

LTS Local Temperature System

Remote temperature measurement system using fiber optical sensors (BRAGG technology)

Application

- Underground cable temperature monitoring.
- Temperature monitoring at critical points of underground cables, for example at splices.
- Temperature monitoring of already installed voltage and current transformers.
- Temperature monitoring of power component connection terminals.
- Soil or ambient temperature monitoring.

Description

Remote temperature measurement system using BRAGG optical technology. The system consists of a signal processing interrogator that integrates up to 60 optical sensors and distribution boxes that facilitate the sensor layout. A G652 single-mode fiber is used to connect all the components. It allows specific solutions to be developed for the predictive maintenance of underground cables, overhead cables and, in general, for any process on industrial machinery where the temperature needs to be monitored.

The notable advantage of using optic sensors with Bragg technology is that the sensors do not need a power supply and a remote measurement range of over 10 km in distance can be reached. Those sensors are constructed with dielectric materials and are not affected by EMC problems. There are, therefore, particularly appropriate for being used in industrial and electric sectors.

The interrogator determines the temperature of each sensor using frequency deviation measured in each of them. The temperature reading is used to establish an alarm criterion for each sensor. These alarms can be grouped on an output contact (eight configurable outputs), which can be wired to the SCADA.

Apart from the eight configurable outputs, the equipment has two alarm contacts: equipment alarm (which includes all its alarms) and the optical alarm of the installation.

The wavelength measurement, the temperature measurement and the status of the temperature criteria date-time stamped are recorded every second in an ASCII file, which can be locally stored on an SD card or remotely (Ethernet-FTP) in a file server in the network.

It has SCADA connection in ModBusRTU, although developing other protocols is feasible.

The LTS system has been designed and manufactured in accordance with ISO 9001 certified quality process.

SYSTEM COMPONENTS

• LTS interrogator



Equipment in 2U high rack that contains the light source, the optical receiver and the signal processing electronic part, HMI and communications. It can include up to 60 optical sensors and 30 temperature criteria that can be configured by the users (with three temperature alarm levels and activate and reset timer). It has 8 configurable outputs and 2 alarm signalling outputs (equipment alarm and optic wiring failure alarm). It has a USB front port to configure the equipment using a PC and a back port with single-mode fiber to connect to SCADA using Modbus protocol.

The HMI consists of backlit 3.5" TFT LCD touch screen. The HMI can be used to fully configure the equipment and to access to all its information and status.

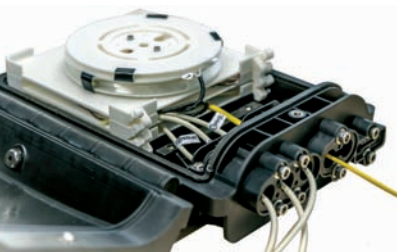
It complies with EMC directives for electric substations.

• STS temperature optical sensors



The optical sensors use Bragg technology (FBG). They are manufactured using dielectric materials, with ceramic sheath and without metallic elements. This all makes them immune to electromagnetic interferences and to corrosion and are particularly appropriate for explosive and electrical environments.

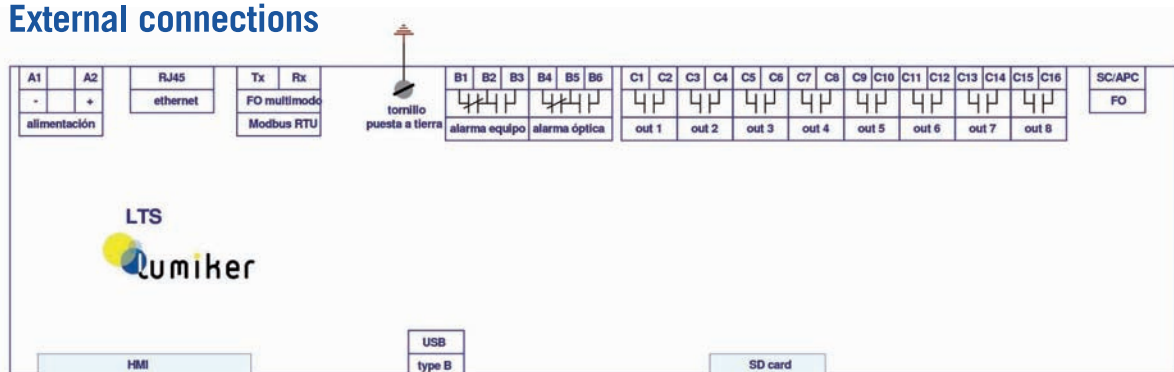
These sensors are light in weight and easy to handle. The measured temperature range is $-25\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ with a resolution of $\pm 0.2\text{ }^{\circ}\text{C}$. They can be spliced in series or in parallel and use splitter temperature boxes and G652 single-mode optical fiber (used in communications) to establish the layout of the sensors.



