CSNV700 SERIES

006009
Issue 4

Flux Gate Current Sensors

AEC-Q100

DESCRIPTION

The CSNV700 Series are advanced flux gate current sensors that use Honeywell patented technology to bring the enhanced combination of performance and reliability. They are non-intrusive and electrically isolated from the monitored circuit. This ensures a simple and reliable structure without loss of power to the monitored circuit. The CSNV700 Series is rated for a primary current measurement range of ±700 A dc and offers two supply voltage options: 12 Vdc and 24 Vdc. They are calibrated and temperature compensated for improved accuracy using multi-point temperature characterization. The CSNV700 incorporates AEC-Q100 qualified integrated circuits to meet higher quality and reliability requirements.

DIAGNOSTIC FUNCTIONALITY/ CAN OUTPUT

The CAN output of the CSNV700 Series provides fault detection and communication capability. Also, the digital CAN communication is resistant to electrical interference. Examples of sensor and host system faults include:

- Sensor fault
- Supply voltage over range
- Supply voltage under range

CUSTOMIZATION

The CSNV700 Series may be customized to meet application needs. Solutions may be tailored to exact specifications for improved time to market, lower total system costs and enhanced reliability. For technical assistance, we provide global engineering and service support for your needs.

DIFFERENTIATION

- **Accuracy:** Multi-point temperature characterization and calibration for improved accuracy over temperature range
- **Magnetic immunity:** Flux gate configuration and optimized magnetic circuit allow for enhanced performance in diverse magnetic environments
- **Flexible:** Customizable on-board firmware to meet specific application requirements

VALUE TO CUSTOMERS

- **Accurate:** Designed to enable precise battery state measurement for improved user experience
- **Ease of use:** Magnetic immunity and multiple voltage options allow easy and reduced cost of integration into various battery systems and magnetic environments
- **Easy system integration:** CAN communication is transmitted using international road vehicle standard ISO 11898. CAN 2.0A is the default protocol

APPLICATIONS

- Current measurement for battery management systems in electrified vehicles (EV, HEV, PHEV or BEV)
- Current measurement for battery management systems in electric buses, trucks, and heavy-duty vehicles
- Current leakage detection and fault isolation in charging systems
- Current measurement in energy storage systems
- Fault detection in heavy industrial equipment

FEATURES

- Active flux gate current sensing
- Utilizes proprietary Honeywell technology for temperature compensation
- High accuracy and low temperature drift
- 12 Vdc and 24 Vdc supply voltage options
- Operating temperature of -40°C to 85°C [-40°F to 185°F]
- Digital output: CAN bus output with selectable ID
- Internal diagnostic function
- Different configuration options: Mounting type, baud rate, CAN ID
- UL, CE, UKCA certifications; REACH and RoHS compliant (For 24 Vdc supply voltage option: UL certified only for wall-mounted application)
- AEC-Q100 qualified integrated circuits for higher reliability

PORTFOLIO

Honeywell offers a variety of current sensors for potential use in many applications. To view the entire product portfolio, click here.

Honeywell

TABLE 1. ABSOLUTE MAXIMUM RATINGS: SUPPLY VOLTAGE = 12 V (not operating)

Characteristic	Symbol	Unit	Parameter	Condition
Load dump over voltage	V_S	V	32	400 mSec
Over voltage	V_S	V	24 20	10 min continuous
Reverse polarity	V_S	V	-24	10 min
Supply voltage: **minimum** **maximum**	 V_S V_S	 V V	 7 18	 Continuous Continuous
CAN operation: **supply voltage under range alarm, no measurement** **supply voltage over range alarm, no measurement**	 — —	 V V	 7 to 8 18 to 24	 CAN continuous CAN continuous
Insulation resistance	IR	MOhm	>500	500 V dc at 1 min
Creepage distance	D_{Cp}	mm	10	Hole for busbar
Clearance	D_{Cl}	mm	9,5	Hole for busbar
RMS voltage: **ac isolation voltage** **dc isolation voltage**	 — —	 kV kV	 5 5	 50 Hz, 1 min 1 min

TABLE 2. ABSOLUTE MAXIMUM RATINGS: SUPPLY VOLTAGE = 24 V (not operating)

