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User Manual

Wireless Temperature and Humidity Monitoring Devices

Selectric – STP-IG

1. OVERVIEW

The STP-IG is an industrial gateway that includes one 10/100 BaseT Ethernet port, two RS-485 ports, and one wireless LoRa port with configurable radio frequency bands. It is ideal for connecting RS-485 devices and LoRa temperature and humidity sensors, such as the STP-S1 or STP-S3, to an IP-based Ethernet network for SCADA systems or other industrial automation. It also provides support for several key features for both Modbus and a transparent gateway.

The STP-S1 and STP-S3 LoRa temperature sensors are a system for wirelessly monitoring temperature and humidity in all critical connections and equipment locations, as well as in distribution networks up to 110 kV. The sensors enable real-time monitoring of temperatures from -40°C to 125°C and ambient humidity from 10% to 90%. Data is transmitted wirelessly using the LoRa protocol.

Their compact size and flexible installation options make these sensors ideal for detecting overheating issues in a variety of applications, including transformer enclosures, circuit breakers, cable connections, feeders, busbars, cabinets and MCC drawer units, motor enclosures, and other equipment requiring temperature and humidity measurement. The sensor is powered by the magnetic field generated around the current-carrying element when an alternating current flows through it. For stable operation, the sensor requires a minimum current of 5 amps. A sensor with an integrated battery is also available.

The controller cyclically collects data from the sensors and analyzes the received data according to a predefined algorithm. All system monitoring information is available for E-SCADA systems. Monitoring can be optionally displayed on an HMI panel.

System parameterization is available through the built-in web interface.

2. STP-IG FEATURES

- 1x10/100BaseT (RJ45) and 2xRS-485 ports are designed to operate in the harshest industrial environments:
  - 2 kV Ethernet port isolation protection
  - 15 kV air and 8 kV contact ESD protection and 3 kV isolation protection for all serial ports
- One LoRa port with additional ISM bands for EU 863-870/RU 864-870/IN 865-867, US 902-928, AU 915-928, AS1 920-923/AS2 923-925 MHz.
- Transparent gateway between Ethernet and RS-485 ports
  - TCP Server/Client and UDP Server/Client modes
  - Maximum 4 masters per RS-485 port
- Modbus TCP to RTU gateway
  - TCP Server and TCP Client modes
  - 32 slave IEDs per RS-485 port
  - Maximum 8 Modbus TCP masters
- Multi-master support for Modbus and transparent gateway functions
- Temperature and humidity data collection from LoRa temperature sensor (STP-S1 and/or STP-S3) and measurement display via built-in web server/HMI (optional)
  - Maximum 80 STP-S1 and/or STP-S3 sensors for one STP-IG gateway

- Real-time data are updated every 10 seconds
- Data register (DR) logs for temperature and humidity data at 15-minute intervals for at least 2 months
- Daily and monthly max/min data for selectable areas and periods
- 2-level setpoint — warning and alarm for temperature and humidity
- Up to 256 SOE logs

- Embedded web server for configuring LoRa temperature sensors, displaying temperature and humidity measurements, setting up communication, device maintenance, and user management tools
- One-button reset to factory settings
- DIN rail mounting
- Extended Operating Temperature Range

3. FUNCTIONS OF STP-S1 AND STP-S3

- STP-S1 supports 1 built-in NTC sensor for temperature control and 1 built-in humidity sensor
- STP-S3 supports 3 external NTC inputs for temperature control and 1 built-in humidity sensor
- Wireless LoRa communication - 300m transmission range in an open environment or 100m transmission range in a closed cabinet
- Selectable frequency range options

C	EU 863-870 MHz/RU 864-870 MHz/IN 865-867 MHz
D	US 902-928 MHz
E	AU 915-928 MHz
F	AS1 920-923 MHz MB2 923-925 MHz
G	User channel in the range 860-930 MHz

4. AREA OF APPLICATION

STP-IG supports data acquisition from up to 80 STP-S1 and/or STP-S3 LoRa Temp Sensors. The results of temperature and humidity measurements will be automatically transmitted to the station via LoRa wireless communication and stored, as well as displayed on the built-in web server. In addition, STP-IG is capable of generating and displaying max/min data logs, DR logs, as well as SOE logs for collected temperature and humidity data.

