

## Data sheet

# ECL Comfort 310 controller and Remote Control Unit ECA 30 / 31

### Description

ECL Comfort 310 controller series



#### ECL Comfort 310 controller:

The ECL Comfort 310 is an electronic weather compensated temperature controller in the ECL Comfort controller family for use in district heating, central heating and cooling systems. Up to 4 circuits can be controlled. The ECL Comfort 310 controller is loaded with a selected application by means of an ECL Application Key.

It is designed for comfortable temperatures, optimum energy consumption, easy installation by means of the ECL Application Key (Plug-and-Play) and user friendly operation. Improved energy savings are facilitated by weather compensation, adjustment of temperature according to schedule, optimization as well as limitation of return temperature, flow and power. Functionalities such as data logging and alarm functions are implemented in the controller.

The ECL Comfort 310 is easily operated by means of a dial (multi-functional knob) or a Remote Control Unit (RCU). The dial and the display guide the user through the text menus in the selected language.

The ECL Comfort 310 controller has electronic output for motorized valve control, relay output for circulation pump / changeover valve control among others, as well as alarm output. 6 Pt 1000 temperature sensors can be connected. In addition, 4 configurable input signals can be selected as Pt 1000 temperature sensor input, analog input (0 – 10 V) or digital input.

Depending on application, internal I/O module (ECA 32) will be available for extra input and output signals.

The enclosure is designed for mounting on wall and DIN rail. A variant ECL Comfort 310B (without display and dial) is available. It can be used for mounting inside a panel and is operated by means of the RCU ECA 30 / 31 which is placed in front of the panel.

The ECL Comfort 310 communicates with the RCU and other ECL Comfort 210 / 310 controllers via the internal ECL 485 communication bus. Ethernet connection is integrated in the controller. Furthermore, Modbus communication to SCADA systems (Supervisory Control and Data Acquisition) and M-bus communication to heat meters are integrated.

#### Remote Control Unit (RCU):

The RCUs ECA 30 and ECA 31 are used for room temperature control and override of the ECL Comfort 310. The RCUs are connected to the ECL Comfort controllers by means of 2 x twisted pair cable for communication and power supply (ECL 485 communication bus).

The ECA 30 / 31 has a built-in temperature sensor. An external temperature sensor can be connected substituting the built-in temperature sensor. Furthermore, the ECA 31 has a built-in humidity sensor and the humidity signal is used in relevant applications. It is possible to connect up to 2 RCUs on the ECL 485 communication bus. One RCU can monitor max. 10 ECL Comfort controllers (master / slave system).

## ECL Application Key and applications:

Different ECL Application Keys make it easy for the ECL Comfort 310 hardware to run different applications. The ECL Comfort 310 controller is loaded with the desired application by means of the ECL Application Key, which contains information about applications (simple application sketches are shown in the display), languages and factory settings. The ECL Application Keys for ECL Comfort 210 can also be used in ECL Comfort 310.

The application parameters are stored in the controller and are not affected by a power break.

The relevant ECL Application Keys for the ECL Comfort 310 controller can be found in the ordering section.

## Extension module:

The use of the module depends on the selected applications.

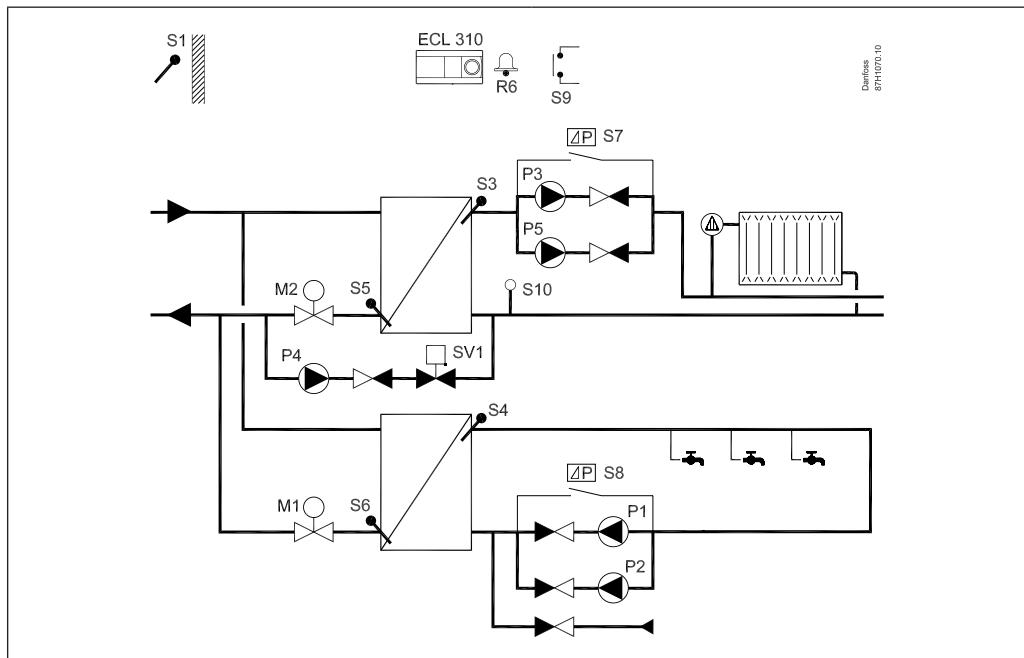
An optional module can be inserted into the controller's base part for additional input and output signals.

