

ECA

Process Controllers

The new ECA series is a family of general purpose process controllers suitable for industrial applications for controlling temperature, pressure, flow, level, etc.

- PID control
- Autotuner
- Adaptive control
- pPI control
- Gain scheduling
- Feed forward
- CLPM
- Analogue or pulse output
- Serial communication
- Configuration from front or PC
- Process value alarm
- Deviation alarm
- Single or dual loop
- Arithmetic and logic functions
- Short sample time
- Stiction compensation

Operation

The ergonomic design makes the controllers restful to the eye and easy to use. All functions, including configuration, can be accessed from the controller front.

Configuration

Configuration can be set during operation. The new controller units are factory preconfigured, enabling practically immediate use. A new configuration structure combines simplicity with power. There are no codes to memorize, and all the user needs to know is shown on the full graphical LCD display in plain English.



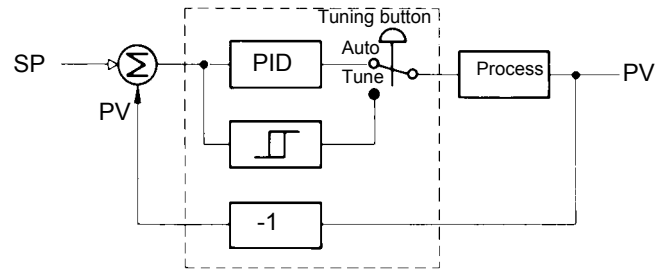
Autotuner

The autotuner is used for automatic setting of the PID parameters. The tuner sets the control loop in a state of controlled oscillation. The oscillation amplitude is correlated to the process noise level. After tuning, the PID parameters are determined and stored automatically. If the process changes, the system can be re-tuned.

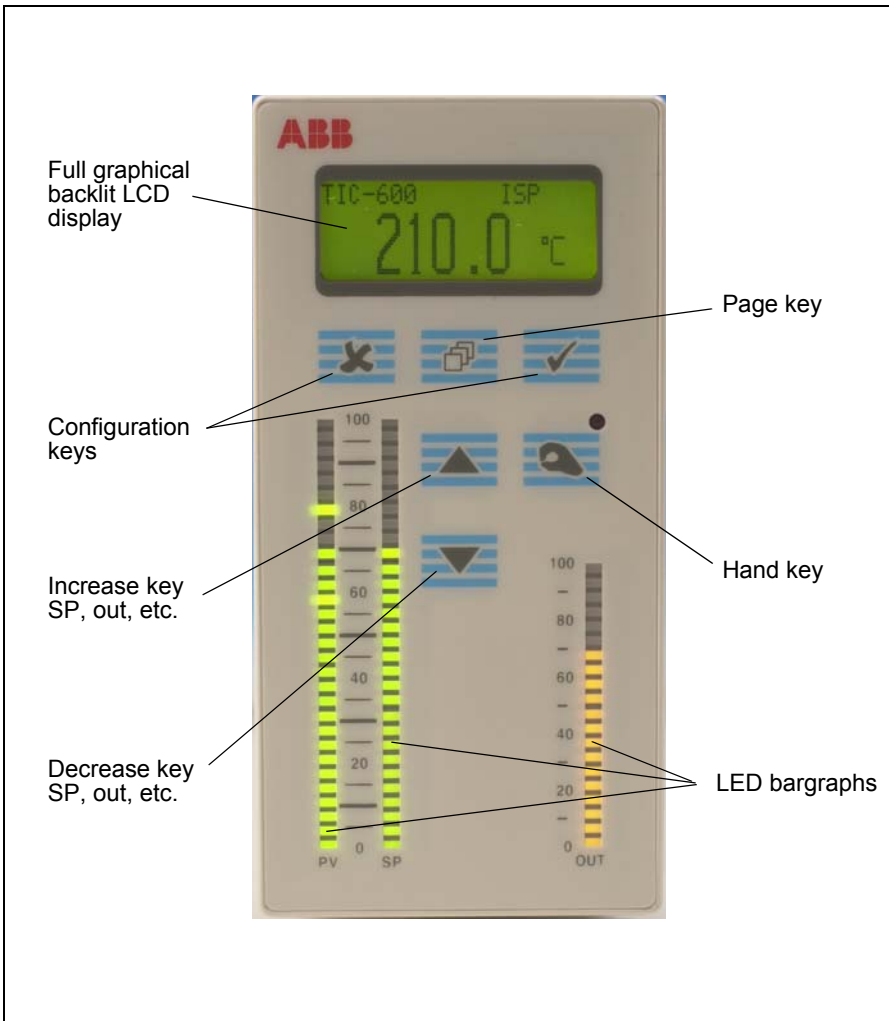
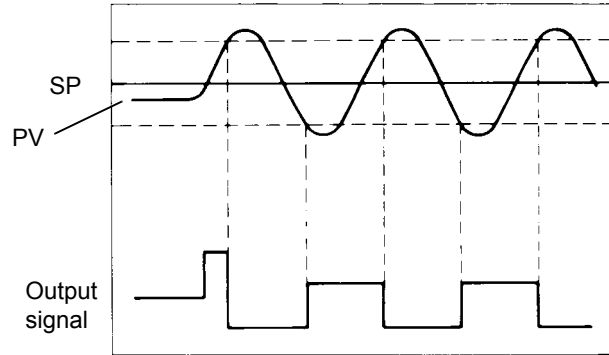
Gain Scheduling