STP-IG supports efficient transmission of serial data packets between upstream network applications and downstream RS-485 devices over a TCP/IP connection. STP-IG allows applications to directly connect to it via A TCP/IP connection for transparently transmitting serial packets over TCP/IP to downstream devices. STP-IG provides a robust interface for SCADA or similar applications that already support direct connections with Ethernet Gateway for communication with serial devices, regardless of the protocols used.

STP-IG also supports the Modbus TCP to Modbus RTU gateway function, which makes it easy for any Modbus TCP Master application to interface with a Modbus RTU-enabled IEDS over a LAN. A simple web interface allows users to easily configure TCP to RTU address translation for downstream RS-485-connected I/O slaves.

STP-IG can support multiple masters, facilitating information exchange and minimizing implementation costs.

5. STANDARD ACCESSORIES

STP-IG

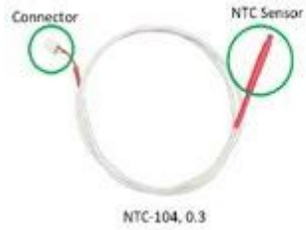
- Power supply: 95-250 V AC/DC, 47-440 Hz / 20-60 V AC
- Communication Interface 1 Modbus TCP port; 2 Modbus RTU ports
- Sensor communication: LoRa (860-935 MHz)
- Number of connected sensors: up to 80 pcs.
- Communication range: up to 300 m
- Mounting method: DIN rail
- Optional: monitoring output to the HMI panel

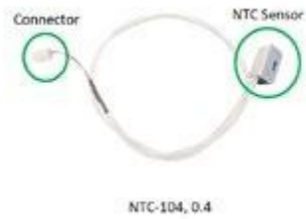
STP-S1

- Power supply: autonomous (powered by magnetic field) / battery (built-in)
- Sensors: 1 built-in temperature sensor and 1 built-in humidity sensor
- Mounting method: magnetic stripe and backing / 3M adhesive tape and clamp
- Voltage level: up to 110 kV

STP-S3

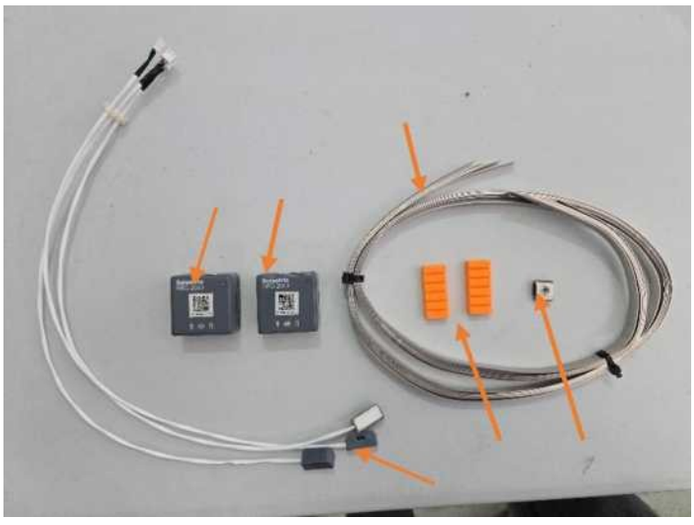
- Power supply: autonomous (powered by magnetic field)
- Sensors: 3 NTC sensor inputs and 1 built-in humidity sensor
- Mounting method: magnetic strip and backing
- Voltage level: up to 1000 V





	1 NTC sensor with an insulated metal protective sleeve and a 0.3 m cable.
NTC-104, 0.4	1 NTC sensor in a PC-ABS housing with a heat-conducting silicone gasket, and a 0.4 m cable.
NTC-104M4, 2	1 NTC sensor with a 4 mm diameter ring connector and a 2 m cable
NTC-104M10, 1~	1 NTC sensor with a 10 mm diameter ring connector and a 1 m cable
NTC-1043, 2	3 NTC-104 sensors (yellow, green, and red) in one set, each with an insulated metal protective sleeve and a 2 m cable

6. MOUNTING HARWARE



1. STP-S1 Sensor
2. STP-S3 Sensor
3. Soft Magnetic Tape
4. NTC Sensors for STP-S3
5. Sealing Backing
6. Tape Holder

7. MOUNTING INSTRUCTIONS

Installation Materials

Before installation, prepare the following materials, shown in the figure below (from left to right):

1) Soft Magnetic Tape (Permalloy 100 cm/10 m) - Ensure sufficient material is available on-site during preparation. When used to measure the temperature of moving contacts of a switch or large copper

rods, a large quantity of tape is required. One roll of 180010033 alloy tape is sufficient for approximately 100 STP-S1 temperature measurement points.