Characteristic	Symbol	Unit	Parameter	Condition
Load dump over voltage	V_S	V	42	400 mSec
Over voltage	V_S	V	36	10 min
Reverse polarity	V_S	V	-36	10 min
Supply voltage: **minimum** **maximum**	 V_S V_S	 V V	 7 32	 Continuous Continuous
CAN operation: **supply voltage under range alarm, no measurement** **supply voltage over range alarm, no measurement**	 — —	 V V	 7 to 8 32 to 33	 CAN continuous CAN continuous
Insulation resistance	IR	MOhm	>500	500 V dc at 1 min
Creepage distance	D_{Cp}	mm	10	Hole for busbar
Clearance	D_{Cl}	mm	9,5	Hole for busbar
RMS voltage: **ac isolation voltage** **dc isolation voltage**	 — —	 kV kV	 5 5	 50 Hz, 1 min 1 min

TABLE 3. OPERATING CHARACTERISTICS IN NOMINAL RANGE (I_{PN}): SUPPLY VOLTAGE = 12 V

Characteristic	Symbol	Unit	Specification			Condition
			Min.	Typ.	Max.	
Primary current, nominal measuring range (dc)	I_{PN}	A	-700	—	700	—
Supply voltage	V_S	V	8	12	18	—
Supply voltage hysteresis:						
maximum	V_{UP}	V	—	18.1	—	When V_S increases
	V_{UP}	V	—	17.7	—	When V_S decreases
minimum	V_{LOW}	V	—	8.1	—	When V_S increases
	V_{LOW}	V	—	7.8	—	When V_S decreases
Current consumption:						
at I_P = 0 A	I_C	mA	—	45	—	V_S = 12 V, T = 25°C
at I_P = 700 A	I_C	mA	—	270	—	V_S = 12 V, T = 25°C
Ambient operating temperature	T_a	°C	-40	—	85	Temperature range with accuracy guaranteed
Total accuracy at 20 A < I_P ≤ 700 A	X_G	%	-0.5	—	0.5	T = -40°C to 85°C, ±3 sigma, 9 V < Vs < 16 V
Error:						
at I_P = 0 A (offset current)	I_{os}	A	-0.05	—	0.05	T = -40°C to 85°C, ±3 sigma 9 V < Vs < 16 V
at $I_P \leq$ 20 A	X_G	A	-0.1		0.1	T = -40°C to 85°C, ±3 sigma 9 V < Vs < 16 V
Linearity	ε_L	%	—	±0.1	—	Room temperature

TABLE 4. OPERATING CHARACTERISTICS IN NOMINAL RANGE (I_{PN}): SUPPLY VOLTAGE = 24 V

Characteristic	Symbol	Unit	Specification			Condition
			Min.	Typ.	Max.	
Primary current, nominal measuring range (dc)	I_{PN}	A	-700	—	700	—
Supply voltage	V_S	V	8	24	32	—
Supply voltage hysteresis:						
maximum	V_{UP}	V	—	32.1	—	When V_S increases
	V_{UP}	V	—	31.7	—	When V_S decreases
minimum	V_{LOW}	V	—	8.1	—	When V_S increases
	V_{LOW}	V	—	7.8	—	When V_S decreases
Current consumption:						
at I_P = 0 A	I_C	mA	—	45	—	V_S = 24 V, T = 25°C
at I_P = 700 A	I_C	mA	—	110	—	V_S = 24 V, T = 25°C
Ambient operating temperature	T_a	°C	-40	—	85	Temperature range with accuracy guaranteed
Total accuracy at 20 A < I_P ≤ 700 A	X_G	%	-0.5	—	0.5	T = -40°C to 85°C, ±3 sigma, 16 V < Vs < 32 V
Error:						
at I_P = 0 A (offset current)	I_{os}	A	-0.05	—	0.05	T = -40°C to 85°C, ±3 sigma 16 V < Vs < 32 V
at $I_P \leq$ 20 A	X_G	A	-0.1		0.1	T = -40°C to 85°C, ±3 sigma 16 V < Vs < 32 V
Linearity	ε_L	%	—	±0.1	—	Room temperature

