

Inspired by **temperature**

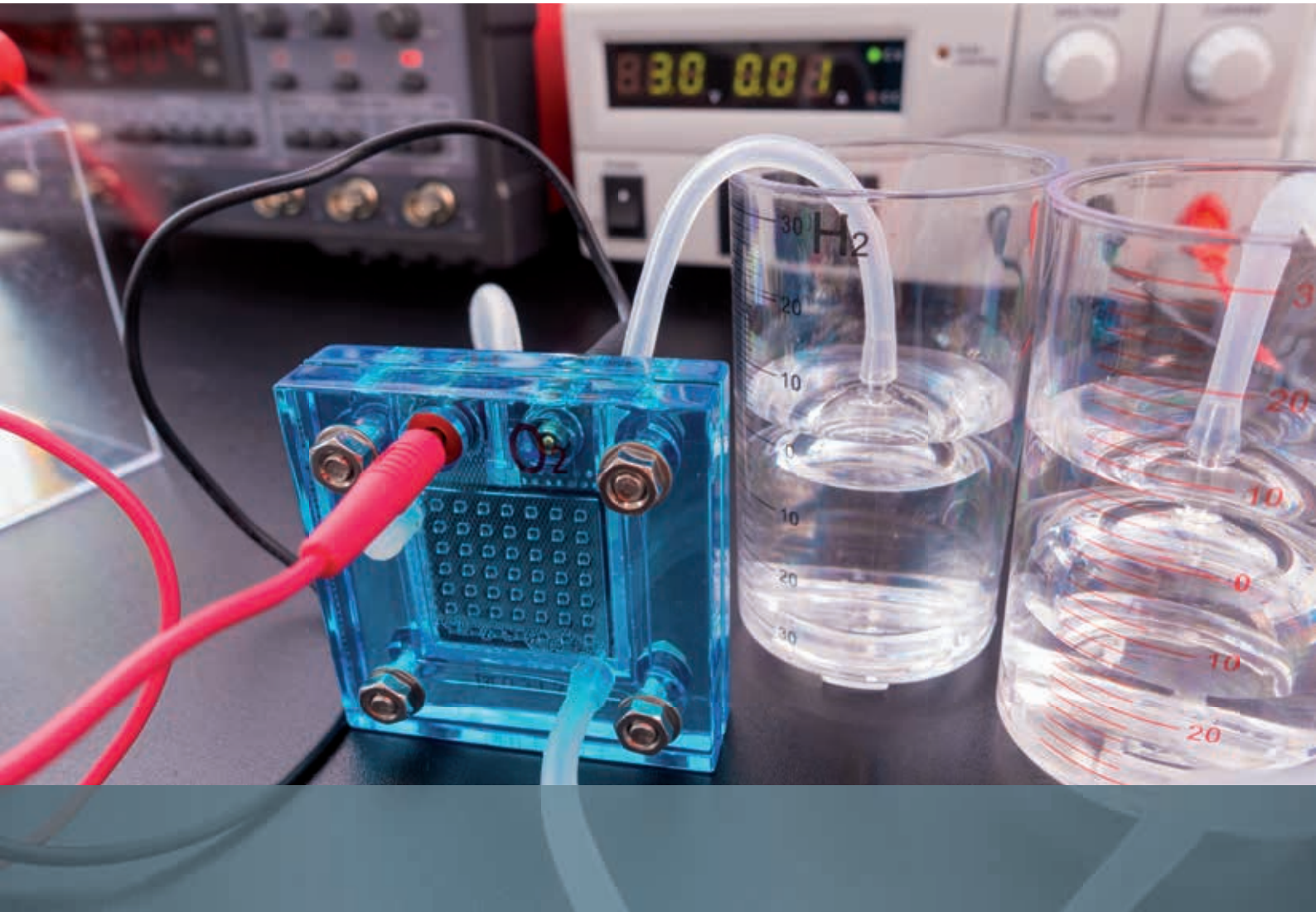


# High precision **Temperature control solutions**

for hydrogen applications and fuel cells

**huber**

# Precise solutions for hydrogen applications



## Temperature control solutions for hydrogen applications

The hydrogen industry faces an exciting future, and correct temperature control plays a major role. In this brochure, you will learn more about the importance of temperature control in various sectors of the hydrogen industry.

