Manual

EN 4.10 Version 2003

pHix® Compact

PH / REDOX TRANSMITTER

mjk

a xylem brand

Your notes:

Table of Contents

Declaration of conformity

CE

Konformitetserklæring

Vi, MJK Automation ApS, DK-3460 Birkerød, påtager os det fulde ansvar for at produktet

Declaration of Conformity

We, MJK Automation ApS, DK-34600 Birkerød, declare under our sole responsibility that the product

Declaração de Conformidade

Nós, MJK Automation ApS, DK-3460 Birkerød, declaramos sob nossa única responsabilidade que o produto

pHix® Compact pH / redox / temperature transmitter

som denne erklæring angår, er i overensstemmelse med følgende standard(er) eller andre normdokument(er).

to which this declaration relates is in conformity with the following standard(s) or other normative document(s).

a que se refere esta declaração está em conformidade com a seguinte norma (s) ou outro documento normativo (s) seguindo

EN 61000-6-4 2007 • EN 61000-6-2 2005

efter bestemmelserne i direktiv

following the provisions of Directive

seguindo as disposições da directiva.

2014/30/EU

Declaration de conformite

Nous, MJK Automation ApS, DK-3460 Birkerød, déclarons sous notre seule responsabilité que le produit

Dichiarazione di conformità

Noi, MJK Automation ApS, DK-3460 Birkerød, dichiariamo sotto la nostra esclusiva respon-sabilità che l'apparecchio

Declaración de Conformidad

Nosotros, MJK Automation ApS, DK-3460 Birkerød Naerum, declaramos bajo nuestra única responsabili-dad que el producto

pHix® Compact pH / redox / temperature transmitter

auquel se réfère cette déclaration est conforme á la (aux) norme(s) ou autre(s) document(s) normatif(s)

al quale questa dichiarazione si riferisce, è conforme alla seguente normativa(e) standard o ad altri documenti di normativa(e)

al cual se refiere esta declaración, está en conformidad con la(s) siguente(e) norma(s) u otros documentos normativos

EN 61000-6-4 2007 • EN 61000-6-2 2005

conformément aux dispositions de Directive

conformemente alla disposizioni della Direzione

según las disposiciones de la(s) directiva(s)

2014/30/EU

15.06.2016

Peer Lensbak, Product Manager

MJK Automation ApS • Blokken 9 • DK-3460 Birkerød • Tel: +45 45 56 06 56 • mjk@mjk.com • www.mjk.com

Introduction

Thank you for choosing a pHix® Compact pH / Redox transmitter. We have done everything possible to make a pH / Redox transmitter that can fulfill all your demands.

pHix® Compact is very simple to install and connect, as electrode, fitting and transmitter is built together in the same NEMA 6X / IP 68 class enclosure. By doing so, all error sources like e.g. bad cable connections and leaking fittings are eliminated.

As pHix® Compact is equipped with an union flange in one end and male thread in the other, the transmitter is very easily mounted in open tanks as well as pipes without the usual use of fittings.

You can always contact your representative or the MJK Service Hotline for advice and guidance. Also, take a look at www.mjk.com[1]

pHix® Compact is registered trademark of MJK.

Measurements and standards used

This manual uses both the US standard measurement system (inches), Fahrenheit and North American industry standards and the metric measurement system, Celsius and European industry standards and side by side.

Safety instructions

1. Read this manual carefully.
2. Be aware of the environment on the installation site. Wear necessary protective equipment and follow all current safety regulations.
3. pHix® Compact can provide a start signal for dangerous machinery. Always ensure that connected machinery and other equipment are effectively being put out of service (i.e. removal of main fuses, lock main- and/or security switches in off position) before commencing setting, fault finding, service and maintenance work etc.

1 http://www.mjk.com

Repair

Repair must only made by MJK or by a service representative approved by MJK.

Explosion hazardous areas

Note! pHix® Compact must **not** be installed in explosion hazardous areas!

Construction

pHix® Compact is a loop powered 4-20 mA 2-wire transmitter with power supply and measuring signal transmitted over the same two wires.

pHix® Compact also has HART® communication capabilities via the mA wires where both the primary measuring signal (pH or redox) and the secondary measurement signal can be read. HART® communication gives the possibility to configure nearly all parameters like measuring ranges, alarm limits, electrode parameters and also commands for buffer adjustment.

HART® communication requires that pHix® Compact is connected to a HART® communicator or a PLC with HART® interface.

pHix® Compact is delivered as standard for pH or redox measurement, but can also be delivered for other types of measurement and non-standard settings.

Product identification

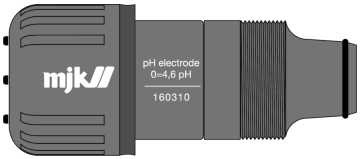
Check that the item(s) delivered corresponds to the ordered item(s). The item number is printed on a label that is sticked onto the packing. Shown in the following, is the label for a delivery including a pHix® Compact transmitter with pH electrode with zero point at pH 4,6:

1. Item number
2. Item description
3. Serial number
4. Electrode specification.
   An identical marking is found on the pH transmitter cable:

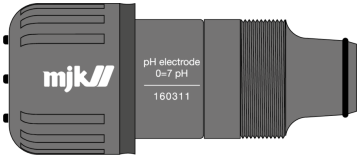
Mounting

Electrode types

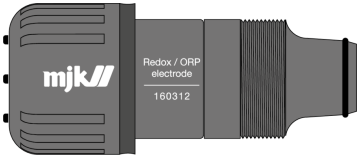
The electrode housing is marked with information about electrode type and measuring range for the actual electrode:



pH electrode, item no. 160310, 1 - 14 pH, 50-176° F / 10-80° C, 0 = 4.6 pH.



pH electrode, item no. 160311, 1 - 14 pH, 50-176° F / 10-80° C, 0 = 7.0 pH.



Redox electrode, item no. 160312, 176° F / 0-80° C.

Mounting the electrode

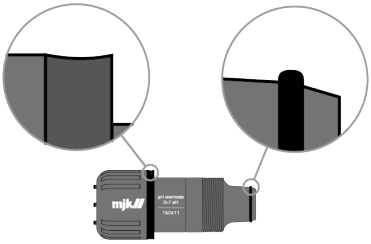
Upon delivery of pHix® Compact, the electrode is **not** mounted. pHix® Compact is configured for the electrode type included in the delivery, and

therefore it must **only** be used together with the electrode with which it was delivered.

