

FIPRES THERMAL WATCH

INFRARED MONITORING SYSTEM

ELECTRICAL FIRE PREVENTION
AND OVERHEATING
CONTROL SYSTEM

APPLICATION SEGMENTS & GEOGRAPHY



POWER TRANSMISSION
UTILITIES



COMMERCIAL AND RESIDENTIAL
BUILDINGS



MINING, OIL &
GAS COMPANIES



INDUSTRIAL
FACTORIES



PANEL
BUILDERS



POWER
PLANTS



HOSPITALS



MALLS

PROBLEM: ELECTRICAL FIRE

Every year fire causes an enormous amount of damage to all kinds of facilities, social and private possessions. It can lead to life threatening incidents and huge losses because of material damage of assets, power supply interruption

and production loss and business opportunity cost. Global statistics shows that around 30% of the fires are caused by electrical faults:

ELECTRICAL FIRE MAY START BECAUSE OF SEVERAL REASONS

- Overheating of defective equipment;
- overloads;
- open circuits;
- harmonics;
- outdated electrical wiring and loose connections, which may happen due to improper torque, corrosion, vibration, withdrawals of moving contacts.



25%

of building fires are due to electrical malfunctions
*according to European Fire Academy (EFA)

32%

of fires in Germany are related with electricity
*according to German Insurance Association

3.2B\$

USD annual cost of damage in the U.S. and Europe due to electrical fires

*according to the National Fire Protection Association (NFPA) and the European Fire Safety Alliance (EFSA)

more often	
Problem	Solution
Loose connection	FIPRES
Aging	FIPRES
Arc faults	Arc fault detection device (AFDD)
Insulation failure	Residual current device (RCD) and Ground fault protection (GFP)
Overloads	Circuit breaker (CB) with overcurrent threshold
Improper selection of equipment	FIPRES
less often	

PROBLEM: CONTACT CONDITIONS

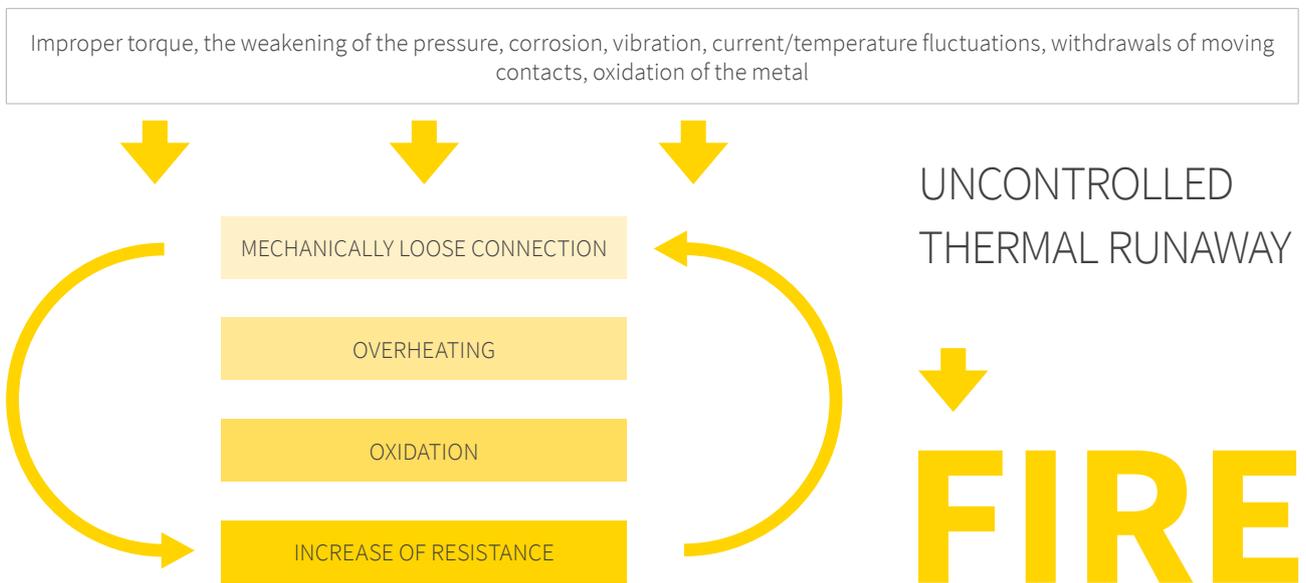
The classic method of equipment inspection and identifying faults is scheduled infrared thermography inspection.

The purpose of thermal monitoring is to detect contacts that can burn out at the moment of maximum load.

