



# ZYGGOT THERMOGRAPHY + OZONE + HUMIDITY

Complete Predictive System for Arc Flash Prevention with Ultra Sensitive 0 to 2000 ppb Ozone Monitoring

ONLINE TEMPERATURE + PARTIAL DISCHARGE/CORONA + HUMIDITY MONITORING



CATÁLOG

World's First Online Thermography System (2004).  
 World Leader in Continuous Temperature Monitoring.  
 World's First UV Arc Protection System.\*  
 Over 1 Million Sensors Installed Worldwide.  
 \* Patent Nº PI 0903809-4  
 CATALOG ZYGGOT V5F/TOH ENG - V17 - May 2025

# varixx



# ZYGGOT THERMOGRAPHY

## TEMPERATURE +OZONE+HUMIDITY PROTECTION SYSTEM



### DESCRIPTION

Varixx was the world's first company to introduce a Continuous, Online, Networked Temperature Monitoring System in 2008 and is a market leader in this area. The low-cost ZYGGOT system was designed to allow online monitoring of the temperatures of low and medium voltage components and internal connections, transformers, motors, etc., replacing old methods of periodic thermography with cameras.

The ZYGGOT system introduced an important innovation to the market because current safety standards prohibit the opening of energized electrical panels for any type of measurement, including temperature measurements with manual point-of-care guns or thermography cameras, without the use of appropriate protective clothing.

An important feature of the ZYGGOT system is that it simultaneously measures both the **target and the sensor body**, which is equal to the temperature of the surrounding air.

This feature also allows the detection of an increase in the internal temperature of the panel, which can identify obstructions or ventilation failures or even an increase in the temperature of equipment not directly monitored.

Sensors with opening angles of 7° allow the monitoring of both well-defined points (points) and areas of any size, depending on the distance from the sensor to the area.

Varixx also introduced the world's first and only Ultraviolet arc detection system in 2014, which does not require confirmation of current rise and inhibits arc formation at its onset due to its extremely fast action (<250 uS), detecting the arc in its initial phase and not in the fourth phase of the arc, already formed, thereby reducing the Incident Energy by around 80 to 150 times compared to the competition. It is a system that has already been widely approved, with hundreds of real cases of detection and action, with minimal or no damage to the protected systems, with a return to operation time of minutes to a few hours.

Furthermore, as it does not require current monitoring, it is very easy to implement and costs much less than light and current detection systems.

In addition to the systems mentioned above, Varixx has introduced the integrated Continuous Temperature Monitoring + Arc Flash Protection systems - V5FTA/O and V5FTA/M respectively Mono and Multi Gateway and also the integrated Continuous Temperature Monitoring + Ozone + Humidity system - V5F/TOH, the equipment covered in this manual, establishing a complete predictive system against possible future electric arcs in the monitored equipment, since the 3 main variables that can lead to the occurrence of an arc are covered and the readings can be obtained worldwide since the relay has Modbus and Ethernet communication.



Gateway

Sensor THM



Sensor BT



Sensor OZÔNIO



### FUNCTION

Monitoring, Alarm and Trip based on the 4 most important variables for preventing Arc Flashes (250 independent measurements):

- \* Multi connections temperatures
- \* Multi internal air temperatures of the panel
- \* Multi Ultra-sensitive ozone level
- \* Multi Air humidity inside the panel

### BENEFITS

- \* Prevents opening of the energized panel.
- \* Dispenses with periodic thermography.
- \* Readings of up to 125 target temperatures (points) and 125 internal air temperatures.
- \* Readings of up to 125 ozone level sensors with extremely high sensitivity in the order of parts per billion + 125 internal air humidity levels.
- \* Non-contact measurement.
- \* May trigger an alarm in the event of an increase in temperature or ozone levels over time.
- \* Indicates a faulty sensor.
- \* Failure history.
- \* Modbus and Ethernet communication

