

# Transmitter pH 2220 X

## Technical Data

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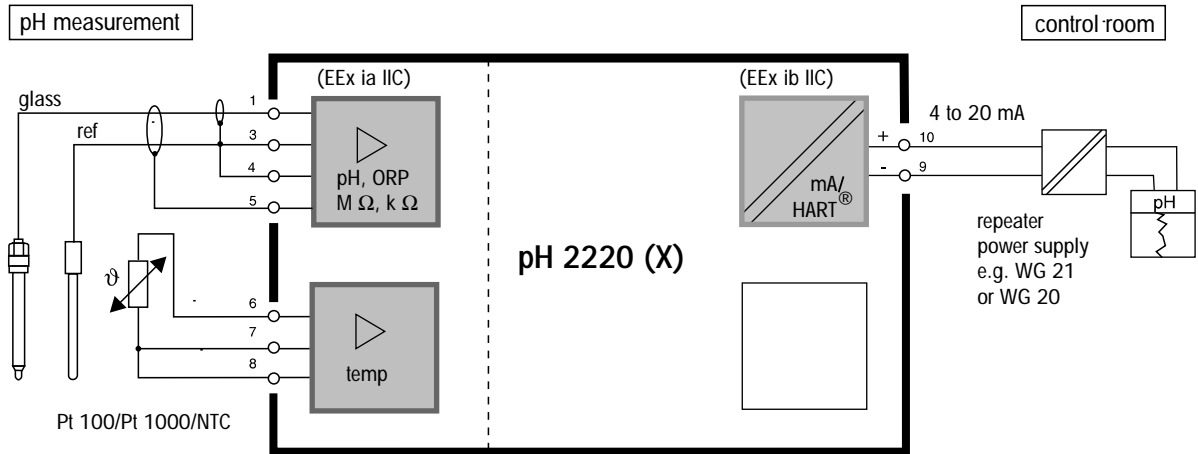
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# Typical Wirings

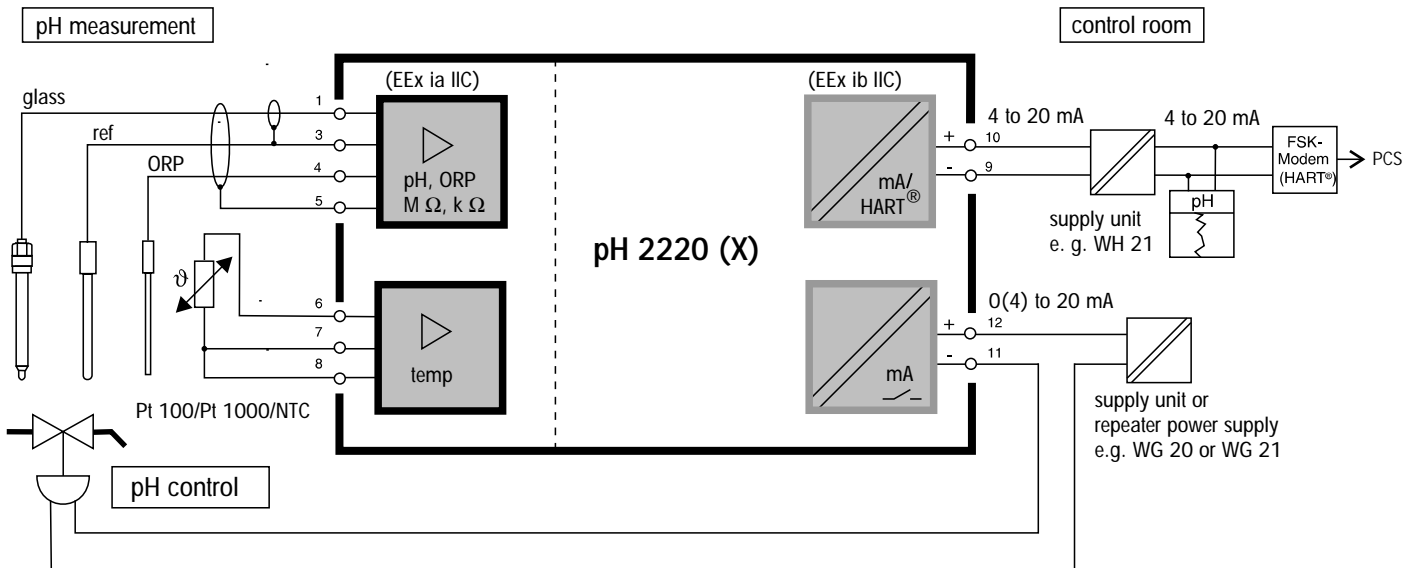
## pH 2220 (X)

Fig. 1: pH measurement with recorder evaluation



## pH 2220 (X)

Fig. 2: pH and ORP measurement with SensoCheck<sup>®</sup> for glass and reference electrode, control, recorder evaluation, connection to a process control system via FSK modem (HART<sup>®</sup>)



