ZYGGOT
ARC PROTECTION SYSTEM

MANUAL_ZYGGOT_ARC_V2.4E

USERS MANUAL

VERSÃO V2.4 E

Version Zyggot Arc Flash Protection System

ZYGGOT® ARC FLASH PROTECTION SYSTEM

MODEL:
SENSOR - P.N.: ZSA/90/24/UVA OR ZSA/90/24/UVB
PROTECTION RELAY - P.N.: VZA/B I

ISO 9001
BUREAU VERITAS
Certification

Varixx

Support Services

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Website Address

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SECURITY

Definitions and Symbols

This symbol indicates high voltage. It calls your attention to items or operations that could be dangerous to you and other persons operating this equipment. Read the message and follow the instructions carefully.

This symbol is the "Safety Alert Symbol." It occurs with either of two signal words: CAUTION or WARNING, as described below.

WARNING

Indicates a potentially hazardous situation which, if not avoided, can result in serious injury or death.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, can result in minor to moderate injury, or serious damage to the product. The situation described in the CAUTION may, if not avoided, lead to serious results. Important safety measures are described in CAUTION (as well as WARNING).

WARNING

Motor control equipment and electronic controllers are connected to hazardous line voltages. When servicing drives and electronic controllers, there may be exposed components with housings or protrusions at or above line potential. Extreme care should be taken to protect against shock.
Stand on an insulating pad and make it a habit to use only one hand when checking components. Always work with another person in case an emergency occurs. Disconnect power before checking controllers or performing maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on electronic controllers or rotating machinery.

DESCRIPTION
MAIN CHARACTERISTICS

DESCRIPTION

The ZYGGOT Arc-Flash Protection System, belongs to Zyggot family togheter with the Temperature Monitoring system, is designed to allow full-time monitoring of low and medium voltage equipment as electrical panels, transformers, motors and generators.

The ZYGGOT Arc-Flash Protection System introduces an important innovation in the market due to the fact it detect ultraviolet radiation (UV) from the very beginning of the arc, that is, the pilot path of the arc in the first arc phase, much before the light detection of other systems. The light phase is already the final stage of the arc, with expanding gases and vaporization of copper and other metals. Another important advantage is the selective monitoring of ultraviolet radiation, dispensing simultaneous monitoring of current to confirm the occurrence of the arc, that light detection systems demands. If there is emission of ultraviolet radiation at certain levels, we can safely trip the system.

Systems that detect visible light could be activated by door openings or light coming through metal gaps, which requires current monitoring simultaneously to prevent unwanted trip and in addition, if there is a visible light input unwanted and constant, you can't have the sensor operation while staying the light, losing the protection.

The ZYGGOT Voltaic Arc protection system, unlike the light detector systems can be applied even in direct incidence of sunlight, thus opening the possibility of using it in external system (outdoor substations, transformers, motors , etc.).

The sensors have a 90 ° opening angle that allows monitoring of large areas. The effective monitoring distance are high due to the high sensitivity of the sensors.
The sensor is connected by a CAN Network to a relay, that send the circuit-breaker opening signal. A single trigger relay can monitor up to 50 sensors.

The interconnection of sensors to the detection and tripping relay, uses high-speed efficient CAN network, unlike systems in a star, with analog signals, that require that each sensor is independently connected to concentrator modules or interface.

The high-speed electric arc occurrence detection, sending the trip signal in less than 300 µs, allows security because as soon as possible to remove the system power lower will be caused damages. Even using circuit breakers with opening time order of dozens of millisecond, it ensures that the system will tripping, even if the network interconnect cable is destroyed by the arc, because before the destruction the signal has reached the relay and circuit breaker.

Another important difference is that the transmitted signals are digital, already processed in the microprocessor of the sensor and transmitted by shielded cables being thus immune to extremely strong electromagnetic fields generated by the arc current, unlike what can occur with visible light detection system with photocell, which transmit analog signal to the interface.

APPLICATION
BENEFITS AND E CHARACTERISTICS

APPLICATION

Protection against electric arcs for low and medium voltage panels,
transformers, motors and generators, substations, transmission lines, primary cabins, etc.

BENEFITS

* Monitoring ultraviolet radiation in bands A and B.
* Detects phase 1 of the arc, before the visible light phase (expansion and destruction).
* Avoids simultaneous current monitoring for setting arc occurrence.
* Sends the trip signal in less than 300 µs.
* A single intelligent timer relay with ARM microprocessor 9, of last generation, monitoring up to 50 sensors.
* Can be used in outdoor environment. Immune to visible light.
* Monitors integrity of the sensors which is impossible with passive sensors.
* Networked sensors (high-speed CAN) and digital signals.
* Immune to strong electromagnetic fields.

MAIN FEATURES OF THE SYSTEM

* Smart Trigger Relay (w / ARM 9 microprocessor).
* Applicable in low and medium voltage.
* High speed CAN network for the sensors.
* Relay with Modbus RTU port for connection to PLCs.
* Intelligent Sensors feeding by the own CAN network.
* Relays and sensors are configured and tested by PC with free program.
* 90 º measuring angle.
* Up to 50 sensors connected to a single relay. Network plug-in sensors.
* Avoids hubs and interfaces use.
* Sensor Health Monitoring.
* Relay with 4 digital outputs N.O., two for Trip with static switch, one Alarm and one Armed.
* Relay with 4 digital inputs.
* Each sensor has a LED that flashes when detect Arc or show its location.
* Easy system test with manual tester (arc generator- ArcSafe).

Electrical Arcing Phases

PRE-ARC

Air ionization and formation of the way (pilot electrical arc) to occurrence of the electrical arc. At this stage already is released the ultra-violet radiation (0 to 5 ms) and it is maintained by the entire electrical arc occurrence. The Zyggot sensor is able to detects the electrical arc already in this instant, ensuring time between arc detection by the sensor and trip command sent to the circuit-breaker in less than 300 µs (this assures that the signal reaches the circuit breaker before any cable of the sensing system could be destroyed unlike other system that uses visible light and current monitoring)

COMPRESSION

The electrical arc energy is discharged into the air in the enclosure with the consequent increased pressure (5 to 15 ms).

EXPANSION

The increased pressure caused by the previous step triggers the relief mechanism and the air begins to be expelled, decreasing the internal pressure (15 to 40 ms)

EXPULSION

The pressure inside the chamber decreases but the hot air remains being expelled at an approximately constant pressure. The temperature increases a lot. The expulsion of air tends to cease when the room environment acquires the temperature of Arc (40-60 ms);

THERMIC

The arc totally affects the insulating material. The temperature reaches thousands of degrees centigrade, and the conductive and structural materials begin to melt. This phase continues until it produces the dissipation of the energy.

Subtypes of Ultra-Violet Radiation

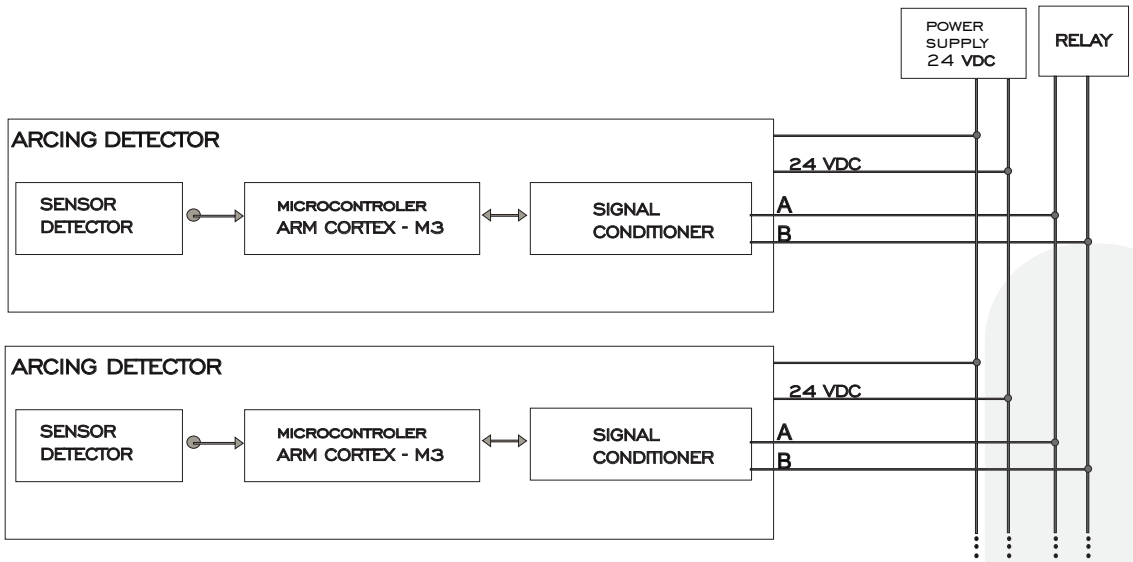
Nome	Wave Lenght (nm)
Ultra-violet A or "black light"	315 nm – 400 nm
Near Ultra-violet	300 nm – 400 nm
Ultra-violet B	280 nm – 315 nm
Middle Ultraviolet	200 nm – 300 nm
Ultraviolet C or "germicidal"	100 nm – 280 nm
Far Ultra-violet	122 nm – 200 nm

OPERATING PRINCIPLE

Each system sensor has a high speed and high performance microprocessor ARM CORTEX-M3. Firmware embedded in the sensor is operating communication and other tasks, but if an arc detection occurs, there will be a high priority interrupt routine and the arc detection data with the sensors numbers is immediately transmitted to the relay. The time from arc occurrence and the detection by the sensor to the activation of the relay TRIP output 1 (high speed) is approximately 290 µs.

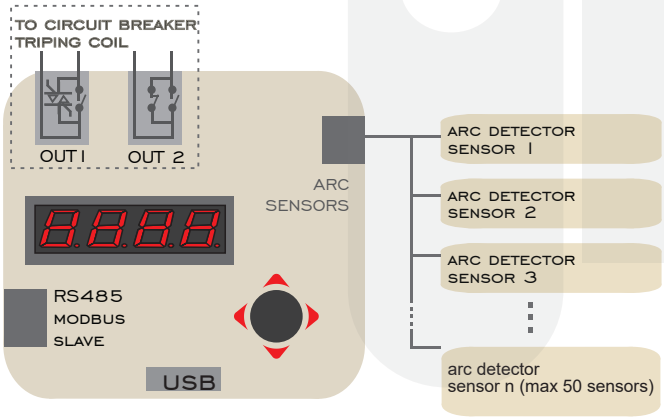
The relay also features an ARM9 microprocessor running an embedded firmware and receive a high priority data packet related to an arc detection, immediately will close the static and dry contact output. After detection, even if the communication cable is destroyed by the arc itself, the trip sequence is terminated, protecting the system from catastrophic destruction.

The system will be protected even during the time of the flash of the LEDs or any other communications, for the CAN protocol has communication priorities, ie more than one or even all network elements can generate communication at the same time and what has priority over High for all communication of lower priority packets are served immediately. As the arc detection data packet is the highest priority, the arc detection signal is read by the smart relay immediately. If more than one sensor detect arc a list of these sensors can be paged by the HMI PREV and NEXT buttons.



