

Data sheet

ECL Apex 10 controller and ECA-XM extension modules

Description

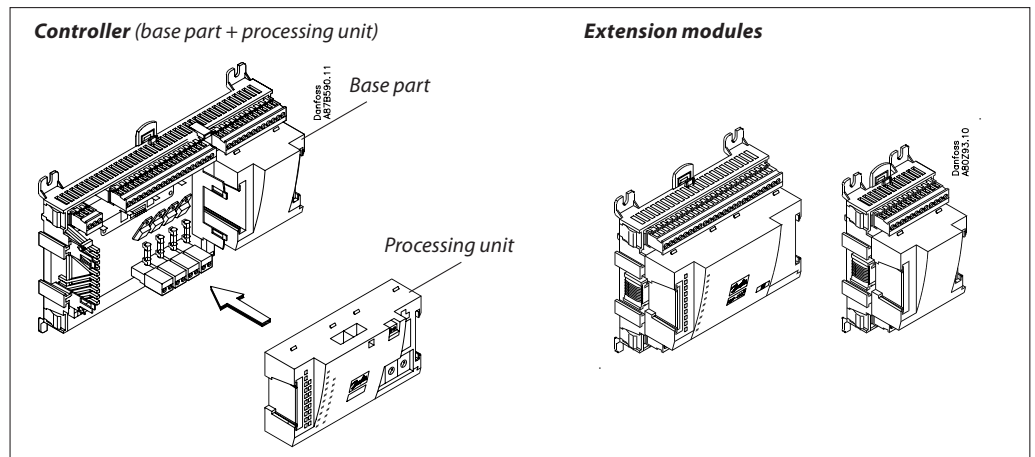


The advantages of the ECL Apex 10 controller are:

- The controller can be extended with modules to fit any heating application
- Several applications with the same controller and modules
- Up to 5 circuits, heating and / or domestic hot-water
- Week schedules and holiday programs
- Communication with SCADA system
- Different user levels
- Data logging facilities
- Frost protection
- Makeup pump control
- Real time clock with power backup
- Alarm functions
- Sequential pump control

The ECL Apex 10 is a configurable controller for temperature control in district heating systems. The controller is operated by means of either a PC or a PDA (Personal Digital Assistant).

Application



The applications for the ECL Apex 10 controller can be configured directly or downloaded from www.heating.danfoss.com (choose *Documentation* to find the ECL Apex 10 software downloads). The applications from the Internet are documented with graphics, electrical connections and wiring tables.

The ECL Apex 10 is the basic part of the control system, which has inputs and outputs capable of controlling systems, typically with 2 circuits.

- The base part - including terminals - is the same for all control systems and it contains 11 analog inputs for sensors, 2 x 2 triac outputs

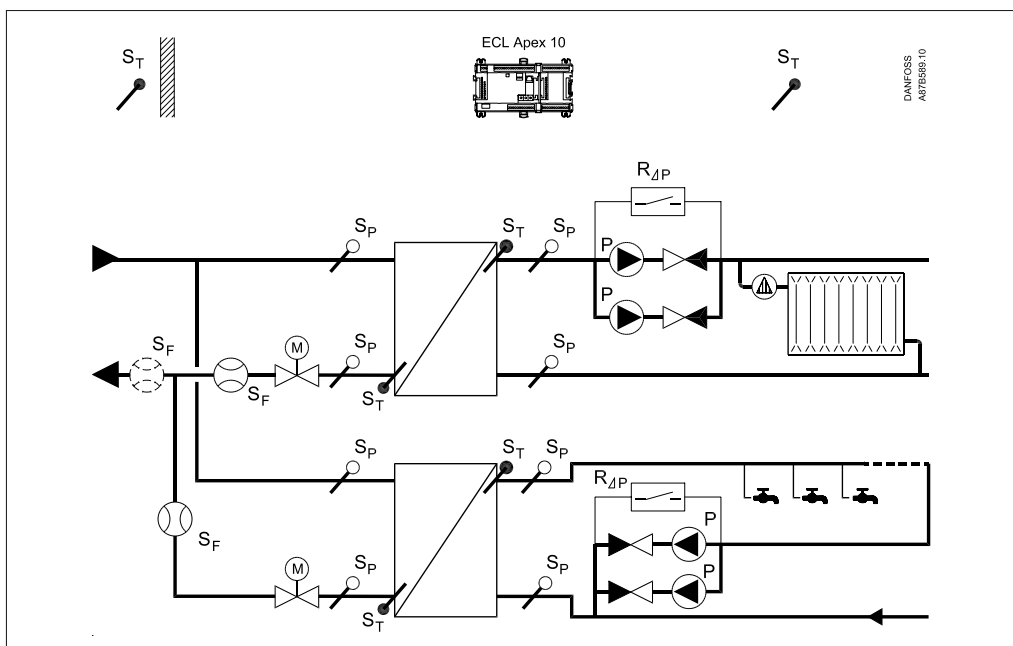
for 3-point actuator control and 4 relays for pump control

- The processing unit is the intelligent part of the control system and it is equipped with connections for data communication. The processing unit is supplied with the base part.

If the control system requires additional functions to be controlled, the control system can be extended.

Additional signals can be received and extra relays can be controlled by extension modules.

Application example



Ordering

Controller and extension modules

Type	Analog inputs (AI)	ON/OFF outputs (DO)		ON/OFF inputs (DI), opto		Analog outputs (AO)	Module with switches	Code no.
	For sensors, pressure, flow and energy transmitters, etc.	Relay (SPDT)	Triac	Low voltage (max 80 V)	High voltage (max 260 V)	0-10 V d.c.	For override of relay outputs	
ECL Apex 10	11	4	4	-	-	-	-	087B2500
Extension modules								
ECA-XM 101A	8							087B2610
ECA-XM 102A				8				087B2620
ECA-XM 102B					8			087B2621
ECA-XM 204A		8						087B2740
ECA-XM 204B		8					x	087B2741
ECA-XM 205A	8	8						087B2750
ECA-XM 205B	8	8					x	087B2751
ECA-XM 210A*	7	3		2		2		087B2760
The following extension module must be placed on the base part in the controller. There is only room for one module.								
ECA-OB 003A						2		087B2530

*) ECA-XM 210A is equipped with the M-Bus communication acc. to EN1434-3 and pulse input for frequencies up to 200 Hz.