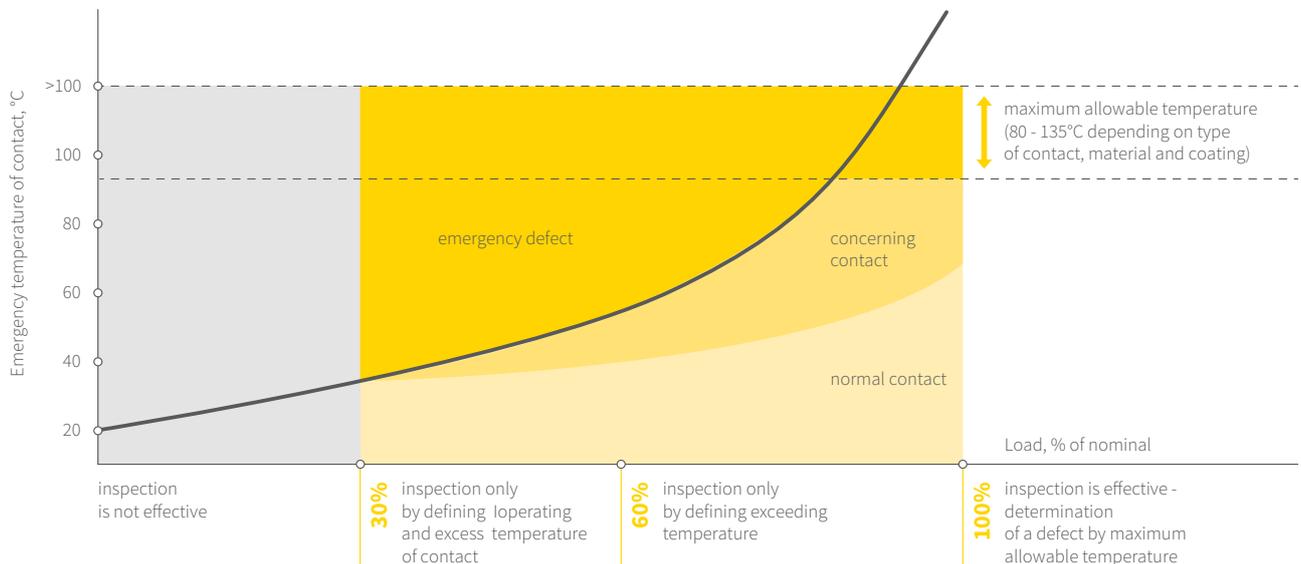
To do this with a thermal imaging camera, you not only need to determine the temperature of the contact, but also adjust it to the nominal load.

Thermal monitoring without measuring the load current is effective only when the load is higher than 60%.

Under 60% the inspection is effective only when measuring the load current and excess temperature of the contact in comparison to other similar contacts. For the load under 30% inspection is not effective at all.



Dependence of the temperature of the emergency contact defect on the load current:



PROBLEM: ELECTRICAL FIRE

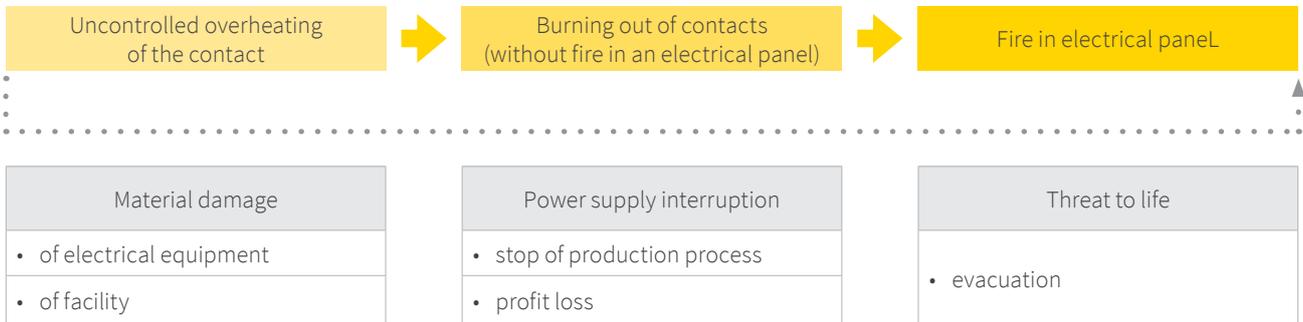
FIRE CONSEQUENCES

The trickiest problem of detecting loose connections is that loosening can happen at any time without any visual signs of overheating. Maintenance personnel may conduct equipment inspections, but an overheated loose contact will look just like a regular one. Such minor hidden problems will slowly cause major devastating scenarios like fire.

Preventative actions also lower utility bills since loose connections increase resistance resulting in higher energy loss. By tightening and cleaning the electrical connections, it is possible to reduce these expenses. Over time, these costs will become significant.

To avoid this, it is necessary to apply regular preventive measures to detect overheating. Ignoring this may result in:

- risk of death;
- fire in a panel with the risk of fire throughout the building;
- production stoppage and loss of profits from downtime;
- equipment damage.



LIMITATIONS OF INFRARED THERMOGRAPHY

The traditional solution to detect dangerous overheating is Infrared thermography inspection (IRT), but it has technology limitations.



PERIODIC BASIS

Infrared thermography is carried out regularly every 6, 12 or 24 months, so it gives an indication of the condition of the equipment only for the time of inspection.

UNSAFE FOR PERSONNEL

Maintenance personnel have to stay close to live parts during inspection.

DEPENDS ON LOAD LEVEL

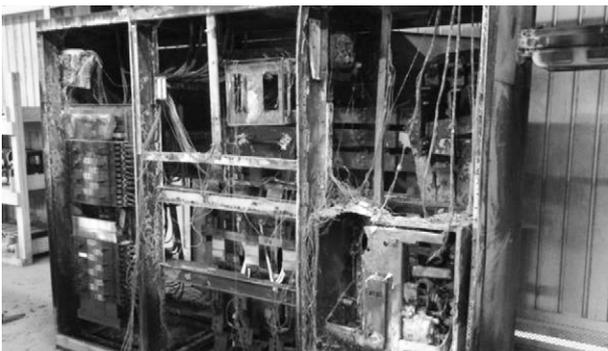
The load at the time of inspection should be at least 60% to see weak points. If the load level is less than required, an additional fictitious load must be connected. Otherwise, you won't be able to see overheated parts of the connections even if they already occurred.

LIMITED ACCESS

Complex layout and partitions in an electrical panel might not allow to inspect 100% of the contact connection. In case of MV panels (which are locked during operations) the inspection can be done only through small IR windows.

