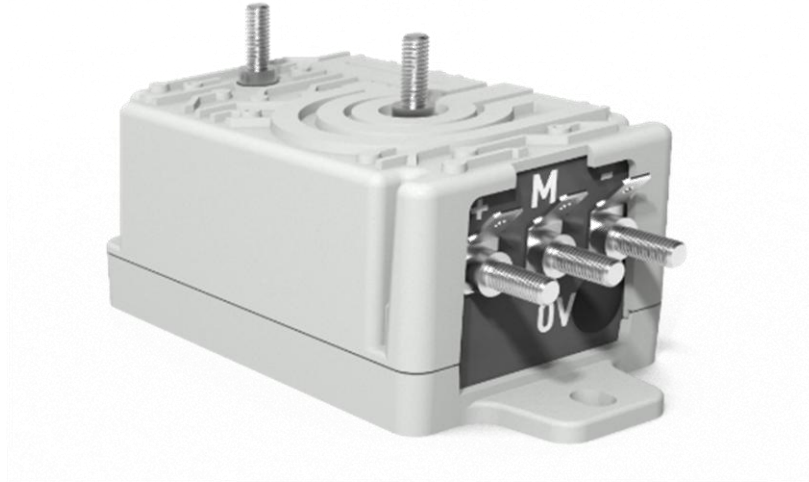


# Voltage Sensor - VenuS 2000 V



## PVE2000T-1BCAA0

Measuring DC, AC, and pulsating voltages with a galvanic insulation between primary and secondary circuits.



