Wilcoxon Research

Device parameters for Wilcoxon's intrinsically safe certified sensors

An intrinsically safe vibration sensor system is composed of a certified safe accelerometer, an associated safety barrier, and the interconnecting cables.

When the accelerometer is certified to be safe for use in an explosive or potentially explosive atmosphere, there are certain requirements which must be met. The sensor must be installed in specific accordance with the associated installation drawing, which is approved during certification. The installation drawing approved during the certification process establishes the mechanical mounting and electrical connection requirements.

In many instances, the sensor must be connected to a safety barrier, which protects the sensor from harmful voltages and currents, in the event of a failure in either the sensor or the associated readout equipment. The safety barrier must be rated In compliance with the ratings established by the certifying agency. These ratings vary based on the type of certification, for instance, if one desires the sensor to be approved for use in a hydrogen atmosphere versus methane atmosphere, different ratings would normally apply. Safety barriers used with hazardous area accelerometer installations typically have five parameters of concern associated with them: voltage, current, power, capacitance, and inductance.

The open-circuit voltage available at the terminals of the barrier is V_{oc}. The short-circuit current that the barrier can sink is I_{sc}. The maximum capacitance that can be connected to the barrier apparatus is C_a while the maximum inductance that can be connected is L_a.

There are corresponding values for the vibration sensor. The voltage rating, V_{max} as determined by the certification agency, is the maximum voltage that can be applied to the terminals of the sensor. The current rating, I_{max}, is the maximum current that can be applied through the terminals of the sensor. The value of internal capacitance, C_i, and inductance, L_i, are also in the certifying documentation. When the sensor and barrier are connected together, the cable capacitance, C_{cable}, and inductance, L_{cable}, must be considered a part of the system. More recent approvals also factor in the total power applicable to the sensor, P_i, and the maximum power output, P_o, available from a barrier.

By comparing the rating of the vibration sensor with that of the barrier and taking the cable values and power into account, an appropriate safety barrier can be selected. As long as the ratings of the barrier satisfy the following equations, the installed system will meet the requirement for an intrinsically safe system.

V_{oc} must be equal to or less than V_{max}
I_{sc} must be equal to or less than I_{max} (or I_i)
C_a must be greater than or equal to $C_i + C_{cable}$
L_a must be greater than or equal to $L_i + L_{cable}$
P_i must be greater than or equal to P_o

$$V_{oc} \leq V_{max}$$
$$I_{sc} \leq I_{max}$$
$$C_a \geq C_i + C_{cable}$$
$$L_a \geq L_i + L_{cable}$$
$$P_i \geq P_o$$

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Wilcoxon Research CSA intrinsically safe apparatus parameters

These sensors with certificate type CSA are approved for use in Canada and the US.

Model	Vmax	Imax	Pmax	Ci	Li	Certification
780A-IS	28 Volts	93 mA	650 mW	0.062 µF	0.0 mH	CL I Div 1-Groups A,B,C,D; CL II Div 1-Groups E,F,G; CL III Div1; CL I Zone 0 Ex ia IIC T4
786A-IS	28 Volts	93 mA	650 mW	0.10 µF	0.0 mH	CL I Div 1-Groups A,B,C,D; CL II Div 1-Groups E,F,G; CL III Div1; CL I Zone 0 Ex ia IIC T4
786F-IS	28 Volts	93 mA	650 mW	0.11 µF	0.0 mH	CL I Div 1-Groups A,B,C,D; CL II Div 1-Groups E,F,G; CL III Div1; CL I Zone 0 Ex ia IIC T4
786T-IS	28 Volts	47 mA	400 mW	0.13 µF	0.0 mH	CL I Div 1-Groups A,B,C,D; CL II Div 1-Groups E,F,G; CL III Div1; CL I Zone 0 Ex ia IIC T4
787A-IS	28 Volts	93 mA	650 mW	0.10 µF	0.0 mH	CL I Div 1-Groups A,B,C,D; CL II Div 1-Groups E,F,G; CL III Div1; CL I Zone 0 Ex ia IIC T4
787A-M8-IS	28 Volts	93 mA	650 mW	0.10 µF	0.0 mH	CL I Div 1-Groups A,B,C,D; CL II Div 1-Groups E,F,G; CL III Div1; CL I Zone 0 Ex ia IIC T4
780A-D2	NA	NA	NA	NA	NA	CL I Div 2 - Groups A, B, C, D; CL 1 Zone 2 Ex na II T4
786A-D2	NA	NA	NA	NA	NA	CL I Div 2 - Groups A, B, C, D; CL 1 Zone 2 Ex na II T4
786F-D2	NA	NA	NA	NA	NA	CL I Div 2 - Groups A, B, C, D; CL 1 Zone 2 Ex na II T4
786T-D2	NA	NA	NA	NA	NA	CL I Div 2 - Groups A, B, C, D; CL 1 Zone 2 Ex na II T4
787A-D2	NA	NA	NA	NA	NA	CL I Div 2 - Groups A, B, C, D; CL 1 Zone 2 Ex na II T4
787A-M8-D2	NA	NA	NA	NA	NA	CL I Div 2 - Groups A, B, C, D; CL 1 Zone 2 Ex na II T4
PC420-IS	30 Volt	106 mA	NA	0.006µF	0.0 mH	CL I, Div.1, Grp A,B,C,D
PC421-IS	30 Volt	106 mA	NA	0.006µF	0.0 mH	CL I, Div.1, Grp A,B,C,D
PC423-IS	30 Volt	106 mA	NA	0.006µF	0.0 mH	CL I, Div.1, Grp A,B,C,D
PC420-EX	Device parameters do not apply to EX models					CL I, Div.1,2,Grp A,B,C,D