Type	Designation	Description
ECA 32	Internal I/O module	Inserted in the base part. Contains: 2 x relay NC and 2 x relay SPDT 3 x analog output signals (0 -10 V) 6 x configurable input signals (Pt 1000 temperature sensor, analog input 0 -10 V, digital input) 2 x pulse counter

## Application examples

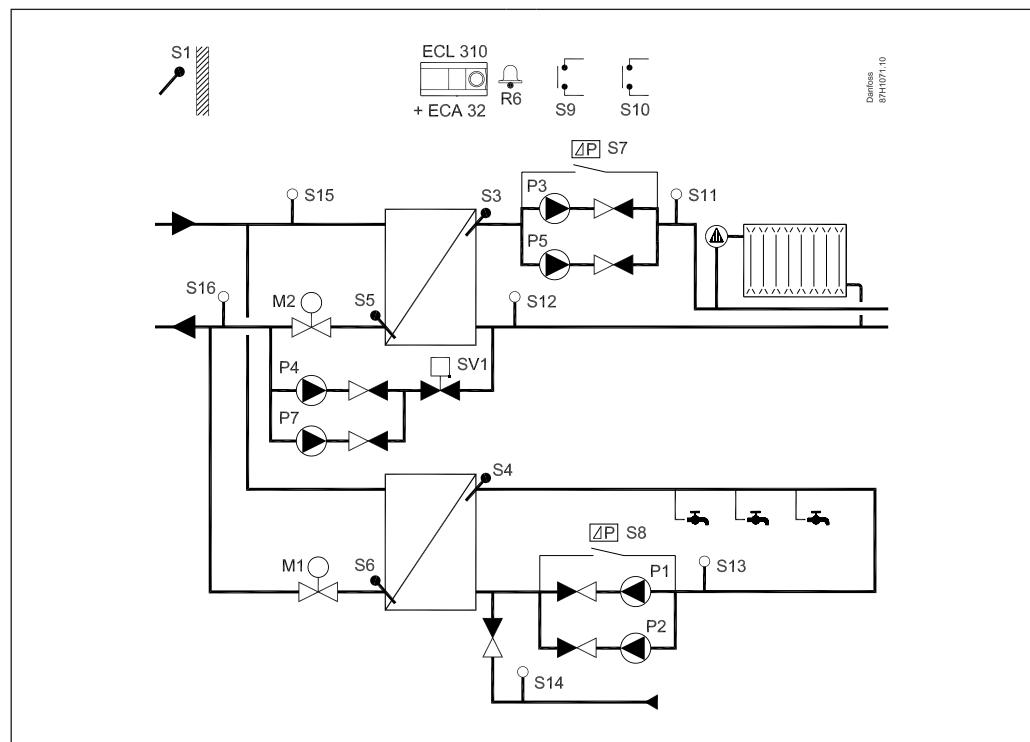
All applications from ECL Comfort 210 can run in ECL Comfort 310 thus enabling some communication facilities.

A368.1:  
Typical heating and DHW system (district heating).

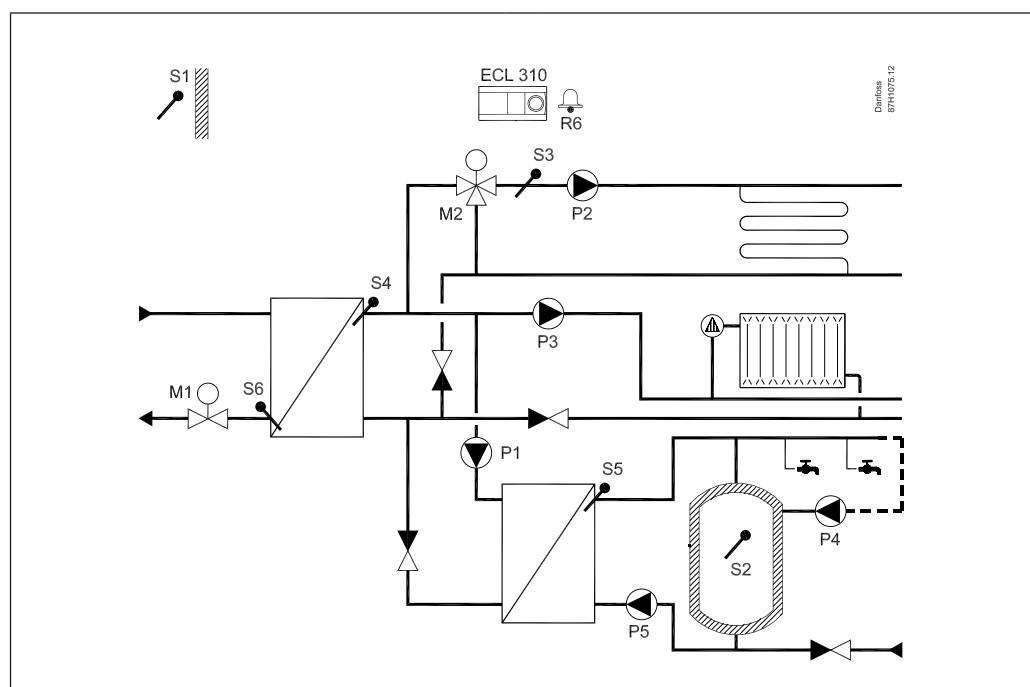


All mentioned components (S = temperature sensor, P = pump, M = Motorized control valve) are wired to the ECL Comfort 310.

**A368.2:**  
Typical heating and DHW system (district heating).



**A367.1:**  
Typical heating and DHW (district heating) system with 2 heating circuits and DHW charging storage tank



**Ordering**

Controller, base part and accessories:

Type	Designation	Code no.
ECL Comfort 310	Universal hardware - 230 V a.c. Base part is not included.	087H3040
ECL Comfort 310	Universal hardware - 24 V a.c. Base part is not included.	087H3044
ECL Comfort 310B	Universal hardware - 230 V a.c. Without display and dial. Requires a Remote Control Unit. Base part is not included.	087H3050
ECL Comfort 310B	Universal hardware - 24 V a.c. Without display and dial. Requires a Remote Control Unit. Base part is not included.	087H3054
ECL Comfort 310 base part	For mounting on wall or DIN rail (35 mm). ECL Comfort 210 can be mounted in an ECL Comfort 310 base part (for future upgrade).	087H3230

Remote Control Units and accessories (ECA 31 ordering according to the stepwise introduction):

Type	Designation	Code no.
ECA 30	Remote Control Unit with an integrated temperature sensor and possibility for connecting an external Pt 1000 temperature sensor. Base part for mounting on wall included.	087H3200
ECA 31	Remote Control Unit with an integrated temperature sensor and a humidity sensor. Possibility for connecting an external Pt 1000 temperature sensor. Base part for mounting on wall included.	087H3201
ECA 30 / 31 frame kit for mounting in panel front	For mounting in a cut-out. Format 144 x 96 mm, actual cut-out 139 x 93 mm.	087H3236

