ECA 71 protocol for the ECL Comfort 200/300 series

Instructions

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1. Introduction

1.1 How to use these instructions

Software and documentation for ECA 71 can be downloaded from http://heating.danfoss.com.

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Safety Note

To avoid injury of persons and damages to the device, it is absolutely necessary to read and observe these instructions carefully. The warning sign is used to emphasize special conditions that should be taken into consideration.

☝

This symbol indicates that this particular piece of information should be read with special attention.

1.2 About the ECA 71

The ECA 71 MODBUS communication module makes it possible to establish a MODBUS network with standard network components. Via a SCADA system (OPC Client) and the Danfoss OPC server it is possible to control the controllers in the ECL Comfort in the 200/300 series remotely.

ECA 71 can be used for all application cards in the ECL Comfort 200 series as well as in the 300 series.

The ECA 71 with proprietary protocol for ECL Comfort is based on MODBUS®.

Accessible parameters (card dependent):
- Sensor values
- References and desired values
- Manual override
- Output status
- Mode indicators and status
- Heat curve and parallel displacement
- Flow and return temperature limitations
- Schedules
- Heat meter data (only in ECL Comfort 300 as of version 1.10 and only if ECA 73 is mounted)

1.3 Compatibility

Optional ECA modules:
The ECA 71 is compatible with ECA 60-63, ECA 73, ECA 80, ECA 83, ECA 86 and ECA 88.
Max. 2 ECA modules can be connected.

ECL Comfort:
ECL Comfort 200 series

- As of ECL Comfort 200 version 1.09 ECA 71 is compatible, but an additional address tool is required. The address tool can be downloaded from http://heating.danfoss.com.

ECL Comfort 300 series

- The ECA 71 is fully compatible with ECL Comfort 300 as of version 1.10 (also known as ECL Comfort 300S) and there is no need for an additional address tool.
- ECL Comfort 300 as of version 1.08 is compatible, but an additional address tool is required.
- All versions of ECL Comfort 301 and 302 are compatible, but an additional address tool is required.

Only ECL Comfort 300 as of version 1.10 can setup the address used in the ECA 71 module. All other ECL Comfort controllers will require an address tool to set up the address.

Only ECL Comfort 300 as of version 1.10 can handle the heat meter data from the ECA 73 module.

2. Configuration

2.1 Network description

The network used for this module is conditionally compliant (implementation class = basic) with the MODBUS over serial line two-wire RS-485 interface. The module uses the RTU transmission mode. Devices are connected directly to the network, i.e. daisy chained. The network uses line polarization and line termination at both ends.

These guidelines depend on the environmental conditions and the physical network characteristics:
- Maximum cable length of 1200 metres without repeater
- 32 devices pr. master / repeater (a repeater counts as a device)

The modules uses an auto baud rate scheme that depends on the byte error ratio. If the error ratio exceeds a limit, the baud rate is changed. This means that all devices in the network must use the same communication settings, i.e multiple communication settings are not allowed. The module can operate with either 19200 (default) or 38400 baud network baud rate, 1 start bit, 8 data bits, even parity and one stop bit (11 bits). The valid address range is 1 – 247.

For specific details, please consult the specifications
- Modbus Application Protocol V1.1a.
- MODBUS over Serial Line, Specification & Implementation guide V1.0

both of which can be found on http://www.modbus.org/

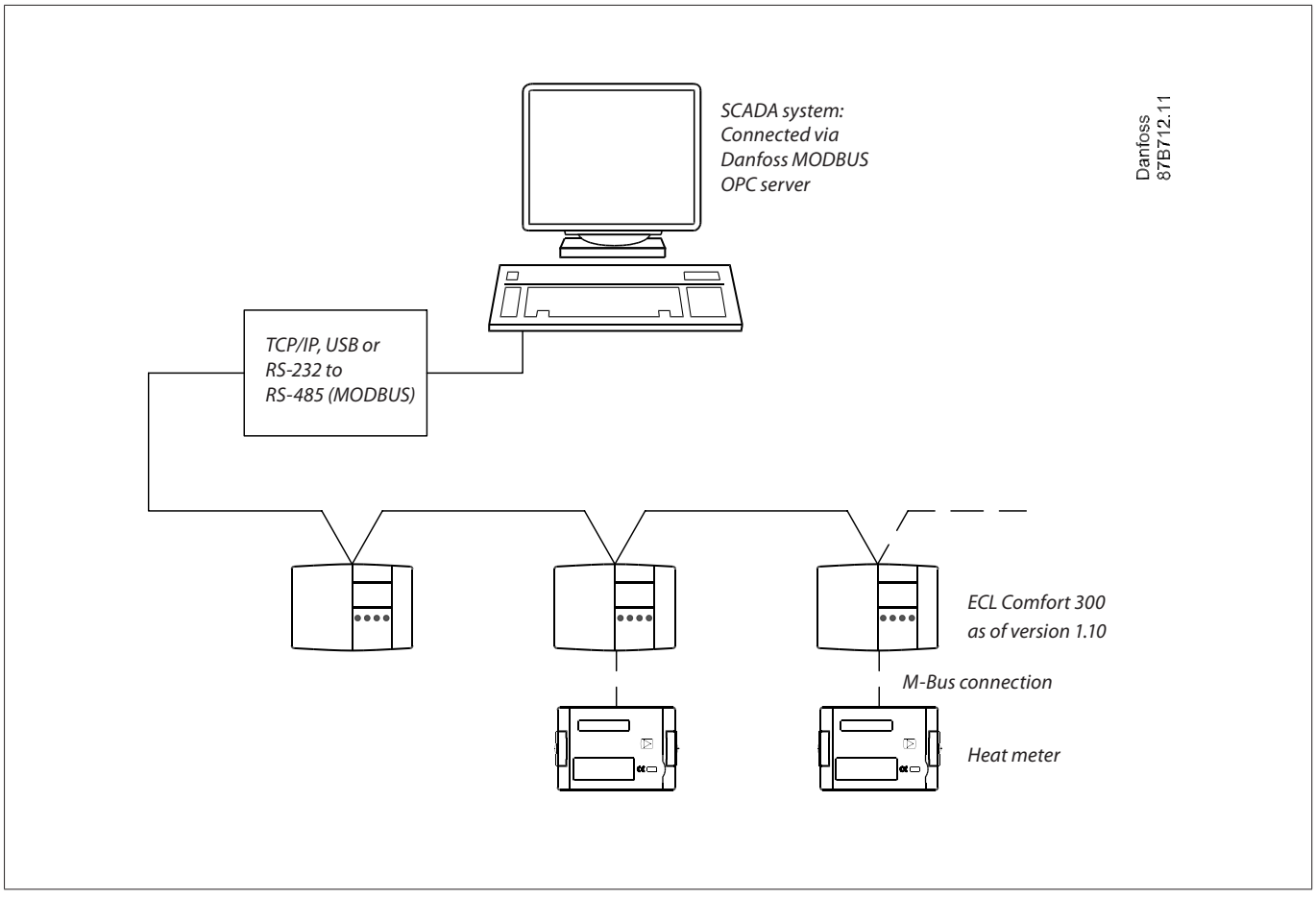
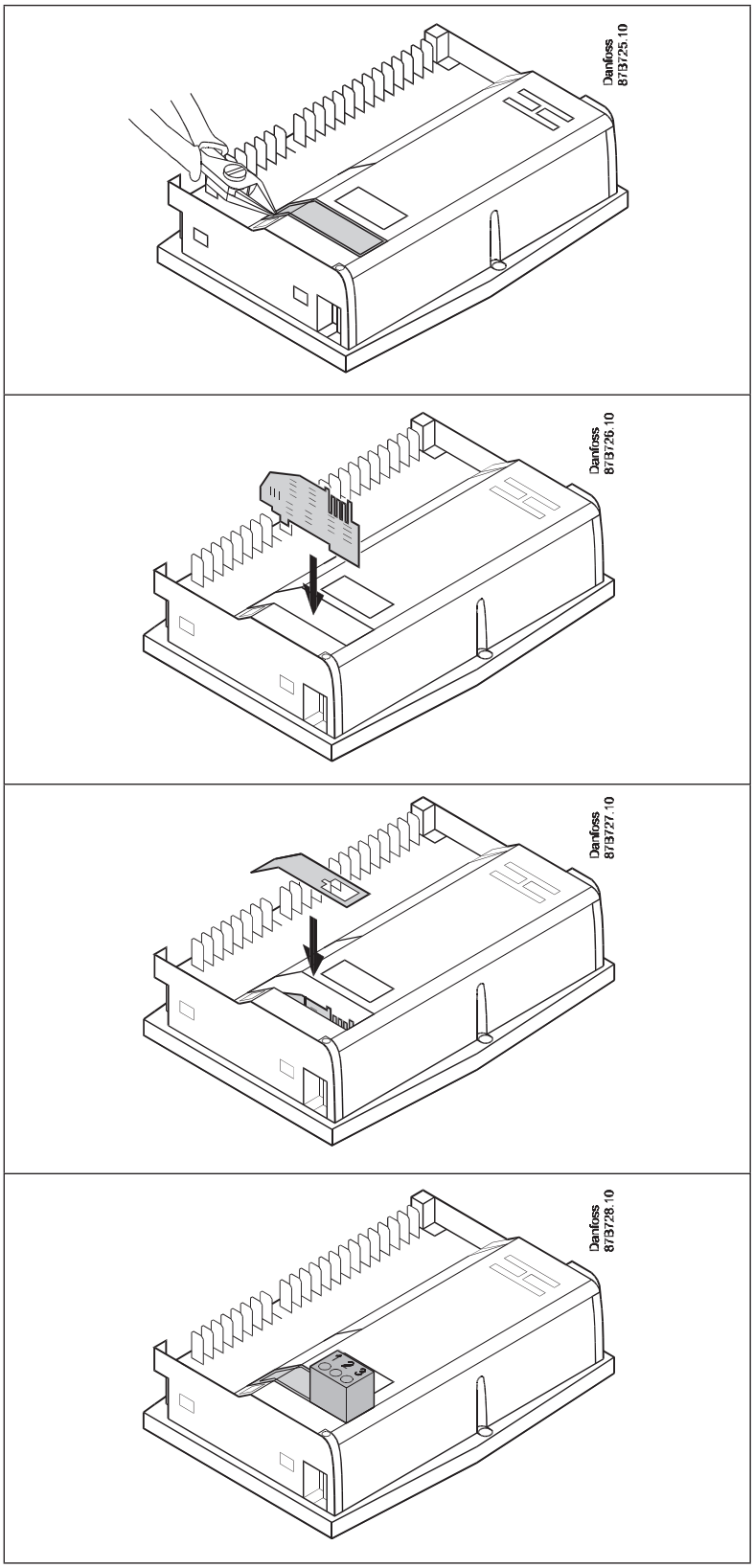