# pH 2220 X

pH 2220 X	<b>Inputs</b>	1 input for pH or mV	
	pH 2220 X: EEx ia IIC	1 input for ORP <sup>1)</sup> 1 input for Pt 100/Pt 1000, NTC 30 kΩ 2- or 3-wire connection	
	<b>Ranges</b>	pH value	-2.00 to +16.00
		electrode potential	-2,000 to +2,000 mV
		ORP	-2,000 to +2,000 mV
		rH value	0.0 to 42.5
		glass impedance	0.5 to 1,000 MΩ
		reference impedance	0.1 to 200.0 kΩ
		option 413	0.5 to 1,000 MΩ
		temperature	-50.0 to +250.0 °C
		with NTC	-20.0 to +130.0 °C
	<b>Display</b>	graphic LCD	240 x 64 matrix
		main display	character height approx. 20 mm
		additional display	character height approx. 6 mm
		dialog display	7 lines, character height approx. 4 mm
	<b>Display Options</b>	Main Display	Additional Display
		pH value	pH value [pH]
		electrode potential	electrode potential [mV]
		ORP	ORP [mV]
		rH value	rH value [rH]
		temperature	temperature [°C]
		time	time [h,min]
			date [d,m,y]
			current output 1 [mA]
			current output 2 [mA]
			cal timer [h]
			glass impedance [MΩ]
			reference impedance [kΩ]
			man. temperature [°C]
			controller output [%]
			controller setpoint X <sub>W</sub>
	<b>2-Channel Measurement Recorder*) (Option 448)</b>	graphical representation of two measured values on the display user defined for pH, mV, ORP, rH, °C, output 1, output 2, glass impedance and reference impedance, span and time feed user defined, recording selectable: snapshot, min, max, or average value 500 measurements with time and date	
	<b>Languages*)</b>	German, English, French, Italian, Spanish with option 477: Swedish instead of Spanish	
	<b>pH/ORP Input</b>		
	Glass Electrode Input	input resistance	> 1·10 <sup>12</sup> Ω
		input current (20 °C) <sup>2)</sup>	< 1·10 <sup>-12</sup> A
		offset voltage	< 0.5 mV
		TC of offset voltage	< 10 μV/K
	Reference Electrode Input	input resistance	> 1·10 <sup>11</sup> Ω
		input current (20 °C) <sup>2)</sup>	< 1·10 <sup>-11</sup> A
		offset voltage	< 0.5 mV
		TC of offset voltage	< 10 μV/K
	<b>Measurement Error (± 1 Count)</b>	pH value	< 0.01
		electrode potential	< 0.1 % of measured value
		ORP	< 0.1 % of measured value
	<b>Impedance Measurement Error (± 1 Count)</b>	glass electrode	< 10 % 2 to 200 MΩ
			< 20 % < 2 MΩ / > 200 MΩ
		reference electrode	< 10 % 0.5 to 50 kΩ
			< 20 % < 0.5 kΩ / > 50 kΩ
	<b>Permissible Cable Capacitance</b>	< 2 nF	(cable length approx. 20 m)
	<b>Permissible Voltage</b>	± 2 V, terminals 1, 3 against terminal 4	
	<b>ORP + pH (mV)</b>		

