

M400: Versatile and Intelligent Advanced Process Control



The M400 transmitter series offers advanced ISM functionalities with “Plug and Measure” feature and sensor diagnostics tools. This multi-parameter transmitter covers pH/ORP, dissolved oxygen, gas phase oxygen (amperometric and TDL technology), conductivity and dissolved carbon dioxide measurements. The M400 is a single-channel (mixed-mode input) unit and accepts either conventional (analog) sensors or ISM sensors. The M400 transmitter is the state-of-the-art transmitter for your most demanding applications.

Specifications

General

Power supply	100 to 240 V AC, or 20 to 30 V DC, 10 VA
Frequency for AC	50 to 60 Hz
Current output	4 × 0/4 to 20 mA, 22 mA alarm
Service interface	USB port
Display	Backlit LCD, 4 lines
Languages	8 (English, German, French, Italian, Spanish, Portuguese, Russian and Japanese)
Ambient temperature	-10 to 50 °C (14 to 122 °F)
Relative humidity	0 to 95 % non-condensing
Rating/approvals	IP 65
Hazardous areas	Type 1, 2, 3: cFMus Class I Division 2, ATEX Zone 2 Type 1 Cond Ind: cFMus Class I Division 2*, ATEX Zone 2*
PID process controller	Yes
Hold input	Yes
Control input	Yes
Alarm contact	Yes (alarm delay 0 to 999 s)

* In progress

Features Overview

- Advanced ISM functionalities
- Single-channel with multi-parameter ability
- Mixed-mode input (ISM or conventional sensors)
- 6 output relays
- 4 current outputs
- PID controller with pulse length, pulse frequency or analog control

Other Highlights

- “Plug and Measure” functionality
- CIP/SIP/Autoclaving counter
- Dynamic Lifetime Indication
- Adaptive Calibration Timer
- Quick set up mode for fast installation



Did You Know

With tools such as the DLI, TTM and ACT, ISM technology on the M400 offers true predictive maintenance, resulting in fewer unscheduled shutdowns.

► www.mt.com/m400

Parameter Specifications**pH, pH/pNa and ISFET Performance**

Measurement parameters	pH, mV, and temperature
pH, ORP input range	-1500 to 1500 mV
pH display range	-2 to 16 pH
Resolution	Auto/0.001/0.01/0.1/1 (can be selected)
Relative accuracy *	± 0.02 pH; ± 1 mV
Temperature input	Pt1000, Pt100, NTC22kΩ
Temperature compensation	Automatic / manual
Temperature measuring range	-30 to 130 °C (-22 to 266 °F)
Temperature resolution	Auto/0.001/0.01/0.1/1 °C/°F (can be selected)
Temperat. measurement error *	± 0.25 °C (± 0.45 °F)
Max. length sensor cable	analog: 20 m (65 ft), depending on sensor; ISM 80 m (260 ft)
Calibration	1 or 2 point calibration, process calibration

* For analog input signal (ISM input signal causes no additional error)

Amperometric Oxygen Performance

Measurement parameters	- Dissolved oxygen: Saturation or concentration and temperature - Oxygen in gas: Concentration and temperature
Current range	0 to 900 nA
Oxygen measuring ranges	- Dissolved oxygen: Saturation 0 to 500 % air, 0 to 200 % O ₂ Concentration 0.1 ppb (µg/L) to 50.00 ppm (mg/L) - In gas: 0 to 9999 ppm O ₂ gas, 0 to 100 vol % O ₂
Oxygen accuracy *	
- Dissolved oxygen saturation:	± 0.5 % of the measured value or ± 0.5 %, whichever is greater. Concentration at high values: ± 0.5 % of the measured value or ± 0.050 ppm/ ± 0.050 mg/L, whichever is greater. Concentration at low values: ± 0.5 % of the measured value or ± 0.001 ppm/ ± 0.001 mg/L, whichever is greater.
- In gas:	± 0.5 % of the measured value or ± 5 ppb, whichever is greater for ppm O ₂ gas. ± 0.5 % of the measured value or ± 0.01 %, whichever is greater for vol % O ₂ .
Resolution current	6 pA
Polarization voltage	- 1000 to 0 mV for analog sensors - 550 mV or -674 for ISM sensors (configurable)
Temperature input	NTC 22kΩ, Pt1000
Temperature compensation	Automatic
Temperature measuring range	-30 to 150 °C (-22 to 302 °F)
Temperature accuracy *	± 0.25 K in the range of -10 to + 80 °C (14 to + 176 °F)
Max. length sensor cable	analog: 20 m (65 ft); ISM 80 m (260 ft)
Calibration	1-point (slope or offset) calibration, process calibration (slope or offset) calibration

* For analog input signal (ISM input signal causes no additional error)

Optical Oxygen Performance

Measurement parameters	DO saturation or concentration and temperature
DO concentration range	0.1 ppb (µg/L) to 50.00 ppm (mg/l)
DO saturation range	0 to 500 %, 0 to 100 % O ₂
DO resolution	Auto/0.001/0.01/0.1/1 (can be selected)
DO accuracy	± 1 digit
Temperature measuring range	-30 to +150 °C (-22 to 302 °F)
Temperature resolution	Auto/0.001/0.01/0.1/1 °C (°F) (can be selected)
Temperature accuracy	± 1 digit
Temperature compensation	Automatic
Max. length sensor cable	15 m (50 ft)
Calibration	1-point (depending on sensor model), 2-point, process calibration