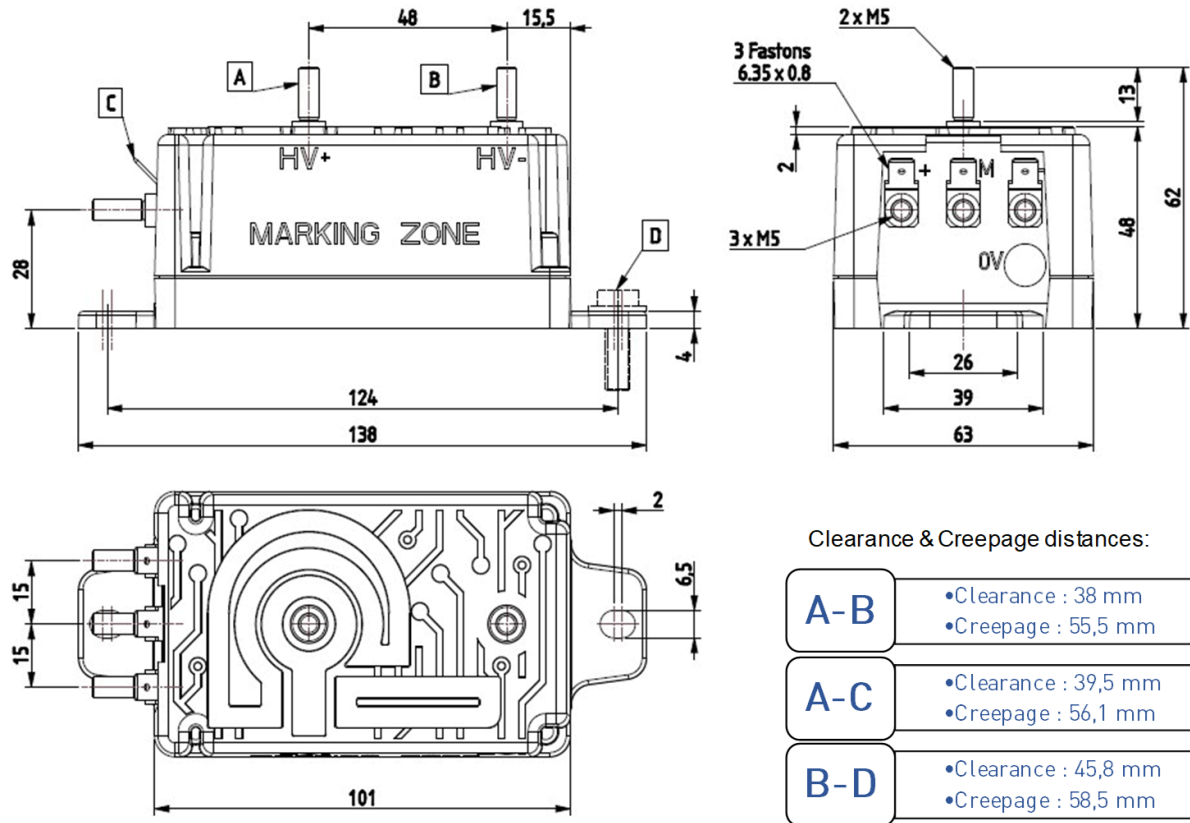
## KEY FEATURES

- High electrical insulation performances
- Bipolar and insulated measurement range of  $\pm 3000$  V DC
- Bipolar current output 50 mA RMS for a primary 2000 V RMS
- Primary input connections 2x M5 studs
- Secondary output connections 3x M5 studs with 3x Faston

## APPLICATIONS



## Overall dimensions



### Marking content:

- Product reference
- Primary nominal voltage
- Secondary nominal voltage
- Supply voltage
- Product number

Marking also include a DataMatrix and the dielectric test voltage value ( $V_d$ )

## Mechanical characteristics

- |                                    |                             |
|------------------------------------|-----------------------------|
| ➤ General tolerance                | ±1 mm                       |
| ➤ Outline                          | 138mm X 63mm x 62mm         |
| ➤ Sensor fixing                    | 2x M6 screws (not provided) |
| ➤ Primary connection               | 2x M5 studs                 |
| ➤ Secondary connection             | 3x M5 studs with 3x Faston  |
| ➤ Recommended M5 tightening torque | 2,2 N.m max                 |
| ➤ Mass                             | < 280g                      |
| ➤ Assembly requirements            | Operational in any position |