Extension module and accessories:

Type	Designation	Code no.
ECA 32	Internal I/O module	087H3202
ECA 99	230 V a.c. to 24 V a.c. transformer (35 VA)	087B1156

ECL Application Keys (ordering according to the stepwise introduction):

Type	Application type description	Controller output signals	Code no.
A214	Constant temperature control (heating / cooling) of ventilation systems.	2 x 3-point, 2 x 2-point	087Hxxxx
A217	Advanced temperature control of DHW (domestic hot-water) circuit with / without storage charging system.	1 x 3-point, 3 x 2-point	087Hxxxx
A230	<ul style="list-style-type: none"> <li>Weather compensated or constant flow temperature control of heating systems with sliding return temperature limitation and with / without wind compensation.</li> <li>Weather compensated or constant flow temperature control of district cooling based systems.</li> <li>Weather compensated flow temperature control of boiler based heating systems and minimum boiler temperature.</li> </ul>	1 x 3-point, 2 x 2-point	087H3802
A231	Weather compensated flow temperature control with twin-pump control for circulation and make-up water.	1 x 3-point, 4 x 2-point	087Hxxxx
A232	Weather compensated flow temperature control in combined heating and cooling systems, typically floor systems. The slab temperature can be limited. In addition, the dew point temperature will limit the flow temperature at cooling (temperature and humidity are measured by ECA 31).	1 x 3-point, 3 x 2-point	087Hxxxx
A237	Weather compensated flow temperature control of systems with sliding return temperature limitation. Constant temperature control of secondarily connected DHW circuits with storage tank charging system or storage tank with internal heat exchanger. Optional ON / OFF control of the DHW circuit in connection with primarily connected storage tank with internal heat exchanger.	1 x 3-point, 3 x 2-point	087Hxxxx
A247	Weather compensated flow temperature control of systems with sliding return temperature limitation. Constant temperature control of DHW circuits with storage tank charging system.	2 x 3-point, 3 x 2-point	087Hxxxx

**ECL Application Keys (continued):**

Type	Application type description	Controller output signals	Code no.
A255	Boiler controller with constant temperature control of DHW circuit and weather compensated flow temperature control of a mixed and an unmixed heating circuit.	1 x 3-point, 3 x 2-point	087Hxxxx
A260	Weather compensated flow temperature control of heating systems with sliding return temperature limitation for two independent heating circuits.	2 x 3-point, 2 x 2-point	087H3801
A266	Weather compensated flow temperature control of heating systems with sliding return temperature limitation. Constant temperature control of DHW circuits with flow system. Additional functions: flow switch control.	2 x 3-point, 4 x 2-point	087H3800
A305	Weather compensated flow temperature control for heat pump system (up to 2 stages), additional heating circuit and temperature control for DHW circuit.	1 x 3-point, 5 x 2-point	087Hxxxx
A361	Weather compensated flow temperature control of heating systems with sliding return temperature limitation for two independent heating circuits with twin-pump control and make-up water function.	2 x 3-point, 7 x 2-point*	087Hxxxx
A367	Weather compensated flow temperature control of heating systems with sliding return temperature limitation for two independent heating circuits. Constant temperature control of the secondarily connected DHW circuits with storage tank with internal heat exchanger or DHW storage charging system.	2 x 3-point, 5 x 2-point	087Hxxxx
A368	Weather compensated flow temperature control of heating systems with sliding return temperature limitation, twin-pump control and make-up water function, also with twin-pump control. Constant temperature control of DHW circuit with flow system and twin-pump control.	2 x 3-point, 7 x 2-point*	087Hxxxx
A375	Multistage boiler controller (up to 8 boiler steps) with ON / OFF temperature control of DHW circuit and weather compensated flow temperature control of a direct heating circuit and a mixed heating circuit.	1 x 3-point, 10 x 2-point*	087Hxxxx
A376	Weather compensated flow temperature control of two independent heating systems with sliding return temperature limitation. Constant temperature control of DHW circuit with flow switch control.	3 x 3-point, 3 x 2-point	087Hxxxx

\* ECA 32 module needed.

Each of the abovementioned code nos. comprises 1 ECL Application Key, 1 mounting guide and 1 set of multi-lingual user guides.

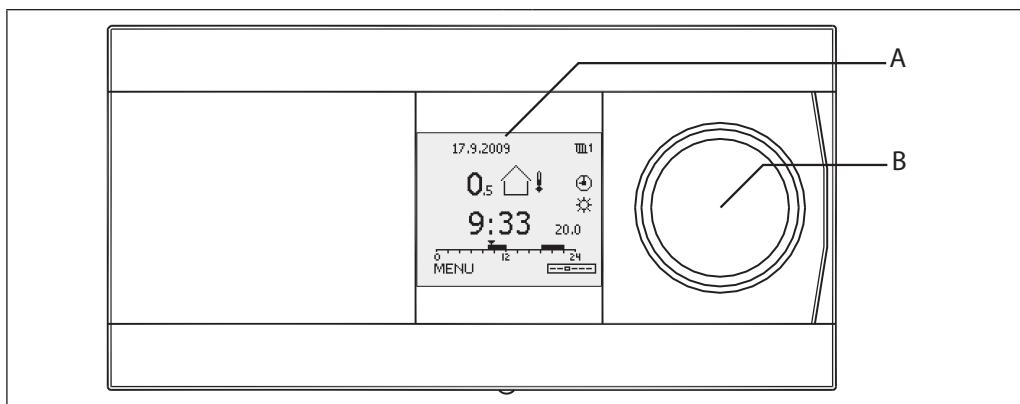
**Pt 1000 temperature sensors (IEC 751B, 1000 Ω / 0 °C):**