Discover the world of temperature control technology in the hydrogen industry and find out how it contributes to sustainable future viability.

In the hydrogen industry and in the fuel cell sector, there are numerous applications for Huber temperature control units. Typical applications are, for example, environmental simulations, material tests and temperature-dependent stress and load tests for materials, gears, bearings, fuels and engine parts.

Another application area is research tasks, test series and quality controls on batteries, rechargeable batteries, sensors and electronic components. Scientists and engineers all over the world rely on our temperature control technology for the construction and operation of test benches.



## Hydrogen filling stations

Modern cooling systems are crucial for the smooth operation of hydrogen filling stations. We demonstrate how our customised temperature control solutions help to reliably cool the compressors and ensure the hydrogen supply.



## Fuel cell

Experience how our temperature control units are used in climatic and environmental tests, material tests and performance tests of fuel cells. The correct temperature control is crucial for the quality and reliability of hydrogen components.



## Electrolysis

Efficient cooling is essential for the electrolyzers that produce hydrogen. Innovative cooling solutions play an important role in the cooling of electrolyzers and compressors. The aim is to make hydrogen production as efficient as possible.

Electrolysis is used to produce hydrogen. The energy carrier/storage medium produced can be used for example as a fuel (fuel cell).

Electrolysis is an electrochemical process in which a chemical compound is separated into its components with the help of electrical energy.

# Temperature control systems

## Unistats

The introduction of Unistat technology in 1989 heralded a revolution in liquid temperature control. Unistats are the ideal solution when it comes to fast and highly accurate temperature control of externally connected applications. Compared to classic circulation thermostats, Unistats impress with extremely fast temperature changes and wide temperature ranges without fluid changes.

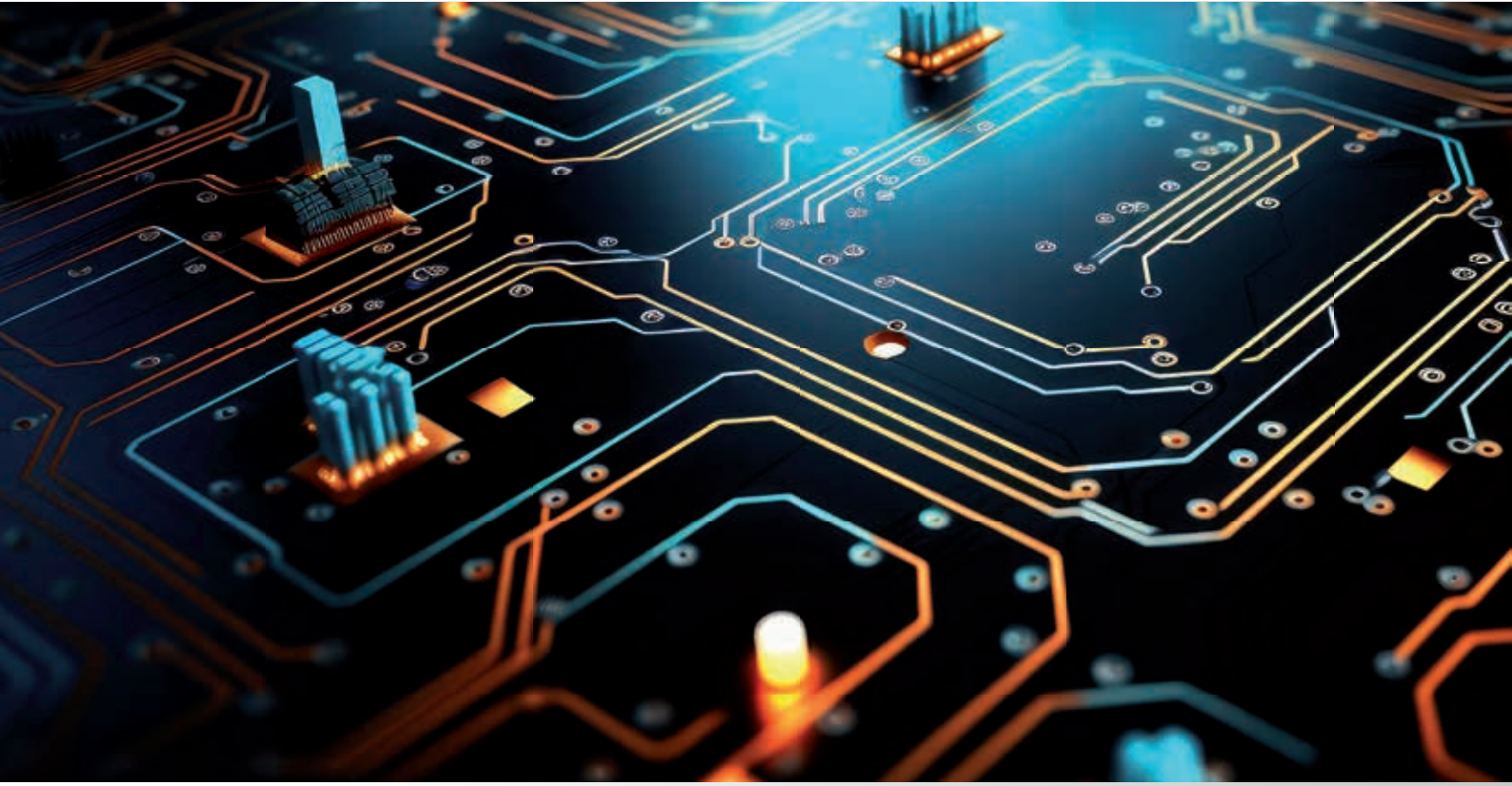
Unistats are predestined for applications in process engineering, e.g. for controlling the temperature of reactors, autoclaves, miniplant/pilot systems, reaction blocks and calorimeters. There is a choice of over 70 models with cooling capacities from 0.48 to 130 kW. Unistats therefore enable professional scale-up from the research laboratory to the production plant with consistently stable process conditions at all times.