**Synoptic :**

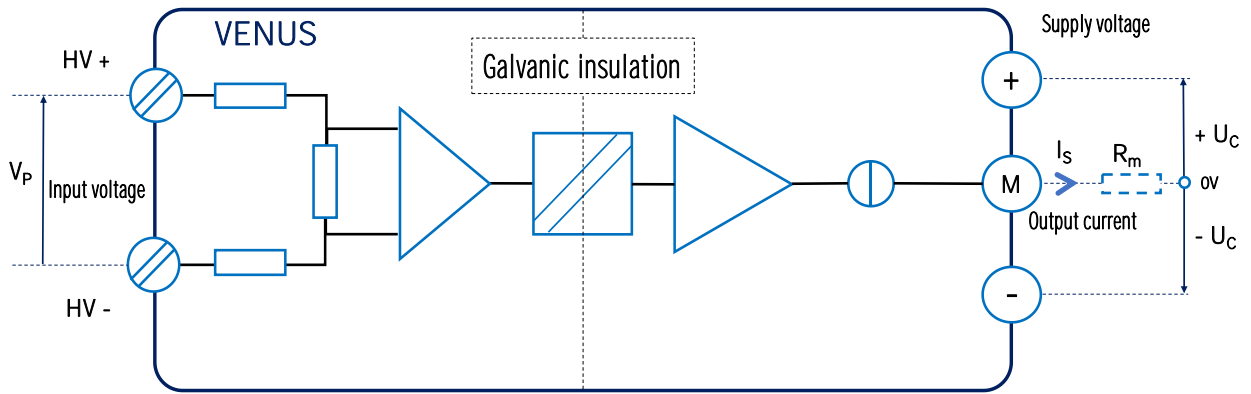


Figure 1: Voltage sensor VENUS synoptic

**Voltage range**

Parameters	Symbol	Unit	Value
Primary nominal voltage	$V_{PN}$	$V_{RMS}$	2000
Measuring range	$V_{P\ max}$	$V_{DC}$	$\pm 3000$
Not measurable overload : 1 s/h	$V_{p\ overload}$	$V_{DC}$	$< 6000$
Minimum power supply voltage	$U_{C\ min}$	$V_{DC}$	$\pm 15 (\pm 5\%)$
Maximum power supply voltage	$U_{C\ max}$	$V_{DC}$	$\pm 24 (\pm 5\%)$
Temporary power supply overvoltage : 0.1sec	$U_{C\ peak}$	$V_{DC}$	$\pm 34$

Using the device beyond these voltage ranges may cause permanent damage that could not be considered as under Petercem's responsibility.



## Power supply and measurement

Using a symmetrical power supply:

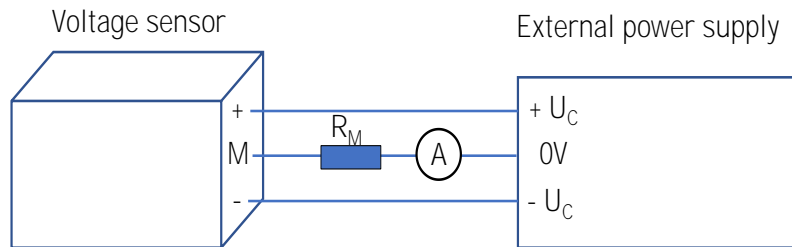


Figure 2: Symmetrical power supply and measurement

The resistance of the external reading instrument should be considered for accurate measurement interpretation.

The external measuring resistance shall be defined according the figure below.

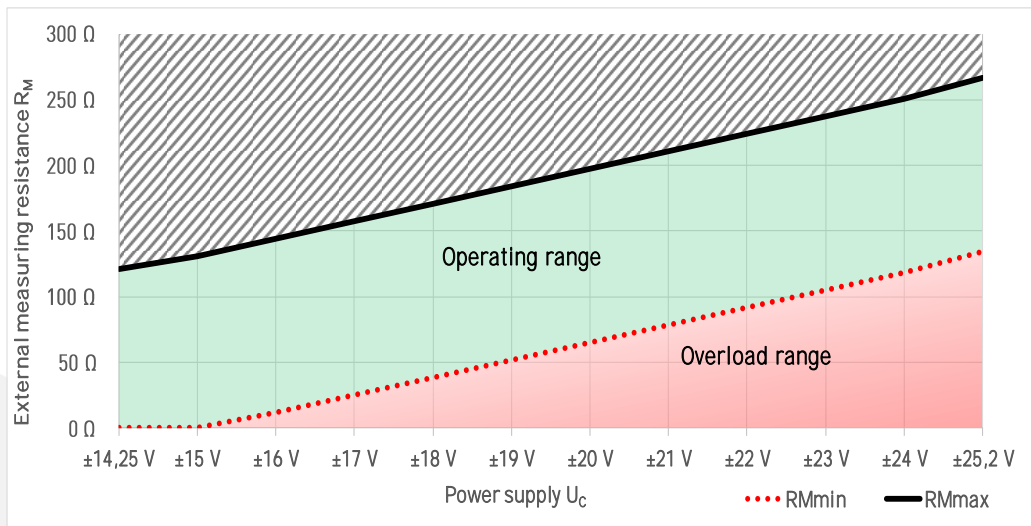


Figure 3 : External measuring resistance according to symmetrical power supply of the sensor

Overload range may reduce the lifespan of the sensor.



## Temperature range

Parameters	Symbol	Unit	Min.	Max.
Operating temperature range	T <sub>o</sub>	°C	-40	+85
Storage temperature range	T <sub>s</sub>	°C	-50	+90

All mentioned electrical performances in this data sheet apply only in the operating temperature range unless otherwise specified.