Do not use alloy tape other than that supplied by Selectric.

2) Scissors or diagonal pliers (for cutting the alloy tape according to actual needs during on-site installation)

3) STP-S1/S3 (record the identification number and channel)

4) Sealing backing pads (2 pcs.) (cut off the required quantity)

5) Allen key

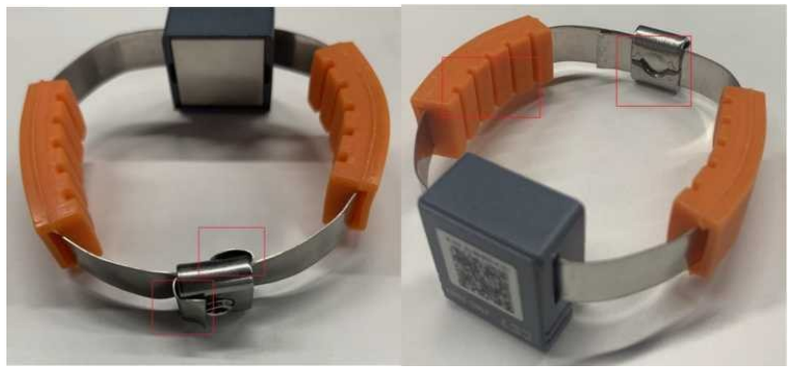
6) Allen nuts with socket head cap

7) Gloves (help protect your hands from cuts, as the alloy strap is sharp).

Items 1, 3, 4, 5, and 6 are supplied with the product, while items 2 and 7 must be prepared on-site.

Installation Steps

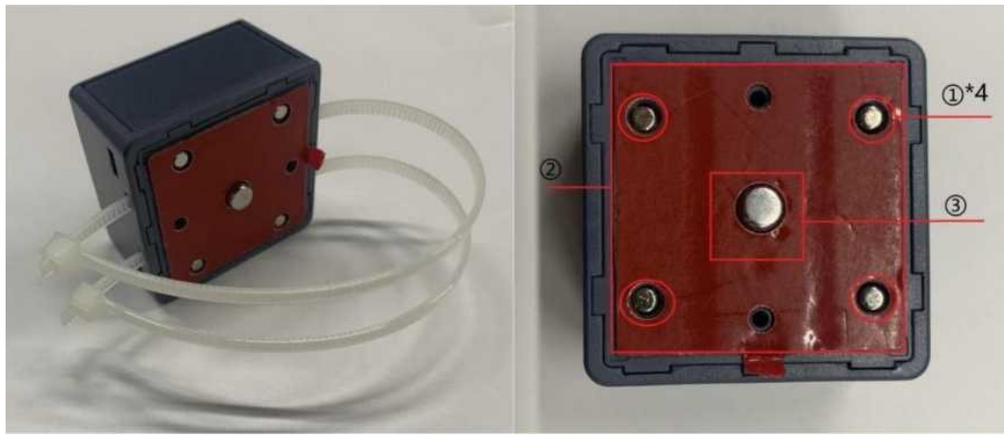
Pass the tape sequentially through the silicone backing, sensor, silicone gasket, and allen nut. Cut the permalloy tape to the required length and secure it with the allen nut. Bend the excess tape back as shown in the figure below (see lower left). The installation direction of the silicone gasket and allen nut must strictly correspond to the diagram in the lower right figure and cannot be changed.



After installation, record the installation location, channel, and sensor ID number.

Installation Options for the STP-S1

The STP-S1 supports three installation options: cable tie, magnetic attraction, and 3M adhesive tape. You can choose the appropriate mounting method based on your installation conditions (cable tie, 2.7 x 300 mm, nylon 66, is standard).



In the figure above, (1) magnets (optional), 4 pcs., (2) 3M adhesive (standard), (3) temperature sensor.

