pH/ORP Measurement OPM223/253

Transmitter for analogue sensors and for ISFET sensors



The modular design of the OPM223/253 allows easy adaption of the transmitter to a variety of customer requirements. Starting with the basic version for "measurement and alarm generation", the transmitter can be equipped with additional software and hardware modules for special applications. These modules can also be retrofitted as required.

Application

- Effluent treatment
- Neutralisation
- Detoxication (electroplating)
- Water treatment
- · Water monitoring

Your benefits

- · Field or panel-mounted housing
- Universal application
- Simple handling
 - Logically arranged menu structure
 - Large two-line display
 - Ultrasimple two-point calibration
- Safe operation
 - Overvoltage (lightning) protection
 - Direct access for manual contact control
 - Calibration plausibility check
- User-defined alarm configuration

The basic unit can be extended with:

- Addtional 2 or 4 contacts for use as:
 - Limit contacts (also for temperature)
 - P(ID) controller
 - Timer for simple rinse processes
 - Complete cleaning with Chemoclean
 - Current input
- Plus package:
 - User defined current output characteristics
 - Automatic cleaning trigger on alarm or limit violation
 - Sensor Check System for pH glass and reference
 - Live check of sensor
 - Special neutralisation controller
- HART[®] or PROFIBUS-PA/-DP
- 2nd current output for temperature, pH/ORP or continuous controller

	Function and system design					
Featurs of the basic version	pH and ORP value measurement					
	This is selected via the menu. During measurement, the value measured can be displayed in the other measuring mode (e.g. pH - mV or ORP % - ORP mV). The temperature is displayed at the same time or, if desired, not shown at all.					
	Calibration					
	pH electrodes are normally calibrated with the same pH values. Therefore the transmitter presents the settings from the previous calibration as defaults for the next calibration. If the buffer solutions are interchanged by accident (e.g. pH 4 buffer first, then pH 7 buffer instead of pH 7 first and then pH 4) the plausibility check ensures that the calibration is accepted anyway.					
	Configuration					
	Different alarms are required depending on application and operator. Therefore the transmitter permits independent configuration of the alarm contact and error current for each individual error. Unnecessary or undesirable alarms can be suppressed in this manner. Up to four contacts can be used as limit contacts (also for temperature) to implement a P(ID) controller or for cleaning functions. Direct manual operation of the contacts (bypassing the menu) provides quick access to limit,					
A		-				
the plus package	Current output	hile still achieving a high recelution in specific ranges				
	In order to output wide measuring ranges while still achieving a high resolution in specific ranges, the current output can be configured as required via a table. This permits bilinear or quasi-logarithmic curves, etc.					
	Sensor-Check-System (SCS)					
	The sensor check system alerts to deviations of the pH glass impedance or reference impedance from the normal range, thus indicating possible failure due to pH electrode blocking or damage.					
	Live-check					
	The live check issues an alarm when the sensor signal does not change over a defined period of time. This may be caused by blocking, passivation, separation from the process, etc.					
	Neutralisation controller					
	A special control response that cannot be handled adequately by a P(ID) controller is required to neutralise solutions. For this reason, the transmitter provides a special neutralisation controller function by combining two P(ID) controllers.					
	Current input					
	The current input of the transmitter allows two different applications: controller shut-down in case of lower flow rate violation or total failure in the main flow as well as feedforward control. Both functions are also combinable.					
Explosion proof versions for zone 2	Field housing OPM253 with power supply 24 V	Application of transmitter and sensor in hazardous area zone 2				
	Field housing OPM253 with power supply 230 V	Application of transmitter as related electrical equipment in non-hazardous area or in simple pressurised apparatus; application of sensor in hazardous area zone 2				
	Panel mounted housing OPM223 with power supply 230 V or 24 V	Application of transmitter as related electrical equipment in non-hazardous area or in simple pressurised apparatus; application of sensor in hazardous area zone 2				

Measuring system

- A complete measuring systems comprises:
 - The transmitter OPM223 or OPM253
 - A pH/ORP electrode with or without an integrated temperature sensor
 - An immersible, flow or retractable assembly
 - A measuring cable(e.g. OPK9)

Options: extension cable, junction box VBA or VBM



Complete measuring system OPM223/253

- 1 Flow assembly OPA250
- 2 Junction box VBA
- 3 Transmitter OPM253
- 4 Measuring cable e.g. OPK9
- 5 Transmitter OPM223