ANGLES OF READING AND REFLECTION

The opening angle (angle of detection) of the sensor sets the UV measurement area, i.e. the area where it is possible to detect the occurrence of the electrical arc. UVA and UVB sensor have aperture angle of 90º covering substantially the entire area of a cubicle depending on the fixing point. In a single compartment cubicle, a single sensor installed at a correct point, as in the corners may be sufficient. Two sensors on opposite angles leave the full volume without area with shadows. Ultraviolet radiation is reflected on surfaces such as visible light (although it can be attenuated). The sensor can capture Zyggot reflected UV radiation (depending on the reflected intensity), which facilitates the detection in the entire volume of interest, even if the arc occurs behind some equipment, not direct visible by the sensor.



Smart ultra fast firing relay with microprocessor Arm9 to control a net of until 50 sensors

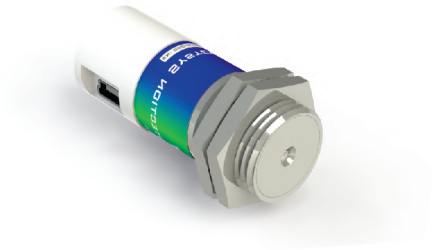
OPERATION PRINCIPLES
MAIN CHARACTERISTICS

COMPONENTS:

A) Arc sensor - 90º - UVA sensitive: ZSA/90/24/UVA
Arc sensor - 90º - UVB sensitive: ZSA/90/24/UVB
B) Relay / firing module: VZA/B1
C) Interconnection cable with mini-USB connector: ZCB/4/2U/...
D) Power Supply - 24 VDC for 50 sensors: VPS12024

arco real a até 30 m*

ZSA/90/24/UVA

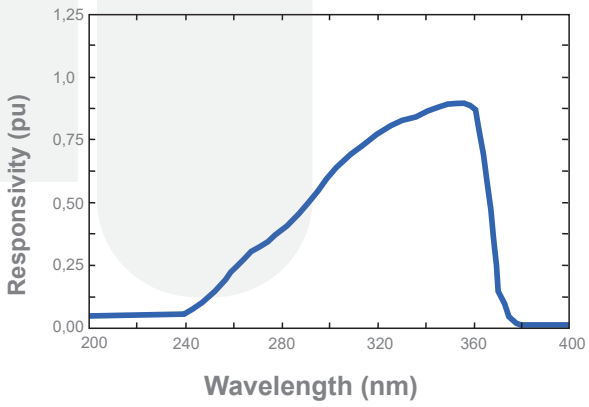


- ☐ Power supply: 24V via standard cable.
- ☐ Opening angle: 90 °
- ☐ LED indicator for localization and arc indication.
- ☐ Network address: configurable via relay or PC.
- ☐ Detects UVA and small amount of visible light (240-340 nm).
- ☐ Applicable in panels and sheltered environments.
- ☐ Does not trigger with ambient light or inner light panels. (Can trigger if is aimed at the clear sky, sun or flash within short distance).
- ☐ Sensitivity to one low energy arc of 2 cm, produced by the test device at a distance of 1.5 m and to real electric arc to 30 m *.

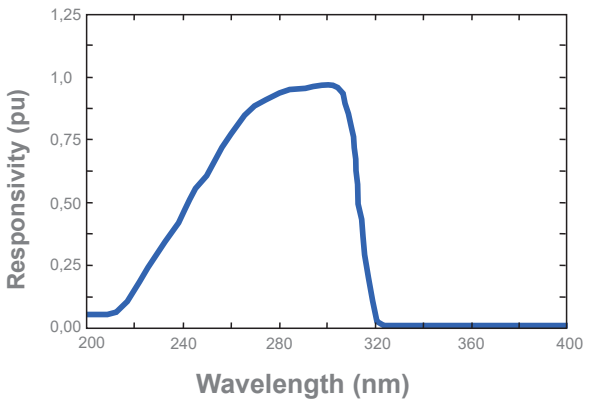
ZSA/90/24/UVB

- ☐ Power supply: 24V via standard cable
- ☐ Opening angle: 90 °
- ☐ LED indicator for localization and arc indication
- ☐ Network address: configurable via relay or PC
- ☐ Detects UVB radiation (220 - 320 nm)
- ☐ Applicable in panels and open environments and monitoring unsheltered equipments.
- ☐ It does not trigger even with strong visible light. (Except if directed to the sun whose rays contains UVB).
- ☐ Sensitivity to one low energy arc of 2 cm, produced by the test device at a distance of 0.2 m and to real electric arc to 10 m *.

Responsivity Curve - UVA



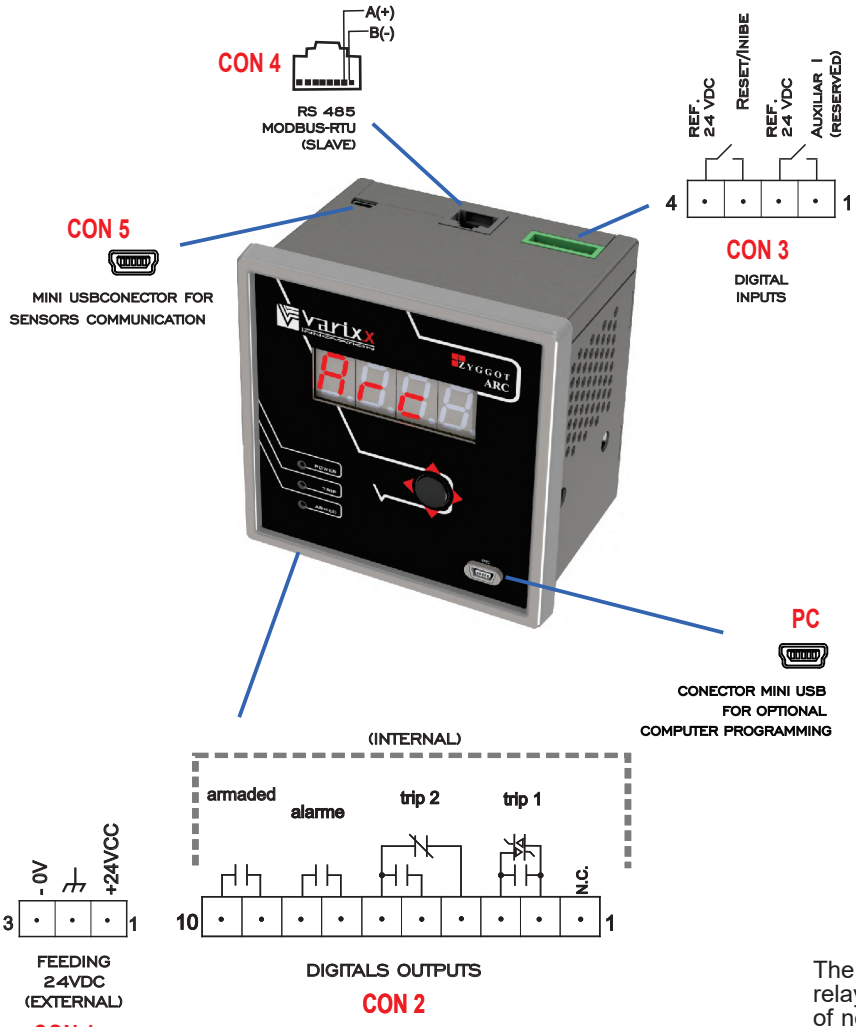
Responsivity Curve - UVB



*Depends on the intensity of the arc.

SYSTEM DETAILS

DETAILS OF THE RELAY VZA/B1
ARCING TESTER (ARCING GENERATOR) ZSA



OVERLAY

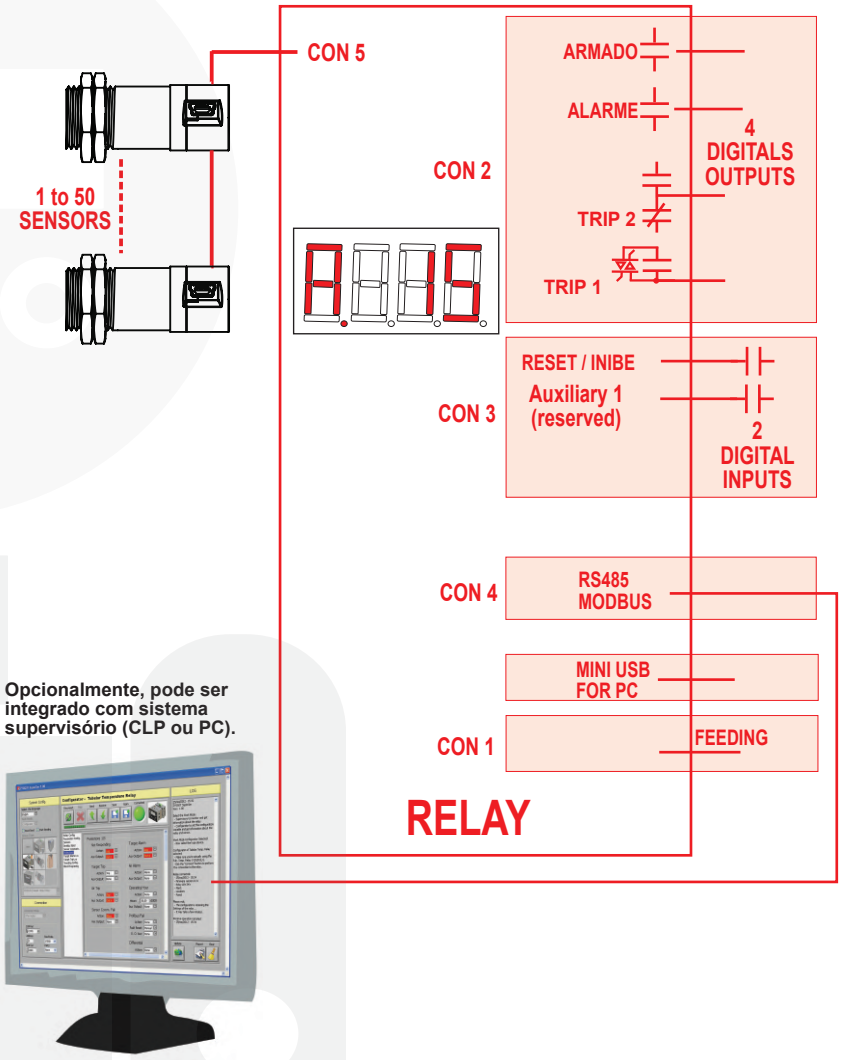
The figure above shows an overlay of the electrical arc relay. The relay has a display that can indicate the quantity of not communicating sensors or sensor activated by the electrical arc. The first digit on the left shows one of the above options and the following three digits indicate the corresponding number, being paged by the PREV and NEXT keys. Three LEDs indicate Power, Trip (in the event of the electrical arc) and Armed (monitoring electrical arc occurrence) which can be performed an displayed even if not all the sensors are connected or communicating, providing effective protection.

