COMEM

FOTEMP T20
Fiber optic temperature measurement system

Content index

General

The fiber optic temperature measurement system described in the operating instructions has been designed and manufactured using state-of-the-art technology.

All components are subject to stringent quality and environmental criteria during production.This manual contains important information on how to handle the device

Follow all safety and work instructions to ensure safe use. Please adhere also to the relevant local accident prevention and general safety regulations for the device's range of use.

The operating instructions are an essential part of the product and should be kept near the device and readily accessible to trained personnel at all times. Qualified personnel must carefully read and understand the operating instructions before using the device.

The manufacturer's liability is void if the device is misused, operating instructions are not followed, unqualified personnel are assigned, or unauthorized modifications are made.

General terms and conditions contained apply. Subject to technical changes.

Safety

Safety instructions

This manual contains important information to ensure personal safety and to prevent damage. Safety instructions in this manual are shown in three different forms to emphasize important information.

⚠️ **WARNING**
Indicates a potentially dangerous situation that can result in injury or death, if not avoided.

⚠️ **CAUTION**
Indicates a potentially dangerous situation that can result in light injuries or damage to equipment or the environment, if not avoided.

❗ **NOTE**
Points out useful tips, recommendations, and information for efficient and trouble-free operation.

Skilled personnel:

Only qualified personnel should commission and operate the devices.
Skilled personnel are those with technical training, knowledge of measurement and control technology, and experience and knowledge of country-specific regulations, current standards, and directives.

Intended use:

he device has been designed and built solely for the described intended use and must only be used accordingly. The technical specifications contained in this manual must be observed.

Unpacking, inspection, service

Please make sure to follow these instructions when unpacking and inspecting your system components:

1. Check all materials against the enclosed packing list.
2. Carefully unpack and inspect all components for visible damage.
3. Save all packing materials, until you have inspected all components and find that there is no obvious or hidden damage.
4. If you notice any damage upon unpacking, contact us immediately.
5. In case of a malfunction or service request, please contact us.

Technical support
Email: customerservice@it.comem.com
TD +49 351 843 599 0

Equipment return address
COMEM Optocon GmbH
Washingtonstrasse 16/16a
01139 Dresden, Germany

Disposal

Inoperable instruments must be disposed of in compliance with local regulations for electronic materials.

Introduction

The FOTEMP T20 fiber optic temperature measurement system with its design is intended for use in power transformers. With fiber optic sensors it is ideal for measuring transformers winding hot spots in real time, allowing an optimized operation of the asset at safe load capacity during normal and emergency condition.

FOTEMP T20 can be used for many fields of application, e.g.:
• EHV/UHV/HVDC transformers
• Power and distribution transformers
• Reactors and generators
• Load tap charger

The probes used for temperature measurement consist of a PTFE-housed glass fiber with a GaAs crystal (gallium arsenide) at the tip The probe is completely non-metallic and therefore completely non-conductive.

COMEMs fiber optic sensors offer complete immunity to RF and microwave radiation with high temperature operating capability, intrinsic safety, and non-invasive use. The probes are also designed to withstand harsh and corrosive environments.

Starting at a light wavelength of 850nm GaAs becomes optical translucent. Since the position of the band gap is temperature dependent, it shifts about 0.4nm/Kelvin. The measurement device contains a light source and a device for the spectral detection of the band gap. This guarantees fast, repeatable, and reproducible measurements.

Thanks to its accompanying software FOTEMP ASSISTANT 2, measurement results can be easily controlled and monitored.
Over the entire life of the system re-calibration is not required to remain within the specifications.
Inoperable instruments must be disposed of in compliance with local regulations for electronic materials.