• STB-Splitter Temperature Box, FSB-Fiber Splice Box and FEB-Fiber Ending Box

The Bragg sensors can be placed in series (direct optical fiber splicing) or in parallel (using splitter temperature boxes). These splitter temperature boxes consist of a splitter that distributes the optical signal power through the fiber layout to connect the optical sensors with the interrogator. The splices performed are protected with the splice box and the optical lines end at a fiber ending box that avoid reflections.

• External connections



• Technical specifications

model	LTS15N	LTS15U	LTS30N	LTS30U	LTS60N	LTS60U
number of channels	1	1	1	1	2	2
number of FBG sensors	15	15	30	30	60 (30 + 30)	60 (30 + 30)
number of temperature criteria	-	15	-	30	-	30
alarm levels for each criterion	-	3	-	3	-	3
timing criteria	-	t<1 hour	-	t<1 hour	-	t<1 hour
hysteresis criteria	-	2°C	-	2°C	-	2°C
temporal resolution criteria	-	0.001s	-	0.001s	-	0.001s
alarm management (OR)	-	YES	-	YES	-	YES
configurable outputs	-	YES	-	YES	-	YES
optical reception: diffraction grating	1525nm-1570nm/256pin		1510nm-1590nm/512pin			
	175pm pin spacing					
	-70 dBm power					

Common features to all models::

Wavelength measurement accuracy		±0.5pm
Data recording	physical media	file server Ethernet/PC/SD card
	recording time	1s PC and Ethernet (5s in LTS60 models) 10s SD card
Synchronism		SNTP
Real Time Clock (RTC)		YES
Language		Spanish, French, English, Italian
Sensors FBG	wavelength	3 nm gap
	bandwidth	0,3 nm
	Temperature range	-25°C a +125°C
Emitter: SLED	wavelength	1550nm
	bandwidth	±40 nm
	power	0 dBm
Linking fiber optical		G652
Fiber optical connections		SC/APC
Rear port communication	protocol	Modbus RTU
	physical media	FO multimode
Communication TCP/IP	protocol	FTP
	physical media	RJ-45 Ethernet
Front port communication	protocol	ASCII
	physical media	USB -type B
HMI		3,5" TFT LCD backlit 320x240 Touch display
Digital outputs	quantity	2+8, of signalling (optical fault and internal fault) and 8 configurable
	nominal voltage	250 Vac
	peak current	16 A in DC 30 A during 4 s
	operation time	< 8 ms
	reset time	< 6 ms
	connectors	Phoenix type 5,08 mm
Housing	dimensions	1 rack 2U x 49"x 355 mm
	weight	5 Kg
	material	aluminium
	IP	IP51
EMC	substation, in power supply and signalling	class 4
Climatic Tests	operation temperature	0°C +50°C
	storage temperature	-20°C +70°C
	humidity	Up to 95% non-condensing
Power Supply	auxiliary voltage	43 – 160 Vdc
	power	12W
	connector	Phoenix type 5,08mm

• Template list

Interrogator LTS- Local Temperature System

LTS	xx	x	x	x	x	x	
							number of sensors
	15						15 sensors
	30						30 sensors
	60						60 sensors
							application
		N					temperature measurement
		U					temperature measurement, temperature criteria, configurable outputs
							power supply
			C				+48V a +160 Vdc
			R				110Vac/220Vac
			I				24Vdc
							additional memory
				N			nothing
				S			SD card
							rear communications
					N		nothing
					M		modbus RTU – monomode fiber optical
					X		customized
							version
						A	version number

Sensor STS- Simple Temperature Sensor

STS	x	xx	xx	
				type
			C	ceramic
			X	(adding new materials possibility)
				band
			15	1550 nm
			13	1310 nm
				frequency
			01	30 working central frequencies are defined
			02	
			-	
			-	
			30	

STB- Splitter Temperature Box

STB	x	x	
			associated lines
		2	this box has 2 output lines
		3	this box has 3 output lines
		4	this box has 4 output lines
			ending
		0	this box is the last one in the line
		1	this box is not the last one in the line



Parque Tecnológico de Bizkaia
 BIC Bizkaia 612 mod. 1
 48160 Derio - Bizkaia
 Tel.: 944 531 226
www.lumiker.com