M400 Multi-Parameter Transmitter Series for pH/ORP, Oxygen, Dissolved Carbon Dioxide and Condctivity

Versatile and Intelligent for advanced process control

Technical Data

ISM®

HART
COMMUNICATION PROTOCOL

Short description

The multi-parameter M400 transmitter series features Intelligent Sensor Management (ISM®) technology and covers pH/ORP, oxygen (for measurement of dissolved oxygen), dissolved carbon dioxide, conductivity depending on the type you choose.

The high contrast black and white touchscreen together with four soft keys, allows you to operate the transmitter even in the harshest applications without compromising user ergonomics. The online diagnostic information with harmonized menu display lets you know when it is time to do maintenance or calibration of sensors equipped with ISM technology. The HART or FOUNDATION fieldbus communication protocol provides easy integration of sensor diagnostics into process control systems.

Features

– Black and white 4" touchscreen as an intuitive user interface
– Soft-key operation
– ISM diagnostics, incl. iMonitor
– Communication protocol: 4 to 20 mA (with HART or FOUNDATION fieldbus)
– Aluminum die cast enclosure (coated)
– Multi-parameter measurement
– Digital 1-channel input
– Four 0/4 to 20 mA current outputs, galvanically isolated
– Analog 4 to 20 mA input signal (for pressure compensation)
– Graphic trending
– Four configurable relays
– One PID process controller
– 4-wire installation
– IP 66/NEMA 4X rating
– 10 languages: English, German, French, Italian, Spanish, Portuguese, Russian, Japanese, Korean and Chinese
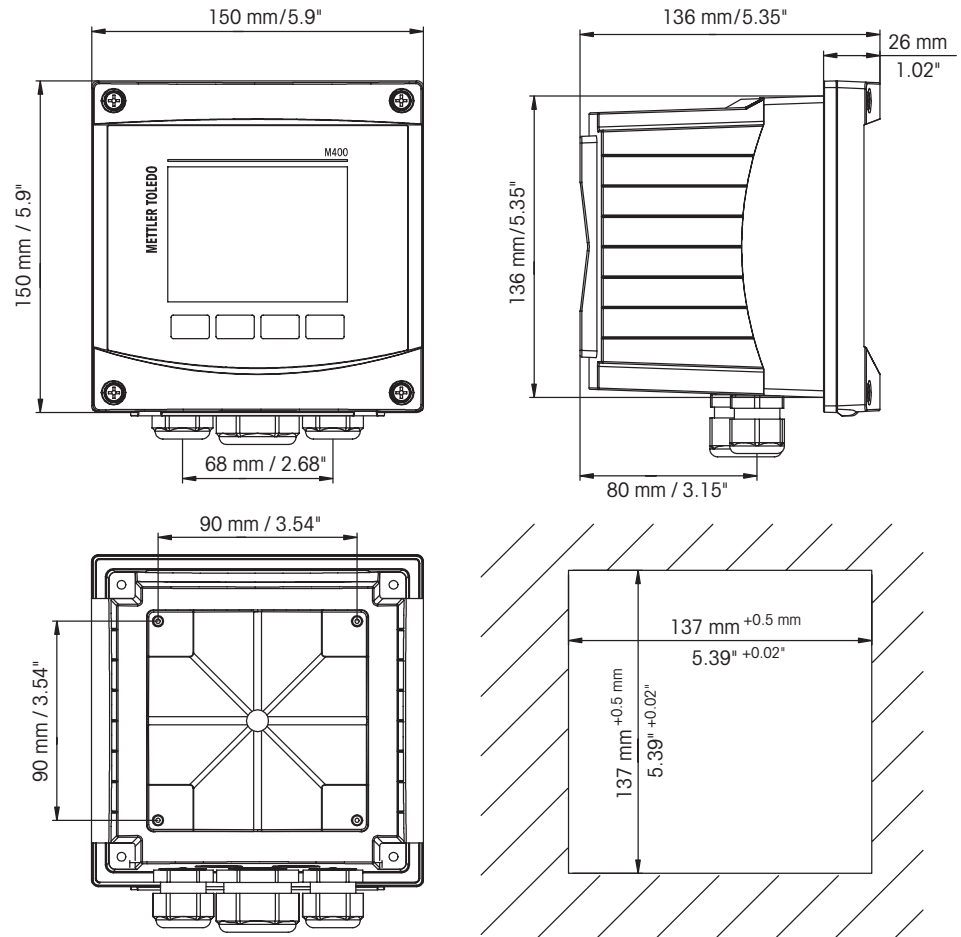
Contents