This feature enables optimal control of non-linear processes. The process is controlled by using different sets of PID parameters for different values of a freely chosen reference signal. Three parameter sets are available.

Autotuner principle



Tuning sequence



Feed Forward

This feature enables the controller to compensate for disturbances before they affect the process. The Feed Forward signal is received from an ordinary sensor. Feed Forward can be either static or adaptive.

CLPM

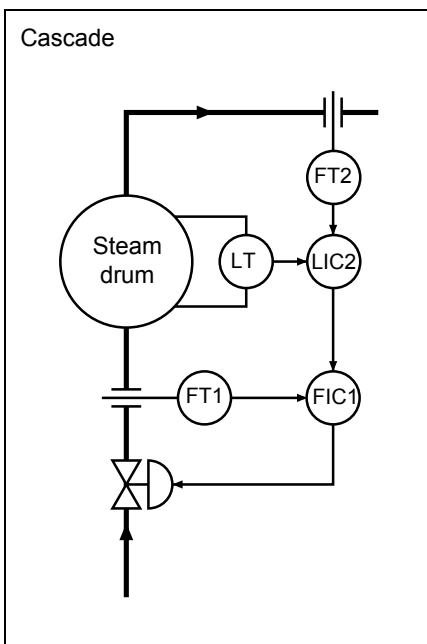
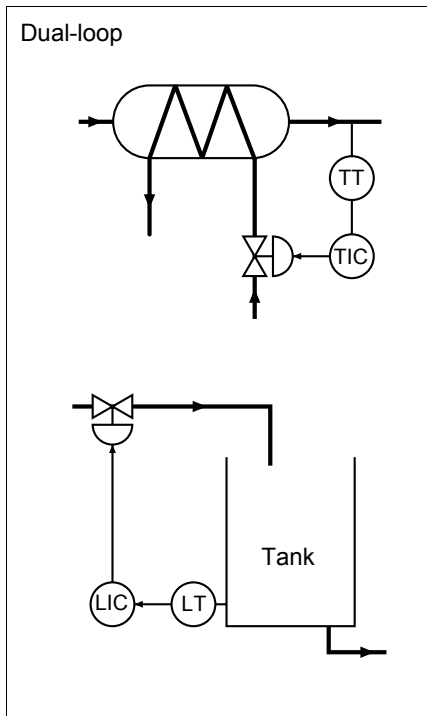
The Control Loop Performance Monitor (CLPM) continuously supervises the control loop. Abnormal oscillations are automatically detected. The function works without any parameters.

pPI Control

The predictive PI controller is a dead-time-compensating controller. The pPI controller differs from other dead-time controllers in the number of parameters. Only three parameters need be set: Gain, Integral Time and Dead-Time. These parameters can easily be determined from a simple step response test on the process. The close resemblance to the PID controller makes the pPI controller easy to use. pPI control can be successfully combined with Gain Scheduling.

Multiple Loop Control

The ECA600 controller unit has two independent controller blocks which can operate either independently (dual-loop) or be combined in cascade. Both blocks have the functionality mentioned above.



