HydroMet

User Manual

HyPremo

KISTERS
Empowering decisions of tomorrow

11-2025 – 01-02-002

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I Disclaimer

The information provided in this manual was deemed accurate as of the publication date. However, updates to this information may have occurred.

This manual does not include all of the details of design, production, or variation of the equipment nor does it cover every possible situation which may arise during installation, operation or maintenance. KISTERS shall not be liable for any incidental, indirect, special or consequential damages whatsoever arising out of or related to this documentation and the information contained in it, even if KISTERS has been advised of the possibility of such damages.

Any errors found in any KISTERS product should be reported to KISTERS where every effort will be made to quickly resolve the problem.

This document is public.

II Scope of Delivery

- 1× HyPremo Vented Hydrostatic Pressure Sensor, with cable length as ordered

III Safety Instructions

- Read the user manual including all operating instructions prior to installing, connecting and powering up the KISTERS HyPremo. The manual provides information on how to operate the product. The manual is intended to be used by qualified personnel, i.e. personnel that have been adequately trained, are sufficiently familiar with installation, mounting, wiring, powering up and operation of the product.
- Keep the user manual on hand for later reference!
- If you encounter problems understanding the information in the manual (or part thereof), please consult the manufacturer or its appointed reseller for further support.
- KISTERS HyPremo is intended to be used in hydrometeorological or environmental monitoring applications.
- Before starting to work, you have to check the functioning and integrity of the system.
  - Check for visible defects on the HyPremo, this may or may not include any or all of the following mounting facilities, connectors and connections, mechanical parts, internal or external communication devices, power supplies or power supply lines, etc.
  - If defects are found that jeopardize the operational safety, work must be stopped. This is true for defects found before starting to work as well as for defects found while working.
- Do not use the KISTERS HyPremo in areas where there is a danger of explosion.
- The present user manual specifies environmental/climatic operating conditions as well as mechanical and electrical conditions. Installation, wiring, powering up and operating the KISTERS HyPremo must strictly comply with these specifications.
- Perform maintenance only when tools or machinery are not in operation.
- If guards are removed to perform maintenance, replace them immediately after servicing.
- Never make any electrical or mechanical diagnostics, inspections or repairs under any circumstances. Return the product to the manufacturer's named repair centre. You can find information on how to return items for repair in the relevant section of the KISTERS website.

Disposal instructions: After taking the KISTERS HyPremo out of service, it must be disposed of in compliance with local waste and environmental regulations. The KISTERS HyPremo is never to be disposed in household waste!

Inputs and outputs of the device are protected against electric discharges and surges (so-called ESD). Do not touch any part of the electronic components! If you need to touch any part, please discharge yourself, i.e. by touching grounded metal parts.

The warnings used in this user manual classify the type and severity of a given hazard. The resulting hazard levels are marked in the user manual with the signal words CAUTION and WARNING in combination with a colour coding in yellow and orange:

CAUTION

- Warning of a hazardous situation with a **low** level of risk.
- The warning indicates the type and source of the hazard. If you do not follow the handling instructions listed here, the hazardous situation can lead to minor to moderate injuries.
- Specific instructions for avoiding the hazardous situation.

WARNING

- Warning of a hazardous situation with a **medium** level of risk.
- The warning indicates the type and source of the hazard. If you do not follow the instructions given here, the hazardous situation could result in death or serious injury.
- Specific instructions for avoiding the hazardous situation.

Note:

- Information to prevent malfunctions or damage to the HyPremo.
- Information to ensure the safety of the appliance.

1 Introduction

Thank you for choosing our product. We hope you will enjoy using the device.

KISTERS manufactures, sells, installs and operates quality instrumentation, data loggers and communication technology. Products are designed with passion for environmental monitoring and with a deep understanding of the quality, accuracy and robustness needed to fulfil the requirements of measurement practitioners in the field.

The present User Manual will help you understand, install and deploy the device. If, however, you feel that a particular information is missing, incomplete or confusing, please do not hesitate to contact us for further support!

KISTERS' vented hydrostatic pressure sensor HyPremo is a programmable, submersible level transmitter designed for measuring the level and temperature of groundwater and surface water. Designed for use in outdoor environments, it is low power and robust, ensuring long-term measurement stability.

1.1 KISTERS HyPremo Sensor

Pressure transducers are a common instrument used for monitoring water levels in hydrometeorological applications. These devices use a sensor diaphragm to convert fluid pressure into an electrical signal that can be interpreted as a pressure value. KISTERS' HyPremo is a programmable, vented SDI-12 water level probe which uses a digital piezoelectric transducer to measure pressure. The pressure value is calculated based on a specific water density. In the case of the KISTERS HyPremo, this density is derived from the measured water temperature using an integrated compensation algorithm. See section Referencing HyPremo to Staff Gauge Readings 12 for more information.

Figure 1 – KISTERS HyPremo Submersible Pressure Sensor

The KISTERS HyPremo is a vented (or gauged) pressure transducer. Vented gauge pressure transmitters employ a reference pressure that is vented to the atmosphere. The pressure-sensing element is located at the base of the transmitter and is in direct contact with the water. An increase in hydrostatic pressure exerts a force on the sensing element, causing deformation. Fluctuations in atmospheric pressure also impact the reference pressure, which can affect measurement accuracy. To ensure precise readings, the vented reference pressure is measured and subtracted from the hydrostatic pressure.