METTLER TOLEDO

½ DIN versions

The ½ DIN versions are suitable for panel, wall and pipe mounting. For accessories refer to "Accessories" on page 9.

pH / ORP (incl. pH / pNα)

Measurement parameters	pH, mV and temperature
pH display range	-2.00 to $+16.00$ pH
pH resolution	Auto / 0.001 / 0.01 / 0.1 / 1 (can be selected)
mV range	-1500 to $+1500$ mV
mV resolution	Auto / 0.001 / 0.01 / 0.1 / 1 mV (can be selected)
Temperature measuring range	-30 to $+140\,°C$ (-22 to $+284\,°F$)
Temperature resolution	Auto / 0.001 / 0.01 / 0.1 / 1 (can be selected)
Temperature compensation	Automatic / Manual
Max. sensor cable length	ISM: 80 m (260 ft)
Calibration	1-point, 2-point or process

Amperometric oxygen

Measurement parameters	Dissolved oxygen (DO): Saturation or concentration and temperature
Oxygen display ranges	Dissolved OxygenSaturation: 0 to 500 % air, 0 to 200 % O_2-sat
	Concentration: 0 ppb (µg / L) to 50.00 ppm (mg / L)
DO resolution	Auto / 0.001 / 0.01 / 0.1 / 1 (can be selected)
Polarization voltage	• O_2 High: Cal / Meas: -675 mV (Configurable)
	• O_2 Low: Cal: -675 mV, Meas: -500 mV (Configurable)
Temperature compensation	Automatic
Temperature measuring range	-10 to $+80\,°C$ ($+14$ to $+176\,°F$)
Temperature resolution	Auto / 0.001 / 0.01 / 0.1 / 1 °C (°F) (can be selected)
Max. sensor cable length	ISM: 80 m (260 ft)
Calibration	1-point (slope and offset) or process (slope and offset)

Optical oxygen

Measurement parameters	Dissolved Oxygen (DO): Saturation or concentration and temperature
Oxygen display ranges	Dissolved Oxygen Saturation: 0 to 500 % air, 0 to 200 % O2-sat
	Concentration: 0 ppb (ug / L) to 50.00 ppm (mg / L)
Oxygen accuracy	± 1 digit
Oxygen resolution	Auto / 0.001 / 0.01 / 0.1 / 1 (can be selected)
Temperature compensation	Automatic
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
Max. sensor cable length	80 m (260 ft)
Calibration	1-point (depending on sensor model) 2-point or process, process scaling

Dissolved carbon dioxide

Measurement parameters	Dissolved carbon dioxide and temperature
CO_2 display range	0 to 5000 mg/L
	0 to 200 % sat
	0 to 1500 mm Hg
	0 to 2000 mbar
	0 to 2000 hPa
CO_2 accuracy	± 1 digit
CO_2 resolution	Auto/0.001/0.01/0.1/1 (can be selected)
mV range	−1500 to +1500 mV
mV resolution	Auto/0.01/0.1/1 mV (can be selected)
mV accuracy	± 1 digit
Total pressure range	0 to 4000 mbar
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
Max. sensor cable length	80 m (260 ft)
Calibration	1-point (offset), 2-point (slope and offset) or process (offset)

Dissolved ozone

Measurement parameters	Concentration and temperature
Ozone measuring range	0 to 5000 ppb (µg/L) O_3
Ozone accuracy	± 1 % (or 0.4 ppb) up to 2000 ppb
	± 2.5 % (or 50−125 ppb) from 2000 to 5000 ppb
Resolution	± 1 digit
Temperature compensation	Automatic
Temperature measuring range	5 to +50 °C (+41 to +122 °F)
Temperature resolution	Auto/0.001/0.01/0.1/1 (can be selected)
Max. sensor cable length	80 m
Calibration	1-point (offset) or process (slope and offset)

Conductivity 2-e/4-e

Measurement parameters	Conductivity/resistivity and temperature
Conductivity ranges	See sensor specification
Chemical concentration curves (used with 4-e sensors)	NaCl: 0−26 % @ 0 °C to 0 − 28 % @ +100 °C
	NaOH: 0−12 % @ 0 °C to 0−16 % @ + 40 °C to 0−6 % @ +100 °C
	HCl: 0−18 % @ −20 °C to 0−18 % @ 0 °C to 0−5 % @ +50 °C
	HNO_3: 0−30 % @ −20 °C to 0−30 % @ 0 °C to 0−8 % @ +50 °C
	H_2SO_4: 0−26 % @ −12 °C to 0−26 % @ +5 °C to 0−9 % @ +100 °C
	H_3PO_4: 0−35 % @ + 5 °C to +80 °C
TDS ranges	NaCl, $CaCO_3$
Cond/Res resolution	Auto/0.001/0.01/0.1/1 (can be selected)
Temperature measuring range	−40 to +200 °C (−40 to +392 °F)
Temperature resolution	Auto/0.001/0.01/0.1/1 (can be selected)
Max. sensor cable length	ISM: 2-e sensors: 90 m (300 ft); 4-e sensors: 80 m (260 ft)
Calibration	1-point, 2-point or process

