

Instructions

ECL Comfort 210 / 296 / 310, communication description



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1. Introduction

This document describes the various communication possibilities built into the ECL Comfort 210, ECL Comfort 296 and ECL Comfort 310 product family.

The initial sections describe the main communication interfaces and their specific properties. The following describes Modbus specific implementations.

The last section describes the communication details of the ECL 485 master/slave bus.

For specific application details consult the application instructions, where the needed information about sensor and output assignments is available.

The application instructions are available here
<http://heating.danfoss.com>

For quick reference to some of the most typical used parameters in SCADA, see the section Parameter list (PNU list) in the Appendix.

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2. ECL Comfort 210/296/310 communication interfaces

There are three communication interfaces for the ECL Comfort 210/296/310.

- USB service port, Modbus RTU with relaxed timing (non Modbus standard)
- RS-485 Modbus RTU, ECL Comfort 296 / 310 with galvanic isolation
- Modbus/TCP, Ethernet communication, ECL Comfort 296 / 310 only

Furthermore, there is an M-bus communication interface for heat meters and an ECL 485 bus for master/slave communication between ECL Comfort 210/296/310 products only.

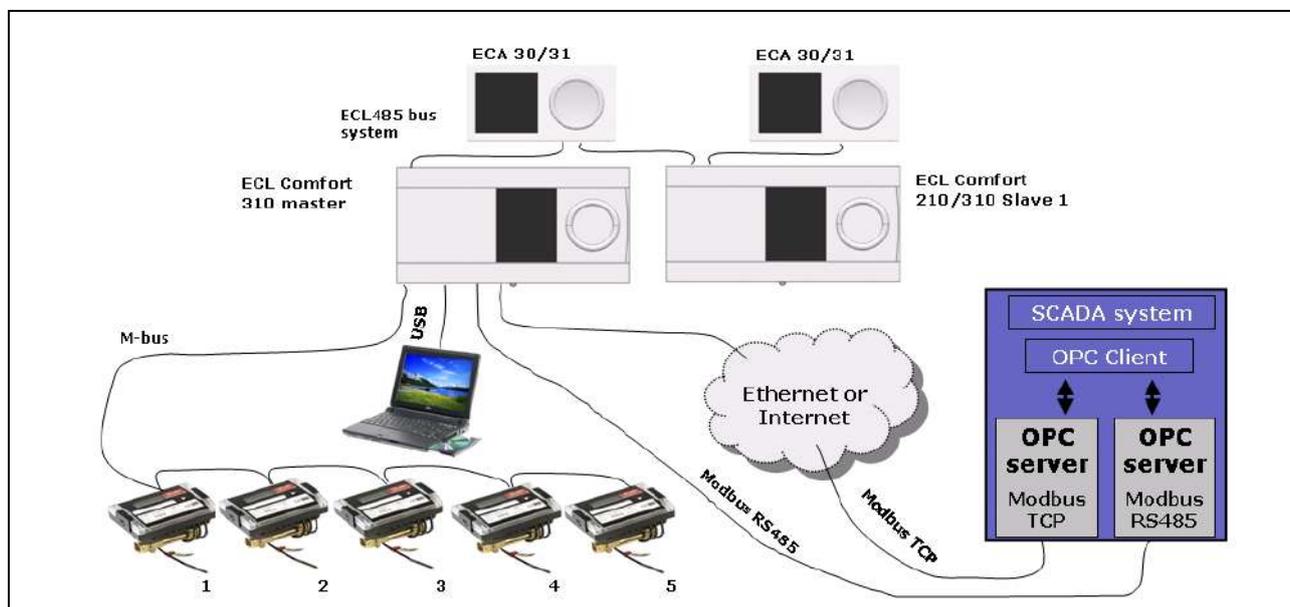


Figure 2-1:
Various communication interfaces for the ECL Comfort 210/296/310 products

The ECL Comfort 210/296/310 product family includes:

- ECL Comfort 210 controller
- ECL Comfort 296 controller
- ECL Comfort 310 controller
- ECA 30 room unit
- ECA 31 room unit with humidity sensor
- ECA 32 internal extension module



The ECL Comfort 210/296/310 product family is not compatible with older ECL controllers such as ECL Comfort 100/110, ECL Comfort 200/300 or ECA modules such as ECA 60-63, ECA 71/73, ECA 80-88.

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3. USB service port

The USB service port enables easy on-site connectivity for the ECL Tool

The USB service port implements a Communication Device Class (CDC) that allows Windows PCs to recognize the ECL Comfort 210/296/310 as a Virtual Serial Port, giving functionality of a point-to-point Modbus RTU communication with the ECL.

The USB service port is similar to the RS-485 Modbus interface, with the following changes:

- Relaxed inter character timing in comparison to standard serial line Modbus
- Baud rate independent
- Point-to-point communication, only the connected ECL can be addressed (service address 254 can be used)

It is necessary to install the ECL USB driver on the PC before it is possible to communicate with the ECL controller via USB.

The driver is available as a free download from <http://heating.danfoss.com>

Information about the ECL Tool is available from <http://heating.danfoss.com>

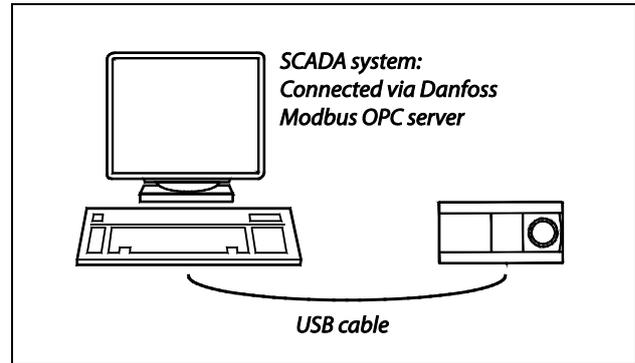


Figure3-1: USB connection example

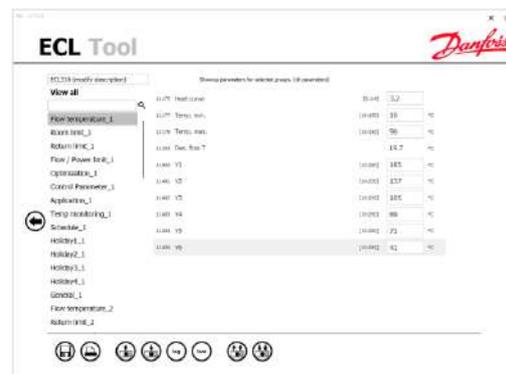


Figure3-2: ECL Tool example

3.1 USB driver installation

- Connect the ECL to the PC
- When Windows asks for a driver, choose the appropriate driver for your system (See the installation guide that accompanies the driver). On Win2k and WinXP systems, Windows will warn that the driver is not 'digitally signed'. Ignore this message and continue with the installation.
- Open the Windows Device Manager to verify that the device is installed correctly.
- A reboot is not necessary.

(see the in-depth installation description in the driver package)

4. RS-485 Modbus

The figure illustrates what a Modbus network might look like.

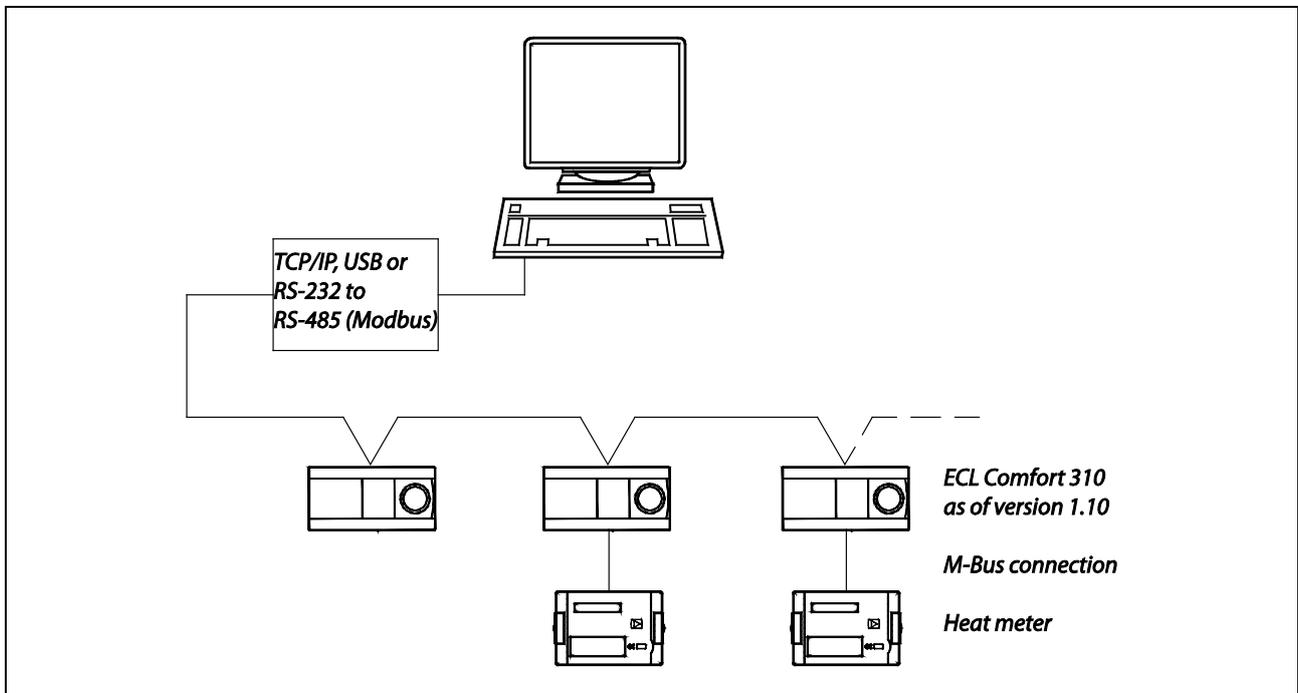


Figure 4.1: Modbus network overview

4.1 RS-485 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 m without repeater
- 32 devices pr. master / repeater (a repeater counts as a device)

All devices in the network must use the same communication settings, i.e. multiple communication settings are not allowed. The module can operate with

- 9600, 19200 or 38400 (default) baud rate
- 1 start bit
- 8 data bits
- even parity
- 1 stop bit
(in total 11 bits).

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/>

4.1.1 Network layouts

Figure 4-2 illustrates how termination and line polarization must be added. For specific details, consult the Modbus specifications.

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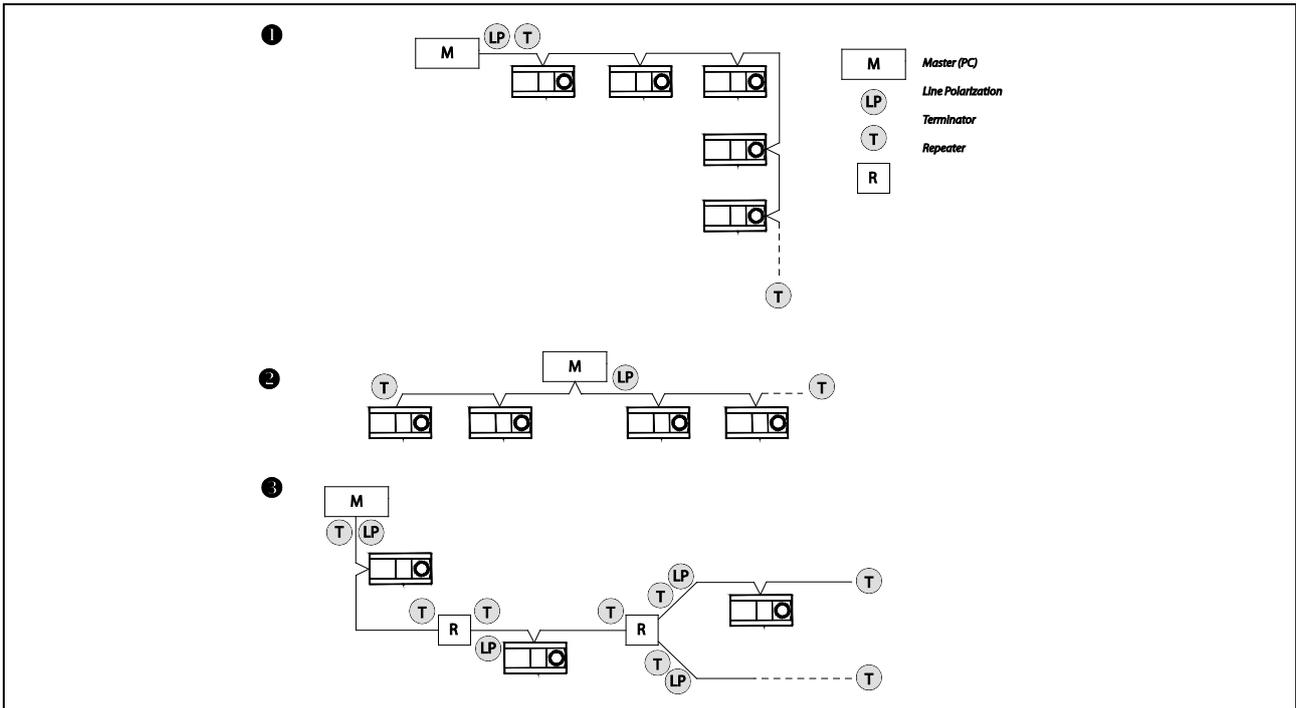


Figure 4-2: Three daisy chain network layouts

Figure 4-3 illustrates some network layouts that will not work properly.

