

# *Operator Quick Guide*

## IN-LINE TC SENSORS



# General Information

## About This Guide

The information in this guide has been carefully checked and is believed to be accurate. However, Hach Ultra assumes no responsibility for any inaccuracies that may be contained in this guide. In no event will Hach Ultra be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect or omission in this guide, even if advised of the possibility of such damages. In the interest of continued product development, Hach Ultra reserves the right to make improvements in this guide and the products it describes at any time, without notice or obligation.

## Basic Principle of Operation

In general terms, the thermal conductivity of a gas is the ability of that gas to transfer heat.

Each gas has a different thermal conductivity. Only gases having distinct thermal conductivity rates can be detected using this method.

The sensor's measuring technique is a combination of a gas diffusion membrane and a gas thermal conductivity detector. The small volume enclosed between the diffusion membrane and the thermal conductivity detector is periodically flushed with a purge gas.

After each purge, the gas to be measured diffuses from the sample through the membrane, changing the thermal conductivity of the gas surrounding the detector. It is the rate of change of the thermal conductivity that allows the concentration of the gas to be calculated.

## Positioning Information

Unless the sensor is part of an Orbisphere complete system, it must be installed in a suitable socket or flow chamber that will allow contact with the sample fluid or gas to be analyzed.

Check that the sensor will be mounted:

- perpendicular to the pipe
- horizontal
- on a horizontal pipe section (or on a flow-ascending vertical pipe)

- minimum 15 meters away from pump's discharge side
- in a place where sample flow is stable and rapid, and as far as possible from:
  - valves
  - pipe bends
  - the suction side of pumps
  - CO<sub>2</sub> injection system or similar

### Note :

*There may be situations where not all the above conditions can be met. Please consult your Hach Ultra representative to appraise the situation and define the best applicable solution.*

## Storage Information

During a short shutdown period (such as weekends), the sensor may stay in place with the instrument turned on, and purge gas supplied. If the inactive period is likely to last longer, remove the sensor, wipe it dry and store it properly, using the plastic storage cap supplied.

### CAUTION :

*We recommend you use the Orbisphere 32605 Purge Safety Backup Unit to ensure that the purge gas supply to the sensor will not get interrupted in case of a mains power outage.*

Instructions for sensor storage:

- If the sensor's head shows deposits, rinse it under tap water
- Wipe the sensor head dry
- Put a small silica desiccant bag inside the storage cap
- Put the storage cap in place
- Store the sensor in a safe dry place
- The storage place must be at a stable room temperature

### CAUTION :

*Pay attention to rapid temperature change situations, such as Air Conditioning being turned on and off daily, that may create condensation inside the sensor's cell and damage the electronics inside.*

## Purge Gas System

### CAUTION :

*It is imperative that when a TC sensor is placed in a liquid sample, a constant supply of dry purge gas is available at all times. Failure to do this will cause damage to the thermal conductor chip.*

### Purge Gas Supply

Make sure there is no interruption to the purge gas supply. The use of a backup gas cylinder and an automatic changeover valve, that activates when the first cylinder is empty, are recommended.

A source of dry and filtered gas (pure at 99.8%) is required with a flow rate set at 10 to 50 ml/min., and a pressure regulated at 2 bar gauge. Do not exceed this, since excess pressure will deform the membrane and give inaccurate measurements.

To check the flow rate, put the exit tube into a cup of water. With the instrument turned on, you should see at least three bubbles per second during the purge cycle.

### Note :

*Do not leave the exit tube in water, as there is a risk that moisture will get sucked back into the sensor.*

### Orbisphere Purge Gas Regulator

The role of the Orbisphere 29089 Gas Regulator (illustrated below) is to deliver purge gas filtered at 40 µm.



The gas flow is indicated by an arrow on the regulator's body.

Drain the condensate periodically. Unscrew the drain at the bottom of the bowl, by hand.

If the filter is contaminated:

- Turn off the gas supply
- Unscrew the bowl by hand
- Unscrew the black disc at the bottom
- Remove the white composite filter
- Wash under clean tap water, blow dry, and re-install

### Purge Safety Backup Unit

In the event of a mains power outage, the 32605 Purge Backup Unit (illustrated below) ensures that the purge gas supply to the sensor is not interrupted at any time. The cycle is slower than usual (around one minute), for approximately four days.



The green LED is on as long as the battery charge is OK. The red LED is on when charging is needed. To save batteries, both LEDs are out when the backup unit is in use, and mains power is out.

The 32605 Purge Backup Unit is connected between the instrument and the sensor. The internal batteries are automatically charged through the sensor cable when the instrument is turned on.

# Membrane Replacement - Removal

## General

Service includes membrane replacement and external cleaning to restore the original sensor sensitivity. This means low running costs and down time reduced to a minimum.

The membrane(s) needs to be replaced once or twice a year depending on application conditions. This can be tailored accordingly.

Periodically, inspect visually the sensor head for any deposits. Rinse it under clean tap water, and dry with a clean tissue.

To verify if the membrane(s) needs to be replaced, check sensor measurements against a known standard sample value. If the deviation exceeds 10% of the original value, replace the membrane.

## Mounting Dual Membranes

In order to prevent unwanted stretching of the membrane on a hydrogen sensor it is recommended to simultaneously mount a support membrane beneath the primary membrane.