Fig. 2.1a: General network description

2.2 Mounting and wiring of the ECA 71



1. Dismount cover plate B on the rear side of the ECL Comfort controller by using a small wire cutter.
2. Insert the module into the slides and press it gently into the connector on the ECL Comfort CPU board.
3. Mount the new cover plate B which is delivered with the module.
4. The connector must be inserted into the ECL Comfort as shown here.

Fig. 2.2a: Mounting of the ECA 71 / 72

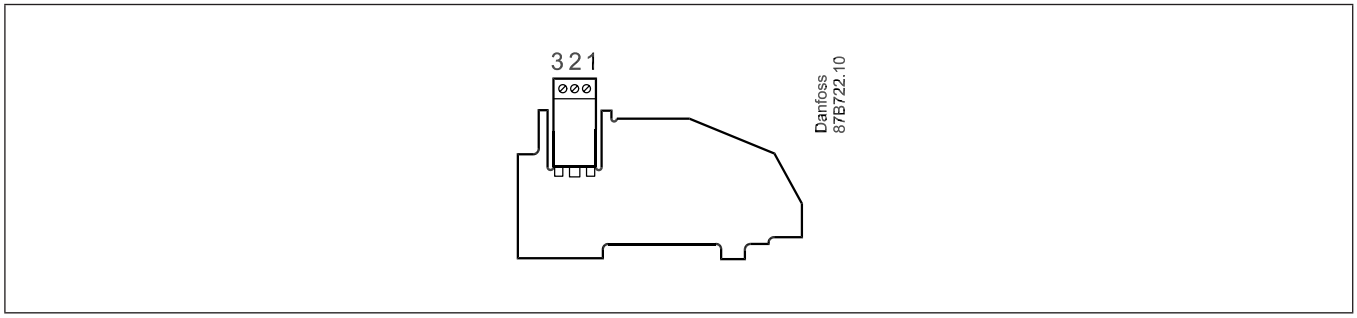


Fig. 2.2b: Wiring of the ECA 71

Pin connection ECA 71

Pin 1	Network connection MODBUS B / DATA + / D1
Pin 2 (middle)	Common / SGND
Pin 3	Network connection MODBUS A / DATA - / D0

The 2 poles + common are galvanically isolated. The pins are not interchangeable. There are no pull up / down resistors and no termination resistor.

2.3 Add devices to the network

When devices are added to the network, the master must be informed. In case of an OPC Server, this information is sent by means of the Configurator. Before adding a device to the network, it is advisable set the address. The address must be unique in the network.

It is recommended to maintain a map with description of device placement and their address.

2.3.1 Setup of addresses in the ECL Comfort 200/300/301

ECL Comfort 300 as of version 1.10:

- Go to line 199 (circuit I) on the grey side of the ECL Card.
- Hold the arrow down button for 5 seconds, parameter line A1 will appear (A2 and A3 are only available for ECA 73).
- The address menu is displayed (ECL Comfort 300 as of version 1.10 only)
- Choose an available address in the network (address 1-247)

Each ECL Comfort controller in the subnet must have a unique address.

ECL Comfort 200 all versions:
ECL Comfort 300 older versions (prior to 1.10):
ECL Comfort 301 all versions:

For all these ECL Comfort controllers, PC software is required for setting and reading the controller address in ECL Comfort. This software, the ECL Comfort Address Tool (ECAT), is downloadable from

http://heating.danfoss.com

System requirements:
The software is able to run under the following operating systems:

- Windows NT / XP / 2000.

PC requirements:

- Min. Pentium CPU
- Min. 5 MB free hard disk space
- Min. one free COM port for connection to the ECL Comfort controller
- A cable from the COM port for connection to the ECL Comfort controller front communication slot. This cable is available on stock (code no. 087B1162).

ECL Comfort Address Tool (ECAT):

- Download the software and run the file: ECAT.exe
- Choose the COM port into which the cable is connected
- Select a free address in the network. Please note that this tool cannot detect whether the same address is used more than once in an ECL Comfort controller
- Press 'Write'
- To verify that the address is correct, press 'Read'
- The button 'Blink' can be used to verify the connection to the controller. If 'Blink' is pressed, the controller starts blinking (press any button of the controller to stop the blinking again).

