

## Protos 3400 X

The modular measuring system for pH, conductivity, and oxygen, for application in hazardous areas



### This device will help you make considerable savings

The perfectly designed Protos 3400 X measuring system is based on a modular hardware and software concept for liquid analysis and offers flexible solutions precisely tailored to the measuring task. It is also possible to easily measure several process variables such as pH/Cond, pH/pH, Cond/Oxy etc. with the appropriate configuration. Similar to a PC, the device that is fitted with a total of 3 slots can be simply retrofitted or modified at any time.

With all these advantages, the Protos 3400 X offers a previously unknown level of functionality and reliability, and with an extraordinarily high level of user comfort.

A razor-sharp display guarantees superb legibility in the most diverse of light conditions.

The hygienic stainless steel enclosure is ideal for applications in:

- biotechnology
- the pharmaceutical industry
- the food industry

The sturdy, corrosion-resistant coated steel enclosure stands up well to harsh industrial environments.

For applications in:

- the chemical industry
- the paper industry
- power station engineering
- water/wastewater technology

The Protos 3400 X can easily be integrated into PROFIBUS PA or FOUNDATION Fieldbus networks. The measuring system also supports all common analog and digital sensors.

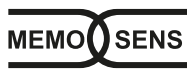
### Facts and Features

- Protos 3400 X S: tightly sealed stainless steel housing with hygienic design
- Protos 3400 X C: sturdy, corrosion-resistant coated steel housing
- Plain-text NAMUR-compliant user interface – simple and intuitive
- Great flexibility provided by modular technology
- Modular hardware and software concept permits retrofitting at any time
- 5 process variables simultaneously
- High-resolution, transfective display, white backlighting
- Perfect legibility in all light conditions
- Icon-based operation
- 6 languages as standard
- Global usability thanks to VariPower power supply
- Galvanic isolation of measuring circuits
- 2 current outputs and 4 relay contacts as standard
- 2-channel measurement recorder, time and event-controlled, with increased resolution on quick changes
- Parameter-set switchover, also remotely
- HOLD function, remote-controllable
- KI recorder detects abnormalities in processes
- Sensocheck sensor monitoring
- Connection possibilities for almost all typical analog and digital sensors available in the world
- Sensor diagram – synchrooptic representation of the sensor data
- Sensor wear monitor
- Sensor load matrix
- Adaptive calibration timer –automatic standardization

# Protos 3400 X

## Facts and Features

- Lightning protection
- Application in hazardous locations  
Zone 1 / CI 1 Div 2
- Control of the fully automatic  
Unical 9000X calibration system
- Control of the fully automatic  
Unclean 900X cleaning system
- PROFIBUS PA
- FOUNDATION Fieldbus
- 3-year warranty



Fieldbus  
Foundation

## The Functions

### Perfection in Progress

Alongside outstanding features like the universal 20 to 265 V AC/DC VariPower power supply, the time- and event-controlled 2 channel measurement recorder, and Sensocheck sensor monitoring, the Protos 3400 system shines with further pioneering functions:

### Early Alarm Detection with the KI Recorder

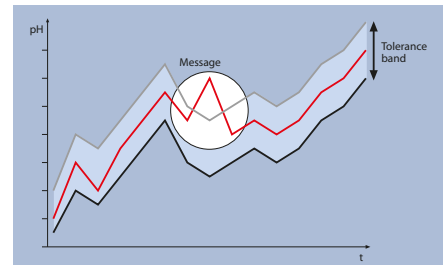
The KI recorder follows the course of the process and releases a messages in the event of a deviation. Monitoring is always carried out on primary process variables such as pH or conductivity, and parallel to this for temperature. The course of the process and limiting values for both variables is visualized graphically.

### Check Batch Processes with the KI Recorder

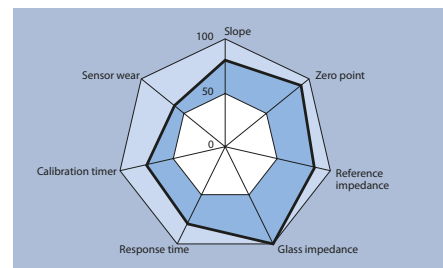
The KI recorder records the course of a batch process (self-teaching function). All further batches are then monitored for deviations from the saved course.

### Sensor Diagram for pH Measurement

Graphical representation of the current sensor parameters in a radar chart on the display – with slope, zero, reference impedance, glass impedance, response time, calibration timer, sensor wear



KI recorder



Sensor diagram

## Modules

### Universally Interchangeable

Various user-defined plug-in measuring modules for measurement and control functions can be combined depending on the measuring task. They also facilitate subsequent trouble-free expansion or modification.

Communication modules for functional expansion: In addition to the OUT module for expanding the output options already available as standard, other modules are also available, including modules for PROFIBUS and FOUNDATION Fieldbus.

Combined with the PHU or FIU measuring and control module, Unical 9000 X / Unclean 900 X, and a retractable fitting such as Ceramat WA 150 or SensoGate WA 130, the Protos 3400 X becomes a fully automatic remote-controlled calibration and cleaning system.

If necessary, it can also measure several process variables in any combination with one device; pH/pH, Cond/Cond etc. or, for example, simultaneous pH and conductivity measurement with analog or digital sensors such as Memosens.

Combined evaluation – i. e. the calculation of several process parameters e.g., for differential measurement or quasi-redundant measuring systems. Up to 3 measuring modules can be combined.

Plug & Play – the modules are simply clicked into place in the slots provided, in any order. The modules are automatically recognized; very straightforward retrofitting or modification; hot-swap technology.

Control module for convenient PID control. Analog and digital outputs, plus limit monitoring.

### PH Measuring Modules

Input modules for pH measurement with glass electrodes, ISFET and enamel sensors. Simultaneous measurement of pH value, ORP, and temperature, also with ISM sensors (Intelligent Sensor Management) and Memosens sensors.

- Sensocheck monitoring of glass and reference electrode
- Sensor monitor
- Sensor wear monitor
- Sensor load matrix
- Sensor diagram
- Adaptive calibration timer
- Timer for sensor checking
- Calimatic automatic calibration
- KI recorder

### COND Measuring Module

Input module for measuring conductivity with 2- or 4-electrode sensors. Simultaneous measurement of electrical conductivity, resistivity, concentration, salinity, and temperature.

- Large measuring range with 2-electrode sensors due to special measuring process
- Sensocheck polarization detection and monitoring of cable capacitance
- Sensor monitor
- USP ultrapure water monitoring in the pharmaceutical industry

### CONDI Measuring Module

Input module for conductivity measurement with commercial electrodeless sensors. Simultaneous measurement of electrical conductivity, resistivity, concentration, salinity, and temperature.

- Sensocheck sensor monitoring
- Sensor monitor
- Universal application with many commercial toroidal conductivity sensors. Adaptation via sensor ID

### OXY Measuring Module

Input module for measuring oxygen in liquids. Simultaneous measurement of oxygen partial pressure, barometric pressure, and temperature, also with ISM sensors (Intelligent Sensor Management). Calculation of oxygen saturation index and concentration. For standard applications and trace measurements in both aqueous media and gases.