Contact MJK if other electrode types should be used. Replacement of an electrode to another of the same type does **not** require reconfiguration.
The electrode must **not** become dry. Therefore, **do not** remove the protective cap before before commissioning of pHix® Compact.

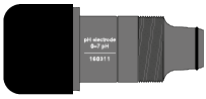
Gasket and O-ring

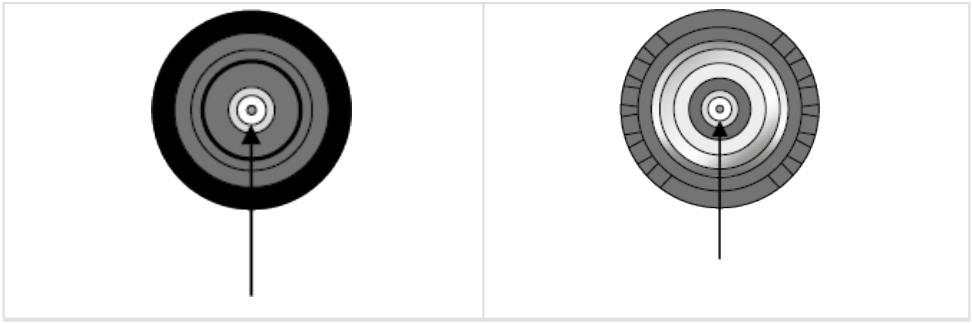
It is very important that both gasket and O-ring and packing surfaces are clean and smooth and without cracks and scratches to avoid penetration of liquid in the center plug connection.



Check that gasket and O-ring are complete and clean and that they are placed correctly.

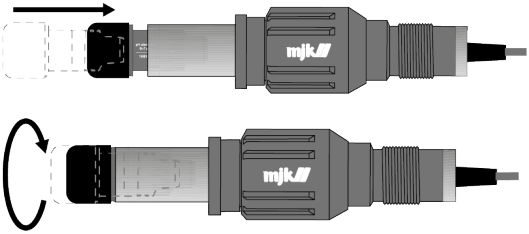
Likewise, the connectors in both transmitter and electrode should be absolutely clean and dry. Use a dry cloth if needed.





Check that the connectors are absolutely clean and dry.

1. Lubricate the O-ring in acid-free grease or Vaseline.
2. Check that the O-ring is placed correctly in the recess of the new electrode.
3. Check that the hole for the electrode in the pHix® Compact is completely dry – if necessary use a dry cloth.
4. Screw in the new electrode and tighten by hand. **Note!** Do **not** use tools!



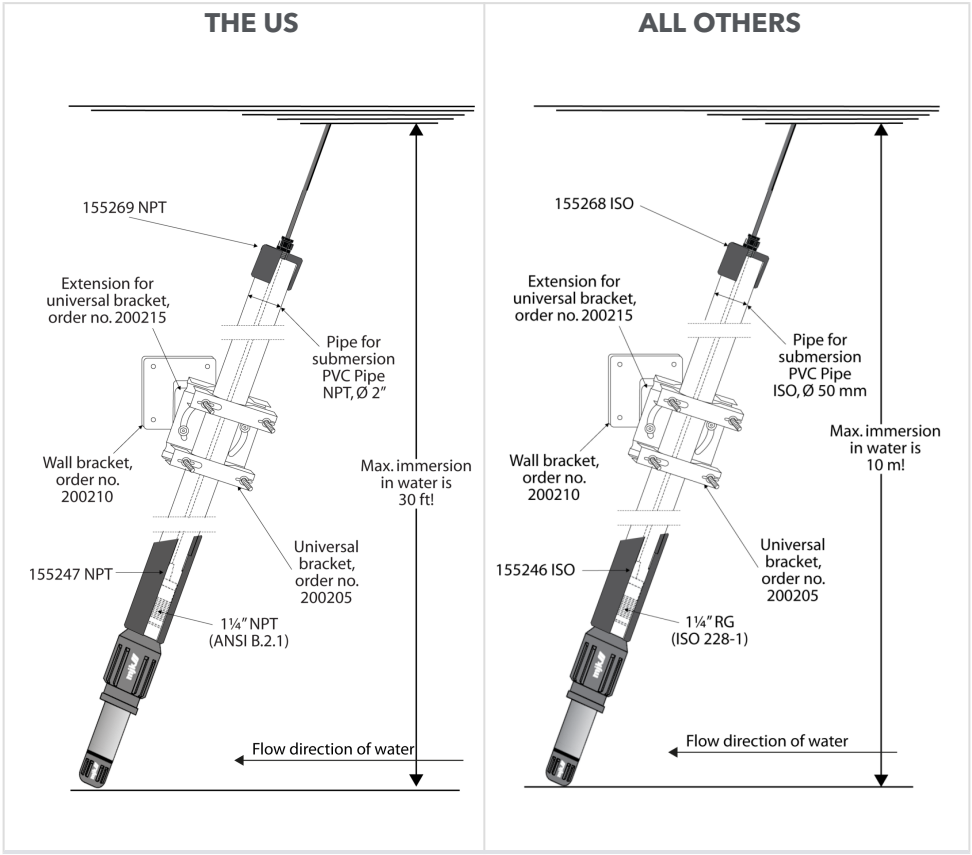
5. Finally, pHix® Compact must be buffer adjusted (see page 22) prior to commissioning.

