VR9032A

Field Overcurrent Relay

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varixx

Description

VR9032A is a member of the family of low-cost relays with dedicated functions for applications in control and protection systems for Synchronous Motors and Generators. Unlike multi-function relays, the use of several relays with dedicated functions allows only the required functions to be chosen, reducing complexity. In addition, if one of the relays in the system fails, it can be replaced locally or removed from the system by “By Pass” for emergency operation.

VR9032A is a relay designed to protect against field Overcurrent in Synchronous Motors and Generators. The current sensing or input circuit has a laser-calibrated True RMS circuit, since the measured current waveform, normally controlled by thyristors, has harmonic components and an undefined waveform. In addition, it provides a voltage output from 0 to 5 VDC for reading the Field Current with the same precision as the TRMS circuit.

The input signal comes from a Shunt connected to the excitation circuit. This Shunt can be 60 mV or 100 mV selectable or another scale if requested in the order. A selection range of 15 trip levels from 10% to 150% of the nominal set by the Shunt allows it to be adapted to any system.

The actuation delay can be selected in four levels (1, 5, 10 and 15 seconds), making it easier to use in Synchronous Motors that have an Exciter with constant Power Factor mode which, in the event of an abrupt increase in load, proportionally increases the excitation to maintain the Power Factor at the pre-set value. A Disable signal on the normally open dry contact allows the relay to be optionally activated only after starting motors with an initial excitation current level higher than the nominal one for safe synchronization.

- Two separate functions: Overcurrent protection and True RMS current reading.
- Two selectable input scales.
- Four trigger delay ranges.
- 15 selectable trip level ranges (10% to 150%).
- 0 to 5VDC True RMS signal output proportional to Field Current.
- Test and Reset buttons.
- ON, Armed and Tripped LED indications (Energized, Armaded and Tripped).
- Standard DIN box, for rail or screw fixing.
- 10VAC or 220VAC power supply defined in the order.
- Voltage signal output proportional to P.F. for measurement.

VR9032A is a relay from the VR90XX family, designed to integrate excitation systems for Synchronous Motors and Generators. This type of machine needs an excitation system to maintain voltage and/or Power Factor in Generators and also to maintain P.F. and synchronization in Synchronous Motors.

In the event of a fault in the excitation system that results in an abnormal increase in the Field Current, violent instability can occur in the Generator system or the Polar Angle factor of Synchronous Motors can become excessively advanced. A fault in the field circuit such as shorted turns can also generate this condition if the Exciter does not operate at constant current.

In this case, the actual excitation may be lower than required, causing Motors to be out of sync and Generators to be motorized. This relay is therefore an important addition to excitation systems.

> Main Features

› **Construction:** In a DIM box for use on a rail or with screws.

› **Power Supply:** 110VAC or 220VAC (-30%/+15%)/3VA (selected on order).

› **Selectable Sensing Rangers (B18/B19):** 60mV, 100mV or on request.

› **Permissible Sensing Overscale (B18/B19):** 500%.

› **Trip Timing Selection Ranges:** 1, 5, 10 and 15 seconds.

› **Output Relay (Trip):** SPDT dry contacts (NO, Common, NC) for up to 2A/250VAC or 0,5A/50VDC.

› **Functions Selectable by Front DIPs Switches:** Trip Level; Timing on Actuation and Sensing Scale.

› **Sensing Input Impedance:** 10K ohms.

› **Output Signal (proportional to Field Current):** 0 to 5VDC/15mA Maximum.

› **LED Indication:** Power; Armed; Tripped.

› **Disable Signal:** Dry contact, 12VDC, corrente 10mA current, with photo coupler.

› **Permissible Crest Factor for the Input signal (Sensing):** 7.

› **Output Signal Accurancy:** Better than 0,5%.

› **Output Signal Linearity:** Better than 0,2%.

Trip Level Selection

S4	S3	S2	S1	S/%
OFF	OFF	OFF	OFF	150
OFF	OFF	OFF	ON	140
OFF	OFF	ON	OFF	130
OFF	OFF	ON	ON	120
OFF	ON	OFF	OFF	110
OFF	ON	OFF	ON	100
OFF	ON	ON	OFF	90
OFF	ON	ON	ON	80
ON	OFF	OFF	OFF	70
ON	OFF	OFF	ON	60
ON	OFF	ON	OFF	50
ON	OFF	ON	ON	40
ON	ON	OFF	OFF	30
ON	ON	OFF	ON	20
ON	ON	ON	OFF	10
ON	ON	ON	ON	0

Actuation Delay Selection

S5	S6	SEG.
OFF	OFF	1
OFF	ON	5
ON	OFF	10
ON	ON	15

Input Scale Selection

S8	S7	SCALE
OFF	OFF	-
OFF	ON	60mV
ON	OFF	-
ON	ON	100mV

Start Up Procedures

› **1.** The relay is factory-set for selectable scales, selectable actuation levels and selectable timing (see tables above).