TESTER (ARC GENERATOR TESTER) ZSA

The ArcSafe tester is optionally offered to test the system operation. The tester generates an extra high voltage (3,800,000 Volts) providing small, low-energy, electrical arcs between the electrodes. These electrical arcs are in turn detected by the sensors at a maximum distance of 1.5 m in the UVA sensor and 0.2 m in UVB sensors. Note: Real high-energy electrical arcs are detected at distances until 7 meters by UVA sensors and 3 meters by UVB sensors.

SYSTEM DETAILS

ONE WIRE DIAGRAM AND MAIN CHARACTERISTICS



Opcionalmente, pode ser integrado com sistema supervisório (CLP ou PC).

Cabos
A facilidade de montagem da rede de sensores está nos dois conectores mini USB presentes nos sensores e nos cabos blindados mini USB fornecidos em diversos tamanhos pela Varixx.

Detecção
O Relé disparador provê detecção de arco de até 50 alvos ou áreas (50 sensores).

Display
O display é conciso como deve ser um relé específico para aplicação de lógica binária (ON/OFF). Mesmo assim é de grande valia para definição da quantidade de sensores na rede e identificação dos sensores que levaram ao desligamento do sistema (incluindo ainda a sequência em que as detecções ocorreram). Ex.: Sensor 3, Sensor 1, Sensor 2.

Programming Tools
A free program developed and provided by Varixx allows the relay parameterization and also testing and configuration of each sensor.

Event memory
The relay allows storage and display of up to 50 sensors activated by arc detection. Visualization is sequential, that is, indicates the order in which occurred the detections, being able to navigate through the NEXT and PREV buttons. To clear the event memory, just press the RESET button.

Communication ports
The relay has three communication ports: RS485 port with Modbus RTU protocol for communication with PLCs or SCADA systems. One mini USB port for connection to a PC for parameterization. One mini USB port with CAN protocol to communicate with the sensors.

Digital Inputs
The relay has two digital inputs, one for Reset / Inhibits and other Auxiliary, reserved. The contact Reset / Inhibits if closed briefly run the Reset function and if remained closed the device performs the inhibit function.

Digital Outputs
4 digital outputs are available, two of them to Trip, triggered simultaneously. An Alarm output that could be triggered if the system detects an inactive sensor or communication failure. An Armed output (N.O.) informs that the system is monitoring electrical arc occurrence.
An output Trip (TRIP 1) only has N.O. contact (SPST) with high speed and closing in parallel with one normal contact, ensuring time between arc detection by the sensor and trip command sent to the circuit breaker in less than 300 µs (this assures that the signal reaches the circuit breaker before any cable of the sensing system could be destroyed unlike other system that uses visible light and current monitoring); the second output Trip (TRIP 2) has a lower operating time (approx. 5 ms) and N.C. contact (SPDT) being suitable for connection to SDCD system (fail safe mode).

Note: An Alarm condition for "Sensor not responding" does not disable the Armed condition or electrical arc detection by the active sensors.

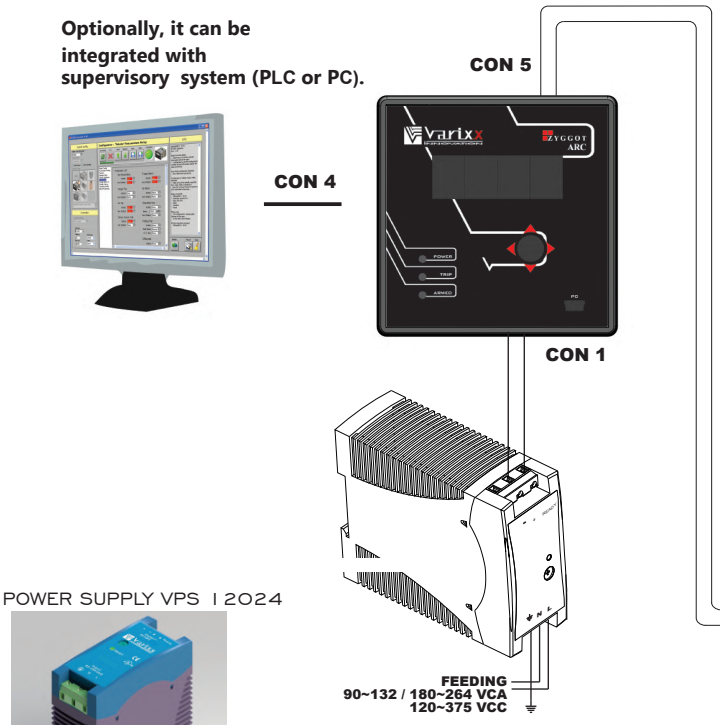
CONNECTION SCHEMATICS

MINI USB MULTI-FUNCTION CONNECTOR

The mini-USB connector on the sensor serve both for parameterization using a USB / mini USB standard cable (supplied separately) and a PC, as communication to the relay through the network cable (supplied separately). The mini two USB ports of the sensor are in parallel. The double mini-USB port facilitates the assembly of the network, enabling easy chain of the sensors. For details of how to parameterize the sensor refer to the programming section.

⚠ CAUTION

Do not connect the sensor to the computer with the other end of the sensor connected to the network sensor. This can damage the sensor and the computer!



POWER SUPPLY VPS I 2024

POWER SUPPLY

NOTE: A single power supply feeds the relay and sensors.

DETAILS OF THE CAN COMMUNICATION NETWORK

The communication system between the sensors and the relay uses a CAN communication network. The CAN protocol allows the use of priority in the transmitted messages. The electrical arc detection signal has high priority on the network, ensuring (along with the high speed static TRIP contact of the relay) that the time between the detection of the electrical arc by the sensor and the relay output contact closure is less than 300 µs, regardless of the number of sensors present on the network. For the network operate without noise problems it requires the use of shielded cables between sensors and between the first sensors and the relay. To ensure having the correct impedance and absence of signal reflection in the network is essential to use terminating resistors at the endpoint. The VZA / B1 relay already has a termination resistor implemented internally in the port CON 5. It is mandatory to connect the ZFR terminating resistor (purchased separately) on the last sensor of the network.

CABLE LENGTH SELECTION FOR EACH SENSOR

The sensors are networked with a shielded cable type. These cables, with mini USB connectors at both ends, are supplied in various lengths by Varixx. Below are the available sizes.

ZCB/4/2U/030	Sensor connection cable of 0,3m
ZCB/4/2U/050	Sensor connection cable of 0.5m
ZCB/4/2U/100	Sensor connection cable of 1m
ZCB/4/2U/200	Sensor connection cable of 2m
ZCB/4/2U/400	Sensor connection cable of 4m
ZCB/4/2U/600	Sensor connection cable of 6m
ZCB/4/2U/800	Sensor connection cable of 8m

NOTE: The maximum length of the network sensors cable (from relay to the last sensor) is 80m.

TECNICAL ESPECIFICATIONS

Relay VZA/B1 with 96 x 96 C/ Display

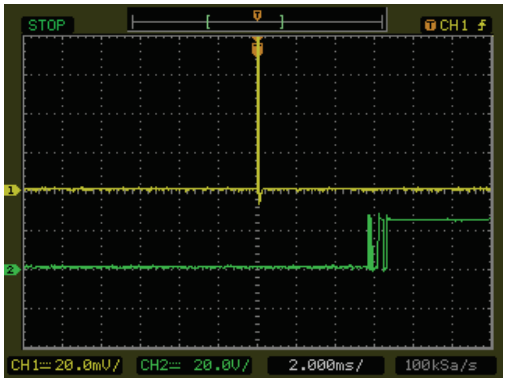
ZYGGOT ARC RELAY - MODEL VZA/B1	
Relay Digital DC Inputs	
Inputs per Module	2
Nominal Voltage	24 VDC
Absolute Max. Voltage	240 VDC
Nominal Input Impedance	10 kΩ
Min Upper Threshold	10 VDC
Max Lower Threshold	3 VDC
Upper Threshold Current	0,9 mA
Lower Threshold Current	0,3 mA
OFF to ON Response	500 µs
ON to OFF Response	500 µs
Isolation	1000 VAC

Zyggot Arc Relay - Model VZA/B1	
Relay Digital Relay Outputs	
Total outputs per module	4
Type	Dry Contact
Outputs per Module	2 SPST (N.O.) + 1 SPDT (N.O.C.)
Type	Static + Dry Contact
Outputs per Module	1 SPST (N.O)
Max. Output	10 A at 250 VAC, resistive 10 A at 30 VDC
Max. Total Current	10 A continuous
Max. Output Voltage	250 VAC / 30 VDC
Min. Output Voltage	22 VAC / VDC
Max. Switched Power	2500 VA / 300 W
Contact Isolation to Ground	1000 VAC
Max. Voltage Drop at Rated Current	0.95 V
Max. Inrush Current	200 A
Expected Life	No load: 5.000.000 Rated load: 100.000

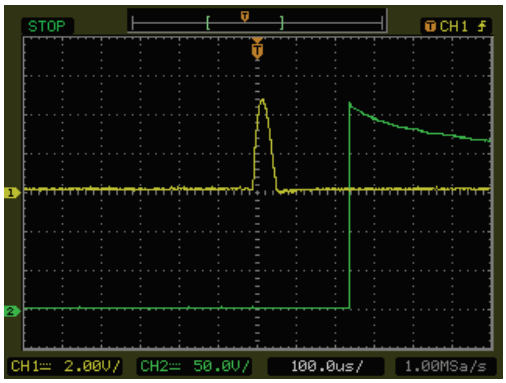
Zyggot Arc Relay Specifications	
Relay General Specifications	**Model VZA/B1**
Nominal Supply Voltage	24 VDC
Nominal Power	130 mA
Nominal Power (Inrush)	30 A for 1 ms @ 24 VDC
Voltage Range	20 ~ 30 VDC
Relative Humidity	5 to 95% Non-condensing
Operating Temperature	-10 to 50º Celsius
Terminal Type	Screw Type, Removable
Weight	12 oz. (340.19 g)
Dimensions mm	96 mm x 96 mm
Display	4 x 7 segments
User Keys	Joystick (1 x 5)
Communication Protocol	Modbus RTU
Can Port	Up to 50 Drops
Serial Ports	1 x RS485
CE	Compliant

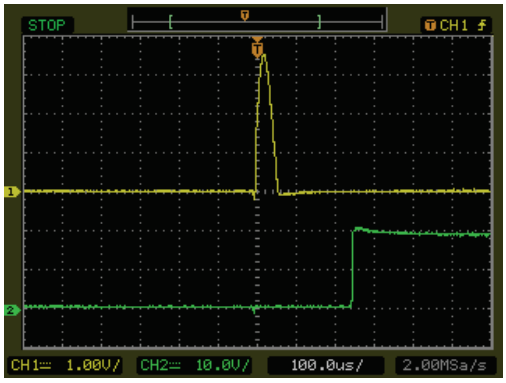
TIME RESPONSE BETWEEN ARC DETECTION (SENSOR) AND TRIP OUTPUT (RELAY)

TRIP 2 Output response time: aprox. 6 ms @ 24 VAC after ARC detection by sensor.