DEPENDS ON THE HUMAN FACTOR

The quality of survey largely depends on the diligence and professionalism of the employee



To prevent all possible negative outcomes of overheating and resulting fire, electrical panels require a solution that continuously monitors all critical points and, if overheating is detected, immediately provides information about this to the maintenance personnel. And Streamer Electric AG is glad to provide such solution — FIPRES.

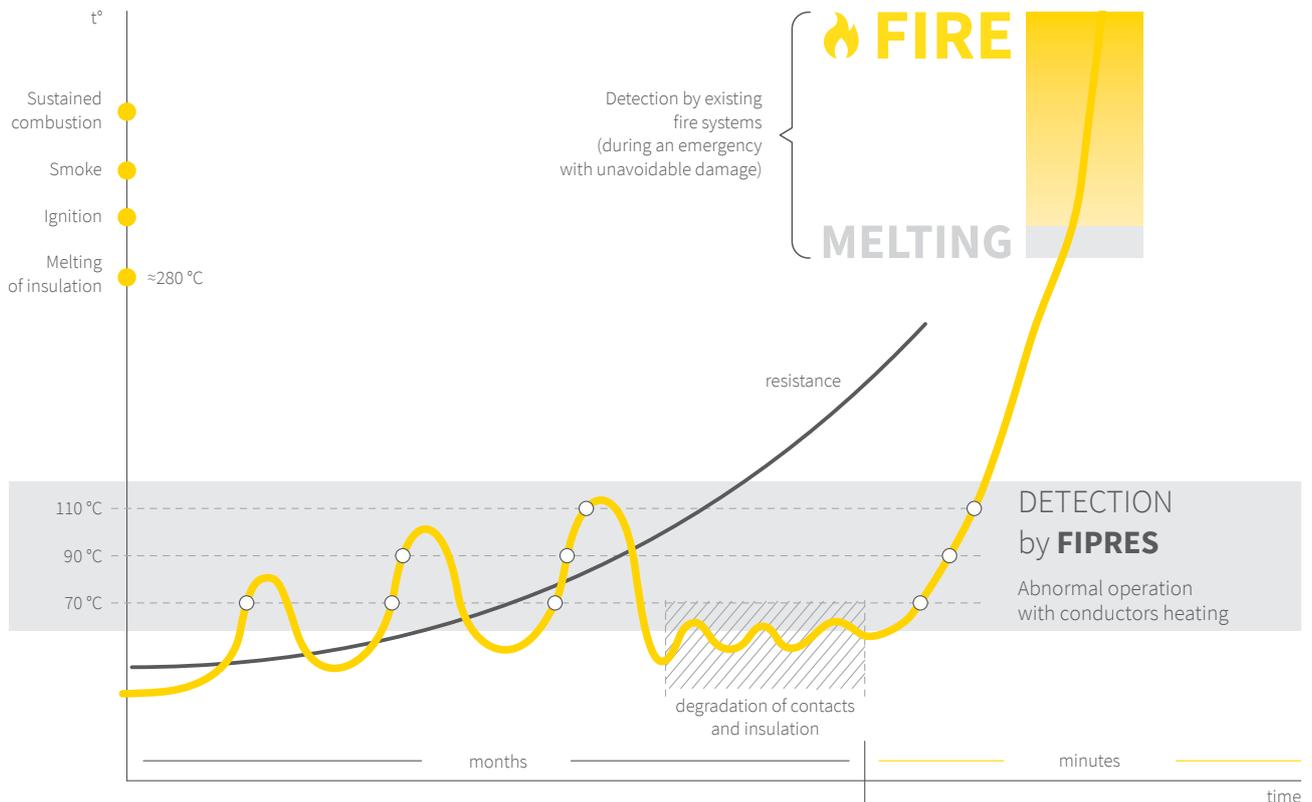
FIPRES TECHNOLOGY

FIPRES – Electrical Fire Prevention and Overheating Control System offers a solution where Infrared thermography is limited. FIPRES is a new and unique technology that allows finding dangerous overheating of loose contacts long before a fire hazard occurs.

FIPRES works on principle of early detection. Indeed, usually fire starts with melting of cable insulation, which is the weakest point in terms of withstanding temperature.

Depending on the material and thickness, generally there are 2 critical temperatures for cable insulation: 200 °C, when insulation to deteriorate and 280°C, when insulation material starts to melt and smoke. FIPRES works way below these temperatures, providing detection of overheating in a range up to 110 °C, which are abnormal temperatures for electrical equipment, but still months before any dangerous situation.

Typical scenario of fire inside electrical cabinets is shown below:



The contact starts to overheat at the moments of high load in the circuit. Each time of high load, the contact deteriorates more, and its resistance continuously increases due to the oxidation process and mechanical weakening.

After dozens of such cycles, the situation becomes critical. The contact gets completely degraded, covered with an oxide film, and the cable insulation loses its dielectric strength due to accelerated aging. After reaching this stage, every single overheating can lead to a fire. At this point, the fire can be detected by fire systems.