The primary membrane, or top membrane, determines the rate at which the H<sub>2</sub> gas enters the measurement chamber of the sensor. The secondary membrane, or support membrane on the bottom, is extremely permeable and is installed to stabilize the position of the primary membrane.

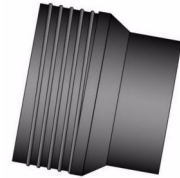
The support or secondary membrane for all H<sub>2</sub> measurement applications is the 29562A.

### CAUTION :

*Carry out any maintenance in a clean dry place in order to avoid damaging the sensor's precision components, and also to prevent water or humidity from getting into the sensor.*

To remove the membrane, place the thermal conductivity sensor vertical with the head up.

Remove the plastic storage cap.



Unscrew the protection cap, using the tool provided in the maintenance kit.

### CAUTION :

*Never remove the protection cap, unless you plan to replace the membrane.*



Pay attention to the components inside the protection cap. Note the assembly order of each item.

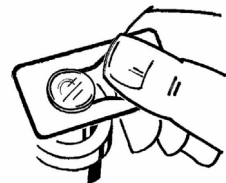
### Note :

*The illustration on the right is an example only. Your configuration may differ.*



Pull up the membrane holding ring with the tool provided in the maintenance kit.

Remove membrane(s).



## Membrane Replacement - Installation

### Note :

*The membrane mounting surface must be clean and even (on top of the sensor, where the membrane and sensor have contact).*

Replace the membrane O-ring on the sensor head with a new one.

### Note :

*The 29039.0 Nitril O-ring can be reused if it is still in good condition. Membrane O-rings are part of the protection cap kit.*



In the maintenance kit, pick up the two part membrane mounting tool.

Install the sleeve over the sensor head (end with shoulder downwards).



To mount a **single** membrane:

- Take a few membranes out of the storage box.
- Using tweezers included in the kit, pick up one membrane from the stack, and gently place it on the sensor tip.
- Make sure it is centered.

To mount **dual** membranes:

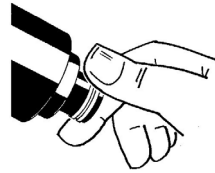
- Remove one 29562A secondary membrane along with one piece of the separation paper from its box. Place the membrane and paper, paper side down, on a clean flat surface.
- Remove a primary membrane along with its separation paper.
- With the separation paper on top of the primary membrane place the primary membrane directly over the secondary membrane, taking care to center the two membranes.
- Rub your finger on the paper of the primary membrane to remove any air bubbles between the membranes. The two membranes should now be sandwiched together and appear as one membrane.
- Pickup the sandwiched membranes with tweezers and remove the separation paper.
- Gently place them on the sensor tip ensuring the secondary membrane (29562A) is on the bottom.
- Make sure they are centered.



## Membrane Replacement - Installation (cont)

The membrane holding ring comes in two slightly different internal diameters, depending on the membrane(s) total thickness. For a correct membrane installation, be sure to use the correct holding ring for the application. If mounting dual membranes, always use mounting ring part number 29229.

Place the membrane holding ring on the installation tool tip.



### CAUTION :

*To avoid damaging the membrane, make sure that the tool tip is totally clean and its surface is even.*

Insert the installation tool inside the guiding sleeve.

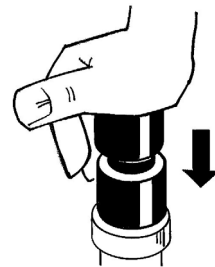


Push the installation tool firmly downwards. This clasps the mounting ring onto the sensor head, folding the membrane(s) over the sensor tip.

Remove the installation tool and guiding sleeve.

Visually check for correct ring placement, try to push it down with your fingers.

Check that the membrane is tight, with no wrinkles.



### Note :

*Once installed, a membrane cannot be reused.*

*Avoid touching membranes with bare fingers, as this may affect its sensitivity.*

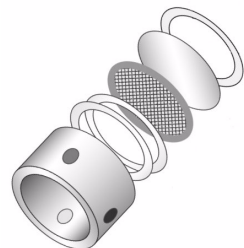
Prepare the protection cap for installation. All parts must be absolutely dry and clean.

Replace all the parts inside the protection cap with new ones (except the grille), and place them back, in the order they were removed.

The Tefzel washers, under the cap, should be slightly lubricated with silicone grease.

### Note :

*The illustration on the right is an example only. Your configuration may differ.*



## Membrane Replacement - Installation (cont)

Tighten the protection cap finger tight.

Then, complete the process using the tool provided in the maintenance kit. Insert into each of the four holes in turn, and tighten as far as possible. Tighten each hole only once.

**Note :**

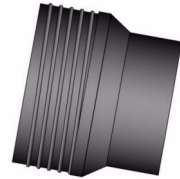
*The grille inside the protection cap should be free to move during tightening. Therefore, and to avoid damage to the membrane, do not touch the grille during the tightening process.*



Always store the sensor in a dry environment, with the storage cap installed.

**Note :**

*For additional storage requirements, see also the information at the beginning of this guide.*



**Note :**

*A sensor that has been taken apart or serviced must always be calibrated. Allow the sensor to settle for 30 minutes to allow measurements to stabilize and the membrane(s) to relax, before performing the sensor calibration.*

Calibrate the sensor to check that the membrane has been installed correctly and not been damaged.

If an error message (like those illustrated right) appears on your instrument, then the membrane has been damaged or incorrectly installed.

CALIBRATION  
OUT OF BOUND

Warning



Calibration failure  
Ratio out of bounds.

OK

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