TRIP 1 Output response time: aprox. 300 µs @ 220 VAC after ARC detection by sensor.





TECNICAL ESPECIFICATIONS

Relay VZA/B1 with 96 x 96 C/ Display
Elecrical Arcing Sensors

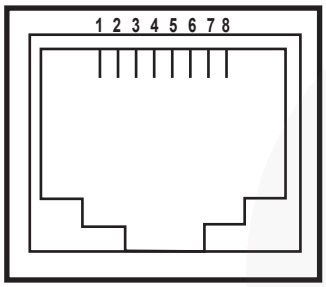
GENERAL CHARACTERISTICS / Características

4 x 7 segments display.
RS-485 + Mini USB Serial Port.
Mini USB (CAN) port for sensors.
1 x Joystick with 5 function contacts.

POWER SUPPLY / Fonte Alimentação

Model.... ....VPS12024
Input Voltage Range.....90 ~ 132 / 180 ~ 264 VAC
....120 ~ 375 VDC
Output Power ....120 W
Output Voltage.... .....24 VDC

CON 4 - RJ 45 JACK



PORT RS485 - Port Pins Assignment

PIN	SIGNAL	SIGNAL DESCRIPTION	Direction
1	B(-)	RS-485 Send/Receive Negative	In/Out
2	A(+)	RS-485 Send/Receive Positive	In/Out
3	N.C.	Not Connected	-
4	N.C.	Not Connected	-
5	N.C.	Not Connected	-
6	N.C.	Not Connected	-
7	N.C.	Not Connected	-
8	N.C.	Not Connected	-

ZYGGOT Specifications	
Arcing Sensors	**(No Contact)**
Tightening	2 Screws
Power Supply Types	By CAN Network
UV Wavelenght	200 to 320 nm
Case Type	Stainless Steel
Sensor Measurement Angle	90º
Radiation Ranges	UVA and UVB Insensible to visible and IR
Sensor Transmission type	High Speed CAN
Temperature Operation	-20 to 89 ºC
Temperature Storage	- 40 to 125 ºC
Maximum measurement range (distance from sensor to target)	30 m depending on the Arc Power
Max. CAN cable lenght	500 m
Configuration (address, Sensivity)	By Computer with Free Program
Indication	Led at rear face
Max. Sensors per Relay	50
CE	Compliant

RELAY INSTALATION AND LOW VOLTAGE CIRCUITS

POWER AND CONTROL CONNECTION

Once mechanically installed the entire system, make the low voltage electrical connections.

To the relay, follow the connections, according to the schematic. The supplied cables are shielded, ensuring greater network reliability.

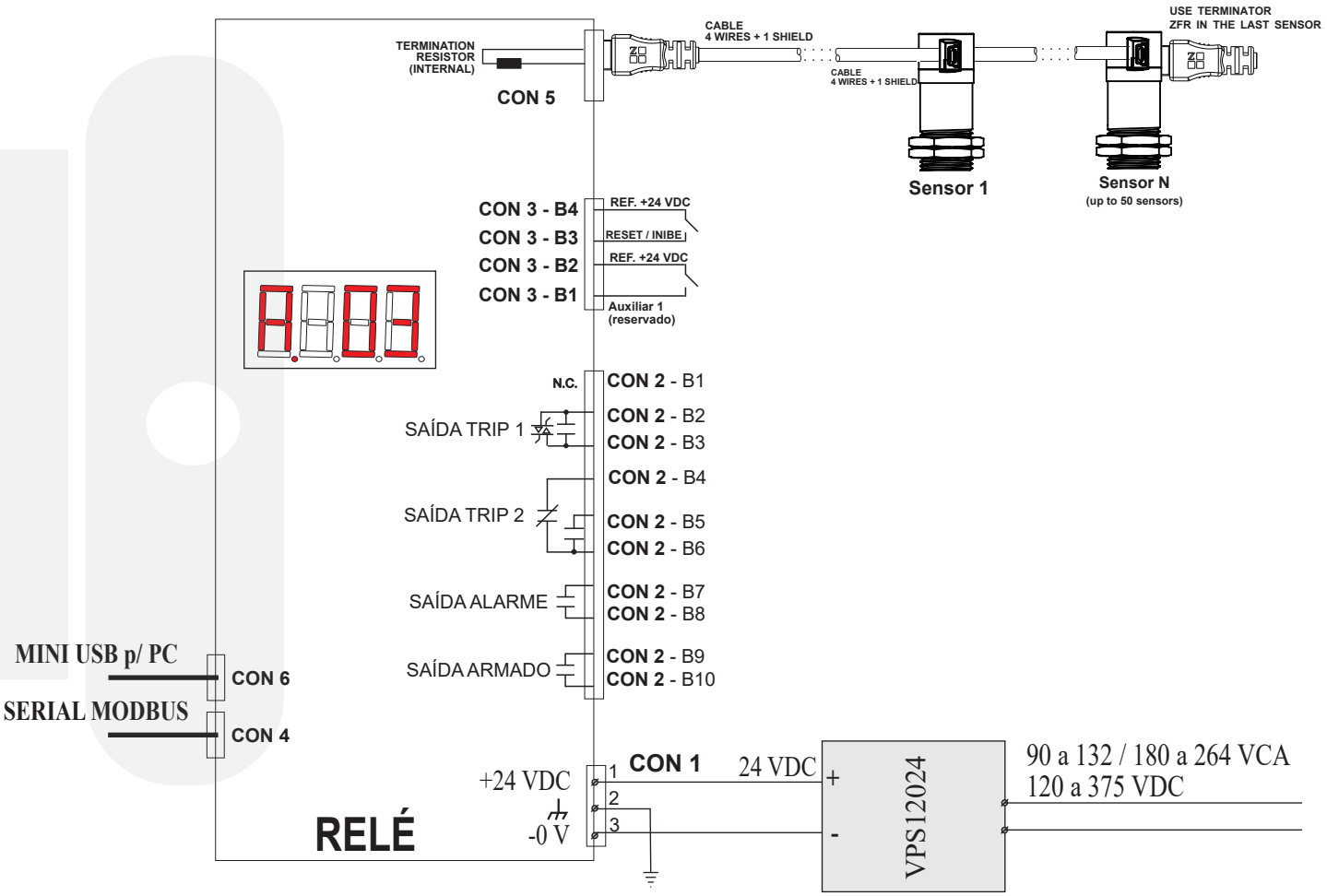
Two digital inputs are available, one for Reset / Inhibition and other reserved (Auxiliary 1).

Four digital outputs are available, two for Trip, one for Alarm and one for Armed.

The Relay has also 3 communication ports, one for the sensor's CAN network, one RS485 with Modbus RTU protocol and one USB for connection to PC for configuration of the relay and obtaining real-time data.

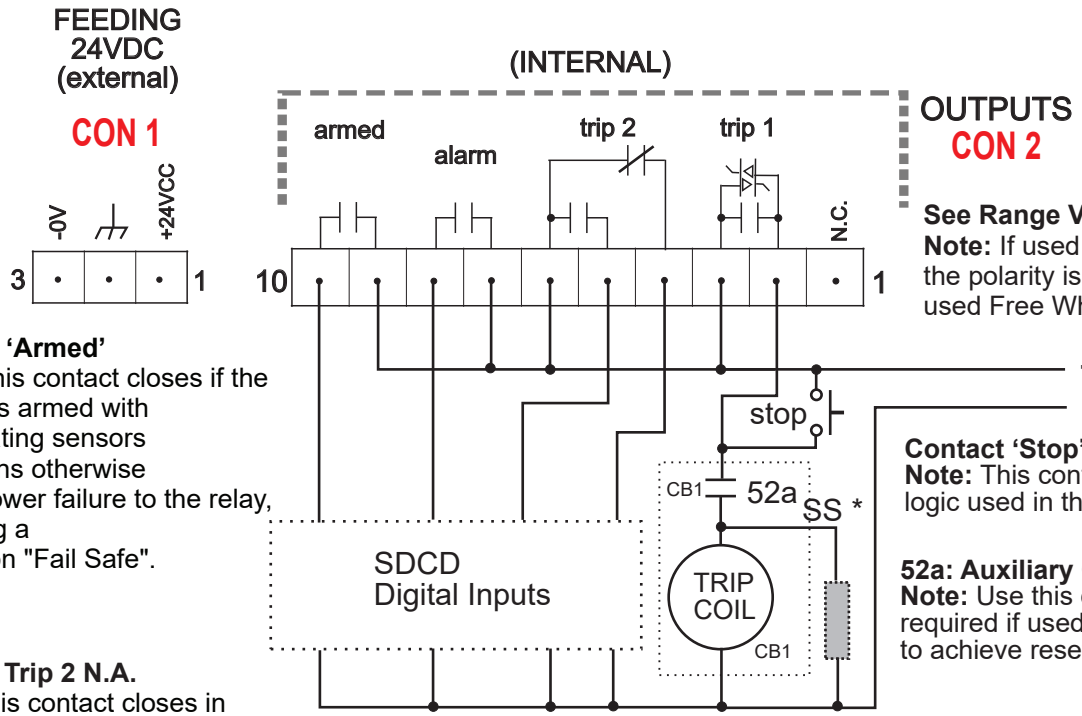
The Modbus RTU communication port can be connected to a PLC, DCS or SCADA.

Once installed, the system can check the integrity of it, running the Page / Reset button, to see a list of sensors possibly not responding or by pressing the joystick down and performing the function of flashing the LEDs of the sensors. For details, see the operation section.



RELAY INSTALATION AND LOW VOLTAGE CIRCUITS

Generic Aplication Example
using the static output with acting time of 300 µs



See Range Voltage DC or AC
Note: If used DC voltage the polarity is important if used Free Wheeling diode.

Contact 'Armed'
Note: This contact closes if the system is armed with all operating sensors and opens otherwise or if a power failure to the relay, providing a protection "Fail Safe".

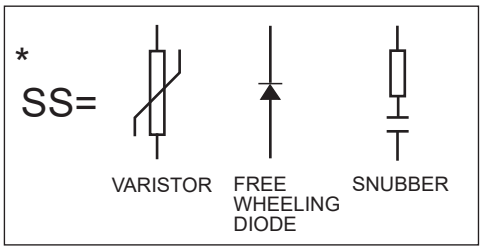
Contact 'Stop' Optional
Note: This contact represents all logic used in the circuit

52a: Auxiliary Circuit Breaker Switch
Note: Use this contact N.O. is required if used voltage D.C. to achieve reset the system.

Contato Trip 2 N.A.
Note: This contact closes in aproximatelly 6 ms.

Contact Trip 2 N.F.
Note: This contact opens in about 6 mS and can be used as input to the DCS or using the circuit breaker's 'minimum' trip coil what should be avoided because it loses the speed of 300 µs response time of the static contact.