### System

- \* Applicable in low, medium and high voltage.
- \* Up to 125 non-contact temperature sensors (250 point and air readings), and 125 ozone and humidity sensors (up to 250 readings) in RS485 network with mini USB connections.
- \* Smart sensors powered by the network itself.
- \* 7° measurement angle for temperature.
- \* Continuous temperature, ozone and humidity level readings.
- \* Relay with color graphic Touch Screen display with Modbus and Ethernet communication.
- \* Fault history with "Time Stamp".
- \* Readings and protections related to 4 analog inputs.
- \* External fault monitoring.
- \* Sensor status monitoring.
- \* 4 programmable digital outputs.
- \* Each sensor has a flashing LED and can be controlled by the relay to facilitate its location and address in the network.
- \* Operation in «Fail Safe» mode
- \* Ethernet protocols:
  - TCP/IP (Modbus Slave):** Modbus over Ethernet).
  - Ethernet/IP:** ODVA CIP over Ethernet.
  - FTP:** (File Server) File Transfer Protocol.
  - ASCII over TCP/IP:** ASCII Data over Ethernet.
  - NTP Protocol:** Network Time Protocol
  - HTTP (Web Server):** Hypertext Transfer Protocol (Web Server).

## KEY POINTS

### MAIN ADVANTAGES

CAN BE TESTED WITH THE SYSTEM OFF

WITH ETHERNET

4 IMPORTANT MEASUREMENTS (PREDICTIVE)

MEASURES OZONE IN PARTS PER BILLION

HIGHLY PREDICTIVE FOR PARTIAL DISCHARGES

DIFFERENTIAL ALARM ACTUATION

AVOID CONVENTIONAL THERMOGRAPHY

MEASUREMENT WITHOUT ELECTRICAL CONTACT

TOUCH SCREEN FRIENDLY COLOR SCREENS

DOES NOT USE BATTERIES

INDIRECTLY MEASURES THE ENTIRE SYSTEM (AIR)

PROVEN RELIABILITY

HISTORY OF EVENTS

INCLUDES DATA PLOTTING

WORLD LEADING SYSTEM

### KEY POINTS

- Color Touch Screen.
- Has Ethernet communication with several protocols.
- Measurement of up to 125 different points of ultra-sensitive ozone from 0 to 2000 parts per billion (ppb) for detection of Corona / Partial Discharges.
- Measurement of up to 125 different points of relative humidity levels of the air inside the panel.
- Measurement of the 4 most important causes for generation of Electric Arc.
- Ultra predictive, with built-in programmable differential variation calculation.
- Several built-in protections.
- Graphical recording in real time (Plot).
- History of failures and events.
- Continuous readings of target and sensor's surrounding air temperatures.
- Modbus RTU communication (and others).
- Networks of common temperature and arc sensors.
- Each relay presents up to 375 continuous measurements namely: Temperature of up to 125 targets, Temperature of up to 125 sensor bodies (surrounding air), Ozone level of up to 125 different points, Relative humidity level of up to 125 different points and voltage of up to 125 temperature sensors and voltage of up to 125 ozone + humidity sensors (allowing monitoring of network integrity).

### APPLICATIONS

- Internal panels for online thermography of connections + air temperature + detection of partial discharges / corona by ozone levels + measurement of relative humidity.
- Fully predictive protection for the 4 most important causes of electric arcs.

### MAIN FEATURES

- Modbus RTU + Ethernet
- Reads temperature of up to 125 targets per relay. Reads temperature from up to 125 sensors (body/surrounding air), allowing detection of temperature increases at points not directly monitored.
- Reads ozone levels from up to 125 sensors
- Reads relative humidity from up to 125 sensors.
- Reads supply voltage from up to 125 sensors.
- Up to 125 Temperature or Ozone+Humidity sensors per relay.
- Monitors partial discharge/corona by ultra-sensitive ozone detection.
- Configurable alarm and trip levels for target temperatures, surrounding air, ozone and humidity for each of the 125 sensors.
- Real-time graphical recording for temperatures and ozone.
- Detection of differential temperature increases integrated into the relay and configurable by the user.
- Failure and status history.
- Continuous readings.
- 4 analog inputs with configurable alarm and trip levels.
- 4+8 digital inputs for external events or faults (ventilation, doors, etc.).
- 4+8 digital outputs for signaling, alarm and trip.
- Color Touch Screen Display providing user-friendly programming and operation.
- Event memorization (history) with Real Time Clock.
- Data recording on included memory card.
- Plot of readings in graphs on the screens and recording on included memory card.
- Internal intelligence, programmable for alarm and trip by differential variation as a function of time.
- Easy installation and commissioning without the need for tools. All connections are Plug and Play.

