VR9034B

Loss of Excitation Relay

varixx

VR9034B › Loss of Excitation Relay

Description

VR9034B is a member of the family of low-cost, dedicated-function relays 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 system's relays fails, it can be replaced or removed from the system by "By Pass" for emergency operation.

VR9034B is a relay designed to protect against loss of excitation in Synchronous Motors and Generators. The input signal comes directly from the machine's field terminals. Two methods can be used to directly detect loss of excitation, the first by current detection and the second by DC voltage detection. This relay uses the second method.

Loss of Excitation in a synchronous machine has serious consequences for the system. In the case of a Synchronous Motor, loss of excitation will almost always lead to desynchronization, with the motor operating as an induction motor with a low power factor, putting its integrity at risk after a short time.

In the case of Generators operating in parallel, the loss of excitation will result in the motorization of the generator, destabilizing the entire system and overloading the other generators in the bar. Even an undesirable partial decrease in excitation can cause the machine to work at an inadequate Polar Angle, overloading it and the system.

The voltage detection sensitivity setting, selectable in 8 ranges and a delay selectable in 4 ranges, makes it possible to detect a partial or total loss of the excitation voltage.

- Loss of Excitation protection by voltage monitoring method.
- Eight selectable detection level ranges from 15VDC to 115VDC or Custom.
- Trip signal type selectable on request between N.C. timed or N.O. timed or instantaneous.
- Condition and fault indication by front LEDs.
- Standard DIN box, for rail or screw fixing.
- Enable and Reset signal inputs via dry contacts (10mA/12VDC optically coupled).
- Test and Reset buttons on the front.
- 110VAC or 220VAC power supply defined on request.
- All selections on front digital switches (DIP Switchs).

VR9034B is a relay from the VR90XX family, developed to integrate excitation systems for Synchronous Motors and Generators. This type of machine needs to operate synchronously with the mains and with a well-defined Polar Angle, which generates a well-defined Power Factor for the machine.

If it loses excitation and consequently synchronism or the right polar angle, it could jeopardize the integrity of the system and the machine. This relay monitors the machine's field voltage, detecting an abnormal decrease in voltage and signaling a fault if the abnormal detection continues for the selected time.

> 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 request.

› **Undervoltage Detection Levels (B11 and B20):** 15 to 155VDC in eight bands (see table below).

› **Field Loss Detection Timing Selection:** 4 (see table below).

› **Output Relay:** Dry contact for up to 2A/250VAC or 0,5A/50VDC.

› **Functions Selectable by Front DIPs Switches:** Relay Type 1: Mode - Enabled Instant Trip or Instant Trip or Timed Trip with Trip output contact type N.O. (Normally Open).

Relay type 2: Mode - Timed Trip with N.C. (Normally Closed) output contact.

› **Voltage Sensing Input Impedance:** Adaptative with 15mA Sinking current.

› **LED Indication:** Power On; Field Off; Field On/Armed; Tripped.

› **Trip Time per Polar Angle:** 0,3 sec.

› **Enable and Reset Inputs:** By dry contacts. I Source = 10mA/12VDC.

› **Trip Signal:** SPST dry contacts (N.O. or N.C. defined on request).

Mode 1 Selection - Mode 1 models only

S1	S2	MODE 1 (See Model)
ON	OFF	N.O Contacts for Enable Instant Trip
OFF	ON	N.O Contacts for Instant Trip
OFF	OFF	N.O Contacts for Timed Trip

Mode 2 Selection - Mode 2 models only

S1	S2	MODE 1 (See Model)
OFF	OFF	N.C Contacts for Timed Trip

Trip Time Selection

S4	S3	Time to Trip
OFF	OFF	1 Second
OFF	ON	5 Seconds
ON	OFF	10 Seconds
ON	ON	15 Seconds

Undervoltage Detection Level Selection

S5	S6	S7	Undervoltage Level
OFF	OFF	OFF	155 Volts
OFF	OFF	ON	135 Volts
OFF	ON	OFF	115 Volts
OFF	ON	ON	95 Volts
ON	OFF	OFF	75 Volts
ON	OFF	ON	55 Volts
ON	ON	OFF	35 Volts
ON	ON	ON	15 Volts

Auto Reset Function Selection

ON	OFF	Auto Reset
S8	-	Enable
-	S8	Disable

Start Up

› **1.** The relay is factory-set to Standard or Custom levels according to the tables and labels affixed to it. Simply select the parameters on the front digital switches.