Type	Designation	Code No.
ESMT	Outdoor temperature sensor	084N1012
ESM-10	Room temperature sensor	087B1164
ESM-11	Surface temperature sensor	087B1165
ESMB-12	Universal temperature sensor	087B1184
ESMC	Surface temperature sensor incl. 2 m cable	087N0011
ESMU-100	Immersion sensor, 100 mm, copper	087B1180
ESMU-250	Immersion sensor, 250 mm, copper	087B1181
ESMU-100	Immersion sensor, 100 mm, stainless steel	087B1182
ESMU-250	Immersion sensor, 250 mm, stainless steel	087B1183

**Accessories and spare parts:**

Pocket	Immersion, stainless steel 100 mm, for ESMU-100, Cu (087B1180)	087B1190
Pocket	Immersion, stainless steel 250 mm, for ESMU-250, Cu (087B1181)	087B1191
Pocket	Immersion, stainless steel 100 mm, for ESMB-12, (087B1184)	087B1192
Pocket	Immersion, stainless steel 250 mm, for ESMB-12, (087B1184)	087B1193

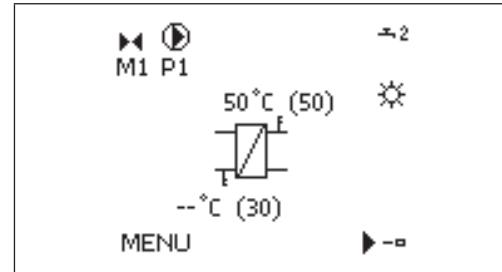
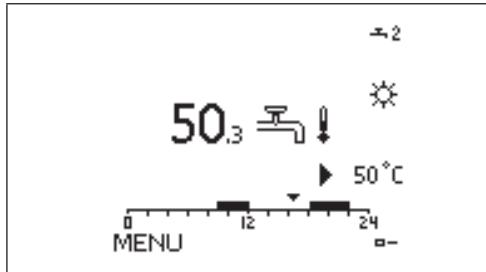
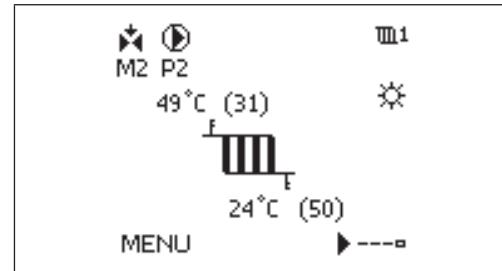
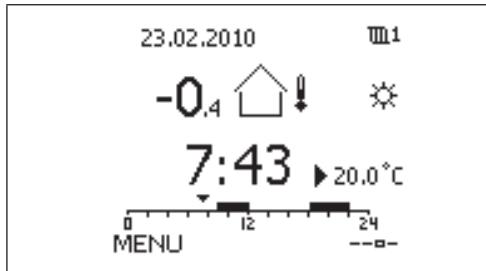
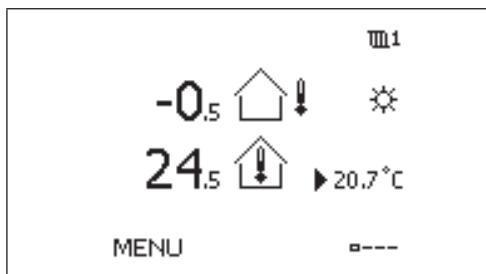
## Operation



The graphical monochrome display (A) shows all temperature values as well as status information and is used for the setting of control parameters. Different favorite displays can be selected. Navigation, browsing and selecting the current item in the menus is done by means of the dial (multi-functional knob (B)).

The RCUs ECA 30 / 31 are used for remote setting and override of ECL Comfort controller. By means of the built-in room temperature sensor, the flow temperature can be corrected to keep a constant room temperature at comfort or saving temperature. The ECA 30 / 31 is operated as an ECL Comfort 310 with dial.

Examples of favorite displays:



**Functions**
**General functions:**

- The ECL Comfort 310 has all the required functions of a modern electronic temperature controller for heating and DHW applications.
- The controller can be used as master or slave in systems with master / slave ECL Comfort 210 / 310 controllers.
- The ECL Application Key contains the application software for flexible configuration. It is possible to update the controller with new application software.
- The ECL Comfort 310 contains, besides the standard functions, log and alarm functions.
- The built-in Real Time Clock gives automatic summer / winter time changeover, week and holiday schedule.
- Motor protection, which ensures stable control and a long life of the motorized control valve, is available for most of the applications. In periods without heat demand, the motorized control valve is exercised to avoid blocking.
- Scheduled control is based on a week program. A holiday program gives the possibility to select days with comfort or saving mode.
- The ECL Comfort 310 can react on pulses from a heat or flow meter to limit the power or the flow.
- The ECL Comfort 310 can communicate via M-bus to heat meters and react on heat or flow signals to limit the power or the flow.
- In many applications analog inputs (0 – 10 V) are configured for pressure measuring among others. The scaling is set in the controller.
- Some applications are configured to handle digital input. This function can be used to have an external switch to run comfort or saving mode or react on a flow switch signal e.g.
- The control parameters, proportional band (Xp), integration time (Tn), running time of the motorized control valve and neutral zone (Nz) can be set individually for each output (3-point control).
- Several applications fulfil the demand for make-up water function and / or twin-pump control.

**Heating functions:**

- The heat curve and max. / min. limitations of the flow temperature are set by means of 6 coordinate points.
- The return temperature limitation can work in relation to the outdoor temperature or be a fixed value.
- The heating cut-out function can switch-out the heating and stop the circulation pump at high outdoor temperatures.
- Based on the room temperature the ECL Comfort 310 can correct the desired flow temperature in order to increase the comfort level.
- The optimizer function ensures heating in the desired periods (the lower outdoor temperature, the earlier cut-in of the heating).
- The ramping function makes a smooth cut-in of the heating (district heating installations).
- The boost function makes a powerful cut-in of the heating (boiler based installations).
- The circulation pump is controlled in relation to heat demand and frost protection. In periods without heat demand, the circulation pump is exercised to avoid blocking.
- The saving function gives two possibilities:
  - reduced flow temperature with fixed reduction or reduction in relation to outdoor temperature (the lower the outdoor temperature, the less the reduction),
  - heating off, still with active frost protection.