The KISTERS HyPremo device provides two direct readings: the water pressure or water level, depending on the sensor settings, and the water temperature.

1.1.1 Why Piezo Pressure Transducers?

Piezoelectric pressure transducers are often used to measure water levels and offer several advantages due to their unique properties and design.

- **High Accuracy and Sensitivity**: Piezoelectric transducers provide precise measurements with high sensitivity. The high sensitivity of HyPremo allows small changes in water level to be detected, which is vital for flood warning systems and water resource management.
- **Long-Term Stability**: The KISTERS HyPremo piezo transducer exhibits excellent long-term stability, maintaining accuracy over extended periods without significant drift.
- **Durability and Robustness**: Thanks to its piezoelectric properties, the KISTERS HyPremo is well-suited for use in a variety of water level measurement scenarios, including streams, reservoirs and lakes, and groundwater cavities. However, it should be noted that the KISTERS HyPremo is not recommended for use in saltwater.

- **Low Power Consumption**: The HyPremo's piezoelectric transducer operates with minimal power consumption, making it an optimal choice for remote or battery-powered applications where energy efficiency is paramount.

1.1.2 HyPremo Main Components

This chapter illustrates the basic components of the actual HyPremo pressure probe. The pictures show the exact position of each component of the device.

Figure 2 – HyPremo Main Components

1. KISTERS HyPremo Vented Piezoelectric Hydrostatic Pressure Sensor
2. Cable with internal Capillary
3. Protective Cap (pre-mounted, removable)

The diaphragm is a metal sheet that protects the piezo pressure element. See figure below.

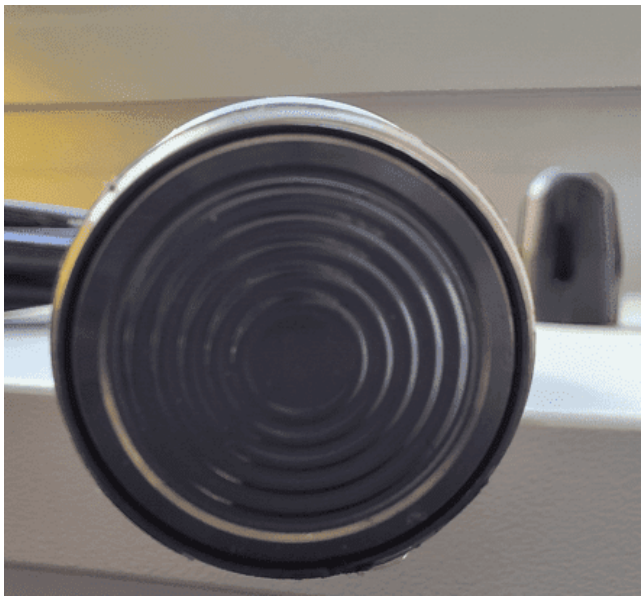

Figure 3 – HyPremo Diaphragm

2 Installation

To achieve precise water level measurement, it is essential that the pressure sensor is submerged to the correct depth. To guarantee the sensor's accuracy and durability, it is crucial to ensure that it is installed and protected correctly. To protect the sensor from mechanical shocks caused by debris in flowing water, protective measures such as cages or open tubes are advisable.

Note: The sensor must be installed in direct contact with the water, and that the protective measures must not affect changes in the water level.

Furthermore, the sensor cable should be securely housed, either by being buried in outdoor-rated conduits, or by being enclosed within 2-inch metal or synthetic tubes. Taking these precautions will prevent damage and maintain reliable performance over time.

The installation is divided into the following subsections:

2.1 Site Selection Criteria

To ensure accurate measurements, careful consideration must be given to selecting suitable installation locations for water level probes. HyPremo sensors are designed for use in hydrological applications. HyPremo sensors can be deployed on waterways, rivers, streams, brooks, lakes, reservoirs, and similar bodies of water.

To ensure long-term monitoring, it is advisable to select sites for sensor installation that guarantee secure placement. This approach will minimise the need for frequent maintenance and recalibration. Additionally, the availability of access to facilities or resources for periodic sensor and data collection equipment inspection and maintenance should be considered.

⚠ WARNING

- Risk of explosion due to sparking and electrostatic charging - not intrinsically safe.
- Operation of the HyPremo in such an atmosphere may result in ignition of the atmosphere, which could cause serious damage to property and injury to personnel.
- HyPremo must not be operated in a potentially explosive atmosphere. Furthermore, the HyPremo does not have ATEX approval (explosion protection).

Depth and Stability

Select locations that have stable water levels and are deep enough to keep the sensor submerged in all conditions.

Flow Dynamics

Assess the flow characteristics (e.g. current velocity and turbulence), as these can affect the accuracy of the sensor. In particular, ensure that the sensor is kept out of areas subject to strong turbulence or frequent and heavy variations in flow conditions.

Sediment and Debris

It is crucial to evaluate the potential impact of sediment or debris on sensor readings and functionality. Sediments entering the protective cap have the potential to accumulate over time and exert constant pressure on the diaphragm, particularly in instances where sensors dry out. This can eventually result in irreversible damage.

2.2 Mounting Instructions

WARNING

- Risk of drowning.
- Be particularly careful when working over or near to water.
- Wear a life jacket/buoyancy aid:
  - Ensure that workers at risk of falling into the water are provided with and wear a life jacket or buoyancy aid.
  - The life jacket should be thoroughly checked by the user prior to use.
- Never work alone: Always be accompanied when working near or over water.