Mechanical mounting

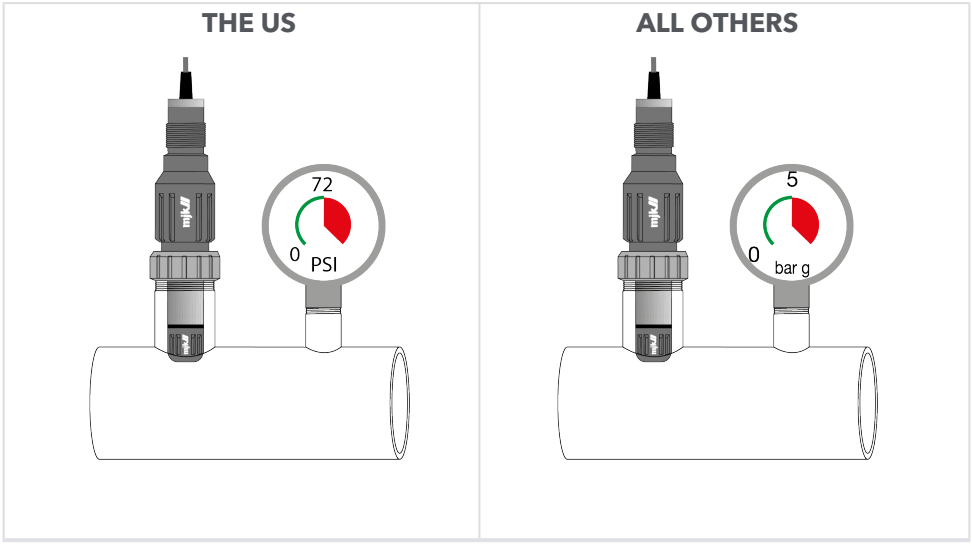
Mechanical mounting in general

Open and closed systems

pHix® Compact is designed for measuring in both open and closed systems. Open systems are, for example, gutters, wells, and reservoirs. Closed systems are, for example, pipe systems or tanks/vessels.



pHix® Compact has class IP 68 / NEMA 6X enclosure, and therefore withstands submersion into open system to a max. pressure of ***14 psi or 30 ft WG / 1 bar or 10 mWG.***

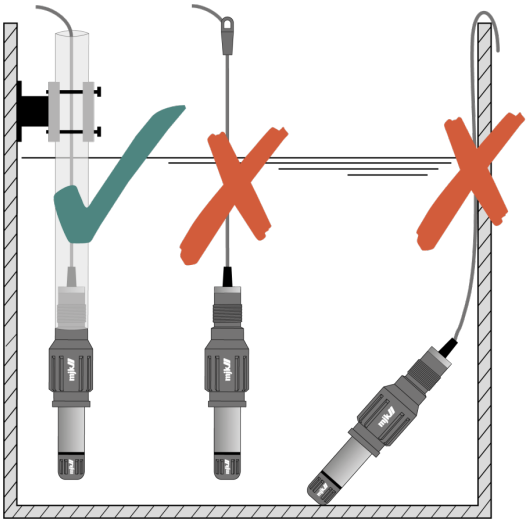


pHix® Compact conforms to pressure class PN 5, and can therefore be mounted in closed systems with a working pressure of ***max. 72 psi / 5 bar.***

Mounting in open channels and reservoirs

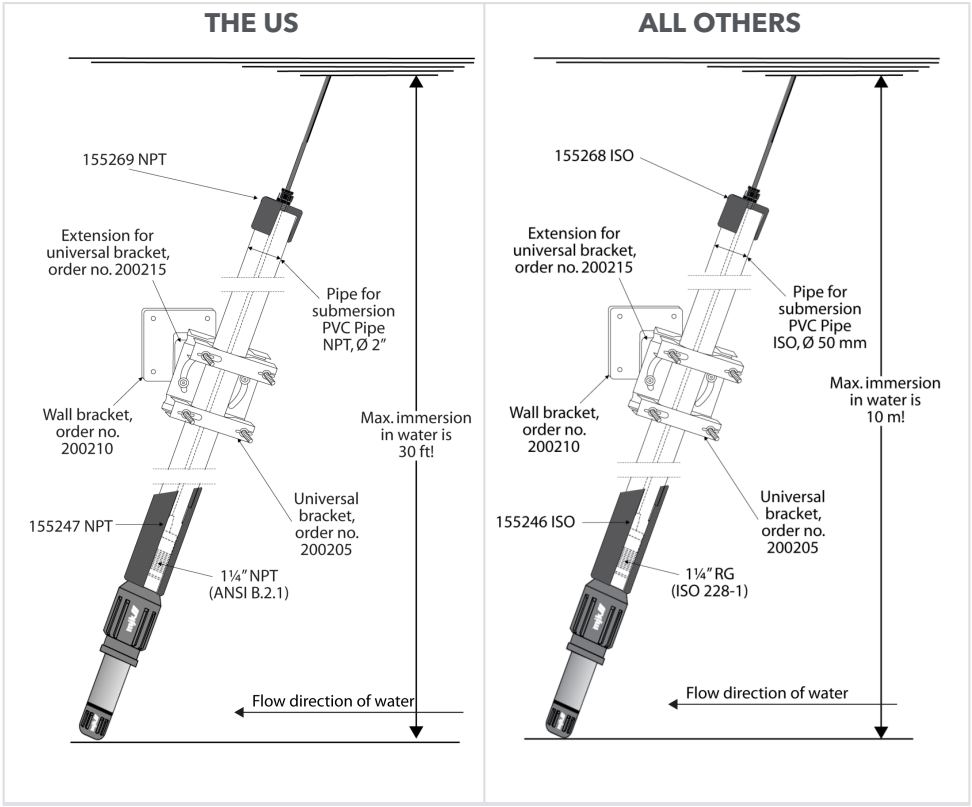
Due to the lifetime of the electrode and measurement accuracy, the following should be complied with when mounting pHix® Compact.

1. pHix® Compact should be mounted on a location with a good liquid circulation.
2. The electrode tip should be minimum 30 cm below the liquid surface.
3. The electrode tip must **not** touch the bottom.
4. The cable must **not** be suspended in a cable bracket.



Mounted on a pipe end

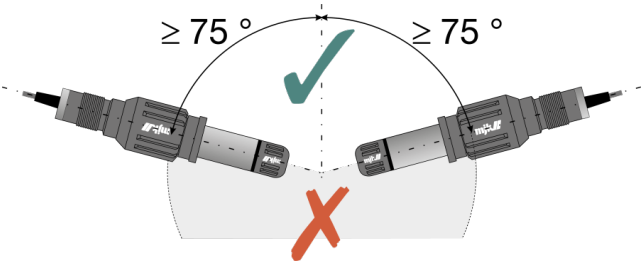
When measuring, pHix® Compact should be firmly fixed. Fixed mounting can be made by means of a pipe with 5/4" inner thread (ISO 228-1), and screwing pHix® Compact directly into the pipe.



pHix® Compact mounted directly on a immersion bracket (item no. 155205), which is fastened with universal bracket (item no. 200205) and wall bracket (item no. 200215).