**DHW functions:**

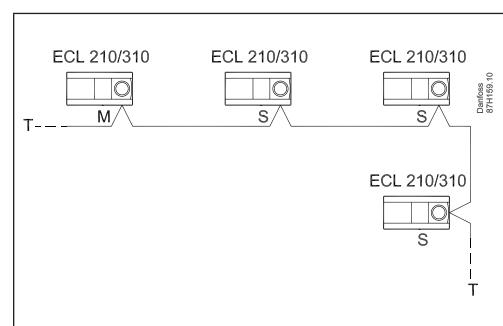
- The Auto Tuning function for the automatic setting of control parameters for constant DHW temperature is integrated in relevant applications (A217, A266 and A368). However, Auto Tuning is only applicable with valves that are approved for Auto Tuning, i.e. the Danfoss types VB 2 and VM 2 with split characteristic as well as logarithmic valves such as VF and VFS.
- The anti-bacteria function can follow a schedule program.
- The heating circuit can have sliding DHW priority.

**Communication**

Ethernet (to SCADA), Modbus (to SCADA) and M-bus (to heat meters) communications are integrated in the ECL Comfort 310.

Besides, the ECL Comfort 310 has an ECL 485 communication bus, which is used for closed communication between master, slave and RCUs.

Additionally, a USB connection (type B) will be available for a Service Tool depending on introduction time.



Master / slave connections

**Languages**

Depending on application, the menu language is available in English and other languages.

**General data**

ECL Comfort controller and RCU data:

	<b>ECL Comfort 310 / 310B</b>	<b>ECA 30 / 31</b>
Ambient temperature		0 - 55 °C
Storage and transportation temperature		-40 - 70 °C
Mounting	Vertically, on wall or DIN rail (35 mm)	Vertically, on wall or in panel cut-out
Temperature sensor type	Pt 1000 (1000 ohm at 0 °C), IEC 751B Range: -60 - 150 °C	Alternative to built-in room temperature sensor: Pt 1000 (1000 ohm at 0 °C), IEC 751B
Digital input	12 V pull-up possible	-
Analog input	0 - 10 V, resolution 9 bits	-
Pulse input	Max. 200 Hz	-
Weight	0.46 / 0.42 kg	0.14 kg
Display	Graphical monochrome with backlight 128 x 96 dots Display mode: Black background, white text	
Min. backup time for time and date	72 hours	-
Grade of enclosure	IP 41	IP 20
 -marking in accordance with the standards	EMC directive 2004/108/EC Immunity: EN 61000-6-1:2007 Emission: EN 61000-6-3:2007 LVD directive 2006/95/EC EN 60730	

ECA module data:

	<b>ECA 32</b>
Ambient temperature	0 - 55 °C
Storage and transportation temperature	-40 - 70 °C
Mounting	In base part
Number of input	6
Input types	Each input can be set up as Pt 1000, 0-10 V or digital input
Number of relays	4
Max. load on relay outputs	4 (2) A (4 A for ohmic load, 2 A for inductive load)
Number of pulse counter inputs	2
Max. frequency of pulse counter input	1 pulse counter: 200 Hz 2 pulse counters: 100 Hz
Number of analog outputs (0 - 10 V)	3
Max. load on analog output	2 mA each (min. resistance 5 kΩ)

ECL 485 communication bus data:

Purpose	For internal ECL Comfort 210 / 310 use only (Danfoss proprietary bus)
Connection	Terminals in base part
Cable type	2 x twisted pair
Max. total cable length (bus cable + sensor cables)	200 m in total (inclusive sensor cables)
Max. number of ECL slaves connected	Addressed units: 9
Max. number of Remote Control Units connected	2
Data sent from master	Date Time Outdoor temperature Desired room temperature DHW-priority signal
Data sent from addressed slave controller	Desired flow temperature
Data sent from ECA 30 / 31	Desired room temperature

**Ethernet communication (Modbus / TCP) data:**

Purpose	For SCADA system
Connection	RJ45 female connector
Protocol	Modbus / TCP
Cable type	Standard Ethernet cable (CAT 5)
Max. Bus cable length	According to Ethernet standard
Auto cross-over detection	Enabled
Default Ethernet address (IP address)	192.168.1.100
Port number	502 (Modbus / TCP port)
Number of connections	1
Security	Must be provided by Ethernet infrastructure

**Modbus RS 485 communication data:**

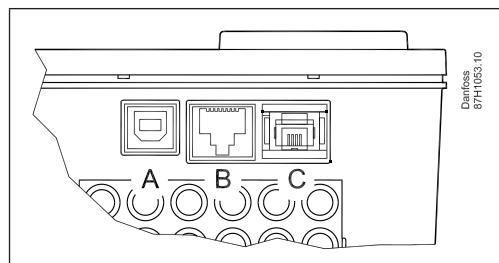
Purpose	For SCADA system
Connection	Terminals in base part. Galvanically separated (500 V)
Protocol	Modbus RTU
Cable type	Twisted pair + Modbus reference (signal ground)
Max. bus cable length	1200 m (dependent on cable type and installation)
Communication speed	38.4 Kbit/s half duplex / 19.2 Kbit/s half duplex
Serial mode	8 data bit, even parity and 1 stop bit
Network	According to the standard Modbus Serial Line Implementation Guide V1.0

**M-bus communication data:**

Purpose	Connection to heat meters, max. 5 heat meters
Connection	Terminals in base part Non galvanically separated
M-Bus master according to	DS / EN 1434-3: 1997
M-Bus cable / pulse cable	Twisted pair and shielded Type: JY(St)Y 2 x 0.8 mm
Max. M-Bus cable length / pulse cable length	50 m
M-Bus baud rate	300 baud (adjustable)
Update time	60 s (adjustable)
Gateway function	In M-bus gateway operating mode, M-bus communication can be accessed from Modbus via user defined telegrams (non-transparent)
Supported heat meters	Infocal 6 Information about other heat meters on request
Transmitted heat meter data	Heat meter type dependent: - Primary flow temperature - Primary return temperature - Actual flow - Accumulated flow - Actual heat power - Accumulated heat energy
Danfoss recommends 230 V a.c. supplied heat meters for faster M-bus data update times	