- ➔ Responsive thermodynamics for fast control behaviour for chemical processes
- ➔ Time saving due to minimal internal filling volume for extremely fast heating and cooling
- ➔ Wide operating temperature ranges without fluid changes and long shelf life due to low oxidation
- ➔ Process stability and reproducible results at all times for solid research work
- ➔ Intelligent TAC control system analyses the control system and determines optimum parameters
- ➔ Large selection of models with cooling capacities up to 130 kW for laboratory and production



# Fluids

## Electrical conductivity



### Heat transfer fluids in the hydrogen industry

Heat transfer fluids are important in the hydrogen industry, especially for cooling and temperature control of systems and processes.

These fluids are used to control the temperature of components, reactors and pipework to ensure optimum operating conditions.

Our temperature control units can be operated with fluids with an electrical conductivity higher than 5  $\mu\text{S}/\text{cm}$ .

### Advantages of low electrical conductivity

#### Efficiency

Improvement in the efficiency of the fuel cell, as an unwanted electrical flow between individual membranes is reduced.

#### Corrosion protection

Heat transfer fluids with lower conductivity can help to reduce corrosion on metallic surfaces. This is important for systems which have contact with hydrogen.

#### Insulation

In some parts of hydrogen systems, such as electrolyzers, electrical components need to be protected from moisture and short circuits. Heat transfer fluids with lower conductivity provide good insulation and minimise the risk of electrical failures.

# Heat exchanger systems





## HTS

Heat exchanger systems with circulation pump for connection to cooling water on the primary side. The devices provide a cooling circuit with stable pressure/ ow and adjustable operating temperature. The cooling capacity is generated using a plate heat exchanger via the cooling water. Since there is no active cooling machine, the devices operate in a quiet and energy-saving manner and are a cost-effective alternative to conventional chillers e.g. for the temperature control of Peltier elements, bioreactors, etc.

### HTS for the hydrogen industry

Our HTS heat exchanger systems can be operated with fluids with an electrical conductivity higher than **5  $\mu\text{S}/\text{cm}$** .

#### Performance:

-  **Down to +3 °C**  
Operating temperature
-  **Up to 75 kW**  
Cooling power at 20 °C
-  **Up to 240 l/min**  
Pump capacity
-  **Pilot ONE**  
Touch screen controller

#### Advantages:

##### Models HTS 3 - HTS 75:

- Efficient circulation pump
- Temperature stability  $\pm 0,1$  K
- RS232 interface
- Pt100 external sensor connection
- Low cooling water usage
- Application protection with cooling stage separation



# Circulation chillers




## Unichiller

Our Unichillers are modern, robust and easy to service. The recirculating chillers are available air- and water-cooled and are suitable for applications in the hydrogen industry with cooling capacities from 0,3 to 50 kW. The chillers offer high efficiency, stable pressure and flow rates and a constant cooling water temperature. The use of recirculating chillers reduces water consumption in many applications, thus protecting the environment and lowering operating costs. Huber Unichillers are therefore a resource-saving solution that pays for itself in a short time.