Operating at mentioned extreme temperatures for an extended period may degrade reliability.

Using the device beyond these temperature ranges may cause permanent damage that could not be considered as under Petercem's responsibility.

## Insulation properties

Parameters	Symbol	Unit	Value	Comments
Dielectric test AC, 50 Hz, 1min	V <sub>d</sub>	kV <sub>rms</sub>	14	See the application examples bellow
Impulse withstand voltage 1.2/50 μs	V <sub>w</sub>	kV	24	
Maximum DC common mode voltage	V <sub>CM</sub>	kV	≤ 6	At V <sub>P max</sub>
Partial discharges	V <sub>e</sub>	kV <sub>rms</sub>	2.7	Extinction voltage at 10pC, 50Hz
Clearance distance	Cl.	mm	See dimension values on page 2	
Creepage distance	Cr.	mm		
Comparative tracking index	CTI	-	600	
Insulation resistance	R <sub>INS</sub>	MΩ	200	At 500Vdc
Primary resistance	P <sub>r</sub>	MΩ	14.8	
Case material	-	-	UL94 - V0	



**Electrical performances**

Parameters	Symbol	Unit	Min.	Typ.	Max.	Comments	
Secondary nominal current RMS	$I_{sn}$	mA	50			See Figure 4	
Secondary measuring range, current DC	$I_{smin/max}$	mA	-75		75		
Sensitivity	S	$\mu A/V$		25		$I_s (\mu A) = 25 \times V_p$	
Offset current ( $V_p = 0 V$ )	$I_{so}$	$\mu A$	-190		190		
Total error	$\epsilon_{TOT}$	% of $V_{Pmax}$	-40 to +85°C at $T_A^*$	-1		+1	See Figure 9
				-0.5		+0.5	
Linearity error over $V_{Pmax}$ range	$\epsilon_L$	% of $V_{Pmax}$	-0.5		0.5	at $T_A^*$	
Sensitivity error	$\epsilon_S$	%	-0.2		+0.2	at $T_A^*$	
Current consumption at $U_c = \pm 24V$ and $V_p = 0 V$	$I_{co}$	mA	70		145	Depend of $V_p$	
Total primary power loss at $V_{PN}$	$P_P$	mW		270			
Start-up time	$t_{start}$	ms			20		
Rise time	$T_R$	$\mu s$	17	20	30	See Figure 6	
Delay time at 10%	$T_{D10}$	$\mu s$	20	21	30		
Delay time at 90%	$T_{D90}$	$\mu s$		38	50		
Frequency bandwidth at	BW	kHz	-3 dB		20	See Figure 7	
			-1 dB		12		
			-0.1 dB		4		