- Sensocheck sensor monitoring: monitoring of the membrane and electrolyte
- Sensor monitor
- Sensor wear monitor
- Sensor load matrix
- Automatic correction of barometric pressure influence
- Also suitable for oxygen trace measurement in the ppb range
- External pressure correction

### PHU measurement and control module

Activation of the fully automatic Unical 9000 X / Unclean 900 X measurement, cleaning and calibration system.

- Integrated pH measurement input
- Manual, interval-, and time-controlled start of calibration and rinsing programs
- 8 programs available



# Protos 3400 X

## Communication Modules

### OUT communication module

General-purpose output module to expand the outputs available as standard.

- 4 user-defined electronic relay outputs
- 2 additional passive analog outputs for further process variables

### PROFIBUS COMPA communication module

PROFIBUS PA communication unit

- Fast cyclic signal transmission with status
- Function block model (PROFIBUS Profile 3.0)
- Hazardous-area connection according to the FISCO model
- EDD for SIMATIC PDM

### FOUNDATION Fieldbus communication module

Expansion for bus-capable field device

- Fast cyclic signal transmission with status
- Function block model
- Hazardous-area connection according to the FISCO model
- EDD for AMS

### PID controller module

Convenient PID controller.

- Continuous controller for the actuation of control valves
- Quasi-continuous pulse length/pulse frequency controller for the actuation of straightway valves or metering pumps
- 2 free limit contacts, e.g., for 3-point control of secondary control processes

### FIU digital module

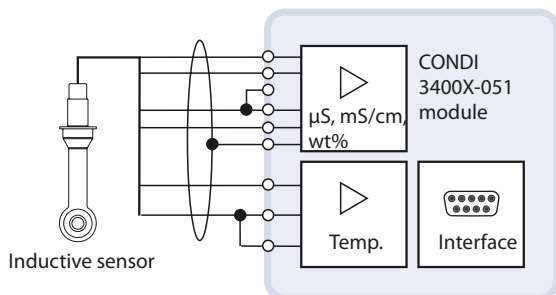
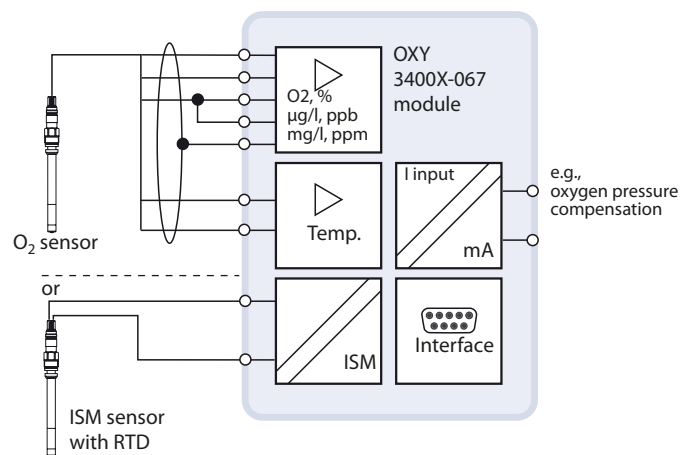
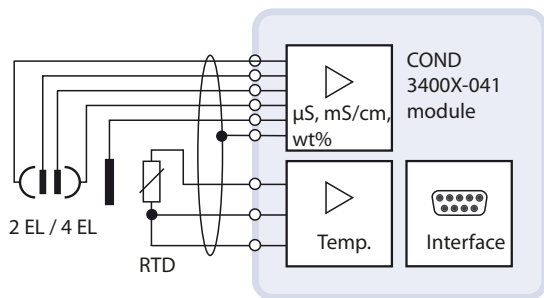
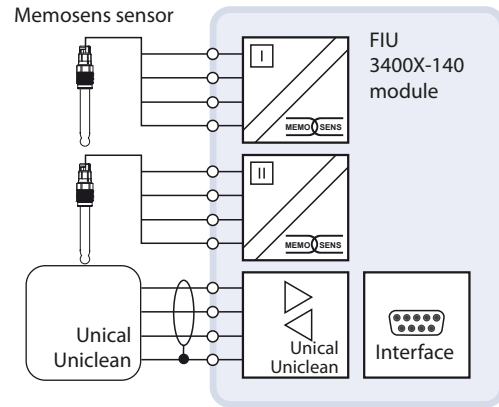
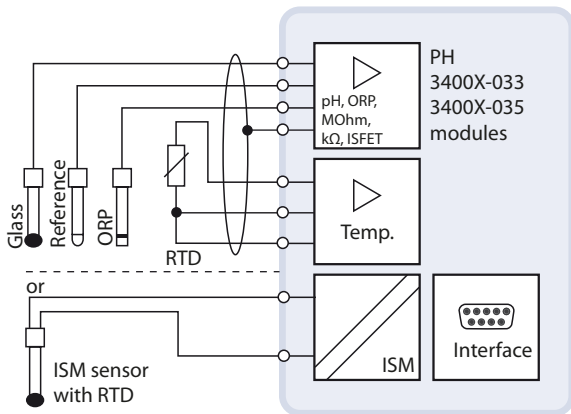
Enables connection of intelligent digital Memosens sensors and Unical 9000 X/ Uniclean 900 X for controlling retractable fittings.

### MS Digital Module

Connection of a Memosens sensor. Also with a current input and a relay input, e.g., for monitoring equipment.