Figure 4 – Installation: No sharp Objects. Do not pinch the cable.

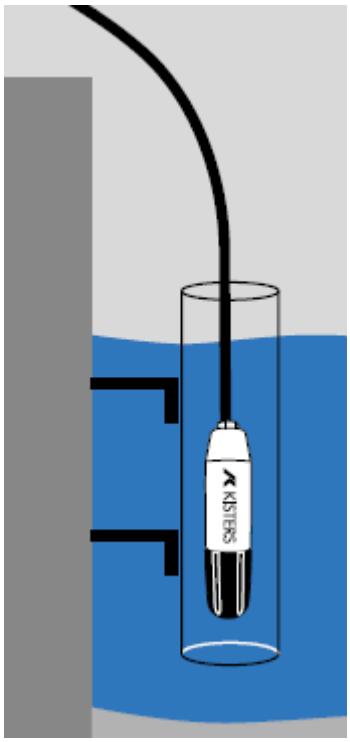

Figure 5 – Sample installation of a HyPremo in a protective tube

- Orientation: Ideally, mount the sensor upright with the pressure transducer pointing downwards.
- It is essential that the sensor is not subjected to any mechanical stress during installation.
- It is essential that the level probe is installed without applying any mechanical tension.
- The device must be connected according to the electrical connections indicated on the accompanying label.
- It is essential to avoid kinking the cable.
- When installing the cable, it is imperative to adhere to the minimum bending radius specifications. The HyPremo is a vented sensor. A capillary cable then runs through the connection cable. The minimum bend radius for capillary cables is 15 times the cable diameter.
- To prevent ground loops that can cause defects in the level probe, avoid potential differences between measuring and connection points.
- For cable lengths over 50 metres, use a retaining cable for safe installation.
- To ensure accurate readings and prevent damage, ensure that the sensor is not installed near motors, pumps, valves, heat sources or other sources of interference that could cause excessive vibrations or pressure peaks.

2.3 Power Supply

CAUTION

- Device Operating on Low DC Power.
- No life or health risk except for vulnerable or highly sensitive individuals who should refrain from working with electrical devices.
- Precaution: Electrical devices should always be installed by qualified personnel.

The SDI-12 sensor is powered via the SDI-12 power line. The HyPremo device operates within a voltage range of 2.8–16 V DC, with a nominal voltage of 5 V DC.

Power-up sequence

HyPremo is ready to use after approximately 250 milliseconds of powering up.

2.4 Cable and Connector Pinout

WARNING

- Incorrect connection of the supply power may result in damage to the HyPremo.
- The power input features diodes that provide limited protection against voltage surges. Please note that the input is not protected against reverse polarity. The maximum recommended input current is 100 mA.
- Check the pinout configuration and make sure it is properly connected to the '2.8–16 V supply' and 'GND' terminals.

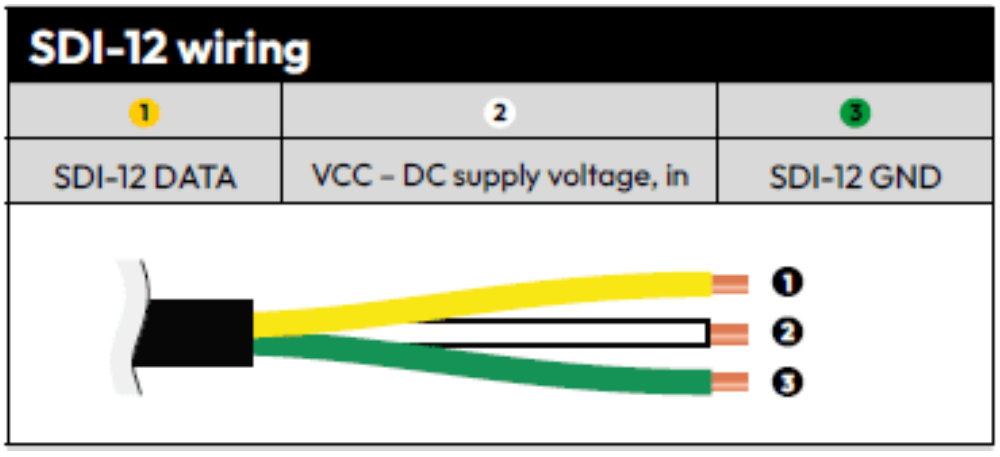

Figure 6 – Cable Pinout

3 Configuration

The configuration is divided into the following subsections:

3.1 HyComm Configuration Software

Note: Bluetooth® communication range of HyPremo

- The Bluetooth® communication range of the HyPremo sensor is approximately two metres. Please note that water may reduce this range further due to signal attenuation.
- For best results, it is recommended that you configure the sensor via Bluetooth® outside the water body, for example in a laboratory or on the riverbank, before deploying it.

> **WARNING**
>
> Risk of falling when accessing HyPremo.
> - If the HyPremo is installed in a water body, it may need to be retrieved for maintenance or configuration.
> - Always use appropriate personal protective equipment (PPE) to prevent drowning.

HyComm is KISTERS' software that facilitates local communication between computers, portable devices, and the HyPremo hydrostatic pressure sensor. It allows you to configure the sensor's parameters.