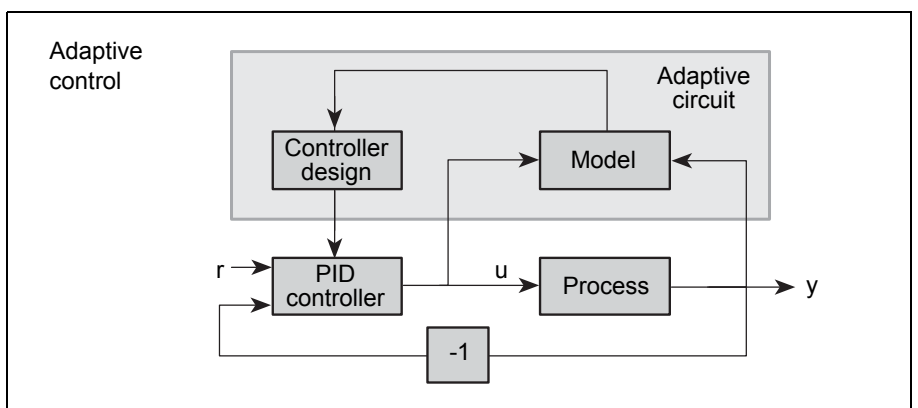
Adaptive Control

This type of control forces the controller to change its parameters continuously to adjust to a changing process.

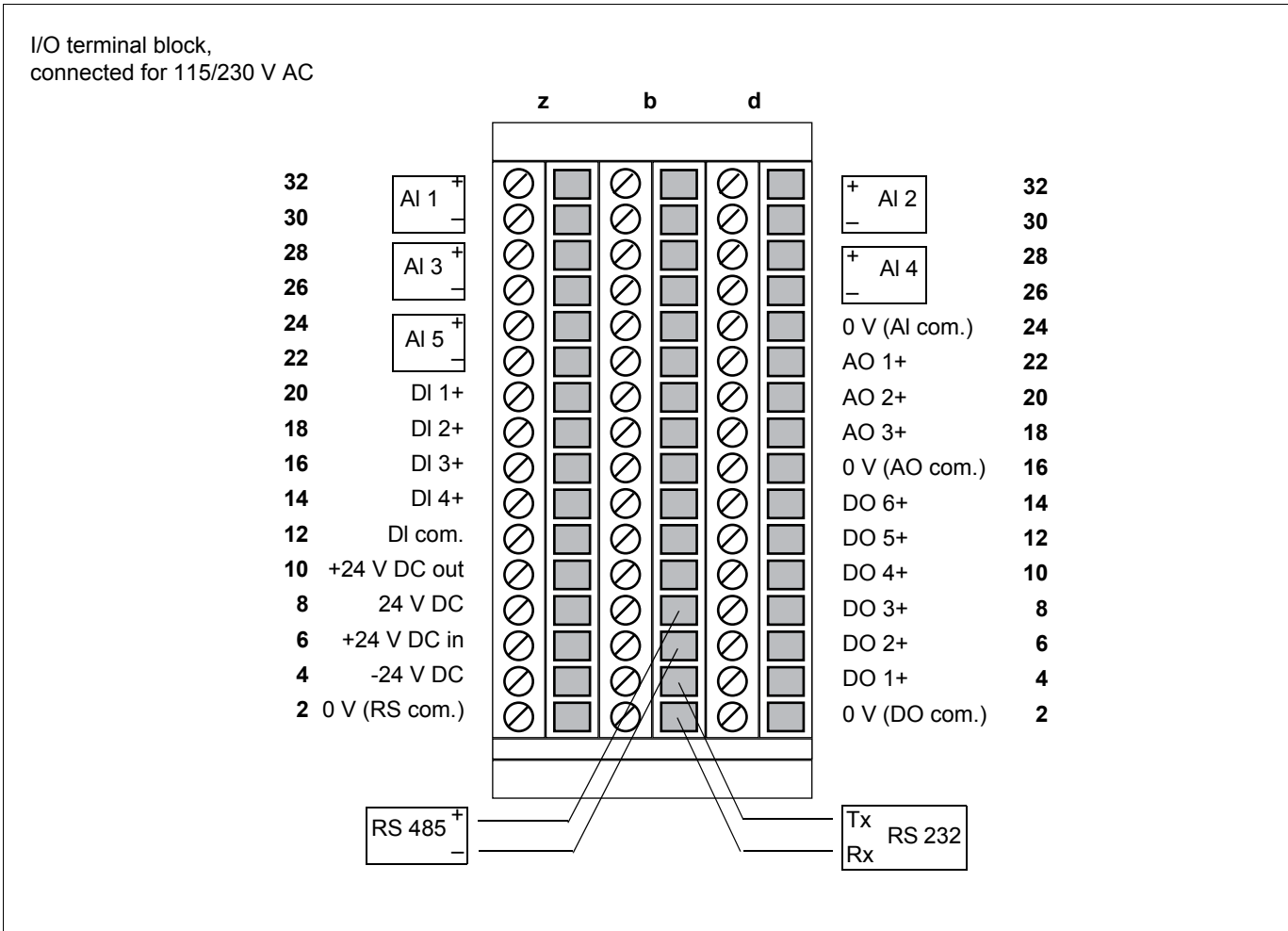
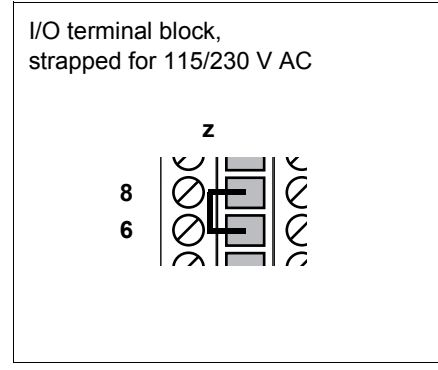
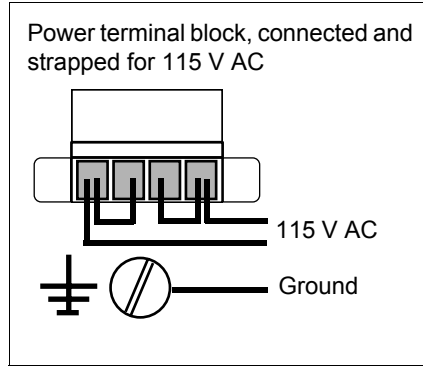
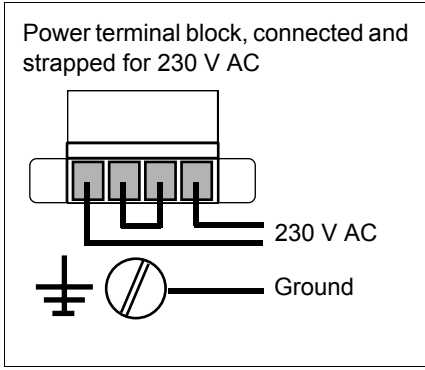
Adaptive control is activated in configuration mode, and is initiated by starting the Autotuner.