The ZYGGOT system with stainless steel tubular sensors was developed for low, medium and medium voltage panels, measuring both connection points without electrical contact and air temperature in each sensor + ultra-sensitive ozone sensors, with detection in the order of parts per billion, in addition to measuring relative humidity. THM sensors measure temperature, without physical contact, by infrared detection and allow local and online reading and protection for up to 125 targets per relay. Each sensor measures two temperature levels: of the target and of the air surrounding the sensor (case), allowing fault detection at unmeasured points, by indirect heating of the air. They are networked, using mini USB cables, in sizes from 0.3 to 8.0 meters (supplied), which allows for quick, error-free and tool-free installation.

Ozone and Humidity Sensors are ultra-sensitive, measuring from 0 to 2000 Parts per Billion of ozone in the air. Systems with compromised or aged insulation present a high rate of Partial Discharges which generate ozone (O<sup>3</sup>) production. An increase in Ozone levels over time indicates the need for predictive maintenance before the eventual occurrence of an electric arc. These sensors also measure the relative humidity of the air inside the panel, which is also

an important variable for the generation of an electric arc.

The relay provides local protection and also through a supervisory system. Alarm and trip levels are freely programmable for each point and each variable. A possible failure in one of the sensors does not interrupt the operation of the other sensors. In addition to the tubular sensors mentioned, which are applied in medium and high voltage systems, LV sensors can also be used in low voltage MCCs, which require a large number of sensors in a small space, in addition to demanding a low cost. Its quick-fix base can be fixed by means of a screw or by means of a stainless steel tape directly to the busbar to be monitored.

# TECHNOLOGY AND BENEFITS OF THE THM+OZONE+HUMIDITY MEASUREMENT SYSTEM

The ZYGGOT Ozone Detection Protection System, integrated in this product with the Zyggot V5F/TOH THM+OZONE+HUMIDITY Temperature Monitoring Relay, was designed to enable full-time monitoring and predictive protection against arc flash in low, medium and high voltage electrical panels and systems.

**OZONE:** The ZYGGOT ultra-sensitive ozone measurement protection system introduces an important innovation to the market due to the fact that it detects levels in the order of parts per billion and is networked.

Differential increases in ozone levels trigger an alert for possible checking and predictive maintenance.

Ozone is composed of 3 oxygen atoms (O<sup>3</sup>) and is a highly oxidizing gas. In gaseous form it is colorless, in liquid form it is dark blue, almost black. Its melting point is 80K and its boiling point is 161K. It has a characteristic odor that can be detected in concentrations as low as 0.015ppm (15 PPB) (0.01mg/kg).

Ozone is produced mainly by the Corona effect (Corona Discharge) or by UV radiation that are present in electrical sparks in an environment with the presence of Oxygen (Air in other words). Its production can be extended to the occurrence of partial discharges in compromised insulating media (due to the existence of emulsified air), which occurs in the case of poor quality of the insulator or its aging. These partial discharges not only increase the Corona level but also directly produce ozone, which ends up leaking into the surrounding air.

Electric arcs in electrical equipment are produced by the reduction of insulation between two electrical conductors or between an energized conductor and ground (panel mass) and also by heating of electrical connections which end up increasing electrical resistance, causing exponential heating of the connection to the point of melting the copper and consequently the opening of an arc due to an abrupt increase in voltage levels in circuits with existing or distributed inductance, since the energy stored in the inductance as  $E = LI^2/2$  is converted into high voltage as  $E = VC^2/2$  (where c is the distributed capacitance).

**HUMIDITY:** The increase in relative humidity of the air inside the panel also contributes to reduced insulation. Its variation in relation to time may indicate, for example, that the system is operating without the internal heaters of the panel in operating conditions, or changes in the condition of the air present in the rooms.

**TEMPERATURE:** THM sensors with an opening angle of 7° (1/8) not only monitor the target (point to be monitored) via infrared, without contact, from long distances, but also allow monitoring of the rise in the internal temperature of the panel, since each sensor also measures the temperature of the surrounding air, thus detecting rises in temperatures and points not directly targeted. The rise in internal temperature in panels, due to fan failure or clogged air filters or even indirect heating through heating of electrical connections, is also an important indicator. Electrical connections not directly monitored by the infrared THM sensor can be indirectly detected by the rise in the internal air of the panel above the historical levels for the panel in question.