Mounting in closed systems

The electrode is filled with a liquid which should cover the membrane internally at all times. Therefore, pHix® Compact should not be mounted in angles exceeding 75° from vertical.

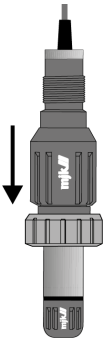


Because of the liquid inside the electrode, pHix® Compact should always be mounted in angles less than 75° from vertical.

pHix® Compact can be screwed into a pipe stub with 2" outer thread. This can happen by means of an union (item no. 521409) placed over the housing flange after removal of the switch ring.

Pull off the switch ring.

Put on the union.



Put on the switch ring if needed.

The switch ring is only used for buffer adjustment (calibration), but it is also possible to perform a buffer adjustment (see page 22) without using the switch ring.

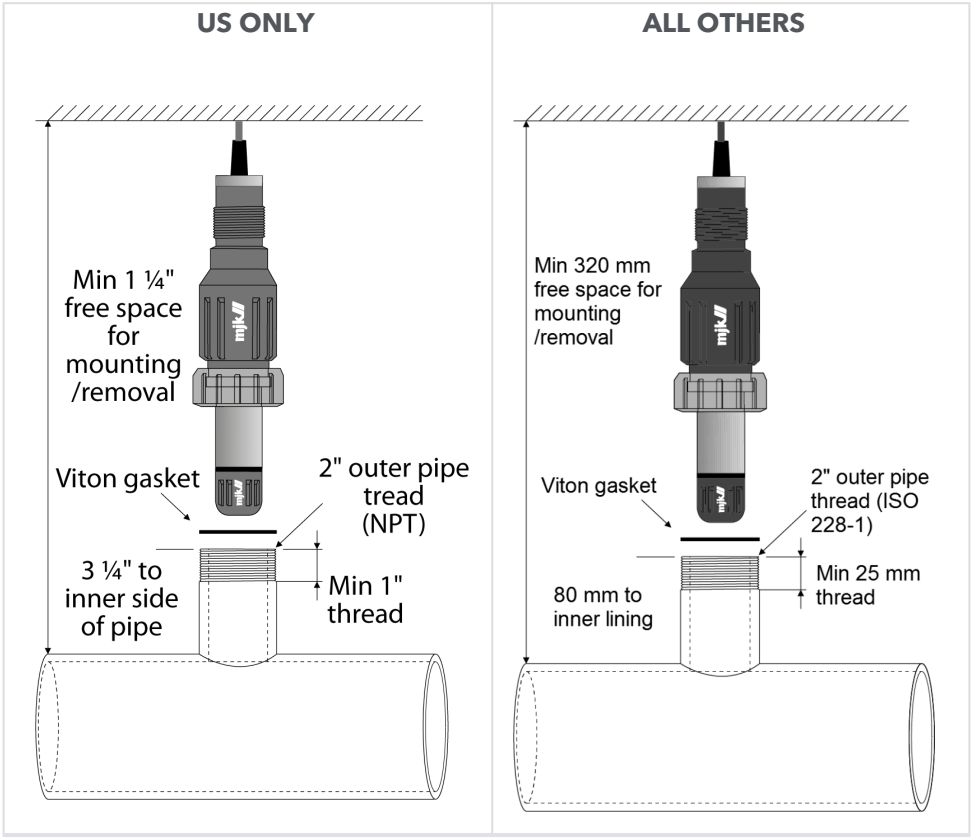
Mounting on pipe socket

In order to ensure a tight seal and correct function of pHix® Compact, the following should be complied with:

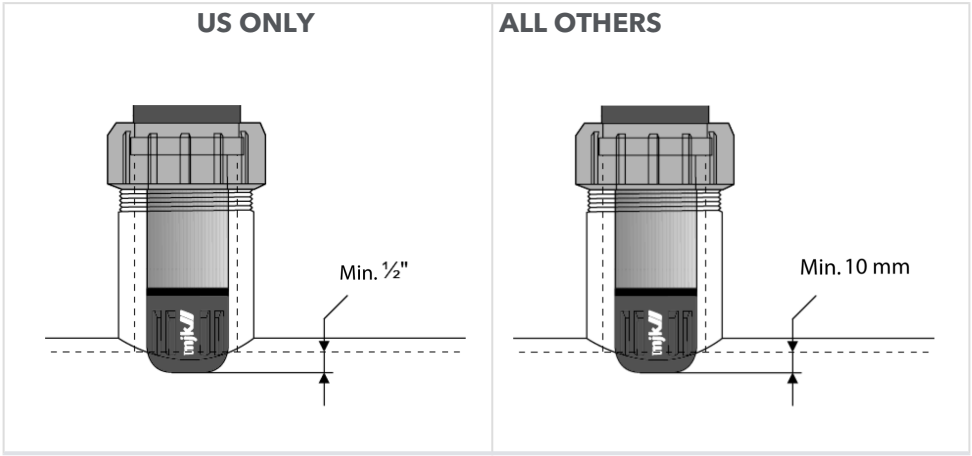
1. The pipe socket must be flushed and free of burrs, etc.
2. The pipe socket must have a length so that the tip of the electrode is immersed min. 10 mm into the liquid.

3. Take care to have adequate room for mounting and removal of pHix® Compact.
4. The working pressure of the system must not exceed **72 psi / 5 bar g .**
5. The working temperature of the system must not exceed **176° F / 80° C.**

See also the following illustrations for correct adaptation to the pipe system.



Max working pressure = 72 psi / 5 bar g. Max working temperature = 176° F / 80° C.



pHix® Compact is mounted correctly when the electrode tip is emerged min. ½" in / 10 mm under the pipes inner pipe wall.

Eletrical mounting

Electrical mounting in general

pHix® Compact must not be installed in explosion hazardous locations!
pHix® Compact should be connected to an active 4-20 mA input or supplied from a separate 12-30 VDC voltage source.
Max power consumption is 50 mW.
pHix® Compact 4-20 mA output(s) is galvanically separated from the liquids potential.