Electrical specifications

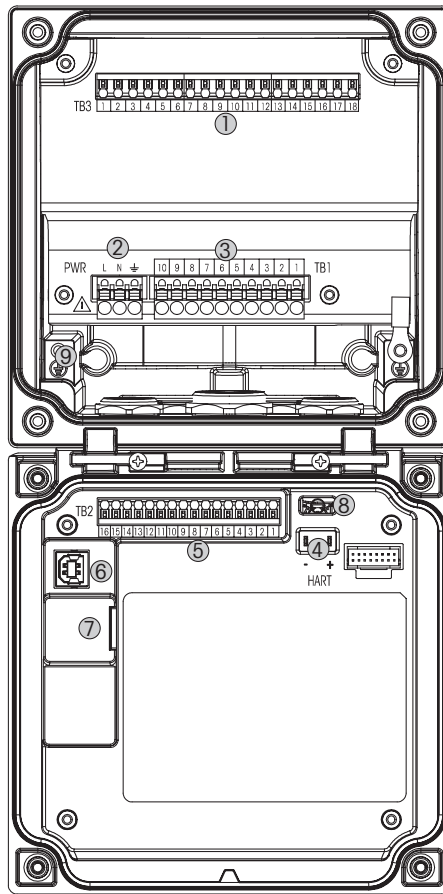|	
Supply voltage	• 80 to 255 VAC, 50 to 60 Hz, 10 VA
	• 20 to 30 VDC, 10 VA
Connection terminal	Detachable screw terminals, appropriate for wire cross section 0.2 to 1.5 mm^2 (AWG 16 – 24)
Mains fuse	2.0 A slow blow, type FC
Analog output [1]	4 × 0/4 to 20 mA, 22 mA alarm, galvanically isolated from input and from earth/ground
Measurement error through analog outputs	$< \pm 0.05$ mA over 1 to 22 mA range
Analog output configuration	Linear, bi-linear, logarithmic, auto range
Load	Max. 500 Ω
PID process controller	1 × PID with pulse length, pulse frequency or analog control output signal
Cycle time analog output	Ca. 1 s
Hold input/Alarm contact	Yes/Yes
Alarm output delay	0 to 999 s, selectable
Relays	• 2 SPDT, mechanical, 250 VAC or 30 VDC, 3 A
	• 2 SPST, Reed, 250 VAC or 250 VDC, 0.5 A, 10 W
Digital input	2
	With switching limits 0.00 VDC to 1.00 VDC inactive, 2.30 VDC to 30.00 VDC active; galvanically isolated up to 60 V from output, analog input and ground/earth
Analog input [2]	1 × 0/4 to 20 mA
User interface	• TFT touch-screen 4"
	• Black and white
	• Resolution: ¼ VGA (320 pixel × 240 pixel)
Keypad	• 4 tactile feedback keys
Languages	10 (English, German, French, Italian, Spanish, Portuguese, Russian, Japanese, Korean and Chinese)
Interfaces	• 1 USB Host: Printer connection, data logging, loading configuration from USB stick and saving configuration to USB stick
	• 1 USB Device: Software update interface

1) For M400 Type 1 ISM and Type 2 ISM.
2) For M400 Type 2 ISM.

Environmental specifications

Storage temperature	−40 to +70 °C (−40 to +158 °F)
Ambient temperature operating range	−20 to +50 °C (−4 to +122 °F)
Relative humidity	0 to 95 % non-condensing
Altitude	Max. 2000 m
EMC	Compliant with EN 61326-1:2013 (Industrial environment) Emission: Class A, Immunity: Class A
CE mark	The measuring system is in conformity with the statutory requirements of the EC Directives. METTLER TOLEDO confirms successful testing of the device by affixing to it the CE mark.
Ex Approvals [1]	• cCSAus Class I, Division 2, Groups A, B, C, D T4 Class I, Zone 2, AEx nA nC IIC T4 Gc • FM Class I, Division 2, Groups A,B,C,D T4 Class I, Zone 2, Groups IIC T4 • ATEX II 3G Ex nA nC IIC T4 Gc