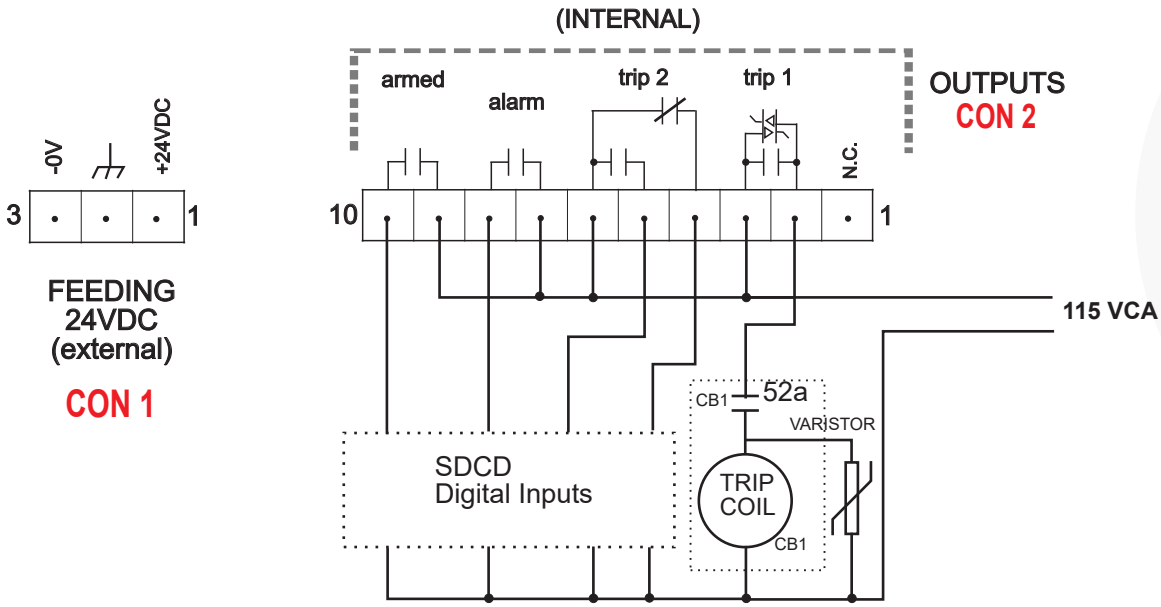
Trip Coil: Circuit Breaker Trip coil
Note: It is important to connect directly to the circuit breaker and not through PLC or auxiliary contact for the signal get the coil in 290 µs.



Transient suppressor and interference:
It is mandatory to use a type of Transient Suppressor compatible with the load type.
For tripping coils (very inductive) is recommended to use a Varistor with appropriate characteristics.
Possible variations to this circuit are "Free Wheeling Diode" (for DC power) and "Snubber" circuit composed of resistor and capacitor.
This minimizes arcing in contact 52a of CB1 and noise, increasing the useful life of the system and avoiding interference and improper operation of other equipments.
When in doubt between the types of circuit, use the varistor.
See the Circuit Breaker's Guide.

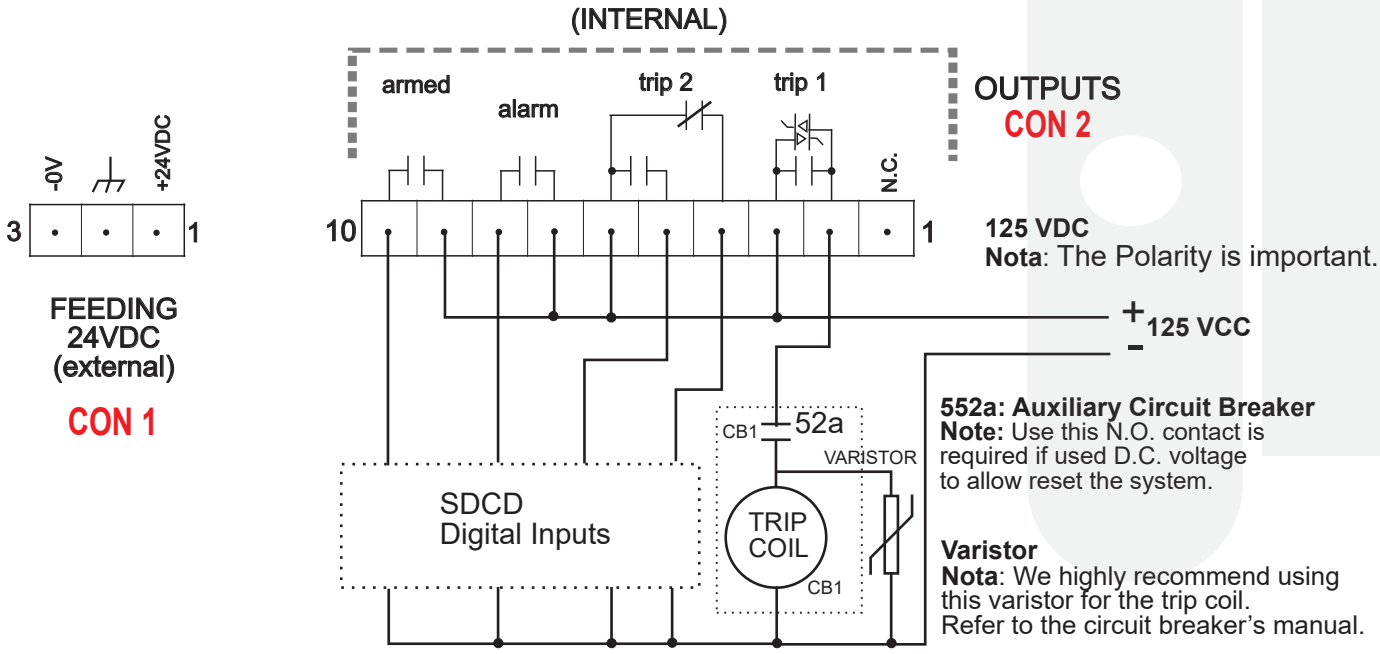
RELAY INSTALATION AND LOW VOLTAGE CIRCUITS

Aplication Example with trip coil of 115 VAC using he static output with acting time of 300 µs



52a: Auxiliary Circuit Breaker Contact
Note: Optional use to avoid the coil be energized for a long time.

Aplication Example with trip coil of 125 VCC using the static output with acting time of 3**00 µs**

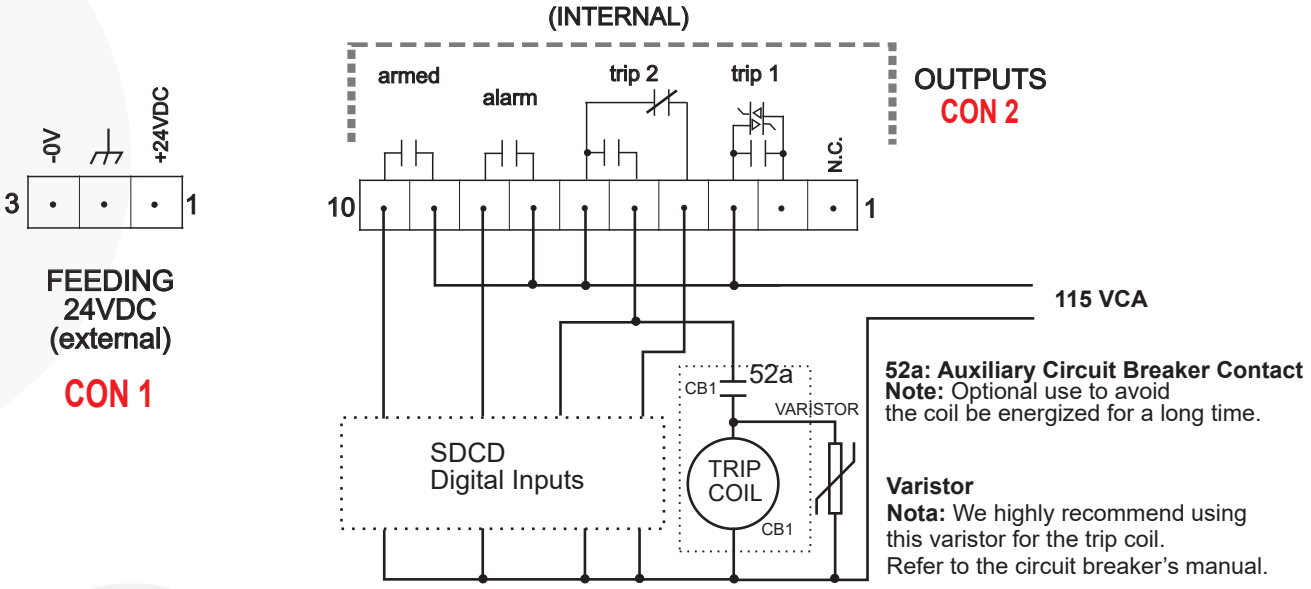


552a: Auxiliary Circuit Breaker
Note: Use this N.O. contact is required if used D.C. voltage to allow reset the system.

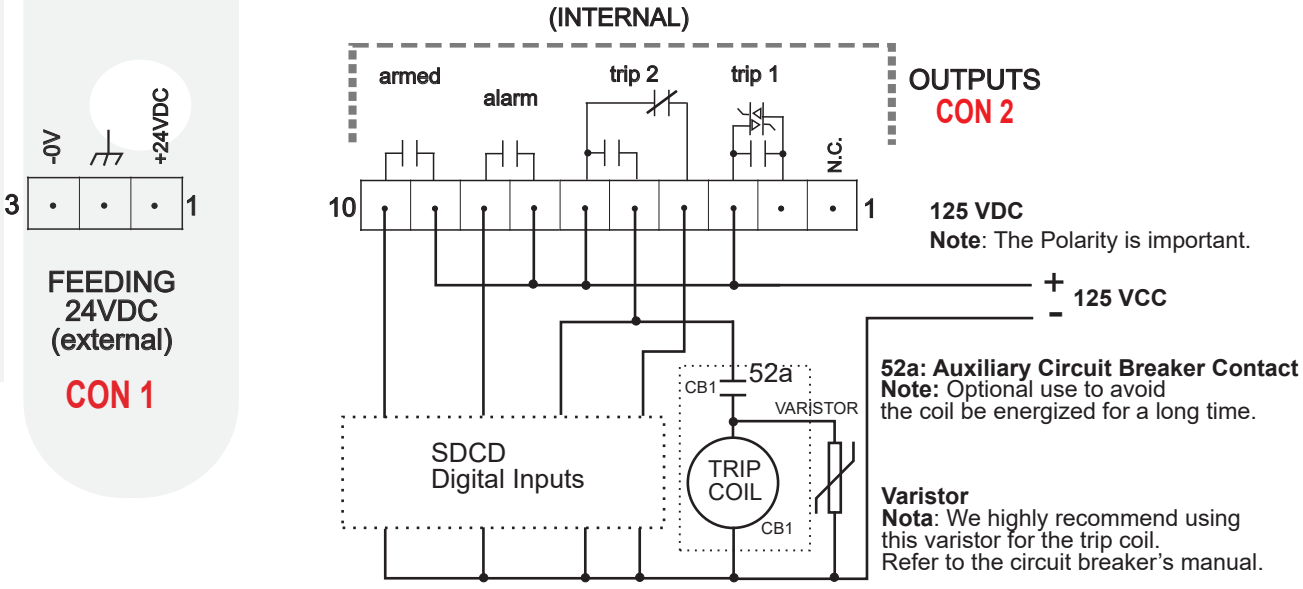
Varistor
Nota: We highly recommend using this varistor for the trip coil. Refer to the circuit breaker's manual.