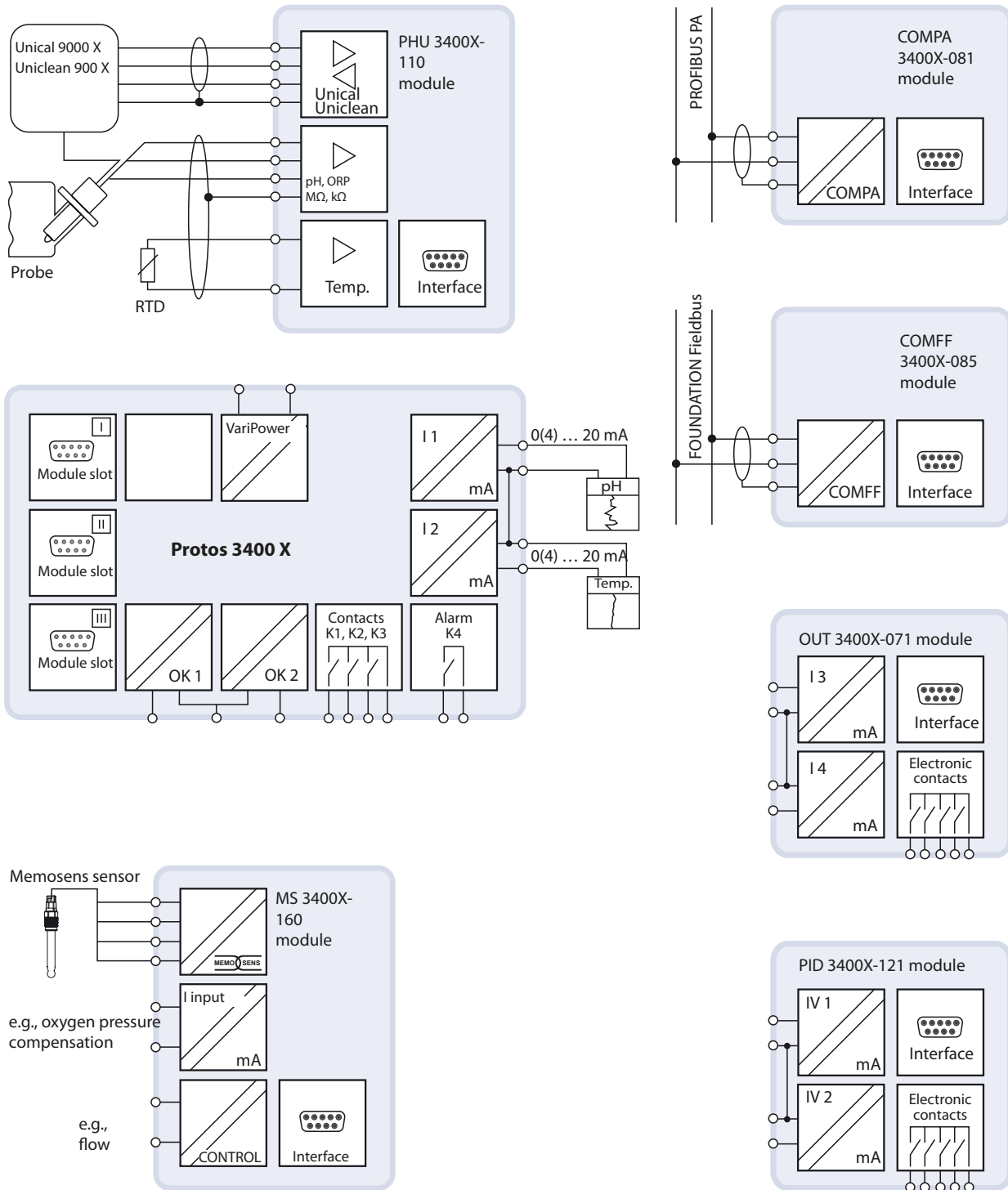


## System Overview



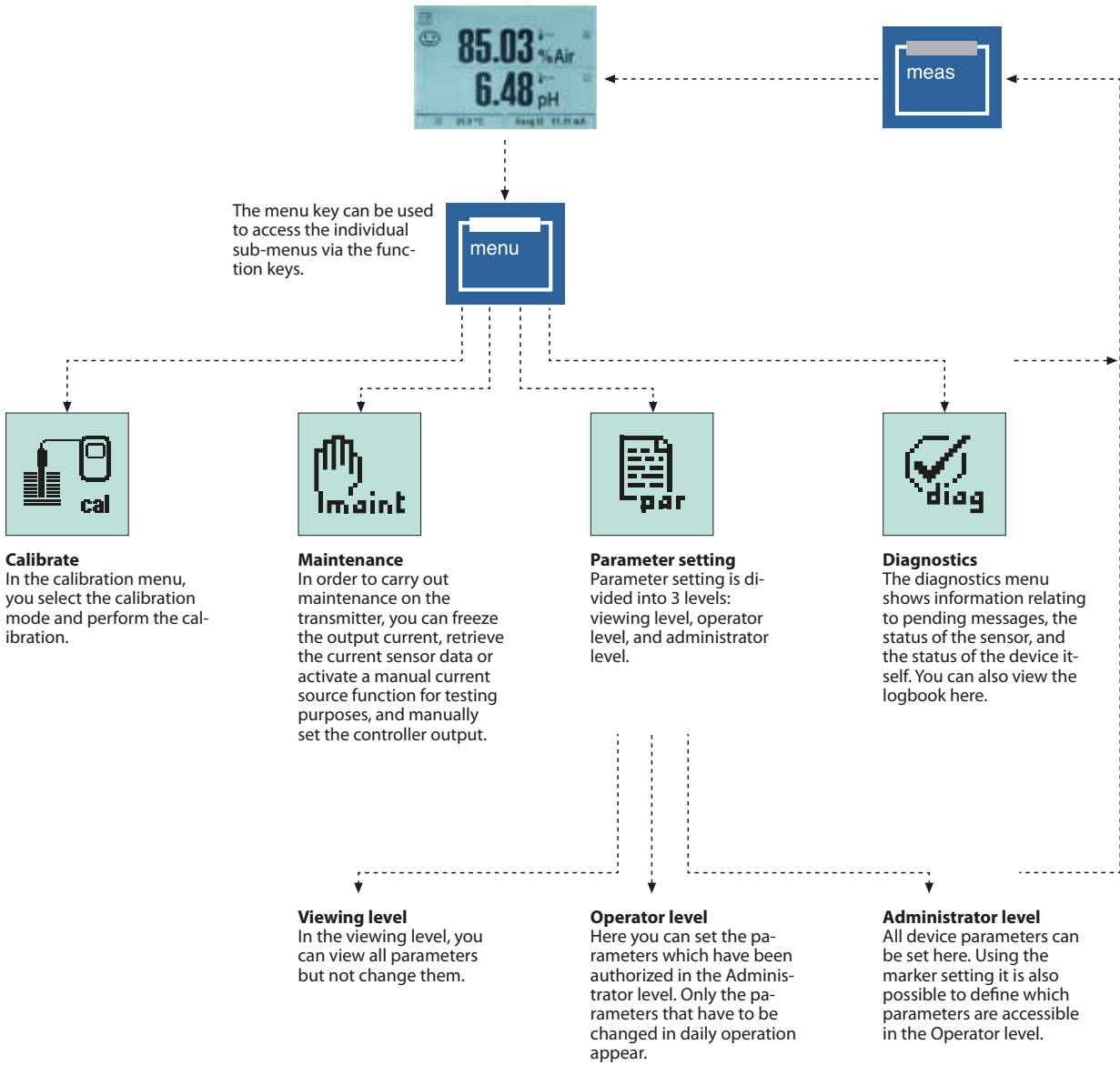
# Protos 3400 X

## System Overview





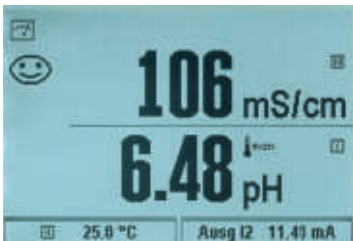
Menu structure



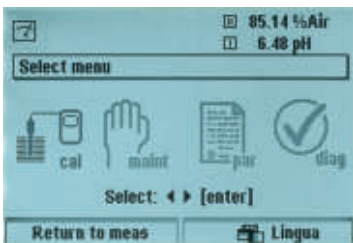
# Protos 3400 X

## Display

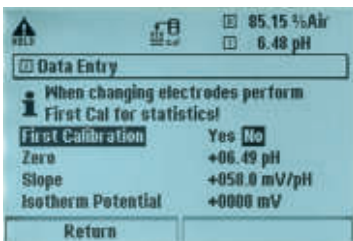
### Innovative Display



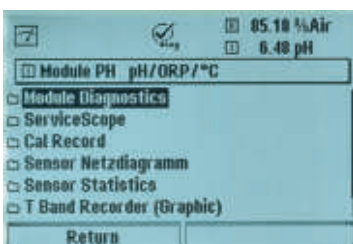
Measurement display with two primary values (above) and two secondary displays (below), i.e. 4 measured values can be simultaneously represented on the display



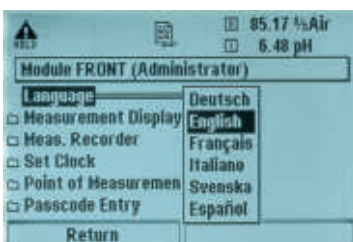
Clear icon menu; selected icon blinks black/gray.