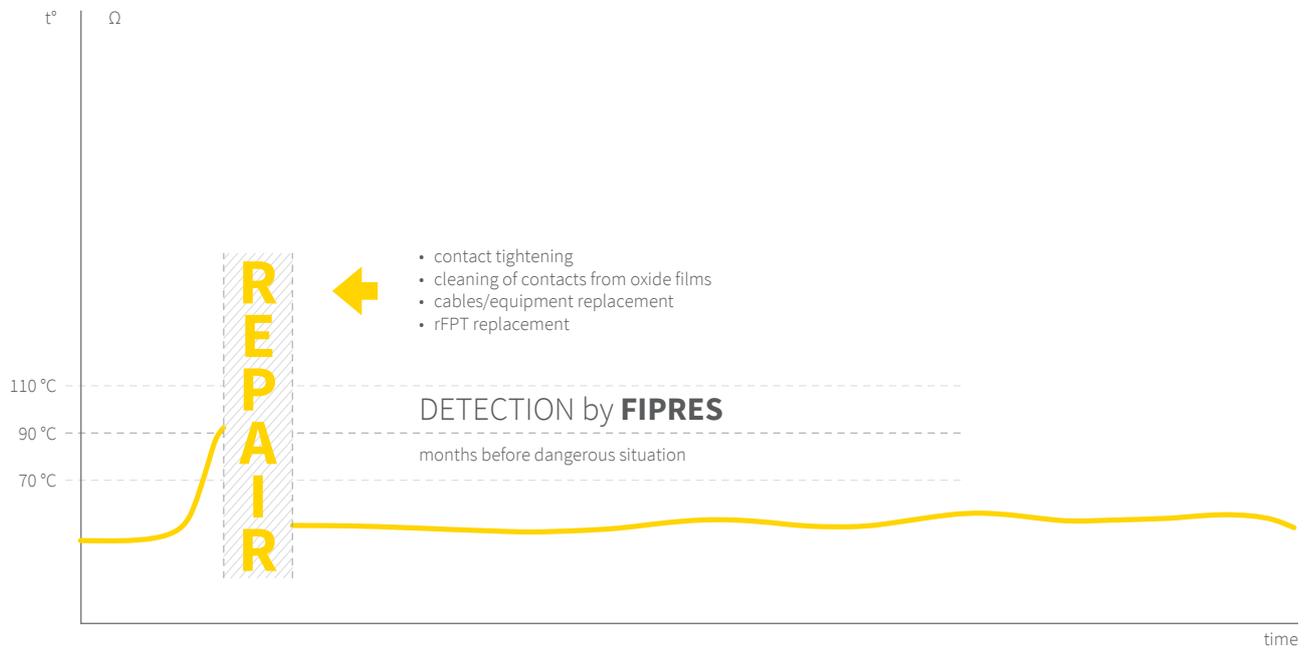
The detection time depends on the type of fire system, its sensitivity, and its placement. But even by using the most sensitive fire systems like an aspiration fire alarm system, which is complex and costly in both CAPEX and OPEX aspects, the user has to deal with material damage of equipment, power outage, and production process interruption.

FIPRES TECHNOLOGY

FIPRES, in turn, proposes to detect overheating at earlier stages, a few months before the stage of degradation, and the actual risk of fire. On the graph, the moments when FIPRES can detect overheating are marked with black dots.

Normally, after the very first detection of overheating, a maintenance electrician should come, check the overheated spot, and schedule the date for repair (clean and tight the contact, replace damaged parts if it's required). After this short and timely repair, the connection is not prone to be overheated in the future.

STANDART SCENARIO OF FIPRES USING



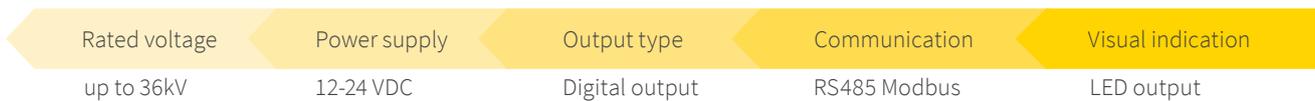
KEY BENEFITS

- 24/7 temperature monitoring of concerning points in LV and MV electrical panel of any configuration
- Allows checking equipment in locked (explosion-proof) enclosures. It doesn't require a special MV switchgear window.
- Allows checking all spots at the same time. You can control every part of the electrical panel and take preventive measures to increase production reliability.
- Safe for personnel since it doesn't require opening a door of electrical panel and standing close to live parts.
- Wireless temperature monitoring
- Detects hot spots long before a dangerous situation arises, hence avoiding material damage, stop of production process and threats to life
- Increases equipment safety and reliability of operation
- Can be integrated to SCADA/BMS and local alarm systems
- Quick and easy installation & maintenance even for existing systems

HOW IT WORKS

Thermal Watch sensors (TWS) are installed directly on key connection points—such as busbar contacts, cable lugs, circuit breaker contacts, fuses, and current transformers—

inside LV or MV panels. The sensors monitor temperature continuously and wirelessly transmit data to the Infrared Receiver (TWR-IR), which is installed in the same enclosure.



THERMAL WATCH RECEIVER (TWR)

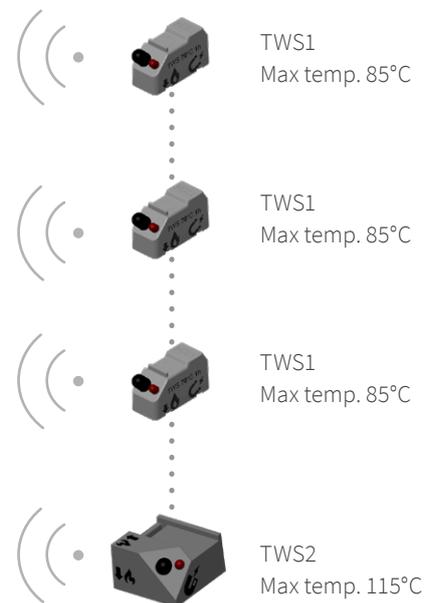
DIN Frame 1 modules receiving devices—TWR1

THERMAL WATCH SENSOR (TWS)

Up to 30 TWS to 1 IR receiver

Thermal Watch-DIN-receiver (TWR-DIN1)
1 IR receiver/
5 IR receivers/
13 IR receivers