› **2.** Check the wiring according to the example diagram below, the label affixed to the relay body and the user's application diagram. Avoid using the disable contact (B3/B4) by leaving the corresponding terminals open. Only use this function if strictly necessary, as an error in the enabling circuit can inhibit the relay's operation. Pay particular attention to the polarity of the Sensing and Shunt circuits.

› **3.** The Sensing signal coming from the Shunt in the field circuit is relatively immune to noise due to its low impedance, but it is advisable to use shielded wires.

› **4.** The voltage output signal, from 0 to 5 VDC, can supply up to 15 mA to a PLC or digital or analog meter. If desired, use a shielded cable with the braid connected to terminal B7.

› **5.** Using the tables above and pasted on the relay body, select the input scale, Trip level and delay as required.

› **6.** After the machine has been started, check the front LEDs. They should indicate ON and Armed. ON simply indicates that the relay is powered and Armed means that the relay is active and ready to trip in the event of an Overcurrent.

› **7.** Check the voltage output signal and make sure it is compatible with the Field Current measured by other means in the system. You can, for example, use a True RMS digital multimeter to measure the voltage on the Shunt. **Attention:** If the multimeter is not marked True RMS, do not use it for this purpose, as its error will be high if the waveform is not flat in the Shunt. This check is important because it can detect a polarity reversal in the Shunt circuit.

› Principle of Operation

Synchronous Motors work, as the name suggests, synchronized with the mains, i.e. the slip is zero. Their rotor poles rotate synchronously with the poles of the stator's rotating field. The motor's excitation directly influences the polar angle, altering the machine's Power Factor. In Generators, off-specification excitation alters the voltage in the case of machines operating in single mode or the balance of the system's reactive loads, causing motorization of machines operating in parallel. Monitoring the Field Current can prevent serious damage to the system. An increase in Field Current above the specified level can be caused by a fault in the Exciter or a fault in the Field Coil.

VR9032A relay monitors the excitation current indirectly, through the voltage produced in a Shunt placed in series with the Field Circuit.

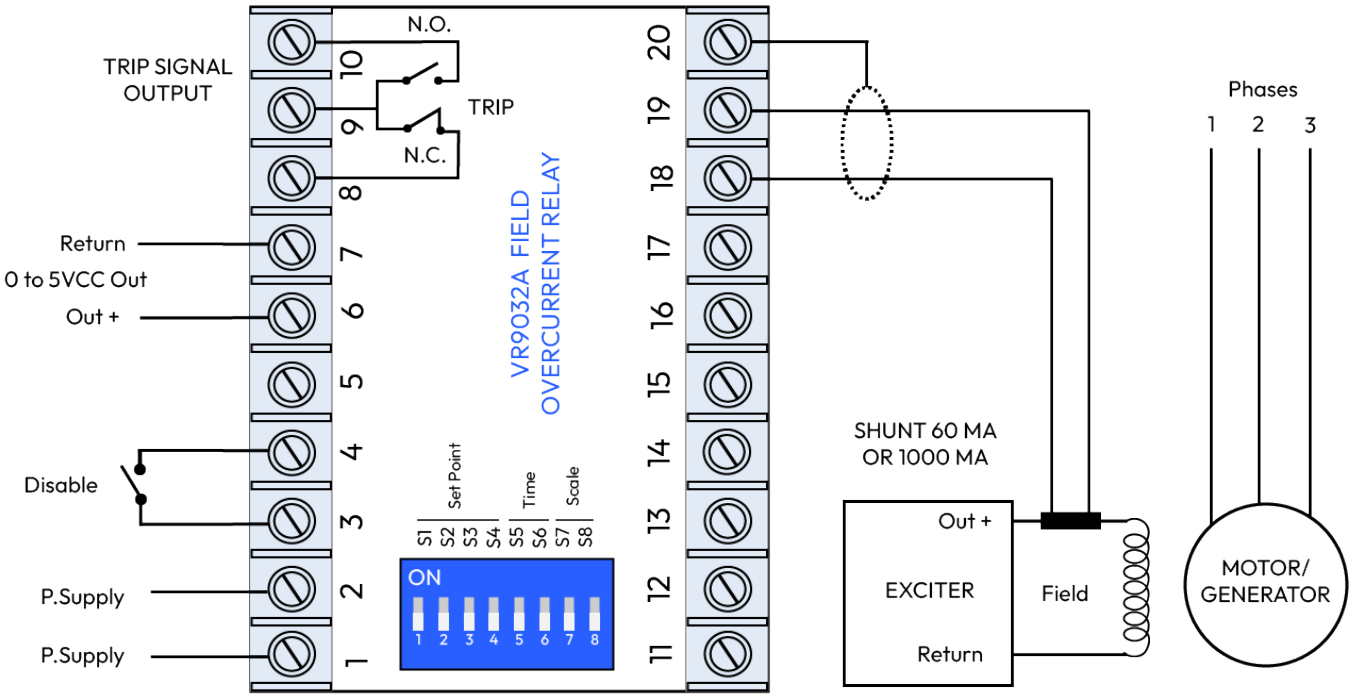
The excitation current causes a voltage drop in the Shunt, which is amplified by an amplifier internal to the relay and then converted into a DC voltage by a high-precision laser-calibrated True RMS integrated circuit, which reflects the RMS value of the Field Current whatever its waveform and accepts crest factors of up to 7. This voltage is compared with a reference level pre-selected by the user, in 15 ranges from 10 to 150%.

