
MODBUS ADDRESS	The RTC menu **SET DEFAULTS** was opened. This deleted the MODBUS address of the RTC in the sc1000.	Go to **MAIN MENU > RTC MODULES / PROGNOSYS > RTC MODULES > RTC > CONFIGURE > MODBUS > ADDRESS** and set the correct MODBUS address.
PROBE SERVICE	A configured sensor is in service status.	The sensor must exit service status.

6.3 Wear parts

Designation	Quantity	Service life
Battery	1	~5 years

Section 7 Replacement parts and accessories

7.1 Replacement parts

Description	Cat. No
DIN rail NS 35/15, punched according to DIN EN 60715 TH35, made of galvanized steel. Length: 35 cm (13.78 in.)	LZH165
Transformer 90–240 V AC/24 V DC 0.75 A, module for DIN rail assembly	LZH166
Terminal for 24 V connection without power supply	LZH167
Terminal for protective earth	LZH168
SUB-D connector	LZH169
C2 circuit breaker	LZH170
CPU base module with Ethernet port, passive ventilation element. (CX1010-0021) and RS422/485 connection module (CX1010-N031)	LZH171
Power supply module, consisting of a bus coupler and a 24 V terminal module (CX1100-0002)	LZH172
Digital output module 24 V DC (4 outputs) (KL2134)	LZH174
Analog output module (2 outputs) (KL4012)	LZH176
Analog input module (1 input) (KL3011)	LZH177
Digital input module 24 V DC (2 inputs) (KL1002)	LZH204
Digital output module 24 V DC (8 outputs) (KL2408)	LZH205
Bus termination module (KL9010)	LZH178
RTC communication card	YAB117
CF card type RTC-Module	LZY748-00
Ferrite core	LZH216

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Section 9 Limited warranty

Hach Company warrants its products to the original purchaser against any defects that are due to faulty material or workmanship for a period of one year from date of shipment unless otherwise noted in the product manual.

In the event that a defect is discovered during the warranty period, Hach Company agrees that, at its option, it will repair or replace the defective product or refund the purchase price excluding original shipping and handling charges. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period.

This warranty does not apply to consumable products such as chemical reagents; or consumable components of a product, such as, but not limited to, lamps and tubing.

Contact Hach Company or your distributor to initiate warranty support. Products may not be returned without authorization from the Hach Company.

Limitations

This warranty does not cover:

- Damage caused by acts of God, natural disasters, labor unrest, acts of war (declared or undeclared), terrorism, civil strife or acts of any governmental jurisdiction
- Damage caused by misuse, neglect, accident or improper application or installation
- Damage caused by any repair or attempted repair not authorized by the Hach Company
- Any product not used in accordance with the instructions furnished by the Hach Company
- Freight charges to return merchandise to the Hach Company
- Freight charges on expedited or express shipment of warranted parts or products
- Travel fees associated with on-site warranty repair

This warranty contains the sole express warranty made by the Hach Company in connection with its products. All implied warranties, including without limitation, the warranties of merchantability and fitness for a particular purpose, are expressly disclaimed.

Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state the above limitation may not apply to you. This warranty gives you specific rights, and you may also have other rights that vary from state to state.

This warranty constitutes the final, complete, and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of Hach Company.

Limitation of Remedies

The remedies of repair, replacement or refund of purchase price as stated above are the exclusive remedies for the breach of this warranty. On the basis of strict liability or under any other legal theory, in no event shall the Hach Company be liable for any incidental or consequential damages of any kind for breach of warranty or negligence.

Appendix A MODBUS address setting

The same slave address must be set for MODBUS communication on the sc1000 controller display and in the RTC module. Since 20 slave numbers are reserved for internal purposes, the following numbers are available for assignment:

1, 21, 41, 61, 81, 101…

The start address 41 is preset at the factory.

NOTICE

If this address is to be or must be changed because, for example, it has already been allocated for another RTC, the changes must be made both on the sc1000 controller and on the CF card of the RTC module.

This can only be done by the manufacturer service department (Section 8)!

Appendix B Configuration of the network modules

B.1 RTC112 SD-Module Profibus/MODBUS telegram

Table 5 RTC112 SD-Module, one-channel

Register	Parameter	Unit	Description
MEASUREMENT 1	Qin 1	m^3/h	Flow rate in the inflow
MEASUREMENT 2	Qavg 1	m^3/h	Average flow rate
MEASUREMENT 3	Qdos1	L/h	Polymer flow rate
MEASUREMENT 4	TSin 1	g/L	TSS concentration in the inflow
MEASUREMENT 5	TSef 1	g/L	TSS concentration in the outflow
ACTUAT VAR 6	Pdos1	L/h	Polymer dosing
ACTUAT VAR 7	Fact 1	g/kg	Specific polymer dosing
ACTUAT VAR 8	Feed 1	m^3/h	Feed flow rate

Table 6 RTC112 SD-Module, two-channel

Register	Parameter	Unit	Description
MEASUREMENT 1	Qin 1	m^3/h	Flow rate in inflow 1
MEASUREMENT 2	Qavg 1	m^3/h	Average flow rate
MEASUREMENT 3	Qdos 1	L/h	Polymer flow rate 1
MEASUREMENT 4	TSin 1	g/L	TSS concentration in inflow 1
MEASUREMENT 5	TSef 1	g/L	TSS concentration in outflow 1
MEASUREMENT 6	Qin 2	m^3/h	Flow rate from the influent 2
MEASUREMENT 7	Qavg 2	m^3/h	Average flow rate
MEASUREMENT 8	Qdos 2	L/h	Polymer flow rate 2
MEASUREMENT 9	TSin 2	g/L	TSS concentration in inflow 2
MEASUREMENT 10	TSef 2	g/L	TSS concentration in outflow 2
ACTUAT VAR 11	Pdos 1	L/h	Polymer dosing 1
ACTUAT VAR 12	Fact 1	g/kg	Specific polymer dosing 1
ACTUAT VAR 13	Feed 1	m^3/h	Feed flow rate 1
ACTUAT VAR 14	Pdos2	L/h	Polymer dosing 2
ACTUAT VAR 15	Fact 2	g/kg	Specific polymer dosing 2
ACTUAT VAR 16	Feed 2	m^3/h	Feed flow rate 2

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