Thermal Watch Infrared Receiver (TWR-IR)



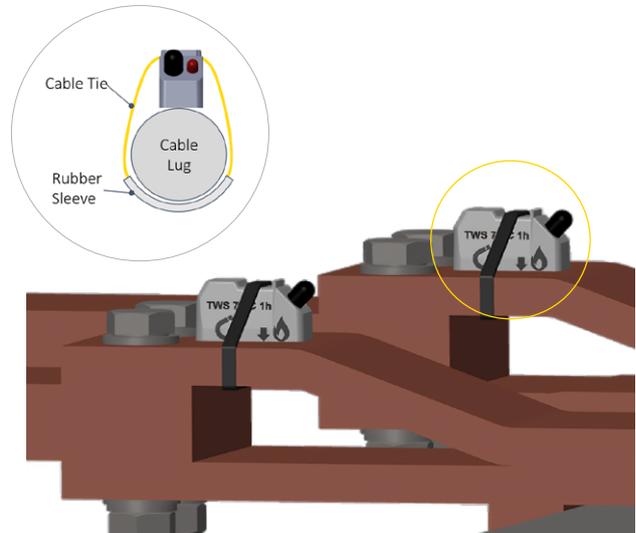
+ INSTALLATION ACCESSORIES:

- Cable ties
- Bracket for TWR-IR

FIPRES TW TECHNOLOGY

THERMAL WATCH SENSOR. TWS

1. TWS should be installed on the cables/busbars close to the contact connection points. For busbars cable tie is required, for cable lugs use cable tie and rubber sleeve. Installation can be done either with cable ties, screws or metal plate. Infrared receiver (TWR-IR) should be installed into the same volume.
2. TWS will send information about the current temperature 24/7 every set temperature monitoring schedule duration together with information about battery condition, ID of the device, and current mode of operation.
3. In emergency situations when the temperature rises above 30–110 °C the TWS goes into Alarm mode, starting blinking with a visual red LED on the sensor, and sending information to TWR-IR.



THERMAL WATCH RECEIVER. TWR-IR, TWR-DIN



TWR-DIN



TWR-IR

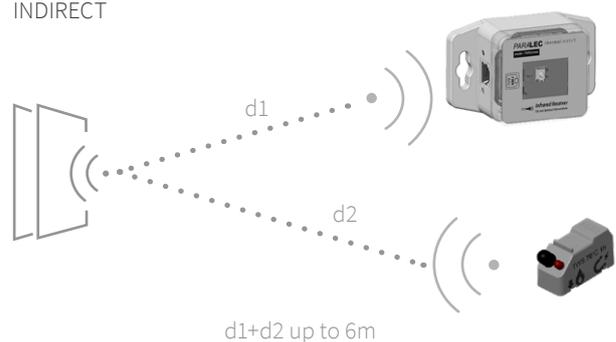
4. From TWR-IR infrared receiver information is transferred to the main body—DIN-receiver (TWR-DIN), which transmits an ALARM signal to SCADA or BMS system by Modbus or to any other external system via dry contact output.

THE COMMUNICATION BETWEEN TWS AND TWR-IR CAN BE DIRECT AND INDIRECT

EYE OF SIGHT

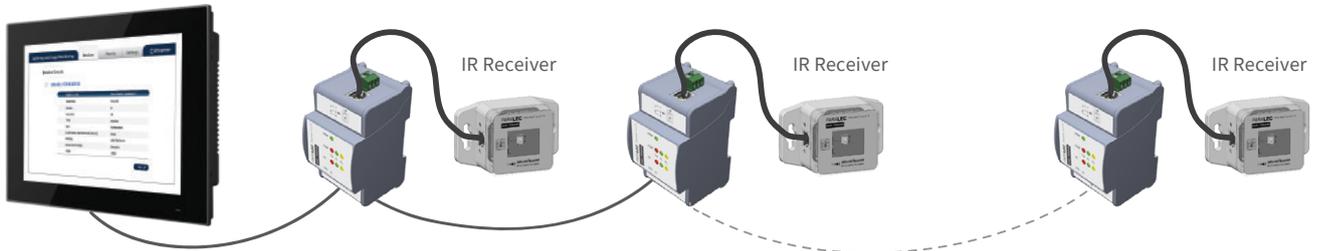


INDIRECT



OPERATION MODES

→ Communication with upper level



Data Display and Storage
with / without HMI

CAT6 cable: RS485 + 12VDC

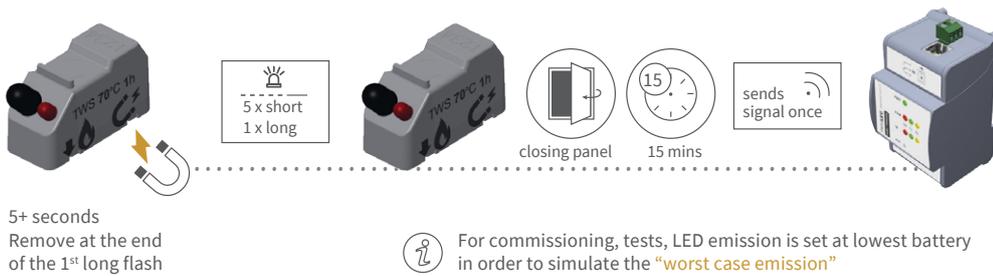
LAN or WIFI connection
IEC61850 / DNP3 / MONBUS or REST API

