control solutions
TERACOM

Water Leak Detector with Modbus RTU Interface
TSF400-4

USER MANUAL

1. Short description

The TSF400-4 is a waterproof water-leak detector with Modbus RTU communication, designed for early detection of unwanted water presence in technical and industrial environments.

It is suitable for installation on floors, in drainage trays, or inside equipment enclosures where water ingress must be detected quickly and reliably.

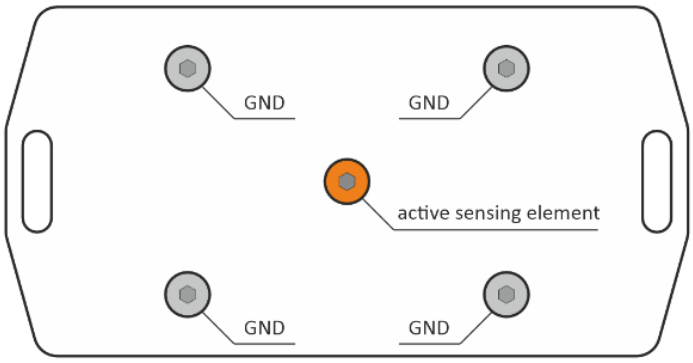
The device allows straightforward integration with PLCs, controllers, and building automation systems for remote monitoring.

The detector is capable of responding to very small amounts of water, including slight floor wetting or residual moisture, such as after cleaning.

The TSF400-4 is intended for continuous operation in applications where reliable water-leak detection is required to protect equipment and infrastructure.

2. Detection principle and electrode layout

The bottom surface of the TSF400-4 enclosure contains five electrodes used for water detection. The central electrode is the active sensing element, while the four surrounding electrodes are connected to ground.



When the device is placed on the floor, the electrodes come into contact with the surface. The presence of water forms a conductive path between the central electrode and any of the surrounding ground electrodes, which triggers the detector and changes the output state.

The electrode arrangement allows reliable detection of water from any direction around the device.

3. Features

- RS-485 interface supporting up to 247 nodes
- LED indicator for communication status
- Firmware update via the RS-485 interface

4. Applications

- Data centers, server rooms, and telecom infrastructure
- UPS rooms and battery backup systems
- HVAC systems – drip trays, air-conditioning units, and condensate drainage lines
- Industrial control cabinets and electrical equipment enclosures
- Building Management Systems (BMS) and infrastructure monitoring
- Technical facilities and utility rooms requiring early water-leak detection

5. Specifications

- Physical characteristics

  Dimensions: 88 x 17 x 46 mm
  Weight: 115 g

- Environmental limits

  Operating temperature range: 0 to 50 °C / 32 to 122 °F
  Operating relative humidity range: 10 to 90 %RH (non-condensing)
  Storage temperature range: -20 to 60 °C
  Storage relative humidity range: 10 to 90 %RH (non-condensing)
  Ingress protection: IP65

- Power requirements

  Operating voltage range (including -15/+20% according to IEC 62368-1): 4.5 to 26 VDC
  Current consumption: 5 mA @ 12 VDC

- Interface

  Protocol: Modbus RTU
  Physical layer: RS-485 serial line non-isolated
  Number of bus transceivers: up to 247
  Response time: ≤ 50 ms

  Master response time-out ≥ Response time + Answer time
  The answer time depends on the number of bits and the baud rate.

- Cable length

  3 meters

- Warranty

  Warranty period: 3 years

6. Cable wiring

Signal	Wire color	Description
RESET	Yellow	Used for factory reset and firmware update
RS-485 -	Blue	RS-485 differential bus line
RS-485 +	White	RS-485 differential bus line
GND	Black	Ground
VDD	Red	+ 4.5 to 26 VDC

7. LED indicator

The device status is indicated by a bi-color LED using color and blink-rate signaling.

Blink rate

- 1 second – communication with the controller established
- 3 seconds – device operating, no communication with the controller

LED color

- Green – normal operation (no water detected)
- Red – water detected (alarm state)