8. TYPICAL INSTALLATION

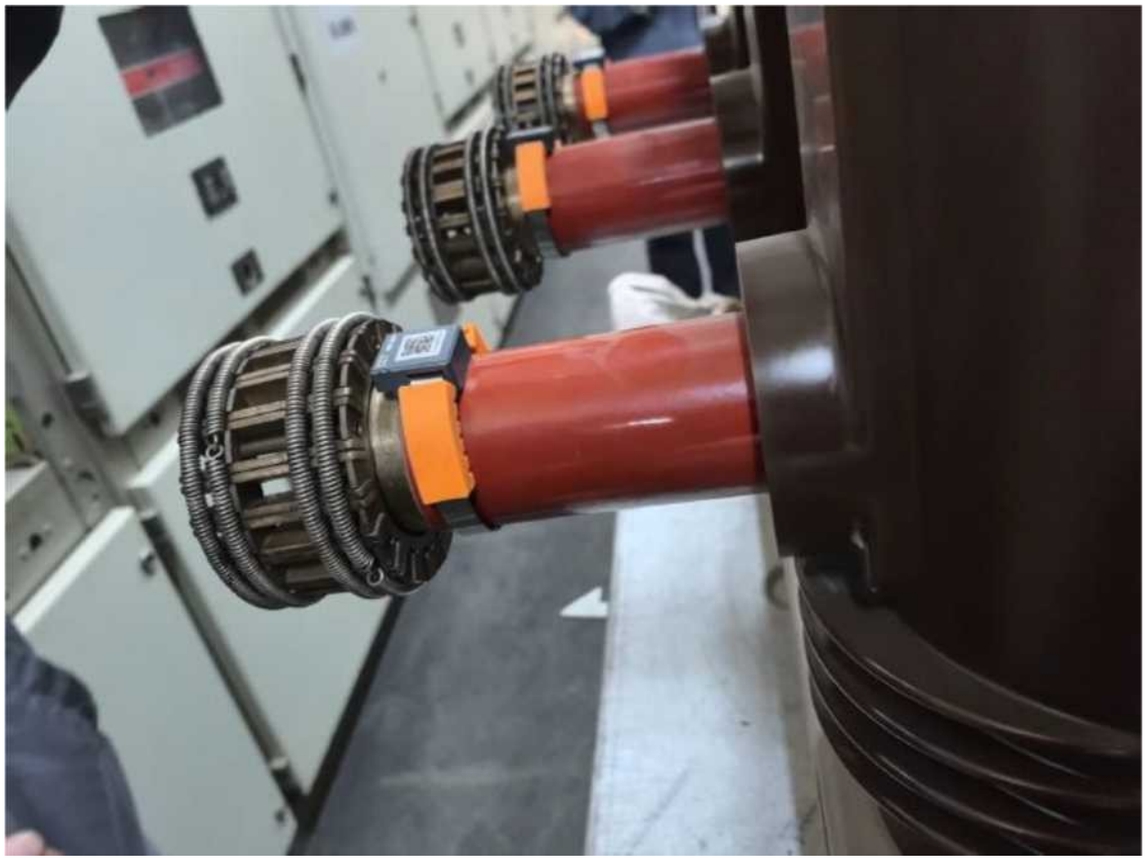
STP-S3 on low-voltage air circuit breaker contact connections

STP- S1 on

low-voltage switchgear busbars

STP-S3 on outgoing cable connection busbars in cabinets with low-voltage drawout units

STP-S1 on 10 kV medium-voltage switchgear contact connections



9. STP-IG TECHNICAL SPECIFICATIONS

Communication	
Ethernet port (P1)	
Speed	10/100 Mbps
Protocol	TCP, UDP, HTTP
RS-485 (P2, P3)	
Data transfer rate	300/600/1200/2400/4800/9600/19200/38400 bps
Data bits	7, 8
Stop bits	1, 2
Lora	
Radio frequency range	860-935 MHz
ISM band	EU 863-870/RU 864-870/IN 865-867, US 902-928, AU 915-928, AS1 920-923/AS2 923-925
RF output power	18 dBm (maximum)
Receiver sensitivity	-136 dBm (maximum)
Output power	0.03 (typical)
FCC Rules Part 15	certified by TCB