### Unichillers for the hydrogen industry

Our Unichillers can be operated with an electrical conductivity higher than **5 µS/cm**.

#### Performance:

-  **Down to -20 °C**  
Operating temperature
-  **Up to 50 kW**  
Cooling power
-  **Up to 220 l/min**  
Pump capacity
-  **Pilot ONE**  
Touch screen controller

#### Advantages:

- Modern energy management reduces operating costs and consumption
- Reliable continuous operation at ambient temperatures up to +40 °C
- Simple operation with large touchscreen or OLED display
- Low cooling water consumption
- Intelligent cooling



# Accessories

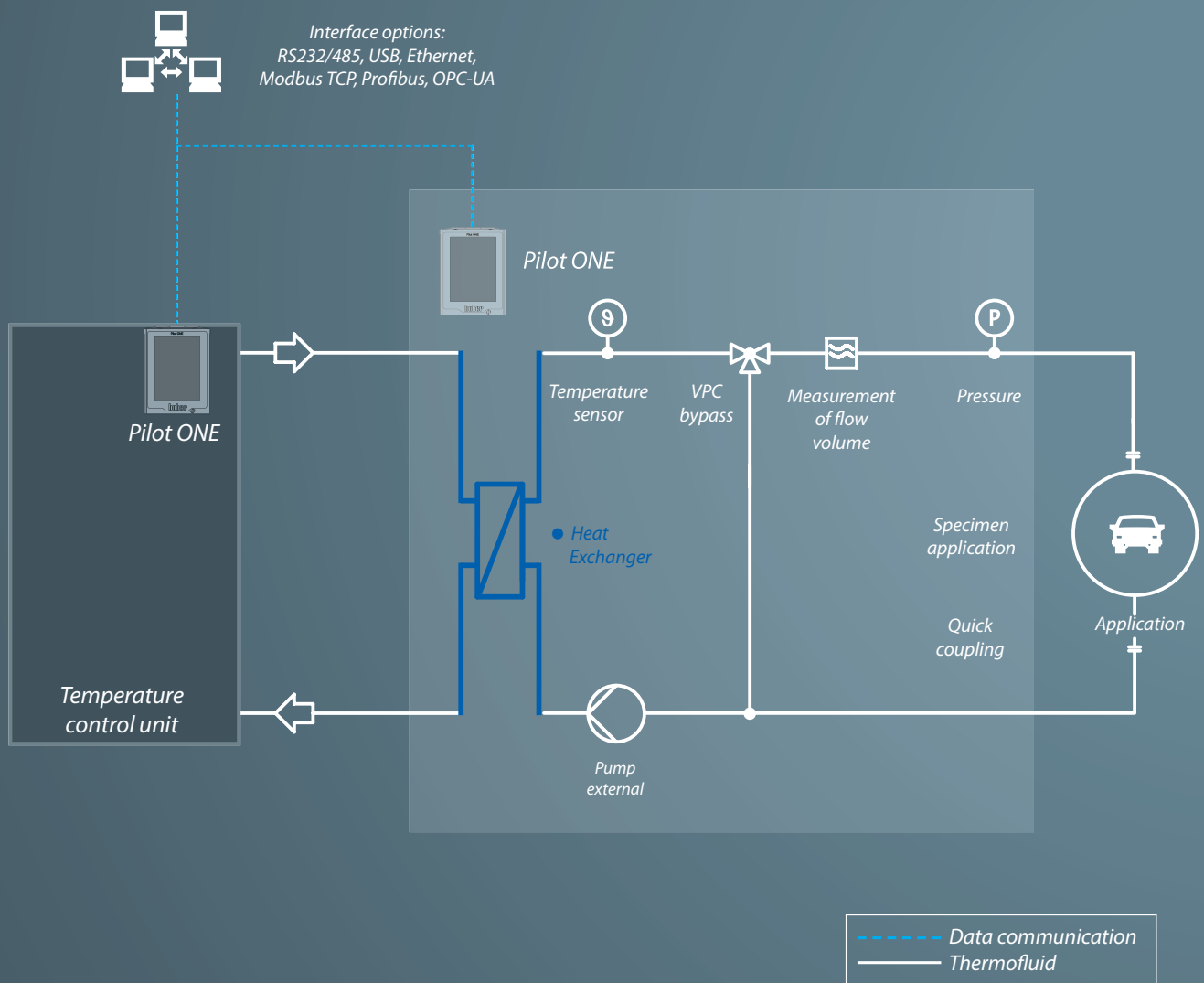
## HXP (Heat Exchange Pump)

