ControlMaster CMF310
Universal process controller, fieldmount
Measurement made easy
Making process control easy

Cost saving field-mount design
• Wall-, pipe- or panel-mountable
• No need for an instrument panel
• IP66 and NEMA4X environmental protection

Comprehensive display of process status
• Crystal-clear, full-color TFT display
• User customizable
• Historical trending

Exceptionally easy to use
• Intuitive user interface and clear text prompts ensure installation, commissioning and operation are quick and simple

Powerful control functionality
• Cascade, feed-forward, ratio, predictive-, profile- and adaptive-control strategies
• Dual-loop capability

Problem-solving capability
• Flexible functionality including math, logic and totalization providing power to solve complex application requirements

PC configuration
• Time-saving off-line software tool including report generation
Overview
The ControlMaster CMF310 is a highly versatile, field-mountable, universal PID process controller. With a unique field-mountable design that enables wall-, or pipe-mounting without the need for an additional enclosure. Detailed process information is presented clearly on the CMF310’s full-color TFT display and an intuitive operator interface simplifies configuration and operation.

Highly scalable in both hardware and software functionality, a CMF310 can be specified easily to meet the needs of virtually any process control application – simple or advanced. Powerful control functions such as adaptive control, math, logic and totalization provide problem-solving flexibility and make the CMF310 suitable for a wide range of process applications. Fully configurable via the easy-to-navigate front panel menus or PC configuration software, the CMF310 can be commissioned rapidly and then tuned via the advanced autotune capability.

MODBUS and Ethernet communication options ensure easy integration into a control system.
Highly scalable

The CMF310 is highly scalable in terms of both hardware and software, to fulfill the demands of the simplest to the most complex process. The basic CMF310 meets the needs of a simple control loop. Templates and control functionality can be increased by adding function keys to the basic model. Each function key added provides additional templates and functionality as shown in Figure 1, while retaining previous templates and functionality. For I/O builds, see ‘Ordering information’ on page 21.

<table>
<thead>
<tr>
<th>Level</th>
<th>Function keys</th>
<th>Template</th>
<th>Functionality</th>
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<tr>
<td>Base</td>
<td>0</td>
<td>Single loop</td>
<td>Process alarms</td>
</tr>
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<td></td>
<td></td>
<td>Single loop with remote setpoint</td>
<td>Basic setpoint switching</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Basic control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Analog PID</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• On / Off or time proportioning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Auto tune</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Split output control</td>
</tr>
<tr>
<td>Standard</td>
<td>1</td>
<td>Auto / Manual station low signal selection</td>
<td>Standard setpoint switching</td>
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<td>Auto / Manual station digital signal selection</td>
<td>Standard control</td>
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<td>Analog backup station low signal selection</td>
<td>• Gain scheduling</td>
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<td>Analog backup station digital signal selection</td>
<td>• Motorized valve control</td>
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<td>Single indicator / manual loader</td>
<td>Output tracking</td>
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<td>Dual indicator / manual loader</td>
<td>Logic</td>
</tr>
<tr>
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<td></td>
<td>Math</td>
</tr>
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<td>Custom linearizers</td>
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<td>Delay timers</td>
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<td>Real time alarms</td>
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<td>Bank control</td>
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<td></td>
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<td>Template customization</td>
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<tr>
<td>Extended</td>
<td>2</td>
<td>Single loop with feedforward</td>
<td>Totalization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single loop with feedforward and remote setpoint ‡</td>
<td>Advanced profile</td>
</tr>
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<td>Cascade</td>
<td>Advanced control</td>
</tr>
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<td></td>
<td>Cascade with remote setpoint ‡</td>
<td>• Feed forward</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cascade with feedforward ‡</td>
<td>• Adaptive control</td>
</tr>
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<td></td>
<td></td>
<td>Ratio controller (internal ratio)</td>
<td>Historical trending</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ratio controller (external ratio) ‡</td>
<td>Display customization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ratio station (internal ratio) ‡</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ratio station (external ratio) ‡</td>
<td></td>
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<tr>
<td>Dual loop</td>
<td>3</td>
<td>Dual loop – local / local</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dual loop – remote / local ‡</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dual loop – remote / remote ‡</td>
<td></td>
</tr>
</tbody>
</table>

Recommended I/O Build: Unless analog values are being digitally communicated to the CMF310, an analog input module is required in position 1. For templates marked ‡, an additional analog input module is required.