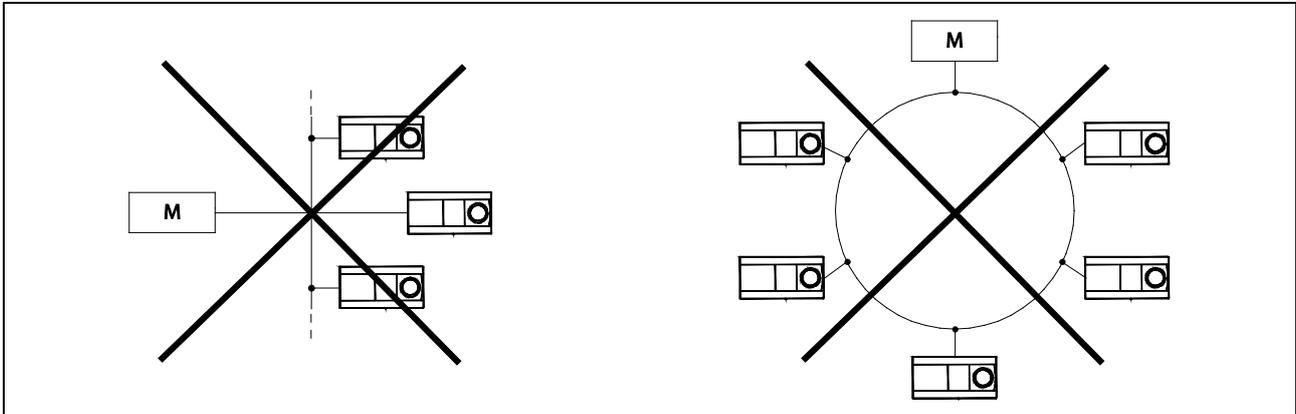


Figure 4-3: Examples of unusable network layouts

4.1.2 Installing a Modbus network

It is recommended that all of the devices on a network are installed sequentially to ensure that they will not conflict with each other.

If two or more devices have the same Modbus address they will conflict, resulting in loss of communication to that address!

The communication settings can be found in the ECL menu 'Common controller settings' > 'System' > 'Communication'

| | |
|-----------------------|--------------------------|
| System | <input type="checkbox"/> |
| Communication: | |
| ECL 485 addr. | 15 |
| ▶ Modbus addr. | 1 |
| Baud | 38400 |
| Service pin | 0 |
| Ext. reset | 0 |

Figure 4-4: Communication settings example

5. Modbus/TCP, Ethernet description

The ECL Comfort 296 / 310 has a Modbus/TCP communication interface that allows the ECL to be connected to an Ethernet network. This allows remote access to the ECL Comfort 296 / 310 controller based on standard communication infrastructures.

For specific details, please consult the Modbus guide [Modbus_Messaging_Implementation_Guide_V1_0b.pdf](#)

which can be found on <http://www.Modbus.org/>

Specific implementation details:

The ECL Comfort 296 / 310 listens for communication on TCP port 502.

Opened Modbus/TCP connections are closed by the ECL Comfort 296 / 310 controller after approximately 75 seconds without any data exchange.

If multiple controllers are present on the same network, they must use different IP addresses.

If multiple controllers are present on a single Internet IP address, a router/firewall must perform port translation so that it is possible to distinguish the controllers by port number. See Figure 5-1 for an example.

Note that not all routers support this and some ISPs (Internet Service Providers) do not allow customers to reconfigure the routers.

Default IP address is 192.168.1.100

5.1.1 Recommended security measures

Place the ECL310 behind a router. Set rules in the firewall that limits the port forwarding range to the ECL to what is needed. If possible, limit the number of IP addresses that can communicate with the ECL310 to a few trusted addresses.

5.2 Static IP address

The ECL Comfort 296 / 310 uses a static IP address as default. DHCP is an option for software version 1.30 and higher. When installing multiple ECL Comfort 296 / 310s on an Ethernet network then be sure to give them unique IP addresses, as they will all have the same default IP address.

Remember also to change the gateway address, net mask and DNS addresses if needed.

The communication settings can be found in the ECL menu

'Common controller settings' > 'System' > 'Ethernet'



Security Note:

The Modbus/TCP implementation guide does not specify a specific security model.

The ECL Comfort 296 / 310 controller does not use any form for access control restriction and it is therefore strongly advised to only use it on a secure local network where a router/firewall provides security to other local networks or the internet. In most routers it is possible to set simple access restrictions for which kind of internet traffic that are allowed to reach the ECL Comfort 296 / 310.

Modbus/TCP communication is not affected by the removal of the key from the ECL controller. It is still possible to change all settings through communication even if the key has been removed in order to prevent this!



It is necessary to reset the controller when internet settings have been changed in order for the changes to take effect for software versions lower than 1.30.

It is recommended to only change Ethernet settings directly at the ECL or via the Modbus RS-485 or USB interface.

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5.3 Dynamic IP address

If the ECL Comfort 296 / 310 is connected to a router that uses a dynamic Internet IP address, a Dynamic DNS (Domain Name System) service can be used to make the installation addressable from a URL name instead of an IP address. E.g. "my_ecl_installation.com" instead of "193.162.34.195".

Several companies provide dynamic DNS services. Searching the internet for dynamic DNS providers can result in these lists among others:

- <http://www.technopagan.org/dynamic/>
- http://www.dmoz.org/Computers/Internet/Protocols/DNS/DNS_Providers/Dynamic_DNS/

5.4 Ethernet network example

The following figure shows a more complex example of a possible network installation. The example also shows the ECL 485 installation for master/slave function.

The installation is separated into two different groupings, which could represent two different building blocks with a single centralized Internet router.

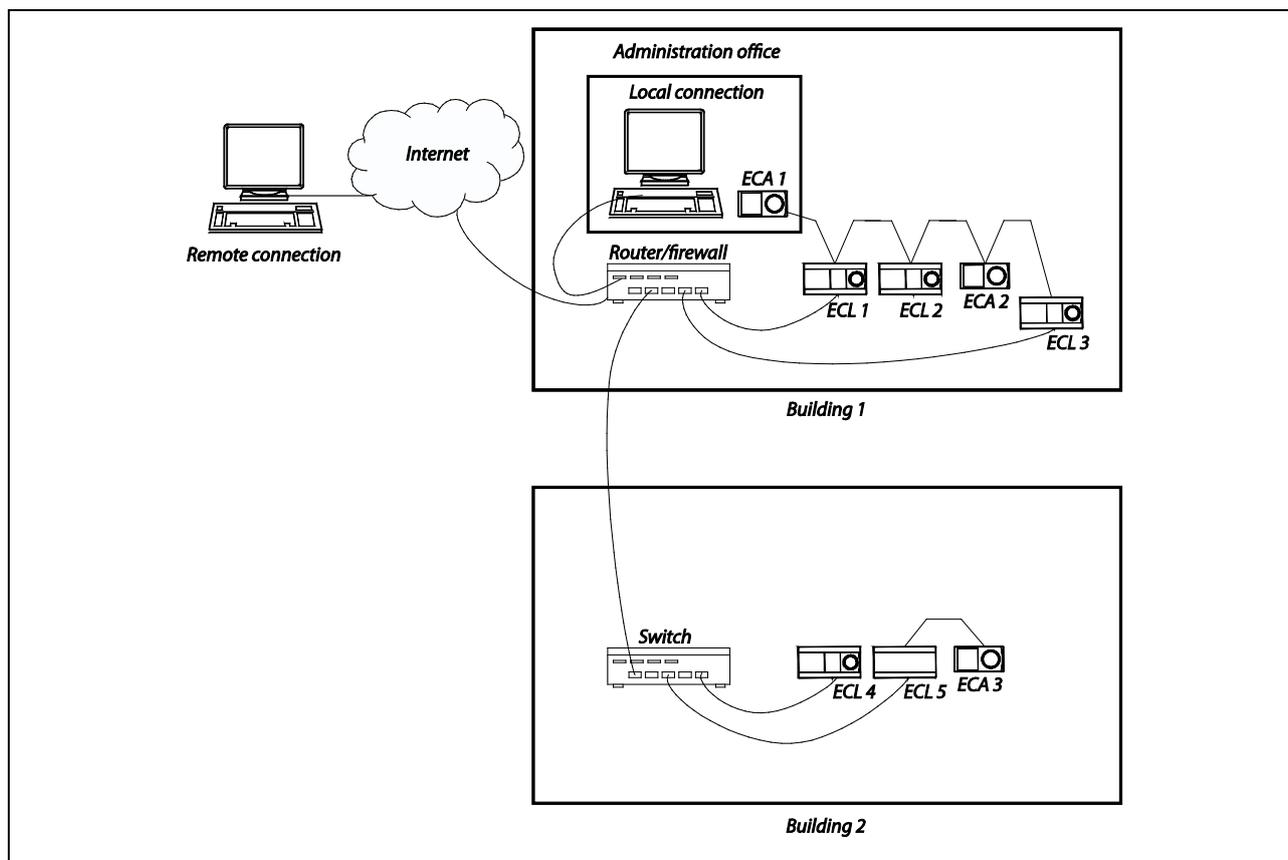


Figure 5-1: Example of an ECL 485 network where some of the controllers are connected to the internet

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In order to contact the controllers on the local area network from the internet it is necessary for the router to perform a port translation.

Table 5-1 lists the addresses on the network. The "Local address" can be used inside the network (private). The "Remote address" must be used from internet side (public). The router/firewall must be setup to handle the necessary port translations.

Table 5-1: Router/firewall port translation example

| Network | Device | Local address | Remote address | ECL 485 address |
|---------|---------------|------------------------|------------------|-----------------|
| 1 | ECL 1 | 192.168.1.100 port 502 | 1.2.3.4 port 503 | 15 |
| | ECL 2 | | -- | 1 |
| 1 | ECL 3 | 192.168.1.102 port 502 | 1.2.3.4 port 504 | 2 |
| | ECA 1 (HMI A) | -- | -- | A |
| | ECA 2 (HMI B) | -- | -- | B |
| 2 | ECL4 | 192.168.1.110 port 502 | 1.2.3.4 port 505 | 4 |
| 2 | ECL 5 | 192.168.1.111 port 502 | 1.2.3.4 port 506 | 15 |
| | ECA 3 (HMI A) | -- | -- | A |

In the example, only the 4 ECL controllers that are connected to the router are accessible from the Internet.

Be sure to select ports that do not interfere with other services or firewalls running on the network or on the remote connection network from which the ECL is contacted.

See www.en.wikipedia.org/wiki/List_of_TCP_and_UDP_port_numbers

for a list of standard port assignments.



Be careful when using port translation on a network where the ECL controllers are using DHCP for Ethernet configuration. DHCP is a dynamic protocol which sometimes can assign different local addresses which will interrupt the port translation.

6. ECL Comfort 210/296/310 Modbus description

This section describes the overall ECL Comfort 210/296/310 Modbus communication interface.

Parameter naming

The parameters are overall divided into two functional sections, the application – and system parameters.

Application parameters depend on the used application, e.g. “A266.1”, and include parameters such as temperature set-points, schedules and control properties etc. The parameters are as rule of thumb located in the address range 11000 – 13999. The 1000th decimal indicates the ECL Comfort circuit number, i.e. 11xxx is circuit 1, 12xxx is circuit 2, 13xxx is circuit 3. The number of applicable circuits depends on the Application, e.g. “A266.1” has 2 circuits (1 heating circuit and 1 DHW circuit).

System parameters include parameters such as system information, raw values, communication settings, output override, input configuration and time & date.

Some of the Parameter Numbers (PNU's) can be seen directly in the ECL display – the ID number.

The application parameters are named (numbered) in accordance with their name in the ECL Comfort.

A partial list of parameters can be found in the appendix.

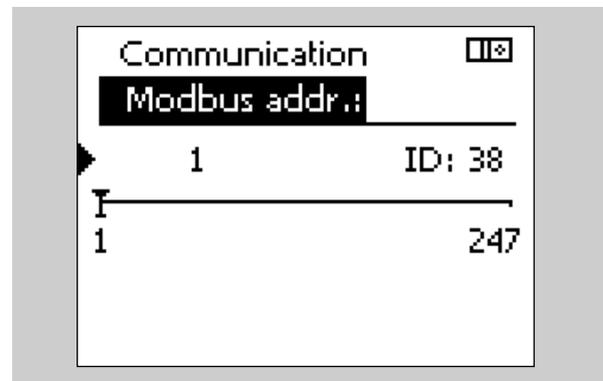
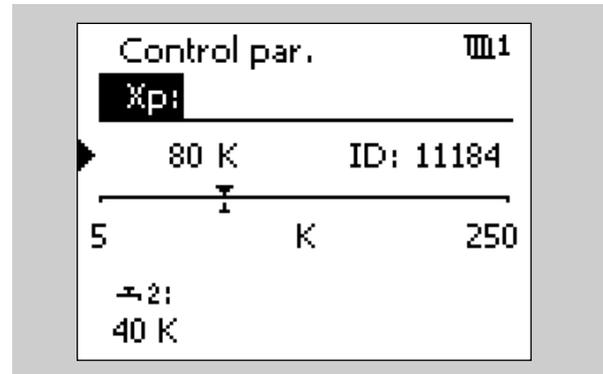


Figure 6-1: Display parameter number examples

6.1 Modbus address

The valid Modbus address range is 1 – 247. The default Modbus address is 1.

Address 254 is used as service address and may only be used when one ECL is connected, e.g. USB service port or Modbus/TCP.

The Modbus address can be changed by writing to PNU 38.

6.2 RS-485 Baud rate

The baud rate for the RS-485 bus can be changed by writing 9 (for baud rate 9600), 19 (for baud rate 19200) or 38 (for baud rate 38400, this is default) to PNU 39 via Modbus. Attempts to write any other values are rejected.

All devices on a network must have the same baud rate.

The ECL menu for changing the baud rate was not included until ECL software version 1.30 so for previous versions it could only be changed through communication.

Modbus address changes take effect immediately.

It is recommended only to change the Modbus address directly at the ECL or via the Modbus USB interface.

Baud rate changes take effect immediately.

Care must be taken if the baud rate is changed via the Modbus interface because the communication connection will be lost due to the change.

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6.3 RS-485 Bias/polarization

Biasing/polarization on the RS-485 Modbus network is necessary for the bus to operate properly. It can be controlled by writing 0 (disable, this is default) / 1 (enable) to PNU 2049.