Example of a MessageBox, e.g., with safety instructions.



Menu logic based on MS Windows with scroll bar.



Selection of a configuration via pull-down menus.



- Transflective LC graphic display (240 x 160 pixels); high resolution and contrast-rich; with half-tone visualization
- Optimal legibility even in the most difficult light conditions thanks to white backlighting
- Plaintext user interface according to NAMUR – simple and intuitive
- Menu texts can be switched to: German, English, French, Italian, Spanish, Portuguese, Swedish
- Menu logic based on MS Windows standards
- 2 softkeys with context-dependent functionality



**Protos Product Range**

<b>Device</b>		<b>Order no.</b>
Protos 3400XS/VPW-A	Basic unit / polished stainless steel enclosure VariPower 85 ... 253 V AC power supply	<b>3400XS/VPW-A</b>
Protos 3400XS/24V-A	Basic unit / polished stainless steel enclosure 24 V AC/DC power supply	<b>3400XS/24V-A</b>
Protos 3400XC/VPW-A	Basic unit / coated steel enclosure VariPower 85 ... 253 V AC power supply	<b>3400XC/VPW-A</b>
Protos 3400XC/24V-A	Basic unit / coated steel enclosure 24 V AC/DC power supply	<b>3400XC/24V-A</b>
<b>Measuring modules</b>		<b>Order no.</b>
PH 3400X-033 measuring module	pH module (double high-resistance)	<b>PH 3400X-033</b>
PH 3400X-035 measuring module	pH module (ISM)	<b>PH 3400X-035</b>
COND 3400X-041 measuring module	Conductivity module	<b>COND 3400X-041</b>
CONDI 3400X-051 measuring module	Inductive conductivity module	<b>CONDI 3400X-051</b>
OXY 3400X-067 measuring module	Oxygen module (trace measurements/increased resolution/ISM)	<b>OXY 3400X-067</b>
PHU 3400X-110 module	Unical 9000 X / Uniclean 900 X communication module	<b>PHU 3400X-110</b>
FIU 3400X-140 digital module	Memosens, Unical, Uniclean module	<b>FIU 3400X-140</b>
MS 3400X-160 digital module	Memosens module	<b>MS 3400X-160</b>
<b>Communication Modules</b>		<b>Order no.</b>
OUT 3400X-071 output module	Output extension module	<b>OUT 3400X-071</b>
PID 3400X-121 controller module	PID controller module	<b>PID 3400X-121</b>
COMPA 3400X-081 PROFIBUS PA module	PROFIBUS PA module	<b>COMPA 3400X-081</b>
COMFF 3400X-085 FOUNDATION Fieldbus module	FOUNDATION Fieldbus module	<b>COMFF 3400X-085</b>

# Protos 3400 X

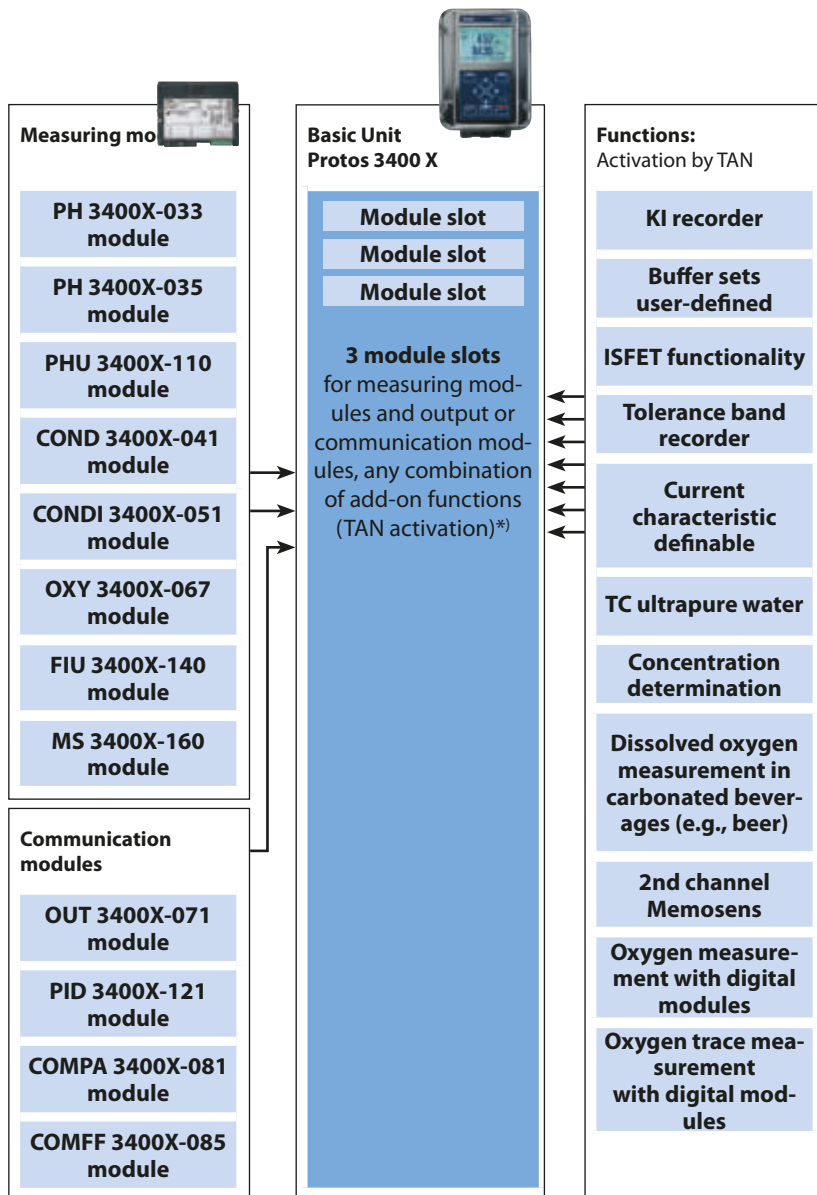
## Product line

<b>Accessories</b>	<b>Order no.</b>
Pipe-mount kit	<b>ZU 0544</b>
Panel-mount kit	<b>ZU 0545</b>
Protective hood	<b>ZU 0548</b>
Terminal cover for Protos 3400 X process analysis system	<b>ZU 1042</b>