### POSSIBLE DESIGN

The individually designed HXP (Heat Exchange Pump) unit can be used for high viscosity fluids according to your requirements. The core components of the unit consist of a pump, a heat exchanger, a Pilot ONE and an FCC bypass. The heat exchanger and pump can be designed to meet individual customer requirements.

### HXP FOR THE HYDROGEN INDUSTRY

The HXP can be used in combination with our temperature control units, such as a Unichiller or Unistat. This application can be used to run cold start tests on a fuel cell. The HXP can be operated with fluids with an electrical conductivity higher than **5  $\mu\text{S/cm}$** .

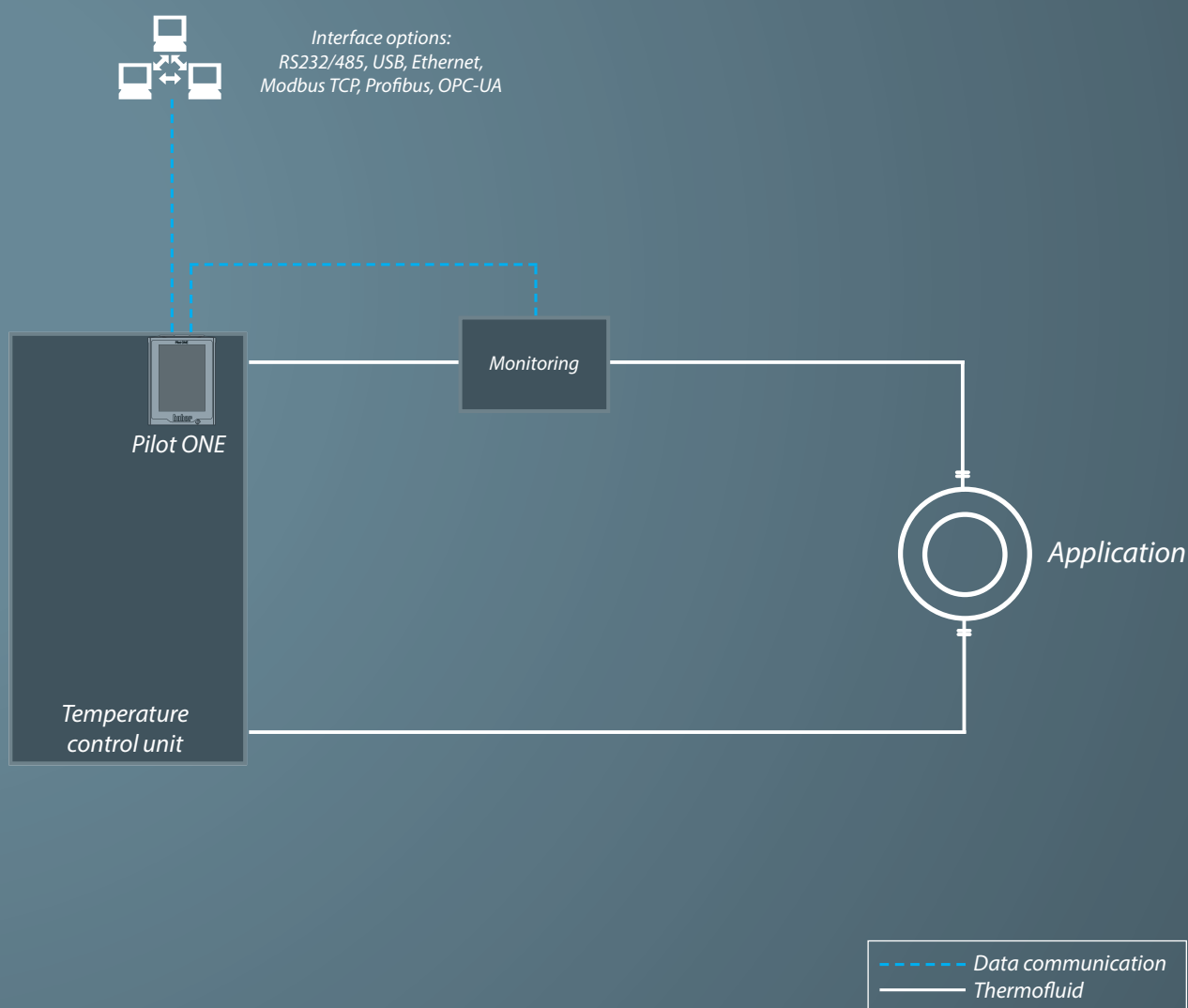


# Monitoring Conductivity

## USAGE IN THE HYDROGEN INDUSTRY

The conductivity is permanently measured and monitored with the electrical conductivity monitoring accessory. The conductivity value can be set individually. When the set conductivity value is exceeded, a warning is activated. If this warning is not responded to, it activates an alarm.

The evaluation unit can be integrated into the temperature control unit and managed by a control system.