These sensors with certificate type CSA are approved for use in Canada.

Model	Safety barrier characteristics	Certification
766-33*	31.5 volts max /68 ma or 28 volt max/300 ohm min	Ex ia CL I, Div 1 Groups A B C D
793-33*	31.5 volts max /68 ma or 28 volt max/300 ohm min	Ex ia CL I, Div 1 Groups A B C D
793L-33*	31.5 volts max /68 ma or 28 volt max/300 ohm min	Ex ia CL I, Div 1 Groups A B C D
793V-33*	31.5 volts max /68 ma or 28 volt max/300 ohm min	Ex ia CL I, Div 1 Groups A B C D
793V-5-33*	31.5 volts max /68 ma or 28 volt max/300 ohm min	Ex ia CL I, Div 1 Groups A B C D
797-33*	31.5 volts max /68 ma or 28 volt max/300 ohm min	Ex ia CL I, Div 1 Groups A B C D
797L-33*	31.5 volts max /68 ma or 28 volt max/300 ohm min	Ex ia CL I, Div 1 Groups A B C D

*Total series inductance and shunt capacitance vaires with Group. See installation drawing

Compatible barrier devices

Generally, the MTL 7728+ zener barrier, or equivalent, will be the proper choice for all 700 Series dynamic sensors.

Generally, the MTL 7787 zener barrier, or equivalent, will be the proper choice for all PC420 Series loop powered sensors.

A barrier device is not required for Class I Division 2 certified sensors used in Class I Division 2 environments.

Device specifications are subject to change, due to the research nature of the organization and our commitment to continuous improvement. Please contact a Wilcoxon customer sales and service representative to ensure accuracy.

Wilcoxon Research IECEx intrinsically safe apparatus parameters

Sensors with certificate type IECEx are approveed for use in many countries internationally.

Model	Vmax	Imax	Pmax	Ci	Li	Certification
780A-IS	28 Volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Zone 0 Ex ia IIC T4
786A-IS	28 Volts	93 mA	650 mW	0.10 µF	0.0 mH	CL I Zone 0 Ex ia IIC T4
786F-IS	28 Volts	93 mA	650 mW	0.062 µF	0.0 mH	CL I Zone 0 Ex ia IIC T4
786T-IS	28 Volts	47 mA	400 mW	0.076 µF	0.0 mH	CL I Zone 0 Ex ia IIC T4
787A-IS	28 Volts	93 mA	650 mW	0.10 µF	0.0 mH	CL I Zone 0 Ex ia IIC T4
787A-M8-IS	28 Volts	93 mA	650 mW	0.10 µF	0.0 mH	CL I Zone 0 Ex ia IIC T4
780A-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
786A-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
786F-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
786T-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
787A-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
787A-M8-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4

Compatible barrier devices

Generally, the MTL 7728+ zener barrier, or equivalent, will be the proper choice for all 700 Series dynamic sensors.
Generally, the MTL 7787 zener barrier, or equivalent, will be the proper choice for all PC420 Series loop powered sensors.
A barrier device is not required for Class I Division 2 certified sensors used in Class I Division 2 environments.

Device specifications are subject to change, due to the research nature of the organization and our commitment to continuous improvement. Please contact a Wilcoxon customer sales and service representative to ensure accuracy.

Wilcoxon Research ATEX intrinsically safe apparatus parameters

Sensors with certificate type ATEX are approved for use in EU countries.