\* $T_A$  = ambient temperature: 20 to 25°C

**Measure range**

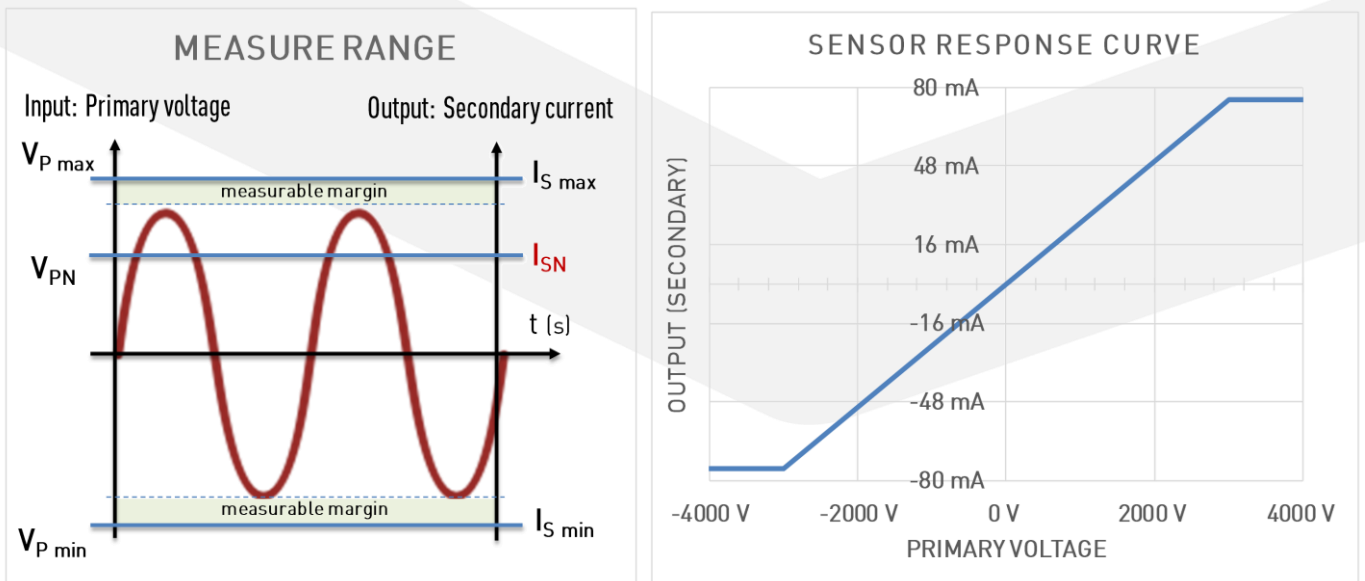


Figure 4: Voltage sensor VENUS primary / secondary measure range and response curve

PVE2000T-1BCAA0



## Response time

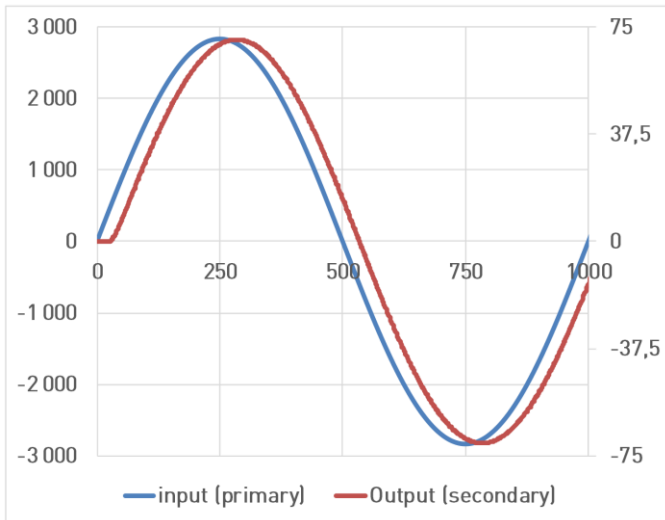


Figure 5: Application example: primary 2000V, 1000Hz and secondary signal according to time ( $\mu$ s)

