
# HAMILTON CPS71E Digital Memosens pH Sensors in Process Analytics Instruction Manual



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## HAMILTON CPS71E Digital Memosens pH Sensors in Process Analytics

## Introduction

These operating instructions apply to all Hamilton process pH sensors with Memosens® plug-in connection. The temperature and pressure specifications shown on the sensor must not be exceeded. These instructions must be read, understood and followed by all staff using the sensor. Hamilton takes no responsibility for damage or operational disruptions resulting from failure to observe these instructions.

## Specifications

| | EasyFerm Plus *** MS ***<br>EasyFerm Bio *** MS ***<br>EasyFerm USD *** MS *** | | Pollyte Plus *** MS *** | | |
|---|---|---|---|---|---|
| **pH glass** | **PHI** | **HB** | **H** | **PHI** | **HF** |
| pH range | 0 - 14 | 0 - 14 | 0 - 14 | 0 - 14 | 0 - 14 |
| a-length [mm] | 120, 225, 325, 360 | 120, 160, 200, 225, 325, 360, 425 | 120, 225, 325, 360, 425 | 120, 225, 325, 425 | 120, 225, 325, 425 |
| [°C]* | 0 - 140 | 0 - 140 | 0 - 130 | 0 - 130 | -10 - 100 |
| Max. pressure [bar] | 6 | 6 | 10 | 10 | 16 |
| A / S / CIP | A / S / CIP | A / S / CIP | A / S | A / S / CIP | – |
| ATEX | ✓ | ✓ | ✓ | ✓ | ✓ |

*Note: the max temperature is restricted in ex applications. T3 is limited up to 130°C, T4 is limited up to 120ºC and T6 is limited up to 70ºC.

| | MecoTrode *** MS *** | |
|---|---|---|
| **pH glass** | **H** | **HF** |
| pH range | 0 - 14 | 0 - 14 |
| a-length [mm] | 120, 225 | 120, 225 |
| Temperature range [°C] | 0 - 130 | 0 - 130 |
| Max. pressure [bar] | 0 - 16 (25°C)<br>0 - 6 (130°C) | 0 - 16 (25°C)<br>0 - 6 (130°C) |
| A / S / CIP | – | – |
| ATEX | ✓ | ✓ |

E.g.: Polilye Plus H MS 120
A = Autoclaving; S = Sterilisation; CIP = Cleaning in Place

## Intended use

The purpose of this sensor is to measure pH. If the sensor is used in areas with potentially explosive atmospheres the instructions in section “Use in Potentially Explosive Atmospheres” must be adhered to. The built-in temperature sensor is only to be used for compensation of the pH value and not to control the process temperature.

## Safety instructions

This sensor is only to be used if it is in good condition and for its intended purpose. Incorrect use or misuse can be dangerous. Assembly and maintenance must be carried out by trained personnel.
The sensor is made of glass and must be handled with care. If the sensor is broken the glass splinters could cause damage. Glass sensors with a pressurized reference system (EasyFerm Plus) carry a risk of spontaneous breakage and glass splinters might spread. Wearing protective glasses is recommended when working with this type of sensor.
Wearing protective glasses and gloves is also recommended when cleaning or regenerating the sensor with acids/bases or solvents.
Take care that the thread and the o-ring are not damaged when the sensor is screwed into place. O-rings are subject to wear and tear and should be replaced regularly, at least once a year.
The temperature limits shown in the specification table before must never be exceeded.

## Liability

The liability of Hamilton Bonaduz AG is detailed in the document “General Terms and Conditions of Sale and Delivery (GTS)”, chapter 12.
Hamilton is expressly not liable for direct or indirect losses arising from use of the sensors. It must in particular be insured in this conjunction that malfunctions can occur on account of the inherently limited useful life of sensors contingent upon their relevant applications. The user is responsible for the calibration, maintenance and regular replacement of the sensors. In the case of critical sensor applications, Hamilton recommends using back-up measuring points in order to avoid consequen-tial damages. The user is responsible for taking suitable precautions in the event of a sensor failure.
Memosens®: Contact-free, inductive, digital transmission of pH signals
The Memosens®-System eliminates contact corrosion, influences from interfering potentials, be-cause sensor and transmitter are galvanically isolated, and is completely water tight. Storing data in the sensor allows calibration and adjustment away from the measuring point, for instance in a laboratory. A sensor can be replaced with a new sensor, pre-calibrated in the laboratory, and the new sensor will automatically be recognized in the process.
These are the most important data stored in the sensor:
**Manufacturing data**