To simplify the installation, Danfoss recommends that bias/polarization is implemented at the Modbus master.

See the section 'Network layouts' for further information about biasing/polarization.

6.4 Mode and status

The mode parameters are located within the PNU range 4201 – 4206, i.e. 4201 is circuit 1, 4202 is circuit 2, ..., 4206 is circuit 6. The mode can be used to control the ECL Comfort mode.

The status parameters are located within the PNU range 4211 – 4216, i.e. 4211 is circuit 1, 4212 is circuit 2, ..., 4216 is circuit 6. 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 for each circuit if the information is available.

All output will follow the ECL manual output setting when in manual mode.

The operating status will be read as 0 (setback) if the operating mode is larger than 3.

Operating status was enlarged from 4 states to 8 states in firmware version 1.43

Table 6-1:

| Operating mode | Code |
|------------------------------|------|
| Manual operation | 0 |
| Scheduled operation | 1 |
| Constant comfort temperature | 2 |
| Constant setback temperature | 3 |
| Frost protection/standby* | 4 |
| Active cooling** | 5 |

*

Standby and frost protection modes are not available in all applications. In general, the standby mode is available in cooling applications instead of frost protection. Please read the application instructions if in doubt.

**

Active cooling is only available in A232.

Table 6-2:

| Operating status | Symbol | Code |
|--------------------------------------|---|------|
| Setback |  | 0 |
| Pre-comfort |  | 1 |
| Comfort |  | 2 |
| Pre-setback |  | 3 |
| Holiday constant comfort temperature |  | 4 |
| Holiday 7-23h comfort temperature |  | 5 |
| Holiday constant setback temperature |  | 6 |
| Holiday frost protection/standby |  | 7 |

6.5 Heat curve

The heat curve has six points consisting of an outdoor temperature coordinate and a flow temperature coordinate. The outdoor temperature coordinates are not adjustable but the flow temperature coordinates can be changed to give a flow temperature that corresponds to the building's thermodynamic properties.

Table 6-3: Addresses for circuit 1 heat curve

| Parameter | PNU | Default value |
|--|-------|---------------|
| Slope (read only, scale = 10) ¹ | 11175 | 10 (= 1.0) |
| Min. flow temperature | 11177 | 10 °C |
| Max. flow temperature | 11178 | 90 °C |
| Flow temp at -30 °C | 11400 | 75 °C |
| Flow temp at -15 °C | 11401 | 60 °C |
| Flow temp at -5 °C | 11402 | 50 °C |
| Flow temp at 0 °C | 11403 | 45 °C |
| Flow temp at 5 °C | 11404 | 40 °C |
| Flow temp at 15 °C | 11405 | 28 °C |

The minimum value for the parameters in Table 6-3 is 10 °C and the maximum value is 150 °C. It is possible to set the flow temperature higher than the maximum flow temperature setting (default 90 °C) but the flow temperature will still be capped by the maximum. The slope will possibly still be affected depending on the other flow temperature points.

Table 6-3 is for circuit 1 parameters. For circuit 2 add 1000 to the PNU. For circuit 3 add 2000 to the PNU and so on.

Not all applications or circuits have a heat curve.
If an Application has a writable Slope, e.g. 11175, writing this value will cause adjustment of the point values, e.g. 11400 – 11405.

¹ Not all applications allow readout of this parameter. Not all applications allow write of this parameter

6.6 Time and date

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

Table 6-4:

| Parameter | PNU |
|-----------------------------|-------|
| Hour [0;23] | 64045 |
| Minute [0;59] | 64046 |
| Day [1;31] | 64047 |
| Month [1;12] | 64048 |
| Year [2009;2099] | 64049 |
| Automatic summer time [0;1] | 10198 |

6.6.1 Rules for setting time

The valid date range is from 01/01/2009 to 31/12/2099 using the Gregorian calendar.

When a new time is set, the seconds are internally reset to 0 in the controller. It is not possible to externally set seconds.

If an attempt is made to set an invalid time, it will be rejected.

When adjusting the date, it is necessary to set a valid date.

Example: If the date is 30/3 and it must be set to 28/2, it is necessary to change the day first before changing the month because 30/2 is not a valid date. Likewise, care must be taken during leap years. If the set date is 29/2/2012 then it is necessary to change the day before changing the year because 29/2/2011 is not a valid date.

Summer time rules

The rules for summer time change are the EU rules for central Europe. If the automatic summer time is enabled, the hour in which the clock is set forward is not a valid time. If the time is changed from 02:00 to 03:00, the time between 02:00 and 03:00 cannot be valid. Consequently, it is therefore not possible to change the time to e.g. 02:15 on the day where the summer time change takes place. By disabling automatic summer time, it is possible to overcome this problem but remember to enable it again!

When the clock is set back to normal time in autumn, the time between 02:00 and 03:00 will exist twice. The controller will therefore automatically assume that any time adjustment in that interval is after the changeover, i.e. that the summer time has ended.

Summer time starts on the last Sunday in March and ends on the last Sunday in October.

Automatic summer time is enabled by writing 1 to address 10198 and disabled by writing 0 to the same address.

6.7 Rules for schedule adjustment

The ECL Comfort divides the schedules into 7 days (1–7), each day consisting of 48 periods lasting 30 minutes.

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 equal to the start period, the period is not active.
5. Written values that would cause invalid periods, will force automatic adjustment of affected periods

Table 6-5: Address range circuit 1

| | | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|----|---------|---------------|----------------|------------------|-----------------|---------------|-----------------|---------------|
| P1 | Start 1 | 3110 | 3120 | 3130 | 3140 | 3150 | 3160 | 3170 |
| | Stop 1 | 3111 | 3121 | 3131 | 3141 | 3151 | 3161 | 3171 |
| P2 | Start 2 | 3112 | 3122 | 3132 | 3142 | 3152 | 3162 | 3172 |
| | Stop 2 | 3113 | 3123 | 3133 | 3143 | 3153 | 3163 | 3173 |
| P3 | Start 3 | 3114 | 3124 | 3134 | 3144 | 3154 | 3164 | 3174 |
| | Stop 3 | 3115 | 3125 | 3135 | 3145 | 3155 | 3165 | 3175 |

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As a general rule the address range for circuit 1 is 3110-3175, for circuit 2 it is 3210-3275, for circuit 3 it is 3310-3375 and for circuit 4 it is 3410-3475. However, some applications can have special schedules for relays controlling pumps or other things that need to run on a time schedule. Therefore, address ranges 3510-3575, 3610-3675, 3710-3775, 3810-3875 and 3910-3975 can also be used by some applications.

Example:

The schedule for Tuesday is P1 starts at 6:30 and stops at 08:00, P2 starts at 16:30 and ends 22:00 and P3 is not active.

- Write 630 to address 3120
- Write 800 to address 3121
- Write 1630 to address 3122
- Write 2200 to address 3123
- Write 2400 to address 3124
- Write 2400 to address 3125

A time period can be deactivated by writing 2400 as start and stop time.

If 0 is written as a stop value, then all other previous values on that day are also set to 0. Therefore 0 is recommended to only be used as a start value for P1.

6.8 Anti-bacteria

The anti-bacteria function can be set to be active on several days per week by setting the day setting to a value corresponding to a combination of the days. Table 6-6 shows how to calculate the value for days on which the function is active. The letter combination is for Sunday, Saturday, Friday, Thursday, Wednesday, Tuesday and Monday. Each day corresponds to a bit in the day setting so they can be combined together to give a binary value for the whole week. Table 6-6 shows some examples of how the days can be combined and gives the corresponding binary and decimal values. Table 6-7 gives the addresses for the anti-bacteria settings.

Table 6-6: Value examples for the day setting

| Sun | Sat | Fri | Thu | Wed | Tue | Mon | Binary value | Decimal value |
|-----|-----|-----|-----|-----|-----|-----|--------------|---------------|
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0000001 | 1 |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0000011 | 3 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0001000 | 8 |
| 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0010101 | 21 |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1001001 | 73 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1111111 | 127 |

The start time value must be in the range 0-47 which corresponds to half-hour periods during the day like this: 0 = 00:00, 1 = 00:30, 2 = 01:00, 3 = 01:30 ... 47 = 23:30. The function will activate at the same time for each of the chosen days.

The duration is set in minutes and can last from 10 minutes to 600 minutes. The duration is 120 minutes by default.

The desired temperature can be set between 10 °C and 110 °C

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but is typically around 80 °C. The anti-bacteria function is turned off by writing the value 9 to the desired temperature setting.

Table 6-7:

| Setting | Value | Address (if DHW is circuit 2) |
|--------------------------|--------|-------------------------------|
| Day | 0-127 | 12122 |
| Start time | 0-47 | 12123 |
| Duration [m] | 10-600 | 12124 |
| Desired temperature [°C] | 9-110 | 12125 |

The addresses in the table above refer to circuit 2. For circuit 1 the addresses are from 11122 to 11125, for circuit 3 the addresses are from 13122 to 13125 and so on

- The anti-bacteria function is not active if the frost protection mode is active.

6.9 Holiday

The address range for holiday settings is from 10700 to 10839. Table 6-8 shows how a schedule consists of a mode (mode from Table 6-9 depending on application), a start time (day-month-year) and an end time (day-month-year) as well as the addresses to change them. Up to 20 schedules can be defined but typically less will actually be used depending on the application. See the application instructions for information about which holiday schedules belong to the specific circuits.

The end date must be in the future compared to the ECL's current date otherwise the holiday mode will be cancelled.

The holiday mode must be written after the start and end dates. If the mode is written before then the holiday period will perhaps not be accepted if the old end date is in the past.

Table 6-8: Addresses for holiday schedules

| | Mode | Start day | Start month | Start year | End day | End month | End year |
|--------------|-------|-----------|-------------|------------|---------|-----------|----------|
| Schedule P1 | 10700 | 10701 | 10702 | 10703 | 10704 | 10705 | 10706 |
| Schedule P2 | 10707 | 10708 | 10709 | 10710 | 10711 | 10712 | 10713 |
| Schedule P3 | 10714 | 10715 | 10716 | 10717 | 10718 | 10719 | 10720 |
| Schedule P4 | 10721 | 10722 | 10723 | 10724 | 10725 | 10726 | 10727 |
| ... | ... | ... | ... | ... | ... | ... | ... |
| Schedule P20 | 10833 | 10834 | 10835 | 10836 | 10837 | 10838 | 10839 |

Maximum start or end year is 2050.

Table 6-9: Modes for holiday schedules

| Operating mode | Code | Display symbol |
|-----------------------------------|------|----------------|
| Scheduled operation (holiday off) | 0 | |

ECL Comfort 210 / 296 / 310, communication description

| | | |
|------------------------------|---|--|
| Constant comfort temperature | 1 | |
| 7 – 23h Comfort temperature | 2 | |
| Constant setback temperature | 3 | |
| Frost protection / standby | 4 | |

It depends on the specific application or circuit whether frost protection or standby mode is available.

A holiday period is only active if the circuit is in scheduled operating mode.

6.10 Alarm

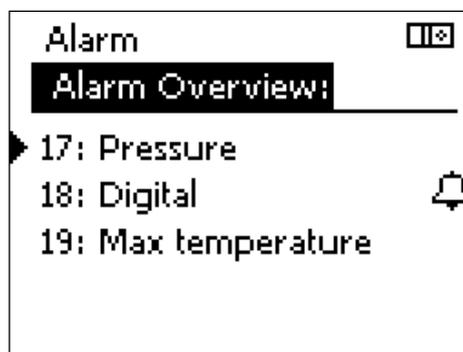
PNU 1024 and 1025 holds the alarm status bitmask. The meaning of the alarm numbers is specific to the application. Alarm number 1 corresponds to PNU 1025 bit 0.

The ECL display can be used to show the alarm numbers, e.g. PNU 1040 – 1071 hold the status of each individual alarm ID 1 – 32.

A non-zero value indicates an alarm.

Example:

Alarm ID 18 has PNU 1057.



6.11 Energy meter data, M-bus (from version 1.10)

The ECL Comfort 296 / 310 allows communication with up to 5 energy meters via M-bus. The M-bus readout is based on the EN-1434 standard.



Danfoss recommends that AC supplied energy meters are used for M-bus communication.

Use of a battery supplied energy meter will normally shorten the battery life-time. Consult the specific manufacturer for details about battery life-time and the allowed data exchange rate.

M-bus configuration

| PNU | Description | |
|------|-----------------------|--|
| 5997 | M-bus Baud rate | 0: 300 (default) 1: 600 2: 1200 3: 2400 |
| 5998 | M-bus command request | 0: None 1: Init (re-initialization) |

ECL Comfort 210 / 296 / 310, communication description

| | | |
|------|-------------|---|
| | | 2: Scan for energy meter |
| 5999 | M-bus state | 0: Reset 1: Init 2: Scanning 3: Idle (collecting data if setup is present) |

The available data from an energy meter depends on selected 'Type' and what the energy meter supports. See {Appendix} for further description.

| Base PNU | |
|----------|----------------|
| 6000 | Energy meter 1 |
| 6050 | Energy meter 2 |
| 6100 | Energy meter 3 |
| 6150 | Energy meter 4 |
| 6200 | Energy meter 5 |

ECL Comfort 210 / 296 / 310, communication description

| PNU offset | Description | Default |
|------------|-----------------------------------|--|
| 0 | Address | 255, 0 – 254 are valid (251 – 254 have special function. Only use 254 if one meter is attached) |
| 1 | Type | 0 : Generic small data set, small units 1: Generic small data set, large units 2: Generic large data set, small units 3: Generic large data set, large units 4: Volume & Energy only data set |
| 2 | Scan time in seconds | 60 |
| 3 | ID / Serial | |
| 4 | | |
| 5 | Reserved | |
| 6 | Flow temp. [0.01 °C] | |
| 7 | Return temp. [0.01 °C] | |
| 8 | Flow [0.1 l/h] | |
| 9 | | |
| 10 | Power [0.1 kW] | |
| 11 | | |
| 12 | Acc. Volume [0.1 m ³] | |
| 13 | | |
| 14 | Acc. Energy [0.1 kWh] | |
| 15 | | |
| ... | | |
| 49 | Reserved | 0 |

When two PNU are used, the first contains the high word information and the last the low word information.