ALARM MODE



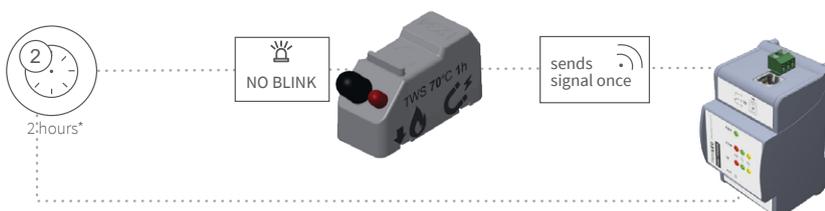
ID 0001	
ID of device	0001
Temperature	100 °C
Mode	Alarm
Battery left	OK

COMMISSIONING MODE



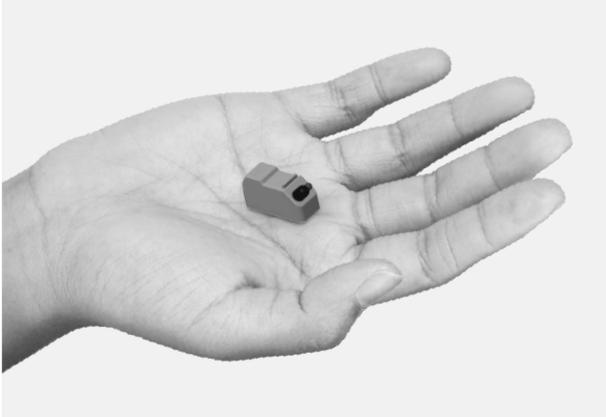
ID 0001	
ID of device	0001
Temperature	82 °C
Mode	Commissioning
Battery left	OK

TEMPERATURE MEASUREMENT



ID 0001	
ID of device	0001
Temperature	82 °C
Mode	Health check
Battery left	OK

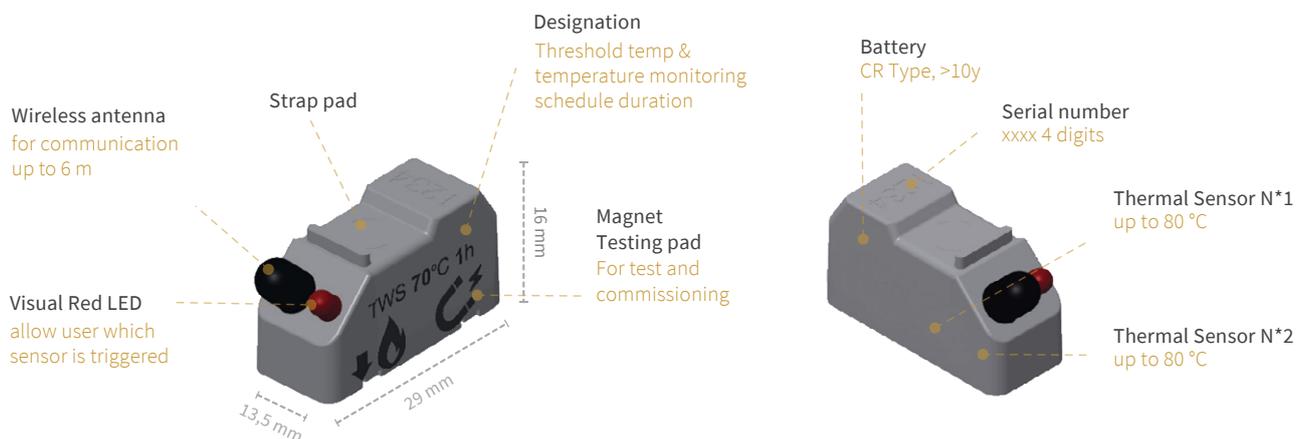
TWS. THERMAL WATCH SENSOR



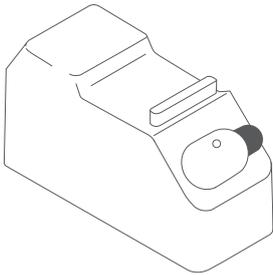
- 24/7 temperature monitoring
- Real time temperature alerts
- Visual indication of fault location
- Self-test on installation
- Operative indoor and outdoor, IP68
- Up to 6 meters communication between sensor and receiver
- Install anywhere 13.5 x 16 x 29 mm device
- No wiring. Install in seconds
- Communication setup free
- License free signaling worldwide
- Fail safe: redundancy with two Independent temperature sensors
- Operative till 115 °C
- Over 10 years lifespan guaranteed

TWS should be installed on the cables/busbars close to the contact connection points. Installation can be done either with cable ties, screws or metal plate. Infrared receiver (TWR-IR) should be installed into the same volume.

TWS will send information about the current temperature 24/7 every set temperature monitoring schedule duration together with information about battery condition, ID of the device, and current mode of operation. In emergency situations when the temperature rises above 30–110 °C the TWS goes into Alarm mode, starting blinking with a visual red LED on the sensor, and sending information to TWR-IR.