Signal cable

pHix® Compact comes with either 1 or 2 galvanically separated signal outputs.

pHix® Compact with 1 x 4-20 mA output for pH or redox measurement.

Nr.	Designation	PUR cable > 2017 color	PUR cable > 2018 color	Signal
1)	12-30 + V DC	1 black	Red	pH- or redox signal
2)	4-20 - mA	2 black	Black	Output 1
3)	Shield (**not** signal ground!)			

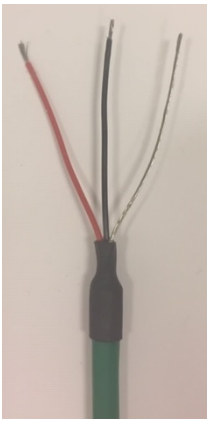
Note! pHix® Compact is delivered with cables made of PVC or PUR. Check the type of cable according to the specifications in the following before connecting pHix® Compact.

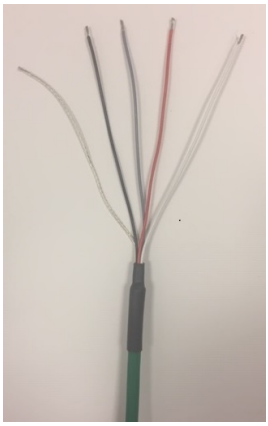
pHix® Compact with 2 x 4-20 mA outputs, one for pH or redox measurement and one for temperature measurement.

Nr.	Designation	PUR cable > 2017 color	PUR cable > 2018 color	Signal
1)	12-30 + V DC	1 black	Red	pH or redox signal
2)	4-20 - mA	2 black	Black	Output 1
3)	12-30 + VDC	Grey	White	Temperature signal
4)	4-20 - mA	Brown	Grey	Output 2
5)	Shield (**not** signal ground!)			

Cutting the signal cable

The cable comes with stripped wire ends ready for mounting.



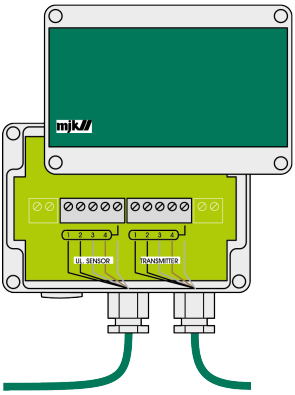


pHix® Compact uncut cable-end with one, respectively two, signal outputs.

Extending the signal cable

There are no specific demands to the cable that may be used for extending the existing cable, except that it should be shielded and that the voltage drop should not be too big.
Note! pHix® Compact is a passive transmitter. Considerations should be taken regarding the voltage drop over the signal cable.

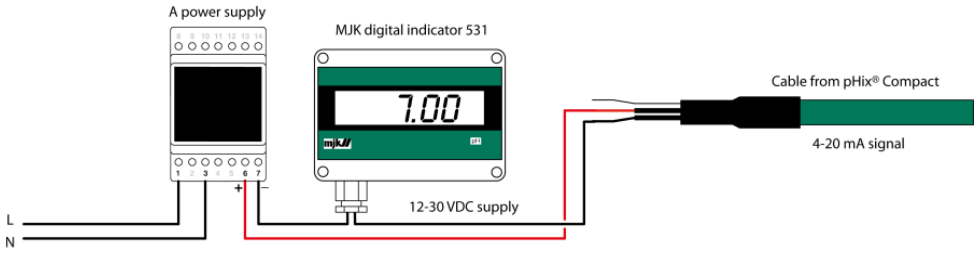
The supply voltage on the site must not drop below 12 V DC at maximum current (20 mA.)
In order not to compromise operational reliability, the cables should be interconnected by means of a watertight connection box (item no. 200590).



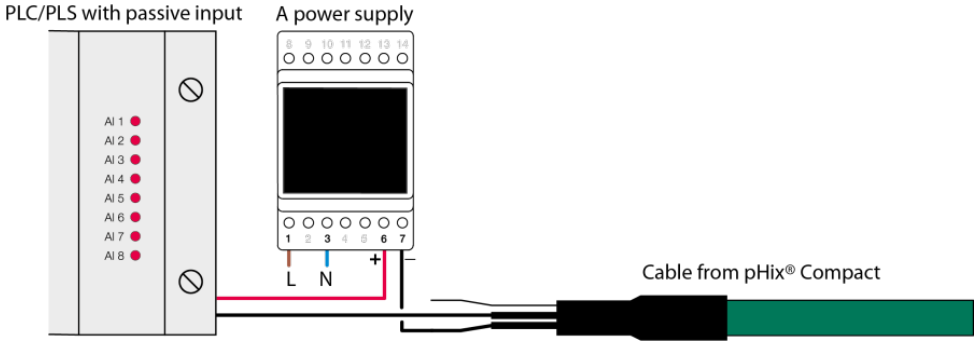
MJK connection box (item no. 200590).

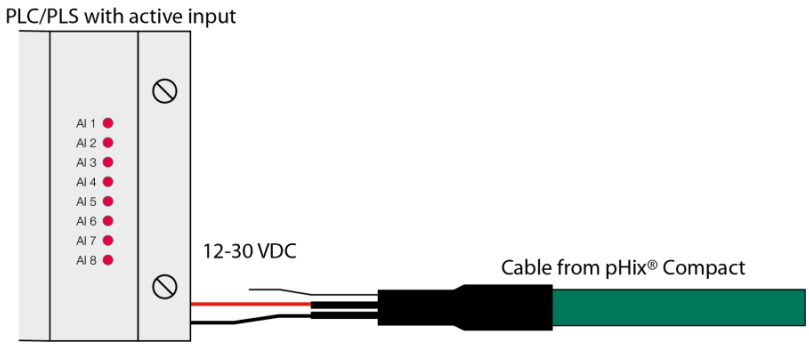
Connection examples

Local display



Connection to PLC_PLS





Buffer adjustment

Buffer adjustment in general

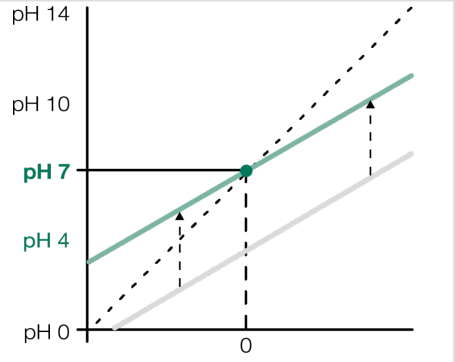
In order to ensure a precise and stable pH measurement, pHix® Compact must be buffer adjusted with regular intervals. Buffer adjustment is a calibration, which is carried out in practice by dipping pHix® Compact in solutions (buffers) with known pH values. The calibration is made by using these known pH values as a reference point.

pHix® Compact is buffer adjusted using two buffers with pH values of 4 and 7 (acidic range) or pH values of 7 and 10 (alcalic range). For measurements around pH 7 (neutral), both buffers can be used.