RELAY INSTALATION AND LOW VOLTAGE CIRCUITS

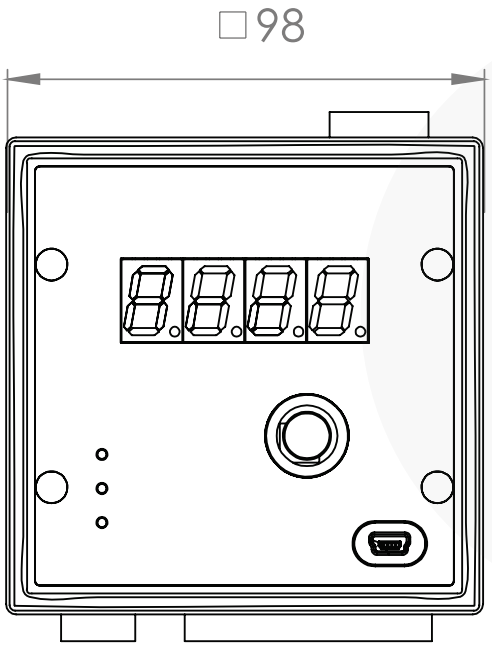
Aplication Example with trip coil of 115 VAC using the dry contact, with acting time of 6 ms

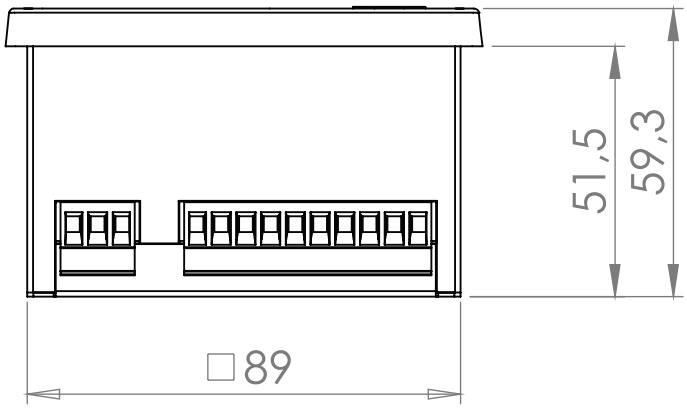


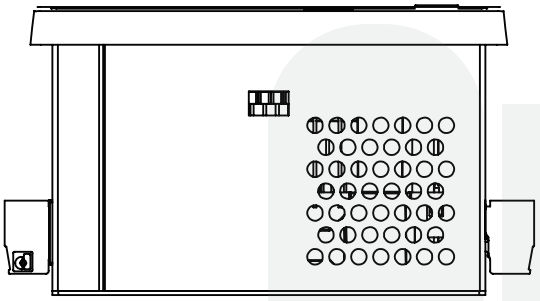
Aplication Example with trip coil of 125 VDC using the dry contact, with acting time of 6 ms



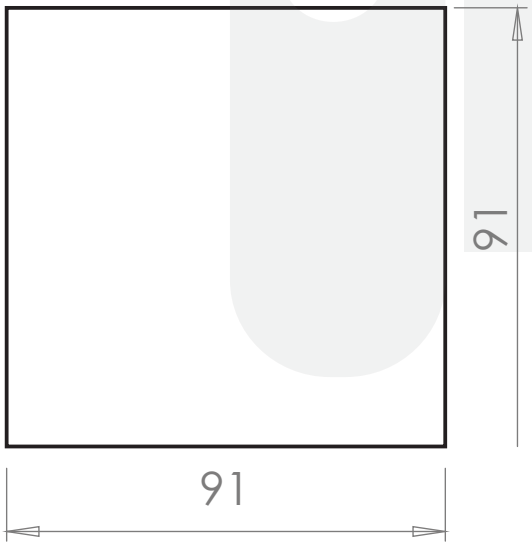
MECHANICAL
Relay VZA/B1 with 96 x 96 C/ Display



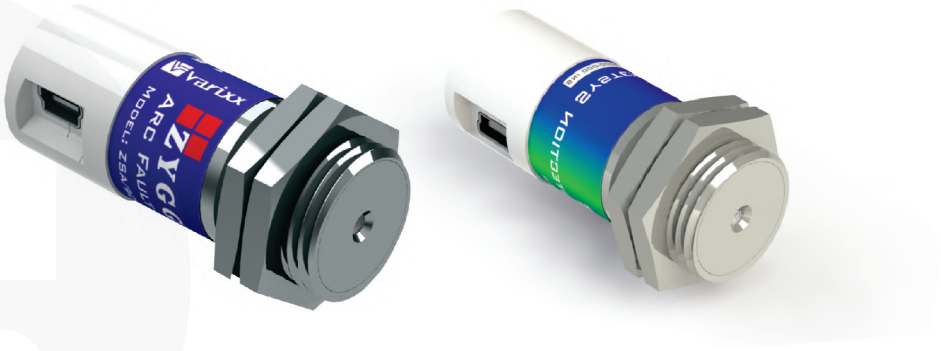


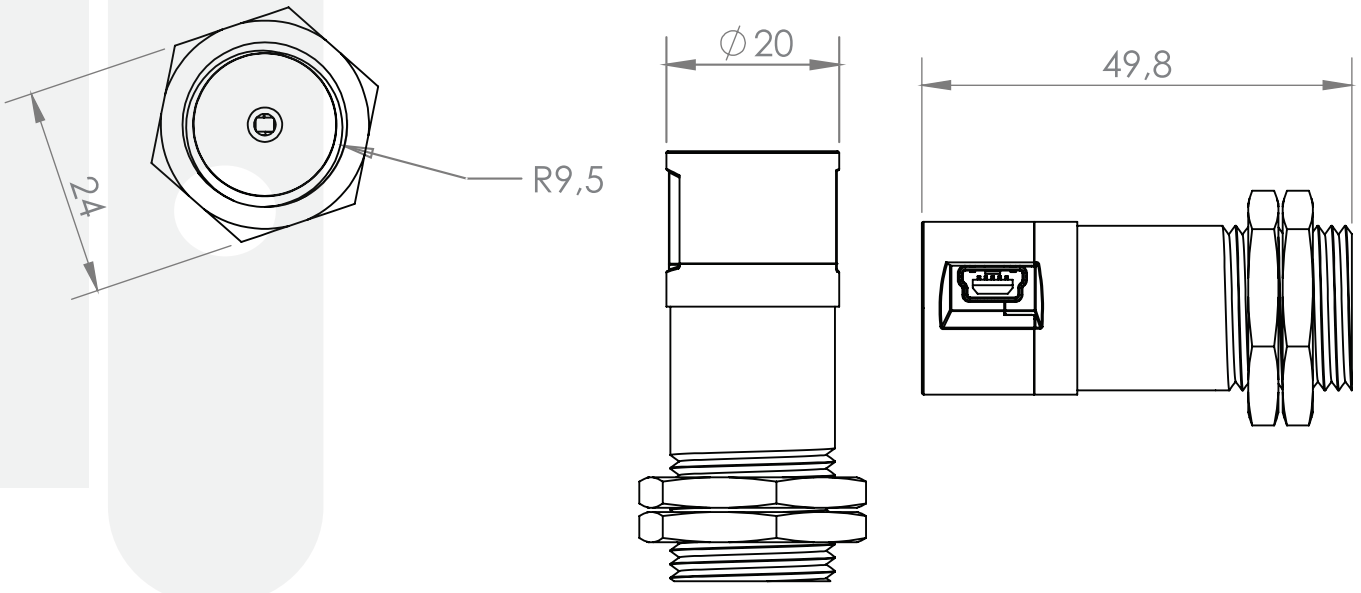


Dimension of the sheet cuting in the panel door

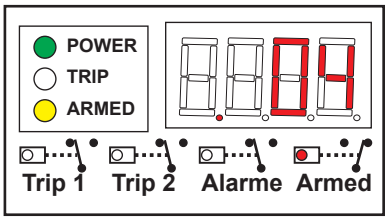


MECHANICAL
Sensors ZSA/90/24/UVA and ZSA/90/24/UVB

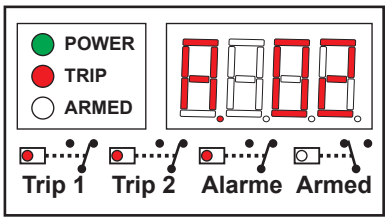




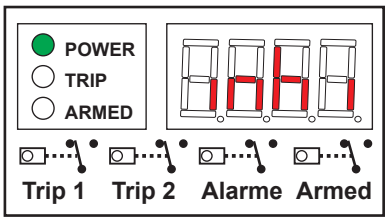
OPERATION
Relay Display indications, Leds and the Output Contacts



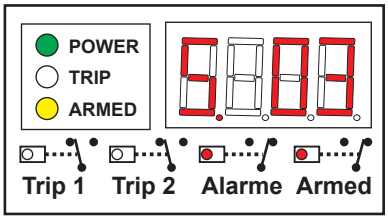
. XXX
This is the normal operating condition. The XXX value will indicate the number of installed sensors and usually communicating in the CAN network. The number of sensors is one of the parameters set in the relay configuration (by PC software or by the setting keys). In this condition, stays lit, the Power led (green) and Armed led (yellow). In normal operating condition only the Armed led output is lit.



A. XXX
The letter A stands for ARC and then indicates the number of the first sensor that sent the trip signal. To view all the sensors that sent the trip signal use the navigation keys NEXT and PREV. The sensor indication sequence follows the sequence in which occurred the arc detection. To reset the condition press the joystick (Page / Reset button). In the Trip condition stays lit the Power led (green) and Trip led (red). On the Trip condition are enabled both outputs of Trip and the Alarm output.



inhi
The acronym inhi means "Inhibited" or non-armed. This condition exists if the Reset / Remote Inhibit input is kept active. Caution: In this condition the relay can not protect the system! If the input is activated momentarily it will perform the Reset function of the trip or alarm condition.
In the state inhi only the Power led (green) is lit and no output contact is activated.



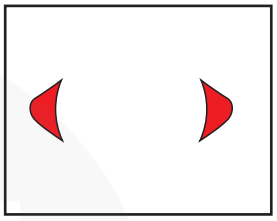
S. XXX
The acronym S.XXX where XXX is a number from 1 to 50 indicating the corresponding sensor number in the CAN network that is not communicating with the relay. To view all the sensors that are not communicating use the navigation buttons NEXT and PREV. All sensors "not responding" is displayed sequentially. To reset the condition, check the indicated sensors, your communication cable and, if necessary, check the address set for the sensor by using the PC software provided by Varixx. In S.XXX condition stays lit the Power led (green) and Armed led (Yellow) and are active the outputs Alarm and Armed.
Note: In this condition the sensors that are still active and operating can generate a trip, not losing the entire system protection.