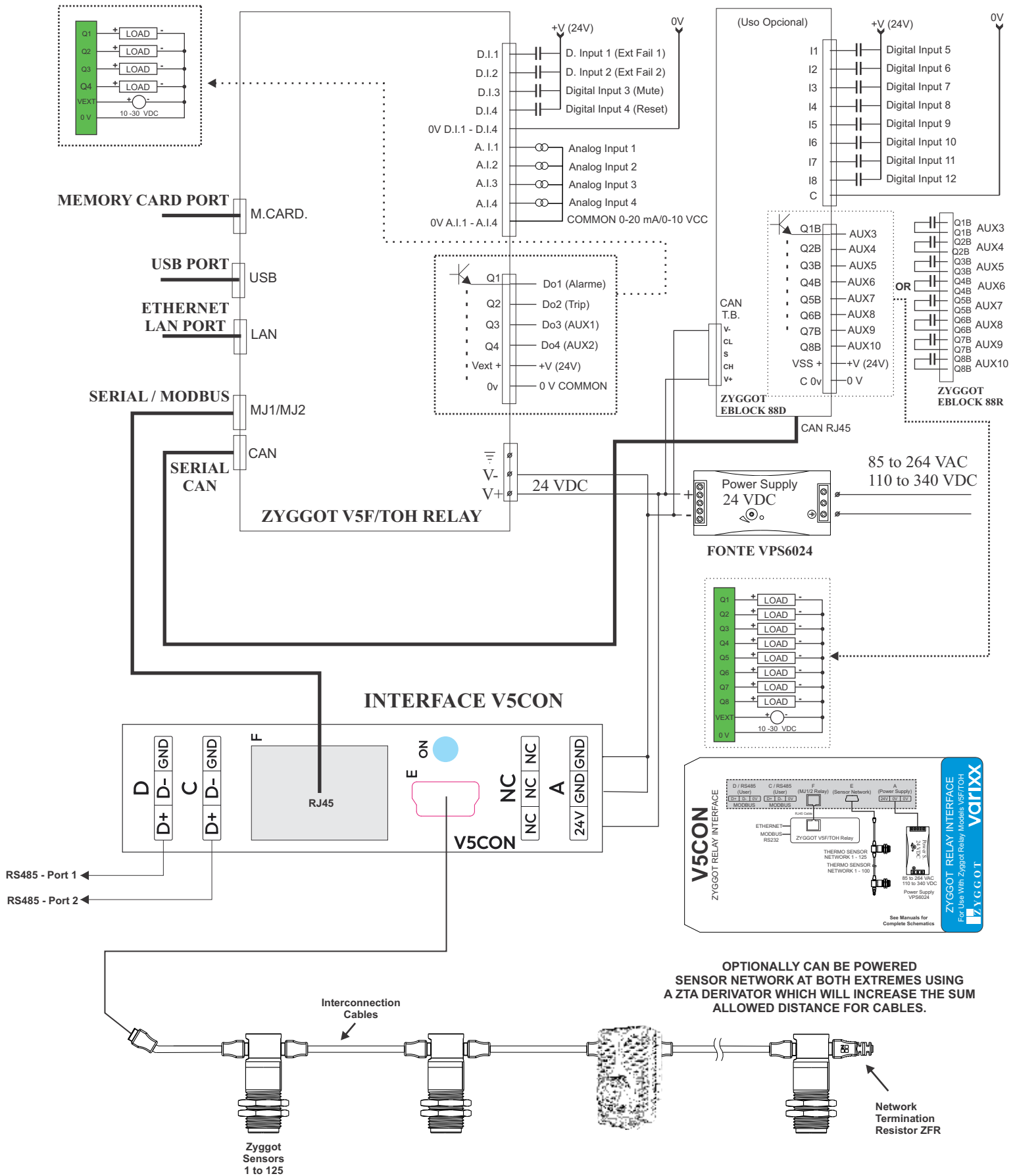
## BENEFITS

- !Monitors, at the same time, with a single relay and a single network of up to 125 sensors and 250 measurements, 4 important variables to avoid future arc flash.
- !Detects poor contact due to mechanical failure or oxidation in electrical connections.
- !Detects aging of the panel or its insulation.
- !High sensitivity for ozone detection.
- !The only networked system for ozone detection worldwide (low cost).
- !Easy installation and commissioning. Low implementation cost.
- !High reliability.
- !High alarm selectivity with independent alarms for sensor groups and identification of the sensor sending the alarm.