<b>Connector Plugs and Cables</b>	<b>Order no.</b>	
VP8 connector	<b>ZU 0721</b>	
M12 socket	<b>ZU 0822</b>	
VP8-ST cable (both ends with VP socket)	Length: 3 m	<b>ZU 0710</b>
	Length: 5 m	<b>ZU 0711</b>
	Length: 10 m	<b>ZU 0712</b>

<b>Add-on functions</b>	<b>Order no.</b>
KI recorder (for pH measurement only)	<b>SW 3400-001</b>
Specifiable buffer sets (for pH measurement only)	<b>SW 3400-002</b>
Tolerance band recorder (for pH measurement only)	<b>SW 3400-005</b>
Current characteristic definable	<b>SW 3400-006</b>
Ultrapure water: Temperature compensation for conductivity	<b>SW 3400-008</b>
Concentration determination (for Cond and CondI modules only)	<b>SW 3400-009</b>
Dissolved oxygen measurement in carbonated beverages (e.g., beer)	<b>SW 3400-011</b>
ISFET functionality for PH 3400X-035 measuring module	<b>SW 3400-012</b>
2nd channel for digital module (for FIU 3400X-140-2 only)	<b>SW 3400-014</b>
Oxygen measurement with FIU 3400X-140, MS 3400X-160 modules	<b>SW 3400-015</b>
Oxygen trace measurement with FIU 3400 X-140, MS 3400X-160 modules	<b>SW 3400-016</b>

Product Range – Continued



\*) 2 module slots when using 1 x FIU module.

Device equipment

- Device status
- 2 parameter sets
- ORP measurement (SHE)
- Sensor diagram
- Calimatic
- Sensocheck
- VariPower power supply
- 2 current outputs
- 4 relay contacts
- KI recorder
- Specifiable buffer sets
- Adaptive calibration timer
- USP function (Cond)
- Tolerance band recorder
- Current characteristic definable
- TC ultrapure water (pH)
- TC ultrapure water (Cond)
- Concentration determination
- Dissolved-oxygen measurement in carbonated beverages (e.g., beer)
- ISFET functionality
- Oxygen measurement with digital modules
- Oxygen trace measurement with digital modules

The properties marked with ● are already installed in the device as standard. The properties marked with ○ can be retrofitted by TAN (TransAction number).

# Protos 3400 X

## Specifications Protos 3400 XS and Protos 3400 XC

Display <sup>1)</sup>	Graphic LC display, white backlighting		
	Resolution	240 x 160 pixels	
	Language	German, English, French, Italian, Spanish, Swedish, Portuguese	
Keypad	NAMUR keypad, individual keys, no double assignments [meas] [menu] [cursor keys] [enter] [softkey 1] [softkey 2], red and green NAMUR LEDs		
Logbook	Recording of function activations, appearance and disappearance of warning and failure messages, with date and time		
	Storage capacity	Approx. 50 entries, readable on display	
Sensor monitor	Direct display of measured values from sensor for validation		
KI recorder	Adaptive representation of process flow with monitoring and signaling of critical process parameters		
Device self-test	Testing of RAM, FLASH, EEPROM, display and keypad, records for QM documentation in accordance with ISO 9000		
Clock	Real-time clock with date		
	Power reserve	Approx. 1 year (lithium battery)	
Data retention in case of power failure	Parameters and adjustment data	> 10 years (EEPROM)	
	Logbook, statistics, records	> 1 year (lithium battery)	
Module slots	3		
EMC	EN 61326-1	EN 61326-2-3	NAMUR NE 21
	Emitted interference	Class B (residential)	
	Immunity to interference	Industrial applications	
	Lightning protection	according to EN 61000-4-5 Installation class 2	
Housing	Protos S	stainless steel, polished, 1.4305	
	Protos C	stainless steel, coated	
Mounting	Wall mounting / pipe mounting / panel mounting, sealed against panel		
Dimensions	See dimension drawings		
Degree of protection	IP 65		
Cable Glands	5x M20 x 1.5 (A/F 24 mm)		
Weight	Approx. 3.2 kg plus approx. 150 g per module		
Explosion protection	See Ex Certificates and EU Declaration of Conformity or <a href="http://www.knick.de">www.knick.de</a>		
Rated operating conditions	Ambient temperature	-20 ... 50 °C	-4 ... 122 °F
	Relative humidity	10 ... 95%	non-condensing
	Pollution degree 2		
	Transport/storage temperature	-20 ... 70 °C	-4 ... 158 °F
Power supply			
Terminals N/L BASE module 3400X-025/VPW	100 (-15 %) ... 230 (+ 10%) V AC < 15 VA, 48 ... 62 Hz		
Terminals L1/L2 BASE module 3400X-026/24 V	AC 24 V (- 15 %, + 10 %) < 15 VA, 48 ... 62 Hz		
	DC 24 V (- 15 %, + 20 %) < 8 W		
	Terminal PE: protective conductor terminal acc. to EN 61010-1 for the connection to the external protective earthing system for safety purposes.		
	Overvoltage category	II	
	Protection class	I	
	Pollution degree	2	
	Terminals, inside	Single or stranded wires up to 2.5 mm <sup>2</sup>	Tightening torque min. 0.5 Nm/max. 0.6 Nm

## Specifications Protos 3400 XS and Protos 3400 XC (Continued)

OK 1 input <sup>2)</sup> (terminals 30/31)	Terminal, outside	Equipotential bonding "PA" Single or stranded wires > 4 mm <sup>2</sup>	
		Galvanically isolated (optocoupler) Galvanic isolation up to 60 V U <sub>i</sub> ≤ 30 V, floating	
	Function	switches the device to HOLD mode (function check)	
	Switching voltage	Inactive	0 ... 2 V AC/DC
		Active	10 ... 30 V AC/DC (can be inverted)
		Control current	5 mA
OK 2 input <sup>2)</sup> (terminals 30/33)		Galvanically isolated (optocoupler) Galvanic isolation up to 60 V U <sub>i</sub> ≤ 30 V, floating	
	Function	Switching to second parameter set	
	Switching voltage	Inactive	0 ... 2 V AC/DC
		Active	10 ... 30 V AC/DC (can be inverted)
		Control current	5 mA
Current output I1 <sup>2)</sup> (terminals 51/52)		0/4... 20 mA (22 mA), max. 10 V	Galvanically connected with output I2
		Galvanic isolation up to 60 V	
	Load monitoring	Error message if load is exceeded	
	Overrange <sup>2)</sup>	22 mA for messages	
	Measurement error <sup>3)</sup>	< 0.2% current value	< 0.02 mA
	Current source	0.00 ... 22.00 mA	
Current output I2 <sup>2)</sup> (terminals 53/54)		0/4 ... 20 mA (22 mA), max. 10 V	Galvanically connected with output I1
		Galvanic isolation up to 60 V	
	Load monitoring	Error message if load is exceeded	
	Overrange <sup>2)</sup>	22 mA for messages	
	Measurement error <sup>3)</sup>	< 0.2% current value	< 0.02 mA
	Current source	0.00 ... 22.00 mA	
Relay contacts <sup>2)</sup> (terminals 61/63/65/60/71/73)	4 relay contacts K1 ... K4	Floating, K1, K2, K3 interconnected on one side	
		Galvanic isolation up to 60 V	
	Load capability	DC: < 30 V / < 500 mA, < 10 W	
	Usage <sup>2)</sup>	K1 ... K3, user definable as NAMUR maintenance request/function check (HOLD), limit values, parameter set B active, rinsing contact, USP output, K4 permanently set as alarm contact (NAMUR failure)	

1) **NOTICE!** Never expose the display to strong direct sunlight. Readability of the LC display may be limited at ambient temperatures below 0 °C / 32 °F. This will not adversely affect the device functions.