Connection

Follow these steps to connect HyPremo to your computer or portable device:

- Activate the Bluetooth® function on your computer or portable device
- Launch the HyComm software
- Select the Bluetooth® connection option and choose the HyPremo from the list of found devices
- HyComm will be paired with the HyPremo
- Once the HyPremo has automatically established a Bluetooth® connection with your computer or portable device, you can start configuring the sensor with HyComm

Features

HyComm is available for download from the KISTERS. You can find more information about HyComm in a separate manual that can be downloaded from the HyComm product page.

With HyComm, users can edit the following sensor settings:

- Visualize the sensor ID
- Access the sensor release information and device PIN
- Read the current sensor settings
- Set the sensor address
- Set the measurement unit
- Set offset and gain – sensor re-calibration
- Reference the sensor to a water level reading or geodesic datum
- Set 4 coefficients:
  - K0: pressure gain (factory setting = 1.0)
  - K1: pressure offset (factory setting = 0.0)
  - K2: temperature gain (factory setting = 1.0)
  - K3: temperature offset (factory setting = 0.0)
- RSSI monitoring ON / OFF
- Firmware update
- Factory reset

3.2 Referencing HyPremo to Staff Gauge Readings

The sensor can be referenced to a staff gauge reading. Since the water level is affected by its own weight, the calibration is influenced by both the salinity of the water and the local gravitational force.

Slight variations in gravitational acceleration across different regions affect pressure measurements in freshwater, because pressure depends on the weight and height of the water column, both of which are influenced by gravity. Specifically, the pressure at a given depth in freshwater can be calculated using the following equation:

$$P = \rho \times g \times h$$

Where:

- P is the pressure
- ρ is the density of water (typically 1.00 kg/L for freshwater)
- g is the local gravitational acceleration (in m/s^2)
- h is the water depth (in metres)

This equation and its accompanying explanations apply to freshwater with a salinity of less than 0.1 % and a density of 1.00 kg per litre.

3.2.1 Impact of Regional Gravity Differences

Since gravity varies slightly from one region to another, the way in which pressure corresponds to a specific water depth is affected.

1. Regions with higher gravity (e.g., near the equator, g approx. 9.83 m/s^2):
   - The pressure exerted by water increases slightly with depth because the gravitational force is stronger.
   - For instance, one bar of pressure corresponds to a slightly shallower depth of water compared to areas with lower gravity.
2. Regions with lower gravity (e.g., near the poles, g approx. 9.79 m/s^2):
   - The pressure exerted by water at a given depth is slightly lower because gravitational force is weaker there.
   - Therefore, one bar of pressure corresponds to a slightly deeper level of water.

Region	Geographical gravity g (approx.)	Ref. pressure	Approx. equivalent freshwater level
Central Europe	9.806 m/s^2	1 bar	10.197 m
Australia	9.797 m/s^2	1 bar	10.205 m
New Zealand	9.799 m/s^2	1 bar	10.203 m
Latin America – near equator	9.78 m/s^2	1 bar	10.221 m
Latin America – southern regions	9.8 m/s^2	1 bar	10.203 m
Southeast Asia	9.783 m/s^2	1 bar	10.218 m
North America	9.807 m/s^2	1 bar	10.196 m
Africa – north	9.797 m/s^2	1 bar	10.197 m
Africa - equatorial	9.780 m/s^2	1 bar	10.220 m
Africa - sub-Saharan	9.785 m/s^2	1 bar	10.215 m

Table 1 – Geographical gravity and water depth for 1 bar of pressure in freshwater

Practical Implications

Although the difference in pressure due to gravitational variation is small (fractions of metres per bar), it needs to be accounted for in precise measurements for applications such as hydrology, engineering and scientific research.

4 Operation

The operation is divided into the following subsections:

4.1 SDI-12 Data Transfer Interface

SDI-12 is a standard for interfacing data recorders with microprocessor-based sensors. SDI-12 stands for Serial/Digital Interface at 1200 baud. It is intended for applications with the following requirements:

- Battery-powered operation with minimal current drain: max. 420 mA @ 12 V.
- Bus operation involves the use of a single data recorder with multiple sensors on one cable. Each device must have a unique address represented by a single ASCII character. All units connected to the same physical SDI-12 bus must have a distinct address.
- The sensors are supplied with power through the physical wires of the SDI-12 interface.
- Addressing devices on the bus: The address of an SDI-12 device is a unique identifier that is used for communication within an SDI-12 network. This address is crucial for the data logger to distinguish between multiple sensors connected to the same SDI-12 bus, ensuring accurate data collection and command execution.

Parameter	Settings
Protocol	SDI-12, Version 1.3
Default Address	0 (factory settings)
Baud Rate	1200 baud
Start Bits	1
Data Bits	7

Table 2 – SDI-12 Interface Specifications

4.2 SDI-12 Command Set

The implementation of the SDI-12 commands complies with the SDI-12 Specification V 1.3. The subsequent sections outline the fundamental SDI-12 commands integrated into the HyPremo sensors. The responses provided by the sensor are described for each command, where appropriate. SDI-12 is a bidirectional communication protocol in which sensors act as clients, providing responses to commands received from a data acquisition device. Commands are sent to the sensor by a data logger or controller.