- Reference Number (Ref)
- Serial number (S/N)
- Date of manufacture

**Calibration data**

- Calibration date
- Calibration slope and zero point at 25°C
- Temperature offset
- Number of calibrations

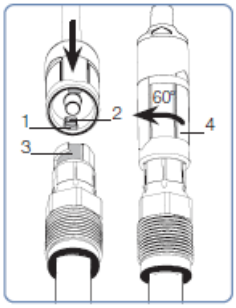
**Operating data**

- Operating hours
- Date of first use
- Operating hours at temperatures above 80°C/above 100°C Operating hours at very low/very high pH values
- (Nernst voltage below -300mV, above +300mV)
- Number of sterilizations
- Glass membrane impedance (pH sensors only)

All data can be read using a Memosens®-compatible transmitter or a special PC software.
When the sensor is connected to a Memosens®-compatible transmitter with a Memosens® data cable, the sensor data is automatically transferred to the transmitter and used to calculate the actual pH value. Storing data in the sensor allows calibration / adjustment at an optimal place, for instance in a laboratory. Of course, the sensor can also be calibrated as normal at the measuring point. Hav-ing stored operating data in the sensor enables preventive maintenance.

## Initial operation

Unpack the sensor and check the sensor for any damage. A damaged sensor should be returned to the Hamilton dealer in the original packaging.
**Preparing the sensor:** Carefully remove the watering cap. Rinse the sensor with water.
Check for air bubbles inside the pH glass membrane. Allow any air bubbles to rise to the top by gently shaking the sensor. For refillable sensors: open the reservoir stopper before measuring and close it after measuring. Check the level of electrolyte in the sensor.
**Connecting sensor to Memosens® data cable**

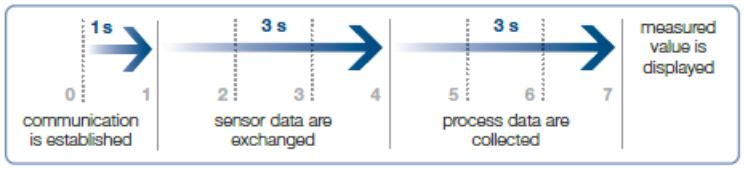



1. Rotate the lower part of the coupling so that the keys, (1 & 2), sit above each other.
2. As in a bayonet connection, plug the coupling into the plug-in head so that the keys engage

3. Turn the lower part of the coupling (4) clockwise as far as possible (approx. 60°). Doing so locks the coupling and prevents the connection from opening inadvertently.

Follow the instructions in the reverse order to disconnect the data cable.
All moisture problems have been eliminated owing to the contact-free inductive transmission of measured values (Enclosure rating IP68, 10m water column, 25°C, 45 days, 1M KCl). It is even possible to make the connection under water.

**Start-up behavior**
It will take only a few seconds after connecting a new sensor and turning on the transmitter for communication between sensor and transmitter to be established and the actual pH read out to be displayed.




## Calibration

Always use fresh, unused, Hamilton DuraCal pH buffers for calibration / adjustment. For detailed instructions refer to the manual of the transmitter used.

## Storing the sensor

Sensors should be stored with the watering cap on, containing 3M KCl solution (Ref 238036) or storage solution (Ref 238931). Sensors that have been stored dry will give drifting values. If the sensor dries out it can be regenerated overnight by placing it in storage solution.

## Cleaning

Sensors with glass shafts can be cleaned quickly with acidic or alkaline solutions or with common solvents. Rinse with water immediately afterwards. Sensors can have delayed response for some time after cleaning and should therefore be placed in storage solution for at least 15 min. Ceramic diaphragms: In the event of protein contamination, immerse the sensor for several hours in 0.4% HCl+5g/l Pepsin. If the diaphragm has been blackened (due to silver compounds), immerse the sensor in 0.4%HCl+76g/l thiourea.
Using the Cleaning Solution Set (Ref 238290) will clean all the above described contaminations.

## Regeneration

Immerse the sensor for 10 min in 0.1-1M NaOH and then for another 10 min in 0.1-1M HCl. After regeneration place the sensor in storage solution for 15 min.

## Disposal

Hamilton sensors are designed to minimize environmental impact. Memosens® sensors contain electronic parts which require the sensors to be disposed of as electrical or electronic waste and NOT as municipal waste (see e.g. Directive 2012/19/EU and the local laws). The sensors can also be returned to Hamilton for disposal. Sensors with pressurized reference systems (EasyFerm Plus) should be disposed of in their polystyrene packaging to prevent injury from glass splinters of broken sensors.