\*) user-defined

1) oxidation-reduction potential

2) doubles every 10 K

<b>pH Electrode Standardization</b>	<p>Operating Modes*)</p> <ul style="list-style-type: none"> <li>Calimatic® automatic calibration and buffer recognition with fixed buffer sets:           <table border="0"> <tr> <td>METTLER TOLEDO techn. buff.</td> <td>2.00/4.01/7.00/9.21</td> </tr> <tr> <td>Knick technical buffers</td> <td>2.00/4.01/7.00/9.21</td> </tr> <tr> <td>Merck/Riedel de Haën</td> <td>2.00/4.00/7.00/9.00/12.00</td> </tr> <tr> <td>techn. buffers DIN 19267</td> <td>1.09/4.65/6.79/9.23/12.75</td> </tr> <tr> <td>Ciba (94)</td> <td>2.06/4.00/7.00/10.00</td> </tr> </table> </li> <li>customer-specific buffer sets (opt. 357)</li> <li>entry of individual buffer values</li> <li>sample calibration</li> <li>entry of premeasured calibration data</li> <li>automatic check of redox electrodes</li> </ul>	METTLER TOLEDO techn. buff.	2.00/4.01/7.00/9.21	Knick technical buffers	2.00/4.01/7.00/9.21	Merck/Riedel de Haën	2.00/4.00/7.00/9.00/12.00	techn. buffers DIN 19267	1.09/4.65/6.79/9.23/12.75	Ciba (94)	2.06/4.00/7.00/10.00		
METTLER TOLEDO techn. buff.	2.00/4.01/7.00/9.21												
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Merck/Riedel de Haën	2.00/4.00/7.00/9.00/12.00												
techn. buffers DIN 19267	1.09/4.65/6.79/9.23/12.75												
Ciba (94)	2.06/4.00/7.00/10.00												
Calibration Ranges	<table border="0"> <tr> <td>zero point</td> <td>pH = 6 to 8</td> </tr> <tr> <td>slope</td> <td>50 to 61 mV/pH (25 °C)</td> </tr> <tr> <td><math>V_{iso}</math></td> <td>-200 to +200 mV</td> </tr> </table>	zero point	pH = 6 to 8	slope	50 to 61 mV/pH (25 °C)	$V_{iso}$	-200 to +200 mV						
zero point	pH = 6 to 8												
slope	50 to 61 mV/pH (25 °C)												
$V_{iso}$	-200 to +200 mV												
Nominal Zero Point and Slope of Electrode*) (Opt. 356)	<table border="0"> <tr> <td>zero point</td> <td>pH = 0 to 14</td> </tr> <tr> <td>adjustment range</td> <td><math>\Delta</math> pH = <math>\pm</math> 1</td> </tr> <tr> <td>slope</td> <td>25 to 61 mV/pH</td> </tr> <tr> <td>adjustment range</td> <td><math>\pm</math> 5.5 mV/pH</td> </tr> <tr> <td><math>V_{iso}</math></td> <td>-1,000 to +1,000 mV</td> </tr> <tr> <td colspan="2">e.g. for Antimony probes</td> </tr> </table>	zero point	pH = 0 to 14	adjustment range	$\Delta$ pH = $\pm$ 1	slope	25 to 61 mV/pH	adjustment range	$\pm$ 5.5 mV/pH	$V_{iso}$	-1,000 to +1,000 mV	e.g. for Antimony probes	
zero point	pH = 0 to 14												
adjustment range	$\Delta$ pH = $\pm$ 1												
slope	25 to 61 mV/pH												
adjustment range	$\pm$ 5.5 mV/pH												
$V_{iso}$	-1,000 to +1,000 mV												
e.g. for Antimony probes													
<b>Temperature Input</b>	Pt 100 / Pt 1000 / NTC 30 k $\Omega$ , 2- or 3-wire connection Range												
Range	-50.0 to +250.0 °C; with NTC 30 k $\Omega$ : -20 to +130 °C												
Temp Meas. Error ( $\pm$ 1 Count)	< 0.2 % of measured value $\pm$ 0.3 K												
Temp Compensation pH*)	<table border="0"> <tr> <td>automatic</td> <td>with Pt 100 / Pt 1000 / NTC 30 k<math>\Omega</math></td> </tr> <tr> <td>manual</td> <td>-50.0 to +250 °C</td> </tr> </table>	automatic	with Pt 100 / Pt 1000 / NTC 30 k $\Omega$	manual	-50.0 to +250 °C								
automatic	with Pt 100 / Pt 1000 / NTC 30 k $\Omega$												
manual	-50.0 to +250 °C												