› **2.** For type 1, the Trip contact is Normally Open and for type 2 it is Normally Closed. In type 1 it is possible to select Timed Trip, Instantaneous Trip and Enable-Dependent Instantaneous Trip. For type 2, only Timed Trip is available, which is the most common. The other Trip types require external logic and timing, usually provided by a PLC. It is preferable to select the use of Timed Trip, which already has the enabling signal as a precondition for actuation, thus avoiding actuation before the machine is excited.

› **3.** Select Reset Mode: Auto Reset or Fault Hold as required by the system.

› **4.** Select the Undervoltage Detection level as required. Note that the level selected must be lower than the machine's nominal voltage level.

› **5.** Select the delay time for actuation, so that any "Undershoots" are not detected as a loss of excitation, especially in Generators. For Synchronous Motors, immediately after starting, when not loaded and with constant Power Factor regulators, the excitation must be lower than normal, so the enable contact must be connected to the motor's load enable contact, normally the FCX contact of Field Application relays.

› **6.** Note the LED indicators to make sure everything is correct.

› **7.** You can simulate relay actuation by changing the levels temporarily or by changing the excitation of the machine with no load or by using an adjustable external DC voltage source.

> Theoriy 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. Greater excitation or a decrease in the load causes the Power Factor to become capacitive, while less excitation or an increase in the load causes the P.F. to become inductive and also leads to de-synchronization in the case of loaded Synchronous Motors.

De-synchronization of an excited Motor leads to significant oscillatory surges in the stator current, and it must be tripped or de-excited to attempt synchronization again. In the case of generators operating in parallel with the grid or other Generators, the process is similar. A generator that is out of sync or has the wrong Polar Angle can "motorize", working as a motor or load for other generators, consuming power from the system.

VR9034B relay monitors the field voltage which is responsible for injecting the excitation current into the machine. An enable contact allows monitoring to begin. This contact should be used so that normal low field voltage conditions are not detected, for example during start-up. The Instant Trip mode does not take this signal into account but the Instant Trip with Enable and Timed Trip modes do.

An internal comparator generates a signal if the input voltage falls below the selected level. If this signal persists for the time selected on the time selection DIP switches, a change of state occurs in the Fault Signal output relay. Two reset modes can be selected. In Auto Reset Enabled the fault relay returns to normal after the field voltage normalizes and in Auto Reset Disabled an external or manual Reset signal is required.

Note that in the type 1 relay, with N.O. contacts, there are three different operating conditions: With DIP 2 ON and DIP 1 OFF, the fault contact is closed when the relay is de-energized, opens when the relay is energized and closes in a fault condition regardless of the enable signal. With DIP 1 ON and DIP 2 OFF, the same occurs, but only when the enable signal is active.

In the type 2, with N.C. contacts, DIPs 1 and 2 must be set to OFF and the fault contact is normally closed before and after energizing the relay, only opening in a fault condition.

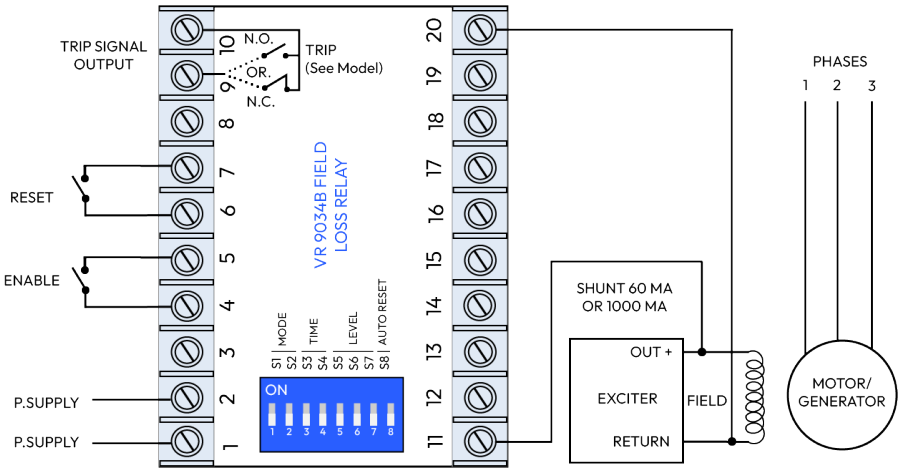
Application Example

The diagram below shows the relay's basic connections. A Normally Open dry contact must be connected to terminals 4 and 5, which closes a few seconds after the machine is excited (normally the FCX contact of the Field Application relay), enabling monitoring to begin.

The voltage sensor must be connected directly to the machine's field in polarity. The positive signal must be connected to terminal 11.

The power supply can be 110VAC or 220VAC or other as specified in the order, and connected to terminals 1 and 2. Check the labels affixed to the relay and its manual before applying it. The external reset signal can come from a PLC. It is not normally used. There is a Reset button on the front of the relay.