Mechanical specifications

Dimensions	Housing – Height × Width × Depth	136 × 136 × 116 mm (5.35 × 5.35 × 4.57")
	Front bezel – Height x Width	150 × 150 mm (5.91 × 5.91")
	Max. depth – panel mounted	116 mm (4.57") (excludes plug-in connectors)
Weight	1.50 kg (3.3 lb)	
Material	Aluminum die cast	
Enclosure rating	IP 66 / NEMA 4X	

Terminal block (TB) definitions

1 TB3 – Terminal block for sensor connection
2 Terminals for supply voltage
3 TB1 – Terminal block for relay outputs
4 HART, for M400 Type 1, Type 2, Type 3 only
5 TB2 – Terminal block for analog output and digital input signals
6 USB Device – Software update interface
7 USB Host – Printer connection, data logging, loading and saving configuration
8 **Warning!** Do not dis-connect the internal ground wire between the front and back module.
9 **Warning!** Ensure to tightly secure an earth wire to the internal PE (Protective Earth) screw terminal. The cross-section of the PE wire must be above 18 AWG (0.8 mm).

TB1 terminal definition – All transmitter versions

Terminal	Description	Contact rating
1	NO 1	250 VAC or 30 VDC, 3 A
2	COM 1	
3	NC 1	
4	NO 2	250 VAC or 30 VDC, 3 A
5	COM 2	
6	NC 2	
7	NO 3	250 VAC or 30 VDC, 0.5 A, 10 W
8	COM 3	
9	NO 4	250 VAC or 30 VDC, 0.5 A, 10 W
10	COM 4	

TB2 terminal definition

Terminal	Description
1	AO 1 + / HART +
2	AO 1 − / HART −
3	AO 2 +
4	AO 2 −
5	AO 3 +
6	AO 3 −
7	AO 4 +
8	AO 4 −
9	DI 1 +
10	DI 1 − / DI 2 −
11	DI 2 +
12	AI +
13	AI −
14 to 16	Not used

TB3 terminal definition – ISM sensors

pH / ORP, amperometric oxygen, dissolved ozone, conductivity 4-e, dissolved CO_2 low

Terminal	Function	Color
1 to 11	Not used	–
12	1-wire	Transparent (cable core)
13	GND	Red (shield)
14	RS 485-B	–
15	RS 485-A	–
16	5 V	–
17	GND 24 V	–
18	24 V	–

UniCond® 2-e, UniCond 4-e

Terminal	Function	Color
1 to 12	Not used	–
13	GND	White
14	RS 485-B	Black
15	RS 485-A	Red
16	5 V	Blue
17 to 18	Not used	–

Optical oxygen

| Terminal | Function | Optical Oxygen | |
		VP8 cables wire color	5-pin cables wire color
1 to 12	Not used	–	
13	GND	Green / Yellow	Green / Yellow
14	RS 485-B	Brown	Blue
15	RS 485-A	Pink	White
16	5 V	–	–
17	GND (24 V)	Blue	Black
18	24 V	Grey	Brown

Transmitter

Transmitter	Order no.
M400 Type 1 ISM	30 490 171
M400 Type 2 ISM	30 490 172

1) Included: 1 piece M 25 × 1.5 cable gland, 4 pieces M 20 × 1.5 cable glands.

M400 parameter fit guide

	M400 Type 1 ISM	M400 Type 2 ISM
pH/ORP	●	●
pH/pNa	●	●
UniCond 2-e/4-e	●	●
Conductivity 2-e	–	–
Conductivity 4-e	●	●
Amp. DO ppm/ppb/trace	–	● / ●[1] / –
Opt. DO ppm/ppb	–	● / ●[1]
Amp. O2 gas ppm/ppb/trace	–	– / – / –
Opt. O2 gas ppm	–	–
Dissolved Ozone	–	●
Dissolved Carbon Dioxide	–	●
CO2 hi	–	–
GPro 500 TDL	–	–

1) Thornton high performance dissolved oxygen and pure water optical sensors only

Accessories

Description	Order no.
Pipe mounting kit for ½ DIN for pipe diameter 40 to 60 mm (1.57 to 2.36")	30 300 480
Panel mounting kit for ½ DIN	30 300 481
Wall mounting kit for ½ DIN	30 300 482
Protective hood for ½ DIN	30 073 328

Notes:

Notes:

For addresses of METTLER TOLEDO
Market Organizations please go to:
www.mt.com/pro-MOs