Adaptive control can be successfully combined with gain scheduling. While gain scheduling works with the static characteristics of the process (e.g. valve non-linearity), adaptive control works with the dynamic characteristics (e.g. load changes).

	ECA06	ECA60	ECA600	EMA60
Hardware				
Analogue inputs	2	3	5	3
Analogue outputs	1	2	3	1
Digital inputs	1	3	4	2
Digital outputs	2	4	6	6
RS232	x	x	x	x
RS485	x	x	x	x
Control features				
Autotuner	x	x	x	
Adaptive control			x	
pPI control			x	
Gain scheduling		x	x	
Feed forward		x	x	
CLPM			x	
Cascade control			x	
Dual-loop control			x	
Stiction compensation	x	x	x	x
Function blocks				
Analogue Input	2	3	5	3
Analogue input communication	4	8	12	4
Analogue user	-	2	8	4
Digital input	1	3	4	2
Digital input communication	4	8	12	4
Digital user	-	2	8	4
Operator	1	1	2	1
PV alarm	1	1	2	3
Deviation alarm	-	1	2	3
Arithmetic	2	4	16	8
Logic	-	2	16	8
Other	-	2	16	8
Control	1	1	2	-
Analogue output	1	2	3	1
Analogue output communication	4	8	12	4
Digital output	2	4	6	6
Digital output communication	4	8	12	4
System	1	1	1	1
Communication protocol				
MODBUS RTU	x	x	x	x
COMLI	x	x	x	x