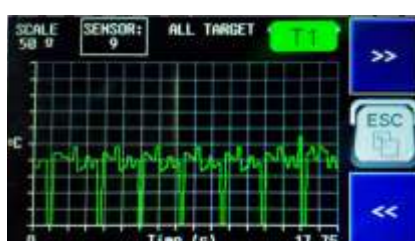
## MAIN FEATURES OF THE SYSTEM

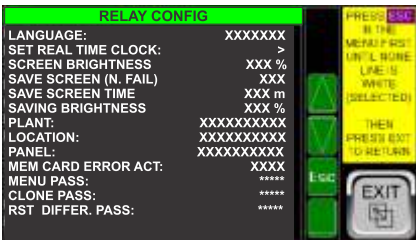
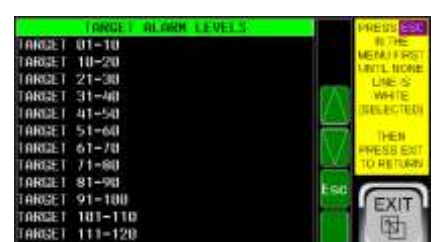
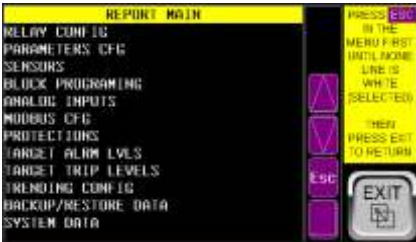
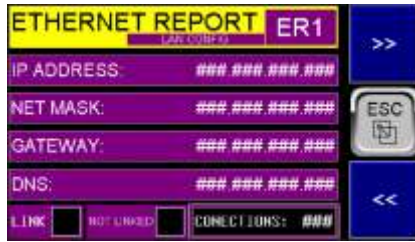
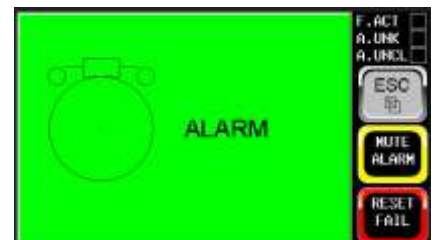
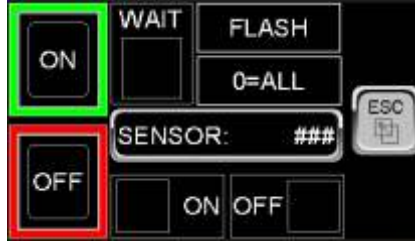
- > Intelligent relay (with color touch screen). User-friendly.
- > Applicable in low, medium and high voltage.
- > Relay with Modbus RTU port for connection to PLC or DCS.
- > Relay with ETHERNET for worldwide monitoring.
- > Intelligent THM and Ozone sensors powered by the network itself.
- > Monitoring of voltages and sensor status.
- > Dispenses with analog interfaces.
- > Sensors and Relays can be configured and tested by PC with free software.
- > Possibility of using only temperature sensors, only ozone+humidity sensors or both, in the same relay.
- > Up to 125 sensors connected to a single Zyggot Relay. (Network with plug-in sensors).
- > Each sensor has an LED that flashes when commanded by the relay, to detect faults or their identification. > Zyggot relay with 4 or 12 programmable digital outputs and 4 digital inputs for external faults, etc., in addition to 4 analog inputs.
- > Easy testing with the system de-energized.

# TYPICAL CONNECTIONS



# CENTENAS DE TELAS AMIGÁVEIS





# COMPOSITION OF THE T+O+H SYSTEM

**COD: V5F/TOH**



**RELAY 96 X 125 Touch Screen**

**Technical information**

**FEATURES: V5F/TOH**

Power Supply	24 VDC
Humidity	5 to 95%
No. of sensors	up to 125 sensors
Resolution	1°C
Inputs	4 analog 4 digital (12 to 24VDC)
Outputs	2 Alarm and Trip outputs (N.O.) 2 programmable outputs (N.O.) 1 output for connection to sensors
Communication	Modbus RTU Devicenet (optional) Ethernet TCP-IP (optional)
Screen	Color, Touch Screen WVGA