Figure 1  Overview of template options
Powerful operator display
The CMF310 features a full-color 9 cm (3.5 in.) display for displaying detailed process information to the user. Process details such as alarm messages and diagnostic information are displayed clearly in full text without the need for difficult-to-read scrolling displays.

Example of an operator page
Automatic selection of standard display templates immediately makes best use of the CMF310’s display. Extensive customization features then enable the displayed information to be tailored to suit the process requirements.

Diagnostics and alarm status display
The diagnostics and alarm status display provides detailed information on any active alarm or diagnostic condition. The operator can see, at-a-glance, the status of any alarm condition present within the process. In addition, diagnostic messages are presented clearly to the operator, enabling rapid notification and simple diagnosis of any critical instrument status condition.

Historical information of diagnostic messages can also be viewed in the controller’s diagnostic log.

Trend display
Any 2 analog values within the CMF310 can be plotted on the trend display to provide a short-term process history. This feature enables control efficiency to be monitored against setpoint and assists in tuning during commissioning.

Exceptionally easy to use
The CMF310’s full text display and simple-to-navigate, pop-up menu makes operation exceptionally easy.

A programmable soft key enables commonly used functions, such as alarm acknowledgement and display selection, to be accessed easily by the operator.
Advanced control functionality
The CMF310 features many advanced control functions providing the power to bring even the most complex process under control.

Autotune
Once initial configuration is complete, a powerful autotune facility enables automatic calculation of the PID values required, enabling rapid commissioning of the CMF310.

Gain scheduling
The CMF310’s gain scheduling functionality is used for efficient control of non-linear processes. Up to 3 different sets of PID parameters are selected automatically from a reference signal ensuring optimum control response, regardless of the process status.

<table>
<thead>
<tr>
<th>Time</th>
<th>P</th>
<th>I</th>
<th>D</th>
<th>Gsref</th>
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<tr>
<td></td>
<td>1.71</td>
<td>4</td>
<td>2.62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.8</td>
<td>15</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.35</td>
<td>3.5</td>
<td>2.71</td>
<td>33</td>
</tr>
<tr>
<td>Limit 1</td>
<td></td>
<td></td>
<td></td>
<td>67</td>
</tr>
<tr>
<td>Limit 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 7  Gain scheduling example

Predictive control (dead-time compensation)
Control of processes with long dead-times, such as pH dosing in a pipeline, is addressed easily using pPI control. Configured via only 3 parameters (gain, integral time and dead-time), pPI control can also be combined with gain scheduling for optimum control efficiency.

Adaptive control
Adaptive control enables the CMF310 to adjust its control response automatically to suit changing process dynamics. This makes the CMF310 particularly useful for processes with varying or uncontrolled types of load, by providing continuous tuning to maximize control efficiency. Figure 9 shows a product used in a manufacturing process that is stored in an outside tank. The use of adaptive control within the manufacturing process compensates automatically for the change in product temperature caused by seasonal variation.

Split output control
The CMF310 can also be configured to perform split output control, for example, when both heating and cooling of a single process is required.

Remote auto / manual switching
In addition to switching via the front panel, the CMF310 can be switched between automatic and manual control mode using an external signal. When switched to manual mode via a digital signal, the value of the control output can be preset, for example, to fully open a control valve automatically during a cleaning cycle.
**External setpoint selection**
The CMF310’s control setpoint can be selected via external digital signals, for example, simplifying operation by selecting different setpoints using external push buttons.

![Figure 12 External setpoint selection](image)

**Bank control**
Bank control enables improved control of multi-element output devices such as banks of heaters, pumps and fans. Aimed at minimizing wear caused by over-use of one specific ‘duty’ device, bank control enables wear to be levelled by sharing duty and assist handling between every device in the bank.