Example:

Energy meter 3 ID / Serial is found by combining PNU 6103 and 6104, if

PNU 6103 = 0x00A7 (hex)

PNU 6104 = 0xFEE3 (hex)

This gives ID / Serial 11009763

Energy meter PNU Example:

Energy meter 3 Flow temperature PNU = 6100+6 = 6106.

See the type descriptions in section "Energy meter type descriptions"

ECL Comfort 210 / 296 / 310, communication description

6.11.1 Installation process

The ECL Comfort 296 / 310 will NOT automatically search for M-bus devices. The M-bus addresses can either be set directly (PNU offset 0, e.g. 6000) or the ECL Comfort 296 / 310 can search for devices via the "SCAN" function.

ECL display examples:

Installation by setting the address directly

Adjust the address for all connected energy meters. (The primary M-bus address must be used – in some M-bus devices the address must be set).

- Adjust the type if needed.
- Adjust the scan time if needed.
- Done.

Installation by SCAN function

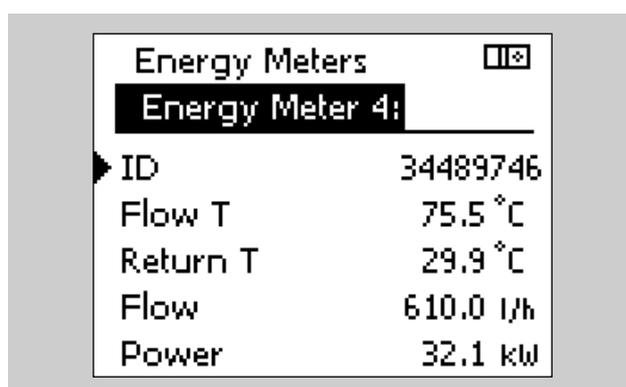
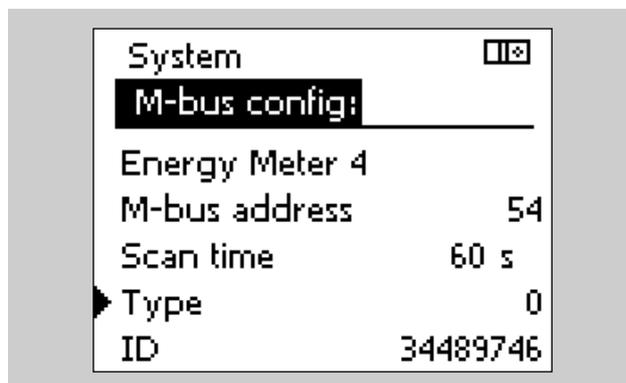
Set Command to SCAN.

Wait until all energy meters are found. This can be observed in the Address fields for the respective energy meters.

When all energy meters have been found, the SCAN function can be ended by setting the Command to INIT. Alternatively wait for the SCAN function to end automatically – this takes about 12 minutes.

- Adjust the type if needed.
- Adjust the scan time if needed.

When an energy meter address or type is changed, the M-bus performs a (re-)initialization, where M-bus values are reset. Values will appear again when the state is in IDLE.



6.12 System information parameters

The system information 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.

Hardware no.

PNU 34 holds the hardware revision number. It is returned as a 2-byte number where the first byte is the major version number and the second byte is the minor version number.

For example, the decimal number 16642 is returned: The hardware revision number is then found as the first byte as Unicode I hexadecimal format.

Unicode 0x41 corresponds to A, Unicode 0x42 corresponds to B, and Unicode 0x43 corresponds to C etc.

The controller from the example is consequently a revision A 2 hardware.

| | |
|----------|-------------|
| Hardware | = 16642 |
| | = 0x4102 |
| | = 0x41.0x02 |
| | = A.2 |

ECL Comfort 210 / 296 / 310, communication description

Software no.

PNU 35 holds the software version number. It is returned as a 2-byte number where the first byte is the major version number and the second byte is the minor version number.

For example, the number 257 is returned.

| | |
|----------|-------------|
| Software | = 257 |
| | = 0x0101 |
| | = 0x01.0x01 |
| | = 1.01 |

Build no.

PNU 8 holds the software build number. Version 1.00 has built number 2410. Later versions will have a higher build numbers.

Production time

PNU 2099 holds the production week and year. It is returned as a 2-byte decimal number which must be converted to another format. The first byte is the year and the second byte the week.

For example, the number 2563 is returned:
The production year is then found as shown.

The controller from the example is then produced during week 3 in the year 2010.

| | |
|-----------------|---------------|
| Production time | = 2563 |
| | = 0x0A03 |
| Production year | = 2000 + 0x0A |
| | = 2000 + 10 |
| | = 2010 |
| Production week | = 0x03 |
| | = 03 |

Application name and version

The application name and version can be read on PNU 2060-2063. Application prefix can be read on PNU 2060, type number can be read on PNU 2061, sub number can be read on PNU 2062 and application version can be read on PNU 2063.

The application version consists of a major number and a minor number. The minor number is usually not used because it is only for very minor changes in the application. If an error has been corrected or a new setting has been added to the application, then it will be the major number that is changed. The minor number is only changed if cosmetic changes in the code itself have been made.

At time of writing all released applications have prefix A, but other prefixes are planned for the future.

Code no.

PNU 19 holds the code number for the product. Use 087H as prefix.

Example for an A214.1 V01 (02):

| | |
|-----------------------------|-------------|
| Application prefix | = 65 |
| | = 0x41 |
| | = A |
| Application type number | = 214 |
| Application type sub number | = 1 |
| Application version | = 258 |
| | = 0x0102 |
| | = 0x01.0x02 |
| | = 1.02 |

| | |
|----------|-------------------------------------|
| 087H3020 | is for ECL Comfort 210, 230 V |
| 087H3024 | is for ECL Comfort 210, 24 V |
| 087H3030 | is for ECL Comfort 210B, 230 V |
| 087H3034 | is for ECL Comfort 210B, 24 V |
| 087H3040 | is for ECL Comfort 296 / 310, 230 V |
| 087H3044 | is for ECL Comfort 296 / 310, 24 V |
| 087H3050 | is for ECL Comfort 310B, 230 V |
| 087H3054 | is for ECL Comfort 310B, 24 V |

Serial number

The ECL controller's serial number can be read on PNU 36 and 37.

| | |
|--------|-------|
| PNU 36 | = 1 |
| PNU 37 | = 215 |

| |
|--|
| Serial no. = 1 & 215 = 0x0001 & 0x0215 = 0x00010215 = 66069 |
|--|

ECL Comfort 210 / 296 / 310, communication description

ECA extension

Serial number, code number, software version and hardware version can be read for an attached ECA 32 or other expansion.

The formats are just as for the ECL controller.

Code no. type is reserved for future use, currently 0 is always read.

If no extension modules are attached, the PNU will return 0.

3rd and 4th extension are reserved for future use but not yet implemented.

Read PNU 10213 to check whether an ECA 30/31 unit is attached as HMI A, or PNU 10216 to check whether an ECA 30/31 unit is attached as HMI B. If no room unit is attached, the value 19200 will be returned.

| ECA extension | Parameter | PNU |
|--------------------------------------|---------------|-----------|
| 1 st extension | Serial no. | 2100-2101 |
| | Software | 2102 |
| | Hardware | 2103 |
| | Code no. type | 2104 |
| | Code no | 2105 |
| 2 nd extension | Serial no. | 2110-2111 |
| | Software | 2112 |
| | Hardware | 2113 |
| | Code no. type | 2114 |
| | Code no | 2115 |
| 3 rd extension (reserved) | Serial no. | 2120-2121 |
| | Software | 2122 |
| | Hardware | 2123 |
| | Code no. type | 2124 |
| | Code no | 2125 |
| 4 th extension (reserved) | Serial no. | 2130-2131 |
| | Software | 2132 |
| | Hardware | 2133 |
| | Code no. type | 2134 |
| | Code no | 2135 |

6.13 System commands

PNU 1, System command:

| Value | Command | Comment |
|-------|------------------------|--|
| 2 | Reset internal ECL log | Also reset during application installation |

PNU 2097, Wink display back light in seconds. Write 0 to abort active wink. If an ECA 30/31 is connected to the ECL, the ECA will also wink.

6.14 Output status, Manual output status and Output override

The outputs are controlled by one of the following sources

- Manual state
- Override state
- Regulation

The resulting value can be read in the output's "status"

When the controller is in Manual mode it controls all output used by the specific application. The manual control has priority.

When the controller is not in Manual mode, the output can be controlled by "Output override".



It is not possible to set the manual output state from the Modbus interface – it can only be done via the ECL display (or ECA 30/31 remote unit).

6.14.1 Output status (from version 1.10)

PNU 3998 and 3999 holds a read only bit mask for all ECL outputs.

| ECA 32 ² | | | Bit 15 | Bit 14 | Bit 13 | Bit 12 |
|---------------------|--|--|--------|--------|--------|--------|
| | | | | | | |

² From version 1.20

ECL Comfort 210 / 296 / 310, communication description

| | | | | | | |
|------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | | | <i>Relay4</i> | <i>Relay3</i> | <i>Relay2</i> | <i>Relay1</i> |
| ECL | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 |
| | <i>Relay6</i> | <i>Relay5</i> | <i>Relay4</i> | <i>Relay3</i> | <i>Relay2</i> | <i>Relay1</i> |
| | | | | | | |
| | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | <i>Triac6</i> | <i>Triac5</i> | <i>Triac4</i> | <i>Triac3</i> | <i>Triac2</i> | <i>Triac1</i> |

See the application description for determining the usage of each output.

Output status for triac 1-6 can be read on PNU 4000-4005

Output status for relay 1-6 can be read on PNU 4006-4011

Output status for ECA 32 relay 1-4 can be read on PNU 4012-4015

Output status for ECA 32 AO 1-3 can be read on PNU 4016-4018

Output status is the current "value" for the output (independent of the source: manual, override or regulation).

The scale for PNU 4016-4018 is 10. I.e. if the read output value is 119 then the output is opened 11.9%. The ECL will only show 11 % because the decimal is not shown.

6.14.2 Manual status (read only)

If a manual status is non-zero it controls, the respective output. Manual status can be read in PNU 4020 – 4031 (Triac 1, Triac 2, ..., relay 6).

Manual status for ECA 32 relay 1-4 can be read on PNU 4032-4035

Manual status for ECA 32 AO 1-3 can be read on PNU 4036-4038

Manual value for ECA 32 AO 1-3 can be read on PNU 4056-4058

The scale for PNU 4056-4058 is 10. I.e. if the read output value is 119 then the output is opened 11.9%.

(The ECL will only show 11 % because the decimal is not shown)

For 3-point motorized control valve value output, the first PNU holds the value, e.g. PNU 4020 for motorized control valve 1.

| Value | Display value | Comment |
|-------|---------------|--|
| 0 | AUTO | Follows regulation or output override value |
| 1 | STOP | The motorized control valve is not moved |
| 2 | CLOSE | The motorized control valve is moved downwards |
| 3 | OPEN | The motorized control valve is moved upwards |

For relay output the following values apply:

| Value | Display value | Comment |
|-------|---------------|---|
| 0 | AUTO | Follows regulation or output override value |
| 1 | OFF | The pump is turned off |
| 2 | ON | The pump is turned on |

6.14.3 Output override

Output override can be used to control output in the ECL when it is **not** in manual mode. If the ECL is in manual mode, the override settings are not necessarily true, as it depends on the output the application uses, and it can therefore not be relied upon to show the actual status of the output. Output override can also be used to control outputs that are not used in a specific application and those outputs will therefore not be overruled if the ECL is in manual mode!

Output override state can be set in

PNU 4060 – 4071 (ECL Triac 1, ..., Triac 6, ..., relay 1, ..., relay 6).

PNU 4072 – 4075 (ECA 32 relay 1, ..., relay 4)

PNU 4076 – 4078 (ECA 32 AO 1, ..., AO 3 **state**)

PNU 4096 – 4098 (ECA 32 AO 1, ..., AO 3 **value**)

Values are formatted equal to manual status.

For ECA 32 analogue outputs there are additional override values which can be read on PNU 4096-4098.

The scale for PNU 4056-4058 and 4096-4098 is 10. I.e. if the read output value is 119 then the output is opened 11.9%.

(The ECL will only show 11 % because the decimal is not shown)

6.15 Configurable input

The ECL Comfort 210 has two configurable input, i.e. S7-S8, whereas the ECL Comfort 296 / 310 has four configurable input, i.e. S7-S10.

Sensor input S7 -S10 are configurable so that they can be connected to different I/O types depending on application.

It is possible to set input options in order to accommodate various output signal types from different hardware. To set a sensor input to a specific type or input option, write the type (1-6) or option (0-3) to the address as indicated in Table 6-10 or Table 6-11.



The tables are only guiding and some applications may have limitations if the input are pre-configured. Please consult the installation guide for the application key for further information.

ECL Comfort 210 / 296 / 310, communication description

Table 6-10:

| Sensor | S7 | S8 | S9 | S10 | S11* | S12* |
|-----------------------|------|------|------|------|------|------|
| PNU | 4100 | 4101 | 4102 | 4103 | 4104 | 4105 |
| Type: 1 = Pt1000 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Type: 2 = 0-10 V ADC | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Type: 3 = Digital | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Type: 4 = Flow switch | | ✓ | | | | |
| Type: 5 = Pulse | ✓ | | | | | |
| Type: 6 = Frequency | ✓ | | | | | |

*S11 and S12 are only available if an internal I/O module is installed

Table 6-11:

| Sensor | S7 | S8 | S9 | S10 | S11* | S12* |
|-----------------------------------|------|------|------|------|------|------|
| PNU | 4120 | 4121 | 4122 | 4123 | 4124 | 4125 |
| Option: 0 = None | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Option: 1 = Pull up ³ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Option: 2 = Cap load ⁴ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Option: 3 = Pull up & Cap load | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Option: 255 = Default | | | | | | |

* S11 and S12 are only available if an internal I/O module is installed

A write error will be returned if the application does not allow the input configuration to be changed.