<b>Output 1*)</b> (Current Loop) Beginning/End of Scale*)	4 to 20 mA (22 mA), floating, power supply required user defined for pH, mV, ORP, rH, °C anywhere within range												
Spans*)	<table border="0"> <tr> <td>pH value</td> <td>1.00 to 20.00</td> </tr> <tr> <td>electrode potential</td> <td>100 to 2,000 mV</td> </tr> <tr> <td>ORP</td> <td>100 to 2,000 mV</td> </tr> <tr> <td>rH value</td> <td>10.0 to 200.0</td> </tr> <tr> <td>temperature</td> <td>10.0 to 300.0 °C</td> </tr> </table>	pH value	1.00 to 20.00	electrode potential	100 to 2,000 mV	ORP	100 to 2,000 mV	rH value	10.0 to 200.0	temperature	10.0 to 300.0 °C		
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electrode potential	100 to 2,000 mV												
ORP	100 to 2,000 mV												
rH value	10.0 to 200.0												
temperature	10.0 to 300.0 °C												
Output Current Error	< 0.3 % of measured value $\pm$ 20 $\mu$ A												
Current Source Mode	4.00 mA to 22.00 mA												
Input Ratings	<table border="0"> <tr> <td>pH 2220 :</td> <td>14 to 40 V; <math>I_{max}</math> = 100 mA</td> </tr> <tr> <td>pH 2220 X (EEx ib IIC):</td> <td>14 to 30 V; <math>I_{max}</math> = 100 mA; <math>P_{max}</math> = 0.8 W</td> </tr> </table>	pH 2220 :	14 to 40 V; $I_{max}$ = 100 mA	pH 2220 X (EEx ib IIC):	14 to 30 V; $I_{max}$ = 100 mA; $P_{max}$ = 0.8 W								
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pH 2220 X (EEx ib IIC):	14 to 30 V; $I_{max}$ = 100 mA; $P_{max}$ = 0.8 W												
<b>Output 2 (passive*)</b> (Option 487) Beginning/End of Scale*)	0(4) to 20 mA (22 mA), floating, power supply required user defined for pH, mV, ORP, rH, °C or as analog controller output anywhere within range												
Spans*)	<table border="0"> <tr> <td>pH value</td> <td>1.00 to 20.00</td> </tr> <tr> <td>electrode potential</td> <td>100 to 2,000 mV</td> </tr> <tr> <td>ORP</td> <td>100 to 2,000 mV</td> </tr> <tr> <td>rH value</td> <td>10.0 to 200.0</td> </tr> <tr> <td>temperature</td> <td>10.0 to 300.0 °C</td> </tr> </table>	pH value	1.00 to 20.00	electrode potential	100 to 2,000 mV	ORP	100 to 2,000 mV	rH value	10.0 to 200.0	temperature	10.0 to 300.0 °C		
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electrode potential	100 to 2,000 mV												
ORP	100 to 2,000 mV												
rH value	10.0 to 200.0												
temperature	10.0 to 300.0 °C												
Output Current Error	< 0.3 % of measured value $\pm$ 20 $\mu$ A												
Current Source Mode	0.00 mA to 22.00 mA												
Input Ratings	<table border="0"> <tr> <td>pH 2220:</td> <td>1 to 40 V; <math>I_{max}</math> = 100 mA</td> </tr> <tr> <td>pH 2220 X (EEx ib IIC):</td> <td>1 to 30 V; <math>I_{max}</math> = 100 mA; <math>P_{max}</math> = 0.8 W</td> </tr> </table>	pH 2220:	1 to 40 V; $I_{max}$ = 100 mA	pH 2220 X (EEx ib IIC):	1 to 30 V; $I_{max}$ = 100 mA; $P_{max}$ = 0.8 W								
pH 2220:	1 to 40 V; $I_{max}$ = 100 mA												
pH 2220 X (EEx ib IIC):	1 to 30 V; $I_{max}$ = 100 mA; $P_{max}$ = 0.8 W												
Defined as Switching Output	switching controller, limit value or alarm output												
Ratings	<table border="0"> <tr> <td>pH 2220:</td> <td>DC <math>V_{max}</math> = 40 V; <math>I_{max}</math> = 100 mA; voltage drop: &lt;1 V</td> </tr> </table>	pH 2220:	DC $V_{max}$ = 40 V; $I_{max}$ = 100 mA; voltage drop: <1 V										
pH 2220:	DC $V_{max}$ = 40 V; $I_{max}$ = 100 mA; voltage drop: <1 V												

