Hazardous area descriptions

National Electrical Code (NEC) 500

Traditional standards used in North America.

Example: **Class I, Div 1, Group B, C, D, T4**

- **Permitted Class**
- **Permitted Division**
- **Permitted Group**
- **Temperature Class**

Permitted Class

Class I: gas vapors
Class II: dusts
Class III: fibers

Permitted Division

Division 1: gasses or vapors exist under normal conditions
Division 2: gasses or vapors are present but are normally contained and can escape only through accident or abnormal operation

Permitted Group

Group A: acetylene
Group B: hydrogen or equivalents
Group C: ethyl ether, ethylene or cylclopropane
Group D: gasoline, hexane, naphtha, benzene, butane, propane, alcohol, acetone, benzol, lacquer, and natural gas
Group E: metal dust
Group F: carbon black
Group G: flour, starch, grain dusts

Temperature Class*

T1: 450°C (842°F)
T2: 300°C (572°F)
T3: 200°C (392°F)
T4: 135°C (275°F)
T5: 100°C (212°F)
T6: 85°C (185°F)

* Device may be exposed to gases whose ignition temperature is higher than this value.

IEC & EU (European) Standards

The IEC (International Electrotechnical Commission) markings are as follows:

Example: **Ex d IIB T3 Gb**

- **Explosion Protection**
- **Type of Protection**
- **Gas Group Classification**
- **Temperature Classification**
- **Equipment Protection Level (EPL)**

Type of Protection

d: flameproof enclosure - contain explosion and quench flame
p: pressurized enclosure - fill with inert gas
ia: intrinsically safe for Zone 0 - limit energy
ib: Intrinsically safe for Zone 1 - limit energy
o: oil immersion
s: special protection
e: increased safety - no arcing, sparking or hot surfaces
m: encapsulation - sealed arcing devices or non-arcing
q: sand-filled
nL: nonincendive - limited energy
nA: nonincendive - non sparking
t: dust explosion protection by enclosure

Gas Group Classification

IIC: acetylene and hydrogen
IIB: diethel ether, ethylene, cyclopropane and others
IIA: gasoline, hexane, butane, naphtha propane, isoprene and many others

Temperature Classification*

T1: 450°C (842°F)
T2: 300°C (572°F)
T3: 200°C (392°F)
T4: 135°C (275°F)
T5: 100°C (212°F)
T6: 85°C (185°F)

* Device may be exposed to gases whose ignition temperature is higher than this value

Equipment Protection Level (EPL)

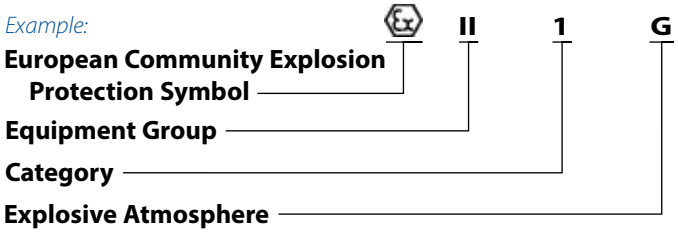
		Applicable Zone
Gas	Ga:	0
	Gb:	1
	Gc:	2
Dust	Da:	20
	Db:	21
	Dc:	22

Hazardous area descriptions

ATEX Directive 2014/34/EU

All equipment exported into European member countries must meet the ATEX hazardous and essential health and safety requirements for acceptance.

Example:



Equipment Group

I: mines
II: other than mines

Category

1: Zone 0
2: Zone 1
3: Zone 2

The ATEX markings are in addition to the standard Zone markings and indicate compliance to the directives.