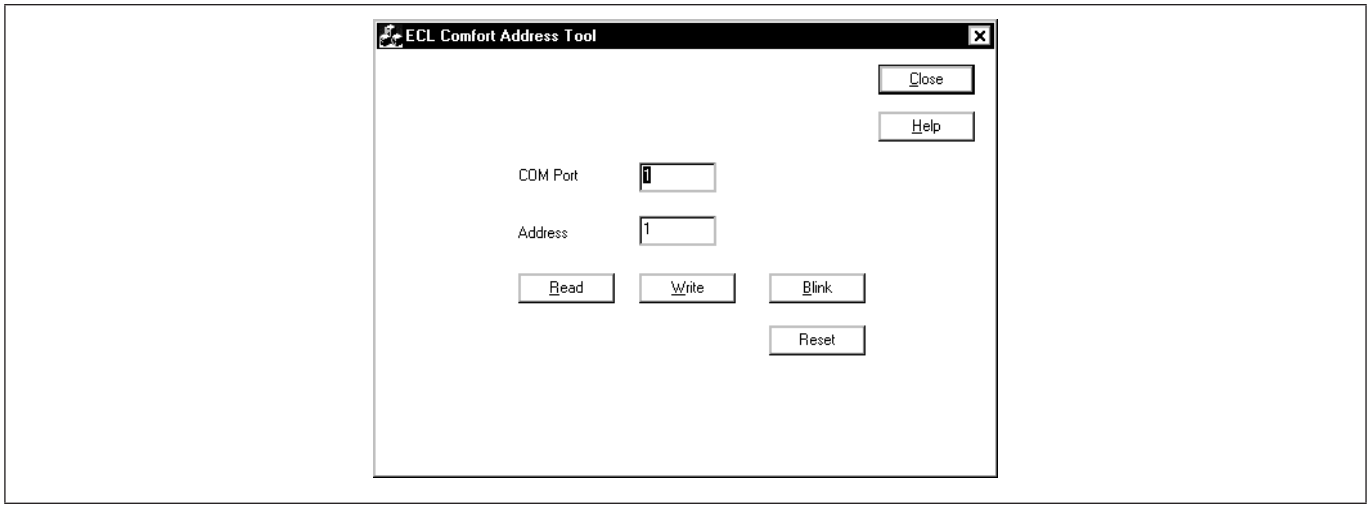


Fig. 2.3.1a: ECL Comfort Address Tool

Address rules

General guideline of the address rules used in the SCADA module:

1. An address can only be used once per network
2. Valid address range 1 – 247
3. The module uses the current or last known address
   a. Valid address in the ECL Comfort controller (set by the ECL Comfort Address Tool or directly in the ECL Comfort 300 as of version 1.10)
   b. The last used valid address
   c. If no valid address has been obtained, the module address is invalid

ECL Comfort 200 and ECL Comfort 300 older versions (prior to 1.10):
Any ECA module mounted inside the ECL Comfort controller must be removed before the address can be set. If the mounted ECA module is not removed before the address is set, the address setup will fail.

ECL Comfort 300 as of version 1.10 and ECL Comfort 301/ ECL Comfort 302:
No issues

3. General parameter description

3.1 Parameter naming

The parameters are divided into some functional sections, the main parts being the control parameter and schedule parameters. The complete parameter list can be found in the appendix.

All parameters correspond to the MODBUS term "holding register" (or "input register" when read-only). All parameters are therefore read/write accessed as one (or more) holding/input registers independently of data type.

3.2 Control parameters

The user interface parameters are located in the address range 11000 – 13999. The 1000th decimal indicates the ECL Comfort circuit number, i.e. 11xxx is circuit I, 12xxx is circuit II and 13xxx is circuit III.

The parameters are named (numbered) in accordance with their name in the ECL Comfort. A complete list of the parameters can be found in the appendix.

3.3 Schedules

The ECL Comfort divides the schedules into 7 days (1–7), each consisting of 48 x 30-minute periods.

The week schedule in circuit III has only one day. A maximum of 3 comfort periods can be set for each day.

Rules for schedule adjustment

1. The periods must be entered in chronological order, i.e. P1 ... P2 ... P3.
2. Start and stop values must be in the range 0, 30, 100, 130, 200, 230, …, 2300, 2330, 2400.
3. Start values must be before stop values if the period is active.
4. When a stop period is written to zero, the period is automatically deleted.
5. When a start period is written different from zero, a period is automatically added.

3.4 Mode and status

The mode and status parameters are located within the address range 4201 – 4213. The mode can be used to control the ECL Comfort mode. The status indicates the current ECL Comfort status.

If one circuit is set to manual mode, it applies to all circuits (i.e. the controller is in manual mode).

When the mode is changed from manual to another mode in one circuit, it also applies to all circuits in the controller. The controller automatically reverts to the previous mode if the information is available. If not (power failure / restart), the controller will revert to the default mode of all circuits which is scheduled operation.

If standby mode is chosen, the status will be indicated as setback.

Operating mode	Code
Manual operation	0
Scheduled operation	1
Constant comfort temperature	2
Constant setback temperature	3
Standby	4

Operating status	Code
Setback	0
Pre-comfort	1
Comfort	2
Pre-setback	3

3.5 Time and date

The time and date parameters are located in the address range 64045 – 64049.

When adjusting the date it is necessary to set a valid date. Example: If the date is 30/3 and must be set to 28/2, it is necessary to change the day first before changing the month.

3.6 Heat meter data

When an ECA 73 with heat meters (only when connected by M-Bus) is installed, it is possible to read the following values*.

- Actual flow
- Accumulated volume
- Actual power
- Accumulated energy
- Flow temperature
- Return temperature

For detailed information please consult the ECA 73 instructions and the appendix.

** Not all heat meters supports these values*

3.7 Special parameters

The special parameters include information about types and versions. The parameters can be found in the parameter list in the appendix. Only the ones with a special encoding/decoding are described here.

Device version

Parameter 2003 holds the device version. The number is based on the ECL Comfort application version N.nn, encoded 256*N + nn.

ECL Comfort application

Parameter 2108 holds the ECL Comfort application. The 2 last digits indicate the application number, and the first digit(s) the application letter.

Value	0	1	2	3	4	5	6	7	8	9	10	11	12
Letter	A	b	C	d	E	F	G	H	L	n	o	P	U

Example: 237, letter 2 = C and the number is 37 so the application is a C37.

4 Good behaviour in designing a district heating MODBUS network

In this chapter some basic design recommendations are listed. These recommendations are based on communication in heating systems. This chapter is built as an example of a network design. The example can vary from a specific application. The typical requirement in heating systems is to get access to a number of similar components and to be able to make a few adjustments. The illustrated performance levels might decrease in real systems.

In general it can be said that the network master controls the performance of the network.

4.1 Considerations before implementing communication

It is very important to be realistic when network and performance are specified. Some considerations have to be made in order to secure that important information is not blocked because of a frequent update of trivial information. Keep in mind that heating systems typically have long time constants, and hence can be polled less frequent.

4.2 Basic needs for information in SCADA systems

The ECL Comfort controller can support a network with some pieces of information concerning a heating system. It might be a good idea to consider how to split up the traffic that these different information types generate.

- Alarm handling:
  Values that are used to generate alarm conditions in the SCADA system.

- Error handling:
  In all networks errors will occur, error means time out, check of sum error, retransmission and extra traffic generated. The errors might be caused by EMC or other conditions, and it is important to reserve some bandwidth for error handling.

- Data logging:
  Logging of temperature etc. in a database is a function which typically is non-critical in a heating system. This function must normally run all the time "in the background". It is not recommended to include parameters such as set-points and other parameters that require user interaction to change.

- Online communication:
  This is a direct communication with a single controller. When a controller is chosen (e.g. service picture in a SCADA system) the traffic to this single controller is increased. Parameter values can be polled frequently in order to give the user fast response. When the online communication is no longer needed (e.g. leaving the service picture in a SCADA system), the traffic must be set back to the normal level.