Product specification

Measurement	
Measurement Range	-200 °C to 300 °C
Measuring Time	< 250 ms per Channel
Accuracy (Standard Deviation)	1.0 K
Resolution	0.1 K
Probes	Compatible with all COMEM fiber optic temperature probes

Environment	
Communication Protocols	ASCII, Modbus
Interfaces	RS485, USB, Ethernet
Operating Temperature	-20 °C to 60 °C
Storage Temperature	-20 °C to 70 °C
Connector Type	ST

Device	
Channel	2 to 16
Display	4.3" LCD
Additional Interfaces	---
Data Logging	Continuous or timed temperature logging
Power Supply	24 VDC
Dimension	209 x 203 x 109 mm
Weight	2.0 kg

Calibration

For accurate temperature measurements in critical areas, we provide a comprehensive calibration service for our fiber optic temperature measurement devices. Our modern labs and our qualified staff ensure very accurate and fast calibration.

You will receive your unit back within a few days, ready to start your fiber optic measurement projects. Your fiber optic thermometer comes factory-calibrated. An annual re-calibration is not necessary, unless required by internal company regulations. All calibrations are performed at our factory.
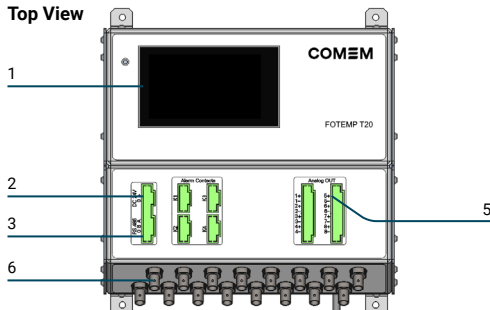
We provide a full certificate of test results for each calibrated device.
For more information contact us:
customerservice@it.comem.com

Quick start

This quick reference guide gives you an overview for quick usage. However, it cannot replace extensive literature with important information and safety warnings.

Top View

1. Display
The LCD display shows the temperature readings and other information for the user.

2. Power supply
Connector for external power supply. Ensure that you only use power supply units that comply with the specifications.

3. Terminal Plug
Port for RS485 bus.

4. Relay header
1WDT, 1 sensor, 2 free programmable relays

5. Analogue
16 pins for 8 channel-bound analogue outputs

6. Sensor connection
These are ST type connectors, mating to each of the optical temperature sensors. If you need to ex-tend the fiber optic temperature sensor, please use the extension cables also available from COMEM.
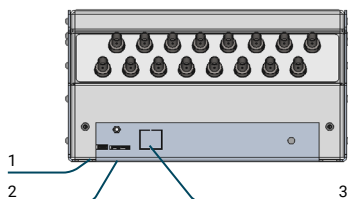
Front View

1. USB interface
USB-Micro Port for communication.

2. Micro SD-Card slot.

3. Ethernet interface

Installation

1. Plug the fiber optic temperature sensors to the ST-socket.
2. Connect the USB for communication and power supply.
3. If you want to supply the device with power externally, please connect it to an appropriate power supply. (Optional)
4. After you have connected the power supply, the device starts and the LED lights up green.
5. Now the device is ready for measurement.

⚠️	**NOTE**

If no sensor is connected or the signal quality is too low, the LED will light up red.

⚠️	**CAUTION**

The fiber optical temperature measurement systems only function with COMEM fiber optic temperature sensors. Please do not use temperature sensors of other brands.

General installation guidelines:

Please read the instructions for installing the fiber optic instrument carefully. Please note especially the order of the instructions exactly.

Sensor connection (page 6)
The temperature sensors are connected via the ST-plugs to the ST-socket. Please note to insert the plugs pushing slightly against the spring pressure and to turn with a clockwise rotation. All fiber optical temperature sensors of COMEM can be connected.

Sensor handling (page 6)
The sensor consists of a ST-plug at the end and a gallium arsenide crystal at the tip of the sensor. The crystal is sensitive and should not be exposed to excessive mechanical stress. Please note the information about the bending radius of the sensor. A forcible bending of the sensor leads to breakage of the fiber. In this case the sensor is damaged and needs to be repaired / replaced.