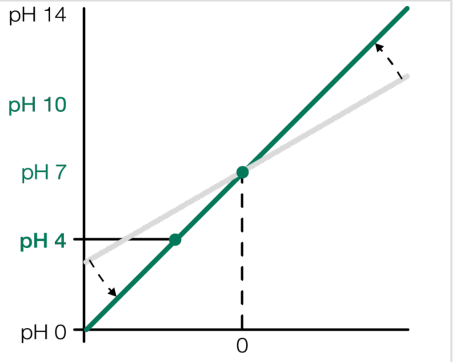
The sequence of different pH buffer solutions is not important. pHix® Compact automatically detects which buffer is used for adjusting the point of origin, and which buffer is used for adjusting the slope (sensitivity).

The first reference point sets the correct zero point for the measurement curve, and the second reference point sets the correct slope for the measurement curve.

pHix® Compact is, as standard, delivered to use buffer values at 4, 7 and 10, but other values can be chosen via HART® communication.



First buffer adjustment with pH 7 as reference.



Second buffer adjustment with pH 4 as reference.

Buffer liquid

Buffer liquid is delivered as ready-to-use solutions with the pH values 4, 7 and 10.

During the buffer adjustment, pHix® Compact is calibrated in accordance with the pH values of the buffer solutions. It is therefore important to use as accurate buffer solutions as possible, i.e. to ensure that a pH 7 buffer solution in fact has a pH value of exactly 7.

MJK delivers buffer solutions for both pH and redox calibration.

The pH value of the buffer liquid is dependent of the temperature, and the stated pH value is valid at 77° F / 25° C.

Buffer liquid has a limited lifetime. Buffer liquid for pH 4 and 7 has a life time of app. one year, and buffer liquid for pH 10 a somewhat shorter lifetime.
Note! Buffer liquid with pH 10 is very unstable and should therefore be disposed of no later than one hour after it has been poured from the bottle.

Cleaning

Before starting buffer adjustment, wash the electrode in running water and wipe it with a cloth before immersing it in the buffer solution. Washing and wiping must be repeated between each step of the buffer adjustment.

Use only fresh buffer solutions! Dispose of any used buffer liquid. Observe that transmitter, electrode and buffer solution has the same temperature - preferably app. 77° F / 25° C.

Buffer adjustment using the switch ring

Remember to clean the electrode as described in the previous section!
When the switch ring has been on for at least 10 minutes, it will only be possible to buffer adjust pHix® Compact with the switch ring. The switch ring has four positions, and must only be set to one of these positions in order to obtain correct function:

Position	Function
M	Measurement. The switch ring should always be in this position during normal service (measuring). This is indicated by the LED flashing app. every 5 seconds.
4	Buffer adjustment in buffer with pH value 4.
7	Buffer adjustment in buffer with pH value 7.
10	Buffer adjustment in buffer with pH value 10.

If the switch ring is set to one of the positions 4, 7 or 10, the LED will give out three short flashes every 5 seconds.

If pHix® Compact is being put into a buffer liquid with the same value as the switch ring is set to, pHix® Compact will automatically begin to scan for a buffer with the same value. When the value is found, pHix® Compact will automatically

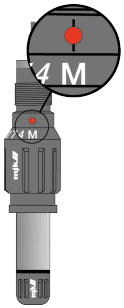
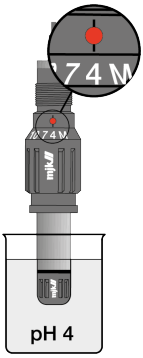
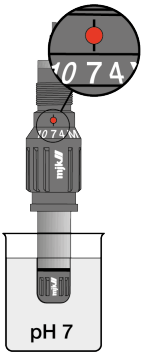
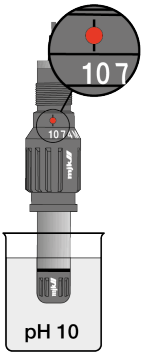
set the 0-point or span to the correct value, and the LED will indicate this with two short flashes every 5 seconds.

pHix® Compact is now ready either for measurement or for another buffer adjustment at another pH value.

pHix® Compact determines automatically if zero point or span needs to be adjusted depending of the electrode's zero point and the preceding buffer values.
If pHix® Compact cannot find the pH value for the selected buffer solution, it will go into alarm mode, which is indicated with continuous LED flashes every second.
Note! There is only need for calibration of two (buffer-) values, for example, 4-7 pH / 7-10 pH.

Example of buffer adjustment in pH 4 and 7

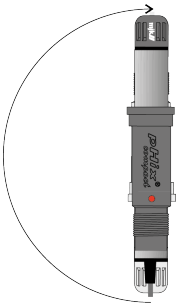
1. With the switch ring in position **M**, flush the electrode tip in water. Carefully, wipe of the electrode tip with a cloth. Never use materials that can scratch the measuring lens. (The LED gives one short flash every 5. sec.)
2. Turn the switch ring from position **M** to position **7**, and dip the electrode tip into the pH 7 buffer solution. (The LED will now begin to give three short flashes every 5 sec.). When the buffer adjustment has finished successfully, the LED will start to give two short flashes every 5 sec. The zero point is now set.
3. Carefully, wipe of the electrode tip with a cloth. Never use materials that can scratch the measuring lens. Turn the switch ring from position **7** to position **4**, and dip the electrode tip into the pH 4 buffer solution. (The LED will now begin to give three short flashes every 5 sec.). When the buffer adjustment has finished successfully, the LED will start to give two short flashes every 5. sec. The span angle is now set.