The base structure of SDI-12 commands sent by a data acquisition device or intelligent controller is as follows:

- The sensor address – denoted 'a' with a value range [0 … 9, A … Z, a … z].
- The character "!" terminates the command.
- Most commands have a command character.

CAUTION

- The "?" address character can only be used if there is a single sensor connected to the physical SDI-12 bus. All sensors connected to the bus will respond to the "?" address character.

The base structure used for all responses sent after a command has been received and processed is as follows:

- The address 'a'.
- The character chain "<CR><LF>" to terminate the answer.
- Most responses also contain data with or without a CRC-16.

Command	Description
aAn!	**Change Address from 'a' to 'n'** ▪ Command Structure: The command "aAn!" consists of the current address "a", the new address "n", and the command identifier "A!". For example, "0A1!" changes the address from '0' to '1'. HyPremo allows the use of a wildcard '?' for 'a'. ▪ Response: The sensor will acknowledge the address change by responding with the new address "n". For example, if the command "0A1!" is sent, the sensor will respond with "1" to confirm the new address. ▪ Purpose: This command is essential for managing multiple sensors on the same SDI-12 network, allowing the user to reassign addresses to avoid conflicts and ensure unique identification for each sensor.

aI!	**Retrieve the identification string from a HyPremo sensor**
	▪ Command Structure: The command "aI!" is sent to the SDI-12 device, where "a" represents the device's address (e.g., "0I!" for a device with address '0').
	▪ Response: Upon receiving this command, the HyPremo responds with a detailed identification string of the type 'a13TT_KLD_A_0310_OSXxxxxxxxx', where:
	  ▪ <a13TT_KLD_A_0310_OSX> is the sensor model identifier, and
	  ▪ <xxxxxxxx> is the serial number.
	▪ Purpose: The identification command is useful for verifying the device's identity, ensuring that the correct sensor is being addressed and to assist with troubleshooting and network management.

aM! aMC!	**Start a measurement** ▪ Command Structure: The command "aM!" is sent to the SDI-12 device, where "a" represents the device's address (e.g., "1M!" for a device with address '1'). ▪ Response: Upon receiving this command, the sensor will initiate a measurement process. It responds with "a<ttt><n>" where: ▪ "a" is the address of the sensor. ▪ "<ttt>" is the time (in seconds) it will take to complete the measurement. ▪ <n>=2 is the number of measurement values that HyPremo will return: Pressure and Temperature. ▪ Purpose: The measurement command is essential for triggering the sensor to collect data. After the specified time has elapsed, the data logger can retrieve the measurement results using the "aD0!" command. This ensures that the data collection is synchronized and properly managed within the SDI-12 network.
aM1!	**Start a measurement and request the supply voltage reading in addition to the primary measurement** ▪ Command Structure: The command "aM1!" is sent to the SDI-12 device, where "a" represents the device's address, and "M1" specifies the type of measurement (e.g., "2M1!" for a device with address '2'). ▪ Response: Upon receiving this command, HyPremo will start the specified measurement process and respond with "a<ttt><n>" where: ▪ "a" is the address of the sensor. ▪ "<ttt>" is the time, in seconds, the sensor will take to complete the measurement. ▪ <n>=3 is the number of measurement values that can subsequently be read using the 'aD0!' command. The three values are: Pressure, Temperature and Voltage. ▪ Purpose: The "aM1!" command is used to initiate a secondary or alternate measurement that the HyPremo is capable of performing. After the specified time has elapsed, the measurement results can be retrieved using subsequent data commands like "aD0!".
aD0!	**Retrieve the measurement data from the sensor after a measurement command has been issued and the measurement has been completed** ▪ Command Structure: The command "aD0!" is sent to the SDI-12 device, where "a" represents the device's address (e.g., "1D0!" for a device with address '1'). ▪ Response: Upon receiving this command, the sensor responds with the measurement data. The response format is typically "a<value1><value2>...<valueN>", where: ▪ "a" is the address of the sensor.

Command	Description
	▪ "<value1>", "<value2>", ..., "<valueN>" are the measurement values returned by the sensor. ▪ Purpose: The "aD0!" command is essential for retrieving the data collected by the sensor during the measurement initiated by the "aM!", "aMC!" or "aM1!" command. This command allows the data logger or host system to obtain the results of the measurement for further processing, analysis, or logging. Multiple "aD!" commands (like "aD1!", "aD2!", etc.) might be used if the sensor returns multiple sets of data.

Table 3 – HyPremo SDI-12 Command Set

4.2.1 Error Codes

Error Code	Description
1101	Sensor internal error ('No Reply1') probably sensor or internal connection broken.
1102	Sensor internal error ('No Reply2') probably sensor or internal connection broken.
1103	Sensor internal error ('Timeout') probably sensor or internal connection broken.
1104	Sensor internal error ('Busy') probably sensor or internal connection broken.
1105	Sensor internal error ('MemoryError') probably sensor or internal connection broken.
1106	Sensor internal error ('No Coefficients') probably sensor or internal connection broken.

Table 4 – HyPremo Error Codes

5 Maintenance

WARNING

Risk of falling when accessing HyPremo.

- If the HyPremo is installed in a water body, it may need to be retrieved for maintenance or configuration.
- Always use appropriate personal protective equipment (PPE) to prevent drowning.