TABLE 5. MECHANICAL CHARACTERISTICS	
Catalog Listing	**Description**
Housing material	Plastic PA66-GF25 (UL 94V-0)
Mounting screw	M6, 6 N m maximum torque The installation bracket should have a flatness tolerance of ≤0,2 mm. The size tolerances of the installation bracket and nut, as well as the use of installation tools and fixtures, have an impact on the maximum installation torque of the product. If there are any relevant design or process changes, it is advisable to implement them after verification.
Mating electrical connector	TEM PN 1473672-1
Weight	66,5 g ±5 g

Figure 1. Error vs. Current

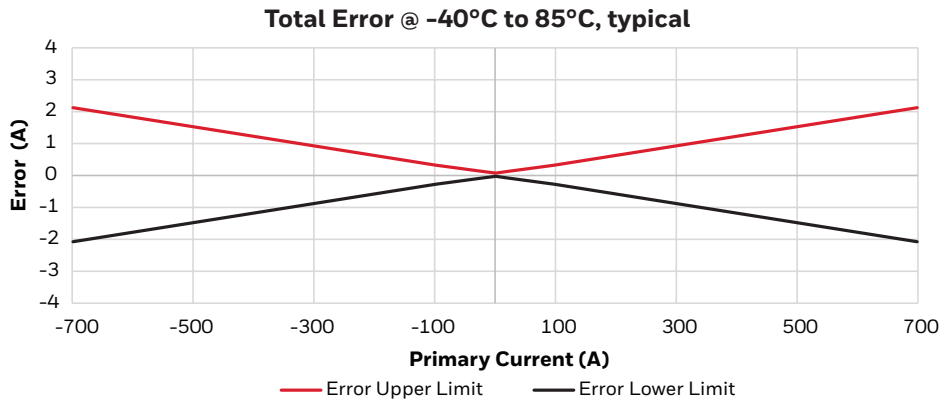


TABLE 6. CANBUS CHARACTERISTICS[1,2,3,4]							
Message Description	**Can ID**	**Data Length**	**Message Launch Type**	**Signal Description**	**Signal Name**	**Start Bit**	**Length**
Output current Ip (mA)	See Figure 2	8 bytes	Cyclic transmitted message 10 mSec cycle.	I_p value: 80000000h = 0 mA 7FFFFFFFh = -1 mA 80000001h = 1 mA	IP_VALUE	24	32
				Error information	ERROR_INFORMATION	32	7
				Error indication (1 bit): 0 = normal 1 = failure	ERROR_INDICATION	39	1
				Fixed to 0	VACANT_DATA_2BYTES	48	16
				CRC-8 POLY: 8 + X2 + X + 1	CRC_8	56	8

[1]CANBUS speed: Refer to Figure 2
[2]CAN bus protocol: Version 2.0A
[3]CAN oscillator tolerance: 0.3125 %
[4]Byte order: Big endian (Motorola)

TABLE 7. DIAGNOSTIC TROUBLE CODES			
Failure mode	**I_p Value**	**Error Indication**	**Error Information**
Flash CRC error	FFFF FFFFh	1	0x48
AFE over range[1]	FFFF FFFFh	1	0x49
AFE error	FFFF FFFFh	1	0x50
Internal LUT error	FFFF FFFFh	1	0x51
Power minimum limit	FFFF FFFFh	1	0x54
Power maximum limit	FFFF FFFFh	1	0x55

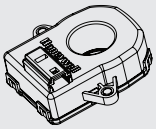
[1]Overcurrent detection I_p > 740 A

TABLE 8. ORDER GUIDE

Catalog Listing	Description
CSNV700N-354	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 12 V supply voltage, 500 k baud rate, 3C4 CAN ID
CSNV700N-355	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 12 V supply voltage, 500 k baud rate, 3C5 CAN ID
CSNV700N-356	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 12 V supply voltage, 500 k baud rate, 3C6 CAN ID
CSNV700N-324	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 12 V supply voltage, 250 k baud rate, 3C4 CAN ID
CSNV700N-325	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 12 V supply voltage, 250 k baud rate, 3C5 CAN ID
CSNV700N-326	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 12 V supply voltage, 250 k baud rate, 3C6 CAN ID
CSNV700N-454	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 24 V supply voltage, 500 k baud rate, 3C4 CAN ID
CSNV700N-455	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 24 V supply voltage, 500 k baud rate, 3C5 CAN ID
CSNV700N-456	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 24 V supply voltage, 500 k baud rate, 3C6 CAN ID
CSNV700N-424	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 24 V supply voltage, 250 k baud rate, 3C4 CAN ID
CSNV700N-425	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 24 V supply voltage, 250 k baud rate, 3C5 CAN ID
CSNV700N-426	CSNV700 Series current sensors, 700 rated current, through-hole with metal bushing, 24 V supply voltage, 250 k baud rate, 3C6 CAN ID