- Other devices:
  Do not forget to reserve bandwidth for devices from other manufacturers and future devices. Heat meters, pressure sensors, and other devices have to share the network capacity.

The level for different kinds of communication types must be considered (an example is given in figure 4.2a).

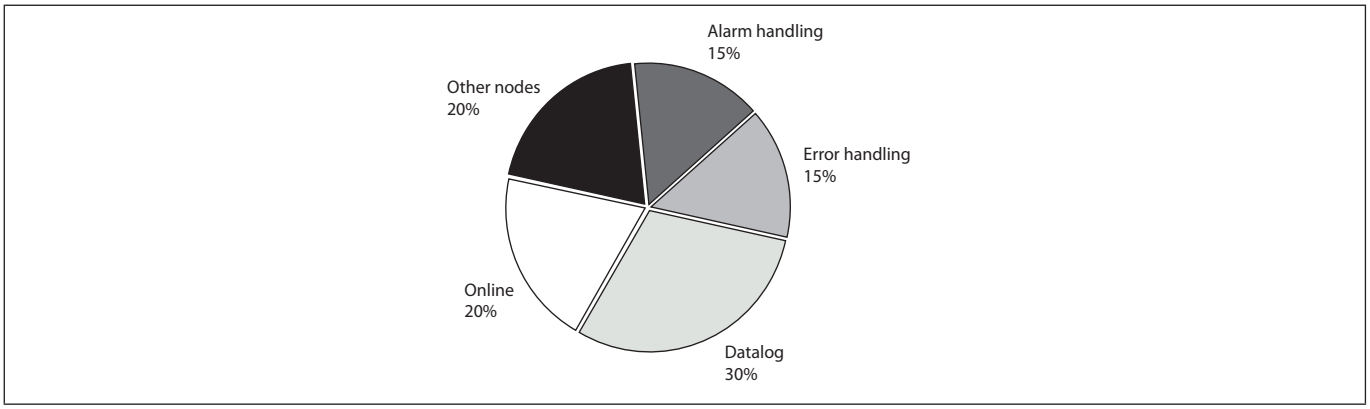


Fig. 4.2a: Split up of information type

4.3 Final number of nodes in the network

At start-up the network has to be designed with due consideration to the final number of nodes and the network traffic in the network.

A network with a few controllers connected might run without any bandwidth problems at all. When the network is increased, however, bandwidth problems might occur in the network. To solve such problems, the amount of traffic has to be decreased in all controllers, or extra bandwidth can be implemented.

4.4 Parallel network

If a large number of controllers are used in a limited area with a limited length of the communication cable, parallel network might be a way to generate more bandwidth.

If the master is located in the middle of the network, the network can easily be split-up into two and the bandwidth can be doubled.

4.5 Bandwidth considerations

The ECA 71 is based on a command/query and response, meaning that the SCADA system sends a command/query and the ECA 71 responses to this. Do not attempt to send new commands before the ECA 71 has send the latest response or the timeout expires.

In a MODBUS network it is not possible to send commands/queries to different devices at the same time (except broadcast). One command/query – response must be completed before the next can be started. It is necessary to think about the roundtrip time when designing the network. Larger networks will inherently have larger roundtrip times.

If multiple devices must have the same information, it is possible to use the broadcast address 0. Broadcast can only be used when no response is necessary, i.e. by a write command.

4.6 Update rate from the ECL Comfort controller

Values in the module are buffered values. The value update times depend on the application.

The following is a rough guideline:

Parameter type	**Update time (approx.)**
Control parameters	All parameters, once every 10 seconds
Schedule	One day, once a minute
Mode	Once every 15 seconds
Output	Once every 5 seconds
Time & date	Once every 30 seconds
M-Bus (actual values)	Once every 60 seconds (1 minute)
M-Bus (accumulated values)	Once every 300 seconds (5 minutes)

These update times indicate how often it is reasonable to read values from the different categories.

4.7 Minimize the copy of data in the network

Minimize the number of copied data. Adjust the poll time in the system to the actual need and the data update rate. It makes little sense to poll time and date every second when they only are updated once or twice every minute from the ECL Comfort controller.

4.8 Network layouts

The network must always be configured as a daisy chained network, see the three examples from a very simple network to more complex networks below.

Fig. 4.8a illustrates how termination and line polarization must be added. For specific details, consult the MODBUS specifications.

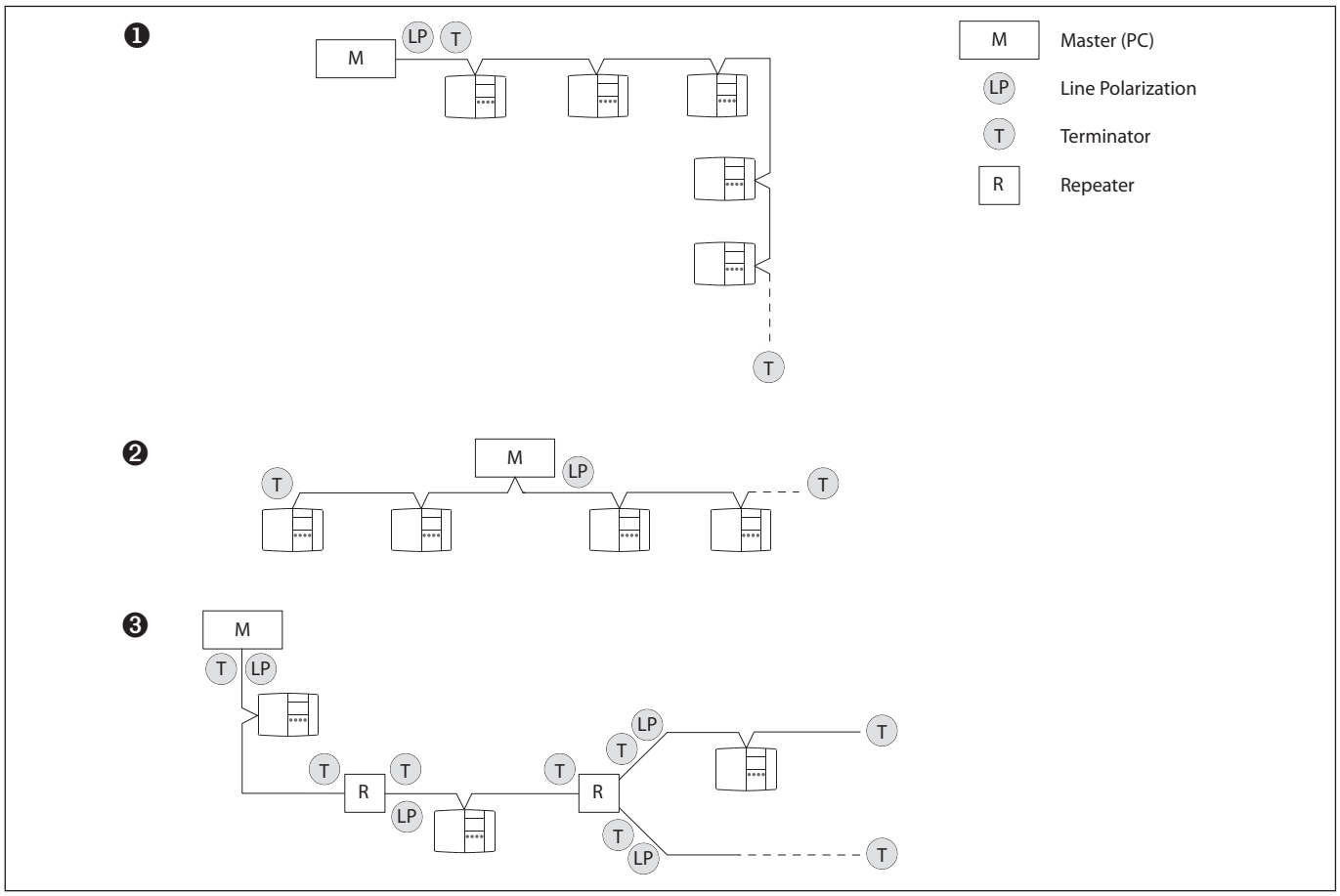


Fig. 4.8a: Daisy chain types

The network should not be configured as shown below:

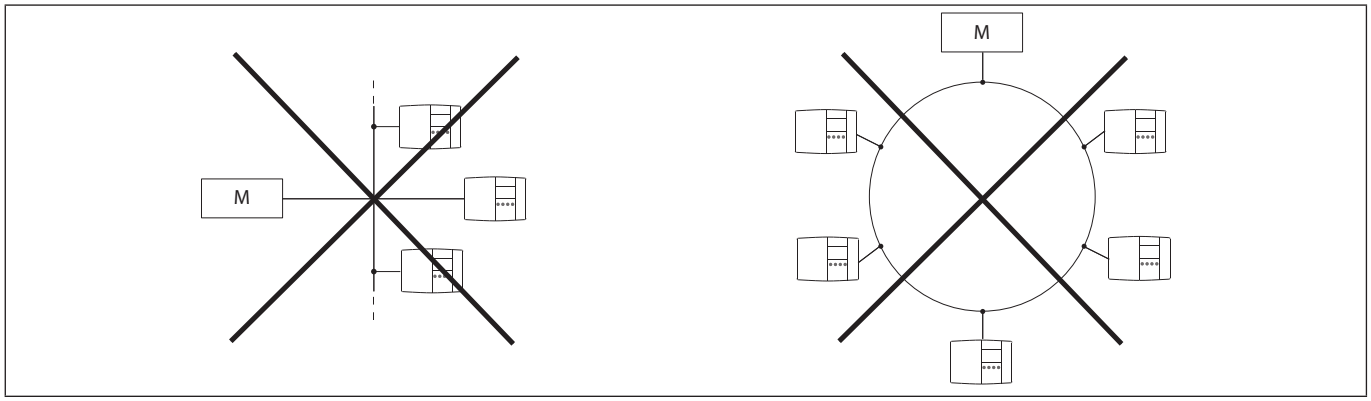


Fig. 4.8b: Not allowed

5. Protocol

The ECA 71 module is a MODBUS compliant device. The module supports a number of public function codes. The MODBUS application data unit (ADU) is limited to 50 bytes.

Supported public function codes

03 (0x03) Read Holding Registers
04 (0x04) Read Input Registers
06 (0x06) Write Single Register

5.1 Function codes

5.1.1 Function codes overview

Function	Function code	Comments
Read PNU	0x03	Single PNU/register only
Read PNU	0x04	Single PNU/holding register only
Write PNU	0x06	Single PNU/holding register only

5.1.2 MODBUS/ECA 71 messages

5.1.2.1 Read read-only parameter (0x03)

This function is used to read the value of an ECL Comfort read-only parameter number. Values are always returned as integer values and must be scaled according to the parameter definition.

Requesting a quantity of more than 17 parameters in sequence gives an error response. Requesting non-existing parameter number(s) will give an error response.

Request

Function code	1 byte	0x03
Start PNU	2 bytes	0x0064 – 0xffff
Quantity N of PNU	2 bytes	0x0001 – 0x0011

Response

Function code	1 byte	0x03
Byte count	1 byte	2 – 34
PNU data value	2 bytes	0x0000 – 0xffff

Error

Function code	1 bytes	0x83
Error code	2 bytes	1, 2, 3 or 4

The request/response is MODBUS compliant when reading a sequence of parameters (Read input register).

5.1.2.2 Read parameters (0x04)

This function is used to read the value of an ECL Comfort parameter number. Values are always returned as integer values and must be scaled according to the parameter definition.

Requesting a quantity of more than 17 parameters gives an error response. Requesting non-existing parameter number(s) will give an error response.

Request

Function code	1 byte	0x04
Start PNU	2 bytes	0x0064 – 0xffff
Quantity N of PNU	2 bytes	0x0001 – 0x0011

Response

Function code	1 byte	0x04
Byte count	1 byte	2 - 34
PNU data value	2 bytes	0x0000 – 0xffff

Error

Function code	1 byte	0x84
Error code	2 bytes	1, 2, 3 or 4

The request/response is MODBUS compliant reading a sequence of parameters (Read input register).

5.1.2.3 Write parameter number (0x06)

This function is used to write a new setting value to an ECL Comfort parameter number. Values must be written as integer values and must be scaled according to the parameter definition.

Attempts to write a value outside the valid range will give an error response. The minimum and maximum values must be obtained from the instructions for ECL Comport controller.

Request

Function code	1 byte	0x06
Write PNU	2 bytes	0x0064 – 0xffff
New PNU value	2 bytes	0x0000 – 0xffff

Response

Function code	1 byte	0x06
Write PNU	2 bytes	0x0064 – 0xffff
New PNU value	2 bytes	0x0000 – 0xffff

Error

Function code	1 byte	0x86
Error code	2 bytes	1, 2, 3 or 4

The request/response is MODBUS compliant when writing a parameter (Write single register).

5.2 Broadcasts

The modules support MODBUS broadcast messages (unit address = 0).

Command/function where a broadcast is usable
- write ECL parameter (0x06)

5.3 Error codes

For specific details, please consult the specifications
- Modbus Application Protocol V1.1a.
- MODBUS over Serial Line, Specification & Implementation guide V1.0

both of which can be found on http://www.modbus.org/

6. Dismounting

Disposal instruction:

This product should be dismantled and its components sorted, if possible, in various groups before recycling or disposal.

Always follow the local disposal regulations.

Appendix

Parameter list

ECL Comfort control parameters

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter line	Cir. I	Cir. II	Cir. III		default 0
11	11 Cancel red	Setback temperature dependent on outdoor temperature	11011	12011	NA	R/W	
12	12 Boost	Boost	11012	12012	NA	R/W	
13	13 Ref ramp	Reference ramping	11013	12013	NA	R/W	
14	14 Opt const	Optimizing time constant	11014	12014	NA	R/W	
16	16 Frost lim	Frost protection by DHW circulation pump	11016	NA	NA	R/W	
17	17 Tref f back	Influence on desired flow temperature Temperature reference feedback	11017	NA	NA	R/W	
18	18 Ball tmp	Balance temperature	11018	NA	NA	R/W	
21	21 Total stop	Total stop Relay 1 (R1) function related to room temperature	11021	12021	NA	R/W	
30	30 RTL const	Return temperature limitation Limitation temperature, sensor S4	11030	12030	NA	R/W	
31	31 RTL upper X	Return temperature limitation - upper limit (X-axis)	11031	12031	NA	R/W	
32	32 RTL upper Y	Return temperature limitation - upper limit (Y-axis)	11032	12032	NA	R/W	
33	33 RTL lower X	Return temperature limitation - lower limit (X-axis)	11033	12033	NA	R/W	
34	34 RTL lower Y	Return temperature limitation - lower limit (Y-axis)	11034	12034	NA	R/W	
35	35 RTI max	Limitation temperature influence, max.	11035	12035	NA	R/W	-1
36	36 RTI min	Limitation temperature influence, min.	11036	12036	NA	R/W	-1
37	37 Adaptive RTL	Time constant for temperature limitation Time constant for return temperature limitation	11037	12037	NA	R/W	
44	44 Max DHW load	Max. DHW charging time	11044	12044	NA	R/W	
45	45 Max heat time	DHW charging deactivation time Compensation of heat loss in circulation circuit	11045	12045	NA	R/W	
53	53 PI ref DHW	Desired flow temperature, DHW charging	11053	12053	NA	R/W	
57	57 Comp infl min	Temperature influence by S4, sliding frost protection Surface temperature influence during cooling	11057	12057	NA	R/W	-1
58	58 Comp	Compensation	11058	12058	NA	R/W	
59	59 Adaptive comp	Adaptive function of compensation	11059	12059	NA		
60	60 Comp limit	Compensation temperature, 1. point Surface temperature limitation during heating Max. slab temperature limitation	11060	12060	NA	R/W	
61	61 Comp infl max	Compensation temperature influence, 1. point, max. limitation	11061	12061	NA	R/W	-1
62	62 Comp infl min	Influence at max. slab temperature Compensation temperature influence, 1. point, min. limitation Surface temperature influence during heating	11062	12062	NA	R/W	-1
63	63 Adaptive comp	Time constant, compensation temperature Adaptive function of max. slab temperature limitation Adaptation of the surface temperature limitation	11063	12063	NA	R/W	
64	64 Comp limit	Compensation temperature, 2. point Min. slab temperature limitation Flow temperature, max. limitation during heating (thermostatic function)	11064	12064	NA	R/W	
65	65 Comp infl max	Compensation temperature influence, 2. point, max. limitation Influence at min. slab temperature	11065	12065	NA	R/W	-1
66	66 Comp infl min	Compensation temperature influence, 2. point, min. limitation	11066	12066	NA	R/W	-1
67	67 Adaptive comp	Adaptive function of min. slab temperature limitation Adaptive function of S2 flow temperature during DHW charging	11067	12067	NA	R/W	

