SWITCHERGEAR
GEAR TO CONTROL YOUR POWER SWITCHES

Accessory SNV005

Voltage sensor ±1000 V

Differential high-voltage measurement for power systems

REFERENCE MANUAL

Features

Standard accessory for SwitcherGear

Connects directly to Module AIN004

Measurement range ±1000 V

Frequency response DC to 40 kHz

Gain accuracy 0.4%

High impedance floating inputs

Internal shield reduces interference from switch-mode converters

4 mm shrouded safety connectors

Applications

Voltage measurement for

PWM power converters

DC link

1-phase and 3-phase grid

Renewable energy and storage

Ideal for use with

Converters with 1200 V IGBTs

Semikron® Semiteach® IGBT

General Description

The SNV005 Accessory is an enclosed voltage sensor for power converter systems. It provides a simple and safe way to connect voltage sensors into your power system. The sensors can be connected directly to a SwitcherGear AIN004 Module.

Ordering Information

Order Code	*Description*
SNV005	*SwitcherGear accessory, voltage sensor ±1000 V, enclosed*
SNV004	*SwitcherGear accessory, quad voltage sensor ±1000 V*
SNV006	*SwitcherGear accessory, voltage sensor ±1000 V, open*
SNI003	*SwitcherGear accessory, quad current sensor ±50 A*
AIN004	*SwitcherGear module, 4-channel analogue input for sensors, uni/bipolar current 20 to 200 mA*

Standard Interfaces

Input Connectors (Front Panel)

The 4 mm shrouded safety connectors allow the voltage sensors to be connected into the power system. The markings on the front panel show the measurement polarity.

Use only patch cables that have a suitable voltage rating to make the connections.

Output Connector (Rear Panel)

A 3-way pluggable screw terminal connector allows for connection of power and the measurement output signal. Table 1 and the markings on the rear panel show the pin-out of the connector.

The connection can be keyed by inserting a coding section (Phoenix Contact part number 1734401) into the recess in the header, and coding profiles (Phoenix Contact part number 1734634) are inserted into the slot on the plug.

Functional Description

The SNV005 unit uses high value resistor dividers to accurately measure the voltage in power converter systems. Figure 1 shows the function and connections of the voltage sensor.

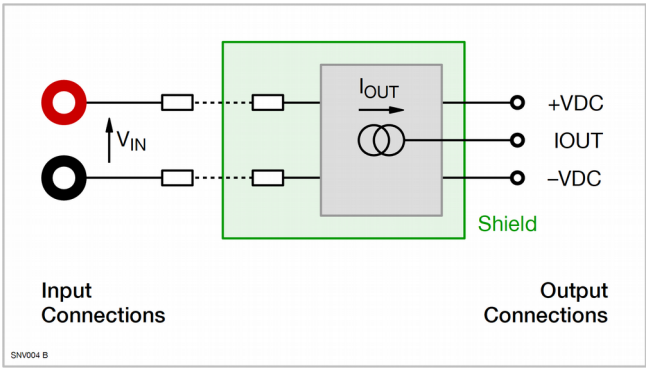

Figure 1: Functional diagram of voltage sensor.

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Table 1: Sensor output connector

Pin	Signal	Description
1	+VDC	Sensor positive supply voltage input.
2	IOUT	Sensor measurement current output.
3	-VDC	Sensor negative supply voltage input.

Figure 2: View of front panel.

Figure 3: View of rear panel.

The inputs are connected to the circuits of interest. The output from the sensor is a current, I_{OUT}, that is a scaled replica of the input voltage, V_{IN}.

The inputs have a very high impedance that allows them to be safely connected to the voltages of the power system.

The output current should be connected to the control system using suitable signal conditioning.

The polarity convention for the sensors is that current flows out from the IOUT terminal when the potential on the red input connector is higher than the black input connector.

Shielding

The SNV005 Accessory includes internal shielding to reduce the coupling of switching interference from the power converter system to the output signal.

It is recommended to separate the input wires from the output wires to prevent external coupling of interference to the output signal. This should be applied throughout the system, so that the power system is separated from the controller system.

Electrical Safety

The input connectors and the enclosure of the SNV005 Accessory provide protection against direct contact with the power system voltages.

The design of the SNV005 Accessory provides protection in case of direct contact with the sensor outputs and shields (and the circuits connected to them). The protection is provided by means of protective separation between the input and output sides of the sensor, which is comprised of both reinforced insulation and protective impedance.

Applications Information

The SNV005 voltage sensor is ideal for measuring DC link voltage and AC supply voltages. It is intended to be used in control systems where the voltage is sampled synchronously to the PWM carrier, or at a lower rate.

The sensor is not suited to the measurement of the PWM voltage outputs of voltage source inverters, or other signals that have significant signal content above the bandwidth of the sensor.

Warnings

Use only suitably rated shrouded 4 mm plugs and cables to connect to the inputs of the sensor.

Absolute Maximum Ratings

Stresses above these ratings may cause permanent damage. These are stress ratings only – functional operation is not implied. Exposure to absolute maximum conditions for extended periods may affect reliability.

Parameter	Conditions		Max	Unit
Total Supply Voltage			33	V
Supply Current			50	mA
Voltage between each input and output			2000	V

Electrical Characteristics

The following specifications apply for V_{DC} = ±10 to ±15 V, T_A = 25 °C, unless otherwise noted.

Parameter	Conditions	Min	Typ	Max	Unit
SENSOR INPUT					
Measurement Range					
Differential mode, V_{INDM}		–1000		1000	V
Common mode, V_{INCM}		–1500		1500	V
Input Resistance					
Differential			4		MΩ
Each input to output side			2		MΩ
SENSOR OUTPUT					
Gain, I_{OUT} / V_{INDM}			20		µA/V
Gain Error				±0.4	%
Offset Error, Referred To Input	V_{INDM} = V_{INCM} = 0 V			±0.1	V
Common Mode Error, Referred To Input	V_{INDM} = 0 V, V_{INCM} = 1000 V			±3	V
Compliance Voltage Range	V_{DC} = ±12 V, I_{OUT} = ±20 mA	–8.8		8.8	V
High Frequency Response Limit	-3 dB		40		kHz
SUPPLY					
Bipolar Supply Voltage, V_{DC}		±10		±15	V
Current Consumption	For each sensor		2 + I_{OUT}		mA

Electrical Safety

IEC 61800-5-1	Reinforced insulation, Cat III, PD 2				
Working Voltage, AC, U_{AC}	50 Hz, U_{DC} = 0 V			480	V
Working Voltage, DC, U_{DC}	U_{AC} = 0 V			1000	V
Working Voltage, Recurring Peak, U_{ACP}				2400	V

Mechanical Characteristics

Parameter	Conditions			Unit
Enclosure Width			66	mm
Enclosure Height	Excluding feet		29	mm
Enclosure Depth	Excluding connectors		108	mm
Mass	Including output connector		80	g

Revision History

Revision	Date	Changes From Previous Release
1	17 May 2018	▪ Original release.