6.15.1 ECA 32 Extension I/O module

If an ECA 32 I/O module is installed, more sensors are available. Sensor input S13-S14 are configurable so that they can be connected to a Pt 1000 temperature sensor or a 0-10 V digital input, depending on application.

Input S17-S18 are configurable so that they can be connected to a Pt1000 temperature sensor, a 0-10 V digital input, a dry contact or a pulse (200 Hz) input, depending on application.

To set a sensor input to a specific type or input option write the type (1-6) or option (0-3) to the address as indicated in Table 6-12 or Table 6-13.



The tables are only guiding and some applications may have limitations if the inputs are pre-configured. Please consult the application instructions for further information.

Table 6-12:

| Sensor | S13 | S14 | S15 | S16 | S17 | S18 |
|-----------------------|------|------|------|------|------|------|
| PNU | 4106 | 4107 | 4108 | 4109 | 4110 | 4111 |
| Type: 1 = PT1000 | ✓ | ✓ | ✓ | ✓ | | |
| Type: 2 = 0-10V ADC | ✓ | ✓ | ✓ | ✓ | | |
| Type: 3 = Digital | ✓ | ✓ | ✓ | ✓ | | |
| Type: 4 = Flow switch | | | | | | |
| Type: 5 = Pulse | | | | | ✓ | ✓ |
| Type: 6 = Frequency | | | | | ✓ | ✓ |

³ Pull up enables a pull-up resistor to +12V

⁴ Cap load enables a capacitor load. This is used to keep mechanical contact points clean

ECL Comfort 210 / 296 / 310, communication description

Table 6-13:

| Sensor | S13 | S14 | S15 | S16 | S17 | S18 |
|--------------------------------|------|------|------|------|------|------|
| PNU | 4126 | 4127 | 4128 | 4129 | 4130 | 4131 |
| Option: 0 = None | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Option: 1 = Pull up | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Option: 2 = Cap load | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Option: 3 = Pull up & Cap load | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Option: 255 = Default | | | | | | |

A write error will be returned if the application does not allow the input configuration to be changed.

6.16 Unit and pulse

The unit setting (PNU 1X115) is a special setting which depends on the value of the pulse setting (PNU 1X114). See in the table below what the unit value means depending on the pulse value.

| | Pulse = 0 | Pulse > 0 |
|----------|-----------|-----------|
| Unit = 0 | L/h | mL, L/h |
| Unit = 1 | L/h | L, L/h |
| Unit = 2 | m3/h | mL, m3/h |
| Unit = 3 | m3/h | L, m3/h |
| Unit = 4 | kW | Wh, kW |
| Unit = 5 | kW | kWh, kW |
| Unit = 6 | MW | kWh, MW |
| Unit = 7 | MW | MWh, MW |
| Unit = 8 | GW | MWh, GW |
| Unit = 9 | GW | GWh, GW |

6.17 Limiter status (from version 1.32)

The limiter information holds information about what is influencing the temperature reference.

E.g. if room influence is active and room temperature is higher than room set-point, the reference will be turned down.

The limiter value indicates which way the reference is moved – in some cases it is not known in advance and both directions are selected.

The limiter information is interpreted as a bit mask.

| Word | Limiter |
|--------|---|
| Word 1 | Return lim. (bit 0-1) Room lim. (bit 2-3) Wind influence Res Res Res Parallel priority Flow / power lim. (bit 14-15) |
| Word 2 | Holiday (bit 0-1) Ext. override ECA override Anti-bacteria Boost Ramp Slave, demand Heating cut-out (bit 14-15) |
| Word 3 | DHW priority (bit 0-1) DHW influence SCADA offset SCADA override Ext. desired T Res Res Res (bit 14-15) |
| Word 4 | Res |

| Circuit | PNU |
|-----------|-------------|
| Circuit 1 | 4220 – 4223 |
| Circuit 2 | 4224 – 4227 |
| Circuit 3 | 4228 – 4231 |
| Circuit 4 | 4232 – 4235 |

| Value | "Symbol" & meaning | |
|-------|--|---------------------|
| 0 | | |
| 1 |  | Increased reference |
| 2 |  | Decreased reference |
| 3 |  | Changed reference |

7. Modbus protocol

The ECL Comfort 210/296/310 controllers are Modbus compliant devices. The controller supports a number of public function codes. The Modbus application data unit (ADU) is limited to 240 bytes.

Supported public function codes

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

7.1 Function codes

Table 7-1: Function codes

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

7.1.1 Modbus messages

7.1.1.1 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 123 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 | 0x0001 – 0xffff |
| Quantity N of PNU | 2 bytes | 0x0001 – 0x007B |

Response

| | | |
|----------------|---------|-----------------|
| Function code | 1 byte | 0x03 |
| Byte count | 1 byte | 2 – 246 |
| PNU data value | 2 bytes | 0x0000 – 0xffff |

Error

| | | |
|---------------|---------|---|
| Function code | 1 byte | 0x83 |
| Error code | 2 bytes | 1: Illegal Function 2: Parameter not available 3: Quantity exceeds limit 4: Invalid telegram |

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

7.1.1.2 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 123 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 | 0x0001 – 0xffff |
| Quantity N of PNU | 2 bytes | 0x0001 – 0x007B |

Response

| | | |
|----------------|---------|-----------------|
| Function code | 1 byte | 0x04 |
| Byte count | 1 byte | 2 - 246 |
| PNU data value | 2 bytes | 0x0000 – 0xffff |

Error

| | | |
|---------------|---------|---|
| Function code | 1 byte | 0x84 |
| Error code | 2 bytes | 1: Illegal Function 2: Parameter not available 3: Quantity exceeds limit 4: Invalid telegram |

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

7.1.1.3 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 Comfort controller.

Request

| | | |
|---------------|---------|-----------------|
| Function code | 1 byte | 0x06 |
| Write PNU | 2 bytes | 0x0001 – 0xffff |
| New PNU value | 2 bytes | 0x0000 – 0xffff |

Response

| | | |
|---------------|---------|-----------------|
| Function code | 1 byte | 0x06 |
| Write PNU | 2 bytes | 0x0001 – 0xffff |
| New PNU value | 2 bytes | 0x0000 – 0xffff |

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Error

| | | |
|---------------|---------|---|
| Function code | 1 byte | 0x86 |
| Error code | 2 bytes | 1: Illegal Function 2: Parameter not available 3: Illegal value 4: Invalid telegram / PNU not writable |

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

7.2 Broadcasts

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

Command/function where a broadcast is usable

- Write ECL parameter (0x06)

The Modbus address 254, service address, can be used if only one ECL is connected. For the address 254 all commands can be used.

7.3 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/>

7.4 Modbus/TCP

The ECL Comfort 296 / 310 supports Modbus over TCP connections so that it is possible to send and receive Modbus commands over an Ethernet network. The Modbus traffic must be sent to port 502.

7.5 Communication example

The following examples show how the communication looks from the low level on the serial line
ECL Modbus address 1 is used.

Read of Comfort set-point, PNU 11180

The register address is PNU-1, i.e. 11179 = 0x2BAB

Complete request & response⁵:

01 03 2B AB 00 01 FC 0E

01 03 02 00 C8 B9 D2

The value 0x00C8 is 200, scale of the set-point is 10, i.e. the values are 20,0

Read of Sensor S2, PNU 10202

The register address is PNU-1, i.e. 10202 = 0x 27DA

Complete request & response:

⁵ The two last hexadecimal values are the CRC

ECL Comfort 210 / 296 / 310, communication description

01 03 27 D9 00 01 5F 45

01 03 02 08 60 BF AC

The value 0x0860 is 2144, scale of the sensor is 100, i.e. the values are 21,44 (21,5)

8. ECL 485 bus description

The ECL 485 bus is used to connect ECL Comfort 210/296/310 and ECA 30/31 with each other in a master/slave system.

The master/slave communication exchanges information between the devices, e.g. time and date, outdoor temperature, refill request⁶ etc.

The ECL 485 bus wiring must be done similar to a Modbus RS-485 network, i.e. devices must be connected in a daisy chain network (polarization is done by the ECL master, address 15). The recommended network installation procedure is as in section 8.1.2.

The total cable length of maximum 200 meters (all devices incl. the internal ECL 485 communication bus) should not be exceeded. Cable lengths of more than 200 meters may increase noise sensitivity (EMC).

² Refill is a functionality for the A231, A331, A361 and A368 applications



Only Danfoss District Energy products developed for the ECL 485 bus can be used.



No third party products can be used!

8.1 Installation of the ECL 485 network

The ECL 485 bus is similar to Modbus concerning that an address is to be used only once in the network. Using the same address multiple times will cause malfunction. It is recommended that all of the devices are installed sequentially to ensure that they will not conflict with each other.

Address 15 is reserved for the master controller.

Addresses 1-9 are reserved for slave controllers.

Address 0 is reserved for listening slaves. Listening slaves can only listen for master broadcasts and cannot broadcast anything to the master. Blind controllers cannot be used as listening slaves.

⁶ Refill is a functionality for the A231, A331, A361 and A368 applications

8.1.1 ECL Comfort 210B and ECL Comfort 310B application installation

The ECA 30/31 can be used for installation of an application in an ECL controller without display and dial (also called blind/B/type B/HMI less).

Installation of the application must be done in a point-to-point connection between the ECL and ECA 30/31.

If necessary, disconnect other ECL or ECA products from the ECL 485 bus

Connect the ECL Comfort 210B / 310B directly to the ECA 30/31

If necessary, set the ECA 30/31 slave address to 'A' and the connection address to 15

The ECA 30/31 will now act as an ECL with display and dial. Select the application normally

When the application is installed the ECL will be set to ECL 485 master (address 15)

If necessary, adjust the ECL Comfort 210B / 310B's ECL 485 address and connect it to the ECL 485 network again.

8.1.2 Recommended installation sequence

Before starting the electrical wiring and installation, it is recommended that a network plan is made which specifies ECL 485 address. If the ECL controllers are to be used in a SCADA system, it is also recommended to include the network plan.

1. Setup all the hardware with all cables and wires for the controllers and room units
 - a. If necessary, ensure that terminations are present
2. Turn on power to the intended master controller, ECL with ECL 485 address 15
 - a. If necessary, install application
 - b. Check that everything (including all addresses (ECL 485, Modbus & IP) is as intended
3. Turn on power to room units one by one
 - a. Check that the slave and ECL addresses are as intended
 - b. Copy application if needed from controller.
4. Turn on power to the slave controller with the lowest address
 - a. If the controller is without HMI, type B, the ECL must be configured separately
 - b. If necessary, install application and make sure the set ECL 485 address

Repeat step 4 until all controllers are installed.

8.1.3 ECA 30/31 application copy

The ECA 30/31 will automatically detect a new application after 30 seconds when it connects to a controller that has been updated.

The ECA 30/31 can hold 10 applications in its memory which is sufficient for a network with one master and nine slaves.

The copying process takes about 2–3 minutes. If two ECA 30/31 are used at the same time the process will take longer for the ECA 30/31 that started last.

9. Appendix

9.1 References

| | | |
|-----|---|---|
| [1] | http://www.Modbus.org/ | Modbus homepage The Modbus standards can be downloaded from here |
| | | |

9.2 Definitions and Abbreviations

| | Description |
|-----------|---|
| SW | Software |
| HW | Hardware |
| HMI | Human Machine Interface |
| ECL | ECL Comfort 210, ECL Comfort 296 or ECL Comfort 310 |
| B type | ECL Comfort 210B or ECL Comfort 310B, ECL without HMI (display and dial) |
| ECA | ECA 30 Room unit module |
| Room Unit | ECA 30 module |
| SCADA | Supervisory Control and Data Acquisition, common name for (Modbus) network solutions |
| PNU | Parameter NU number, is referring to the Modbus register address Note the PNU starts with 1, whereas Modbus registers starts with 0 |

ECL Comfort 210 / 296 / 310, communication description

9.3 Energy meter type descriptions

The following shows the possible types and the related values. Note that some energy meter only supports a limited number of parameters.

The type 0 & 1 values should be supported by most energy meters.