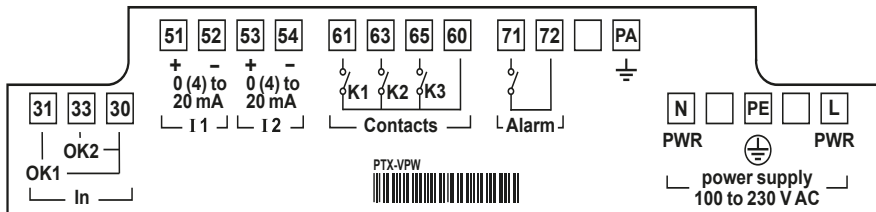
<sup>2)</sup> User-defined

<sup>3)</sup> At rated operating conditions

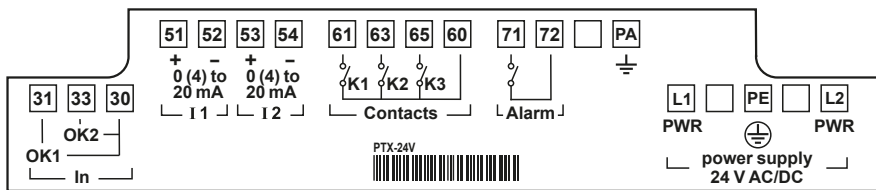
# Protos 3400 X

## Terminal Assignments

**Protos 3400 XC VPW-A** 100 ... 253 V AC  
**Protos 3400 XS VPW-A**



**Protos 3400 XC/24 V-A** 24 V AC/DC  
**Protos 3400 XS/24 V-A**





**Mounting Examples**

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**ZU 0544 Pipe-Mount Kit**  
For mounting on vertical  
or horizontal posts or pipes.