A Test button on the front of the relay can be used to simulate a fault condition to test the system. During normal operation of the relay, triggering it will trip the system.



> User Manual

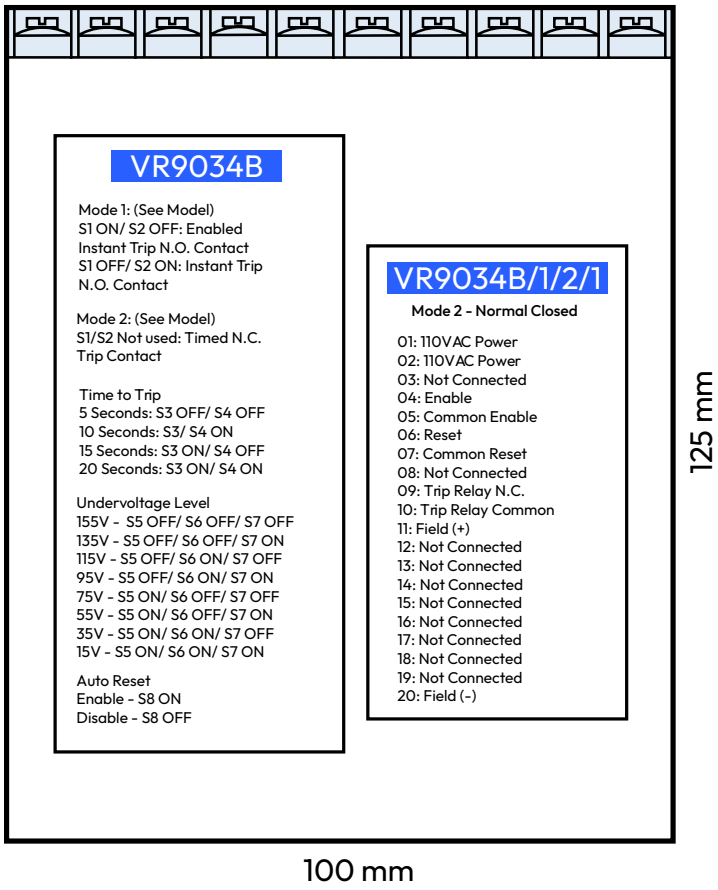
This bulletin can accompany a piece of equipment purchased. In this case, a customization sheet is attached, containing the data relating to the specific type purchased, as well as useful information for the future, such as order number, date of purchase, serial number and other data, in addition to 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.

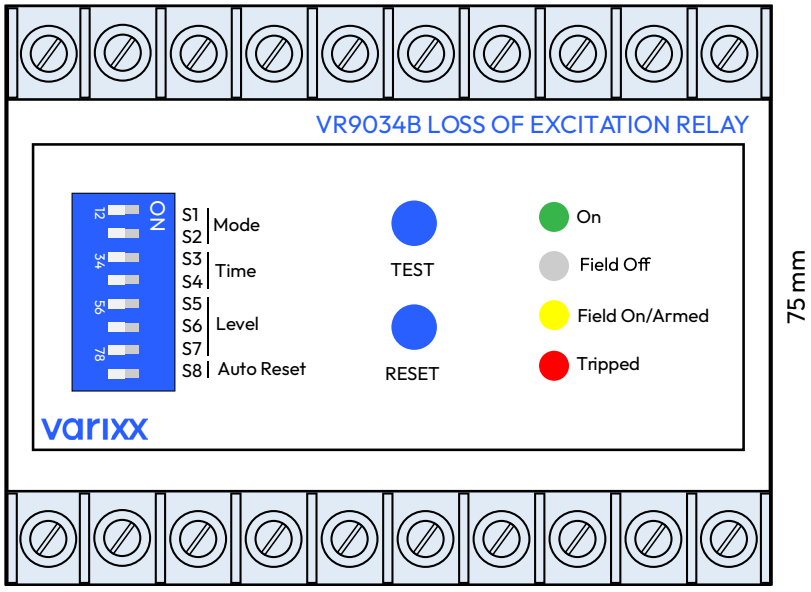
> Application

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

VR9030A / X / X / X

A B C

A	Power Supply	1= 110 VAC 2= 220 VAC 3= Other - (Type)
B	Mode	1= Normally Open Timed and Instant Trip Contact 2= Normally Closed Timed Trip Contact
C	Under Voltage Range	1= Normal - See table 2= Custom - Type

EXAMPLE:
VR9034B/1/2/1: Power Supply 110 VAC; Normally Closed Trip contact with selectable delay and normal undervoltage range.

Others 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 VR9034B

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