Oxygen TDL Performance

Measurement parameters	Oxygen
Oxygen concentration range	0 to 9999 ppm O ₂ gas, 0 to 100 vol % O ₂
Resolution	Auto/0.001/0.01/0.1/1 (can be selected)
Accuracy	± 1 digit
Temperature compensation	Analog 4...20 mA input signals or manually set values
Max. length sensor cable	100 m (300 ft)
Calibration	1-point, process calibration

Transmitters

Monitoring and Control of In-line Measurement Systems

Multi-Parameter Transmitter (4-Wire)

Cond & Cond Ind Performance

Measurement parameters	Conductivity, and temperature
Conductivity ranges (2-e/4-e)	2-electrode sensor: 0.02 to 2000 $\mu\text{S}/\text{cm}$ (500 $\Omega\times\text{cm}$ to 50 $\text{M}\Omega\times\text{cm}$) 4-electrode sensor: 0.01 to 650 mS/cm (1.54 $\Omega\times\text{cm}$ to 0.1 $\text{M}\Omega\times\text{cm}$)
Conductivity (inductive) range	0.0 to 2000 mS/cm
Temperature input	Pt1000
Temperature measuring range	-40 to 200 °C (-40 to 392 °F)
Max. length sensor cable	60 m (196.9 ft) with 2-electrode sensor 15 m (50 ft) with 4-electrode sensor 10 m (33 ft) with inductive sensor 80 m (260 ft) with ISM sensor
Cond/Res accuracy*	$\pm 0.5\%$ of reading or 0.25 Ω , whichever is greater, up to 18 $\text{M}\Omega\times\text{cm}$
Cond Ind	accuracy $\pm 1\%$ of reading or ± 0.005 mS/cm
Cond/Res repeatability*	$\pm 0.25\%$ of reading or 0.25 Ω , whichever is greater
Cond Ind repeatability	$\pm 1\%$ of reading or ± 0.005 mS/cm
Cond/Cond Ind resolution	Auto/0.001/0.01/0.1/1 (can be selected)
Temperature resolution	Auto/0.001/0.01/0.1/1 °C/°F (can be selected)
Temperature accuracy*	± 0.25 °C (± 0.45 °F)
Temperature repeatability*	± 0.13 °C (± 0.23 °F)
Chemical concentration curves	NaCl, NaOH, HCl, HNO ₃ , H ₂ SO ₄ , H ₃ PO ₄ User-defined concentration table (5×5 matrix) TDS ranges NaCl, CaCO ₃
Calibration	1 or 2 point calibration, process calibration

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Dissolved carbon dioxide Performance

Measurement parameters	Dissolved carbon dioxide and temperature
Dissolved carbon dioxide range	0 to 5000 mg/L , 0 to 200 % sat, 0 to 1500 mmHg , 0 to 2000 mbar 0 to 2000 hPa
mV range	-1500 to 1500 mV
Total pressure range	0 to 4000 mbar
Dissolved carbon dioxide accuracy*	$\pm 5\%$ of reading ± 2 mg/L resp. $\pm 0.2\%$ of reading ± 2 hPa
Resolution	Auto/0.001/0.01/0.1/1 (can be selected)
Temperature input	Pt1000/NTC 22k Ω
Temperature range	-30 to 150 °C (-22 to 302 °F)
Temperature resolution	Auto/0.001/0.01/0.1/1 °C/°F (can be selected)
Temperature accuracy*	± 0.25 °C (± 0.45 °F) within -10 to 80 °C
Temperature repeatability*	± 0.13 °C (± 0.23 °F)
Max. length sensor cable	15 m (50 ft), ISM 80 m (260 ft)
Calibration	1 or 2 point calibration, process calibration

*For analog input signal (ISM input signal causes no additional error)

Ordering Information

Transmitters	Order Number
M400, Type 1	52 121 348
M400, Type 1 Cond Ind	52 121 495
M400, Type 2	52 121 349
M400, Type 3	52 121 350

Installation Accessories	Order Number
Pipe mount kit	52 500 212
Panel mount kit	52 500 213
Protective hood	52 500 214
Terminal blocks for M300, M400	52 121 504

Parameter Fit Guide

Transmitters	Analog Sensor	ISM Sensor
M400 Type 1	pH/ORP ISFET Cond 2-E Cond 4-E	pH/ORP
M400 Type 1 Cond Ind	Cond Ind	Cond 4-E pH/ORP Cond 4-E
M400 Type 2	pH/ORP ISFET Cond 2-E Cond 4-E Amp. DO ppm	pH/ORP Cond 4-E Amp. DO ppm Optical DO ppm
M400 Type 3	Amp. O ₂ Gas high pH/ORP ISFET Cond 2-E Cond 4-E Amp. DO ppm Amp. DO ppb Amp. O ₂ Gas high Amp. O ₂ Gas low CO ₂	Amp. O ₂ Gas high pH/ORP Cond 4-E Amp. DO ppm Optical DO ppm Amp. DO ppb Optical DO ppb Optical DO traces Amp. O ₂ Gas high Amp. O ₂ Gas low CO ₂ high CO ₂ O ₂ Gas, TDL

Dimension Drawings