Bank control gives users the choice of either ‘Rotate’ or ‘First In, First Out (FIFO)’ wear-levelling schedules. If required, bank control can be combined with PID control, assigning the PID output signal to the bank control function.

Bank control can also be utilized when split output control is configured. For example, when two variable speed pumps are being controlled in a duty assist configuration. Each time both pumps are stopped the duty and assist outputs are alternated.

![Figure 13 Independent on and off trip points](image)

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**Problem solving flexibility**
Extensive functionality is available to provide flexible problem-solving capability; making the CMF310 much more than just a process controller.

**Process alarms**
8 independent process alarms can monitor any analog signal within the CMF310, enabling extensive process monitoring capability. Alarms can be used to drive physical outputs or soft-wired to other functions within the controller.

**Real-time alarms**
The ‘alarm clock’ functionality provided by the CMF310’s real-time alarms enables time-of-day decisions to be introduced into the controller’s actions or specific functions to be triggered routinely at specified times.

**Delay timers**
Event sequencing is enabled through the use of the CMF310’s delay timers. A predetermined delay and output duration can be programmed into each delay timer and timers can be linked together.

**Custom linearizers**
The CMF310 has 2 independent 20-point custom linearizers that can be applied to any analog signal within the controller. These linearizers can be used in applications such as level-to-volume conversion of a non-linear tank level or to accommodate special input signals or output devices.

**Math**
8 math blocks provide arithmetic, averaging, min. / max. hold, square root and signal switching functionality. Simple equations can be performed in a single math block or multiple math blocks can be nested together to construct complex equations.

Signal switching ‘multiplexer’ math blocks switch between 2 analog signals based on a trigger signal. For example, a backup sensor could be selected automatically on failure of a primary sensor.

**Logic**
8 comprehensive logic equations provide powerful interlock functionality. Inputs and outputs of the logic equations can be soft-wired to any digital signal within the controller to maximize flexibility.

**Totalizer**
2 totalizers are available on the CMF310. The totalizers can configured to perform multiple functions:
- integration against an analog signal to totalize flow
- counting digital pulses
- totalization of flow based on a frequency signal from an electromagnetic flow meter.
Communications

Extensive communication options enable the CMF310 to be integrated into larger control systems easily or connected to other process instrumentation.

RS 485 MODBUS

Using RS 485 MODBUS, values and status can be communicated to, and from, the controller in real-time via an RS 485 connection.

Ethernet

Optional Ethernet communications enable CMF310 to be integrated into an Ethernet network quickly. The following functionality is provided:

- **Email**
  - Notification of a critical process event or status can be made by email. Multiple events can trigger an email that can be sent to multiple recipients

- **MODBUS TCP**
  - Process values and status can be communicated to and from the CMF310 in real-time using MODBUS TCP, enabling it to be integrated easily into larger control systems or connected to a data recorder

- **Webserver**
  - The CMF’s integrated webserver enables the current status of the process and controller to be viewed remotely using a standard web browser

PC Configuration

The CMF310 can be fully configured using ABB’s ConfigPilot software. Available free of charge, ConfigPilot enables off-line creation and editing of configuration files. Configurations are transferred to and from the indicator via its standard IrDA port and a USB IrDA adapter.
Setpoint profile
Setpoint profile capabilities make the CMF310 ideally suited to thermal processing applications where a specific temperature profile needs to be followed. Profiles are quickly created by programming a series of segments (for example, ramp, hold, wait or step). Process operators can then easily activate and monitor the required program via dedicated profile operator displays and menus.
Profile control is available in two versions:

- **Standard Profile**:
  - ideal for simple applications standard functionality provides a single program of up to 10 segments.

- **Advanced Profile**:
  - capable of accommodating 30 programs, advanced functionality provides 140 programmable segments and powerful features such as sequencing and timed-, or segment-events.