- 6 Retractable assembly OPA450
- 7 Electrode, e.g OPS11
- 8 Immersion assembly OPA111
- 9 Extension cable

Input

Measured variables	pH (analogue or digital sensors) ORP Temperature			
Measuring range	pH:	-216		
	ORP: Tomporaturo:	–1500 +1500 mV / 0 100 %		
	Pt 100 Pt 1000	-50 +150 °C (-58 +302 °F)		
	NTC 30K	-20 +100 °C (-4 +212 °F)		
Input resistance	> $10^{12} \Omega$ (for nominal operating conditions) for standard sensors			
Cable specification	Length of cable (analogue): Length of cable (digital):	max. 50 m (164.05 ft) max. 100 m (328.10 ft)		
Binary inputs	Voltage:	10 50 V		
	Power consumption:	max. 10 mA		
Current input	4 20 mA, galvanically separate	d		
	Load: 260 Ω at 20 mA (voltage drop 5.2 V)			

Output

Current range	0 / 4 20 mA, galvanically seperated				
Error current	2.4 or 22 mA				
Load	max. 500 Ω (depending on operating voltage)				
Output range	pH: adjus ORP:	able, min. Δ 1 pH			
	absolute: adjus	able, min. Δ 50 mV			
	relative: fixed,	0 100 %			
	Temperature: adjus	able, Δ 10 Δ 100 % of upper range value			
Resolution	max. 700 digits/mA				
Min. distance for 0 / 4 20 mA signal	10 % of measuring range				
Isolation voltage	max. 350 V _{rms} / 500 V DC				
Overvoltage protection	acc. to EN 61000-4-5:1995				
Auxiliary voltage	Output voltage:	15 V ± 0.6			
output	Output current:	max. 10 mA			
Contact outputs	Switching current with ohmic load (cos) = 1): max. 2 A			
	Switching current with inductive load (c	$s \phi = max. 2 A$			
	0.4):				
	Switching voltage:	max. 250 V AC, 30 V DC			
	Switching power with ohmic load (cos φ = 1): max. 1250 VA AC, 150 W DC				
	Switching power with inductive load (cos φ = 0.4):max. 500 VA AC, 90 W DC				

Limit contactor	Pickup/dropout delay:	0 2000 s	
Controller	Function (adjustable):	pulse length/pulse frequency controller	
	Controller response:	PID	
	Control gain K _n :	0.01 20.00	
	Integral action time T _n :	0.0 999.9 min	
	Derivative action T_v :	0.0 999.9 min	
	Period for pulse length controller:	0.5 999.9 s	
	Frequency for pulse frequency controller:	60 180 min ⁻¹	
	Basic load:	0 40% of max. set value	
Alarm	Function (selectable):	latching/momentary contact	
	Alarm threshold adjustment range:	pH/temperature: complete measuring range	
	Alarm delay:	0 2000 s	
	,	0 2000 min	



Electrical connection of the transmitter

- A Standard sensor
- B ISFET sensor
- C Shield for glass electrodes
- D Solution ground
- E Temperature sensor
- F Signal output 1 pH/ORP
- G Signal output 2 temperature, pH/ORP or continuous controller
- H Binary input 1 (Hold)
- I Binary input 2 (Chemoclean)

- J Aux. voltage output
- K Alarm (current-free contact position)
- L Relay 1 (current-free contact position)
- M Relay 2 (current-free contact position)
- N Relay 3 (current-free contact position)
- O Relay 4 (current-free contact position)
- P Current input 4 ... 20 mA
- Q Power supply

Connection of sensor

The pH and ORP electrodes are connected using special terminated and shielded multicore cables. The measuring cable can be extended with a junction box and an extension cable. Termination instructions are supplied with the measuring cable.