**ZU 0548 Protective Hood**  
Additional protection from  
direct weather exposure  
and mechanical damage.

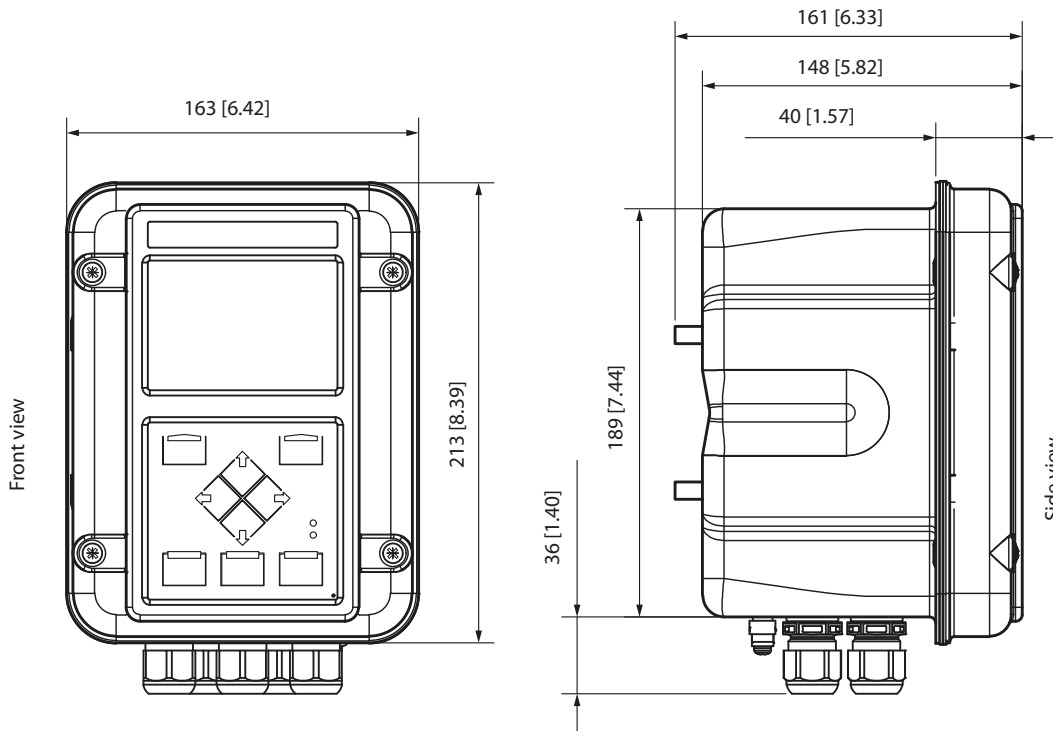


**ZU 0545 Panel-Mount Kit**  
For assembly in  
standardized panel cutout  
144 x 194 mm.

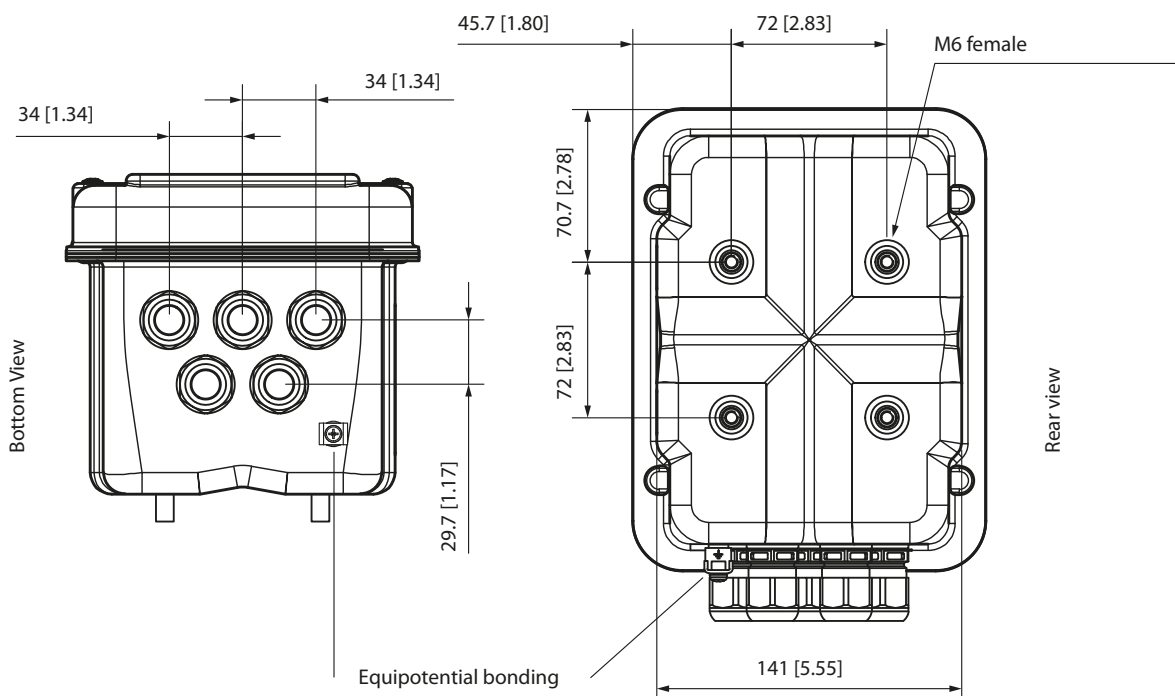


# Protos 3400 X

## Dimension drawings

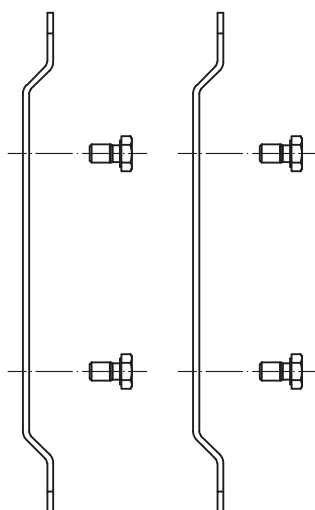
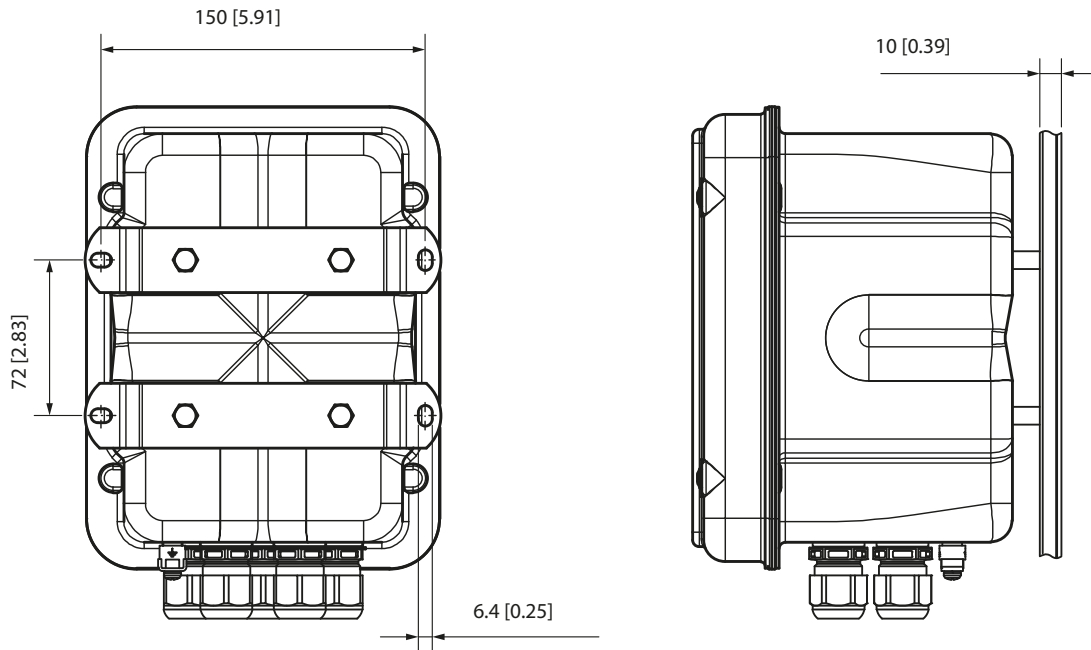


Cable glands M20 x 1.5 (A/F 24)



All dimensions in mm [inches]

Dimension Drawings – Wall Mounting

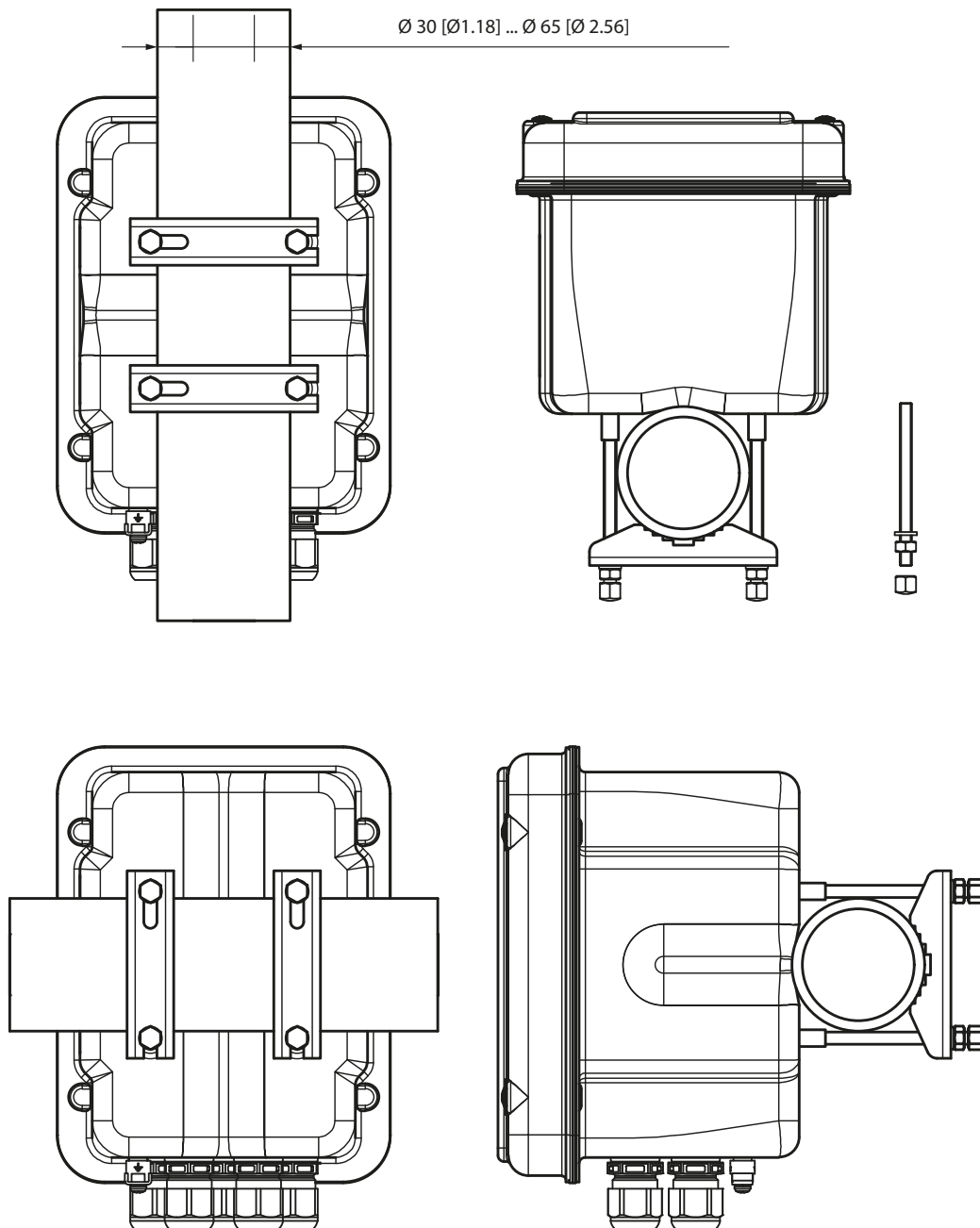


2 x wall mounting brackets (stainless steel A4)  
 4 x hex bolt M6x10  
 (A/F 10, stainless steel A4)  
 (included in the package)