Controller

Type	Designation	Code no.
ECL Apex 10	Controller for district heating control system	087B2500
ECA-ST 101A	Service tool software for operation of the ECL Apex 10 controller (CD-ROM)	087B2510
ECA-ST 101B	Service tool software for operation of the ECL Apex 10 controller (CD-ROM) incl. Jeode runtime program needed for PDA operation and 64 MB SD-card	087B2511

Accessories

Type	Designation	Code No.
-	Cable between PC and ECL Apex 10 controller	080Z0262
-	Cable* between PDA cable and ECL Apex 10 controller or cable* between null modem cable and ECL Apex 10 controller <small>*See drawing on page 15</small>	080Z0261
ECA 99	24 V transformer, Lübke (35 VA)	087B1156

Pt 1000 temperature sensors

Type	Designation	Code No.
ESMT	Outdoor temperature sensor	084N1012
ESM-10	Room temperature sensor	087B1164
ESM-11	Surface sensor	087B1165
ESMB-12	Universal sensor	087B1184
ESMC	Surface 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

Principles

- The ECL Apex 10 is capable of handling different system requirements.

Processing unit

- the intelligent part of the controller system
- definition of control functions
- connection for data communication

- Extension modules

The system can be expanded with extension modules, if the complexity of the system becomes higher and additional inputs or outputs are required.

The extension modules are power supplied and communicates by the *LINK* (internal communication between modules).

- Connection types

Analog inputs:

- Sensors (temperature or pressure)
- Contacts
- 0 - 10 V

Digital inputs:

- Low voltage (typical 24 V a.c.)
- High voltage (typical 230 V a.c.)

Outputs:

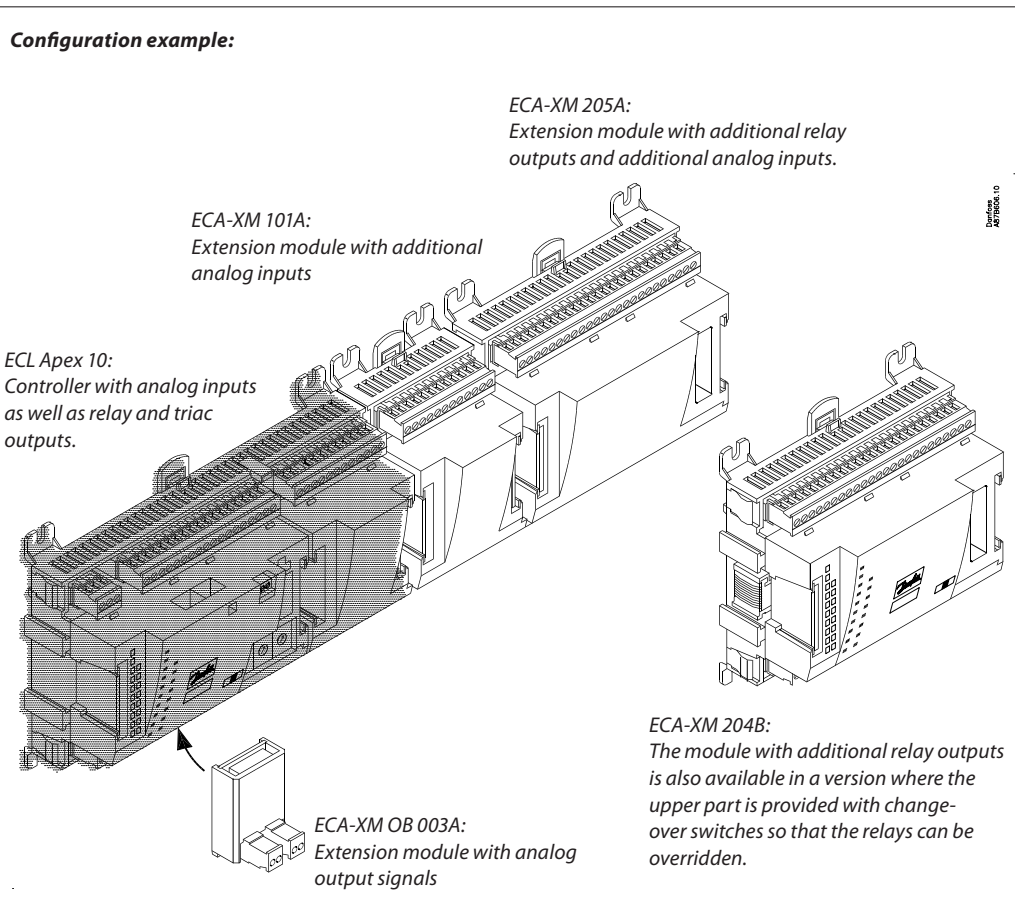
- Triacs (for 3-point controlled actuators)
- Relays (e.g. pumps)
- Analog, 0 - 10 V (for voltage controlled units)

- Programming of connections

The controller must know where each individual input and output signal is connected.

Each connection is configured and defined according to the following principle:

- module
- point (terminals)
- type (e.g. temperature sensor - Pt 1000)



Functions in general**Circuits**

The ECL Apex 10 controller is able to control up to 5 circuits (heating and / or domestic hot water (DHW)).

Control modes

The flow temperature can be controlled individually by four different modes:

- Automatic: according to the time schedule, changeover between the desired comfort and reduced temperatures.
- Comfort: according to the desired comfort temperature.
- Reduced: according to the desired reduced temperature.
- Standby: a min required flow temperature of 10 °C (frost protection).