ECL Comfort control parameters

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter line	Cir. I	Cir. II	Cir. III		default 0
78	78 Setpoint	Desired temperature for anti-bacteria function Activation of humidistat	11078	12078	NA	R/W	
80	80 Time set-up	Anti-bacteria function period Humidistat, post activation	11080	12080	NA	R/W	
99	99 Man valve pos	Set valve position manual (0-250)	11099	12099	NA	R/W	
100	100 Acc Out tmp	Accumulated outdoor temperature	11100	12100	NA	R	
101	101 Acc room tmp	Accumulated room temperature	11101	12101	NA	R	
102	102 RH	Actual humidity	11102	12102	NA	R	
103	103 CSPT	Dew point temperature	11103	12103	NA	R	
104	104 Valve pos	Valve position 0-100%	11104	12104	NA	R	
110	110 Act value	Actual flow / energy	11110	12110	NA	R	
111	111 Setpoint	Flow / enegy limitation	11111	12111	NA	R/W	
112	112 Flow int	Integrator time constant	11112	12112	NA	R/W	
113	113 Flow filter	Filter time constant	11113	12113	NA	R/W	
114	114 Flow type	M-Bus / amount of unit	11114	12114	NA	R/W	
115	115 Flow unit	Flow / energy unit	11115	12115	NA	R/W	
116	116 FL upper y	Flow / energy limitation - upper limit (Y-axis)	11116	12116	NA	R/W	
117	117 FL lower y	Flow / energy limitation - lower limit (Y-axis)	11117	12117	NA	R/W	
118	118 FL upper x	Flow / energy limitation - upper limit (X-axis)	11118	12118	NA	R/W	
119	119 FL lower x	Flow / energy limitation - lower limit (X-axis)	11119	12119	NA	R/W	
133	133 Prop Xp low	Proportional band, Xp - lower circuit III	11133	12133	NA	R/W	
134	134 Prop Xp up	Proportional band, Xp - upper circuit III	11134	12134	NA	R/W	
135	135 Int const Tn	Integration time constant, Tn circuit III	11135	12135	NA	R/W	
136	136 Neutral zone	Neutral zone - Nz circuit III	11136	12136	NA	R/W	
142	142 Alarm type	Function of input S2 TR restart period	11142	12142	13142	R/W	
146	146 Alarm setpt4	TST pressure stabilization time	11146	12146	NA	R/W	
156	156 Cooling out	Activation / deactivation of cooling, accumulated outdoor temperature	11156	12156	NA	R/W	
157	157 Cooling room	Activation / deactivation of cooling, accumulated room temperature Acceptable temperature deviation below desired flow temperature (ΔT1ALARM)	11157	12157	NA	R/W	
158	158 R infl heat	Room temperature influence, heating Acceptable temperature deviation above the desired flow temperature (ΔT2ALARM)	11158	12158	NA	R/W	
159	159 R infl cool	Room temperature influence, cooling Time interval ΔtALARM before activation of alarm function	11159	12159	NA	R/W	
160	160 Max outdoor	Max. outdoor temperature (cut-in / cut-out value)	11160	12160	NA	R/W	
161	161 Min outdoor	Min. outdoor temperature (cut-in / cut-out value)	11161	12161	NA	R/W	
162	162 Setpoint	Generel set-point	11162	12162	NA	R/W	
163	163 R diff cool	Cooling, activation difference, actual room temperature	11163	12163	NA	R/W	
164	164 Disp COCSPT	Displacement of the calculated dew point temperature	11164	12164	NA	R/W	
C	175 Heat curve	Slope	11175	12175	NA	R/W	-1
175	175 Heat curve	Slope	11175	12175	NA	R/W	-1
176	176 Paral disp	Parallel displacement	11176	12176	NA	R/W	
2	177 Flow tmp min	Flow temperature, min. limits Boiler flow temperature limits, min.	11177	12177	NA	R/W	
177	177 Flow tmp min	Flow temperature , min. limits	11177	12177	NA	R/W	
178	178 Flow tmp max	Flow temperature , max. limits	11178	12178	NA	R/W	

ECL Comfort control parameters

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter line	Cir. I	Cir. II	Cir. III		default 0
1	179 Heat cut out	Limit for heating cut-out	11179	12179	NA	R/W	
179	179 Heat cut out	Limit for heating cut-out	11179	12179	NA	R/W	
A	180 Day setpt	Desired room temperature - comfort	11180	12180	NA	R/W	
180	180 Day setpt	Desired room temperature - comfort	11180	12180	NA	R/W	
181	181 Night setpt	Desired room temperature - setback	11181	12181	NA	R/W	
B	182 Room inf max	Room temperature influence - max	11182	12182	NA	R/W	-1
3	182 Room inf max	Room temperature influence	11182	12182	NA	R/W	-1
182	182 Room inf max	Room temperature influence - max	11182	12182	NA	R/W	-1
183	183 Room inf min	Room temperature influence - min Room temperature influence	11183	12183	NA	R/W	-1
4	184 Prob Xp	Proportional band, Xp	11184	12184	NA	R/W	
184	184 Prob Xp	Proportional band - Xp	11184	12184	NA	R/W	
5	185 Int const Tn	Integration time constant, Tn	11185	12185	NA	R/W	
185	185 Int const Tn	Integration constant - Tn	11185	12185	NA	R/W	
6	186 Run time	Running time of the motorized control valve	11186	12186	NA	R/W	
186	186 Run time	Running time of the motorized control valve	11186	12186	NA	R/W	
7	187 Neutral zone	Neutral zone, Nz	11187	12187	NA	R/W	
187	187 Neutral zone	Neutral zone - Nz	11187	12187	NA	R/W	
188	188 BEM	BEM-function Boiler temperature difference	11188	NA	NA	R/W	
190	190 DHW day	Desired DHW temperature - comfort	11190	12190	13190	R/W	
191	191 DHW night	Desired DHW temperature - setback	11191	12191	13191	R/W	
192	192 DHW diff	DHW temperature difference	11192	12192	NA	R/W	
193	193 Charging tmp	Charging temperature difference	11193	12193	NA	R/W	
194	194 Diff1 cutout	Cut-out temperature difference - (lower sensor)* Temperature difference at DHW charging, cut-out temperature difference - lower tank temperature sensor	11194	12194	NA	R/W	
195	195 Diff2 cutin	Cut-in temperature difference - (upper sensor)* Temperature at DHW charging, cut-in temperature difference - upper tank temperature sensor	11195	12195	NA	R/W	
198	198 Summertime	Daylight saving time changeover	11198	NA	NA	R/W	