WARNING

- Risk of drowning.
- Be particularly careful when working over or near to water.
- Wear a life jacket/buoyancy aid:
  - Ensure that workers at risk of falling into the water are provided with and wear a life jacket or buoyancy aid.
  - The life jacket should be thoroughly checked by the user prior to use.
- Never work alone: Always be accompanied when working near or over water.

Preliminaries

The HyPremo vented hydrostatic pressure sensor is designed to be low-maintenance. No special maintenance work is required, nor is it necessary to replace components at regular intervals. Nevertheless, we recommend regularly inspecting and checking the entire measuring point. We recommend carrying out the following maintenance work at least once every six months, for example as part of a measuring point inspection. Unscheduled maintenance is also recommended after exceptional events, such as flooding, or if the measured values are implausible.

5.1 Periodic Maintenance

This chapter outlines the maintenance work that should be carried out every six months (recommended).

The following process ensures the safe handling and protection of the device during maintenance operations.

Site

- Check for changes in conditions at the site: If necessary, remove any debris or vegetation that may collect around the sensor and affect the sensor readings.
- Check all synthetic or metal conduits and fasteners for mechanical damage and corrosion. If there is a risk of material failure, replace damaged/corroded parts.

Sensor and Cable Installation

- Check the cable connection. Ensure that the bleed cable is not bent, pinched, damaged or twisted. Ensure that the vent tube (capillary) is free from blockages and debris.
- Check the sensor position and adjust if necessary.
- Check the HyPremo mounting point for position and stability. Correct if necessary or, if not possible, select a new fixing/mounting point.

Cleaning

Relative pressure cells measure the pressure difference between the water column and atmospheric pressure, which is transmitted through a vented cable. The metal diaphragm is the sensor's most sensitive component– even minimal deformation can result in permanent zero-offset errors or non-linearity.

Cleaning is intended to remove sediment, biofouling, and mineral deposits while preserving the integrity of the diaphragm.

Preparation

- Remove the sensor carefully from deployment – avoid pulling by cable or vent tube.
- Inspect the cable and vent for damage or moisture ingress.
- Work in a clean, static-free, and well-lit area.
- Prepare soft, lint-free materials (microfibre cloth, soft brush, cotton swabs).
- Use a mild cleaning solution (deionized water, mild detergent).

Never use strong acids, alkalis, or solvents (e.g., HCl, NaOH, acetone, ethanol) – they can damage diaphragm and adhesives.

Cleaning the Pressure Cell

- Rinse the sensor exterior with clean deionized (DI) water to remove loose material and silt.
- Remove the protective cap / nose cone carefully:
  - Unscrew the protective cap: see figure 19 and explanation below.
  - Inspect the inside of the cap for sediment, algae, or mineral buildup.
  - Clean the cap thoroughly using a soft brush or cotton swab dipped in clean water or a light detergent.
  - Rinse with DI water and set aside to dry.
- Inspect the sensing area (pressure diaphragm) for fouling or deposits:
  - If necessary, soak only the sensor tip (not the vented cable) in the mild cleaning solution.
  - Immerse only up to the sensing head – do not submerge the vent opening or cable junction.
    - Take care not to touch or press on the diaphragm itself.
    - Let the clean water/mild cleaning solution or mild flow remove particles.
      Note: Never touch, scrape, or press on the metal diaphragm surface – it can deform under very slight force.
    - Rinse the diaphragm area and protective cap thoroughly with DI water to remove any cleaning residues.
    - Allow both to air dry completely in a clean environment.

CAUTION

- Never touch or pinch the diaphragm with tools, brushes, or your fingers.
- Never use an ultrasonic bath – the vibration could damage the bonding of the diaphragm.
- Do not use compressed water, detergent, air or heat in neither the cleaning nor the drying process – pressure may exceed diaphragm limits.

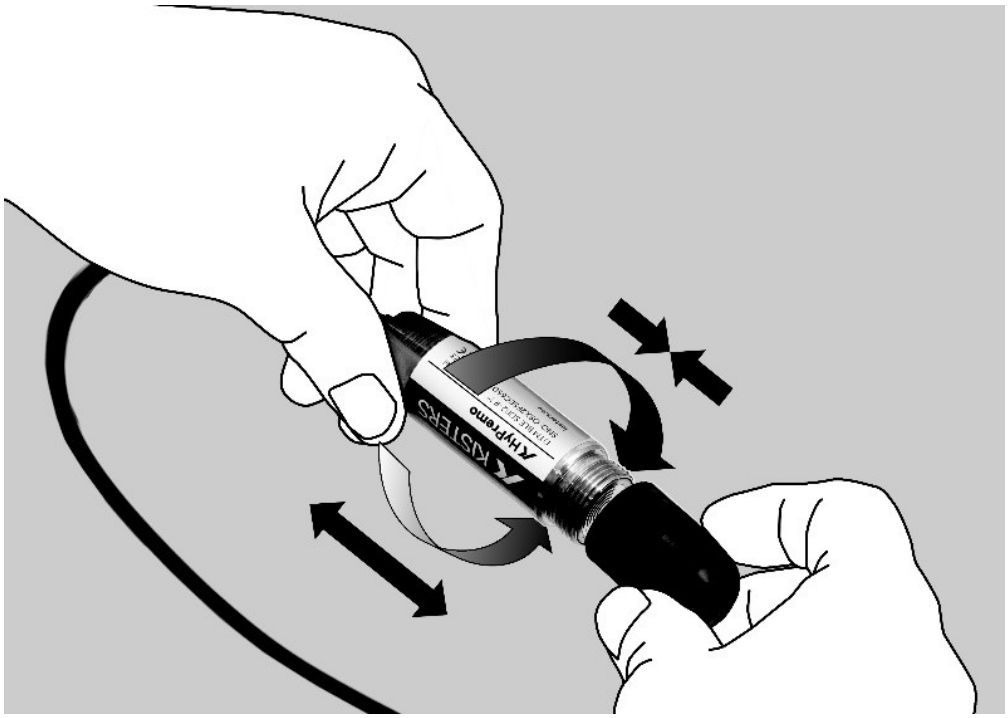

Figure 7 – Remove and attach the protective cap (unscrew/screw)