Manual control will influence all circuits, so that none of the circuits will be controlled.

Heating circuit(s)

can be controlled by one of the four control modes.

The required flow temperature is controlled with influence mainly from the outdoor temperature (weather compensation) but can also be influenced by:

- Time schedule (comfort / reduced)
- Optimized time control
- Boost function
- Max and min flow temperature limitations
- Return temperature (outdoor temperature dependant or fixed value)
- Max allowed flow
- Max allowed energy consumption
- Wind and sun intensity
- Universal limiter

Domestic hot water (DHW) circuit(s)

can be controlled by one of the four control modes.

The required flow temperature can be influenced by:

- Time schedule (comfort / reduced)
- Return temperature
- Max allowed flow
- Max allowed energy consumption
- Anti-bacteria function

DHW - priority

can be used in case of limited energy supply resulting in an unacceptable DHW temperature. Heating circuit(s) can either be gradually (slidingly) or totally (100%) closed to allow more energy for heating the DHW.

Frost protection

will start the circulation pump when the outdoor temperature gets below a user-defined value, typically 2 °C.

Alarm functions

can be associated to system, application and monitoring failures. It is possible to set 4 different warning levels.

Reference ramping

results in a sliding rise in temperature from reduced temperature to comfort temperature.

Access control

allows 4 different user levels: *Supervisor, Service user, Daily user and Default user*. The access control protects the ECL Apex 10 controller against unauthorized use / changes.

Data communication

with SCADA systems (Supervisory Control and Data Acquisition) can easily be established by using the OPC driver.

Makeup pumps

can reestablish the static pressure on the secondary side, if it is too low.

Planning table

This table helps you determine whether there are sufficient inputs and outputs on the ECL Apex 10 controller. If not, the controller must be equipped by one or more of the mentioned ECA-XM extension modules.

List the number of connections you require:

Analog input signal (AI)
 Digital low voltage input (DI)
 Digital high voltage input (DI)
 Digital output, relay (DO)
 Analog output, 3-point (DO)
 Analog output, 0 - 10 V (AO)
 Limitation

	Analog input signal (AI)	Digital low voltage input (DI)	Digital high voltage input (DI)	Digital output, relay (DO)	Analog output, 3-point (DO)	Analog output, 0 - 10 V (AO)	Limitation
Analog inputs							
Temperature sensors, ST							Max 4 / module
Pressure transmitters, SP							
Voltage signal, SV							
Contact							
Digital voltage inputs							
24 V							
230 V							
Digital outputs							
Relay (SPDT), P							
3-point output, M							
Analog voltage outputs							
0 - 10 V, AO							
Total number of connections							
Number of connections, ECL Apex 10	11	0	0	4	2	0	
Additional connections required							
Additional connections supplied by:							
ECA-XM 101A (8 x AI)							___ pcs. á 2 VA = ___
ECA-XM 102A (8 x DI, low voltage)							___ pcs. á 2 VA = ___
ECA-XM 102B (8 x DI, high voltage)							___ pcs. á 2 VA = ___
ECA-XM 204A/B (8 x DO, relay)							___ pcs. á 5 VA = ___
ECA-XM 205A/B (8 x DO, relay+ 8 AI)							___ pcs. á 5 VA = ___
ECA-XM 210A (7 x AI + 2 x DI, low voltage + 3 x DO, relay + 2 x AO + M-Bus, EN1434-3)							___ pcs. á 5 VA = ___
ECA-OB 003A (2 x AO)							___ pcs. á 1 VA = ___
ECL Apex 10							___1___ pcs. á 8 VA = ___8___
Sum =							
							Max sum: 24 VA

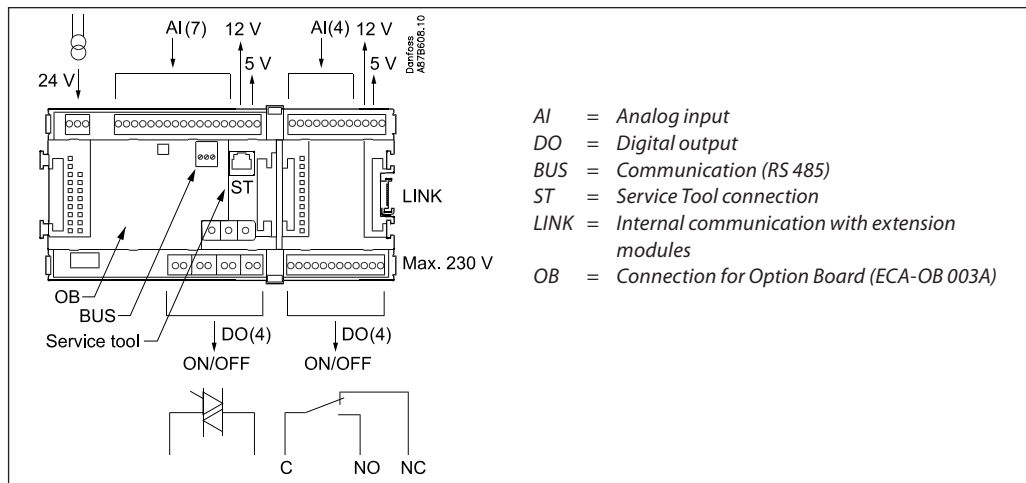
Technical data, general

Ambient temperature	During transport	-40 to 70 °C
	During operation	-20 to 55 °C 0 to 95% RH (non condensing) No shock influences / vibrations
Enclosure	Material	PC / ABS
	Density	IP 10, VBG 4
	Mounting	For mounting on wall or DIN rail
Weight with screw terminals	Controller Modules in 100 / 200 / 300 series	600 g 200 g / 500 g / 600 g
Approvals	EU low voltage directive and EMC requirements are complied with	LVD tested according to EN 60730 EMC tested Immunity according to EN 61000-6-2 Emission according to EN 50081-1
	UL file number	E166834