Changes to the Type settings causes meter value reset, i.e. it should be set once.

| "PNU offset" | Type 0 (default) | Type 1 |
|--------------|------------------------|------------------------|
| 0 | Address | Address |
| 1 | Type | Type |
| 2 | Scan time | Scan time |
| 3 | ID / Serial | ID / Serial |
| 4 | - low part | - low part |
| 5 | Reserved | Reserved |
| 6 | Flow temp. [0,01 °C] | Flow temp. [0,01 °C] |
| 7 | Return temp. [0,01 °C] | Return temp. [0,01 °C] |
| 8 | Flow [0,1 l/h] | Flow [0,1 l/h] |
| 9 | - low | - low |
| 10 | Power [0,1 kW] | Power [0,1 kW] |
| 11 | - low | - low |
| 12 | Acc. Volume [0,1 m3] | Acc. Volume [0,1 m3] |
| 13 | - low | - low |
| 14 | Acc. Energy [0,1 kWh] | Acc. Energy [0,1 MWh] |
| 15 | - low | - low |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | |
| 21 | | |
| 22 | | |
| 23 | | |
| 24 | | |

ECL Comfort 210 / 296 / 310, communication description

| "PNU offset" | Type 2 | Type 3 |
|--------------|---|---|
| 0 | Address | Address |
| 1 | Type | Type |
| 2 | Scan time | Scan time |
| 3 | ID / Serial | ID / Serial |
| 4 | - low part | - low part |
| 5 | Reserved | Reserved |
| 6 | Flow temp. [0,01 °C] | Flow temp. [0,01 °C] |
| 7 | Return temp. [0,01 °C] | Return temp. [0,01 °C] |
| 8 | Flow [0,1 l/h] | Flow [0,1 l/h] |
| 9 | - low | - low |
| 10 | Power [0,1 kW] | Power [0,1 kW] |
| 11 | - low | - low |
| 12 | Acc. Volume [0,1 m3] | Acc. Volume [0,1 m3] |
| 13 | - low | - low |
| 14 | Acc. Energy [0,1 kWh] | Acc. Energy [0,1 MWh] |
| 15 | - low | - low |
| 16 | Tariff1 Acc. Energy [0,1 kWh] | Tariff1 Acc. Energy [0,1 MWh] |
| 17 | - low | - low |
| 18 | Tariff2 Acc. Energy [0,1 kWh] | Tariff2 Acc. Energy [0,1 MWh] |
| 19 | - low | - low |
| 20 | Up time [d] | Up time [d] |
| 21 | Current time [m-bus defined structure] | Current time [m-bus defined structure] |
| 22 | - low | - low |
| 23 | Error status [heat meter defined bitmask] | Error status [heat meter defined bitmask] |
| 24 | | |

| "PNU offset" | Type 4 | |
|--------------|------------------------|--|
| 0 | Address | |
| 1 | Type | |
| 2 | Scan time | |
| 3 | ID / Serial | |
| 4 | - low part | |
| 5 | Reserved | |
| 6 | Acc. Volume [0,1 m3] | |
| 7 | - low | |
| 8 | Acc. Energy [0,1 kWh] | |
| 9 | - low | |
| 10 | Acc. Volume2 [0,1 m3] | |
| 11 | - low | |
| 12 | Acc. Energy2 [0,1 kWh] | |
| 13 | - low | |
| 14 | Acc. Volume3 [0,1 m3] | |
| 15 | - low | |
| 16 | Acc. Energy3 [0,1 kWh] | |
| 17 | - low | |
| 18 | Acc. Volume4 [0,1 m3] | |
| 19 | - low | |
| 20 | Acc. Energ4y [0,1 kWh] | |
| 21 | - low | |
| 22 | | |
| 23 | | |
| 24 | | |

9.4 Good behavior 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.

9.4.1 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.

9.4.2 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 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 9.1).

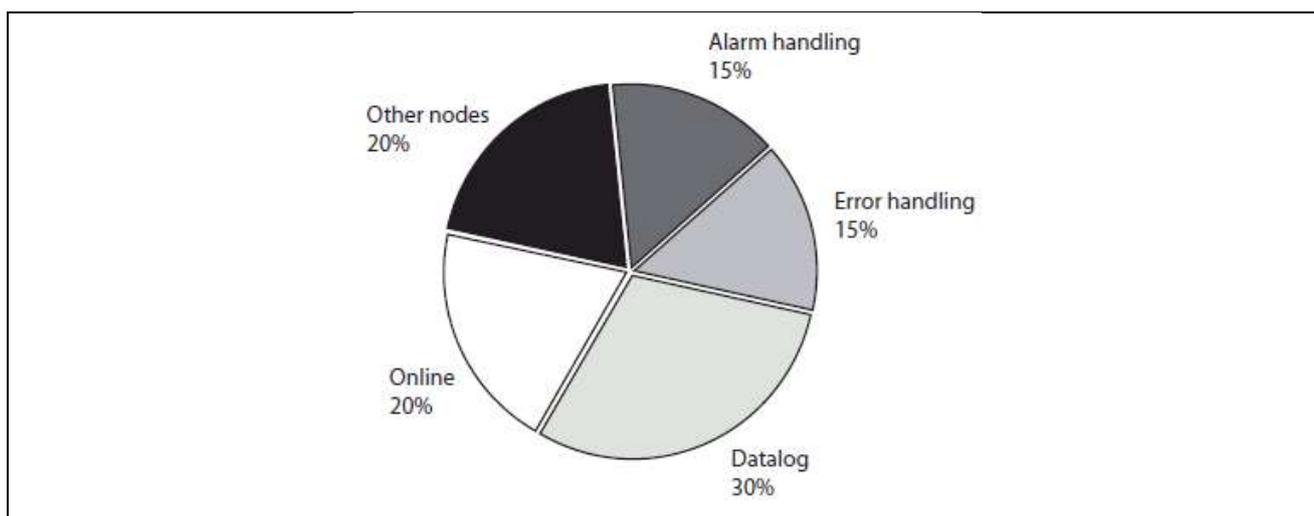


Figure 9-1

9.4.3 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.

ECL Comfort 210 / 296 / 310, communication description

A network with 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.

9.4.4 Parallel network

If a large number of controllers is 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.

9.4.5 Bandwidth considerations

Modbus is based on a command/query and response, meaning that the SCADA system sends a command/query and the ECL controller respond to this. Do not attempt to send new commands before a response is received 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.

The network must always be configured as a daisy chained network, see the three examples from a very simple network to more complex networks in section 'Network layout'.

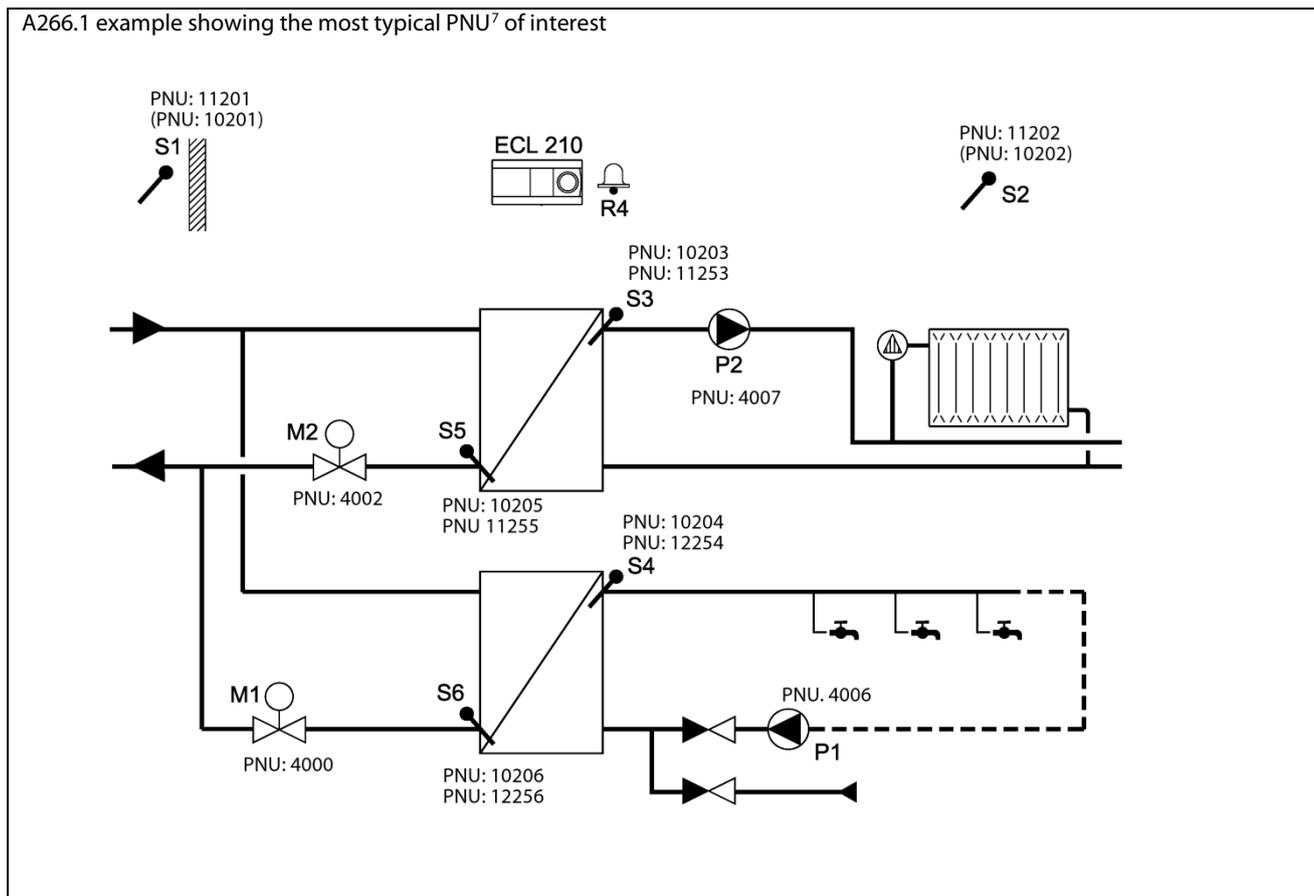
ECL Comfort 210 / 296 / 310, communication description

9.5 Parameter list (PNU list)

The parameter list is an overall description of possible parameters. The actual available parameters depend on the used application, e.g. A266.1 contains more parameters than the A230.1 application.

For details consult the installation guide for the application key.

Example of typical PNU of interest for an A266.1



Further most typical PNU of interest

| | PNU | |
|------------------------|--------------|---------------------------------|
| Circuit 1 | 4201, 4211 | Mode and status |
| | 11180, 11181 | Comfort / Saving room set-point |
| Circuit 2 (DHW) | 4202, 4212 | Mode and status |
| | 12190, 12191 | Comfort / Saving DHW set-point |

⁷ The (PNU), e.g. (PNU: 10202) are the sensor value.

ECL Comfort 210 / 296 / 310, communication description

Note: The list only contains circuit I examples. Circuit II, III and IV will use equal numbers, with 12xxx, 13xxx, 14xxx prefix.

Any scale information in the parameter list should only be used as a guideline, as this may change with Application.