Relays (page 8)
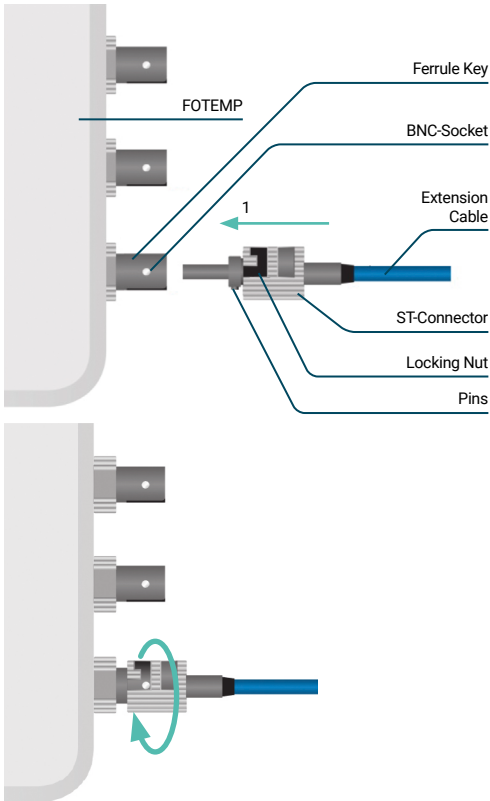The device offers four relays for different functions.

Logging (page 9)
It is possible to write all measured values to an SD card.

Serial communication (page 9)
The device can be connected to a PC via RS485, USB, or Ethernet.

Sensor connection

- Ferrule Key
- FOTEMP
- BNC-Socket
- Extension Cable
- 1
- ST-Connector
- Locking Nut
- Pins

To ensure accurate measurements and long life of the fiber optic sensors and instruments, it is necessary to clean them regularly. More information about cleaning can be found on page 7.

> ⚠ **NOTE**
>
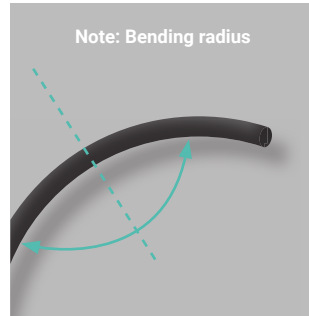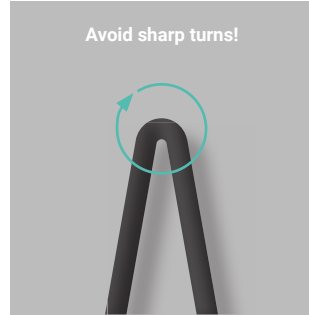> Any unused channels must be protected with supplied dust caps.
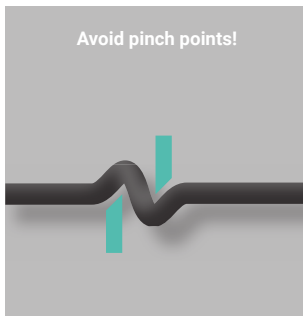
Test of sensor functionality

To test the functionality of the sensor, you can place the sensor into a test liquid, of which the temperature is known (e.g. boiling water). The sensor will respond with the given temperature within a few seconds.

Sensor handling

Bending radius:

Fibers with a core diameter of 200 µm have a short time (≤10 min) bending radius of 10,0 mm and a long time (>10 min) bending radius of 27,0 mm.

Avoid sharp turns!

Note: Bending radius

Avoid tight loops!

Mechanical load:

Avoid stretching!

Avoid pinch points!

Avoid shocks on sensor tip and connector head!

Storage:

When not in use, the sensor should be carefully stored in its delivery box or suitable storage container to prevent bending or crushing.

Sensor/connector cleaning
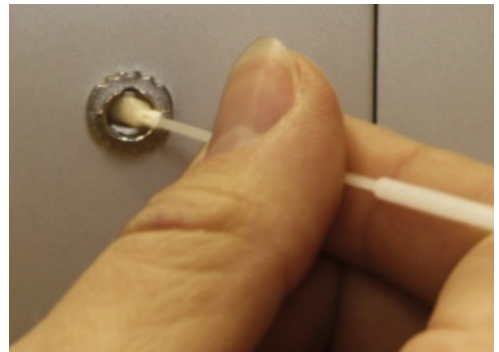
Instructions

Clean the ST sensor's connector with the connector cleaner. Softly press the connector on the cloth tape and rotate across the tape while rotating the connector.
You can clean up to 6 connectors before advancing the tape. Tear off excess tape as required.
Take a swab and wet it with the isopropanol wipes. Insert the swab into the internal connector of the conditioner by rotating it smoothly. Avoid using cotton swabs.