Time counters

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter	Cir. I	Cir. II	Cir. III		default 0
	Minutes step 1	Minutes step 1	11213	12213	NA	R	
	Minutes step 2	Minutes step 2	11214	12214	NA	R	
	Hours step 1	Hours step 1	11215	12215	NA	R	
	Hours step 2	Hours step 2	11216	12216	NA	R	
	Cutin step1	Cut in step 1	11242	12242	NA	R	
	Cutin step2	Cut in step 2	11243	12243	NA	R	
	Cutin 1000 step1	Cut in * 1000 step 1	11245	12245	NA	R	
	Cutin 1000 step2	Cut in * 1000 step 2	11246	12246	NA	R	

Sensors and references

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter	Cir. I	Cir. II	Cir. III		default 0
	S1 sensor	S1 sensor	11201	NA	NA	R/W	-1
	S2 sensor	S2 sensor	11202	12202	13202	R	-1
	S3 sensor	S3 sensor	11203	12203	13203	R	-1
	S4 sensor	S4 sensor	11204	12204	13204	R	-1
	S5 sensor	S5 sensor	11205	12205	13205	R	-1
	S6 sensor	S6 sensor	11206	12206	13206	R	-1
	Room temp	Room temperature	11211	12211	NA	R	-1
	Minutes step 1	Minutes step 1	11213	12213	NA	R	-1
	Minutes step 2	Minutes step 2	11214	12214	NA	R	
	Hours step 1	Hours step 1	11215	12215	NA	R	
	Hours step 2	Hours step 2	11216	12216	NA	R	
	1000 h step 1	Hours * 1000 step 1	11218	12218	NA	R	
	1000 h step 2	Hours * 1000 step 2	11219	12219	NA	R	
	NA	Relative humidity	11220	12220	NA	R	
	S7 sensor	S7 options sensor	11221	12221	13221	R	-1
	S8 sensor	S8 options sensor	11222	12222	13222	R	-1
	S9 sensor	S9 options sensor	11223	12223	13223	R	-1
	S10 sensor	S10 options sensor	11224	12224	13224	R	-1
	S1 reference	S1 sensor 1 reference	11228	12228	13228	R	-1
	S2 reference	S2 sensor 2 reference	11229	12229	13229	R	-1
	S3 reference	S3 sensor 3 reference	11230	12230	13230	R	-1
	S4 reference	S4 sensor 4 reference	11231	12231	13231	R	-1
	S5 reference	S5 sensor 5 reference	11232	12232	13232	R	-1
	S6 reference	S6 sensor 6 reference	11233	12233	13233	R	-1
	Cutin step1	Cut in step 1	11242	12242	NA	R	
	Cutin step2	Cut in step 2	11243	12243	NA	R	
	Cutin 1000 step1	Cut in * 1000 step 1	11245	12245	NA	R	
	Cutin 1000 step2	Cut in * 1000 step 2	11246	12246	NA	R	
	S7 reference	S7 sensor reference	11248	12248	13248	R	-1
	S8 reference	S8 sensor reference	11249	12249	13249	R	-1
	S9 reference	S9 sensor reference	11250	12250	13250	R	-1
	S10 reference	S10 sensor reference	11251	12251	13251	R	-1

Output status

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter	Cir. I	Cir. II	Cir. III		default 0
	Relay 1	Relay 1 status	4001	NA	NA	R/W	
	Relay 2	Relay 2 status	4002	NA	NA	R/W	
	Relay 3	Relay 3 status	4003	NA	NA	R/W	
	Relay 4	Relay 4 status	4004	NA	NA	R	
	Relay 5	Relay 5 status	4005	NA	NA	R	
	Triac 1	Triac 1 status	4101	NA	NA	R/W	
	Triac 2	Triac 2 status	4102	NA	NA	R/W	
	Triac 3	Triac 3 status	4103	NA	NA	R/W	
	Triac 4	Triac 4 status	4104	NA	NA	R/W	
	Alarm word	Alarm word	4110	NA	NA	R	

Controller mode

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter	Cir. I	Cir. II	Cir. III		default 0
	Cir 1 mode	Circuit 1 mode	4201	NA	NA	R/W	
	Cir 2 mode	Circuit 2 mode	4202	NA	NA	R/W	
	Cir 3 mode	Circuit 3 mode	4203	NA	NA	R/W	
	Cir 1 status	Circuit 1 status	4211	NA	NA	R	
	Cir 2 status	Circuit 2 status	4212	NA	NA	R	
	Cir 3 status	Circuit 3 status	4213	NA	NA	R	

Schedules

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter line	Cir. I	Cir. II	Cir. III		default 0
	Active Schedule	Active Schedule (X-value Schedule)	1100	NA	NA	R/W	
	Monday P1 ON	Schedule Monday circuit X period 1 start	1110	NA	NA	R/W	
	Monday P1 OFF	Schedule Monday circuit X period 1 stop	1111	NA	NA	R/W	
	Monday P2 ON	Schedule Monday circuit X period 2 start	1112	NA	NA	R/W	
	Monday P2 OFF	Schedule Monday circuit X period 2 stop	1113	NA	NA	R/W	
	Monday P3 ON	Schedule Monday circuit X period 3 start	1114	NA	NA	R/W	
	Monday P3 OFF	Schedule Monday circuit X period 3 stop	1115	NA	NA	R/W	
	Tuesday P1 ON	Schedule Tuesday circuit X period 1 start	1120	NA	NA	R/W	
	Tuesday P1 OFF	Schedule Tuesday circuit X period 1 stop	1121	NA	NA	R/W	
	Tuesday P2 ON	Schedule Tuesday circuit X period 2 start	1122	NA	NA	R/W	
	Tuesday P2 OFF	Schedule Tuesday circuit X period 2 stop	1123	NA	NA	R/W	
	Tuesday P3 ON	Schedule Tuesday circuit X period 3 start	1124	NA	NA	R/W	
	Tuesday P3 OFF	Schedule Tuesday circuit X period 3 stop	1125	NA	NA	R/W	
	Wednesday P1 ON	Schedule Wednesday circuit X period 1 start	1130	NA	NA	R/W	
	Wednesday P1 OFF	Schedule Wednesday circuit X period 1 stop	1131	NA	NA	R/W	
	Wednesday P2 ON	Schedule Wednesday circuit X period 2 start	1132	NA	NA	R/W	
	Wednesday P2 OFF	Schedule Wednesday circuit X period 2 stop	1133	NA	NA	R/W	
	Wednesday P3 ON	Schedule Wednesday circuit X period 3 start	1134	NA	NA	R/W	
	Wednesday P3 OFF	Schedule Wednesday circuit X period 3 stop	1135	NA	NA	R/W	
	Thursday P1 ON	Schedule Thursday circuit X period 1 start	1140	NA	NA	R/W	
	Thursday P1 OFF	Schedule Thursday circuit X period 1 stop	1141	NA	NA	R/W	
	Thursday P2 ON	Schedule Thursday circuit X period 2 start	1142	NA	NA	R/W	
	Thursday P2 OFF	Schedule Thursday circuit X period 2 stop	1143	NA	NA	R/W	
	Thursday P3 ON	Schedule Thursday circuit X period 3 start	1144	NA	NA	R/W	
	Thursday P3 OFF	Schedule Thursday circuit X period 3 stop	1145	NA	NA	R/W	
	Friday P1 ON	Schedule Friday circuit X period 1 start	1150	NA	NA	R/W	
	Friday P1 OFF	Schedule Friday circuit X period 1 stop	1151	NA	NA	R/W	
	Friday P2 ON	Schedule Friday circuit X period 2 start	1152	NA	NA	R/W	
	Friday P2 OFF	Schedule Friday circuit X period 2 stop	1153	NA	NA	R/W	
	Friday P3 ON	Schedule Friday circuit X period 3 start	1154	NA	NA	R/W	
	Friday P3 OFF	Schedule Friday circuit X period 3 stop	1155	NA	NA	R/W	
	Saturday P1 ON	Schedule Saturday circuit X period 1 start	1160	NA	NA	R/W	
	Saturday P1 OFF	Schedule Saturday circuit X period 1 stop	1161	NA	NA	R/W	
	Saturday P2 ON	Schedule Saturday circuit X period 2 start	1162	NA	NA	R/W	
	Saturday P2 OFF	Schedule Saturday circuit X period 2 stop	1163	NA	NA	R/W	
	Saturday P3 ON	Schedule Saturday circuit X period 3 start	1164	NA	NA	R/W	
	Saturday P3 OFF	Schedule Saturday circuit X period 3 stop	1165	NA	NA	R/W	
	Sunday P1 ON	Schedule Sunday circuit X period 1 start	1170	NA	NA	R/W	
	Sunday P1 OFF	Schedule Sunday circuit X period 1 stop	1171	NA	NA	R/W	
	Sunday P2 ON	Schedule Sunday circuit X period 2 start	1172	NA	NA	R/W	
	Sunday P2 OFF	Schedule Sunday circuit X period 2 stop	1173	NA	NA	R/W	
	Sunday P3 ON	Schedule Sunday circuit X period 3 start	1174	NA	NA	R/W	
	Sunday P3 OFF	Schedule Sunday circuit X period 3 stop	1175	NA	NA	R/W	