Model	Ui	Ii	Pi	Ci	Li	Certification
780A-IS	28 Volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4
786A-IS	28 Volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4
786F-IS	28 Volts	93 mA	650 mW	0.062 µF	0.0 mH	II 1 G Ex ia IIC T4
786T-IS	28 Volts	93 mA	400 mW	0.76 µF	0.0 mH	II 1 G Ex ia IIC T4
787A-IS	28 Volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4
787A-M8-IS	28 Volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4
780A-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
786A-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
786F-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
786T-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
787A-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
787A-M8-D2	NA	NA	NA	NA	NA	II 3 G Ex nA II T4
PC420-EX	Device parameters do not apply to EX models					EEx d IIC T3
PC420-IS	30 Volt	106 mA	0.75W	0nF	0.0 mH	EEx ia IIC T3
PC421-IS	30 Volt	106 mA	0.75W	0nF	0.0 mH	EEx ia IIC T3
PC423-IS	30 Volt	106 mA	0.75W	0nF	0.0 mH	EEx ia IIC T3
766-35	28 Volts	93 mA	650 mW	0.03 µF	0.0 mH	Ex ia IIC T4
793-10-35	28 Volts	93 mA	650 mW	0.05 µF	0.0 mH	Ex ia IIC T4
793-35	28 Volts	93 mA	650 mW	0.03 µF	0.0 mH	Ex ia IIC T4
793V-35	28 Volts	93 mA	650 mW	0.05 µF	0.0 mH	Ex ia IIA T4
797-35	28 Volts	93 mA	650 mW	0.03 µF	0.0 mH	Ex ia IIC T4
797-5-35	28 Volts	93 mA	650 mW	0.03 µF	0.0 mH	Ex ia IIC T4
797L-35	28 Volts	93 mA	650 mW	0.05 µF	0.0 mH	Ex ia IIC T4

Compatible barrier devices

Generally, the MTL 7728+ zener barrier, or equivalent, will be the proper choice for all 700 Series dynamic sensors.
Generally, the MTL 7787 zener barrier, or equivalent, will be the proper choice for all PC420 Series loop powered sensors.
A barrier device is not required for Class I Division 2 certified sensors used in Class I Division 2 environments.

Device specifications are subject to change, due to the research nature of the organization and our commitment to continuous improvement. Please contact a Wilcoxon customer sales and service representative to ensure accuracy.

Wilcoxon Research FM intrinsically safe apparatus parameters

Sensors with certificate type FM are approved for use in the US

Model	Gp A,B:Vmax	Vmax	Imax	Ci	Li	Certification
766E	30 Volts	30 Volts	180 mA	0.03 µF	0.0 mH	CL I, II, III, T4, Div 1 Group - A B C D E F G Nonincendive for Class 1, Div 2 Group A B C D Suitable for Class II Div 2, Groups F, G
793E	30 Volts	30 Volts	180 mA	0.03 µF	0.0 mH	CL I, II, III, T4, Div 1 Group - A B C D E F G Nonincendive for Div 2 Group A B C D Suitable for Class II Div 2, Groups F, G
793LE	30 Volts	30 Volts	180 mA	0.03 µF	0.0 mH	CL I, II, III, T4, Div 1 Group -A B C D E F G Nonincendive for Div 2 Group A B C D Suitable for Class II Div 2, Groups F, G
793VE	30 Volts	30 Volts	180 mA	0.32 µF	0.0 mH	CL I, II, III, T4, Div 1 Group - A B C D E F G Nonincendive for Div 2 Group A B C D Suitable for Class II Div 2, Groups F, G
793V-5E	30 Volts	30 Volts	180 mA	0.32 µF	0.0 mH	CL I, II, III, T4, Div 1 Group - A B C D E F G Nonincendive for Div 2 Group A B C D Suitable for Class II Div 2, Groups F, G
797E	30 Volts	30 Volts	180 mA	0.03 µF	0.0 mH	CL I, II, III, T4, Div 1 Group - A B C D E F G Nonincendive for Div 2 Group A B C D Suitable for Class II Div 2, Groups F, G
797LE	30 Volts	30 Volts	180 mA	0.03 µF	0.0 mH	CL I, II, III, T4, Div 1 Group - A B C D E F G Nonincendive for Div 2 Group A B C D Suitable for Class II Div 2, Groups F, G
797VE	30 Volts	30 Volts	180 mA	0.32 µF	0.0 mH	CL I, II, III, T4, Div 1 Group - A B C D E F G Nonincendive for Div 2 Group A B C D Suitable for Class II Div 2, Groups F, G
376E/ CC726E	26.6 Volts	30 Volts	180 mA	0.14 µF	0.0 mH	CL I, II, III, T4, Div 1 Group - A B C D E F G Nonincendive for Div 2 Group A B C D Suitable for Class II Div 2, Groups F, G

Compatible barrier devices

Generally, the MTL 7728+ zener barrier, or equivalent, will be the proper choice for all 700 Series and 376 Series dynamic sensors.
Generally, the MTL 7787 zener barrier, or equivalent, will be the proper choice for all PC420 Series loop powered sensors.

Device specifications are subject to change, due to the research nature of the organization and our commitment to continuous improvement. Please contact a Wilcoxon customer sales and service representative to ensure accuracy.