Front panel LED indicators	
Operation (green)	Flashing - system is operating normally
Data (yellow)	Flashing - LoRa is receiving and transmitting data
P2, P3 (green)	Flashing - signal reception
P2, P3 (yellow)	Flashing - signal transmission

Power supply	
Standard (L/+, N/-)	95-250VAC/DC, 47-440Hz
Option (+, -)	20-60VAC
Load	<3W

Protection Level	
Emergency Stop Protection	15kV (air) & 8kV (contact)
Isolation Protection	3kV for RS-485, 2kV for Ethernet port

Environmental Conditions	
Operating Temperature	-25°C to +70°C
Storage Temperature	-40°C to +85°C
Humidity	5% to 95% non-condensing
Atmospheric Pressure	70kPa to 106kPa

Mechanical Specifications	
Device Dimensions	72x65x95mm
Fasteners	DIN Rail
IP Standard	30

Antenna	
Frequency Range	860-935 MHz
Bandwidth	75 MHz
Impedance	500Q
Power	50W
Height	239.5±5mm
Standing wave ratio	<2
Antenna gain	4dBi

10. LORA TEMPERATURE SENSOR

-	STP-S1-A	STP-S1-B	STP-S3
Number of sensors	IxNTC (built-in) +1 humidity sensor (built-in)		3xNTC (external) ■^Humidity (built-in)
Temperature Measurement Range:	-40°C to 125°C (accuracy: ±1°C) Humidity: 10% to 90% (accuracy: ±2%)		
Dimensions	26x22x11mm	38x38x22mm	
Power supply	Self-powered by inductive current	3V, 1000 mAh, battery life 5 years	Self-powered by inductive current
Starting current	Minimum 3.5A	-	Minimum 3.5A
Start-up time	30 seconds at Ist=5A		
Voltage level	Up to 10 kV		Up to 1000 V

Lora	STP-S1-A	STP-S1-B	STP-S3
Data transfer rate	15000bps		
Operating Current	22.5 mA		
RF output power	14dBm	15dBm	14dBm
Transmission Cycle	TC Change <2°C: 30 sec, TC Change >2°C: 10 sec, Humidity: 60 sec		

11. STP-IG ORDERING INFORMATION

Product Code						Description
STP-IG Ethernet Serial/LoRa Gateway						
Primary Function	T					Modbus Gateway and Transparent Gateway
Power supply		2				95-250 V AC/DC, 47-440 Hz
		3				20-60VAC
Wired Communication			T2			1x10/100BaseT +2xRS-485
Wireless Communication				T		LoRa (860-935 MHz) with configurable frequency ranges for collecting data from LoRa temperature sensors (STP-S1 and STP-S3)
Language					E	English
STP-IG -	T	2	T2	T	E	STP-IG-T2T2TE (standard model)

12. STP-S1/STP-S3 SENSORS ORDERING INFORMATION

Temperature Sensor STP-S1 LoRa						
Temperature Sensor STP-S3 LoRa						
Power supply	A					Self-powered by inductive current
	B					Battery (3 V, 1000 Ah, 5-year battery life, and STP-S1 only)
Sensor Input		1				1 built-in NTC sensor + 1 built-in humidity sensor (STP-S1 only)
		2				3 NTC inputs (for external NTC sensor) + 1 built-in humidity sensor (STP-S3 only)
Frequency Range*		C				EU 863-870 MHz/RU 864-870 MHz/IN 865-867 MHz
		D				US 902-928 MHz
		E				AU 915-928 MHz
		F				AS1 920-923 MHz /AS2 923-925 MHz
		G				User channel in the range 860-930 MHz (MOQ=500 pcs.)
LoRa Channel				1		Channel 1
				2		Channel 2
				3		Channel 3
				4		Channel 4
				5		Channel 5
				6		Channel 6
				7		Channel 7
				8		Channel 8
Installation Method					1	3M adhesive tape and clamp (only for STP-S1, power supply option B)
					2*^	3M adhesive tape, clamp and magnetic attraction (only for STP-S1, power supply option B)
					3	Magnetic tape with sealing
Language					E	English

STP-S1	-	A	1	C	1	3	E	STP-S1-A1C13E (standard model)
STP-S3	-	A	2	C	1	3	E	STP-S3-A2C13E (standard model)

*Optional (additional charge applies)

Factory pre-installed parameters for the LoRa channel configurations for each frequency band option are listed in Table A. Note that the LoRa channel is not field configurable, and only one channel should be selected for STP-S1 or STP-S1. Please select the correct LoRa channel when ordering the LoRa temperature sensor.