**COD: V5CON**  
(Includes in each Relay Supplied)



**INTERFACE**

**COD: ZST/M/7/300/24**



**THM TUBULAR SENSOR**

**Technical information**

**FEATURES: EBLOCK 88x (x=D or x=R)**

Power Supply	24 VDC (10 - 30 VDC) 2W
Moisture	5 to 95%
Communication	CAN
Temperature	Oper: 0 to 60 °C /// Armaz: -10 to +60 °C
Inputs	8 Digital Inputs (12 - 24 VDC)
Outputs	Model 88D = 8 Digital Outputs (DC) Model 88R = 8 Digital Output (Relay)
Inputs	Imp.: 10K /// Treshold: 8 VDC / 3 VDC
Distance Max	1000 M
Output Current (Model 88D)	2,5 A Max per point /// 10A Total Max (model 88D)
Output (mod 88R)	3,0 A @ 250 VAC Res. Max (mod. 88R)

**Informações Técnicas**

**FEATURES: OZONE SENSOR**

Measuring range O <sup>3</sup> :	0 - 2000 ppb
Typical reading error (*):	+/- 1%
Sensitivity O <sup>3</sup> :	< 5 ppb
Humidity Range:	0 - 100%
Resolution O <sup>3</sup> :	0.1 PPB
Humidity Resolution:	0.1 %
Humidity Sensitivity:	< 2%
Power Supply:	24 Vdc
Diameter:	54 mm
Length:	31,2 mm
Communication:	Modbus RTU
Material:	Polycarbonate

**COD: ZSB/M/60/120**



**SENSOR THM BT**

**Technical information**

**FEATURES: THM TUBULAR SENSOR**

Measurement angle:	7°
Typical read error (*):	+/- 0,5°C (trg: 0-125°C)
Normal Distribution (100 s):	0.48°C at 80°C target
Emissivity:	Programmable (0,95 std)
Resolution:	1°C
Target reading:	0 to 300 °C
Environment reading:	0 to 75 °C
Power:	24 Vcc
Diameter:	19 mm
Length:	53 mm
Communication:	Modbus RTU
Material:	Stainless Steel / Polycarbonate

(\* See test report at the end of this manual)

**Technical information**

**Connectors: EB/88D & EB 88R**

1:	Digital Outputs / Relay Outputs
2:	NET address selection switches
3:	LEDs de status
4:	Inputs
5:	CAN & Power Supply
6:	Ground
7:	CAN RJ45

**COD: ZSO/2000**



**OZONE SENSOR**

**Technical information**

**FEATURES: BT SENSOR**

Measurement angle:	120°
Typical read error (*):	+/- 0,5°C (trg: 0-125°C)
Normal Distribution (125 s):	0.48°C at 80°C target
Emissivity:	Programmable (0,95 std)
Resolution:	1°C
Target reading:	0 to 120 °C
Environment reading:	0 to 75 °C
Power:	24 Vcc
Diameter:	54 mm
Length:	31 mm
Communication:	Modbus RTU
Material:	Polycarbonate

(\* See test report at the end of this manual)

# ACCESSORIES

Accessory

COD: VPS6024 ou VPS12024



POWER SUPPLY

Accessory

COD: ZSF2



Support for fixing and sight for tubular

Accessory

COD: VZX/B1/U ou VZX/B1/U/P



SUITCASE WITH LASER SIGHT

Accessory



Y-split Derivator, USB cables and terminating resistor

Accessory

COD: VLP2



Laser sight attachable to tubular sensor for startup

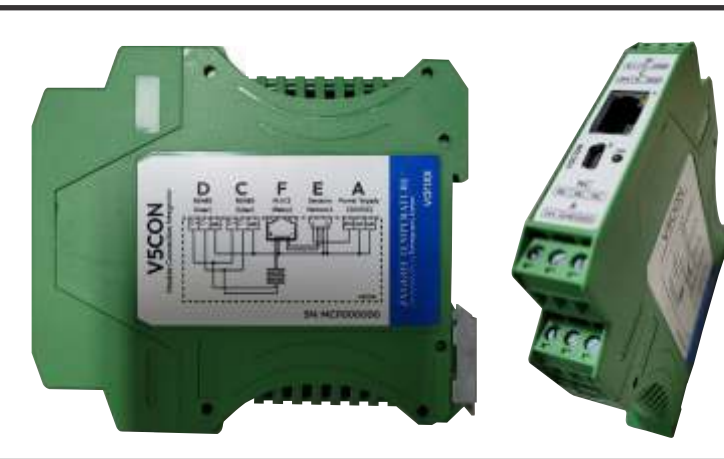
Accessory

COD: ZA232-2



SPLIT RS232

Accessory



COD: V5CON  
(Comes with each Relay)

