

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 |

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

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 | pH/ORP |
| | ISFET | |
| | Cond 2-E | |
| | Cond 4-E | Cond 4-E |
| M400 Type 1 Cond Ind | Cond Ind | pH/ORP |
| | | Cond 4-E |
| M400 Type 2 | pH/ORP | pH/ORP |
| | ISFET | |
| | Cond 2-E | |
| | Cond 4-E | Cond 4-E |
| | Amp. DO ppm | Amp. DO ppm |
| | Amp. O₂ Gas high | Amp. O₂ Gas high |
| M400 Type 3 | pH/ORP | pH/ORP |
| | ISFET | |
| | Cond 2-E | |
| | Cond 4-E | Cond 4-E |
| | Amp. DO ppm | Amp. DO ppm |
| | Amp. DO ppb | Amp. DO ppb |
| | | Optical DO ppm |
| | | Optical DO ppb |
| | | Optical DO traces |
| | Amp. O ₂ Gas high | Amp. O ₂ Gas high |
| | Amp. O ₂ Gas low | Amp. O ₂ Gas low |
| CO ₂ | CO ₂ | |
| | O ₂ Gas, TDL | |

Dimension Drawings