# Accessories

## Desalinator

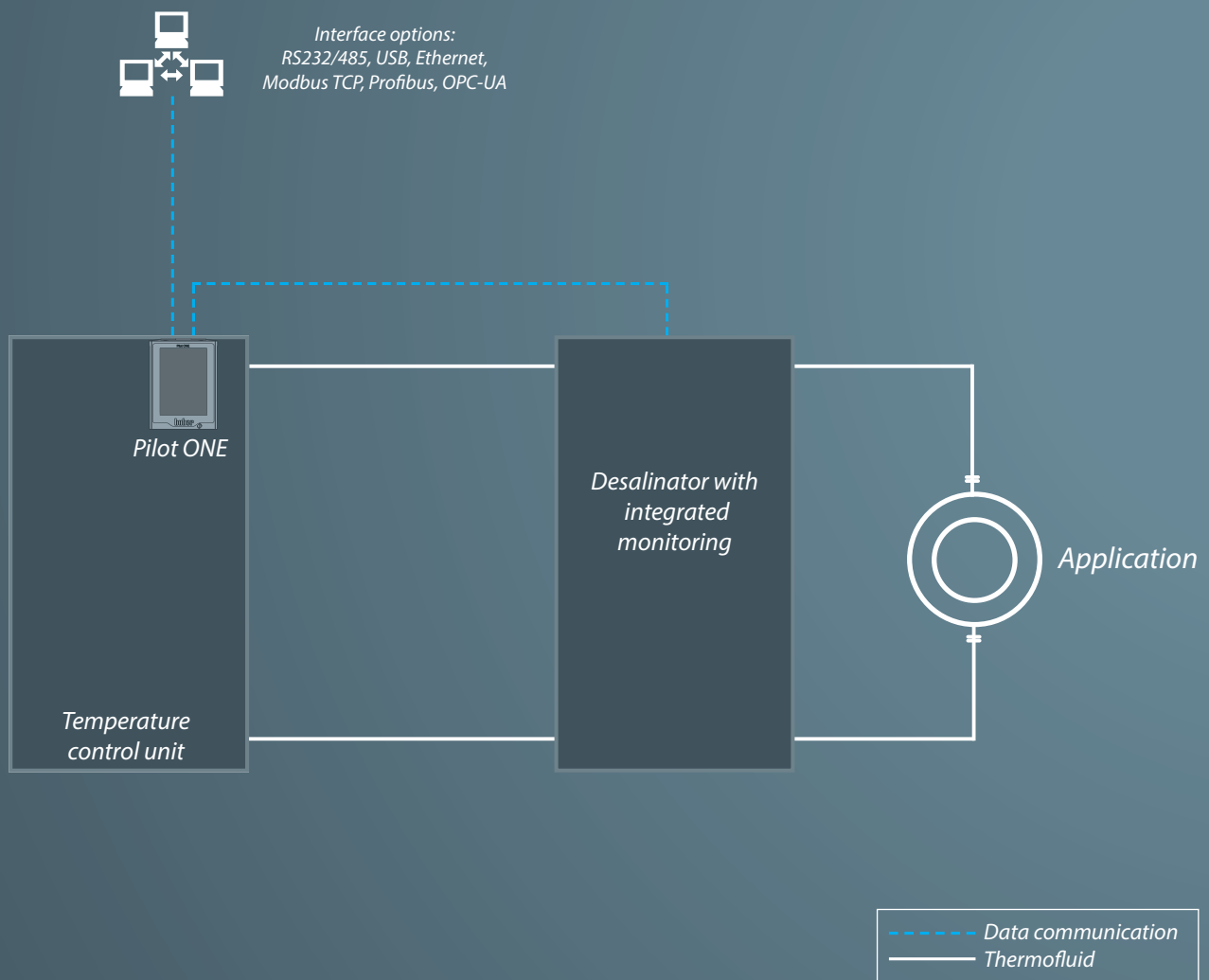
### USAGE IN THE HYDROGEN INDUSTRY

The desalinator includes the desalinator and a monitoring device for the electrical conductivity.

This accessory can be used to monitor the electrical conductivity and desalinate the liquid. The threshold values can be set individually and if they are exceeded, a warning and subsequently an alarm are activated.

The system can be integrated into the temperature control unit and managed with a control system.

The desalinator is equipped with a separate power connection.

