

Safety automation solutions

Preventa safety modules type XPS VNE

For zero speed detection

Operating principle

Preventa safety modules XPS VNE for zero speed detection are used to detect the stop condition of electric motors. Their most common applications include: providing the unlock signal for electrically interlocked sliding or removable machine guards, controlling rotation direction signals for reversing motors and engaging locking brakes after a motor has come to a standstill.

As electric motors run down, a remanent voltage is produced in the windings of the motor due to residual magnetism. This voltage is proportional to the speed of the motor and, therefore, decreases as the motor comes to a standstill. This remanent voltage is measured in a redundant manner so as to detect the stop condition of the motor. The cabling between the motor windings and the inputs of the XPS VNE module is also monitored to prevent a cabling breakage or fault being seen as a stopped motor.

A transformer should not be used to connect the motor to terminals Z1, Z2 and Z3 since there is no monitoring of the connection with the motor winding via the resistance monitoring.

Modules XPS VNE are suitable for detecting the stop condition of all types of a.c. or d.c. motor driven machines which, when the motor runs down, produce a remanent voltage in the windings due to residual magnetism. These machines can be controlled by electronic devices, such as variable speed drives or d.c. injection brakes.

The input filters for standard XPS VNE modules are designed for a frequency of up to 60 Hz.

For motors operating at a frequency higher than 60 Hz, which therefore produce a high frequency remanent voltage, special modules XPS VNE●●●●HS should be used.

Modules XPS VNE have 2 potentiometers mounted on the front face of the module which allow independent adjustment of the switching threshold for each input circuit. This allows adjustment for different types of motors and application requirements.

To aid diagnostics, modules XPS VNE have 4 LEDs and 2 solid-state outputs to provide information on the status of the zero speed detection circuit.

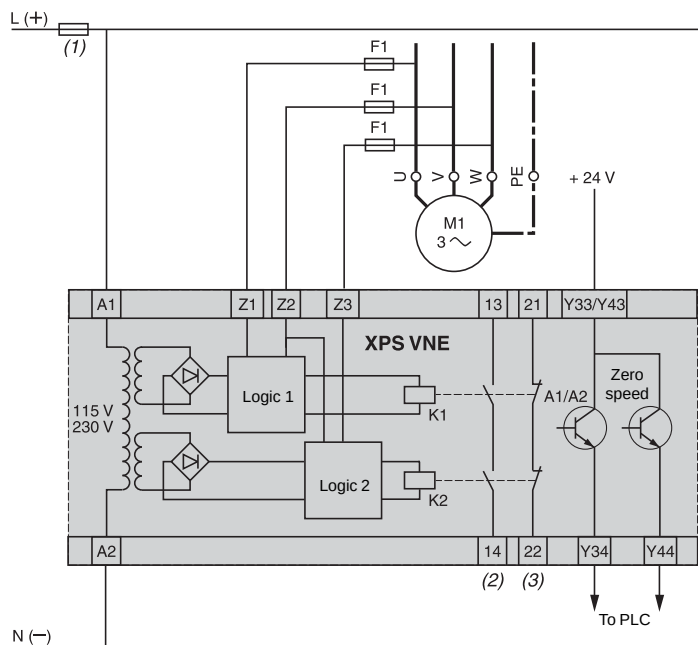
Characteristics			
Module type		XPS VNE	
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)		Category 3 max.	
Conformity to standards		EN 60204-1, EN/IEC 60947-5-1, EN 50082-2	
Product certifications		UL, CSA, BG	
Supply	Voltage	V	--- 24 ~ 115 ~ 230
	Voltage limits		- 15...+ 10% (--- 24 V) - 15...+ 15% (~ 115 V) - 15...+ 10% (~ 230 V)
	Frequency	Hz	50/60 (115 V, 230 V)
Consumption		W	≤ 3.5 (--- 24 V)
		VA	≤ 7.5 (~115 V), ≤ 7 (~ 230 V)
	Frequency of motor power supply	Hz	≤ 60 Hz (XPS VN●●42), > 60 Hz (XPS VN●●42HS)
Inputs	Maximum voltage between terminals Z1 - Z2 - Z3	V	500 rms
	Detection threshold	V	0.01 - 0.1 (adjustable)
Outputs	Voltage reference		Volt-free
	Number and type of safety circuits		1 N/O (13-14), 1 N/C (21-22)
	Number and type of additional circuits		2 solid-state
	Breaking capacity in AC-15		C300 (inrush: 1800 VA/maintained: 180 VA)
	Breaking capacity in DC-13		24 V/1.5 A - L/R = 50 ms (contact 13-14) 24 V/1.2 A - L/R = 50 ms (contact 21-22)
	Breaking capacity of solid-state outputs		24 V/20 mA, 48 V/10 mA
	Max. thermal current (I _{the})	A	2.5
	Output fuse protection	A	4 gG, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200
	Minimum current (volt-free contact)	mA	10 (1)
	Minimum voltage (volt-free contact)	V	17 (1)
Electrical durability		See page 38610-EN_Ver11.1/2	
Rated insulation voltage (U_i)		V	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (U_{imp})		kV	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
LED display			4
Operating temperature		°C	- 10...+ 55
Storage temperature		°C	- 25...+ 85
Degree of protection Conforming to IEC 60529	Terminals		IP 20
	Enclosure		IP 40
Connection	Type		Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end	Solid or flexible cable: 0.2...2.5 mm ²
		With cable end	Without bezel, solid or flexible cable: 0.25...2.5 mm ² With bezel, solid or flexible cable: 0.25...2.5 mm ²
	2-wire connection	Without cable end	Solid cable: 0.2...1 mm ² , flexible cable: 0.2...1.5 mm ²
		With cable end	Without bezel, flexible cable: 0.25...1 mm ² With bezel, flexible cable: 0.5...1.5 mm ²