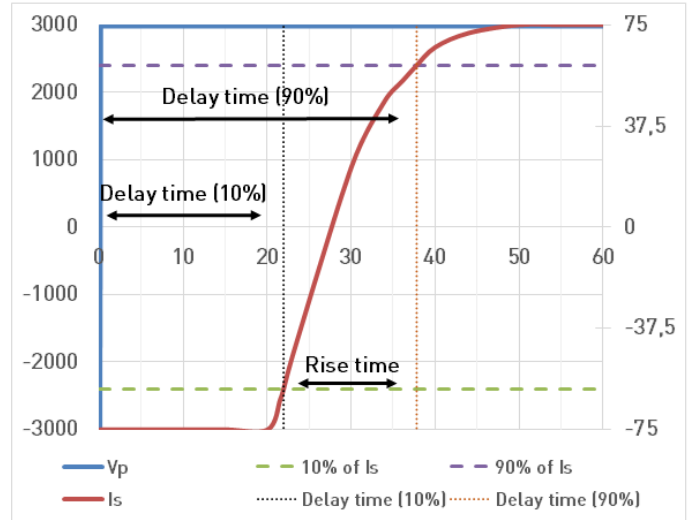


Figure 6: Delay and rise time ( $\mu$ s) for a pulse from -3000V to 3000V

## Bandwidth

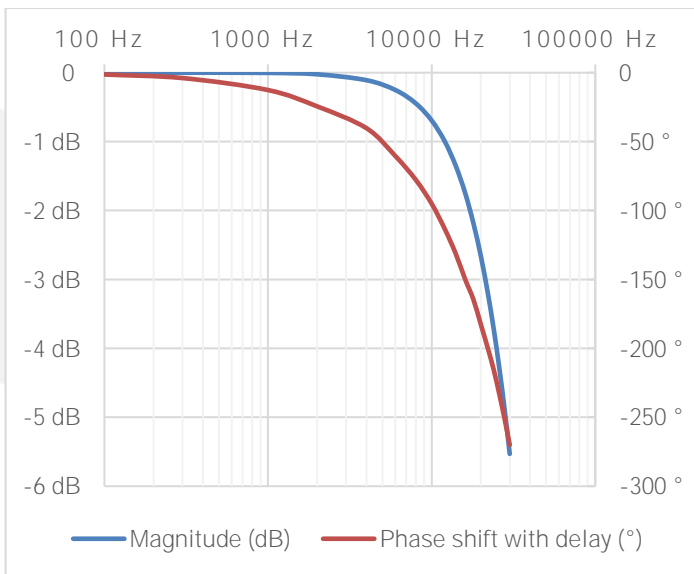


Figure 7: Voltage sensor VENUS frequency bandwidth

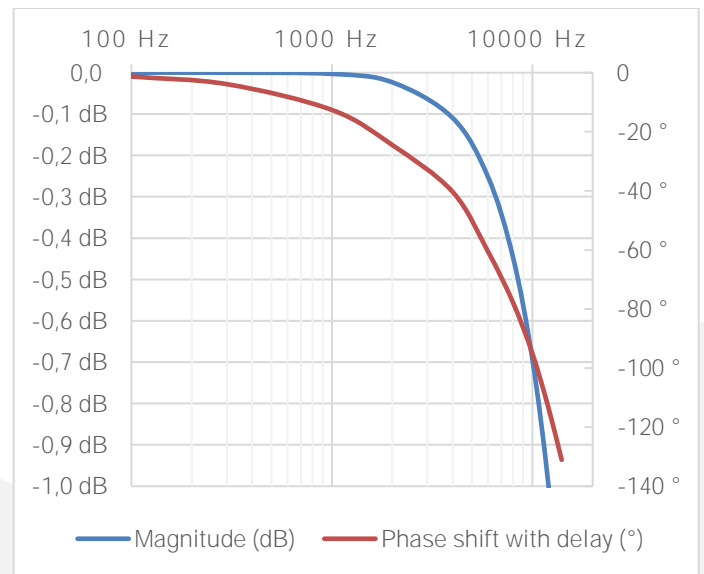


Figure 8: frequency bandwidth between 0 and -1 dB



### Thermal drift

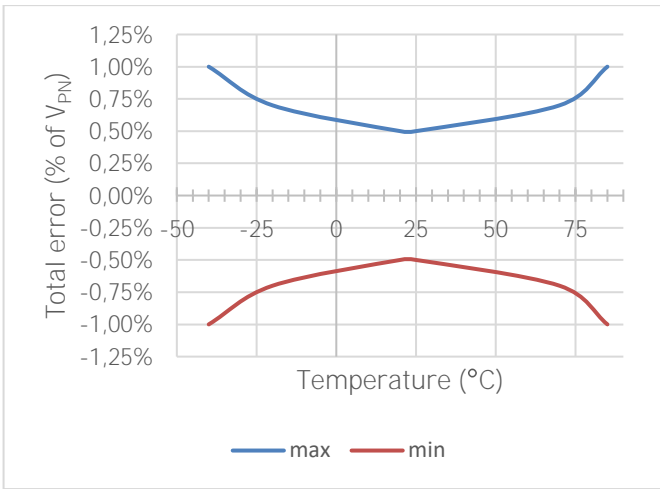


Figure 9: Total error (% of  $V_{PN}$ ) according to temperature

### Output noise

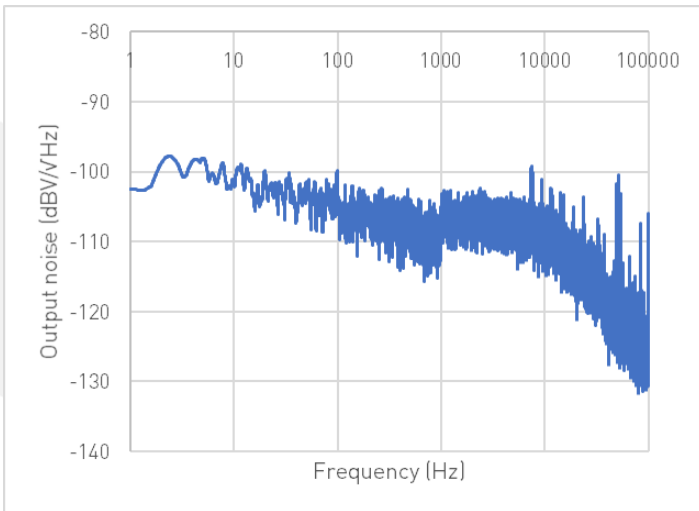


Figure 10: Output noise spectral density

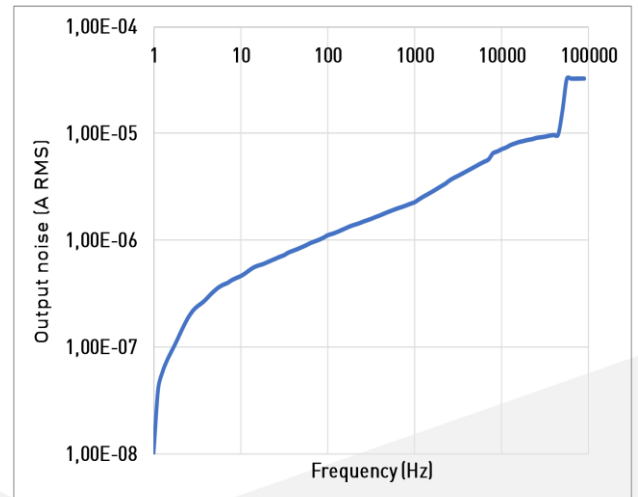


Figure 11: Cumulative output noise current according to frequency

### Other characteristics

Parameters	Comments
Burn in test according to cycle	FPTC404304



## Standards

Standards	Revision
EN 50155: OT6, ST0, H2, PC2	2021
EN 50124-1	2017
EN 50121-3-2	2019
EN 50128	2011
EN 50178	1999
EN 45545: HL2	2013
NFPA 130	2017
IEC 61010	2016
UL 508	2003 (Pending)
UL 314	(Pending)

### Conditions for Acceptance:

1. These components must be installed within an appropriate enclosure for their intended end-use application.
2. The device's Basic Insulation Level is rated at 24kV, which has been verified through Impulse Withstand Testing. If a higher BIL rating is requested, we need to plan more tests on our VenuS and the cost of the tests will be borne by the applicant.



## Safety warnings

This sensor must be used in electrical circuits according to EN61010-1.



This sensor must be used in electric/electronic equipment with respect to applicable standards and safety requirements in accordance with the system instructions and internal customer rules.



Caution: risk of electrical shock. When operating the sensor, certain parts can carry hazardous voltages (primary bar, power supply...). Ignoring this warning can lead to injury and/or cause serious damage.



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