**Technical data,
ECL Apex 10**

Supply voltage	24 V a.c. ±20%	
Power consumption	8 VA	
Analog inputs (11)	Pt 1000 (1000 ohm / 0 °C)	Dissolution: 0.1 K Accuracy: ±0.5 K
	Pressure transmitter type AKS 32R / AKS 32 (1-5 V)	Dissolution: 1 mV Accuracy: ±10 mV Max connection of 4 pressure transmitters on one module
	Voltage signal 0-10 V	
	Contact function (ON / OFF)	ON at R < 20 ohm OFF at R > 2 K ohm (gold-plated contacts not necessary)
Voltage outputs	12 V d.c., max 20 mA 5 V d.c., max 20 mA	
Relay outputs (4) SPDT	AC-1 (ohmic)	5 A
	AC-15 (inductive)	3 A
	Voltage	Min 24 V Max 230 V
	Fuse (in module)	5 A (T)
<p>The outputs must be used either as 24 V or 230 V. A mixed usage with 24 V and 230 V is not allowed!</p>		
Triac outputs (2 x 2)	Used for loads that are cut in and out frequently, i.e. motorized control valves	Load: Max 240 V a.c., min 24 V a.c. Max 250 mA, min 35 mA OFF value c. 1 mA
	Fuse (in module)	2 A (F)
	<p>The outputs must be used either as 24 V or 230 V. A mixed usage with 24 V and 230 V is not allowed!</p>	
Power backup (real-time clock)	8 years (Li battery)	
Data / settings	Non-volatile memory (EEPROM)	

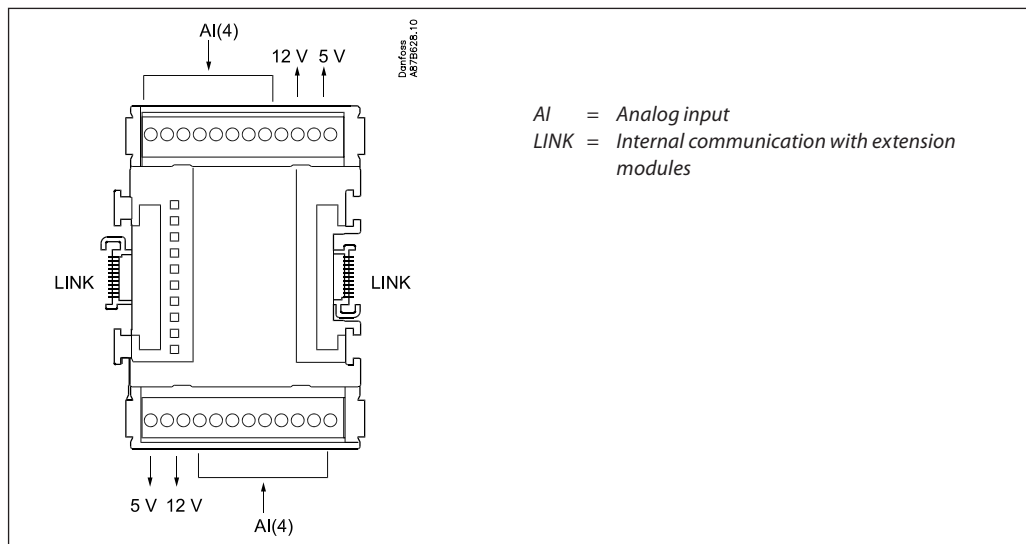
Wiring, ECL Apex 10



Technical data, ECA-XM 101A

Supply voltage	Via the LINK	
Power consumption	2 VA	
Analog inputs (8)	Pt 1000 (1000 ohm / 0 °C)	Dissolution: 0.1 K Accuracy: ±0.5 K
	Pressure transmitter type AKS 32R / AKS 32 (1-5 V)	Dissolution: 1 mV Accuracy: ±10 mV Max connection of 4 pressure transmitters on one module
	Voltage signal 0-10 V	
	Contact function (ON / OFF)	ON at R < 20 ohm OFF at R > 2 K ohm (gold-plated contacts not necessary)
Voltage outputs	12 V d.c., max 20 mA 5 V d.c., max 20 A	

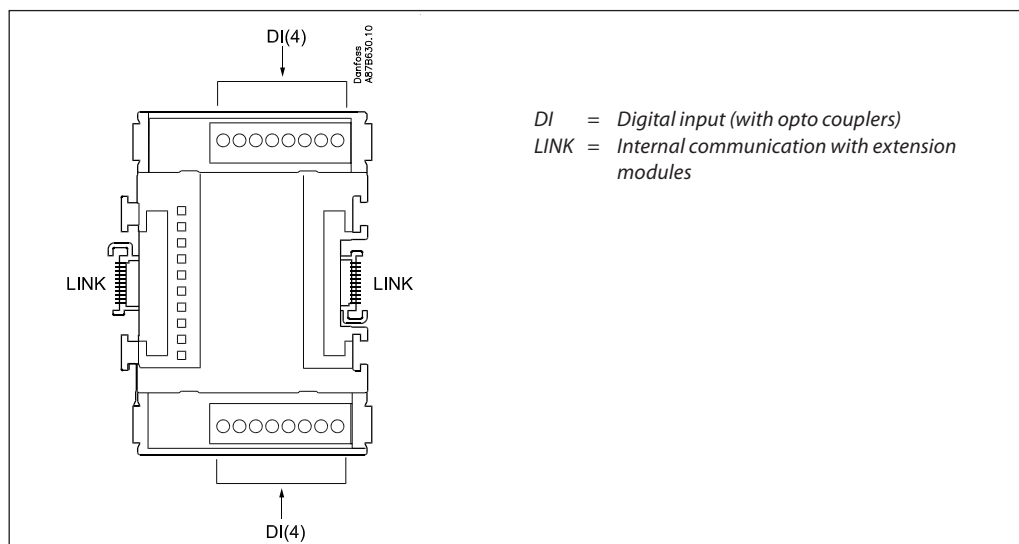
Wiring, ECA-XM 101A



**Technical data,
ECA-XM 102A**

Supply voltage	Via the LINK
Power consumption	2 VA
Digital inputs (8)	24 v a.c., max 80 V a.c., ON: > 10 V a.c., OFF: < 2 V a.c. The inputs have opto couplers for galvanic separation.