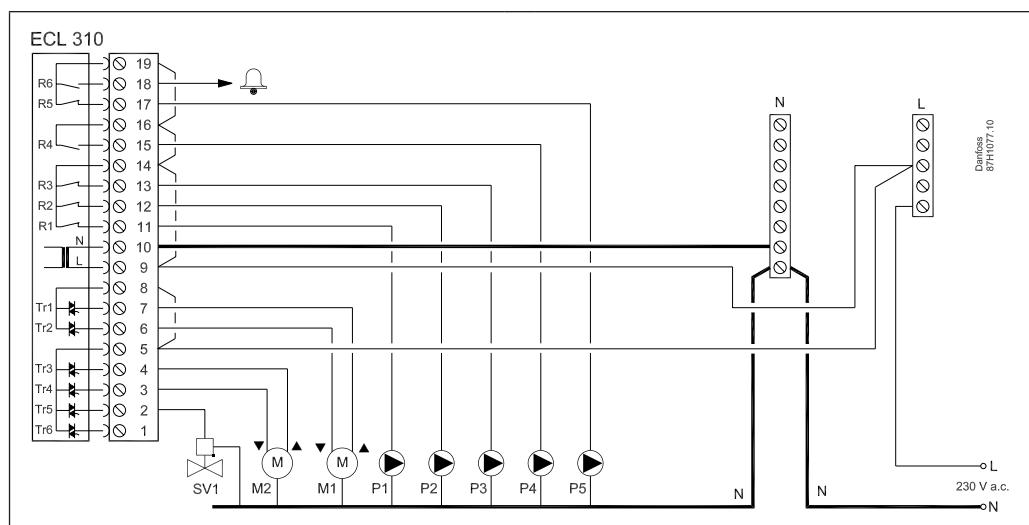
**USB communication data:**

USB CDC (Communication Device Class)	For service purposes (Windows driver is needed, to enable that Windows recognize the ECL as a virtual COM port)
Modbus over USB	Similar to the serial Modbus, but with relaxed timing
Connection, cable type	Standard USB cable