	
In service (measurement). One flash every 5. second.	*Buffer adjustment in pH 4 buffer.*
	
Buffer adjustment in pH 7 buffer.	*Buffer adjustment in pH 10 buffer.*

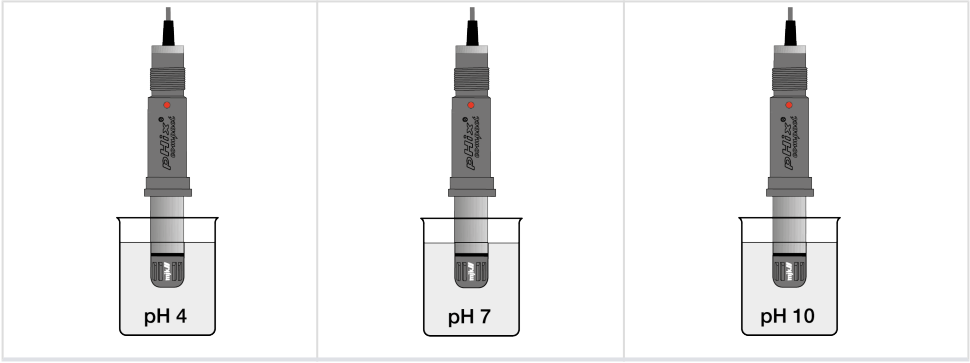
Buffer adjustment using the tilt switch

Remember to clean the electrode as described earlier!
Only the built-in tilt switch is active when the switch ring has been removed for more than 10 minutes.
The tilt switch inside pHix® Compact detects when the electrode tip is turned upwards. When the electrode tip has been turned upwards for more than 30 seconds, pHix® Compact will go into buffer adjustment mode.

Proceed as described:
Remove pHix® Compact from the process, rinse the electrode, and turn the electrode upside-down.



The buffer adjustment mode is initiated after app. 30 seconds - this is indicated by the LED with 3 short flashes every 5 seconds.



If pHix® Compact is dipped into a buffer solution with a value of 4, 7 or 10 pH, pHix® Compact automatically searches for a buffer with one of those values. When the correct value is found, the zero point or span will automatically be set to the right value. The LED will give one short flash every 5 seconds for indication of a successful calibration.

pHix® Compact is now ready to be put into service or for another buffer adjustment with another pH value.

Maintenance

Maintenance in general

Intervals

The interval between buffer adjustments and cleaning depends widely on the working conditions. Therefore, the easiest way to find the most appropriate cleaning interval is by feeling one's way.
For instance, start out by cleaning and buffer adjusting every week.

If measurements are unchanged or just slightly changed after buffer adjustment, the electrode were not dirty or just slightly dirty, and the cleaning interval can be changed to two weeks and after that, one month.
The intervals are equally reduced if the electrodes are very dirty and the measurements are significantly changed after buffer adjustment.

There are no general guidelines to cleaning and adjustment, but in most cases, a monthly adjustment is sufficient. Before beginning a buffer adjustment, the electrode must be thoroughly washed:

1. first in running water
2. then, if necessary, in a degreasing fluid, like, for example a 10% hydrochloric acid solution
3. then, before the electrode is put into the buffer solution, and again in between every step of the buffer adjustment, rinse with water and dry with a dry cloth.

Redox electrodes

Like pH electrodes, Redox electrodes require cleaning but not buffer adjustment. However, MJK does deliver redox buffers for control of electrode and transmitter.

If the transmitter does not show the correct value when put into the buffer solution, the electrode must be exchanged.

Cleaning of the electrode

Electrode lifetime

The expected lifetime of the electrodes is dependent of the measurement. The lifetime is given with reservation as the physical conditions as well as the temperature, pressure and pollution of the fluid has great influence on the stated lifetime.
The lifetime is based on **77° F / 25° C**, but if the temperature is doubled, the lifetime is halved!

pH electrodes in purifying plants for ordinary household waste-water lasts approximately one year, whereas the lifetime of pH electrodes in industrial plants is dependent on measuring application and the process. Redox electrodes have a lifetime of approximately two years, depending on cleaning.

Electrode spare parts

Item no.	Description
160310	pHix® pH electrode, 0-point=4,6 pH
160311	pHix® pH electrode, 0-point=7,0 pH
160312	pHix® redox electrode
571030	Black rubber gasket for electrode
521409	Union ring w. Viton gasket for mounting of pHix® on pipe **- NOT AVAILABLE IN THE US**
521441	Viton gasket for union ring **- NOT AVAILABLE IN THE US**

The following is recommended for cleaning and buffer adjustment:

Item no.	Description
163032	pH buffer, 0,25 liter pH 4 **- NOT AVAILABLE IN THE US**
163034	pH buffer, 0,25 liter pH 7 **- NOT AVAILABLE IN THE US**
163036	pH buffer, 0,25 liter pH 10 **- NOT AVAILABLE IN THE US**
163040	Redox buffer, 6x20ml +180 mV Pt/Kalomel/ +220mV PT-Ag/AgCL **- NOT AVAILABLE IN THE US**

Note! For further accessories, see **pHix Compact Datasheet** which can be downloaded from our Download Center[2] under **Datasheet.**

Electrode storage

When a pH-electrode is not in use and is kept in storage, always put the electrode in a 1/10 3mol KCL-solution and 9/10 buffer 4. If a storage solution is not available, a buffer 4 can be used temporarily.
Note! Never store the electrode in water.