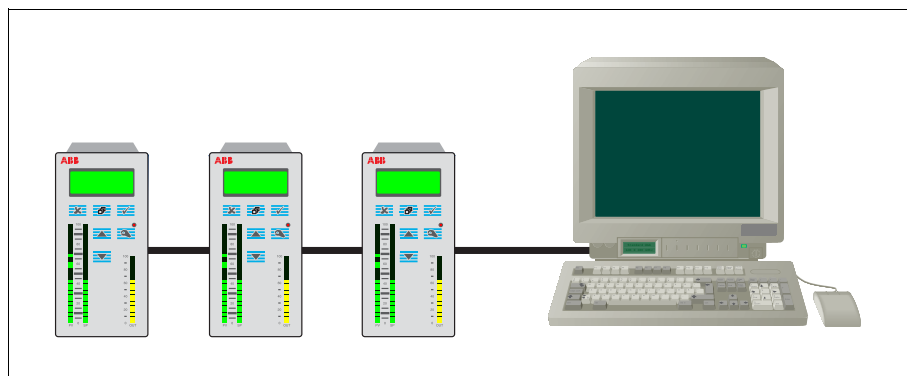


Connection and Strapping



Communication

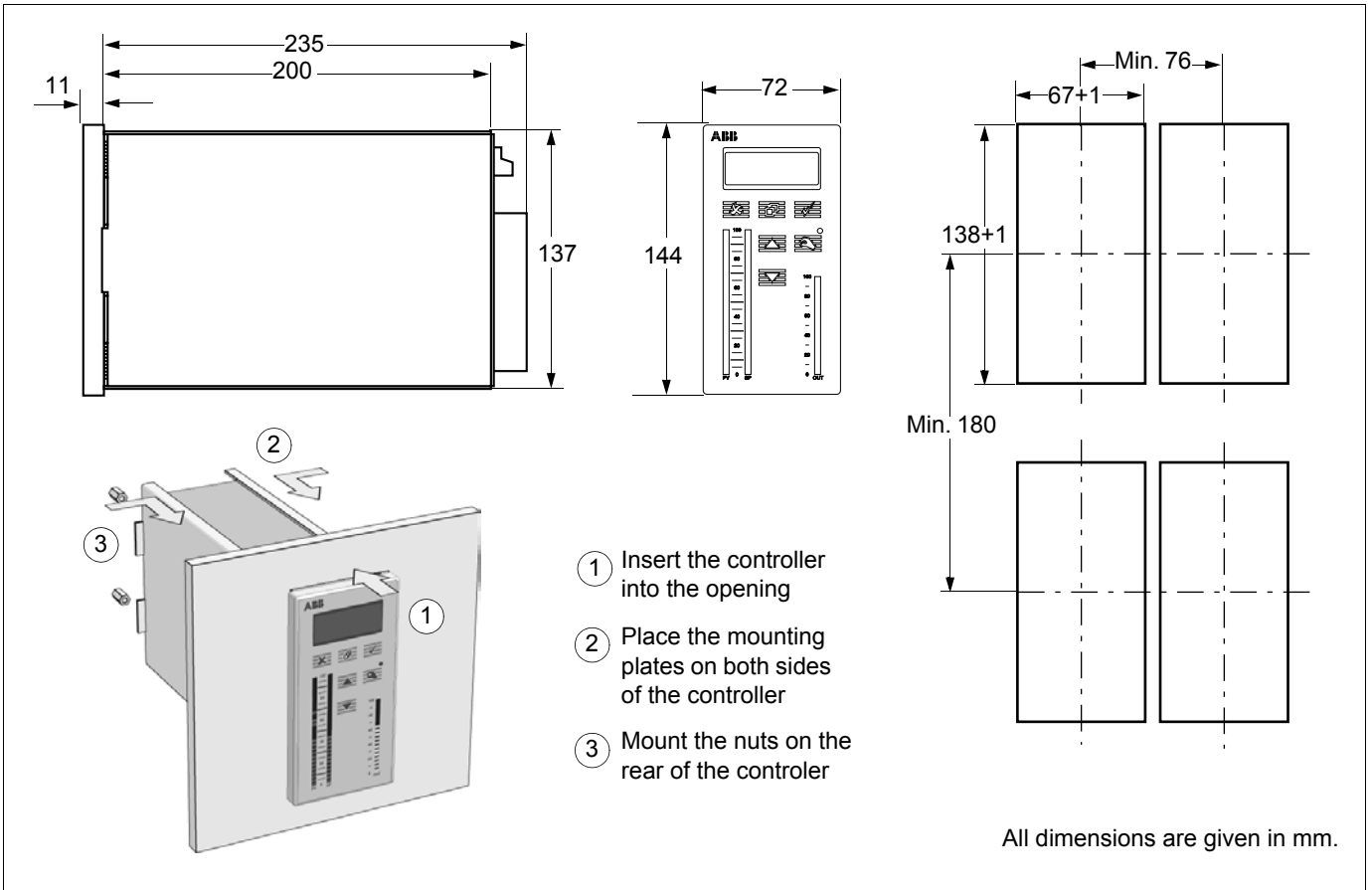
All units in the new ECA family can communicate with a computer using the standard COMLI protocol or MODBUS RTU. Both real-time data and configuration information can be transferred via the communication link. The baud rate is adjustable.