All dimensions in mm [inches]

# Protos 3400 X

## Dimension Drawings – Pipe Mounting

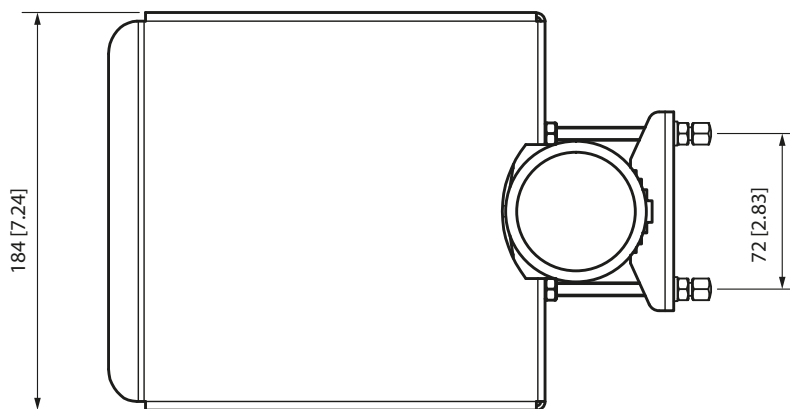
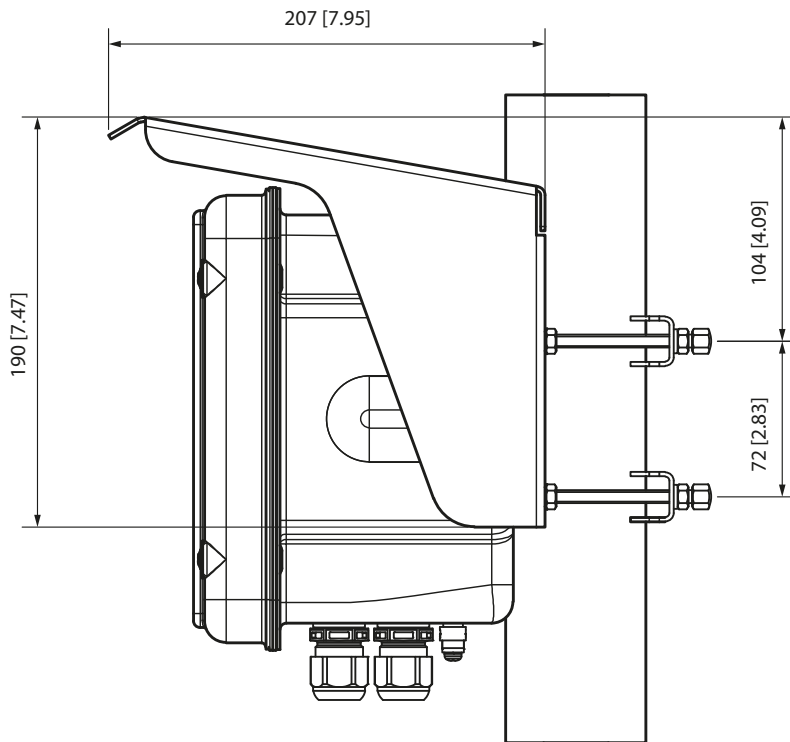


- ZU 0544 Pipe-Mount Kit:  
 2 x pipe clamp (stainless steel A4)  
 4 x threaded bolt M6 (stainless steel A4)  
 4 x washer, nut, cap nut (stainless steel A4)

All dimensions in mm [inches]

Dimension Drawings – ZU 0548 Protective Hood

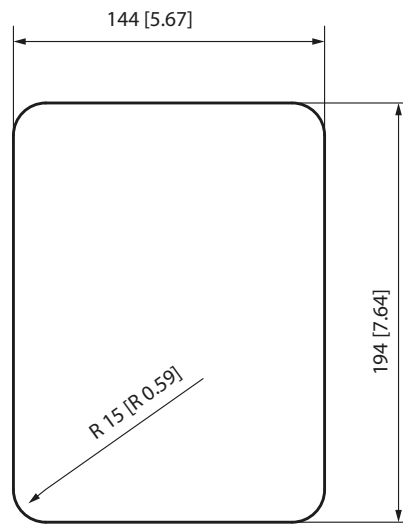
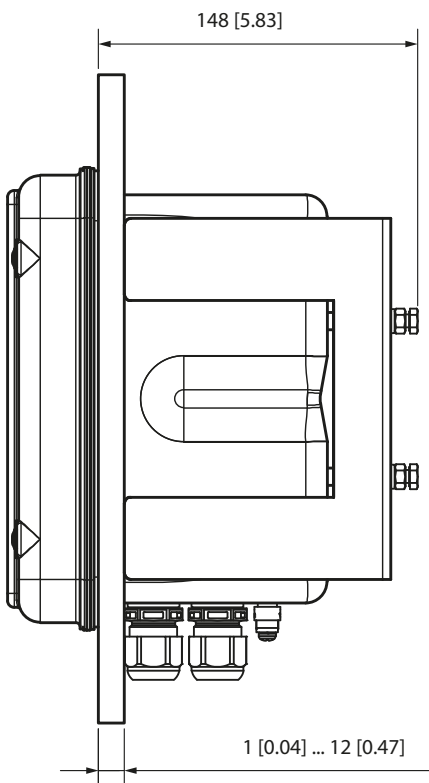
1 x protective hood (stainless steel A2)  
 4 x nut M6 (stainless steel A4)



All dimensions in mm [inches]

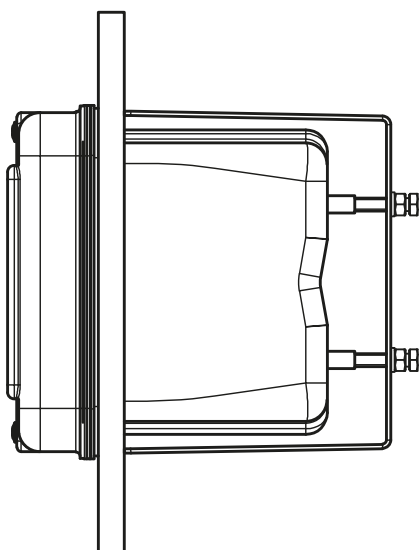
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## Dimension Drawings – ZU 0545 Panel-Mount Kit



Control panel cutout

Panel mounting



Panel sealing