Connection OPS11 with OPK9 and OPS471 with OPK12 to the transmitter

- A Panel-mounted instrument
- B Field instrument
- C Potential matching PM for symmetrical connection



Unsymmetrical and symmetrical connection of ORP electrodes to the transmitter

- A Panel-mounted instrument
- B Field instrument
- C Potential matching PM for symmetrical connection

Power supply	depending on ordered version: 100/115/230 V AC +10/-15 %, 48 62 Hz 24 V AC/DC +20/-15 %
Power consumption	max. 7.5 VA
Mains protection	microfuse, medium time-lag, 250 V/3.15 A

Performance characteristic

Reference temperature	25 °C (77 °F)	
Resolution	pH:	0.01 pH
	ORP:	1 mV/0.1 %
	Temperature:	0.1 °C
Deviation of indication ^a	Display	
	E Ha	max. 0.5 % of measuring range
	ORP:	max. 0.5 % of measuring range
	Temperature:	max. 1.0 % of measuring range
	Signal output	
	pH:	max. 0.75 % of measuring range
	ORP:	max. 0.75 % of measuring range
	Temperature:	max. 1.25 % of measuring range
Repeatability ^a	pH:	max. 0.2 % of measuring range
	Redox:	max. 0.2 % of measuring range
Zero point	Glass:	pH 5.0 9.0 (nominal pH 7.00)
	Antimon:	pH –1.0 3.0 (nominal pH 1.00)
	ISFET:	-500 +500 mV
Slope	Glass:	38.00 65.00 mV/pH (nominal 59.16 mV/pH)
-	Antimon:	25.00 65.00 mV/pH (nominal 59.16 mV/pH)
	ISFET:	38.00 65.00 mV/pH (nominal 59.16 mV/pH)
Offset	pH:	±2 pH
	ORP:	±120 mV/±50 %
	Temperature:	±5 °C
	- 1, -, -, -, -, -, -, -, -, -, -, -, -, -,	

Installation conditions

Installation instructions



Field instrument



Mounting on cylindrical pipes





Wall mounting of the field instrument



Mounting of the field instrument with mounting post and weather protection cover



Dimensions panel-mounted instrument



Installation of the panel mounted instrument

- 1 Wall of control cabinet
- 2 Gasket
- 3 Tensioning screws

Environment

Ambient temperature	-10 +55 °C (+14 +131 °F)			
Ambient temperature limit	–20 +60 °C (-4 +140 °F)			
Storage and transport temperature	–25 +65 °C (-13 +149 °F)			
Electromagnetic compatibility	Interference emission and interference immunity acc. to EN 61326: 1997 / A1: 1998			
Ingress protection	Panel mounted instrument: Field instrument:	IP 54 (front), IP 30 (housing) IP 65		
Relative humidity	10 95%, non-condensing			

Mechanical construction

Dimensions	Panel mounted instrument:	96 x 96 x 145 mm (3.78 x 3.78 x 5.71 inches) Mounting depth: approx. 165 mm (6.50") 247 x 170 x 115 mm (9.72 x 6.69 x 4.53 inches)	
	Field instrument:		
Weight	Panel mounted instrument:	max. 0.7 kg (1.5 lb)	
	Field instrument:	max. 2.3 kg (5.1 lb)	
Materials	Housing of panel mounted instrument:	Polycarbonate	
	Field housing:	ABS PC Fr	
	Front membrane:	Polyester, UV-resistant	
Terminals	Cross section	2.5 mm ²	

Human interface

Display elements



Operating elements

	1 LC display for display of measured values, configuration data and current menu field
	2 Field for user labeling
	3 4 main control keys for calibration and instrument configuration
	4 Key for switching between automatic/manual operation
	5 LED indicators for switched limit outputs
	6 LED indicator for alarm function
	7 Display of active contact and key for relay switching in manual mode
	The display simultaneously shows the current measured value and the temperature - the essential process data. Brief information texts in the configuration menu provide assistance with parameter configuration.
Instrument control functions	All instrument control functions are arranged in a logical menu structure. Following access code entry, the individual parameters can be easily selected and modified as needed.

Certificates and approvals

C€ symbol	Declaration of conformity The product meets the legal requirements of the harmonized European standards. The manufacturer confirms compliance with the standards by affixing the $C \in$ symbol.		
Ex approval for zone 2	OPM2536	ATEX II 3G EEx nA[L] IIC T4	
	OPM2534 OPM2234 OPM2236	ATEX II 3G [EEx nAL] IIC	