To remove and reattach the protective cap, follow these steps:

- Removing the protective cap (unscrewing):
  - Grip the protective cap firmly by hand.
  - Loosen the cap by turning it anticlockwise (to the left).
  - Continue unscrewing until the cap is fully detached from the device.
  - Set the cap aside in a safe place.
- Reattaching the protective cap (screwing):
  - Align the protective cap with the device.
  - Turn the cap clockwise (to the right) to begin threading it onto the device.
  - Keep turning until the cap is securely fastened, but be careful not to overtighten it, as this could cause damage.

Control Measurement

Finally, take a control measurement and compare it with the reference value (e.g. the level rod value) to check that it is correct. If the result shows an unexpectedly large deviation, the sensor must be referenced (set to zero) or recalibrated, or both.

- Perform a quick static water column check (e.g., 0.5 m and 1.0 m immersion) to confirm linearity.
- Compare readings with known values – deviation > 0.1 % FS indicates a need for a recalibration in a laboratory.

Maintenance Log

Maintain detailed records of all inspections, cleanings, calibrations and repairs. This documentation will help you to track sensor performance and identify recurring problems.

Sample Document Structure:

- Date and reason for cleaning
- Type of fouling and solution used
- Visual condition of diaphragm
- Post-cleaning zero reading and calibration check results

Note: Depending on local conditions, it may be necessary to carry out maintenance at more frequent intervals. This is particularly the case where there is a significant build-up of debris at the measurement point, or where there is a high probability of increased biofouling or sediment accumulation due to unfavourable environmental conditions.

6 Troubleshooting

WARNING

Risk of falling when accessing HyPremo.

- If the HyPremo is installed in a water body, it may need to be retrieved for maintenance or configuration.
- Always use appropriate personal protective equipment (PPE) to prevent drowning.

WARNING

- Risk of drowning.
- Be particularly careful when working over or near to water.
- Wear a life jacket/buoyancy aid:
  - Ensure that workers at risk of falling into the water are provided with and wear a life jacket or buoyancy aid.
  - The life jacket should be thoroughly checked by the user prior to use.
- Never work alone: Always be accompanied when working near or over water.

No output signal

- Check the power supply. Replace it if necessary.
- Check that the cable is intact; any breaks may interrupt the supply voltage. The sensor and cable must be returned for rewiring. Please follow the repair instructions 23 to return the items.
- Check that the cable is not bent at sharp angles or crushed. Any damaged cables must be replaced by a qualified technician. Please follow the repair instructions 23 to return items.

Output signal shows no variation

- Ensure that the diaphragm is clean and can move freely. Always handle the diaphragm with care and only use very mild detergents. If the diaphragm is damaged, the sensor must be replaced.
- Make sure that no moisture or water droplets have entered the capillary. Clogging of the capillary can result in a constant output signal. Note: moisture and blockages are difficult or impossible to remove. Prevention is therefore essential. If the capillary is blocked, the sensor must be replaced. A correctly connected cable outlet is the optimal solution for protecting against foreign objects or moisture ingress. The vented cable should terminate in a dry junction box containing a desiccant.
- Check the diaphragm for any signs of deformation or damage. If it is damaged, the sensor must be replaced.

Output signal shows heavy/frequent variations

- Frequent and significant variations in both directions indicate an unsuitable installation. A pressure sensor must be protected from horizontal water movement. Pressure sensors are typically installed in locations where there is little variation in flow velocity, or in a stilling well.

Lack of linearity

- The temperature is outside the operating range. The installation site is unsuitable for the sensor. Install the sensor in a location where the operating temperature range is respected.
- The desiccant is wet and can no longer remove moisture from the ambient air. Replace the desiccant packs in the junction box.