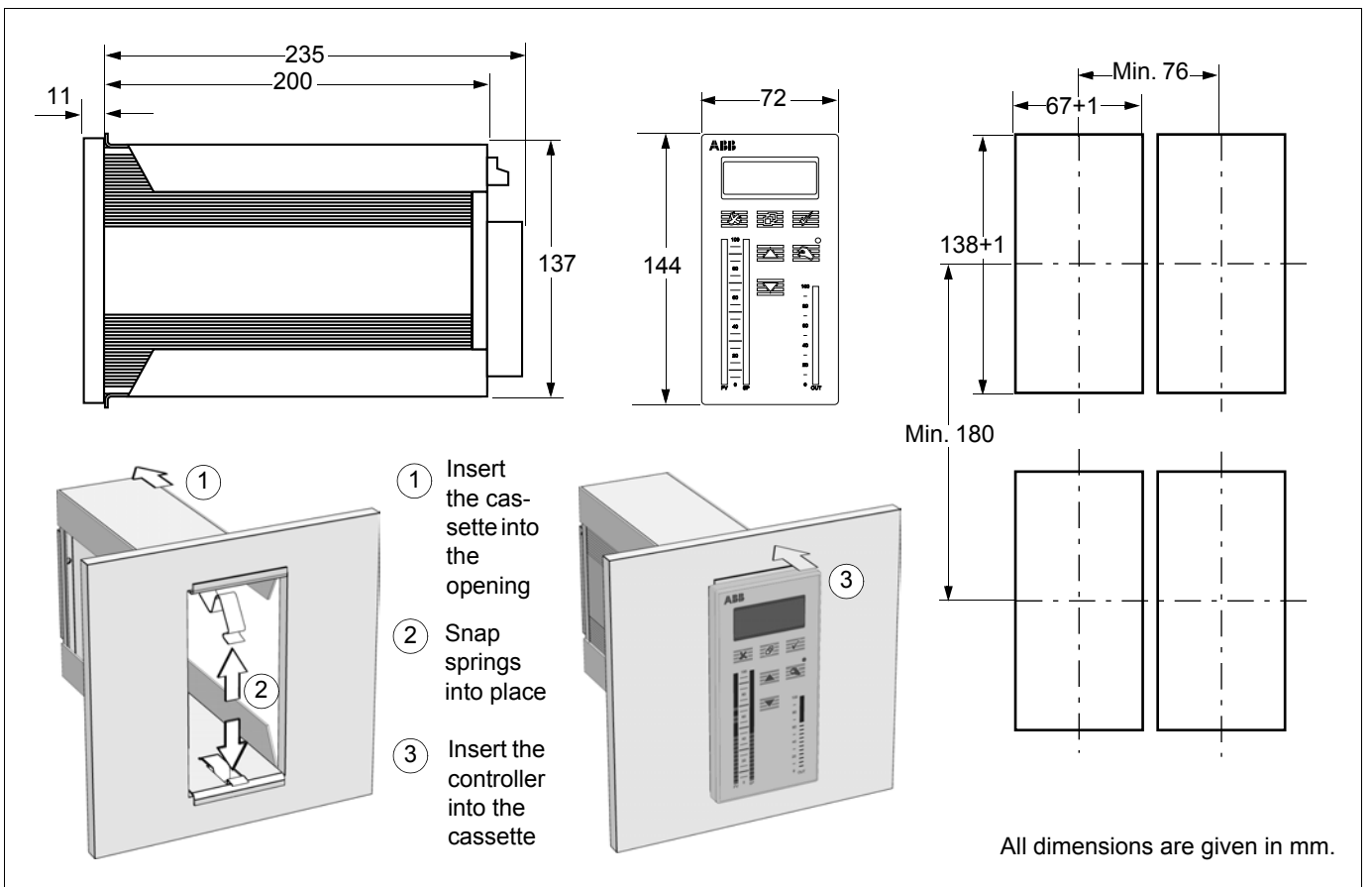
Mounting

The controllers need a kit for panel mounting (492-8905-01).

A cassette is available as an option.



Panel mounting



Cassette mounting

Technical Data

Controller		Presentation	Process value, set point, controller output indicated on bar graphs and on LCD display. Alarms indicated on process value bar graph. Set point type (internal/external) indicated on LCD display. Computer/local status indicated on LCD display.
Control functions	P, PD, PI, PID, pPI		
Gain	0.01–99.99		
Integral time	0.1–9999.9 seconds		
Derivative time	0.0–9999.9 seconds		
Control action	Direct, reversed		
Set point	Internal, external, ramp		
Control output	Analogue, pulse	Digital Inputs	
Alarms	Process value, deviation.	Type	24 V DC, common digital input ground, current sink, opto-isolated.
Sample time	30–500 ms	Voltage	Max. 35 V, min. -0.5 V.
Analogue Inputs		Logic levels	0 < 3 V (IEC 1131-2, type 1) 1 > 15 V (IEC 1131-2, type 1).
Input ranges	0–20 mA, 4–20 mA, 0–5 V, 1–5 V, 0–10 V, 2–10 V.	Digital Outputs	
Input types	Differential or single ended (jumper selectable).	Type	24 VDC, current source.
Input impedance	Current 250 Ω. Voltage 200 kΩ.	Load current	Max. 250 mA per output, max. 500 mA total.
Alarm function for out-of-range signal	Yes, for 4–20 mA, 1–5 V and 2–10 V, when the signal drops below the lower limit.	Short-circuit current	Max. 500 mA transient current during 1 μs.
Functions	First-order software filter, linear / square root.	Power supply	
Resolution	12 bits	AC	115/230 V AC ± 10%, 50–60 Hz, 20 VA or 19 V AC ± 10%, 50–60 Hz, 1 A.