	5				
Product structure	Ser	Sensor input; software			
	PR	рн (g pH (a	pH (glass/ISFET) / ORP; Plus package		ic version
	PS	pH (g	lass)/OR	RP; Plu	s package
		Power supply; approval			
		0	230 V	AC	
		1	1 115 V AC		
		2	3 115 V AC; CSA Gen. Purp.		
		4	230 V	AC; AT	FEX II 3G [EEx nAL] IIC
		5 100 V AC			
		6	24 V AC/DC; A LEX II 3G [EEX nAL] IIC for OPM223, EEX nA[L] IIC T4 for OPM253		ATEX II 3G [EEx nAL] IIC for OPM223, EEx nA[L] IIC T4 for OPM253
		8	24 V A 24 V A	C/DC	A Gen. Puip.
		1 -	Outou		
			0	1 x 20) mA, pH/ORP
			1	2 x 20	mA, pH/ORP + selectable
			3	PROF	IBUS PA
			4 5	PROF	
			6	2 x 20	mA, pH/ORP HART + selectable
				Addi	tional contacts: analogue input
				05	not selected
				10	2 x relay (limit/P(ID)/timer)
				15 16	4 x relay (limit/P(ID)/Chemoclean)
				20	2 x relay (limit/P(ID)/timer); 20 mA
				25	4 x relay (limit/P(ID)/Chemoclean); 20 mA
				26	4 x relay (limit/P(ID)/timer); 20 mA
	OPM253-				
	OPM223-				complete order code
Additional functions of the Plus package	 Current out Monitoring Neutralisati Automatic of 	put tab of sens on con cleaning	le to co or and troller t g funct	over la l proc to kee ion st	arge areas with varying resolution less for safe operation ep pH value constant by dosing acid and alkali lart
Scope of delivery	The delivery of the field instrument includes: 1 transmitter OPM253 1 plug-in screw terminal 1 cable gland Pg 7 1 cable gland Pg 16 reduced 2 cable glands Pg 13.5 1 operating instructions BA194e00 • versions with HART communication: 1 operating instructions Field Communication with HART, BA208e00 • versions with PROFIBUS communication: 1 operating instructions Field Communication with PROFIBUS PA/DP, BA209e00 • versions with explosion protection for hazardous area zone II (ATEX II 3G): Safety instructions for use in explosion-hazardous areas, XA194a300 The delivery of the panel mounted instrument includes: 1 transmitter OPM223 1 set of plug-in screw terminals 2 tensioning screws 1 BNC-plug (solder-free) 1 operating instructions BA194e00 • versions with HART communication:				
	1 operating	instruc	tions F	-ield (Communication with HART, BA208e00

Ordering information

- versions with PROFIBUS communication:
- 1 operating instructions Field Communication with PROFIBUS PA/DP, BA209e00
- versions with explosion protection for hazardous area zone II (ATEX II 3G): Safety instructions for use in explosion-hazardous areas, XA194a300

Accessories

Sensors	 OPS11 pH electrode for process applications, with PTFE diaphragm; Ordering acc. to product structure, see Technical Information OPS12 ORP electrode for process applications, with PTFE diaphragm; Ordering acc. to product structure, see Technical Information OPS41 pH electrode with ceramics diaphragm and KCI liquid electrolyte; Ordering acc. to product structure, see Technical Information OPS42 ORP electrode with ceramics diaphragm and KCI liquid electrolyte; Ordering acc. to product structure, see Technical Information OPS42 ORP electrode with ceramics diaphragm and KCI liquid electrolyte; Ordering acc. to product structure, see Technical Information OPS71 pH electrode with double chamber reference system and integrated bridge electrolyte; Ordering acc. to product structure see Technical Information
	 OPS72 ORP electrode with double chamber reference system and integrated bridge electrolyte; Ordering acc. to product structure, see Technical Information OPS91 pH electrode with open aperture for media with high dirt load; Ordering acc. to product structure, see Technical Information
	 OPS471 Sterilisable and autoclavable ISFET sensor for food and pharmaceuticals, process technology, water treatment and biotechnology; Ordering acc. to product structure, see Technical Information OPS441 Sterilisable ISFET sensor for media with low conductivity, with liquid KCl electrolyte; Ordering acc. to product structure, see Technical Information OPS491 ISFET sensor with open aperture for media with high dirt load; Ordering acc. to product structure, see Technical Information
Assemblies	 OPA450 Manually operated retractable assembly for pH electrodes, for the installation of 120 mm electrodes in tanks and pipes, Ordering acc. to product structure, see Technical Information OPA471 Compact retractable stainless steel assembly, for the installation in tanks and pipes, manual or pneumatic operation; Ordering acc. to product structure, see Technical Information OPA472 Compact retractable plastic assembly, for the installation in tanks and pipes, manual or pneumatic operation; Ordering acc. to product structure, see Technical Information OPA472 Compact retractable plastic assembly, for the installation in tanks and pipes, manual or pneumatic operation; Ordering acc. to product structure, see Technical Information OPA473 Retractable stainless steel process assembly, with ball valve for a particularly safe and reliable separation of the medium from the environment:
	 Ordering acc. to product structure, see Technical Information OPA474 Retractable plastic process assembly, with ball valve for a particularly safe and reliable separation of the medium from the environment; Ordering acc. to product structure, see Technical Information