FLUX GATE CURRENT SENSORS
CSNV700 SERIES

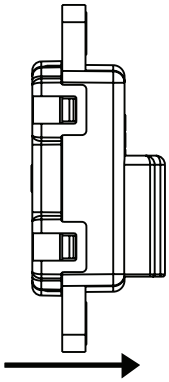
Figure 2. Nomenclature

CSN	V	700	N	3	5	4	X
Type	Use	Rated Current	Mounting Type	MCU Type	Baud Rate	CAN ID[1]	Customization[2]
Current Sensor	V Designed for vehicle applications	700 700 A	N Through hole with metal bushing 	3 MCU2 12 V 4 MCU2 24 V	2 250 k 5 500 k	4 3C4 5 3C5 6 3C6	A to Z

[1] Custom CAN IDs are available. Contact Honeywell Customer Service for more information.
[2] Custom CAN Layouts are available. Contact Honeywell Customer Service for more information.
[3] For MCU Type “3”, refer to Table 1: Absolute Maximum Ratings and Table 3: Operating Characteristics in Nominal Range (IPN)
[4] For MCU Type “4”, refer to Table 2: Absolute Maximum Ratings and Table 4: Operating Characteristics in Nominal Range (IPN)

Figure 3. Positive Primary Current Direction (Polarity)

Application condition: Pollution degree PD2



FLUX GATE CURRENT SENSORS
CSNV700 SERIES

Figure 4. Dimensional Drawings (For reference only: mm/[in])