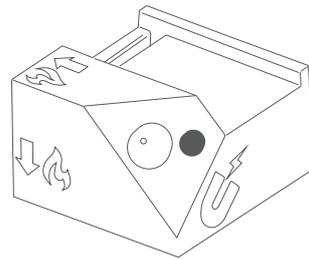


TWS. THERMAL WATCH SENSOR VERSION 1



Monitoring up to 85°C
 Max operating temperature 150 °C
 Thresholds: 30°C, 40°C, 50°C, 60°C, 70°C
 29 x 16 x 13.5 mm
 Vertical mounting

TWS. THERMAL WATCH SENSOR VERSION 2



Monitoring up to 115°C
 Max operating temperature 150°C
 Thresholds: 30°C, 40°C, 50°C, 60°C, 70°C, 80°C, 90°C, 100°C, 110°C
 25 x 25 x 16 mm
 Flat and vertical mounting

Configuration #	Temperature monitoring period	Alarm signal period	Commissioning Time	Life expectancy	
				TWS 1	TWS 2
1	2 mins	1 min	1 min	2 months	1 year
2	30 mins	2 mins	16 mins	4 years	10 years
3	1 hour	2 mins	16 mins	8 years	10 years
4	2 hours	2 mins	16 mins	10 years	10 years

TWR. THERMAL WATCH RECEIVERS

Dry contact output NO & NC

3 terminals: NO, common, NC
For control/ command & external LED

Connection for IR receiver
RJ12, up to 3m

ON & Communication
Green/Yellow
LED indicator



ALARM

Red LED indicator

Reset button

Communication & Power

RJ45 IN and OUT
RS485 Modbus RTU
12-24 VDC power supply

Mounting holes for easy installation

Hole slots



Connection for IR DIN
RJ12 up to 3m

Cleanable receiver window

TWR1-IR= IR Receiver

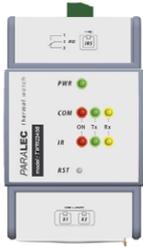
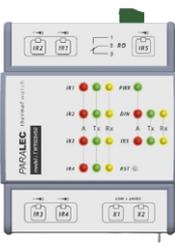
TWR1-DIN = DIN Receiver

- 1, 5 or 13 ports for IR-Receiver
- Modbus RS485 communication to connect to SCADA, BMS
- 1 NO dry contact, 1 NC dry contact to connect to local alarm system
- 12 to 24VDC power supply
- DIN 3 modules as per EN60715
- Can be used in environment up to 36 kV

TWR DIN-receiver is a device that connects infrared receivers. TWR-DIN can connect 1, 5 or 13 IR-receiver, allowing to install TW system in the electrical panels with a big number of compartments, for instance, motor control centers, large switchgears with few separated compartments (e.g., busbars compartment, incoming cables compartment, CB compartment, etc.).

TWR-IR—Thermal Watch Infrared receiver is a device that will receive infrared signal from TWS sensor and transmit this information to main body—TWR-DIN receiver.

TW DIN-receiver after transmits an ALARM signal to SCADA or BMS system by Modbus or to any other external system via dry contact output.

TWR-DIN1 = 1 IR receiver	TWR-DIN5 = 5 IR receivers	TWR-DIN13 = 13 IR receivers
		
<p>MEMORY</p> <ul style="list-style-type: none"> • 288,000 measurement records • 200 sensors send data every 1 hour for 2 months • 72,000 alarm records <p>REPORTING FORMAT</p> <ul style="list-style-type: none"> • Identification of TWS : 11bits, 4 digits, 0 to 2048 • Temperature: 8 bits, 3 digits, 0 to 128°C • Battery : 1 bit, OK / NOK • Mode: 2 bit, Alarm / Commissioning / Measurement / Test 		

ACCESSORIES

THERMAL WATCH CABLE TIES

- Withstanding high corrosion resistance
- Strength over -60°C to 170°C temperature range.
- Material : Ethylene tetrafluoroethylene (ETFE)
- Withstand : chemical, acid, gamma radiation, ultraviolet.
- UL94-V0

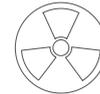
L	W	Max Bundle Diam	Tensile strength
100 mm	2.5 mm	22 mm	80N
150 mm	3.6 mm	35 mm	178N
200 mm	4.6 mm	50 mm	222N
300 mm	4.6 mm	76 mm	445N



Higher Chemical Resistant



-60° ~ 170°C
-76° ~ 338° F



Radiation Resistant



UL94V0



THERMAL WATCH SOFTWARE

- Digital display of fault location
- Temperature curves with up to 1000 points on the chart
- Diagnostic page
- Cloud-based available

Thermal Watch software can be installed locally on a computer or purchased as a cloud-based option.

All sensors can be monitored in one place, being connected via Modbus RS485 communication to TW DIN-Receiver or TW Concentrator devices.

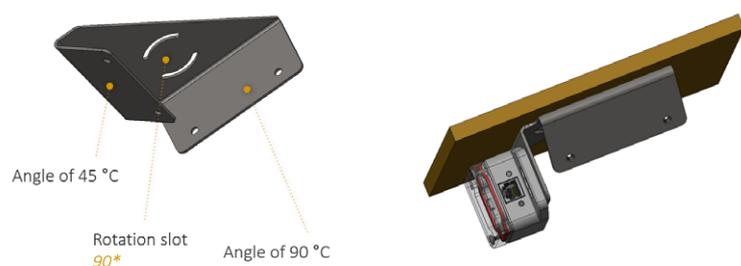
After reaching alarm threshold level, the values turn red. It's possible to build a graph of temperature of each sensor and monitor contact connection condition.

Each sensor can be labeled according to installation place and panel type for a quick identification of an overheating connection.