## General

The lifetime of a sensor is determined by the requirements of the response time, zero point and slope. Measuring conditions, especially high temperatures and aggressive solutions, can shorten the lifetime. Under favorable conditions the lifetime can be 1-3 years at room temperature and 1-3 months at 90°C. Marginal ageing also happens during storage. Air/gas bubbles may stick to the sensitive area of the sensor. As a consequence, the measurement value might be wrong.
Every sensor is delivered with a “DECLARATION OF QUALITY” giving the calibration values of the final factory test as well as specifications and information about materials used.
For additional information go to “Process Analytics” at **www.hamiltoncompany.com**.

## Use in potentially explosive atmospheres

**Marking**
Ex Marking 0035 II 1G Ex ia IIC T3/T4/T6 Ga
Manufacturer Hamilton Bonaduz AG, CH-7402 Bonaduz, Switzerland
EC-Type Examination Certificate BVS 11 ATEX E 038 X
IECEx Certificate of Conformity IECEx BVS 16.0079 X

EG-Type Examination Certificate and the Certificate of Conformity can be downloaded from:
**www.hamiltoncompany.com**
The following Memosens sensors have ATEX approval:
EasyFerm Plus *** MS ***, EasyFerm Bio *** MS ***, EasyFerm USD *** MS ***,
Polilyte Plus *** MS ***, MecoTrode *** MS ***
The ATEX certification of the above listed sensor types is only valid:

- for serial numbers 4000 and higher
- when the sensor carries the ATEX-marking described above
- when the sensor has an orange ring around the sensor connector

**Special conditions for safe operation**

1. Conditions described in Certificate BVS 11 ATEX E 038 X and IECEx BVS 16.0079 X must be adhered to.
2. The operator of equipment in potentially explosive atmospheres is responsible for making sure that all components of the system are certified for the relevant zone and mutually compatible.
3. The sensor must not be operated under electrostatically critical process conditions.
4. Intense vapor or dust directly impacting on the connection system must be avoided.
5. If a sensor is temporarily powered by a non-intrinsically safe electrical circuit the sensor will lose its ATEX / IECEx certification.
6. Before insertion or removal of housing or sensor, it must be established that no potentially explosive atmosphere is present in the reactor.
7. O-rings that prevent the escape of potentially explosive material from the reactor must be replaced every time the sensor is removed from the reactor

## Thermal specifications

It is important to keep within the following ambient temperature ranges:

| Temperature Class | Ambient temperature range |
|---|---|
| T3 | 0 °C < Ta < +130 °C |
| T4 | 0 °C < Ta < +120 °C |
| T6 | 0 °C < Ta < + 70 °C |

## Electrical specifications

The sensors, in connection with the measuring cables Ref 355350; 355351; 355352 (BVS 17 ATEX E 108 X and IECEx BVS 17.0090 X) can be connected to the transmitter H220X (Ref 242081-**) (TÜV 16 ATEX 7938 X).
The following transmitters can also be connected to the above mentioned cables:

- Knick PROTOS Module Type MS 3400X-16* (KEMA 03ATEX2530) and
- Knick STRATOS PRO Transmitter Type A20.X-.- und A21.X-.- (KEMA 08ATEX0100)

It is the responsibility of the user to make sure that the ATEX certificates for these two instruments are valid.
Furthermore, the connection to an intrinsically safe output circuit (Ex ia IIC) with the following maximum values is possible:

- Maximum output voltage Uo DC 5.1 V
- Maximum output current Io 130 mA
- Maximum output power Po 166 mW
- (Linear output characteristic)

The maximum internal capacity and inductivity of the intrinsically safe output circuit must not exceed the following maximum values:

- Maximum internal capacity Ci 15 µF
- Maximum internal inductivity Li 95 µH
- Alternatively:
- Maximum output voltage Uo DC 5.04 V
- Maximum output current Io 80 mA
- Maximum output power Po 112 mW (Trapezoidal output characteristic)

The maximum internal capacity and inductivity of the intrinsically safe output circuit must not exceed the following maximum values:

- Maximum internal capacity Ci 14.1 µF
- Maximum internal inductivity Li 237.2 µH

## Documents / Resources

| | |
|---|---|
|  | **HAMILTON CPS71E Digital Memosens pH Sensors in Process Analytics** [pdf] Instruction Manual<br>CPS71E, Digital Memosens pH Sensors in Process Analytics, CPS71E Digital Memosens pH Sensors in Process Analytics, Memosens pH Sensors in Process Analytics, pH Sensors in Process Analytics, Sensors in Process Analytics |

## References

- Hamilton Company
- Hamilton Company