Mounting type N: Through-hole with metal bushing

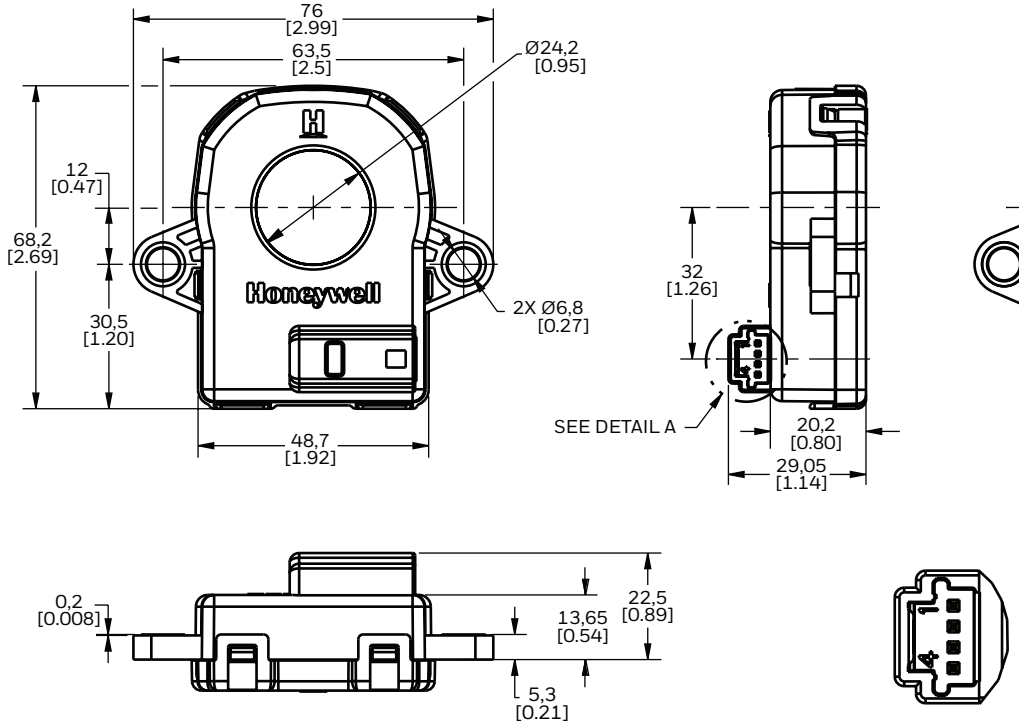


TABLE 9. PINOUT

Pin	Output
1	CAN-L
2	CAN-H
3	GND
4	V_S

TABLE 10. EMC TEST SPECIFICATIONS

Test	Standard	Procedure
CISPR 25 Conducted RF Emissions - Voltage	CISPR25	According to CISPR 25:2008 Commission Form of Testing
CISPR 25 Conducted RF Emissions - Current	CISPR25	According to CISPR 25:2008 Commission Form of Testing
CISPR 25 Radiated Emissions- ALSE method	CISPR25	According to CISPR 25:2008 Commission Form of Testing
Transient Conduction Emission	ISO 7637-2	According to ISO 7637-2
Low Frequency Magnetic Field Emission	SAE J551-5	According to SAE J551-5
Low Frequency Field Interference	ISO 11452-8	According to ISO 11452-8
Bulk Current Injection (BCI) Test	ISO 11452-4	According to ISO 11452-4
Rf Anti-Interference - ALSE Method	ISO 11452-2	According to ISO 11452-2
Transient Disturbances Conducted along Supply Lines	ISO 7637-2	According to ISO 7637-2
Transient Disturbances Conducted along I/O or Sensor Lines	ISO 7637-3	According to ISO 7637-3
Electrostatic discharge	ISO 10605	Unpowered direct contact discharge: ±8 kV Unpowered air discharge: ±15 kV Powered-up direct contact discharge: ±4 kV Powered-up air discharge: ±8 kV
Portable Transmitter	ISO 11452-9	According to ISO 11452-9
Surge	IEC 61000-4-5	±0.5 kV
Radio Frequency Electromagnetic Field	IEC 61000-4-3	10 V/m (80 MHz to 1 GHz), 3 V/m (1.4 GHz to 2 GHz), 1 V/m (2.0 GHz to 2.7 GHz)
Fast Transients Bursts Susceptibility Test	IEC 61000-4-4	2 kV power port, 2 kV CAN signal and control port
Radio Frequency Continuous Conducted	IEC 61000-4-6	0.15 MHz to 80 MHz, 3 V 80 % AM (1 kHz)
Radio Frequency Magnetic Field	IEC 61000-4-8	30 A/M
Radiated Disturbance (3M semi-anechoic chamber)	CISPR-11	Group 1, Class A

TABLE 11. ENVIRONMENTAL TEST SPECIFICATIONS

Test	Standard	Procedure
Low Temperature Operating Endurance	ISO 16750-4	120 hr, -40°C, power on. Performance test before and after test only at 25°C and VS nom.
High Temperature Operating Endurance	ISO 16750-4	3000 hr, 85°C, power on. Performance test before and after test only at 25°C and V_S nom.
Thermal Cycle Test	ISO 16750-4	120 cycles, one cycle contains -40°C (120 min soak) & 85°C (120 min soak). Transition time = 240 min. Performance test before and after test only at 25°C and V_S nom.
High Temperature and Humidity Endurance	IEC 60068-2-67	1000 hr, 85°C, 85% humidity, power on. Performance test before and after test only at 25°C and V_S nom
Vibration	IEC 60068-2-64	5 Hz to 2000 Hz, 20 hr/axis, 3 axis with –40°C/85°C temperature cycle during test. Product power on. Performance test before and after test only at 25°C and V_S nom.
Mechanical Shock	ISO 16750-3	500 m/s, 2,20 each direction (60 total), half sine pulse. Product power on. Performance test before and after test only at 25°C and V_S nom.
Package Drop	ISTA-1A	With final packaging, drop in direction at 1 corner, 3 edge, 4 face > total 9 drops, 1 m on concrete floor.
Handling Drop	ISO 16750-3	1st fall of each DUT at a different dimensional axis, 2nd fall with the given DUT at the same dimensional axis but on the opposite side of the housing, from 1 m on concrete floor. Performance test before and after test only at 25°C and V_S nom.
Waterproof and Dust (and other Solid Intrusion)	ISO 20653	IP category: 40