Fast run mode
When activated, fast run mode runs a profile at 8 times normal speed allowing complex or long duration programs to be tested prior to use.

Guaranteed Ramp / Soak
For processes where strict tolerances must be adhered to during a profile cycle, guaranteed ramp/soak can be applied to appropriate segments. A configurable hysteresis can be applied to a segment; if the process variable exceeds these limits the program is placed on hold until the process recovers. Once back within limits the profile can be configured to continue, or repeat, the current segment.

Hysteresis limits can be above, below or above and below the setpoint value.

Sequencing and interlocks
Advanced profile functionality provides features that enable sequencing and control of peripheral devices that must be activated at specific points during a profile. For example, valves and cooling fans can be driven by segment events that are freely configurable throughout a profile program. In addition, the setpoint for slave controllers can be generated by an analog user value which is programmable for each segment of a profile program.

When interlocks are required, wait segments can be placed in a program. On arriving at a wait segment the profile waits until a required condition is met (for example, digital input received) before continuing with the program.

Dedicated profile displays
To make day-to-day operation as easy as possible, profile control has dedicated display templates. A concise display detailing the program name, status and time remaining is shown to the operator. A more detailed program and segment status information is available on sub-pages.

![Figure 18 Profile control](image-url)
**Application templates**

To minimize commissioning time, the CMF310 features up to 20 preconfigured control strategy templates. By selecting the required control strategy, the template configures the CMF310’s function blocks and display automatically. Customization of the preconfigured templates is also possible, providing the flexibility to create customized solutions.

**Single loop**

This template provides standard, single-loop process control and is available with or without a remote setpoint.

In this example, the temperature of a product heated by a heat exchanger is regulated via the control of the steam feed to the heat exchanger.

**Single loop with feed-forward**

This template adds feed-forward functionality to the single-loop template and is available with or without a remote setpoint. Feed-forward control enables the CMF310 to anticipate, and respond to, process occurrences not yet detected by the process variable signal.

In this example, the CMF310 is regulating the speed of a dosing pump used to neutralize the pH of waste discharge. The flow rate of the waste discharge is monitored and fed forward to the CMF310 so that, as the flow rate increases, the speed of the dosing pump increases automatically to neutralize the extra volume of waste discharge.
Cascade
The cascade template connects two PID loops together to enhance the control of a master variable (master loop) by manipulation of a slave loop.

In this example, the temperature of a furnace is regulated (master loop) by monitoring and controlling the gas flow rate to the burner (slave loop). By performing slave loop control on the gas flow rate, variations in gas supply can be accounted for and better temperature control performance achieved. This template is available with or without a remote setpoint.

Cascade with feed-forward
This template combines the benefits of the feed-forward and cascade templates.

In this example, the effect of steam demand change on the level within the boiler drum is predicted and accounted for via the feed-forward signal. Feed water supply is then controlled accurately using a ‘slave’ flow loop that accounts for any variations in water supply.
...Application templates

Ratio controller
The ratio controller template configures the CMF310 to regulate one process variable against another based on a specified ratio. When using the ratio control template, the CMF310's display shows the required ratio (setpoint) and the actual ratio achieved (process variable).

In this example, a controlled amount of 'Flow B' is added to 'Flow A' at a ratio programmed into the CMF310.

This template is available with or without an external ratio.

Ratio station
The ratio station template configures the CMF310 as an indicator and setpoint generator.

In this example, the CMF310 is calculating and indicating the ratio of flow A and flow B. The operator is able to enter the required ratio on the CMF310; the CMF310 then retransmits the setting to the slave controller. In many applications, the slave controller is a blind or remotely-located device. This template is available with or without an external ratio.
Auto / Manual station and analog backup station
These templates configure the CMF310 to backup a master controller, typically a PLC or DCS. A fault condition is detected via a low output signal from the master controller or a digital signal. On detection of a fault signal, the CMF310 can take control of the process (analog backup template), freeze its output or switch to a safe output (auto / manual station template).

In this example, a critical control of flow is backed-up by the CMF310.