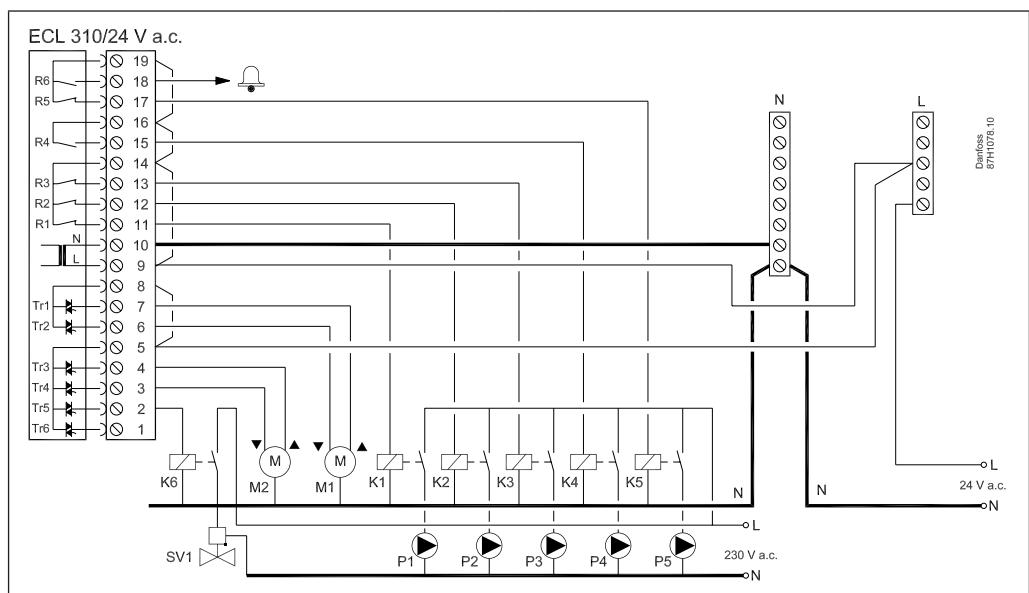

**A port:** USB (type B plug)

**B port:** Ethernet

**C port:** ECL Application Key

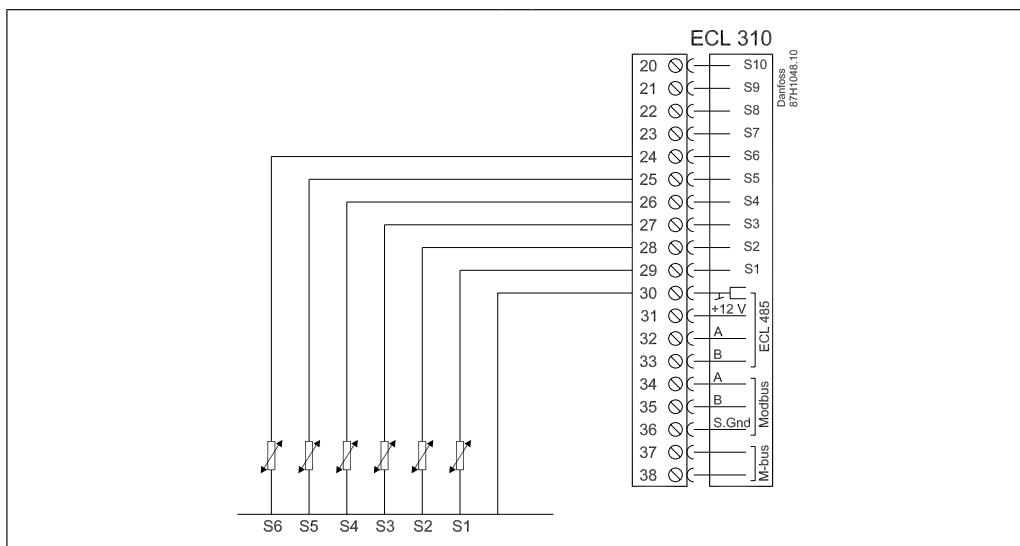
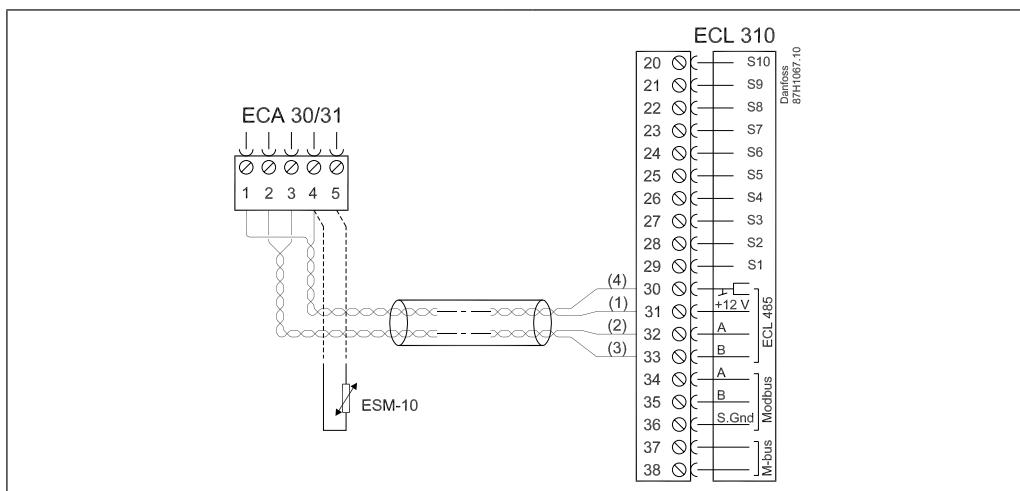
**Wiring - 230 V a.c.**

**ECL Comfort 310 wiring example: Application A368.1**

Supply voltage	230 V a.c. - 50 Hz
Voltage range	207 to 244 V a.c. (IEC 60038)
Power consumption	5 VA
Max. load on relay outputs	4(2) A - 230 V a.c. (4 A for ohmic load, 2 A for inductive load)
Max. load on actuator outputs	0.2 A - 230 V a.c.

**Wiring - 24 V a.c.**

**ECL Comfort 310 wiring example: Application A368.1**

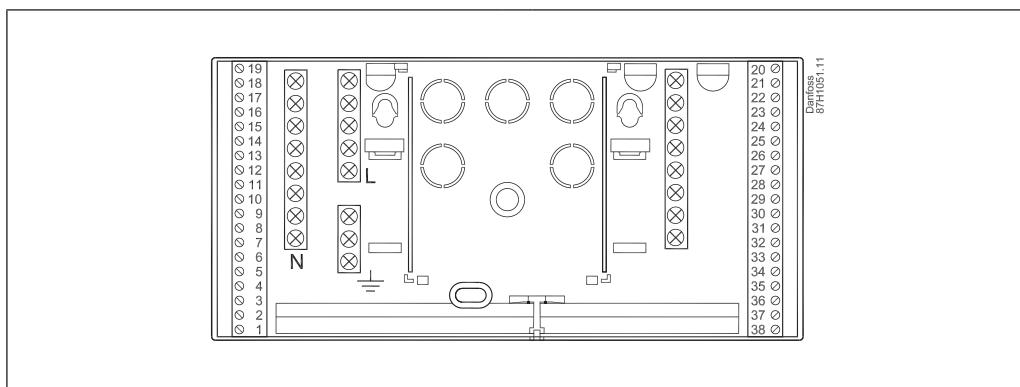
Auxiliary relays (K) must be used in order to separate the 230 V a.c. supply from the 24 V a.c. supply of the controller.

Supply voltage	24 V a.c. - 50 Hz
Voltage range	21.6 to 26.4 V a.c. (IEC 60038)
Power consumption	5 VA
Max. load on relay output	4(2) A - 24 V a.c. (4 A for ohmic load, 2 A for inductive load)
Max. load on actuator output	1 A - 24 V a.c.

