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 requirements 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 Sensing Technologies CSA intrinsically safe apparatus parameters

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

Model	V_{max}	I_{max}	P_{max}	C_i	L_i	Certification
780A-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
786A-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
786F-IS	28 volts	93 mA	650 mW	0.068 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
786T-IS	28 volts	47 mA	400 mW	0.076 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
787A-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
787A-M8-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
787-500-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
787-500-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
787A-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
786-500-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
786-500-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 Ex ia IIC T4
786A-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	CL I Div 1 - Groups A, B, C, D; CL II Div 1 - Groups E, F, G; CL III Div 1; CL I Zone 0 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 Sensing Technologies CSA intrinsically safe apparatus parameters

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

Model	V_{max}	I_{max}	P_{max}	C_i	L_i	Certification
PC420xx-yy-IS	30 volts	106 mA	N/A	0.006 µF	0.0 mH	CL I Div 1, Groups A, B, C, D (Ta = 85°C max)
PC421xx-yy-IS	30 volts	106 mA	N/A	0.006 µF	0.0 mH	CL I Div 1, Groups A, B, C, D (Ta = 85°C max)
PC423xx-yy-IS	30 volts	106 mA	N/A	0.006 µF	0.0 mH	CL I Div 1, Groups A, B, C, D (Ta = 85°C max)
PC420xx-yy-EX	Explosion-proof model - device parameters do not apply					CL I Div 1,2 Groups A, B, C, D; CL II Div 1,2 Groups E, F, G; CL III T3C (Ta = 85°C max)
780A-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
786A-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
786F-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
786T-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
787A-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
787A-M8-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
787-500-M12-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
787-500-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
787A-M12-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
786-500-M12-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
786-500-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
786A-M12-D2						CL I Div 2 - Groups A, B, C, D; CL I Zone 2 Ex na II T4
LPA100T-D2	12 volts	330 mA	1 W	6 µF	0.0 mH	CL I Div 2 - Groups A, B, C, D; CL II Div 2 - Groups E, F, G; CL III CL I Zone 2 AEx/Ex nL IIC T5 (-50°C ≤ Ta ≤ 85°C)
PCH420-HZ						CL I Div 2 - Groups A, B, C, D; CL 1 Zone 2 AEx na nC IIC T4 (-40°C ≤ Ta ≤ 105°C)

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 Sensing Technologies CSA and FM intrinsically safe apparatus parameters

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

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

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

Model	V_{max}	I_{max}	P_{max}	C_i	L_i	Certification
993B-5-33	30 volts	100 mA	N/A	5.1 nF	3.0 mH	CL I Div 1 Groups A B C D T4, Ta = +85°C max
993B-6-33	30 volts	100 mA	N/A	5.1 nF	3.0 mH	CL I Div 1 Groups A B C D T4, Ta = +85°C max
993B-7-33	30 volts	100 mA	N/A	5.1 nF	3.0 mH	CL I Div 1 Groups A B C D T4, Ta = +85°C max
993B-7-M12 [CERT]	30 volts	100 mA	N/A	44.7 nF	3.0 mH	CL I Div 1 Groups A B C D T4, Ta = +85°C max

These sensors with certificate type FM are approved for use in the US.

Model	Parameters	Certification
766E	Entity parameters per installation drawing	CL I, II, III, Div 1 Groups A B C D E F G Nonincendive for Class I, II, III Div 2 Groups A B C D E F G (Ta = -50°C to +40°C)
793E	Entity parameters per installation drawing	CL I, II, III, Div 1 Groups A B C D E F G Nonincendive for Class I, II, III Div 2 Groups A B C D E F G (Ta = -50°C to +40°C)
793LE	Entity parameters per installation drawing	CL I, II, III, Div 1 Groups A B C D E F G Nonincendive for Class I, II, III Div 2 Groups A B C D E F G (Ta = -50°C to +40°C)
793VE	Entity parameters per installation drawing	CL I, II, III, Div 1 Groups A B C D E F G Nonincendive for Class I, II, III Div 2 Groups A B C D E F G (Ta = -50°C to +40°C)
797E	Entity parameters per installation drawing	CL I, II, III, Div 1 Groups A B C D E F G Nonincendive for Class I, II, III Div 2 Groups A B C D E F G (Ta = -50°C to +40°C)
797LE	Entity parameters per installation drawing	CL I, II, III, Div 1 Groups A B C D E F G Nonincendive for Class I, II, III Div 2 Groups A B C D E F G (Ta = -50°C to +40°C)
797VE	Entity parameters per installation drawing	CL I, II, III, Div 1 Groups A B C D E F G Nonincendive for Class I, II, III Div 2 Groups A B C D E F G (Ta = -50°C to +40°C)

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 Sensing Technologies IECEx intrinsically safe apparatus parameters

These sensors with certificate type IECEx are approved for use in many countries internationally.