If the measured voltage exceeds the reference for longer than the time selected by the user, a fault indication will be given and the output relay will be activated, whose contacts can be routed to a PLC or to the machine's main circuit breaker. The Disable contact should be used with caution, since as the name implies it inhibits the relay from acting. It should only be used in special cases, during start-up or initial excitation in some systems.

Application Example (Simplified)

The diagram below shows the basic connections of the relay, which is quite simple. Shunt must have the appropriate IN/60mV or IN/100mV scale, where IN is the machine's rated excitation current. Note that the positive output of the Exciter establishes the positive side of the Shunt, which must be connected to terminal 18. If the Shunt is placed on the negative output of the exciter, the polarities are reversed. It's a mandatory condition that the Shunt's positive voltage enters terminal 18 and its negative voltage enters terminal 19.

The 0 to 5 VDC signal proportional to the current can be routed to a PLC or analog or digital meter. Avoid running them close to power circuits to avoid induction. If necessary, use a shielded cable with the braid connected to terminal 7. The supply voltage of 110 VAC or 220 VAC is defined in the order. Check the label attached to the relay for the correct supply voltage.



User Manual

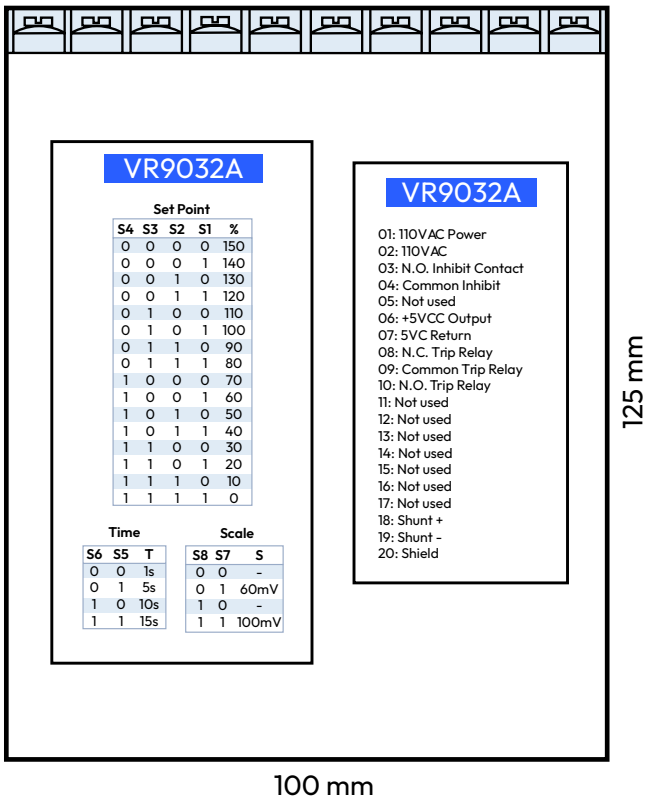
This bulletin can accompany a piece of equipment purchased. In this case, a customization sheet is attached, containing the data relating to the specific type purchased, as well as useful information for the future, such as order number, date of purchase, serial number and other data, in addition to the conditions of supply and a sheet with the Varixx standard warranty terms or negotiated warranty. Any additional information deemed necessary, such as installation conditions, will make up the user manual. It is therefore advisable to keep the manual in a safe place.