\*) user defined

	pH 2220 X (EEx ib IIC):	DC $V_{\max} = 30 \text{ V}$ ; $I_{\max} = 100 \text{ mA}$ ; $P_{\max} = 0.8 \text{ W}$ ; voltage drop: $< 1 \text{ V}$
<b>HART® Communication</b> (Option 467)	digital communication via FSK <sup>3)</sup> modulation of loop current (only output 1), HART®- protocol (version 6.2) point-to-point connection or multidrop (bus) <sup>*)</sup>	
<b>PI Controller</b> (Option 353)	quasi-continuous switching controller via output 2 (option 487) pulse duration or pulse frequency user defined or continuous controller via output 2 (option 487) user defined for pH, mV, ORP, rH, and °C	
<b>Clock</b>	real-time clock with date, self-contained date format user defined	
<b>Records</b>	for quality management documentation to ISO 9000	
Logbook (Option 354)	recording of	function activations, appearance and disappearance of warning and failure messages, with date and time
	storage capacity	200 entries available
Unit Self-Test	test of RAM, EPROM, EEPROM, display and keypad	
Electrode Statistics	electrode data from the last three calibrations and first calibration, data retrievable via display	
pH Calibration Record	all relevant data of the last pH calibration for documentation to GMP	
Tolerance Band Recorder (Option 447)	registers zero and slope of electrode system and adjusted tolerance band, graphic representation on display	
<b>Data Retention</b> in Case of Power Failure	parameters and calibration data	$> 10 \text{ years}$ (EEPROM)
	logbook, statistics, cal record	$> 1 \text{ year}$ (lithium battery)
	clock, reserve power	$> 1 \text{ year}$ (lithium battery)
	no battery replacement required (according to NAMUR <sup>4)</sup> NE 32)	
<b>Explosion Protection pH 2220 X</b> EEx ib [ia] IIC T6		
<b>RFI Suppression</b>	to EN 50 081-1 and EN 50 081-2	
<b>Immunity to ESD</b>	to EN 50 082-1 and EN 50 082-2 and in accordance with NAMUR <sup>4)</sup> -NE 21 EMC recommendation for process and laboratory control equipment	
<b>Environmental Temperature</b>	operation <sup>5)</sup>	$-20 \text{ to } +50 \text{ }^{\circ}\text{C}$
	transport and storage	$-20 \text{ to } +70 \text{ }^{\circ}\text{C}$
<b>Enclosure</b>	case with separate terminal compartment, suitable for outdoor mounting material: acrylonitrile butadiene styrene (ABS), front: polyester IP65 protection	
Cable Glands	5 Pg 13.5 threaded cable glands	
Dimensions	refer to dimension drawing	
<b>Weight</b>	approx. 1.5 kg	

\*) user-defined

3) frequency shift keying

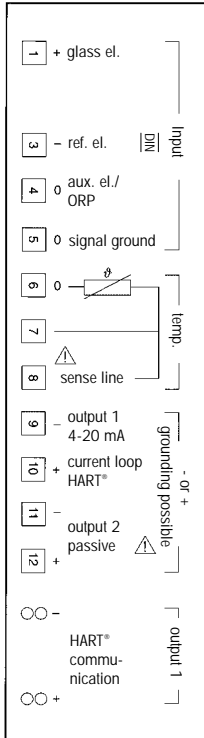
4) German committee for measurement and control standards in the chemical industry

5) At ambient temperatures below 0 °C the readability of the display may be  
reduced, however the unit functions are not impaired.