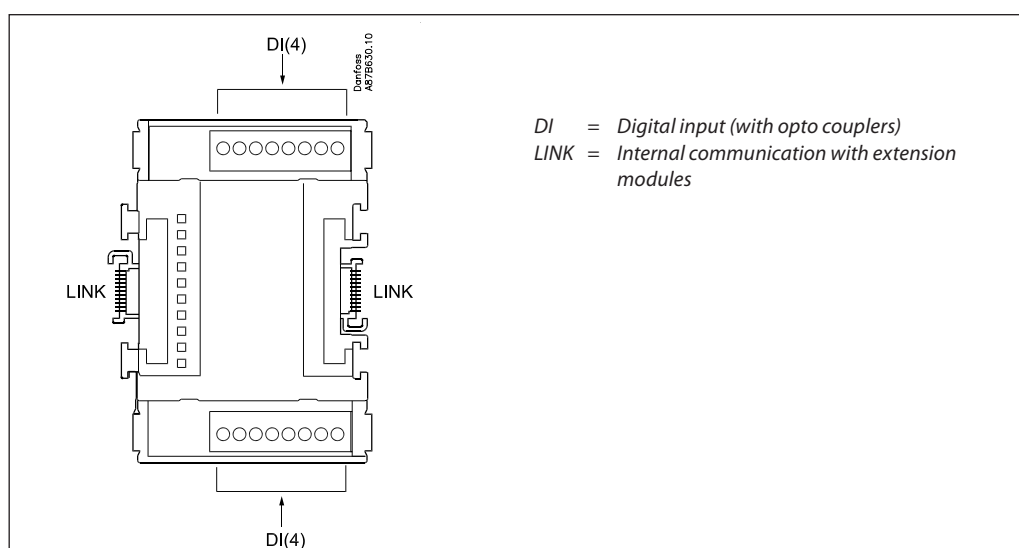
Wiring, ECA-XM 102A



**Technical data,
ECA-XM 102B**

Supply voltage	Via the LINK
Power consumption	2 VA
Digital inputs (8)	230 V a.c., max 280 V a.c., ON: > 80 V a.c., OFF: < 24 V a.c. The inputs have opto couplers for galvanic separation. The inputs must not be used as 24 V input or mixed with 24 V.

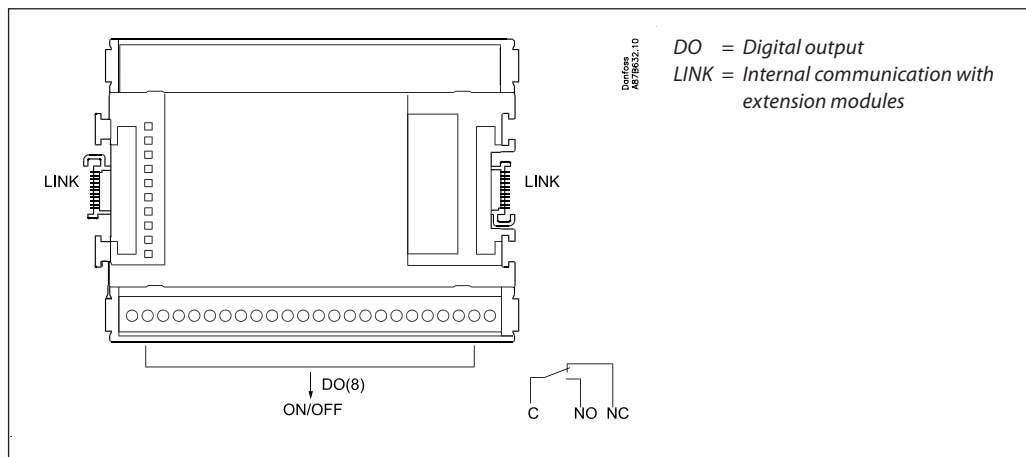
Wiring, ECA-XM 102B



Technical data,
ECA-XM 204A

Supply voltage	Via the LINK	
Power consumption	5 VA	
Relay outputs (8) SPDT	AC-1 (ohmic)	5 A
	AC-15 (inductive)	3 A
	Voltage	Min 24 V Max 230 V
	Fuse (in module)	5 A (T)
<p>The outputs must be used either as 24 V or 230 V. A mixed usage with 24 V and 230 V is not allowed!</p>		