(1) The module is also capable of switching low power loads (17 V/10 mA) provided that the contact has not been used for switching high power loads (possible contamination or wear of the gold layer on the contact tips).

References							
	Description	Number of safety circuits	Solid-state outputs for PLC	Supply	Frequency of motor power supply	Reference	Weight kg
	Safety modules for zero speed detection	2	2	--- 24 V	≤ 60 Hz	XPS VNE1142P	0.500
					> 60 Hz	XPS VNE1142HSP	0.500
				~ 115 V	≤ 60 Hz	XPS VNE3442P	0.600
					> 60 Hz	XPS VNE3442HSP	0.600
				~ 230 V	≤ 60 Hz	XPS VNE3742P	0.600
					> 60 Hz	XPS VNE3742HSP	0.600

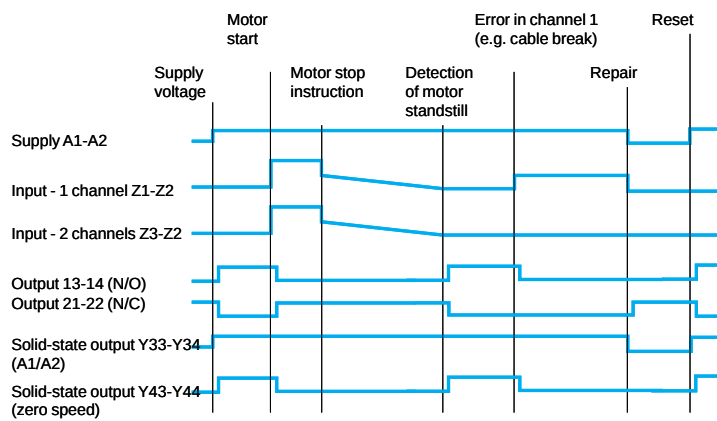
XPS VNE

XPS VNE
Wiring diagram



- (1) Technical characteristics for establishing maximum rating of fuses, see page 38777-EN_Ver9.1/3.
(2) Disengagement in event of stop.
(3) Motor running.
F1 = 2 A