Dual loop
The dual loop template enables a CMF310 to act as 2 independent controllers and is available with a remote setpoint for either, or both, control loops. In this example, the temperature and humidity of a climatic chamber are controlled independently.
**Specification**

**Operation**
- Color, ¼ VGA TFT, liquid crystal display (LCD) with built-in backlight

**Language**
- English, German, French, Italian and Spanish

**Operator keypad**
- 6 tactile membrane keys

**Trend display**
- Recording of 2 variables
- Configurable sample rate (1 second to 5 minutes)
- 272 samples displayed on screen

**Security**
- Password protection
  - Basic / Advanced – user-assigned password protection (not set at factory)

**Standard functions**

**Control strategies**
- Base templates:
  - Single loop with local setpoint
  - Single loop with remote setpoint

**Standard templates**
- Auto / Manual station (low signal detection)
- Auto / Manual station (digital signal selection)
- Analog backup station (low signal detection)
- Analog backup station (digital signal detection)
- Single indicator / manual loader station
- Dual indicator / manual loader station

**Extended templates**
- Single loop with feedforward
- Single loop with feedforward and remote setpoint
- Cascade
- Cascade with remote setpoint
- Cascade with feedforward
- Ratio controller with internal ratio
- Ratio controller with external ratio
- Ratio station with internal ratio
- Ratio station with external ratio

**Dual loop templates**
- Dual loop with local setpoints
- Dual loop with remote setpoint on 1 and local setpoint on 2
- Dual loop with remote setpoint on both

**Control output types**
- Current proportioning
- Time proportioning
- On / Off
- Motorized valve with feedback
- Motorized valve without feedback
- Split output – with combinations of relay, digital output and current outputs

**Control parameters**

- **Proportional band** *
  - 0.0 to 999.9 %
- **Integral** *
  - 0 to 10000 s
- **Derivative** *
  - 0.0 to 999.9 s
- **Manual reset**
  - 0.0 to 100.0 %

**Setpoints**
- **Local**
  - 4, selectable via digital input or front panel
- **Remote**
  - selectable via digital input or front panel keys
- **Profile**
  - 1 program, 10 segments (Basic functionality)
  - 30 programs, 140 segments (Standard functionality)

**Auto tune**
- On-demand calculation of control settings

**Process alarms**
- **Number**
  - 8
- **Types**
  - High / Low process
  - High / Low latch
- **Source**
  - Fully configurable (for example – PV, Analog input, Math block inbuilt, OP control loop deviation)
- **Hysteresis**
  - Level and time
- **Alarm enable**
  - Enable / Disable individual alarms via a digital signal
- **Acknowledgement**
  - Via front panel keys or digital signals

**Real-time alarms** **
- **Number**
  - 2
- **Programmable**
  - Time
  - Day
  - Duration

* 3 sets of PID parameters when used with Gain Scheduling facility
** Functionality level ‘Standard’ and above only
Math blocks *
Number 8
Operators +, −, ×, ÷
Average, Maximum, Minimum
High / Low / Median select
Square root
Multiplexer

Delay timers *
Number 2
Programmable
Delay
Duration

Logic equations *
Number 8
Elements 15 per equation
Operators OR, AND, NOR, NAND, NOT, EXOR

Custom linearizer *
Number 2 (total) 9 digit totals
Elements 20 breakpoints

Bank control **
Number of outputs: 6
Wear levelling: Rotate or FIFO

Totalizer **
Number: 2 (total) 9 digit totals
Type: Analog, digital, frequency or pulse
Statistical calculations:
Average, maximum, minimum (for analog signals)
Update rate: 125 ms

Analog inputs
Universal process inputs
Number 2 (1 standard, 1 optional)
Type
Voltage
Current
Resistance (Ω)
3-Wire RTD
4-Wire RTD
Thermocouple
Digital volt-free
Digital 24 V
Frequency (input 1)
Pulse

Non-universal process inputs
Number 2 (1 standard, 1 optional)
Type
Voltage
Current
Thermocouple ***
Digital volt-free
Digital 24 V