# Terminal Assignments

pH 2220 X

## Terminal assignments pH 2220 X

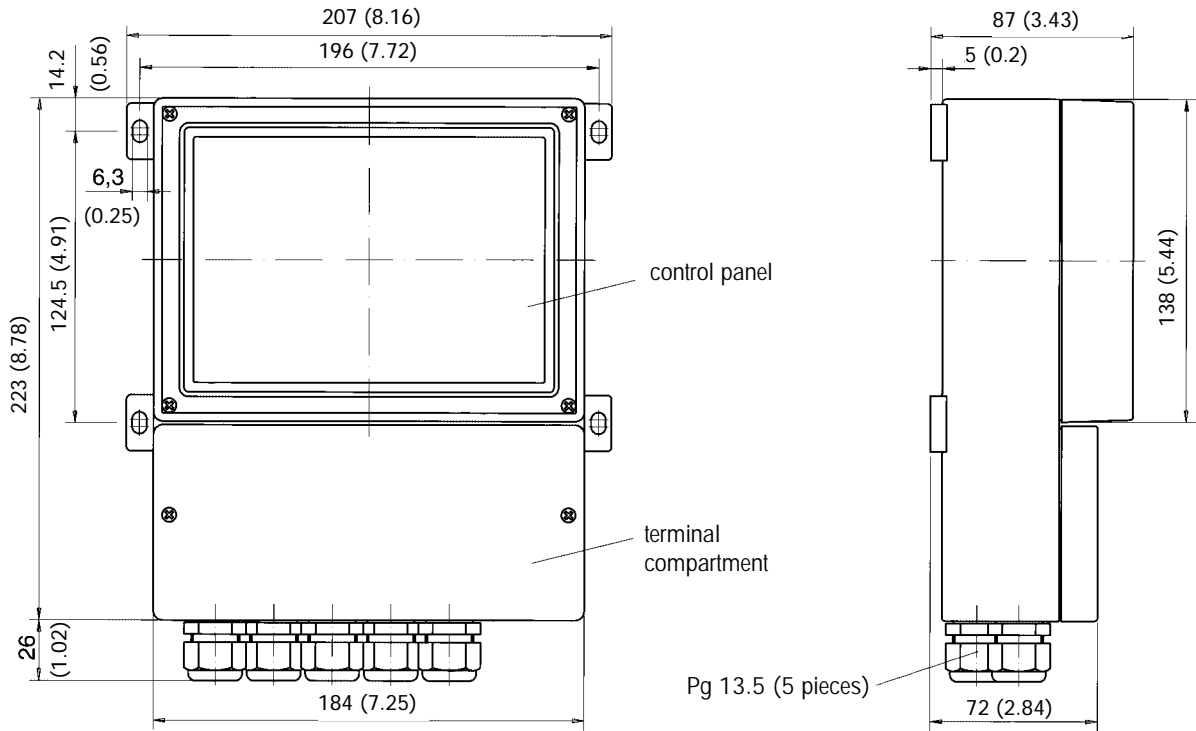


# EMC Test Records

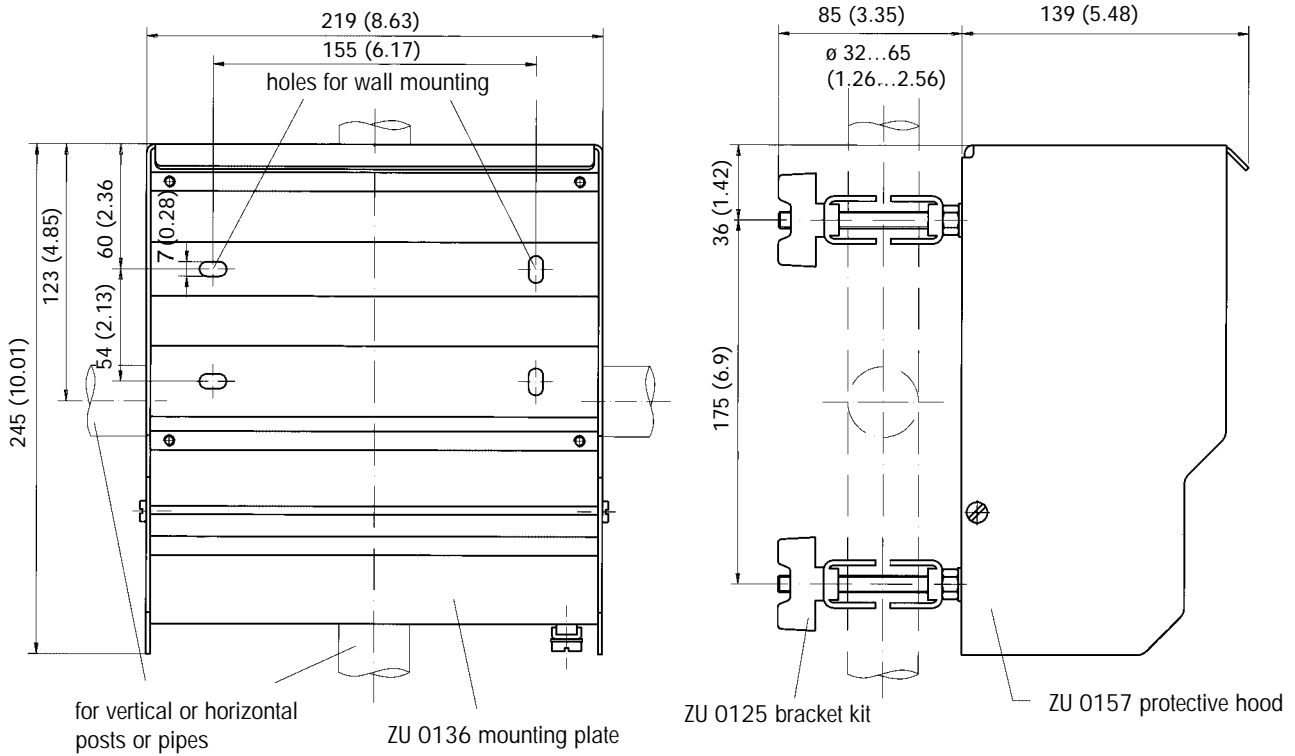
EMV-Meßprotokoll: pH 2220 X		Seite: 2	
Datum: 06.10.1995	Prüfer: Laß	Abteilung: EMV-Labor	
Gerät: Process Unit 77X pH			
<b>Störfestigkeit gemäß NAMUR-Empfehlung</b>			
	nicht notwendig	durchgeführt	bestanden ja / nein
1. Netzversorgungstoleranzen	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> / <input type="checkbox"/>
2. Netzunterbrechung	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> / <input type="checkbox"/>
3. Einschaltstrombegrenzung	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> / <input type="checkbox"/>
4. Einzelimpulse auf Versorgungsleitungen	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> / <input type="checkbox"/>
5. Burst auf Versorgungsleitungen	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> / <input type="checkbox"/>
6. Burst auf Daten-, E/A- u. Signalleitung	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> / <input type="checkbox"/>
7. Entladung statischer Elektrizität	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> / <input type="checkbox"/>
8. Elektromagnetische Felder	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> / <input type="checkbox"/>
9. Störunterdrückung	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> / <input type="checkbox"/>
10. Funkstörung	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> / <input type="checkbox"/>
<b>Impulsfestigkeit</b>			
11. Impulstest 1,2/50µs 5kV nach IEC 255-4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> / <input type="checkbox"/>
12. Impulstest nach VDE 0160	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> / <input type="checkbox"/>
<b>Bemerkungen:</b>			
Das Verhalten bei Störungen durch elektromagnetische Beeinflussung ist wie folgt definiert: die Fehlergrenzen des Prüflings werden während der Störeinwirkung eingehalten.			
Nach Ausfall des Speisemeßstromkreises automatischer Wiederanlauf.			
Prüfungen 1 - 5 entfallen, da Prüfling keine Netz- bzw. Versorgungsleitungen nach Punkt 1 - 5 besitzt.			
Das Protokoll umfaßt 15 Seiten.			
i.A. Laß		(ppa. Feucht)	(ppa. Kabis)
Unterschrift Prüfer		rechtsverbindliche Unterschrift	