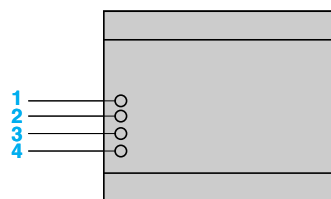
Functional diagram of module XPS VNE



Key 0 1

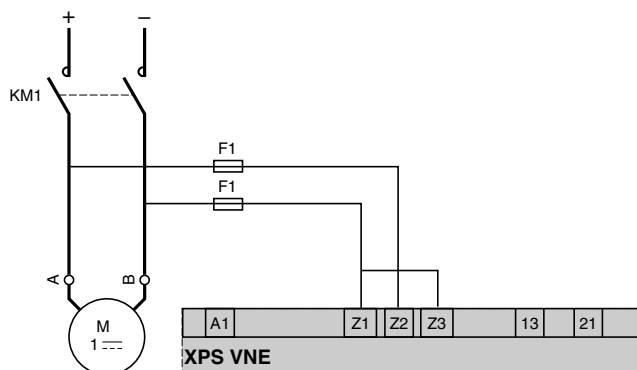
The voltages at terminals Z1, Z2 and Z3 are indicated solely for the purposes of schematic diagram representation.

LED details



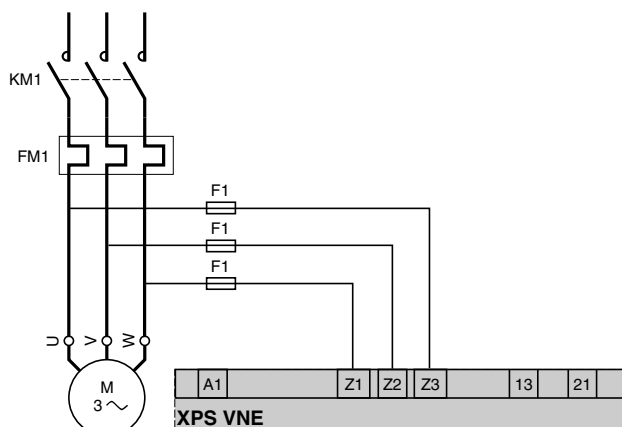
- 1 Supply voltage A1-A2.
2 Stop detected by channel 1.
3 Stop detected by channel 2.
4 Motor stop condition detected by both channels within time window.