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|--------------------------------------|-------------|------|--------|-------|
| ECL Sales and order number | | 19 | | |
| Hardware revision | | 34 | | |
| ECL Software version | | 35 | | |
| Serial high part | | 36 | | |
| Serial low part | | 37 | | |
| Modbus Network Address | | 38 | | |
| Modbus Baud rate | | 39 | | |
| Address Type (1: Static IP, 0: DHCP) | | 258 | | |
| IP adr. 1 | | 278 | | |
| IP adr. 2 | | 279 | | |
| IP adr. 3 | | 280 | | |
| IP adr. 4 | | 281 | | |
| Net mask 1 | | 286 | | |
| Net mask 2 | | 287 | | |
| Net mask 3 | | 288 | | |
| Net mask 4 | | 289 | | |
| Gateway adr. 1 | | 282 | | |
| Gateway adr. 2 | | 283 | | |
| Gateway adr. 3 | | 284 | | |
| Gateway adr. 4 | | 285 | | |
| Alarm field 2 – Sum alarms 17-32 | | 1024 | | |
| Alarm field 1 – Sum alarms 1-16 | | 1025 | | |
| Alarm field 2 – Clear alarms 17-32 | | 1032 | | |
| Alarm field 1 – Clear alarms 1-16 | | 1033 | | |
| Alarm Context #01 | | 1040 | | |
| Alarm Context #02 | | 1041 | | |
| Alarm Context #03 | | 1042 | | |
| Alarm Context #04 | | 1043 | | |
| Alarm Context #05 | | 1044 | | |
| Alarm Context #06 | | 1045 | | |
| Alarm Context #07 | | 1046 | | |
| Alarm Context #08 | | 1047 | | |
| Alarm Context #09 | | 1048 | | |
| Alarm Context #10 | | 1049 | | |
| Alarm Context #11 | | 1050 | | |
| Alarm Context #12 | | 1051 | | |
| Alarm Context #13 | | 1052 | | |
| Alarm Context #14 | | 1053 | | |
| Alarm Context #15 | | 1054 | | |
| Alarm Context #16 | | 1055 | | |
| Alarm Context #17 | | 1056 | | |
| Alarm Context #18 | | 1057 | | |
| Alarm Context #19 | | 1058 | | |
| Alarm Context #20 | | 1059 | | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|--|-------------|------|--------|-------|
| Alarm Context #21 | | 1060 | | |
| Alarm Context #22 | | 1061 | | |
| Alarm Context #23 | | 1062 | | |
| Alarm Context #24 | | 1063 | | |
| Alarm Context #25 | | 1064 | | |
| Alarm Context #26 | | 1065 | | |
| Alarm Context #27 | | 1066 | | |
| Alarm Context #28 | | 1067 | | |
| Alarm Context #29 | | 1068 | | |
| Alarm Context #30 | | 1069 | | |
| Alarm Context #31 | | 1070 | | |
| Alarm Context #32 | | 1071 | | |
| | | | | |
| ECL485 Bus address | | 2048 | | |
| Modbus Bias | | 2049 | | |
| Language | | 2050 | | |
| | | | | |
| Pt1000 sensor monitor | | | | |
| Sensor monitor valid mask1 | | 2052 | | |
| Sensor monitor valid mask2 | | 2053 | | |
| Sensor monitor error mask1 | | 2054 | | |
| Sensor monitor error mask2 | | 2055 | | |
| | | | | |
| Application info | | | | |
| Application prefix | | 2060 | | |
| Application type number | | 2061 | | |
| Application type sub number | | 2062 | | |
| Application version | | 2063 | | |
| Res. for further PNU's e.g. App sales number | | | | |
| | | | | |
| Wink | | 2097 | | |
| ECL Sales number type | | 2098 | | |
| ECL production date | | 2099 | | |
| | | | | |
| 4* Extension Device x info | | | | |
| Serial High | | 2100 | | |
| Serial Low | | 2101 | | |
| SW version | | 2102 | | |
| HW version | | 2103 | | |
| Sales number type | | 2104 | | |
| Sales number | | 2105 | | |
| Device 2 | | 2110 | | |
| ... | | ... | | |
| Device 4 info end | | 2135 | | |
| | | | | |
| Service Pin | | 2150 | | |
| Extension Reset | | 2151 | | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|---|------------------|------|--------|-------|
| Schedule PNU 3110 - 3675 | | | | |
| Schedule Monday circuit X period 1 start | Monday P1 ON | 3110 | R/W | |
| Schedule Monday circuit X period 1 stop | Monday P1 OFF | 3111 | R/W | |
| Schedule Monday circuit X period 2 start | Monday P2 ON | 3112 | R/W | |
| Schedule Monday circuit X period 2 stop | Monday P2 OFF | 3113 | R/W | |
| Schedule Monday circuit X period 3 start | Monday P3 ON | 3114 | R/W | |
| Schedule Monday circuit X period 3 stop | Monday P3 OFF | 3115 | R/W | |
| Schedule Tuesday circuit X period 1 start | Tuesday P1 ON | 3120 | R/W | |
| Schedule Tuesday circuit X period 1 stop | Tuesday P1 OFF | 3121 | R/W | |
| Schedule Tuesday circuit X period 2 start | Tuesday P2 ON | 3122 | R/W | |
| Schedule Tuesday circuit X period 2 stop | Tuesday P2 OFF | 3123 | R/W | |
| Schedule Tuesday circuit X period 3 start | Tuesday P3 ON | 3124 | R/W | |
| Schedule Tuesday circuit X period 3 stop | Tuesday P3 OFF | 3125 | R/W | |
| Schedule Wednesday circuit X period 1 start | Wednesday P1 ON | 3130 | R/W | |
| Schedule Wednesday circuit X period 1 stop | Wednesday P1 OFF | 3131 | R/W | |
| Schedule Wednesday circuit X period 2 start | Wednesday P2 ON | 3132 | R/W | |
| Schedule Wednesday circuit X period 2 stop | Wednesday P2 OFF | 3133 | R/W | |
| Schedule Wednesday circuit X period 3 start | Wednesday P3 ON | 3134 | R/W | |
| Schedule Wednesday circuit X period 3 stop | Wednesday P3 OFF | 3135 | R/W | |
| Schedule Thursday circuit X period 1 start | Thursday P1 ON | 3140 | R/W | |
| Schedule Thursday circuit X period 1 stop | Thursday P1 OFF | 3141 | R/W | |
| Schedule Thursday circuit X period 2 start | Thursday P2 ON | 3142 | R/W | |
| Schedule Thursday circuit X period 2 stop | Thursday P2 OFF | 3143 | R/W | |
| Schedule Thursday circuit X period 3 start | Thursday P3 ON | 3144 | R/W | |
| Schedule Thursday circuit X period 3 stop | Thursday P3 OFF | 3145 | R/W | |
| Schedule Friday circuit X period 1 start | Friday P1 ON | 3150 | R/W | |
| Schedule Friday circuit X period 1 stop | Friday P1 OFF | 3151 | R/W | |
| Schedule Friday circuit X period 2 start | Friday P2 ON | 3152 | R/W | |
| Schedule Friday circuit X period 2 stop | Friday P2 OFF | 3153 | R/W | |
| Schedule Friday circuit X period 3 start | Friday P3 ON | 3154 | R/W | |
| Schedule Friday circuit X period 3 stop | Friday P3 OFF | 3155 | R/W | |
| Schedule Saturday circuit X period 1 start | Saturday P1 ON | 3160 | R/W | |
| Schedule Saturday circuit X period 1 stop | Saturday P1 OFF | 3161 | R/W | |
| Schedule Saturday circuit X period 2 start | Saturday P2 ON | 3162 | R/W | |
| Schedule Saturday circuit X period 2 stop | Saturday P2 OFF | 3163 | R/W | |
| Schedule Saturday circuit X period 3 start | Saturday P3 ON | 3164 | R/W | |
| Schedule Saturday circuit X period 3 stop | Saturday P3 OFF | 3165 | R/W | |
| Schedule Sunday circuit X period 1 start | Sunday P1 ON | 3170 | R/W | |
| Schedule Sunday circuit X period 1 stop | Sunday P1 OFF | 3171 | R/W | |
| Schedule Sunday circuit X period 2 start | Sunday P2 ON | 3172 | R/W | |
| Schedule Sunday circuit X period 2 stop | Sunday P2 OFF | 3173 | R/W | |
| Schedule Sunday circuit X period 3 start | Sunday P3 ON | 3174 | R/W | |
| Schedule Sunday circuit X period 3 stop | Sunday P3 OFF | 3175 | R/W | |
| Schedule 2 - start | | 3210 | | |
| Schedule 2 - end | | 3275 | | |
| Schedule 3 - start | | 3310 | | |
| Schedule 3 - end | | 3375 | | |
| Schedule 4 - start | | 3410 | | |
| Schedule 4 - end | | 3475 | | |
| Schedule 5 - start | | 3510 | | |
| Schedule 5 - end | | 3575 | | |
| Schedule 6 - start | | 3610 | | |
| Schedule 6 - end | | 3675 | | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|---|-------------|------|--------|-------|
| Output | | | | |
| Output bit mask High word (digital outputs) | | 3998 | | |
| Output bit mask Low word (digital outputs) | | 3999 | | |
| Triac 1 | | 4000 | R | |
| ... | | | | |
| Triac 6 | | 4005 | R | |
| Relay 1 | | 4006 | R | |
| ... | | | | |
| Relay 6 | | 4011 | R | |
| ECA 32 Relay 1 | | 4012 | R | |
| ... | | | | |
| ECA 32 Relay 4 | | 4015 | R | |
| Manual status, Triac 1 | | 4020 | R | |
| Manual status, Triac 2 | | 4021 | R | |
| Manual status, Triac 3 | | 4022 | R | |
| Manual status, Triac 4 | | 4023 | R | |
| Manual status, Triac 5 | | 4024 | R | |
| Manual status, Triac 6 | | 4025 | R | |
| Manual status, Relay 1 | | 4026 | R | |
| Manual status, Relay 2 | | 4027 | R | |
| Manual status, Relay 3 | | 4028 | R | |
| Manual status, Relay 4 | | 4029 | R | |
| Manual status, Relay 5 | | 4030 | R | |
| Manual status, Relay 6 | | 4031 | R | |
| Manual status, ECA32 Relay 1 | | 4032 | R | |
| Manual status, ECA32 Relay 2 | | 4033 | R | |
| Manual status, ECA32 Relay 3 | | 4034 | R | |
| Manual status, ECA32 Relay 4 | | 4035 | R | |
| Manual status, ECA32 AO1 | | 4036 | | |
| Manual status, ECA32 AO2 | | 4037 | | |
| Manual status, ECA32 AO3 | | 4038 | | |
| Manual values - reserve start | | 4040 | R | |
| Manual value, ECA32 AO1 | | ... | | |
| Manual value, ECA32 AO1 | | 4056 | | |
| Manual value, ECA32 AO1 | | 4057 | | |
| | | 4058 | | |
| Manual values - reserve end | | 4059 | R | |
| Override status, Triac 1 | | 4060 | RW | |
| Override status, Triac 2 | | 4061 | RW | |
| Override status, Triac 3 | | 4062 | RW | |
| Override status, Triac 4 | | 4063 | RW | |
| Override status, Triac 5 | | 4064 | RW | |
| Override status, Triac 6 | | 4065 | RW | |
| Override status, Relay 1 | | 4066 | RW | |
| Override status, Relay 2 | | 4067 | RW | |
| Override status, Relay 3 | | 4068 | RW | |
| Override status, Relay 4 | | 4069 | RW | |
| Override status, Relay 5 | | 4070 | RW | |
| Override status, Relay 6 | | 4071 | RW | |
| Override status, ECA32 Relay 1 | | 4072 | RW | |
| Override status, ECA32 Relay 2 | | 4073 | RW | |
| Override status, ECA32 Relay 3 | | 4074 | RW | |
| Override status, ECA32 Relay 4 | | 4075 | RW | |
| Override status, ECA32 AO1 | | 4076 | | |
| Override status, ECA32 AO2 | | 4077 | | |
| Override status, ECA32 AO3 | | 4078 | | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|--|-------------|------|--------|-------|
| Override values - reserve start | | 4080 | | |
| ... | | ... | | |
| Override value, ECA32 AO1 | | 4096 | | |
| Override value, ECA32 AO2 | | 4097 | | |
| Override value, ECA32 AO3 | | 4098 | | |
| ... | | ... | | |
| Override values - reserve end | | 4099 | | |
| Override values - reserve start | | 4080 | | |
| ... | | ... | | |
| Override value, ECA32 AO1 | | 4096 | | |
| Override value, ECA32 AO2 | | 4097 | | |
| Override value, ECA32 AO3 | | 4098 | | |
| ... | | ... | | |
| Override values - reserve end | | 4099 | | |
| Config setup | | | | |
| Config type S7 | | 4100 | | |
| Config type S8 | | 4101 | | |
| Config type S9 | | 4102 | | |
| Config type S10 | | 4103 | | |
| Config type S11 | | 4104 | | |
| Config type S12 | | 4105 | | |
| ECA 32 Config type S13 | | 4106 | | |
| ECA 32 Config type S14 | | 4107 | | |
| ECA 32 Config type S15 | | 4108 | | |
| ECA 32 Config type S16 | | 4109 | | |
| ECA 32 Config type S17 Pulse/frequency | | 4110 | | |
| ECA 32 Config type S18 Pulse/frequency | | 4111 | | |
| Config option S7 | | 4120 | | |
| Config option S8 | | 4121 | | |
| Config option S9 | | 4122 | | |
| Config option S10 | | 4123 | | |
| Config option S11 | | 4124 | | |
| Config option S12 | | 4125 | | |
| ECA 32 Config option S13 | | 4126 | | |
| ECA 32 Config option S14 | | 4127 | | |
| ECA 32 Config option S15 | | 4128 | | |
| ECA 32 Config option S16 | | 4129 | | |
| ECA 32 Config option S17 Pulse/frequency | | 4130 | | |
| ECA 32 Config option S18 Pulse/frequency | | 4131 | | |
| Controller mode | | | | |
| Circuit 1 mode | | 4201 | R/W | |
| Circuit 2 mode | | 4202 | R/W | |
| Circuit 3 mode | | 4203 | R/W | |
| Circuit 4 mode | | 4204 | R/W | |
| Circuit 1 status | | 4211 | R | |
| Circuit 2 status | | 4212 | R | |
| Circuit 3 status | | 4213 | R | |
| Circuit 4 status | | 4214 | R | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|---------------------------------|-------------|-------|--------|-------|
| Limiter info | | | | |
| Circuit 1 limiter flags 1 | | 4220 | | |
| Circuit 1 limiter flags 2 | | 4221 | | |
| Circuit 1 limiter flags 3 | | 4222 | | |
| Circuit 1 limiter flags 4 | | 4223 | | |
| Circuit 2 limiter flags 1 | | 4224 | | |
| Circuit 2 limiter flags 2 | | 4225 | | |
| Circuit 2 limiter flags 3 | | 4226 | | |
| Circuit 2 limiter flags 4 | | 4227 | | |
| Circuit 3 limiter flags 1 | | 4228 | | |
| Circuit 3 limiter flags 2 | | 4229 | | |
| Circuit 3 limiter flags 3 | | 4230 | | |
| Circuit 3 limiter flags 4 | | 4231 | | |
| Circuit 4 limiter flags 1 | | 4232 | | |
| Circuit 4 limiter flags 2 | | 4233 | | |
| Circuit 4 limiter flags 3 | | 4234 | | |
| Circuit 4 limiter flags 4 | | 4235 | | |
| M-bus | | | | |
| M-bus - common | | | | |
| Baud rate | | 5997 | | |
| Command request | | 5998 | | |
| State | | 5999 | | |
| M-bus Energy meter 1 | | | | |
| Address | | 6000 | | |
| Type | | 6001 | | |
| Scan time | | 6002 | | |
| ID / Serial | | 6003 | | |
| - low part | | 6004 | | |
| Reserved | | 6005 | | |
| Flow temperature | | 6006 | | |
| Return temperature | | 6007 | | |
| Flow | | 6008 | | |
| - low part | | 6009 | | |
| Power | | 6010 | | |
| - low part | | 6011 | | |
| Accumulated Volume | | 6012 | | |
| - low part | | 6013 | | |
| Accumulated Energy | | 6014 | | |
| - low part | | 6015 | | |
| Dynamic part | | ... | | |
| Last pnu | | 6049 | | |
| M-bus Energy meter 2 | | | | |
| .. | | 6050 | | |
| M-bus Energy meter 2 | | | | |
| .. | | 6100 | | |
| M-bus Energy meter 2 | | | | |
| .. | | 6150 | | |
| M-bus Energy meter 2 | | | | |
| .. | | 6200 | | |
| Last pnu | | 6249 | | |
| Daylight saving time changeover | | 10198 | | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|---------------------------------------|---------------|-------|--------|-------|
| Raw sensor 1 | | 10201 | | 100 |
| Raw sensor 2 | | 10202 | | 100 |
| Raw sensor 3 | | 10203 | | 100 |
| Raw sensor 4 | | 10204 | | 100 |
| Raw sensor 5 | | 10205 | | 100 |
| Raw sensor 6 | | 10206 | | 100 |
| Raw sensor 7 | | 10207 | | 100 |
| Raw sensor 8 | | 10208 | | 100 |
| Raw sensor 9 | | 10209 | | 100 |
| Raw sensor 10 | | 10210 | | 100 |
| Raw sensor 11 | | 10211 | | 100 |
| Raw sensor 12 | | 10212 | | 100 |
| ECA30 room A, Raw sensor 13 | | 10213 | | 100 |
| ECA30 room A res. | | 10214 | | |
| ECA30 room A, humidity, raw sensor 15 | | 10215 | | |
| ECA30 room B, Raw sensor 13 | | 10216 | | |
| ECA30 room B res. | | 10217 | | |
| ECA30 room B, humidity, raw sensor 15 | | 10218 | | |
| ECA32 S13 | | 10219 | | |
| ECA32 S14 | | 10220 | | |
| ECA32 S15 | | 10221 | | |
| ECA32 S16 | | 10222 | | |
| ECA32 S17 PF | | 10223 | | |
| ECA32 S18 PF | | 10224 | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Makeup_Number_Of_Pumps | Make up water | 10326 | | |
| | | | | |
| Scada Outdoor temperature | | 10400 | | 100 |
| Scada heat offset 1 | | 10401 | | |
| Scada heat offset 2 | | 10402 | | |
| Scada heat offset 3 | | 10403 | | |
| Scada heat offset 4 | | 10404 | | |
| Scada boiler ctrl 1 | | 10405 | | |
| Scada boiler ctrl 2 | | 10406 | | |
| Scada boiler ctrl 3 | | 10407 | | |
| Scada boiler ctrl 4 | | 10408 | | |
| | | | | |
| MinOutdoorTemp | | 10500 | | |
| MinHourTime | | 10501 | | |
| MinMinuteTime | | 10502 | | |
| MaxOutdoorTemp | | 10505 | | |
| MaxHourTime | | 10506 | | |
| MaxMinuteTime | | 10507 | | |
| | | | | |
| OutdoorTrend | | 10510 | | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|--|-------------------|-----|--------|-------|
| Alarm group contains 20 PNU's can be placed at 10600, 116x0, 126x0, 136x0 | | | | |
| Pressure | | 0 | 10600 | |
| Voltage | | 1 | 10601 | |
| Temperature | | 2 | 10602 | |
| Digital | | 3 | 10603 | |
| -res | | 4 | 10604 | |
| -res | | 5 | 10605 | |
| -res | | 6 | 10606 | |
| Low X | | 7 | 10607 | |
| High X | | 8 | 10608 | |
| Low Y | | 9 | 10609 | |
| High Y | | 10 | 10610 | |
| -res | | 11 | 10611 | |
| -res | | 12 | 10612 | |
| -res | | 13 | 10613 | |
| Alarm High | | 14 | 10614 | |
| Alarm Low | | 15 | 10615 | |
| Digital Alarm value | | 16 | 10616 | |
| Timeout | | 17 | 10617 | |
| -res | | 18 | 10618 | |
| -res | | 19 | 10619 | |
| Holiday group number 107xx, 117xx, 127xx, 137xx | | | | |
| Hol_Status_P1 | Holiday program 1 | | 10700 | |
| Hol_Start_Day_P1 | | | 10701 | |
| Hol_Start_Month_P1 | | | 10702 | |
| Hol_Start_Year_P1 | | | 10703 | |
| Hol_End_Day_P1 | | | 10704 | |
| Hol_End_Month_P1 | | | 10705 | |
| Hol_End_Year_P1 | | | 10706 | |
| Hol_Status_P2 | Holiday program 2 | | 10707 | |
| | | | 10713 | |
| Hol_Status_P3 | Holiday program 3 | | 10714 | |
| | | | 10720 | |
| Hol_Status_P4 | Holiday program 4 | | 10721 | |
| | | | 10727 | |
| Hol_Status_P5 | Holiday program 5 | | 10728 | |
| | | | 10734 | |
| Hol_Status_P6 | Holiday program 6 | | 10735 | |
| | | | 10741 | |
| Hol_Status_P7 | Holiday program 7 | | 10742 | |
| | | | 10748 | |
| Hol_Status_P8 | Holiday program 8 | | 10749 | |
| | | | 10755 | |
| Hol_Status_P9 | Holiday program 9 | | 10756 | |
| | | | 10762 | |
| Hol_Status_P10 | Holiday prog. 10 | | 10763 | |
| | | | 10769 | |
| Hol_Status_P11 | Holiday prog. 11 | | 10770 | |
| | | | 10776 | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|-----------------------|------------------|-------|--------|-------|
| Hol_Status_P12 | Holiday prog. 12 | 10777 | | |
| | | 10783 | | |
| Hol_Status_P13 | Holiday prog. 13 | 10784 | | |
| | | 10790 | | |
| Hol_Status_P14 | Holiday prog. 14 | 10791 | | |
| | | 10797 | | |
| Hol_Status_P15 | Holiday prog. 15 | 10798 | | |
| | | 10804 | | |
| Hol_Status_P16 | Holiday prog. 16 | 10805 | | |
| | | 10811 | | |
| Hol_Status_P17 | Holiday prog. 17 | 10812 | | |
| | | 10818 | | |
| Hol_Status_P18 | Holiday prog. 18 | 10819 | | |
| | | 10825 | | |
| Hol_Status_P19 | Holiday prog. 19 | 10826 | | |
| | | 10832 | | |
| Hol_Status_P20 | Holiday prog. 20 | 10833 | | |
| | | 10839 | | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|--------------------------|-------------|-------|--------|-------|
| ECA addr. | | 11010 | | |
| Auto saving | | 11011 | | |
| Boost | | 11012 | | |
| Ramp | | 11013 | | |
| Optimizer | | 11014 | | |
| Adapt. time | | 11015 | | |
| Master/ slave demand | | 11017 | | |
| | | | | |
| Based on | | 11020 | | |
| Total stop | | 11021 | | |
| P exercise | | 11022 | | |
| M exercise | | 11023 | | |
| Actuator | | 11024 | | |
| | | | | |
| Pre stop | | 11026 | | |
| | | | | |
| Limit | | 11030 | | |
| High T out X1 | | 11031 | | |
| Low limit Y1 | | 11032 | | |
| Low T out X2 | | 11033 | | |
| High limit Y2 | | 11034 | | |
| Infl. - max. | | 11035 | | 10 |
| Infl. - min. | | 11036 | | 10 |
| Adapt. time | | 11037 | | |
| | | | | |
| Heat Circulation postrun | | 11040 | | |
| DHW Primary postun | | 11041 | | |
| DHW Secondary postrun | | 11042 | | |
| Parallel operation | | 11043 | | |
| Max Hot water load time | | 11044 | | |
| Max heat time | | 11045 | | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|----------------------------------|-------------|-------|--------|-------|
| Master/slave Pump demand | | 11050 | | |
| Valve or pump function | | 11051 | | |
| DHW prior. | | 11052 | | |
| Primary secondary placed | | 11053 | | |
| Continue regulation | | 11054 | | |
| DHW Circulation Priority | | 11055 | | |
| | | | | |
| Wind_Gain_Min | | 11056 | | |
| Wind_Gain_Max | | 11057 | | |
| | | | | |
| Flow T adapt time | | 11067 | | |
| | | | | |
| Flow_Switch | | 11069 | | |
| Circulation P frost T | | 11076 | | |
| P frost T | | 11077 | | |
| P heat T | | 11078 | | |
| Max. FlowTemp. | | 11079 | | |
| Delay | | 11080 | | |
| Wind Filter const. | | 11081 | | |
| | | | | |
| External_Setpoint | | 11084 | | |
| Priority | | 11085 | | |
| | | | | |
| Standby T (Cool application) | | 11092 | | |
| Frost pr. T (Heat application) | | 11093 | | |
| Start_Puls | | 11094 | | |
| Stop_Puls | | 11095 | | |
| PI_Tn_Saving | | 11096 | | |
| Sensor_Saving | | 11097 | | |
| Wind speed | | 11098 | | |
| Wind_Setpoint | | 11099 | | |
| S1 T filter | | 11100 | | |
| Ext. desired | | 11101 | | |
| | | | | |
| Flow_Energy_Input_Type | | 11109 | | |
| Flow_Energy_actual | | 11110 | | 10 |
| Flow_Energy_Limit | | 11111 | | 10 |
| Flow_Energy_Intr.gr | | 11112 | | |
| Flow_Energy_Filter_Value | | 11113 | | |
| Flow_Energy_Impuls | | 11114 | | |
| Flow_Energy_Unit | | 11115 | | |
| Flow_Energy_High_Limit_Y2 | | 11116 | | 10 |
| Flow_Energy_Low_Limit_Y1 | | 11117 | | 10 |
| Flow_Energy_Low_Tout_X2 | | 11118 | | |
| Flow_Energy_High_Tout_X1 | | 11119 | | |