Relays

Watchdog relay

The relay is based on the internal watchdog and closes if the device run in some issues and must reboot.

> ⚠️ **NOTE**
>
> The relay can be released by acknowledging the watchdog flag.

Sensor error relay

The relay is based on the operability of the sensors and closes if one or more of the channels get no valid spectrum for the temperature calculation. If a channel is disabled, it will not be considered.

Channel relays

The relay configuration consists of two steps. In the first step you must configure the channel parameters, whereas in the second one you have to signs the channels to the relays.

• Channel parameters configuration

- High and low temperature for the relay limits, configurable between -200°C and 300°C.
- High and low flag to activate the temperatures for the limitation.
- Invert flag for the close and open operation of the channel logic.

• Activation mode

When the high and low flags are disabled the channel logic will work on the following model.
In this model, the temperature must exceed the high temperature to switch the relay and only when the temperature falls below the low temperature, the relay switches again.
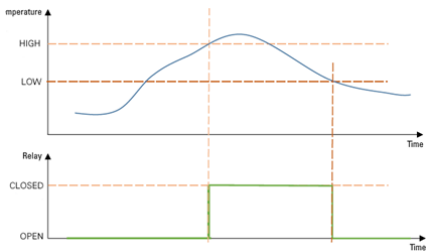

• Limitation mode

If one of the flags are enabled the channel logic will work on the following model.
If the temperature exceeded a limit in its specific direction the relay opens to activate some downstream devices.
You can choose an upper or lower limit, or both.
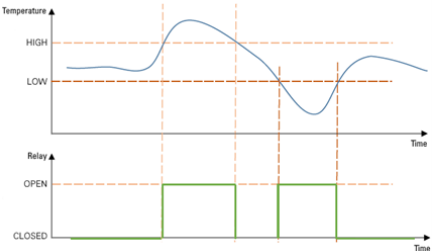
• Hysteresis

Around the limits it was implement a hysteresis of two Kelvin to avoid a fluttering of the relays.
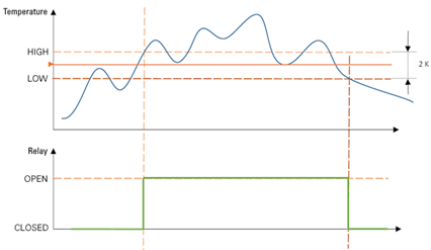
• Relay configuration

You can assign each channel to both relays which implement an OR logic between them.
If a channel is disabled or has an error, it will not be considered.

• Configuration

The temperatures limits and configuration flags can be found in the device configuration menu.
For more information, see the FOTEMP ASSISTANT 2 Manual.

• Modbus

The temperatures limits can be found in the analog output holding registers and the flags in the dis-crete output coils.
For more information, see the FOTEMP Modbus Data Map.

- **ASCII**

For more information, see the FOTEMP Ascii Commands.

Logging

Temperature logging

The device can store the temperature data either at a certain time intervals or continuously after each measurement. The recorded values are stored to a CSV file on the SD card. The time interval can be set using Modbus, our ASCII protocol, or with our dedicated software, FOTEMP Assistant 2.

Serial communication

You can connect the device to your computer using USB, RS485, or Ethernet. Once connected, you can use our free software FOTEMP Assistant 2, to view temperatures on your computer, customize settings, log temperatures, and display them in charts.

Alternatively, you can communicate with the device using our open ASCII protocol or Modbus

Troubleshooting

For more information please contact us or consult the Application note AN206: FOTEMP Device Troubleshooting
https://comem.com/en/library/

This installation manual contains essential information
for the user required to install & operate the product.
In case you need any further information, contact us at
customerservice@it.comem.com

www.comem.com

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