Module XPS VNE associated with a d.c. motor



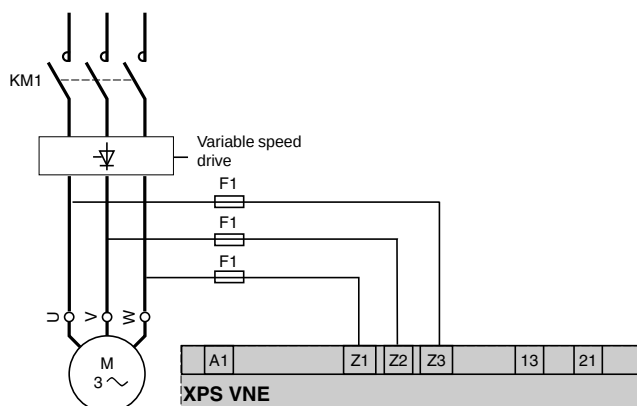
F1 = 2 A

Module XPS VNE associated with a 3-phase motor



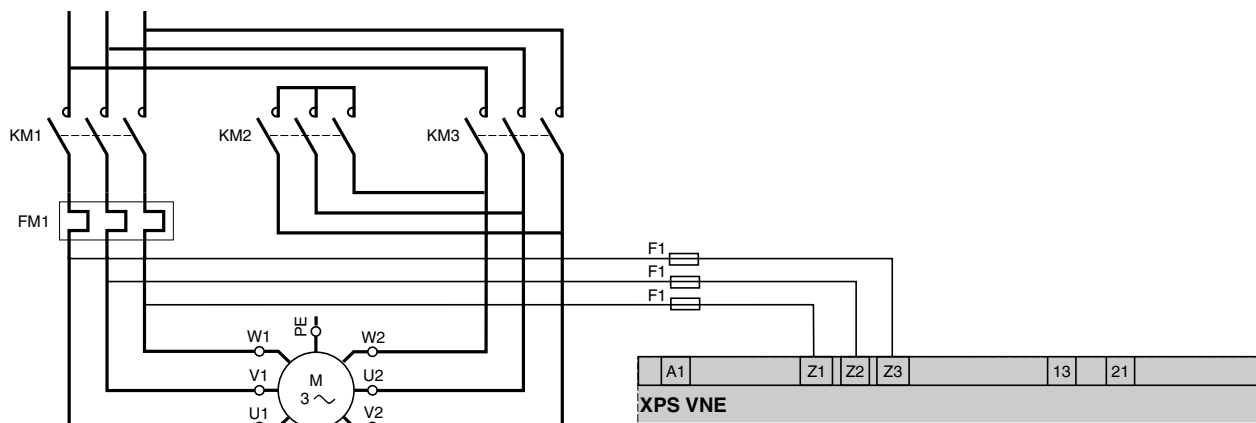
F1 = 2 A

Module XPS VNE associated with a 3-phase motor + variable speed drive



F1 = 2 A

Module XPS VNE associated with a 3-phase motor with start-delta starting



F1 = 2 A

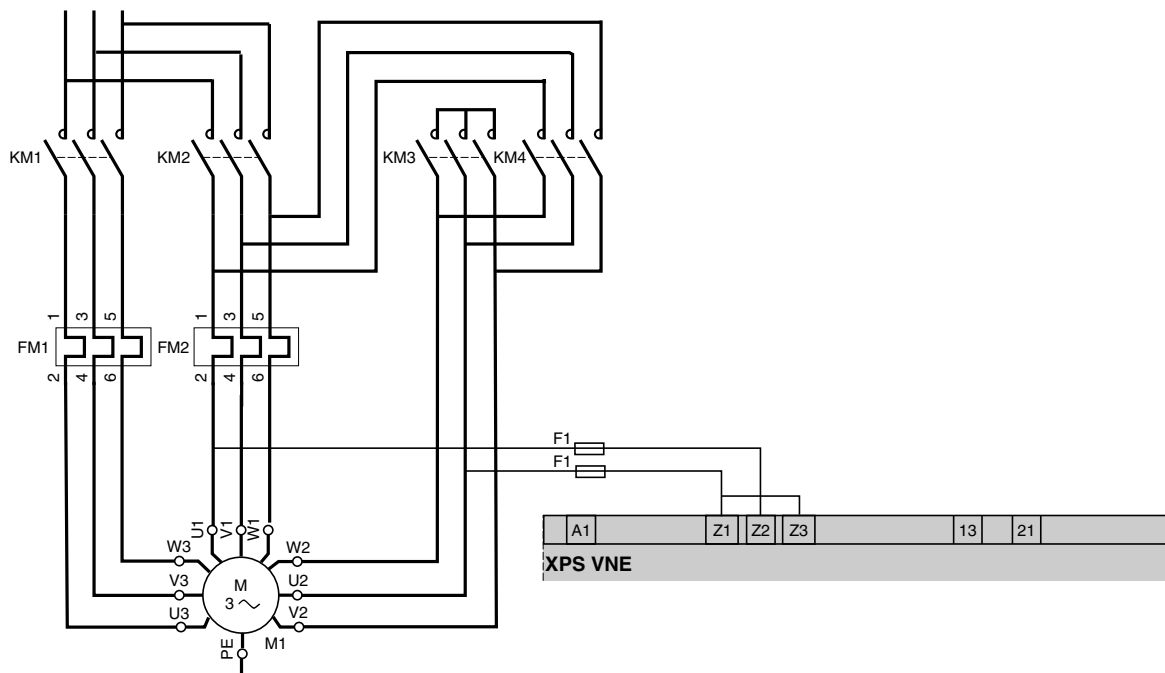
KM1: Fast rotation speed

KM2: Slow rotation speed

KM3: Star