M-Bus data from heat meter

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter line	Cir. I	Cir. II	Cir. III		default 0
	Flow 1	M-Bus slave 1 actual flow value	4501	NA	NA	R	-1
	Flow unit 1	M-Bus slave 1 actual flow unit	4502	NA	NA	R	
	Volumen 1	M-Bus slave 1 accumulated volumen value	4503	NA	NA	R	
	Volumen unit 1	M-Bus slave 1 accumulated volumen unit	4504	NA	NA	R/W	
	Power 1	M-Bus slave 1 actual power value	4505	NA	NA	R	-1
	Power unit 1	M-Bus slave 1 actual power unit	4506	NA	NA	R	
	Energy 1	M-Bus slave 1 accumulated energy value	4507	NA	NA	R	
	Energy unit 1	M-Bus slave 1 accumulated energy unit	4508	NA	NA	R/W	
	Flow temp 1	M-Bus slave 1 flow temperature	4509	NA	NA	R	-1
	Return temp 1	M-Bus slave 1 return temperature	4510	NA	NA	R	-1
	Flow 2	M-Bus slave 2 actual flow value	4521	NA	NA	R	-1
	Flow unit 2	M-Bus slave 2 actual flow unit	4522	NA	NA	R	
	Volumen 2	M-Bus slave 2 accumulated volumen value	4523	NA	NA	R	
	Volumen unit 2	M-Bus slave 2 accumulated volumen unit	4524	NA	NA	R/W	
	Power 2	M-Bus slave 2 actual power value	4525	NA	NA	R	-1
	Power unit 2	M-Bus slave 2 actual power unit	4526	NA	NA	R	
	Energy 2	M-Bus slave 2 accumulated energy value	4527	NA	NA	R	
	Energy unit 2	M-Bus slave 2 accumulated energy unit	4528	NA	NA	R/W	
	Flow temp 2	M-Bus slave 2 flow temperature	4529	NA	NA	R	-1
	Return temp 2	M-Bus slave 2 return temperature	4530	NA	NA	R	-1

Data from ECA 83 and ECA 88

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter line	Cir. I	Cir. II	Cir. III		default 0
	Analog 1	Analog input 1 (ECA 83)	4601	NA	NA	R	-1
	Analog 2	Analog input 2 (ECA 83)	4602	NA	NA	R	-1
	NA	Accumulated pulse circuit 1 (high word)	4611	NA	NA	R/W	
	NA	Accumulated pulse circuit 1 (low word)	4612	NA	NA	R/W	
	NA	Accumulated pulse circuit 2 (high word)	4613	NA	NA	R/W	
	NA	Accumulated pulse circuit 2 (low word)	4614	NA	NA	R/W	

M-Bus high resolution data from heat meter

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter line	Cir. I	Cir. II	Cir. III		default 0
	NA	M-Bus slave 1 high res. Accumulated volumen unit	4620	NA	NA	R/W	
	NA	M-Bus slave 1 high res. Accumulated volumen (high word)	4621	NA	NA	R	
	NA	M-Bus slave 1 high res. Accumulated volumen (low word)	4622	NA	NA	R	
	NA	M-Bus slave 1 high res. Accumulated energy unit	4623	NA	NA	R/W	
	NA	M-Bus slave 1 high res. Accumulated energy (high word)	4624	NA	NA	R	
	NA	M-Bus slave 1 high res. Accumulated energy (low word)	4625	NA	NA	R	
	NA	M-Bus slave 1 high res. Accumulated volumen unit	4626	NA	NA	R/W	
	NA	M-Bus slave 2 high res. Accumulated volumen (high word)	4627	NA	NA	R	
	NA	M-Bus slave 2 high res. Accumulated volumen (low word)	4628	NA	NA	R	
	NA	M-Bus slave 1 high res. Accumulated energy unit	4629	NA	NA	R/W	
	NA	M-Bus slave 2 high res. Accumulated energy (high word)	4630	NA	NA	R	
	NA	M-Bus slave 2 high res. Accumulated energy (low word)	4631	NA	NA	R	

Time, date and system

			PNU (Parameter NUmber)			Access	Scale 10^{-x}
ECL line	Upload text	ECL Comfort parameter line	Cir. I	Cir. II	Cir. III		default 0
	Hour	Hour	64045			R/W	
	Minutes	Min	64046			R/W	
	DayMonth	Date	64047			R/W	
	Month	Month	64048			R/W	
	Year	Year	64049			R/W	
	ECL SW ver	ECL Comfort software version	2003			R	-1
	Manual control	Manual control	2004			R/W	
	ECL net adr	ECL Comfort network address	2008			R	
	ECL Code No	ECL Comfort Code number	2011			R	
	ECA SW ver	Modbus / LON software version	2012			R	-1
	NA	ECA module SW version	2103			R	
	NA	ECA module HW version/revision	2104			R	
	NA	ECL Comfort SW version	2105			R	
	NA	ECL Comfort HW Type	2106			R	
	NA	ECL Comfort Hardware version/revision	2107			R	

Explanations:

ECL line	The parameter line according to the ECL Comfort user interface / instructions
Upload text	Text to be uploaded from the ECA 71 which is used in the ServiceTool
ECL Comfort parameter line	Description of the parameter
Cir.	Circuit in the ECL Comfort controller
Access	Read / write permission
Scale	Decimal numbers cannot be send so the sent value is divided by 10^{-1}. Example: The slope has the scale $^{-1}$. Value read = 18. 18 x 10^{-1} = 1.8

* 0 8 7 R 9 7 7 5 *
* V I K P 0 2 0 2 *

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