Inaccuracy	Max. ± 0.2% of FS within 5–55°C.	DC	24 V DC ± 10%
Temperature stability	0.01% FS per °C within 5–55°C.	Protection	Secondary side of transformer and direct supply fused via thermo type fuse.
Analogue Outputs		Transmitter	Max. 24 V DC/150 mA.
Output ranges	0–20 mA, 4–20 mA.	Environmental specifications	
Type	Current source	Operating temperature	+5 to +55°C (IEC 68-2-1/2).
Max. output current	22 mA	Non-operating temperature	-25 to +70°C (IEC 68-2-1/2).
Load resistance on current output	Max. 650 Ω	Non-operating damp heat steady state	93% relative humidity at +40°C (IEC 68-2-3).
Short circuit protection	Yes	Protection class	IP20 generally. IP65 for front.
Resolution	12 bits	Electrical environment	Fulfils ElectroMagnetic Compatibility, EMC, directive 89/336/EEC
Output signal break detection	Yes	Order codes	ECA 06–0000 ECA 60–0000 ECA 600–0000 EMA 60–0000
Inaccuracy	Max. ± 0.2% of FS within 0–50°C.	Mounting kit	
Communication		A) Mounting plates with terminal blocks	492-8905-01
Number of ports	2, RS232 and RS485 (2-wire).	B) Cassette	492-8576-02
Bus system, communication protocol	COMLI or MODBUS RTU	Weight	
Speed of transfer	Max. 38.4 Kbaud.	ECA/EMA	1.5 kg
Operator Interface		Mounting kit A	0.8 kg
Display	Backlit LCD with 120 x 32 pixels.	Mounting kit B	1.0 kg
Bar graphs	LED, Process value 30 segments, Set point 30 segments, Controller output 20 segments.		
Keys	Six keys: Cancel, Page, OK, Hand, Increase and Decrease.		



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