	 OPA111 Plastic immersion and installatic Ordering acc. to product structure OPA250 Flow assembly for pH and ORP Ordering acc. to product structure Immersion assembly OYA611 for sensor immersion in basins, Ordering acc. to product structure 	n assembly, for open and closed tanks; re, see Technical Information measurement re, see Technical Information open channels and tanks, PVC; re Technical Information	
Connection accessories	 OPK9 special measuring cable For sensors with TOP68 plug-in head, for high-temperature and high-pressure applications, IP 68 Ordering acc. to product structure, see Technical Information 		
	 OPK1 special measuring cable For pH/ORP electrodes with GSA plug-in head Ordering acc. to product structure, see Technical Information 		
	 OPK2 special measuring cable For pH/redox electrodes with GSA plug-in head, with three sensor plugs Ordering acc. to product structure, see Technical Information 		
	 OPK12 special measuring cable For pH/ORP glass electrodes and ISFET sensors with TOP68 plug-in head Ordering acc. to product structure, see Technical Information 		
	 Junction box VBM for cable extension, with 10 terminals, IP 65 / NEMA 4X 		
	Cable entry Pg 13.5 Cable entry NPT ½"	Order no. 50003987 Order no. 51500177	
	 Junction box VBA with 10 high-impedance terminals, protection class: IP 65; material: polycarbonate order no. 50005276 		

Mounting accessories

 Weather protection cover OYY101 for mounting of field housing, for outdoor installation material: stainless steel 1.4031; order no. OYY101-A



Weather protection cover for field instrument

• Kit for mounting of field housing on horizontal or vertical pipes (Ø max. 60 mm (2.36")) order no. 50086842



Pipe mounting kit

 Universal upright post OYY102 Square post for mounting of field housing, material: stainless steel 1.4301; order no. OYY102-A



Square post OYY102

Buffer solutions	 Technical buffer solutions, accuracy 0.02 pH, acc. to NIST/DIN pH 4.0 red, 100 ml (3.4 fl.oz.), order no. OPY2-0 pH 4.0 red, 1000 ml (34 fl.oz.), order no. OPY2-1 pH 7.0 green, 100 ml (3.4 fl.oz.), order no. OPY2-2 pH 7.0 green, 1000 ml (34 fl.oz.), order no. OPY2-3 		
	Technical buffer solutions for single use, accuracy 0.02 pH, acc. to NIST/DIN • pH 4.0 20 x 20 ml (0.68 fl.oz.), order no. OPY2-D • pH 7.0 20 x 20 ml (0.68 fl.oz.), order no. OPY2-E Technical buffer solutions for ORP electrodes • +220 mV, pH 7.0, 100 ml (0.026 US gal.); order no. OPY3-0 • +468 mV, pH 0.1, 100 ml (0.026 US gal.); order no. OPY3-1		
			 KCI-electrolyte solutions for liquid filled electrodes 3.0 mol, T = -10 100 °C (14 212 °F), 100 ml (3 oz), order no. OPY4-1 3.0 mol, T = -10 100 °C (14 212 °F), 1000 ml (30 oz), order no. OPY4-2 1.5 mol, T = -30 100 °C (-22 266 °F), 100 ml (3 oz), order no. OPY4-3 1.5 mol, T = -30 100 °C (-22 266 °F), 1000 ml (30 oz), order no. OPY4-4
	Optoscope	 Optoscope Interface between transmitter and PC / laptop for service purposes. The Windows software "Scopeware" required for the PC or laptop is supplied with the Optoscope. The Optoscope is supplied in a sturdy plastic case with all the accessories required. 	

Order no. 51500650

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