LED off - no power supply

8. Installation guidelines

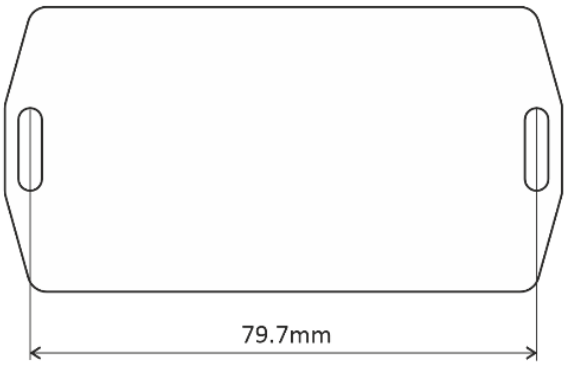
Installation recommendations

- Install the probe at the lowest point where water may accumulate (floor, tray edge, under piping).
- Avoid mounting in locations where the electrodes may remain permanently wet or become contaminated by conductive dust.
- Avoid installation in areas exposed to aggressive chemicals or cleaning agents that may affect the sensing electrodes.
- Detection of de-ionized water may be unreliable and should be verified during commissioning.
- Route the connection cable away from strong electromagnetic sources such as motors, inverters, or power cables.

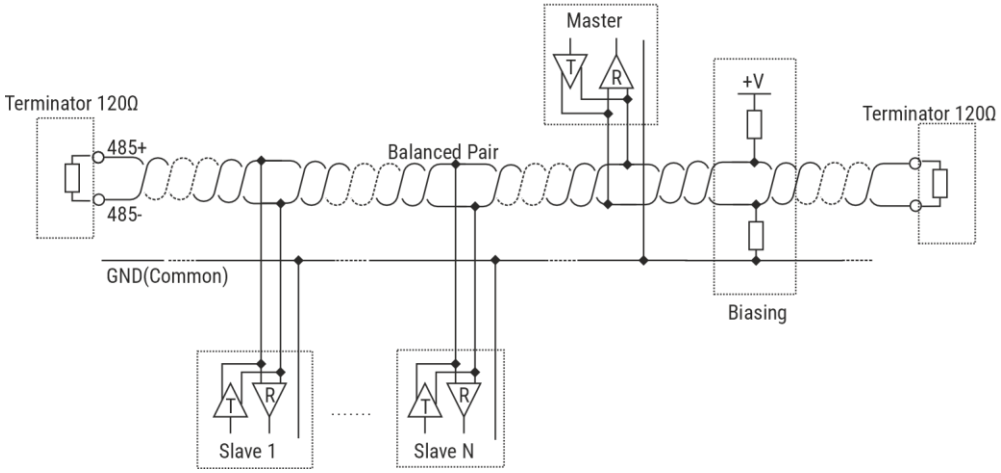
Functional test

After installation, verify the alarm function using a wet sponge or cloth.

The detector enclosure includes slotted mounting holes that allow secure installation to the floor using suitable screws and wall plugs. The recommended screw diameter is 3 mm, with a center-to-center distance of 79.7 mm between the mounting slots.



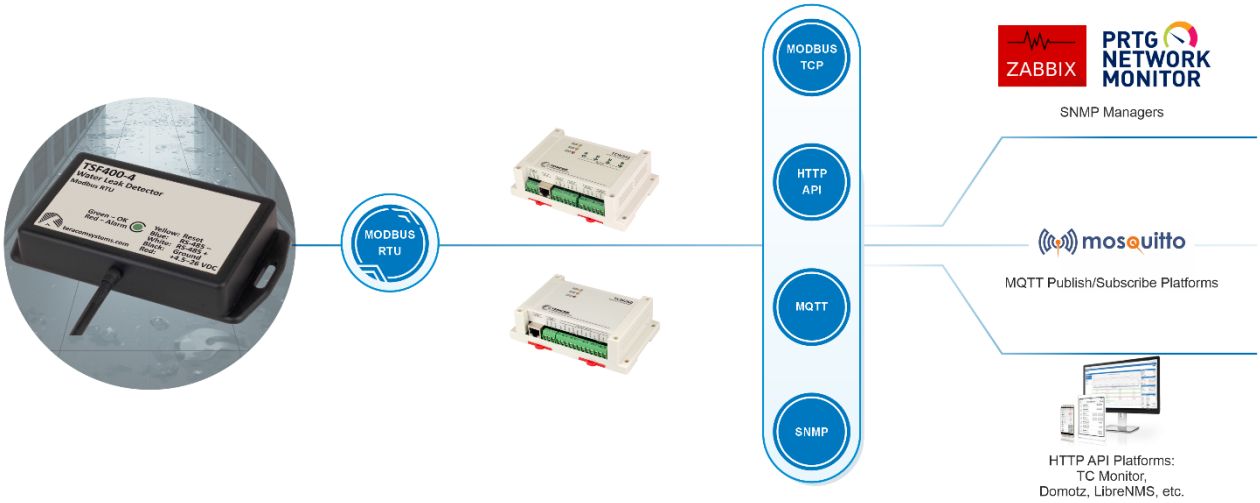
Two-Wire MODBUS definition according to modbus.org:
“A MODBUS solution over a serial line should implement a “Two-Wire” electrical interface in accordance with EIA/TIA-485 standard. On such a “Two-Wire” topology, at any time one driver only has the right for transmitting. In fact, a third conductor must also interconnect all the devices of the bus - the common.”