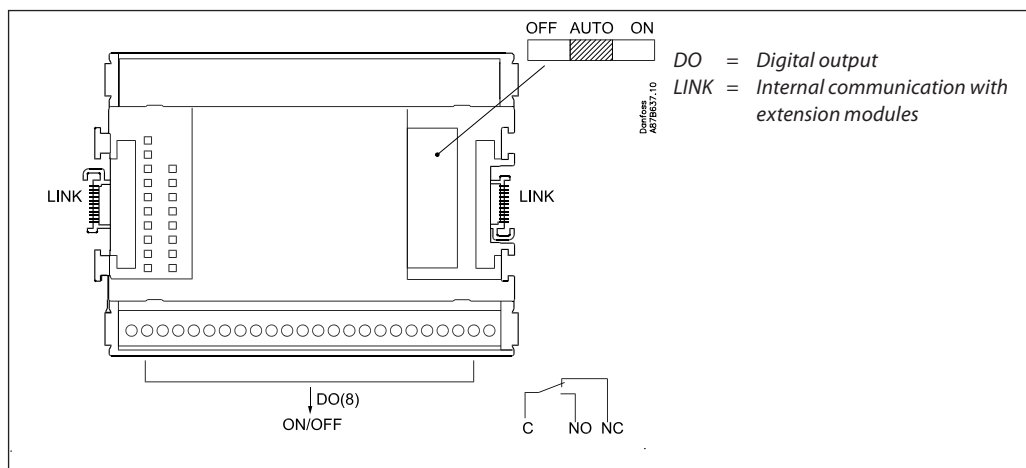
Wiring, ECA-XM 204A



Technical data,
ECA-XM 204B

Supply voltage	Via the LINK	
Power consumption	5 VA	
Relay outputs (8) SPDT	AC-1 (ohmic)	5 A
	AC-15 (inductive)	3 A
	Voltage	Min 24 V Max 230 V
	Fuse (in module)	5 A (T)
Manual - automatic	8 switches (3-position) allow each relay to be controlled to "OFF", "Automatic" or "ON". The switch position is registered by the ECL Apex 10 controller.	
<p>The outputs must be used either as 24 V or 230 V. A mixed usage with 24 V and 230 V is not allowed!</p>		

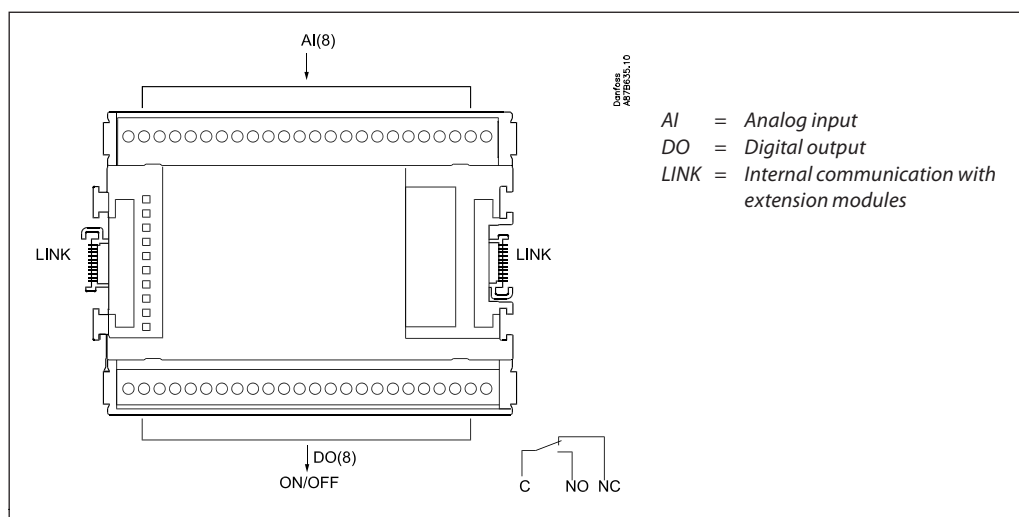
Wiring, ECA-XM 204B



**Technical data,
ECA-XM 205A**

Supply voltage	Via the LINK	
Power consumption	5 VA	
Analog inputs (8)	Pt 1000 (1000 ohm / 0 °C)	Dissolution: 0.1 K Accuracy: ±0.5 K
	Pressure transmitter type AKS 32R / AKS 32 (1-5 V)	Dissolution: 1 mV Accuracy: ±10 mV Max connection of 4 pressure transmitters on one module
	Voltage signal 0-10 V	
	Contact function (ON / OFF)	ON at R < 20 ohm OFF at R > 2 K ohm (gold-plated contacts not necessary)
Voltage outputs	12 V d.c., max 20 mA 5 V d.c., max 20 mA	
Relay outputs (8) SPDT	AC-1 (ohmic)	5 A
	AC-15 (inductive)	3 A
	Voltage	Min 24 V Max 230 V
	Fuse (in module)	5 A (T)
	<p>The outputs must be used either as 24 V or 230 V. A mixed usage with 24 V and 230 V is not allowed!</p>	