^ The magnetic mount is not suitable if the STP-S1 is installed on cable connections or in other situations where the load current exceeds 10 A.

^ Please order external NTC sensors from the "NTC Sensor" table.

Frequency Range Options

Table A

Options of LoRa Channel					
-	**C**	**D**	**E**	**F**	**G**
Channel 1	863.25MHz	902.50MHz	915.50MHz	920.50MHz	Custom
Channel 2	864.25MHz	907.50MHZ	917.50MHz	921.50MHz	-
Channel 3	865.25MHz	912.50MHZ	921.50MHz	923.50MHz	-
Channel 4	866.05MHZ	921.50MHz	923.50MHz	924.50MHz	-
Channel 5	866.85MHz	922.50MHz	919.50MHz	922.50MHz	-
Channel 6	867.85MHz	927.50MHz	925.50MHz	-	-
Channel 7	868.85MHz	-	927.50MHz	-	-
Channel 8	869.85MHz	-	-	-	-

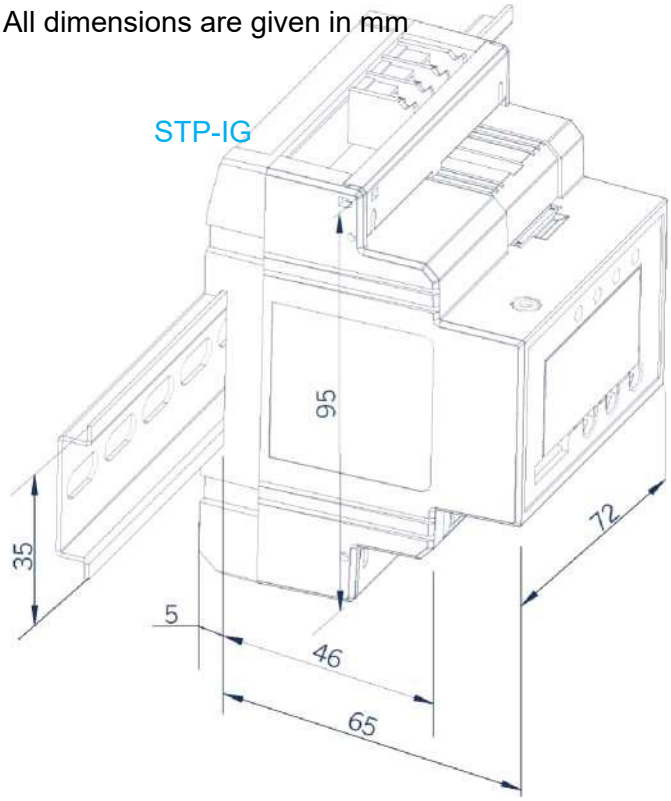
NTC Sensor

Model	**Specification/Description**
NTC-104, 0.3*	1 NTC sensor with an insulated metal protective sleeve and a 0.3 m cable.
NTC-104, 0.4	1 NTC sensor in a PC-ABS housing with a heat-conducting silicone gasket, and a 0.4 m cable.
NTC-104M4, 2	1 NTC sensor with a 4 mm diameter ring connector and a 2 m cable
NTC-104M10, 1~	1 NTC sensor with a 10 mm diameter ring connector and a 1 m cable
NTC-1043, 2	3 NTC-104 sensors (yellow, green, and red) in one set, each with an insulated metal protective sleeve and a 2 m cable

13. DIMENSIONS AND INSTALLATION

All dimensions are given in mm

STP-IG



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ELECTRICAL EQUIPMENT
DESIGNED FOR MAXIMUM RELIABILITY

Office in China

Address: Building C, No. 888, Huanhu West Second Road, Lingang New District, Free Trade Pilot Zone, Shanghai, China
Tel.: +86 180 1775 8966
Email: info.cn@selectric.ru

Office in Russia

Address: Business Center G10, Bld. 10, 21st km, Kievskoye shosse, Moscow
Tel.: +7 499 390 80 00
Email: Info@selectric.ru