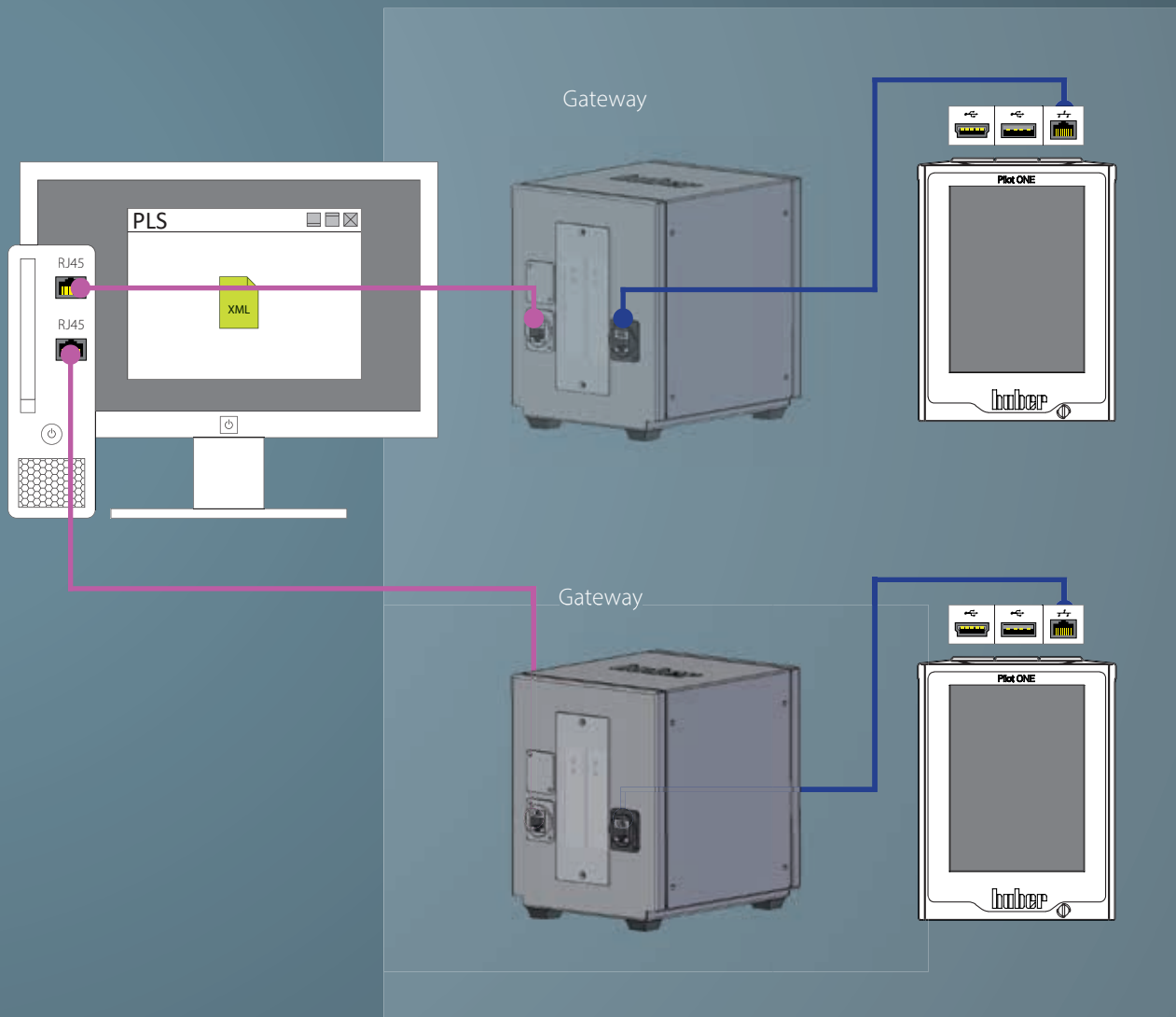


# Gateway



PROFINET (Process Field Network) is the open Industrial Ethernet standard of the PROFIBUS user organisation e. V. (PNO) based on Ethernet-TCP/IP and complements Profibus technology for applications that require fast data communication via Ethernet networks in combination with industrial IT functions. Profinet can be used to implement solutions for manufacturing technology, process automation, building automation and the entire spectrum of drive technology. With the Profinet gateway, Huber temperature control units can be integrated into Profinet networks easily, flexibly and close to the process. The Profinet gateway is integrated into the project planning software with the aid of the associated GSDML file.

EtherCAT, short for Ethernet for Control Automation Technology, is an open Ethernet-based fieldbus technology that is standardised in international standards. EtherCAT is a very fast Industrial Ethernet system that is also suitable for use in time-critical applications. With the EtherCAT gateway, Huber temperature control units can be integrated into EtherCAT networks easily, flexibly and close to the process. The EtherCAT gateway is integrated into the configuration software with the aid of the associated GSDML file.



# Individual configuration

## Options for your application



### AUTOMATION

Support for common data communication standards and software solutions for data recording, remote operation and programming. Interfaces: e.g. Profibus, Modbus TCP, Ethernet, OPC-UA, RS232, RS485, USB, Analogue.



### CIRCULATION PUMPS

Various pump options and optional pressure booster pumps allow flexible alignment of pressure and flow volume for the application.



### SENSOR OPTIONS

Large selection of sensors for temperature measurement and control at almost all relevant points within the application as well as in the flow and/or return.



### QUICK-DISCONNECT

Press & Twist connections make it easier to change the application on the temperature control unit. Only low pressure losses ensure good performance of the overall system.



### SILICONE OIL

Our units can be operated with fluids with low electrical conductivity.