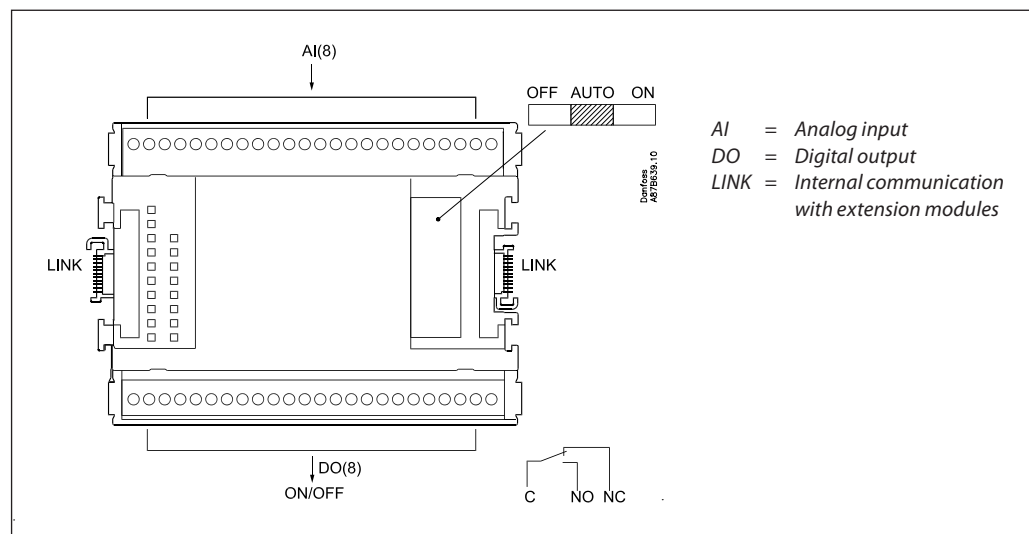
Wiring, ECA-XM 205A



Technical data,
ECA-XM 205B

Supply voltage	Via the LINK	
Power consumption	5 VA	
Analog inputs (8)	Pt 1000 (1000 ohm / 0 °C)	Dissolution: 0.1 K Accuracy: ±0.5 K
	Pressure transmitter type AKS 32R / AKS 32 (1-5 V)	Dissolution: 1 mV Accuracy: ±10 mV Max connection of 4 pressure transmitters on one module
	Voltage signal 0-10 V	
	Contact function (ON / OFF)	ON at R < 20 ohm OFF at R > 2 K ohm (gold-plated contacts not necessary)
Voltage outputs	12 V d.c., max 20 mA 5 V d.c., max 20 mA	
Relay outputs (8) SPDT	AC-1 (ohmic)	5 A
	AC-15 (inductive)	3 A
	Voltage	Min 24 V Max 230 V
	Fuse (in module)	5 A (T)
	Manual - automatic	8 switches (3-position) allow each relay to be controlled to "OFF", "Automatic" or "ON". The switch position is registered by the ECL Apex 10 controller.
<p>The outputs must be used either as 24 V or 230 V. A mixed usage with 24 V and 230 V is not allowed!</p>		

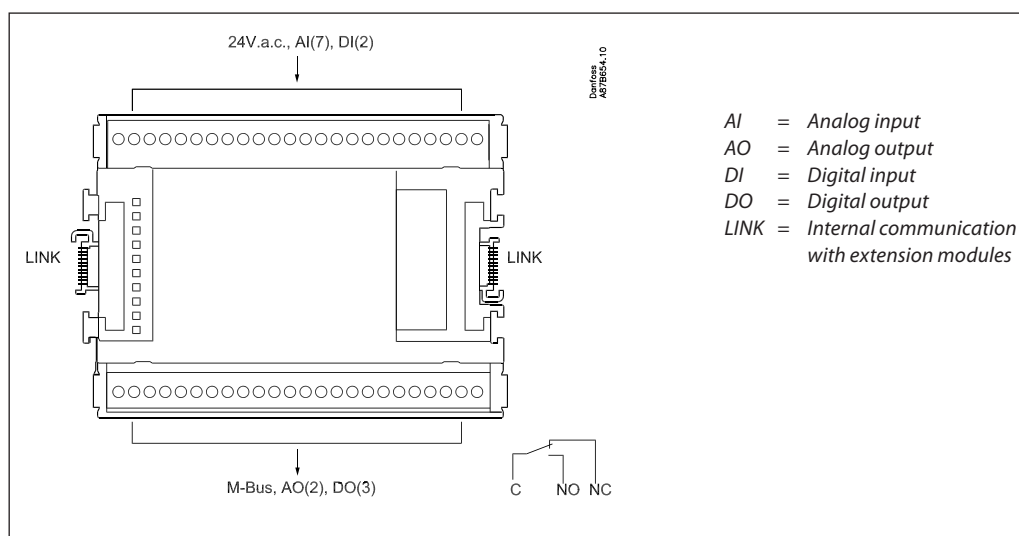
Wiring, ECA-XM 205B



**Technical data,
ECA-XM 210A**

Supply voltage	24 V a.c. and via the LINK	
Power consumption	24 V a.c., max 8 VA Via the link max 4 VA	
M-Bus	M-Bus master according to EN1434-3	Max 10 M-Bus slaves in the network.
	Communication: 300 / 9600 baud. Address field: 1-250 primary addressing	Galvanic isolated bus (isolation voltage 500 V d.c.)
	Cable length: max 1000 m Cable cross-section: 0.5 to 0.8 mm ²	Rmax: 29 ohm Cmax: 180 nF
Digital inputs (2)	2 pulse inputs max 24 V.d.c. Pulse differential voltage 3-5 V	Pull up 5 or 24 V d.c.
	Frequency max: Channel 1: 200 Hz Channel 2: 100 Hz	Pulse / pause width > 1 ms
	Cable length: max 50 m Cable cross-section: 0.4 to 0.8 mm ²	Shielded twisted pair
Analog inputs (7)	Pt 1000 (1000 ohm / 0 °C)	Dissolution: 0.1 K Accuracy: ±0.5 K
	Pressure transmitter type AKS 32R / AKS 32 (1-5 V)	Dissolution: 1 mV Accuracy: ±10 mV Max connection of 4 pressure transmitters on one module
	Voltage signal 0-10 V	
	Contact function (ON / OFF)	ON at R < 20 ohm OFF at R > 2 K ohm (gold-plated contacts not necessary)
Analog outputs (2)	0-10 V, max 2 mA	Galvanic isolated
Relay outputs (3) SPDT	AC-1 (ohmic)	5 A
	AC-15 (inductive)	3 A
	Voltage	Min 24 V Max 230 V
	Fuse (in module)	5 A (T)
	Manual - automatic	8 switches (3-position) allow each relay to be controlled to "OFF", "Automatic" or "ON". The switch position is registered by the ECL Apex 10 controller.
<p>The outputs must be used either as 24 V or 230 V. A mixed usage with 24 V and 230 V is not allowed!</p>		