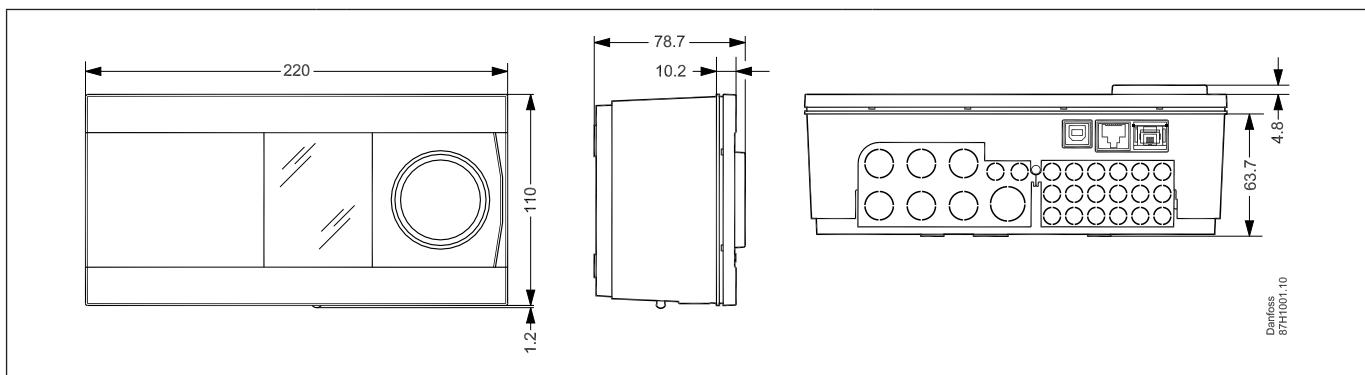
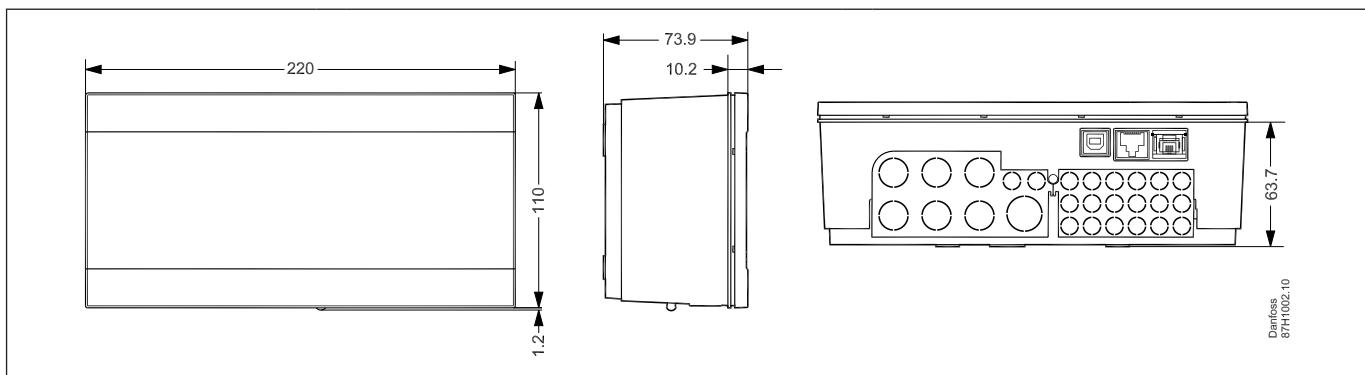
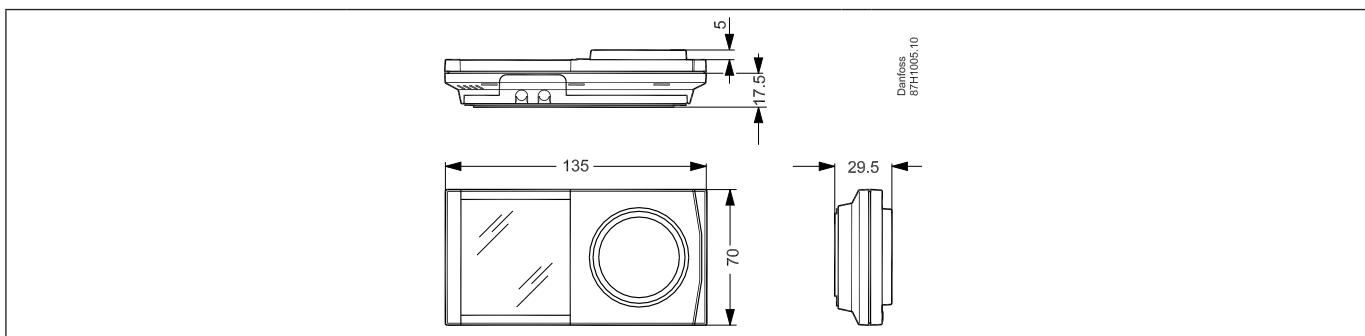
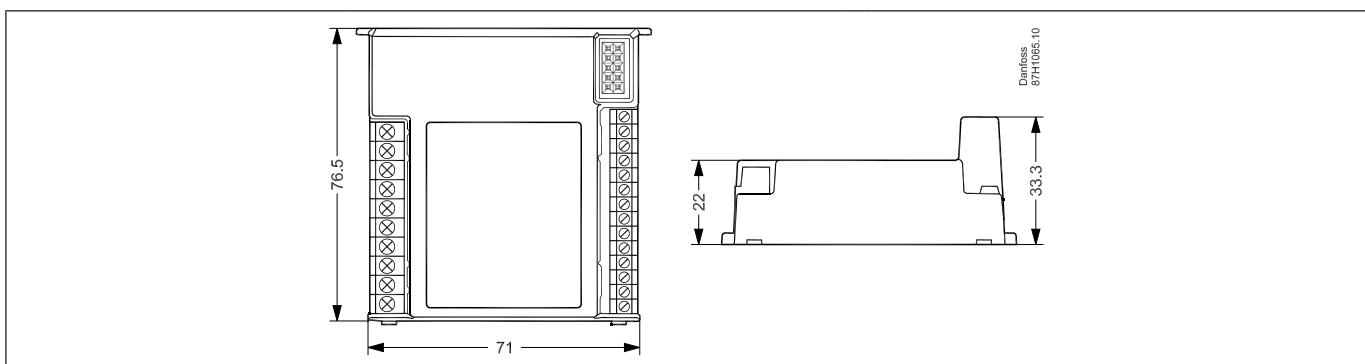
**Wiring - input**

**Wiring - ECA 30 / 31 Remote Control Unit**


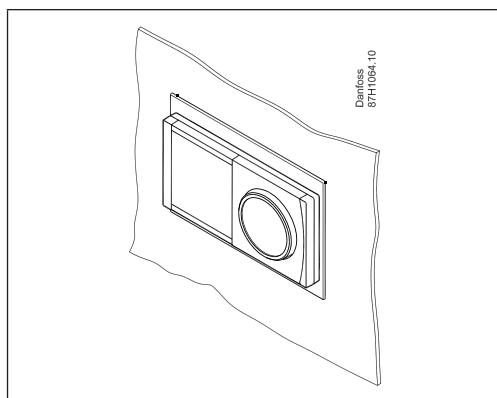
Wiring of ECL Comfort 310 and ECA 30 / 31, 230 V a.c.

Supply Voltage	From ECL 485 communication bus
Power consumption	1 VA
External room temperature sensor	Pt 1000 (ESM-10), substitutes the built-in room temperature sensor
ECA 31 only	Contains humidity sensor, used for special applications

**Base part**


ECL Comfort 310 base part

**Dimensions**

**ECL Comfort 310**

**ECL Comfort 310B**

**ECA 30 / 31**

**ECA 32**

**ECA 30 / 31 cut-out for mounting in panel front**

A frame (code no. 087H3236) is placed in the cut-out (139 x 93 mm) in which the ECA 30 / 31 is placed.

Additional documentation for ECL Comfort 310, modules and accessories is available on <http://den.danfoss.com/>