Thermocouple types
B, E, J, K, L, N, R, S, T

Resistance thermometer
Pt100

Other linearizations
√x, x^{3/2}, x^{5/2}, custom linearization

Digital filter
Programmable 0 to 60 s

Display range
−9999 to 99999

Update rate
125 ms

Common mode noise rejection
> 120 dB at 50 / 60 Hz with 300 Ω imbalance resistance

Normal (series) mode noise rejection
> 60 dB at 50 / 60 Hz

CJC rejection ratio
0.05 °C/°C change in ambient temperature

*Functionality level ‘Standard’ and above only
** Functionality level ‘Extended’
*** Only if universal input 1 on the same input module is configured as ‘Thermocouple’
Specification

Temperature stability
0.02 %/°C or 2 µV/°C (1 µV/°F)

Long term (input) drift
< 0.1 % of reading or 10 µV annually

Input impedance
> 10 MΩ (mV input)
10 Ω (mA input)

Inputs

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<tr>
<th>Thermocouple</th>
<th>Maximum range °C (°F)</th>
<th>Accuracy (% of reading)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>–18 to 1800 (0 to 3270)</td>
<td>0.1 % or ±2 °C (3.6 °F)</td>
</tr>
<tr>
<td></td>
<td>(&lt;140 to 1650)</td>
<td>(above 200 °C [392 °F])</td>
</tr>
<tr>
<td>E</td>
<td>–100 to 900 (&lt;140 to 1650)</td>
<td>0.1 % or ±0.5 °C (0.9 °F)</td>
</tr>
<tr>
<td>J</td>
<td>–100 to 900 (&lt;140 to 1650)</td>
<td>0.1 % or ±0.5 °C (0.9 °F)</td>
</tr>
<tr>
<td>K</td>
<td>–100 to 1300 (&lt;140 to 2350)</td>
<td>0.1 % or ±1.5 °C (2.7 °F)</td>
</tr>
<tr>
<td>L</td>
<td>–100 to 1300 (&lt;140 to 2350)</td>
<td>0.1 % or ±1.5 °C (2.7 °F)</td>
</tr>
<tr>
<td>N</td>
<td>–200 to 1300 (&lt;325 to 2350)</td>
<td>0.1 % or ±0.5 °C (0.9 °F)</td>
</tr>
<tr>
<td>R</td>
<td>–18 to 1700 (0 to 3000)</td>
<td>0.1 % or ±1 °C (1.8 °F)</td>
</tr>
<tr>
<td></td>
<td>(&lt;325 to 2350)</td>
<td>(above 300 °C [540 °F])</td>
</tr>
<tr>
<td>S</td>
<td>–18 to 1700 (0 to 3000)</td>
<td>0.1 % or ±1 °C (1.8 °F)</td>
</tr>
<tr>
<td></td>
<td>(&lt;325 to 2350)</td>
<td>(above 300 °C [540 °F])</td>
</tr>
<tr>
<td>T</td>
<td>–250 to 300 (&lt;400 to 550)</td>
<td>0.1 % or ±0.5 °C (0.9 °F)</td>
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<table>
<thead>
<tr>
<th>RTD</th>
<th>Maximum range °C (°F)</th>
<th>Accuracy (% of reading)</th>
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</thead>
<tbody>
<tr>
<td>PT100</td>
<td>–200 to 600 (&lt;325 to 1100)</td>
<td>0.1 % or ±0.5 °C (0.9 °F)</td>
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<table>
<thead>
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<th>Linear Inputs</th>
<th>Standard analog input</th>
<th>Accuracy (% of reading)</th>
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<tbody>
<tr>
<td>Millivolts</td>
<td>0 to 150 mV</td>
<td>0.1 % or ±20 µV</td>
</tr>
<tr>
<td>Milliamps</td>
<td>0 to 45 mA</td>
<td>0.2 % or ±4 µA</td>
</tr>
<tr>
<td>Volts</td>
<td>0 to 25 V</td>
<td>0.2 % or ±20 mV</td>
</tr>
<tr>
<td>Resistance (low)</td>
<td>0 to 550 Ω</td>
<td>0.2 % or ±0.1 Ω</td>
</tr>
<tr>
<td>Resistance (high)</td>
<td>0 to 10 kΩ</td>
<td>0.5 % or ±10 Ω</td>
</tr>
</tbody>
</table>