Specifications

pHix® Compact	
Supply voltage	12-30 V DC
Consumption	App. 50mW
Temperature range	-4 … +176° F / -20 … +80° C

2 https://mjk.com/download-center?mainCatId=3104&catId=all&lang=english

pHix® Compact	
Housing material	Housing exists in two variants: 1. with Ryton (PPS) only 2. with Ryton (PPS) and stainless steel (EN 1.4404 / ASTM 316L) combined.
Enclosure	NEMA 6X / IP 68, withstands submersion to 10 mWG
Input	0-14 pH/-1000 ... +1000 mV
Input, impedance	Measuring input: > 1012 ohm. Reference input: > 106 ohm
Output	0-14 pH / 4-20 mA. Furthermore, for variants with temperature output: 32-122° F / 0-50° C = 4-20mA
Temperature comp.	-4 … +176° F / -20 … +80° C
Temp. electrode	Built-in to electrode holder
Buffer adjustment	Automatic with tilt switch, switch ring or HART® command
Cable length	19.7 feet / 6 meter
CE approvals	EN61000-6-4 2007-02-19, EN61000-6-2 2005-09-08 following the provisions of Directive 89/336/EEC; 2004/108/EC, 1999/EC

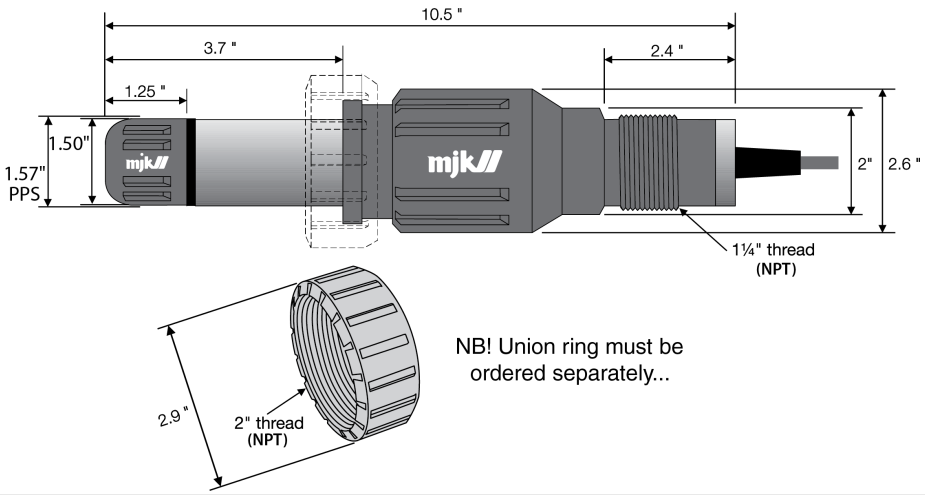
Note! See also **pHix Compact Datasheet** which can be downloaded from our Download Center[3] under **Datasheet.**

Dimensions

Measurements are in mm /inches.

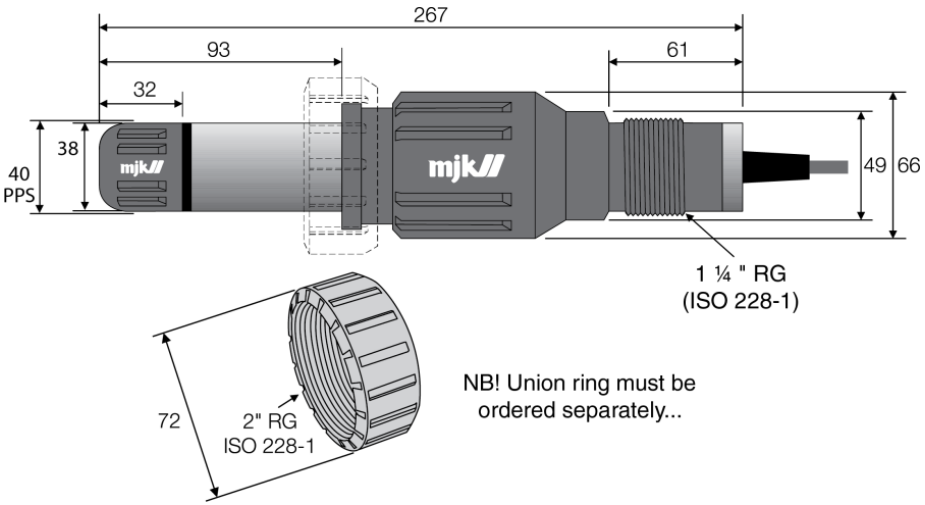
3 https://mjk.com/download-center?mainCatId=3104&catId=all&lang=english

US ONLY



NB! Union ring must be ordered separately...

ALL OTHERS



NB! Union ring must be ordered separately...

Appendencies

Error codes

Symptom/mA signal	Fault	Remedy
Constant current signal or 1 = 0 mA	Electrical connection is not made correctly	Check connection and make the necessary corrections
Unsteady current signal	Undervoltage	Check the voltage at transmitter. Min. voltage @ max. load > 12 V DC
I = 3.80 mA	Undervoltage	Check the voltage at transmitter. Min. voltage @ max. load > 12 V DC
I = 3.85 mA	Electrode error	Exchange the electrode
I = 3.90 mA	Calibration not possible	Exchange the electrode
I = 3.95 mA	pH lower than measuring range	Readjust the measuring range to a lower range
I = 4.00 mA	Error on startup	Disconnect the transmitter from PSU for min. 5 seconds and try again
I = 22.00 mA	pH higher than measuring range	Readjust the measuring range to a higher range

Standard transmitter configuration

The transmitter is standard configured as described below on delivery:

AVAILABLE IN THE US ONLY:

- **pH transmitter, item no. 203111**
  - Measuring range: 0-14 pH = 4-20 mA, 0-point = 4,6 pH

- **pH and temperature transmitter, item no. 203113**
  - Measuring range: 0-14 pH = 4-20 mA, 0-point = 4,6 pH
  - Temperature: 32-122° F = 4-20 mA
- **Redox transmitter, item no. 203121**
  - Measuring range: -1000 to +1000 mV = 4-20 mA

ALL OTHERS:

- **pH and temperature transmitter, item no. 203110:**
  - Measuring range: 0-14 pH = 4-20 mA, 0-point = 4,6 pH
- **pH transmitter, item no. 203112:**
  - Measuring range: 0-14 pH = 4-20 mA, 0-point = 4,6 pH
  - Temperature: 0-50° C = 4-20 mA
- **Redox transmitter, item no. 203120:**
  - Measuring range: -1000 to +1000 mV = 4-20 mA

HART® commands

All commands and settings can be read and set by means of HART® commands. Ask for separate documentation regarding HART® commands.

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Xylem |ˈzīləm|

1) The tissue in plants that brings water upward from the roots;

2) a leading global water technology company.

We're 12,700 people unified in a common purpose:

creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work.

We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to www.xyleminc.com

mjk a xylem brand

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