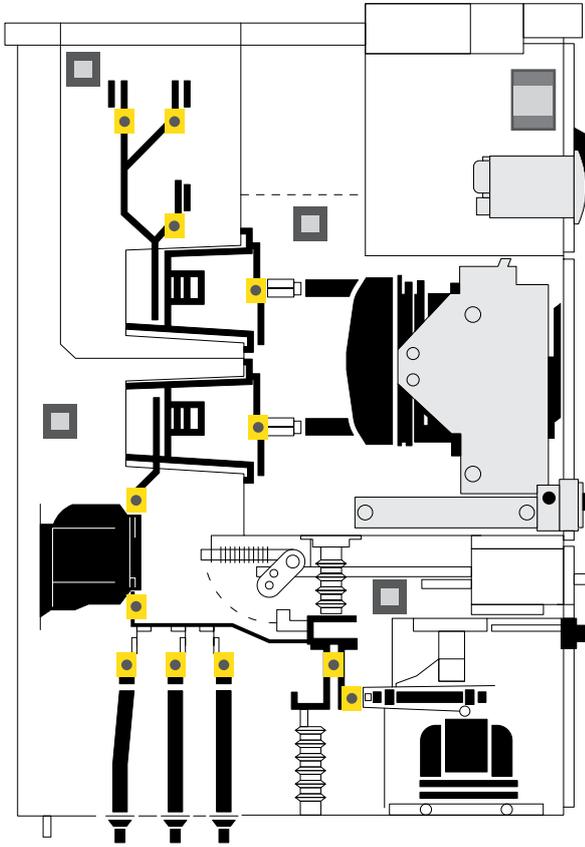


THERMAL WATCH IR RECEIVER BRACKET

- Bracket for TWR-IR receiver
- 45° and 90° angles
- Stainless Steel
- 100 x 102 x 50mm
- For quick and easy installation and rotation of the receiver



APPLICATIONS



-  TWS1 OR TWS2 sensor
-  IR receiver
-  DIN receiver 5 ports IR

The main field of FIPRES application is electrical panels. FIPRES can be installed in:

LOW/MEDIUM VOLTAGE ELECTRICAL PANELS WITH UP TO 4 M³ OF VOLUME:

- Switchgear cells,
- Main Distribution boards (MDB),
- Sub Main Distribution Boards (SMDB),
- Power Factor Correction panels,
- Motor control center panels (MCC),
- other types of panels.

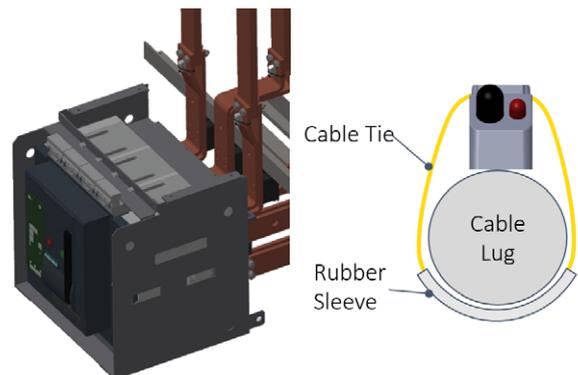
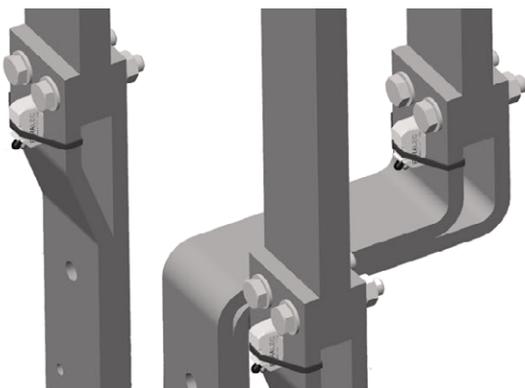
TYPICAL POINTS THAT REQUIRED THE MAXIMUM OF ATTENTION ARE:

- Circuit Breaker (CB) contacts (especially with withdrawable contacts).
- Incoming/outcoming cables connection.
- Cable joints (incoming cables/cable feeders).
- Fuses contacts.
- Disconnecter contacts.
- Capacitor banks.

OTHER POINTS IN PARTICULAR CASES COULD BE:

- Current and voltage transformers.
- Transportation joints
- Busbar-busbar connections.

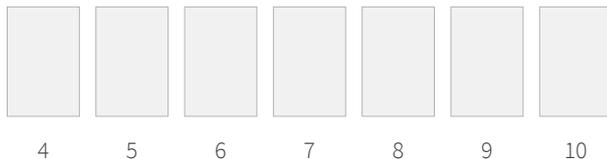
FIPRES THERMAL WATCH INSTALLATION PICTURES



HOW TO ORDER

THERMAL WATCH SENSOR. PART NUMBERS

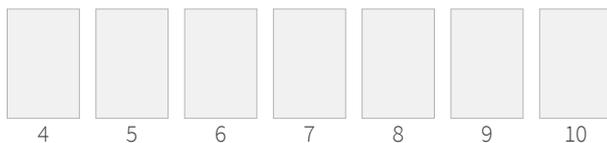
109



4	5	6	7	8	9, 10
Type	Temperature	Monitoring period	Commissioning delay	Mounting	Spare
1. TWS1 85°C 2. TWS2 115°C	1. 60°C 2. 70°C 3. 80°C* 4. 90°C* 5. 100°C* 6. 50°C 7. 40°C 8. 30°C * only for TWS2	1. 2 mins 2. / 3. / 4. 30 mins 5. 1 hour 6. 2 hours	1. 16 mins 2. 1 min	1. strap 2. metal plate 3. embedded hole	11. default

THERMAL WATCH RECEIVER. PART NUMBERS

110



4	5	6	7, 8, 9, 10
Temperature	Number of corded sensors		Spare
1. TWR-DIN & 1x RJ 45 cables (x m, tbc) 2. TWR-IR & 1x RJ 12 cables (3m) 3. TWR-IR & 1x RJ 12 cables & Bracket 4. Adapteur RJ45-terminal block	1. 1 x IR receiver 2. 5 x IR receivers 3. 13 x IR receivers	1. RJ45 2. DB9 3. Terminal 4. RJ12	1111. default

For the latest codes and accessories codes, please contact Streamer Electric AG.

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