Sample Interval
125 ms per sample

Digital Inputs

<table>
<thead>
<tr>
<th>Type</th>
<th>Volt-free or 24 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum pulse duration</td>
<td>Analog inputs 1 and 2:</td>
</tr>
<tr>
<td></td>
<td>• Single inputs configured – 250 ms</td>
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<tr>
<td></td>
<td>• Both inputs configured as analog or digital – 500 ms</td>
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<tr>
<td></td>
<td>Analog inputs 3 and 4:</td>
</tr>
<tr>
<td></td>
<td>• Single inputs configured – 250 ms</td>
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<tr>
<td></td>
<td>• Both inputs configured as analog or digital – 500 ms</td>
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<tr>
<td></td>
<td>Consider analog inputs 1/2 and 3/4 independently</td>
</tr>
</tbody>
</table>

Frequency input*

<table>
<thead>
<tr>
<th>Frequency range</th>
<th>1-signal</th>
<th>0-signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 6000 Hz</td>
<td>15 to 30 V</td>
<td>–3 to 5 V</td>
</tr>
</tbody>
</table>

*For use with devices with open collector outputs

Outputs

Controls / Retransmission outputs

<table>
<thead>
<tr>
<th>Number</th>
<th>4 (2 standard, 2 optional)</th>
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</thead>
<tbody>
<tr>
<td>Type</td>
<td>Configurable as analog or digital pulse</td>
</tr>
<tr>
<td>Isolation</td>
<td>Galvanically isolated from the rest of the circuitry, 500 V for 1 minute</td>
</tr>
<tr>
<td>Analog range</td>
<td>0 to 20 mA programmable</td>
</tr>
<tr>
<td>Load</td>
<td>750 Ω max.</td>
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<tr>
<td>Accuracy</td>
<td>0.25 % of output or ±10 µA</td>
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</tbody>
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Relays

<table>
<thead>
<tr>
<th>Number</th>
<th>6 (4 standard, 2 optional)</th>
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</thead>
<tbody>
<tr>
<td>Type</td>
<td>Standard with changeover contacts</td>
</tr>
<tr>
<td>Contact ratings</td>
<td>2 A, 240 V</td>
</tr>
<tr>
<td>Update rate</td>
<td>125 ms</td>
</tr>
</tbody>
</table>

Volt-free
Contact open > 10 MΩ/ contact closed < 100 kΩ
Digital I/O
Number 6
Type User-programmable as input or output
Minimum input pulse duration – 125 ms
Input Volt-free:
  contact open >10 MΩ
  contact closed <100 KΩ
24 V DC:
  1-signal 15 to 30 V
  0-signal –3 to 5 V
TTL:
  Low: 0 to 0.8 V
  High: 2 to 5 V
Conforms to IEC 61131-2
Output Open collector output
  30 V, 100 mA max. switched
Conforms to IEC 61131-2
Update rate 125 ms
2-Wire transmitter power supply
Number 1 optional
Voltage 24 V DC
Drive 2 loops for each transmitter PSU, 45 mA max.

Communications
Note. Only one communications option can be fitted per controller.
IrDA configuration port (standard)
Baud rate Up to 115 kBaud
Distance Up to 1 m (3 ft)
Functions Firmware upgrade
Configuration upload / download
Ethernet (optional)
Type 10BaseT
Connector RJ 45
Protocols TCP/IP
  HTTP
  MODBUS TCP (Slave)

Web server
Built-in – enables remote monitoring using standard web browsers
Email
  • Can be configured to be sent on the occurrence of a specified event
  • Up to 3 recipients
  • Up to 4 trigger sources with configurable tag
MODBUS RTU (optional)
Baud rate Up to 115 kBaud
Isolation
  Galvanically isolated from the rest of the circuitry,
  500 V DC for 1 minute