# Dimension Drawings

pH 2220 X

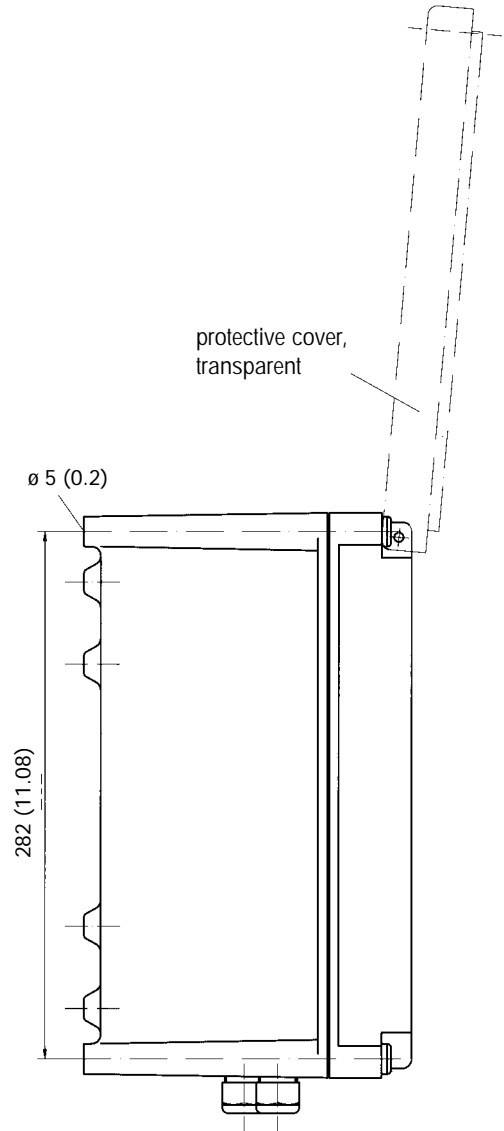
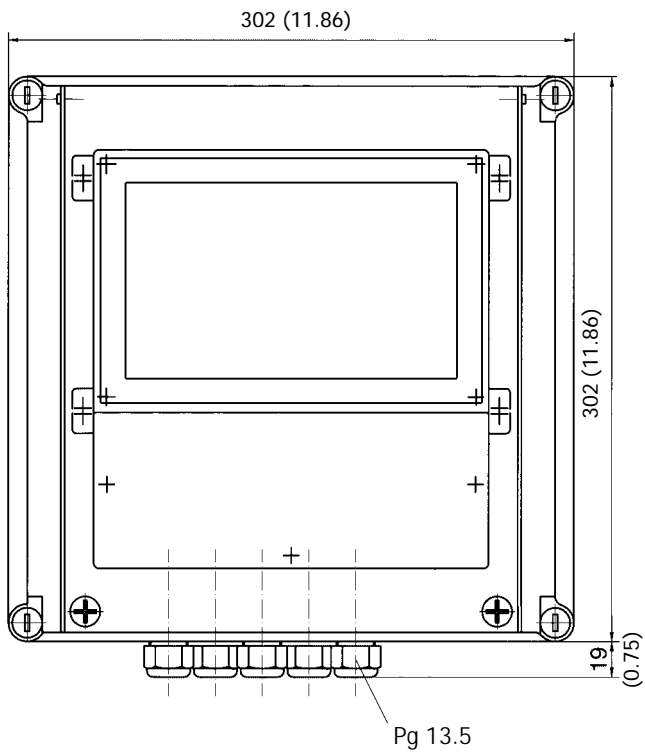
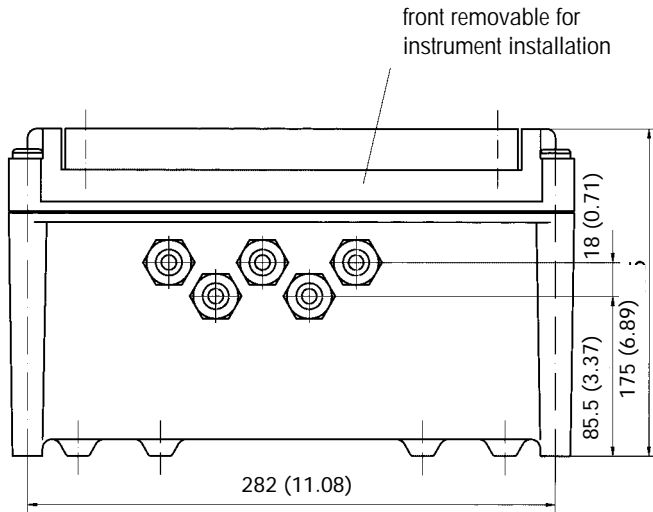


ZU 0157 Protective Hood, ZU 0136 Mounting Plate and ZU 0125 Bracket Kit



Note: All dimensions in millimeters (inches)