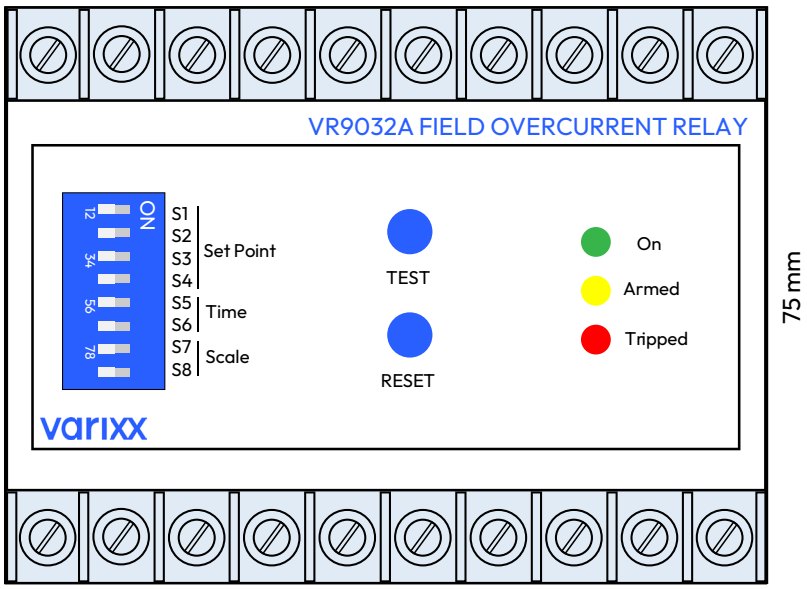
Application

The user must fully understand the characteristics, limitations and protections before specifying and applying any equipment. Among the most important aspects are the following: maximum currents and voltages, precautions against electromagnetic noise or ripple in the signals that could interfere with them and, above all, a thorough understanding of the equipment's operating characteristics.

The application drawing in this bulletin is provided as an example. It is up to the user to correctly dimension and design the actual application. Varixx can supply all the necessary engineering as well as complete equipment and systems.

Outline





ORDER CODE

VR9032A / X / X
A B

A	Power Supply	1= 110 VAC 2= 220 VAC 3= Other - Type
B	Input Scale	1= 60/100mV 2= Other - Type

EXAMPLE:
VR9032A/1/1: Power Supply 110 VAC;
Input Range: Normal (60mV/100mV) Selectable.

Other Varixx Products

› **Static Exciters and AVRs:** Varixx has a complete range of Static Exciters for motors and generators, with dozens of models of servo drives and AVRs, including digital ones. In addition to components, Varixx also supplies complete excitation systems.

› **Large Rectifiers:** Controlled, air-cooled or water-cooled, up to 100.000 Amps.

› **Power Controllers:** Single-phase, Two-phase and Three-phase, up to 2000 Amps, PWM or Phase Angle.

› **Solid-State Contactors and Static Switches:** Single-phase, Two-phase and Three-phase, up to 2000 Amps, for high switching frequencies.

› **Soft Starters:** Up to 1200 nominal Amps, with all the usual features avaible, such as Soft Start, Soft Stop, Energy Saver, Booster, Brake and various protections.

› **Chopper for DC Motors:** Applicable in overhead cranes, monorails, transport trolleys, etc.

› **Chopper for Ring Motors:** Replaces the various rotor resistor banks and provides linear control.

› **Protection relays for Motors and Generators:** Low-cost line, in DIM boxes, with excellent reliability and ease of application.

› **Signal Transmitters for RTD and Thermocouples:** Compact and encapsulated, with 4 to 20mA true output two-wire, no separate power supply required.

› **Crowbar and Active Transient Suppressors:** Applicable to motor and generator excitation.

› **Integrated Systems and Complete Solutions:** For any type of industrial application.

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TECHNICAL BULLETIN VR9032A

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