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|--|-------------|--------------|--------|-------|
| Ext. input | | 11141 | | |
| Ext. mode | | 11142 | | |
| Alarm Clear | | 11146 | | |
| Upper difference | | 11147 | | |
| Lower difference | | 11148 | | |
| Delay | | 11149 | | |
| Cut off temp. | | 11150 | | |
| | | | | |
| Max DHW load temperature | | 11152 | | |
| | | | | |
| Knee point | | 11162 | | |
| | | | | |
| Motor pr. | | 11174 | | |
| Heat curve ⁸ | | 11175 | | 10 |
| Displace | | 11176 | | |
| Temp. min. | | 11177 | | |
| Temp. max. | | 11178 | | |
| Cut-out | | 11179 | | |
| Comfort Room setpoint | | 11180 | | 10 |
| Saving Room setpoint | | 11181 | | 10 |
| Infl. - max. | | 11182 | | |
| Infl. - min. | | 11183 | | 10 |
| Xp | | 11184 | | 10 |
| Tn | | 11185 | | |
| M run | | 11186 | | |
| Nz | | 11187 | | |
| | | | | |
| Min. act. time | | 11189 | | |
| | | | | |
| Comfort DHW setpoint | | 11190 | | 10 |
| Saving DHW setpoint | | 11191 | | 10 |
| | | | | |
| | | | | |
| Circuit 1 sensor values⁹ | | | | |
| S1 sensor | | 11201 | R | 100 |
| S2 sensor | | 11202 | R | 100 |
| S3 sensor | | 11203 | R | 100 |
| S4 sensor | | 11204 | R | 100 |
| S5 sensor | | 11205 | R | 100 |
| S6 sensor | | 11206 | R | 100 |
| S7 sensor | | 11207 | R | 100 |
| S8 sensor | | 11208 | R | 100 |
| S9 sensor | | 11209 | R | 100 |
| S10 sensor | | 11210 | R | 100 |
| | | | | |
| S1 sensor reference | | 11251 | R | 100 |
| S2 sensor reference | | 11252 | R | 100 |
| S3 sensor reference | | 11253 | R | 100 |
| S4 sensor reference | | 11254 | R | 100 |
| S5 sensor reference | | 11255 | R | 100 |
| S6 sensor reference | | 11256 | R | 100 |
| S7 sensor reference | | 11257 | R | 100 |
| S8 sensor reference | | 11258 | R | 100 |
| S9 sensor reference | | 11259 | R | 100 |
| S10 sensor reference | | 11260 | R | 100 |

⁸ In some applications the heat curve parameter is writable, and will, if set, adjust “y” points (PNU 11400 – 11405)!

⁹ Sensors within a circuit (e.g. 11202, 12202, not 10202) are normally only available for sensors that have multiple sources e.g. room temperature that also can come from ECA 30

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|--------------------------------|------------------|-------|--------|-------|
| High_Signal_X2 | | 11300 | | |
| High_Setpoint_Y2 | | 11301 | | |
| Low_Signal_X1 | | 11302 | | |
| Low_Setpoint_Y1 | | 11303 | | |
| | | | | |
| Retry Time | Two pump control | 11310 | | |
| TP_Day_Value | Two pump control | 11311 | | |
| TP_Hour_Value | Two pump control | 11312 | | |
| Stabilization Time | Two pump control | 11313 | | |
| ChangeOver Time | Two pump control | 11314 | | |
| Alarm_Status_Clear_TwinPump | Two pump control | 11315 | | |
| TwinPump_Motion | Two pump control | 11316 | | |
| | | | | |
| Makeup_Motion | Make up water | 11320 | | |
| Makeup_Pressure_Set | Make up water | 11321 | | |
| Makeup_Pressure_Diff | Make up water | 11322 | | |
| Makeup_Time_Out | Make up water | 11323 | | |
| Alarm_Status_Clear_Makeup | Make up water | 11324 | | |
| Wait_Open_Valve | Make up water | 11325 | | |
| Makeup_Number_Of_Pumps | Make up water | 11326 | | |
| Makeup_Input_Type | Make up water | 11327 | | |
| | | | | |
| H-Curve point Y1 | | 11400 | | |
| H-Curve point Y2 | | 11401 | | |
| H-Curve point Y3 | | 11402 | | |
| H-Curve point Y4 | | 11403 | | |
| H-Curve point Y5 | | 11404 | | |
| H-Curve point Y6 | | 11405 | | |
| H-Curve point X1 ¹⁰ | | 11406 | | |
| H-Curve point X2 | | 11407 | | |
| H-Curve point X3 | | 11408 | | |
| H-Curve point X4 | | 11409 | | |
| H-Curve point X5 | | 11410 | | |
| H-Curve point X6 | | 11411 | | |
| | | | | |
| Select reference | | 11500 | | |
| Reference place | | 11501 | | |
| | | | | |
| Pressure | | 11600 | | |
| | | | | |
| Alarm high | | 11614 | | |
| Alarm low | | 11615 | | |
| Alarm timeout | | 11617 | | |
| | | | | |
| Low X | | 11607 | | |
| High X | | 11608 | | |
| Low Y | | 11609 | | |
| High Y | | 11610 | | |
| | | | | |
| Digital | | 11623 | | |

¹⁰ The heat curve X points are typical not available

ECL Comfort 210 / 296 / 310, communication description

| ECL Comfort Parameter | Description | PNU | Access | Scale |
|-----------------------|-------------|-------|--------|-------|
| Alarm value | | 11636 | | |
| Alarm timeout | | 11637 | | |
| | | | | |
| Display backlight | | 60058 | | |
| Display contrast | | 60059 | | |
| Hour | | 64045 | R/W | |
| Min | | 64046 | R/W | |
| Date | | 64047 | R/W | |
| Month | | 64048 | R/W | |
| Year | | 64049 | R/W | |
| | | | | |

9.6 Revision History

| Version | Date | Description |
|---------|------------|---|
| 1 | 2010-11-15 | Initial release |
| 2 | 2011-03-21 | Minor corrections |
| 3 | 2011-08-20 | Correction to schedule description and minor additions |
| 4 | ? | Addition to Holiday description Added description of output (such as ECA 32 relays and analogue outputs) Parameter List updated, scale Added better description about schedules and anti-bacteria and for extra circuits |

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