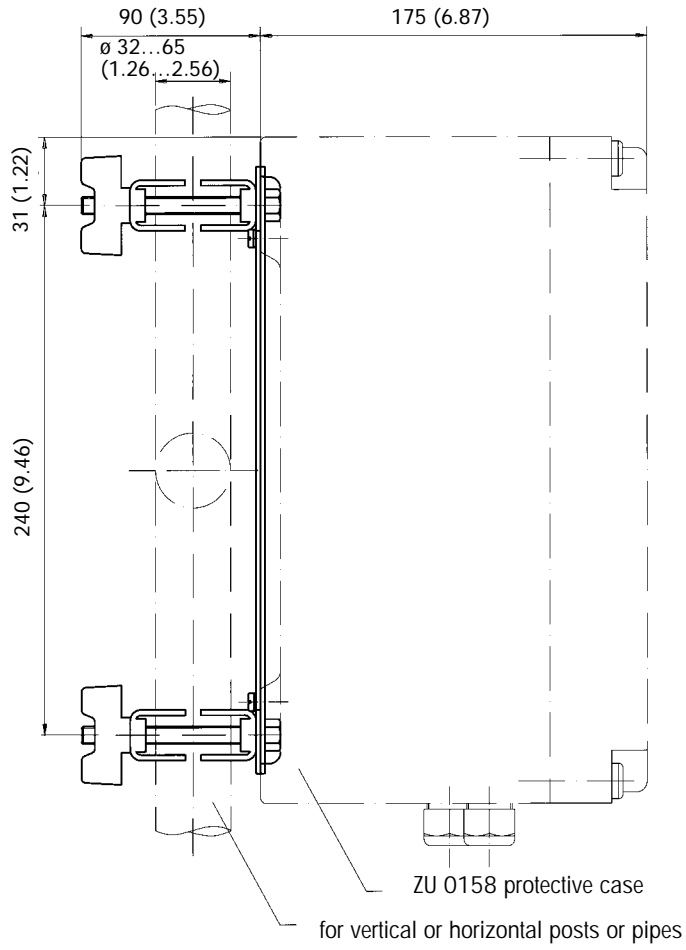
ZU 0158 Protective Case



Note: All dimensions in millimeters (inches)



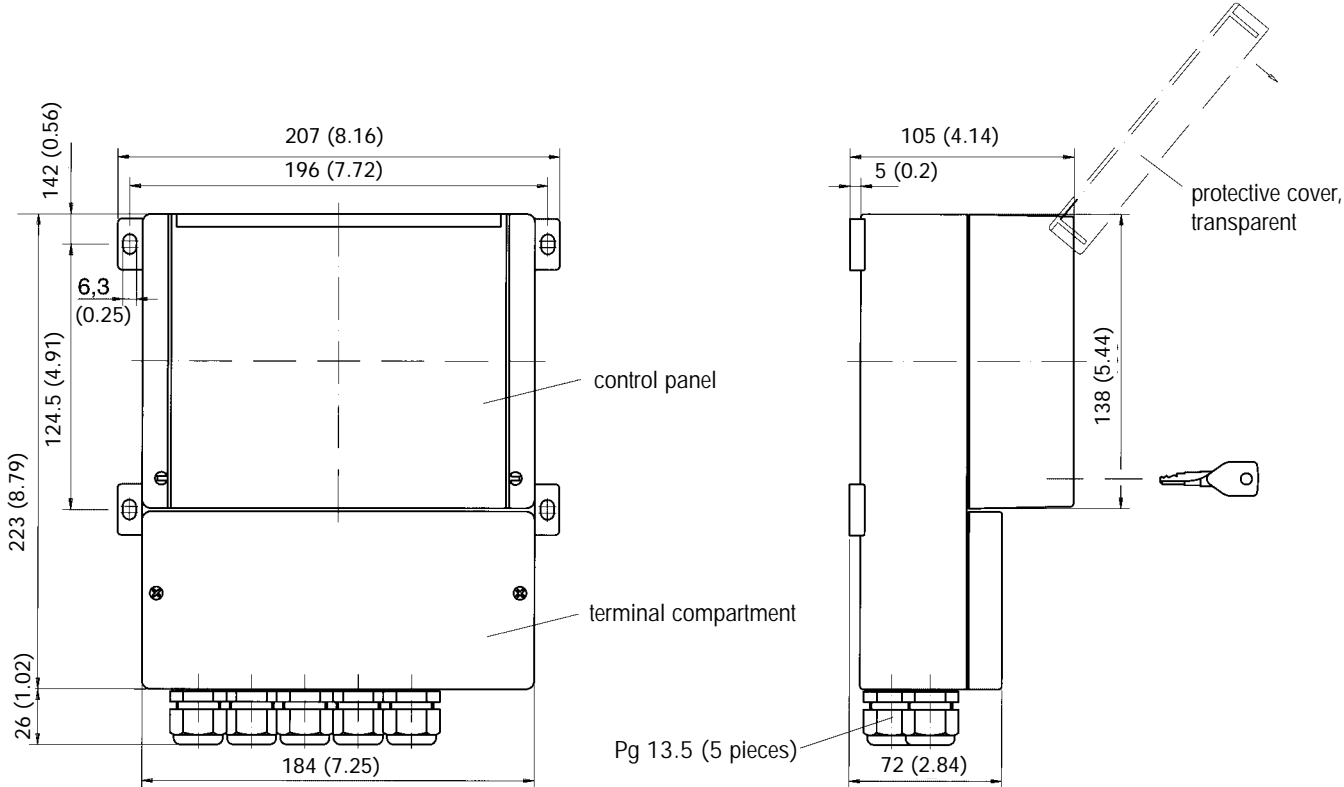
ZU 0158 Protective Case with ZU 0220 Bracket Kit for Protective Case



Note: All dimensions in millimeters (inches)

# pH 2220 X

Unit with Lockable Control-Panel Cover (Option 432)



Note: All dimensions in millimeters (inches)

Subject to change without notice



Management System  
certified according to  
ISO 9001 / ISO 14001



INTERNET

<http://www.mtpro.com>

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