EMC
Emissions & immunity
  Meets requirements of IEC 61326 for an industrial environment

Environmental
Operating temperature range
  0 to 55 °C (32 to 131 °F)
Operating humidity range
  5 to 95 % RH (non-condensing)
Storage temperature range
  –20 to 70 °C (–4 to 158 °F)
Enclosure sealing
  IP 66 & NEMA 4X

Safety
Approvals and certifications
  EN 61010-1
  cULus
General safety
  Pollution category 2
  Insulation category 2
Isolation

Key
  ——— Isolation
...Specification

**Electrical**
Supply ranges
- 100 to 240 V AC ±10 % (90 V min. to 264 V max.)
- 50 / 60 Hz
Power consumption
- 25 W max.
Power interruption protection
- No effect for interrupts of up to 60 ms

**Physical**
Size
- 194 x 214 x 98 mm (7.6 x 8.4 x 3.8 in.)
Weight
- 1.5 kg (3.3 lb) approx. (unpacked)
Panel cutout
- 186 x 186 mm (7.3 x 7.3 in.), 92 mm (3.6 in.) behind panel
Case material
- Glass-filled polycarbonate
Electrical connections

Analog input I/O module 1
(Shown fitted)

Optional communications module
(Ethernet / MODBUS)

Analog input I/O module 2
(Module not fitted)

I/O module 3 option
(Module shown fitted)

Comms. connections
Digital I/O connections
Analog output connections 1 and 2 (standard)
Relay connections 1 to 4 (standard)
Mains supply 100 V to 240 V AC ±10 %
(90 V min. to 264 V max.)
50 / 60 Hz

Fuse 3.15 A Type T 100 to 240 V, 50/60 Hz
Overall dimensions

Dimensions in mm (in.)

Transmitter

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Transmitter Height</td>
<td>213 (8.38)</td>
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<tr>
<td>Height</td>
<td>194 (7.64)</td>
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</table>

Pipe mount option

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
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<tbody>
<tr>
<td>Pipe mount kit</td>
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<tr>
<td>Height</td>
<td>66 (2.6)</td>
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<td>Pipe diameters:</td>
<td>max. 62 (2.44) / min. 45 (1.77)</td>
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<td>Horizontal pipe configuration</td>
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<td>Width</td>
<td>170 (6.7) max.</td>
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Wall mount option

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<th>Dimension</th>
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<tbody>
<tr>
<td>Wall mount Height</td>
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<tr>
<td>Height</td>
<td>62 (2.44)</td>
</tr>
<tr>
<td>Height</td>
<td>66 (2.6)</td>
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<tr>
<td>Width</td>
<td>Ø6.4 (0.25)</td>
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Panel mounting

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<th>Value</th>
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<td>35 (1.4)</td>
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<tr>
<td>Height</td>
<td>92 (3.6)</td>
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<td>Panel cut-out dimensions*</td>
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<tr>
<td>Width</td>
<td>≥40 (1.57)**</td>
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</table>

* To DIN 43700
** ≥150 mm (6 in.) if (optional) cable glands fitted

Pipe diameters: max. 62 (2.44) / min. 45 (1.77)
Vertical pipe configuration
Horizontal pipe configuration
Cable gland kit (optional)
## Ordering information

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Product ordering code example:
CMF310 A2 Y0 Y0 B0 A1 A5 Y1 A1 Y-C1-M5
Standard accessories
Included with each controller:
• Commissioning instructions

Optional accessories
• ConfigPilot PC configuration kit CM30/0715
• After-sales engineered configuration service ENG/CON
• Pipe mounting kit CM40/0700 (page 20)
• Weathershield kit CM40/0702 (see below)

Weathershield kit (pipe- and wall-mount installations)
Dimensions in mm (in.)

Wall-mount entries  Pipe-mount entries

Acknowledgements
MODBUS is a registered trademark of the Modbus-IDA organization.