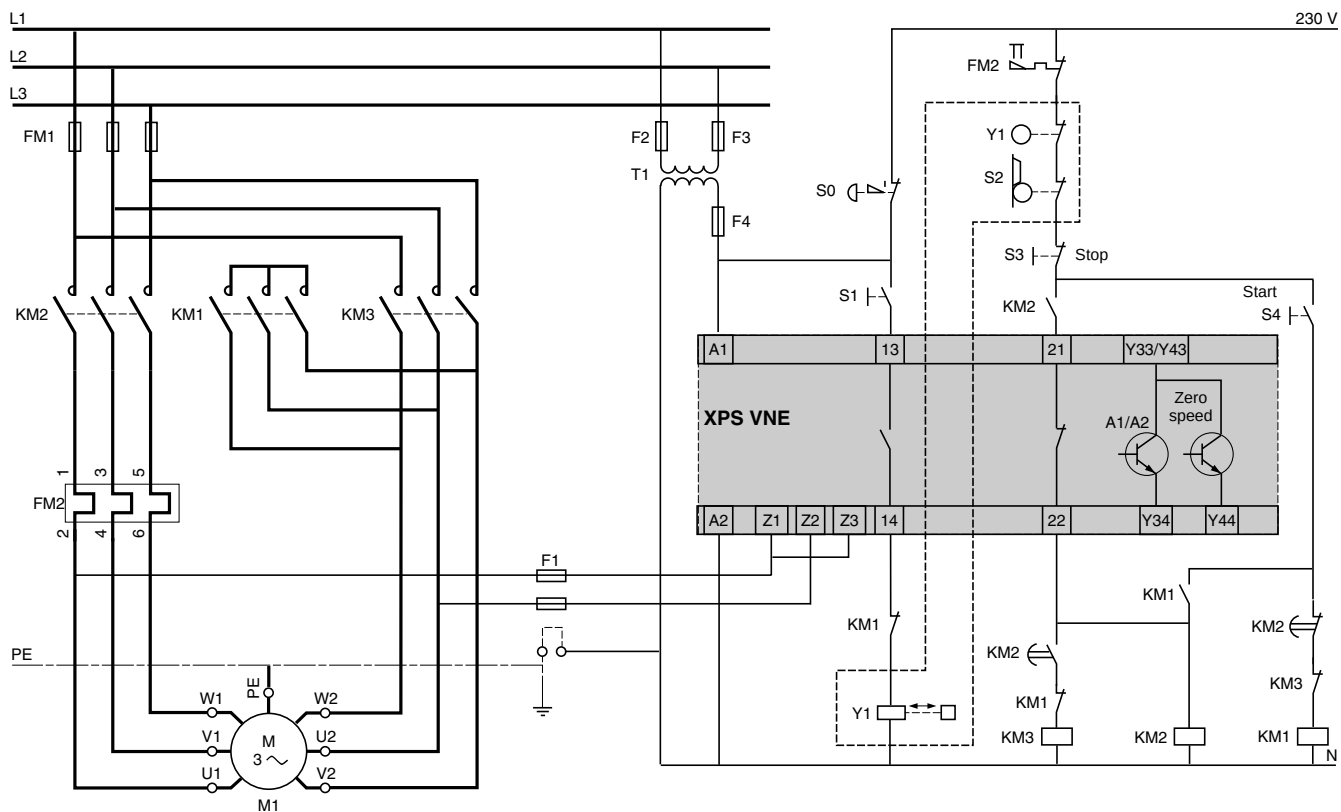
The "Star" contactor (KM3) must be closed after the motor is de-energised, in order to allow detection of zero speed.

Module XPS VNE associated with a 3-phase motor with variable number of poles and star-delta starting



F1 = 2 A
KM1: Fast rotation speed
KM2: Slow rotation speed
KM3: Star
KM4: Delta

Module XPS VNE associated with a star-delta motor starter and guard switch type XCS E



Association of safety modules XPS VNE and XPS AK