Model	V_{max}	I_{max}	P_{max}	C_i	L_i	Certification
780A-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	Ex ia IIC T4 Ga
786A-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	Ex ia IIC T4 Ga
786F-IS	28 volts	93 mA	650 mW	0.062 µF	0.0 mH	Ex ia IIC T4 Ga
786T-IS	28 volts	93 mA	650 mW	0.076 µF	0.0 mH	Ex ia IIC T4 Ga
787A-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	Ex ia IIC T4 Ga
787A-M8-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	Ex ia IIC T4 Ga
787-500-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	Ex ia IIC T4 Ga
787-500-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	Ex ia IIC T4 Ga
787-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	Ex ia IIC T4 Ga
786-500-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	Ex ia IIC T4 Ga
786-500-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	Ex ia IIC T4 Ga
786A-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	Ex ia IIC T4 Ga
PC420xx-yy-IS						Ex ia IIC T4 Ga
PC421xx-yy-IS						Ex ia IIC T4 Ga
PC423xx-yy-IS						Ex ia IIC T4 Ga
PCH420-HZ						Ex nA nC IIC T4 Gc (-40°C ≤ Ta ≤ +105°C)

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.

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Wilcoxon Sensing Technologies ATEX intrinsically safe apparatus parameters

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

Model	U_i	I_i	P_i	C_i	L_i	Certification
780A-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
786A-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
786F-IS	28 volts	93 mA	650 mW	0.062 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
786T-IS	28 volts	93 mA	650 mW	0.076 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
787A-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
787A-M8-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
787-500-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
787-500-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
787-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
786-500-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
786-500-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
786A-M12-IS	28 volts	93 mA	650 mW	0.058 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
780A-D2						II 3 G Ex nA IIC T4 Gc
786A-D2						II 3 G Ex nA IIC T4 Gc
786F-D2						II 3 G Ex nA IIC T4 Gc
786T-D2						II 3 G Ex nA IIC T4 Gc
787A-D2						II 3 G Ex nA IIC T4 Gc
787A-M8-D2						II 3 G Ex nA IIC T4 Gc
787-500-M12-D2						II 3 G Ex nA IIC T4 Gc
787-500-D2						II 3 G Ex nA IIC T4 Gc
787-M12-D2						II 3 G Ex nA IIC T4 Gc
786-500-M12-D2						II 3 G Ex nA IIC T4 Gc
786-500-D2						II 3 G Ex nA IIC T4 Gc
786A-M12-D2						II 3 G Ex nA IIC T4 Gc

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 Sensing Technologies ATEX intrinsically safe apparatus parameters

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

Model	U_i	I_i	P_i	C_i	L_i	Certification
PC420xx-yy-IS	30 volts	106 mA	≤750 mW	0.0 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga (-40°C ≤ Ta ≤ +85°C)
PC421xx-yy-IS	30 volts	106 mA	≤750 mW	0.0 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga (-40°C ≤ Ta ≤ +85°C)
PC423xx-yy-IS	30 volts	106 mA	≤750 mW	0.0 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga (-40°C ≤ Ta ≤ +85°C)
PCH420-HZ						II 3 G Ex nA nC IIC T4 Gc (-40°C ≤ Ta ≤ +105°C)
PC420xx-yy-EX	Special conditions for safe use shall be conduit seals. See certification.					II 2 G Ex d IIC T3 II 3 G Ex nA IIC T3 (-40°C ≤ Ta ≤ +85°C)
766-35	28 volts	93 mA	650 mW	0.03 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
793-10-35	28 volts	93 mA	650 mW	0.05 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
793-35	28 volts	93 mA	650 mW	0.03 µF	0.0 mH	II 1 G Ex ia IIC T4 Ga
793V-35	28 volts	93 mA	650 mW	0.72 µF	0.0 mH	II 1 G Ex ia IIC T4 (-20°C ≤ Ta ≤ +40°C)
797-35	28 volts	93 mA	650 mW	0.05 µF	0.0 mH	II 1 G Ex ia IIC T4 (-20°C ≤ Ta ≤ +40°C)
797L-35	28 volts	93 mA	650 mW	0.05 µF	0.0 mH	II 1 G Ex ia IIC T4 (-20°C ≤ Ta ≤ +40°C)

Compatible barrier devices

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