### EXPANSION

A range of expansion vessels is available as accessories for compensation of temperature-dependant volume changes.



### MEASUREMENT AND CONTROL OF HTF

VPC bypasses and various flow rate meters allow measurement and control of heat transfer fluid (HTF) pressure and flow volume.



### CONNECTION SETS

Preconfigured sets consisting of T-bend and pipe extension for connecting additional M-FCC Flow Control Cubes.



# Technology leader for high precision temperature control solutions

We are the technology leader for high-precision temperature control solutions for research and industry. Our extensive product range offers solutions for all temperature applications from  $-125^{\circ}\text{C}$  to  $+425^{\circ}\text{C}$ . The product range includes highly dynamic temperature control systems with cooling capacities of up to 250kW as well as chillers and circulation thermostats for applications in research and development laboratories, pilot plants and production facilities.

With several innovative products, we are pioneers in technological development in the field of liquid temperature control. The introduction of Unistat temperature control systems in 1989 was a revolution in temperature control technology. 30 years later, Unistats are still pioneers in highly dynamic temperature control processes.



# Advantages



Responsive thermodynamics for fast control behaviour for chemical processes



Extremely fast heating and cooling rate due to small internal volumes



Process stability and reproducible results at any time for solid research work



Intelligent TAC function continually monitors performance and automatically tunes the PID parameters for optimum control



Large selection of models for different temperature ranges with different cooling and heating capacities



Wide operating temperature range without fluid change and long service life of the HTF



Data communication standards and data recording. Interfaces: e.g. Profibus, Modbus, TCP, Ethernet, OPC-UA, RS232, RS485, USB, analogue



Inspired by **temperature**  
designed for you



We would be delighted to solve your temperature control task.  
We look forward to your enquiry.

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