7 Technical Data

Technical Specification	HyPremo
Measurement Range	▪ 0 … 5 mH_2O ▪ 0 … 10 mH_2O ▪ 0 … 20 mH_2O ▪ 0 … 30 mH_2O ▪ 0 … 100 mH_2O
Long-Term Stability	typ. ±0.1 % FS, max. ±0.2 % FS (for pressure ranges < 1.5 bar: ±3 mbar)
Accuracy	max. ±0.15 % FS
Resolution	Pressure: typ. 0.0015 % FS ▪ 0 … 5 mH_2O: 0.075 mm ▪ 0 … 10 mH_2O: 0.150 mm ▪ 0 … 20 mH_2O: 0.300 mm ▪ 0 … 30 mH_2O: 0.450 mm ▪ 0 … 100 mH_2O: 1.500 mm Water Temperature: 0.1 °C / 0.18 °F
Overpressure	4 × pressure range (max. 40 bar)
Supply Voltage (Range)	2,8 … 16 V DC, nominal 5 V DC
Power Consumption	SDI-12 Low-Power Mode: ▪ SDI-12 measurement: < 4 mA for approx. 300 ms ▪ Deep sleep between measurements: < 0.015 mW SDI-12 in continuous mode (sensor constantly powered): ▪ Constant power draw: < 4 mA Active Bluetooth® LE connection: ▪ < 0.25 mW
Ingress Protection	IP68 for permanent immersion until max. over pressure
Temperature Ranges	Diaphragm/Pressure Cell: ▪ Compensated temperature range: -5 °C … 50 °C, no icing permitted ▪ Operational range: -20 °C … +85 °C, no icing permitted Electronics designed to operate between -40 °C … +85 °C. Storage Temperature: -20 °C … +85 °C
Dimensions and weight	100 mm × 25 mm (sensor body and protective cap, no cable)
Weight	160 g

Technical Specification	HyPremo
Materials	Diaphragm: stainless steel AISI 316 Ti (DIN 1.4571) Body: stainless steel AISI 316 Ti (DIN 1.4571), titanium-stabilized for good corrosion resistance to low contents of hydrochloric and organic acids O-ring: Viton® Shore A Cap: POM
Compliance	CE, RoHS

8 Repair

KISTERS precision instruments and data loggers are produced in quality-controlled processes. All KISTERS production and assembly sites in Australia, New Zealand and Europe are ISO 9001 certified. All equipment is factory tested and/or factory calibrated before it is shipped to the client. This ensures that KISTERS products perform to their fullest capacity when delivered.

Despite KISTERS most rigorous quality assurance (QA), malfunction may occur within or outside of the warranty period. In rare cases, a product may not be delivered in accordance with your order.

In such cases KISTERS' return and repair policy applies. For you as a customer, this means the following:

- Contact KISTERS using the Repair Request Form and the Declaration of Contamination made available online:

Region (Language)	Download Link
Asia-Pacific (English)	Repair Request Form (APAC) Declaration of Contamination (APAC)
Europe, the Middle East and Africa (English)	Repair Request Form (EMEA) Declaration of Contamination (EMEA)
Germany (German)	Repair Request Form (DE) Declaration of Contamination (DE)

  In response you will receive a reference number that must be referenced on all further correspondence and on the freight documents accompanying your return shipment.
- Please provide as much information and/or clear instructions within the return paperwork. This will assist our test engineers with their diagnosis.
- Please do not ship the goods prior to obtaining the reference number. KISTERS will not reject any equipment that arrives without reference number; however, it may take us longer to process.

Custom requirements for items sent to KISTERS for warranty or non-warranty repairs: Check with your national customs/tax authorities for details, processes and paperwork regarding tax exempt return of products. Typically, special custom tariff codes are available (such as HS Code = 9802.00) that verify the item is being returned for repair and has no commercial value. Please note that the customs invoice / dispatch documents should also clearly state: "Goods being returned to manufacturer for repair – No Commercial value". It is mandatory to have any returned goods accompanied by a commercial invoice on headed paper. KISTERS reserves the right to charge the customer for time spent rectifying incorrect customs documents.

Note: Please ensure that your goods are packed carefully and securely. Damage that occurs during transit is not covered by our warranty and may be chargeable.

9 Obligations of the Operator and Disposal

This chapter contains the following subsections:

9.1 Obligations of the Operator

European Union

In the Single European Market it is the responsibility of the operator to ensure that the following legal regulations are observed and complied with: national implementation of the framework directive (89/391/EEC) and the associated individual directives, in particular 2009/104/EC, on minimum safety and health requirements for the use of work equipment by employees at work.

Worldwide

Regulations: If and where required, operating licences must be obtained by the operator. In addition, national or regional environmental protection requirements must be complied with, regardless of local legal provisions regarding the following topics:

- Occupational safety
- Product disposal

Connections: Local regulations for electrical installation and connections must be observed.

9.2 Dismantling / Disposal

When disposing of the units and their accessories, the applicable local regulations regarding environment, disposal and occupational safety must be observed.

Before dismantling

- Electrical Devices:
  - Switch off the units.
  - Disconnect electrical appliances from the power supply, regardless of whether the appliances are connected to the mains or to another power source.
- Mechanical devices:
  - Fix all loose components. Prevent the device from moving independently or unintentionally.
  - Loosen mechanical fastenings: Please note that appliances can be heavy and that loosening the fastenings may cause them to become mechanically unstable.

Disposal

Operators of old appliances must recycle them separately from unsorted municipal waste. This applies in particular to electrical waste and old electronic equipment.

Electrical waste and electronic equipment must not be disposed of as household waste!

Instead, these old appliances must be collected separately and disposed of via the local collection and return systems.

Integrated or provided batteries and accumulators must be separated from the appliances and disposed of at the designated

collection point. At the end of its service life, the lithium-ion battery must be disposed of according to legal provisions.

EU WEEE Directive

As players in the environmental market, KISTERS AG is committed to supporting efforts to avoid and recycle waste. Please consider:

- Avoidance before recycling!
- Recycling before disposal!

This symbol  indicates that the scrapping of the unit must be carried out in accordance with Directive 2012/19/EU. Please observe the local implementation of the directive and any accompanying or supplementary laws and regulations.

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Empowering decisions of tomorrow