INTERFACE

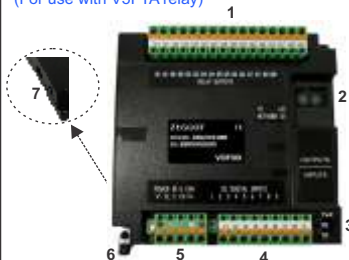
Accessory

COD: RJ45/C2  
(Comes with each V5CON module and each Eblock)



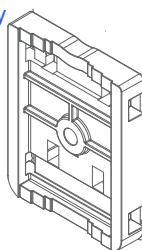
RJ45 CABLE

COD: EB/88D ou EB/88R  
(For use with V5FTA relay)



EBLOCK (Optional Use)

Included with every BT sensor



Quick Fixing Base for BT Sensor

## ABOUT VARIXX

For over 40 years, Varixx has pursued its vocation for developing high-tech products and focuses its efforts on serving the industrial market with quality and speed. Our know-how in power electronics has allowed us to offer the market a wide range of products that have become known for their long service life and reliability. We were the creators of the global online thermography market, with the Zyggot line, which is becoming a global reference in the market for temperature monitoring and diagnostics and arc flash detection in electrical systems in general.

Our product portfolio also includes LED luminaires from our ONNO division, developed and manufactured 100% in Brazil with cutting-edge technology. Varixx values the introduction of innovative concepts worldwide.

## AREAS OF ACTIVITY

- ✓ **MANUFACTURERS OF GENERATOR MACHINES AND SYNCHRONOUS MOTORS**  
Static Exciters, Control Box Controllers, Low and Medium Voltage Soft Starters, Semiconductors
- ✓ **PRODUCTION OF ALUMINUM AND HYDROGEN / OXYGEN**  
High Current Rectifiers, Solid State Contactors, Smart Relay for CCM, Online Thermography System and Arc Flash Detection and Onno LED Luminaires.
- ✓ **BASE INDUSTRY, MINING AND STEEL INDUSTRY**  
Smart Relays for CCMs, Low and Medium Voltage Soft Starters, Solid State Contactors, AC/DC Converters for electromagnets, High Current Rectifiers, Online Thermography System, Arc Flash Detection and Protection and Onno LED Luminaires.
- ✓ **OIL COMPANIES**  
Smart Relays for CCMs, Static Excitation, Low and Medium Voltage Soft Starters, Solid State Contactors, Online Thermography System, Arc Flash Detection and Protection and Onno LED Luminaires.
- ✓ **ELECTRIC PANEL ASSEMBLERS**  
Smart Relays for CCMs, Online Thermography, Arc Flash Detection and Protection System, Semiconductors, Power Supplies and Onno LED Luminaires.

### Why ZYGGOT Thermography And Arc Flash Protection?



**SINGLE CABLE / EASY TO INSTALL**



**PREDICTIVE / DIFFERENTIAL PROTECTION**



**EFFECTIVE PROTECTION AGAINST ARC DESTRUCTION**



**WORLDWIDE UNIQUE BY UV DETECTION / NO CURRENT READINGS REQUIRED**



**DOES NOT NEED CONVENTIONAL THERMOGRAPHY / ALSO MEASURES AIR TEMP.**



**WITHOUT CONTACT / WITH NETWORK COMMUNICATION**

## LEARN MORE!

### ZYGGOT ARC FLASH SYSTEM

- ✓ **Low Cost // Up to 100 sensors per gateway.**
- ✓ **Innovative in the market // Faster (<300 uS versus up to 500 mS)**
- ✓ **Ultraviolet arc detection**
- ✓ **Does not operate with ambient light (False Alarm)**
- ✓ **No need for current readings**

# varixx

ALWAYS INNOVATING

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ZYGGOT THERMOGRAPHY