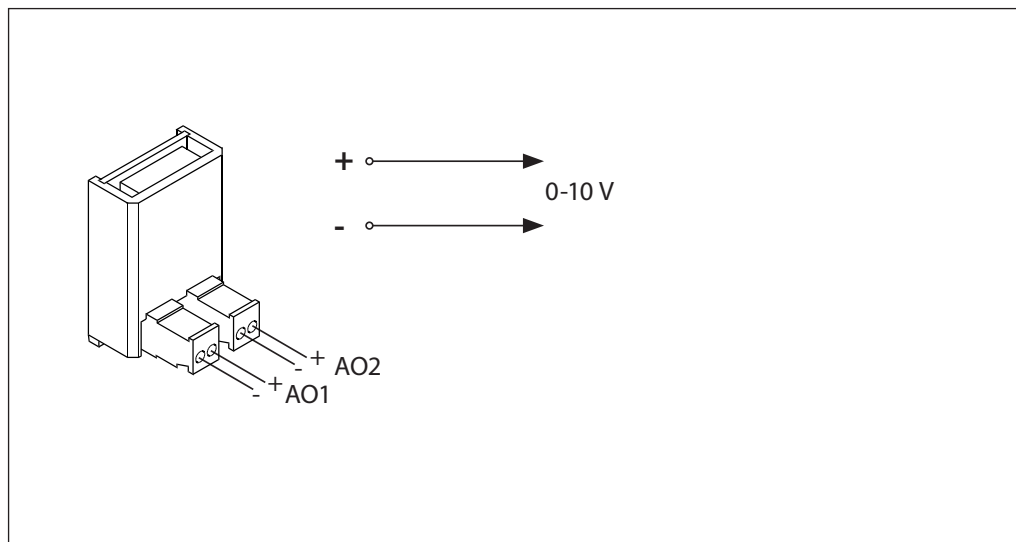
Wiring, ECA-XM 210A



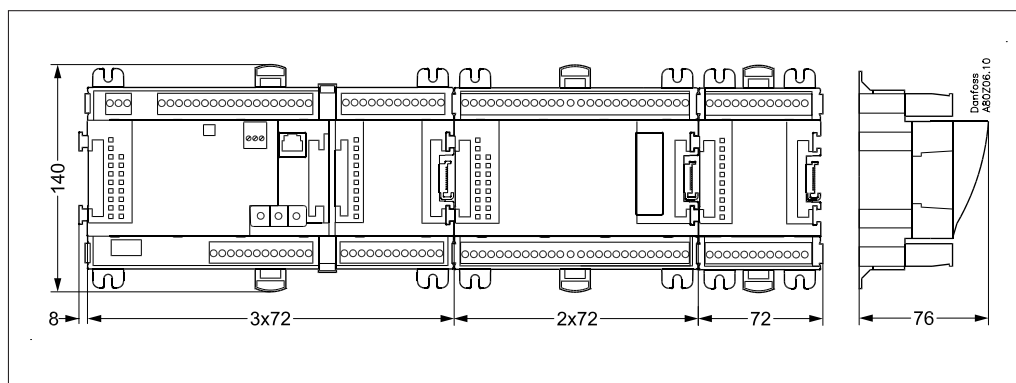
Technical data,
ECA-OB 003A

Supply voltage	From the ECL Apex 10 when inserted	
Power consumption	1 VA	
Analog outputs (2) (voltage outputs)	0-10 V, max 2 mA	Resolution: 40 mV

Wiring, ECA-OB 003A



Dimensions

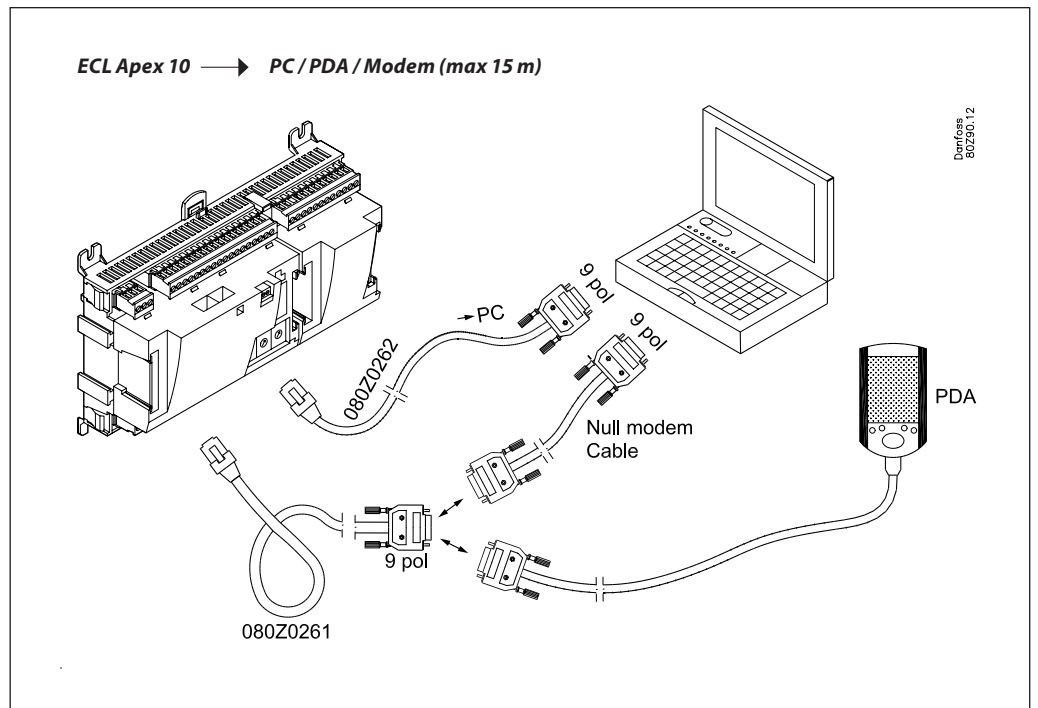


The length of each unit is 72 mm.

The length of the ECL Apex 10 controller corresponds the length of three units.

Modules in the 100 series consist of one unit.
 Modules in the 200 series consist of two units.
 Modules in the 300 series consist of three units.

Cable for service tool



Visit our Internet for additional literature about ECL Apex 10 and ECA-XM extension modules:
<http://heating.danfoss.com/>

Use the *product search* facility or choose *Documentation* to find the literature you require.

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