TABLE 12. ELECTRICAL TEST SPECIFICATIONS FOR 12 VDC SUPPLY VOLTAGE OPTION

Test	Standard	Procedure
Long Time Overvoltage Test	ISO 16750-2	Power supply at 18 V for 60 min.
Superimposed Alternating Voltage	ISO 16750-2	Test voltage Uc max 18 V for 12 V systems; ac voltage (sinusoidal): Severity 2, UPP = 4 V
Slow Decrease/Increase of Supply Voltage	ISO 16750-2-4.5	10 cycles. Power supply changes from18 V to 0 V/ 0 V to 18 V with 0.5 V ±0.1 V step. At any step, power supply maintain 1 min.
Slow Decrease Fast Increase of Supply Voltage	ISO 16750-2-4.5	According to ISO 16750-2-4.5 of testing standard and Fig
Reset Behavior at Voltage Drop	ISO16750-2-4.6.2.2	See Fig. 6
Momentary Drop in Supply Voltage	ISO 16750-2-4.6.1	Ucmin to 4.5 V. See Fig. 4
Starting Profile	ISO16750-2	According to ISO 16750-2 of testing standard and Fig
Reverse Voltage Test	ISO16750-2-4.7	Power supply at -24 V for 10 min.
Single Line Open Circuit Tests	ISO16750-2-4.9	Connect sensor to 12 V power supply and power on the sensor. Disconnect Us, GND, CAN-H, and CAN-L in sequence. Each open circuit time: 60 s ±1 s
Connector Open Circuit Tests	ISO16750-2	Connect sensor to 12 V power supply and power on the sensor. Disconnect connector. Each open circuit time: 10 s ± 1s
dc Supply Voltage	ISO16750-2	Power supply at Uc min. 7 V and Uc max. 18 V
Insulation Resistance Test	ISO 16750-2-4.12	500 Vdc for 60 s; Resistance criteria: > 500 MOhm
dc & ac Voltage Insulation Test	ISO 16750-2-4.12	Test voltage: 5000 Vdc & ac Frequency: dc & 50 Hz~60 Hz. Test Duration: 60 s

TABLE 13. ELECTRICAL TEST SPECIFICATIONS FOR 24 VDC SUPPLY VOLTAGE OPTION

Test	Standard	Procedure
Long Time Overvoltage Test	ISO 16750-2	Power supply at 36 V for 60 min.
Superimposed Alternating Voltage	ISO 16750-2	Test voltage Uc max 32 V for 24 V systems; ac voltage (sinusoidal): Severity 2, UPP = 4 V
Slow Decrease/Increase of Supply Voltage	ISO 16750-2-4.5	10 cycles. Power supply changes from 32 V to 0 V/ 0 V to 32 V with 0.5 V ±0.1 V step. At any step, power supply maintains 1 min.
Slow Decrease Fast Increase of Supply Voltage	ISO 16750-2-4.5	According to ISO 16750-2-4.5 of testing standard and Fig
Reset Behavior at Voltage Drop	ISO16750-2-4.6.2.2	See Fig. 6
Momentary Drop in Supply Voltage	ISO 16750-2-4.6.1	Ucmin to 4.5 V. See Fig. 4
Starting Profile	ISO16750-2	According to ISO 16750-2 of testing standard and Fig
Reverse Voltage Test	ISO16750-2-4.7	Power supply at -36 V for 10 min.
Single Line Open Circuit Tests	ISO16750-2-4.9	Connect sensor to 24 V power supply and power on the sensor. Disconnect Us, GND, CAN-H, and CAN-L in sequence. Each open circuit time: 60 s ±1 s
Connector Open Circuit Tests	ISO16750-2	Connect sensor to 24 V power supply and power on the sensor. Disconnect connector. Each open circuit time: 10 s ± 1s
dc Supply Voltage	ISO16750-2	Power supply at Uc min. 7 V and Uc max. 32 V
Insulation Resistance Test	ISO 16750-2-4.12	500 Vdc for 60 s; Resistance criteria: > 500 MOhm
dc & ac Voltage Insulation Test	ISO 16750-2-4.12	Test voltage: 5000 Vdc & ac. Frequency: dc & 50 Hz~60 Hz. Test Duration: 60 s

WARRANTY/REMEDY

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Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING
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Failure to comply with these instructions could result in death or serious injury.

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