A daisy-chain (linear) topology and UTP/FTP cables for multiple devices are strongly recommended. For proper operation of the interface, terminators (120 ohms resistors) must be installed at both ends of the bus.

9. Application example

To help visualize proper detector deployment, the picture below illustrates typical installation scenario. It shows how the TSF400-4 can be connected and arranged in real application to ensure reliable leak detection and integration with monitoring and control system.
This example is for illustration only. Always follow the specific requirements of your project.



10. Factory default settings

To restore the device to factory default settings:

- Disconnect the power supply.
- Connect the RESET wire to GND and keep it connected.
- Apply power while the RESET wire is connected to GND.
- The status LED will turn ON for 3 seconds, then blink for 7 seconds, and then turn ON again.
- Disconnect the RESET wire from GND.

The device will restart with factory default settings.

11. Firmware update

The device firmware can be updated using a Teracom controller with Modbus RTU support or the MBRTU-Update software.
To enter firmware update mode, follow these steps:

- Remove the power supply. Then disconnect the device from the shared RS-485 bus so that it is the only slave device on the RS-485 line.
- Connect the RESET wire to GND and keep it connected.
- Apply power while the RESET wire remains connected to GND.
- The status LED will turn ON for 3 seconds. During this period, disconnect and reconnect the RESET wire to GND three times.
- The device enters firmware update mode. In this mode, the status LED remains continuously ON.
- Update the device firmware and then restart the device (power cycle).

12. Recycling

Please recycle all applicable materials in accordance with local regulations.
Do not dispose of the device as regular household waste.
Electronic components should be properly recycled to minimize environmental impact.

13. Modbus register table

Register name	R/W	FC	PDU decimal address	Logical decimal address	Data size	Default	Valid values
Holding registers							
Modbus address	R/W	3,6,16	10	40011	uint16	1	1 to 247
Baud rate*	R/W	3,6,16	11	40012	uint16	19200	2400, 4800, 9600, 19200, 38400, 57600
Parity, data, stop bits*	R/W	3,6,16	12	40013	uint16	1	1=E81, 2=O81, 3=N81
Data order	R/W	3,6,16	13	40014	uint16	1	1=MSWF (MSW, LSW) 2=LSWF (LSW, MSW)
Device code	R	3	14	40015	uint16		0x00DF
FW version	R	3	15	40016	uint16		
Vendor URL	R	3	18	40019	UTF-8 64 bytes		teracomsystems.com
Float test value (MSW)	R	3	82	40083	float32		-9.9(0xC11E6666)
Float test value (LSW)	R	3	84	40085	float32		-9.9(0xC11E6666)
Signed integer test value	R	3	86	40087	int16		-999(0xFC19)
Signed integer test value (MSW)	R	3	87	40088	int32		-99999(0xFFFE7961)
Signed integer test value (LSW)	R	3	89	40090	int32		-99999(0xFFFE7961)
Unsigned integer test value	R	3	91	40092	uint16		999(0x03E7)
Unsigned integer test value (MSW)	R	3	92	40093	uint32		99999(0x0001869F)
Unsigned integer test value (LSW)	R	3	94	40095	uint32		99999(0x0001869F)
Alarm	R	3	100	40101	uint16		1 = Water absent 0 = Water present
Alarm (inverse)	R	3	102	40103	uint16		1 = Water present 0 = Water absent
Input registers							
Alarm	R	4	1	30002	uint16		1 = Water absent 0 = Water present
Alarm (inverse)	R	4	2	30003	uint16		1 = Water present 0 = Water absent

* Changes take effect after a device restart (power cycle).
PDU address: Actual register address used in the Modbus Protocol Data Unit (zero-based).
Logical addresses are shown using the standard Modbus offsets: 40001 for holding registers and 30001 for input registers.
MSWF – Most Significant Word First (bits 31…16, bits 15…0)
LSWF – Least Significant Word First (bits 15…0, bits 31…16)
If a floating-point value is not available, the returned value is “NaN” (e.g. measurement error).
If a 32-bit signed integer value is not available, the returned value is “-2147483648” (e.g. measurement error).