⚠ CAUTION

Do not connect the sensor to the PC while the other Mini USB port is connected to the network.

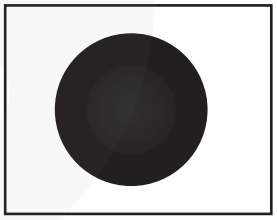
NEVER connect two sensors simultaneously to the PC

ALWAYS address a sensor at a time



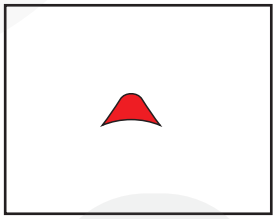
PREV / NEXT

A quick touch in these keys performs paging, to go to the next item press NEXT to see the previous item press PREV. If the display is indicating sensor condition not communicating or sensors that sent the trip signal arc, every touch will display the subsequent sensor number that generated the condition. For example, if there are 10 sensors installed and the number 2, number 5 and number 7 are not communicating, the number reported to occur the situation will be S02. The first touch will shown S05, the second touch will shown S07, the fourth touch will shown S02 and so on. In the case of arc indication, the sequence will start with the first sensor that detected the arc. Example: in the case of an arc initially detected by the sensor 3, after the sensor 6, and last detected by the sensor 2, the relay sequence at each key touch will result in: A. 03, A. 06, A. 02.



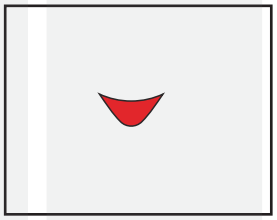
RESET/ENTER

Pressing the center button of the joysitck is performed the command **RESET / ENTER.**
If you are on the main screen pressing the button sends a RESET signal, restoring the state of the outputs.
When in the Setup or Flash menu, the button is replaced by the command function **ENTER.**



CONF./UP

When in the main menu press **CONF. / UP** to set the amount of sensors installed on the network. Pressing the button will show the SETUP message “CONF.” and on the screen appears C.XXX where XXX indicates the number of configured sensors. Use the **NEXT** and **PREV** or **UP** and **DOWN** keys to increase or decrease the amount of sensors installed on the network. To save the new amount not press any keys until the C.XXX indication flashes. After it flash press the ENTER button to confirm. If this button is not pressed at the time C.XXX is flashing, the setting of the number of sensors iscanceled.
At the end of the process the system returns to the main screen.



FLASH/DOWN

In the main menu, pressing the down arrow key is performed the **FLASH** command. FLASH command allows command one specific sensor’s led on the network to flash, to confirm / discover their location or allow flash the led of all sensors that are communicating normally. After pressing the **FLASH / DOWN** key will be displayed the FLASH menu. The initial option is "ALL", that correspond to all sensors; use the navigation keys **NEXT** and **PREV** if you want to choose a specific sensor. Once defined which the sensor should flash press the **RESET / ENTER** button to start the process. Press **RESET / ENTER** again to stop flashing and return to the home menu.
In the Flash menu, before starting the process, if no key is pressed within 5 seconds the system automatically returns to main menu.
Note: The system will be protected even during the time the Leds flashing or any other communication.

WARNING

By the security standards should never be opened any energized panels. Always remove power and use safety devices to make sure that there is no risk of inadvertent power-up or residual energy in the equipment.

Auto Flash

After connecting the power to sensors (mini USB cable), each sensor flashes the rear led indefinitely until there is the first communication with the relay. This allows quick check of the communication with the relay and sensor integrity. If in doubt, disconnect the sensor then reconnect. The LED will flash for a short time and then be lit continuously. If it keeps flashing is because it is not communicating. Check cables, sensor address programming and the number of sensors programmed in the relay.
Of course if the sensor is not communicating the relay will also indicate the absence of communication wit this specific sensor if the sensor number is programmed correctly.

PROGRAMMING
Programming the relay sensors

ZYGGOT

PROGRAMMING THE SENSORS

1 - Install the free PC software of the equipment configuration (it is on CD with each relay or our website (http://www.varixx.com.br).
2 - Open the configuration program.
3 - Connect the sensor to the computer's USB port using a mini USB cable / USB (connect only one sensor at a time). When connecting the sensor its rear led lit. The program performs automatic detection sensor. If this not happens we can choose manual connection (Manual connection). Choose the corresponding PC serial port to USB in which the sensor cable is connected and press the Connect key to attempt a connection. When connected, a green light comes on in the program indicating that the connection was successful.
4 - Set the sensor address (1 to 50) in the corresponding window and click send to record the information on the sensor. Disconnect the sensor by simply removing it from the cable.
5 - It is advisable to label the sensor with its address settled to facility when carrying out assembly in the field. If you want to configure another sensor return to step 3.
6 - With all sensors programmed with the addresses, set the sensors in defined positions using the two existing screw-nuts in front of the sensor. As mounting suggestion is advised to use our specific metal holder, with adjustable angle, that enables to use just one rivet with internal nut (boelhof or similar) at the panel location choose, to fix and to aim it.

PROGRAMMING THE RELAY

Connect the relay to the power supply. The screen will indicate the version and then the amount of installed sensors or sensors not responding. There are two ways to program the relay.

Through relay interface:

1 - Press the **CONF / UP** button to enter the setup menu.
2 - Using the buttons **NEXT / PREV** or **UP / DOWN** to choose the amount of installed sensor on the network.
3 - Wait a few seconds until the screen flashes. After it flashes press the **RESET / ENTER** button.
If no button is pressed while the screen is flashing, in 5 seconds, the command set is canceled.
4 - The relay will show again the main screen and if the sensor network is connected to the relay and all sensors are configured correctly it will indicate the amount of installed sensors. If any sensor is not responding, the relay will indicate the address of the unresponsive sensors.

Using the PC software:

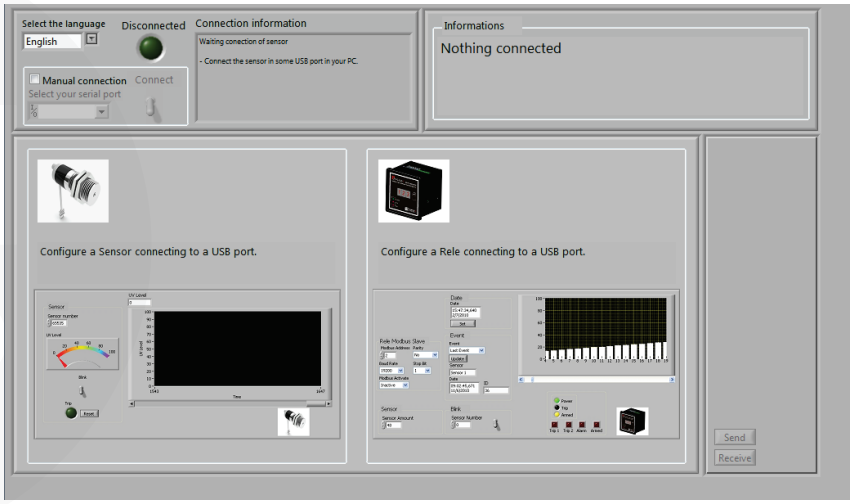
1 - Install the free PC software configuration from the CD sent with each relay or the **Varixx** site (http://www.varixx.com.br).
2 - Open the configuration program.
3 - Connect the relay in the computer's USB port using a mini USB / USB cable (using the relay PC port). The program performs automatic detection of the relay. If this not happens we can choose manual connection (Manual connection), choose the corresponding serial PC port related to the USB in which the sensor cable is connected and press the Connect key in the PC screen, to attempt a connection. When connected, a green light comes on in the program indicating that the connection was successful.
4 - Set the number of arc sensors that relay should monitor (50 max.) In the **SENSOR** panel. If using Modbus communication go to the next step, otherwise skip to step 6.
5 - Set the Modbus communication parameters in **MODBUS RELAY SLAVE** panel.
6 - Press the SEND button to record the information in the relay.

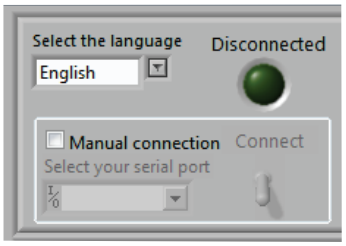
⚠ CAUTION

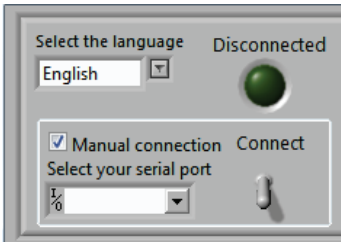
Varixx

Software Zyggot Electrical Arc

The Zyggot Electrical Arc software is a configurator that performs the addressing and test of the sensors as well the parameterization and configuration of the relay. The software is available on CD with the relay or through the Varixx website (http://www.varixx.com.br). The figure below shows the initial screen of the Zyggot Electrical Arc software.





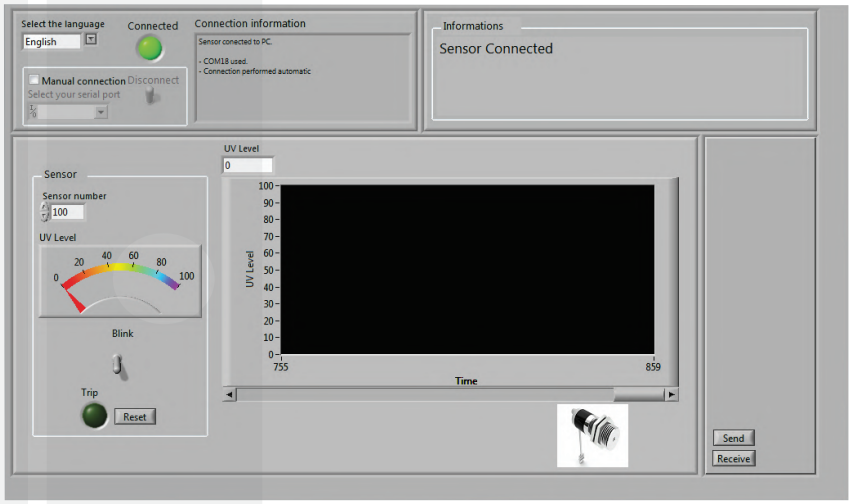


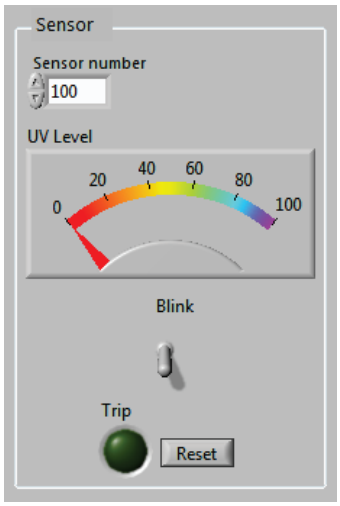
The software automatically recognizes the device and the port that it is connected to the computer. If the port is not recognized you can manually choose the port through connection box Manual connection. When choosing manually connection we should choose the serial port where the device is connected and press the Connect button.

When a sensor is connected to the computer the program screen automatically switches to the image below. When connecting a sensor the program automatically reads the address settings.

CAUTION

NEVER connect two sensors simultaneously to the PC





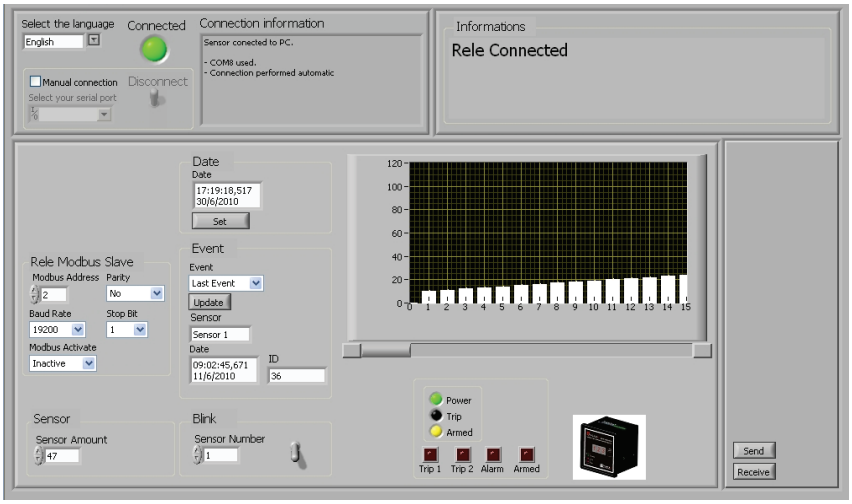
To set a new address to the sensor we must change the sensor number in the Sensor tab. By doing this, the sensor number will flash in red indicating that a change has not yet forwarded to the sensor. To save the change, press the Send button.

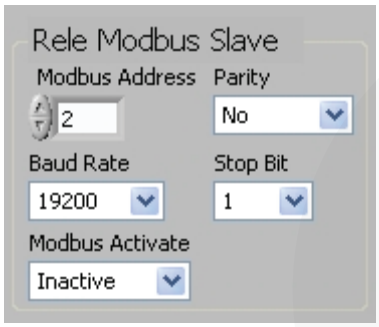
In the Sensor tab is also available the Trip indication of the sensor. Use ArcSafe tester to generate an arc in front of the sensor. When detecting the arc Trip indicator changes to red and the tear led of the sensor flashes. To restore the sensor status, press the Reset button. Use the key Blink to get the led on the back of the sensor flashes indefinitely. Press again to stop. There is also a chart and a UV level indicator. As the ArcSafe tester generates low intensity arcs and with very short time you can not see the UV level generated. Point UVA sensors for UV sources (UV lamps, projectors) to view the UV chart response (Note: it is not necessary to test the sensor – it is used on factory to calibration and test purpose).

When you want to disconnect the sensor simply remove it from the USB mini port.

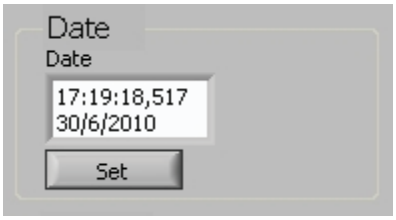
PROGRAMMING
Software Zyggot Electrical Arc

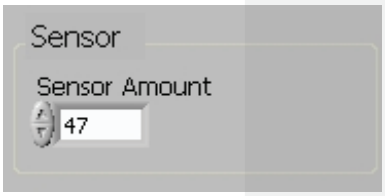
When connecting a relay to the computer screen automatically switches to the image below.
In addition to the number of sensors configuration and Flash command (blinking) that can be made too through the own relay, other options are only available through the PC configuration.
This section will describe the options available in Zyggot Electrical Arc software for the relay.

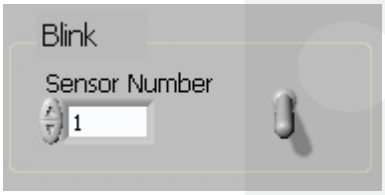




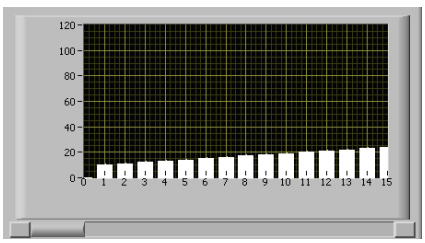
The tab “Relay Modbus Slave” allows you to configure the data of the Modbus RTU communication. Sets the relay address on Modbus network, Baud Rate, Parity and Stop Bit. To enable the network change the Modbus state on the Enable Modbus box to Active.
When modify any parameter in the program, the modified parameter flashes red indicating that there are changes not sent to the relay yet. To send the settings use the Send button.
The relay has internal battery that powers a clock with the date of storage. The relay also stores the last 20 events that ran to TRIP.
To view the events using the Event tab. Select Event and press Update, the sensor number is indicated, the date and event time and a unique ID number relative to that electrical arc event.
To set the clock, use the Date tab. Press Set to synchronize the date and time of the relay to the computer.







Through the tab Sensor defines the number of sensors installed in the electric arc detection network.
Being the network installed we can use the Blink command to check where in the physical network is determined sensor.
The program also indicates the status of the leds Power, Trip and Armed and contacts Trip 1, Trip 2, Alarm and Armed as well as the UV levels of each sensor.



OPERATION TESTS
Using the ArcSafe Tester (P.N. ZSA)

WARNING / CAUTION

CAUTION IN USING THE ELECTRICAL ARC TESTER ArcSafe!

The ArcSafe tester generates very low current arcs, representing negligible risk of death. The risk however, is not zero and can cause serious muscle damage and even death, especially if the operator is in special conditions like high places or confined spaces, which can lead to falls or collisions with energized parts, and involuntary movements in the case of shock. Use ZSA with extreme care and attention. Always turn off the slide switch when it is not in operation. Just turn the key moments before each test and turn off right away. At Each turn on, the front light will blink and lit up the ON indication Led.

Arc generator ZSA

The figure shows the Varixx ArcSafe tester (supplied separately) for system operation test. The ArcSafe is rechargeable in 110 or 220 VAC electrical outlet. The equipment generates an extra high voltage (3,800,000 Volts) generating small electrical arcs, with low energy, between the electrodes, which are detected by the sensor to an average distance of 1.5 meters (UVA sensor) within your viewing angle. You can hold the shutter button, generating a sequence of arcs, (arc detection by the sensor and relay is always the first arc) or take a quick hit on the button and generate a single arc.

How to perform system testing with ArcSafe generator

- Mount the system completely and make sure that the relay is indicating Armed, ie ready to monitoring the occurrence of arc. In this condition there is no indication of previous trips. Note that the sensors eventually in the condition “not responding” only triggers the Alarm output, not preventing the condition “Armed”, since even with some network sensors unresponsive others may be operative and active. We highly recommend using the Alarm output to indicate this condition in the DCS system or in the panel door.
- For each sensor to be tested, place the ZSA arc generator in front of the sensor within the viewing angle of 90 °, ie, up to 45 ° of the center line of the sensor. Remember to obey the maximum distance tester detection for UVA sensors (1.5 m) and UVB (0.2 m).
- Note: in case of real electrical arc, the detection ranges are higher due to the large amount of energy released in UV radiation. Real electrical Arcs can be detected at a distance of up to 30 m *.
- Get preferably only one arc, beating rapidly in the ArcSafe shutter button.
- Will occur detection of the arc and triggered the Trip output, with the led Trip lit on the relay and indication of the corresponding sensor (the rear led of the sensor will blink too).
- After verifying the correct operation, reset the relay from the front button or the contact RESET / INHIBIT.
- Repeat the test for each sensor of the system.

• Maximum limit of detection of the sensors. The actual distance detection of an electrical arc depends on the intensity at which the arc occurs.

TEST WITH CAMERA FLASH

Common old photo cameras flashes are also a spark gap in an inert gas ampoule and thus most flashes emit ultraviolet light in addition to visible light.
The UVA sensors can detect this type of flashes, when near it, while UVB sensor has lower detection range and are thus immune to photographic flash.
Note: Not all photographic flashes emit UV radiation, mainly new flashes made with leds.

Holding Registers		
Address	**Name**	**Range**
10	CLOCK_CONTROL	0=KEEP, 1=READ, 2=WRITE
11	CLOCK_DAY	1 - 31
12	CLOCK_MONTH	1 - 12
13	CLOCK_YEAR	1 - max
14	CLOCK_HOUR	0 - 24
15	CLOCK_MINUTE	0 - 60
16	CLOCK_SECOND	0 - 60
17	CLOCK_MILLISECOND	0 - max
20	BLINK_SENSOR	0 - 50 (0=ALL)
21	BLINK_COMMAND	0=BLINK_OFF, 1=BLINK_ON
30	EVENT_ACTIVE_NUMBER	0 - 35 (0=LASTEST)
31	EVENT_ID_LSB	read only
32	EVENT_ID_MSB	read only
33	EVENT_SENSOR	read only
34	EVENT_TIMESTAMP_DAY	read only
35	EVENT_TIMESTAMP_MONTH	read only
36	EVENT_TIMESTAMP_YEAR	read only
37	EVENT_TIMESTAMP_HOUR	read only
38	EVENT_TIMESTAMP_MINUTE	read only
39	EVENT_TIMESTAMP_SECOND	read only
40	EVENT_TIMESTAMP_MILLISECOND	read only

Inputs Registers	
Address	**Name**
1	SYSTEM_VERSION
2	SERIAL_NUMBER_LSB
3	SERIAL_NUMBER_MSB
4	STATUS_WORD
5	LAST_SENSOR_NUMBER
1001	SENSOR_001_LEVEL
...	...
1100	SENSOR_50_LEVEL

Discrete Inputs (Coil)	
Address	**Name**
1	STATUS_LED_POWER
2	STATUS_LED_TRIP
3	STATUS_LED_ARMED
4	STATUS_RELAY_TRIP_1
5	STATUS_RELAY_TRIP_2
6	STATUS_RELAY_ALARM
7	STATUS_RELAY_ARMED

STATUS_WORD						
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**
RELAY_ARMED	RELAY_ALARM	RELAY_TRIP_2	RELAY_TRIP_1	LED_ARMED	LED_TRIP	LED_POWER

USERS MANUAL - ZYGGOT ELECTRIC ARC PROTECTION SYSTEM
USERS MANUAL_ZYGGOT_ARC_V2_5_E

Rua Phelippe Zaidan Maluf, 450 - Piracicaba-SP
Distrito Industrial Unileste - CEP 13422.190
fone: (19) 34244000 - (19) 33016900 - fax: (19) 34244001
for more informations: info@varixx.com.br
visit our website: www.varixx.com.br

TWO YEARS OF WARRANTY TO ALL ZYGGOT SYSTEMS AND
SPECIALIZED TECHNICAL SUPPORT FOREVER