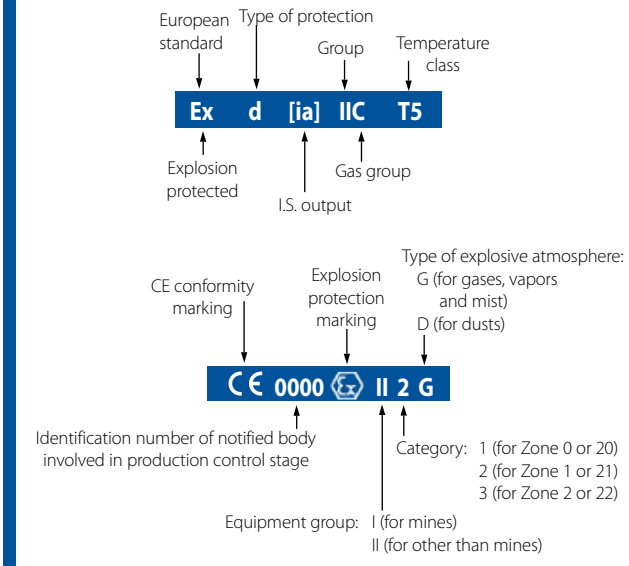
Explosive Atmosphere

G: gases/vapors
D: dusts

Other hazardous area information

European Union

EU (directive 2014/34/EU) - ATEX



Ambient temperature ranges other than standard (-20° C< Ta < +40° C) must be marked.

Area Classification

	Flammable Material Present Continuously	Flammable Material Present Intermittently	Flammable Material Present Abnormally
IEC/EU	Zone 0	Zone1	Zone 2
US NEC® 505	Zone 0	Zone1	Zone 2
US NEC® 500	Division 1		Division 2
CA CEC Section 18	Zone 0	Zone1	Zone 2
CA CEC Annex J	Division 1		Division 2

IEC classification per IEC 60079-10
EU classification per EN 60079-10
US classification per ANSI/NFPA 70 National Electric Code® (NEC®) Article 500 or Article 505
CA Classification per CSA C22.1 Canadian Electrical Code (CEC) Section 18 or Annex J

Enclosure standards and protection concepts

NEMA enclosure type standards

NEMA (National Electrical Manufacturers' Association) has established standards for enclosures to provide protection from environmental contamination. A description of the more common standards is listed below. Type definitions are from NEMA 250-1997. For more detailed and complete information, NEMA Standards Publication 250-1997, "Enclosures for electrical equipment (1000 Volts Maximum)" should be consulted. This Standards Publication, as well as all other NEMA publications, is available from IHS at 1-800-854-7179.

Comparison of specific applications of enclosures for outdoor nonhazardous locations

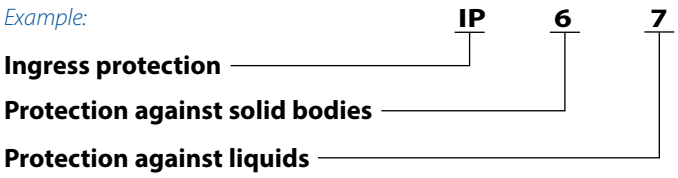
	NEMA enclosure type guide						
Provides a degree of protection against the following environmental conditions	3	3R*	3S	4	4X	6	6P
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X
Rain, snow, and sleet**	X	X	X	X	X	X	X
Sleet***	…	…	X	…	…	…	…
Windblown dust lint, fibers, and flyings	X	…	X	X	X	X	X
Hosedown	…	…	…	X	X	X	X
Corrosive agents	…	…	…	…	X	…	X
Occasional temporary submersion	…	…	…	…	…	X	X
Occasional prolonged submersion	…	…	…	…	…	…	X

* These enclosures may be ventilated.
** External operating mechanisms are not required to be operable when the enclosure is ice covered.
*** External operating mechanisms are operable when the enclosure is ice covered.

IEC enclosure standards

The International Electrotechnical Commission has established enclosure standards for protection from environmental contamination as shown below. These standards are used widely in Europe, the Middle East, Africa and parts of Asia.

Example:



Protection against solid bodies

0: no special protection
1: protected against solid objects greater than 50 mm
2: protected against solid objects greater than 12 mm
3: protected against solid objects greater than 2.5 mm
4: protected against solid objects greater than 1 mm
5: dust protected
6: dust-tight

Protection against liquids

0: no special protection
1: protected against vertical falling water drops
2: protected against vertical falling water drops when enclosure is tilted at 15°
3: protected against sprayed water
4: protected against splashing water
5: protected against water jets
6: protected against heavy seas
7: protected from the effects of temporary immersion
8: protected from the effects of continuous immersion

Chemical compatibility

The chemical compatibility reference guide has been developed to assist you in selecting the best StoneL products and material options for your applications. While this chart should assist you in selecting compatible materials, it is not a substitute for careful testing of a specific product in your operating environment. For additional assistance please contact StoneL technical support.

Key

A	No effect (recommended)
B	Moderate effect
U	Severe effect (not recommended)
FC	Fusion coating recommended on polycarbonate
---	No test data or experience available

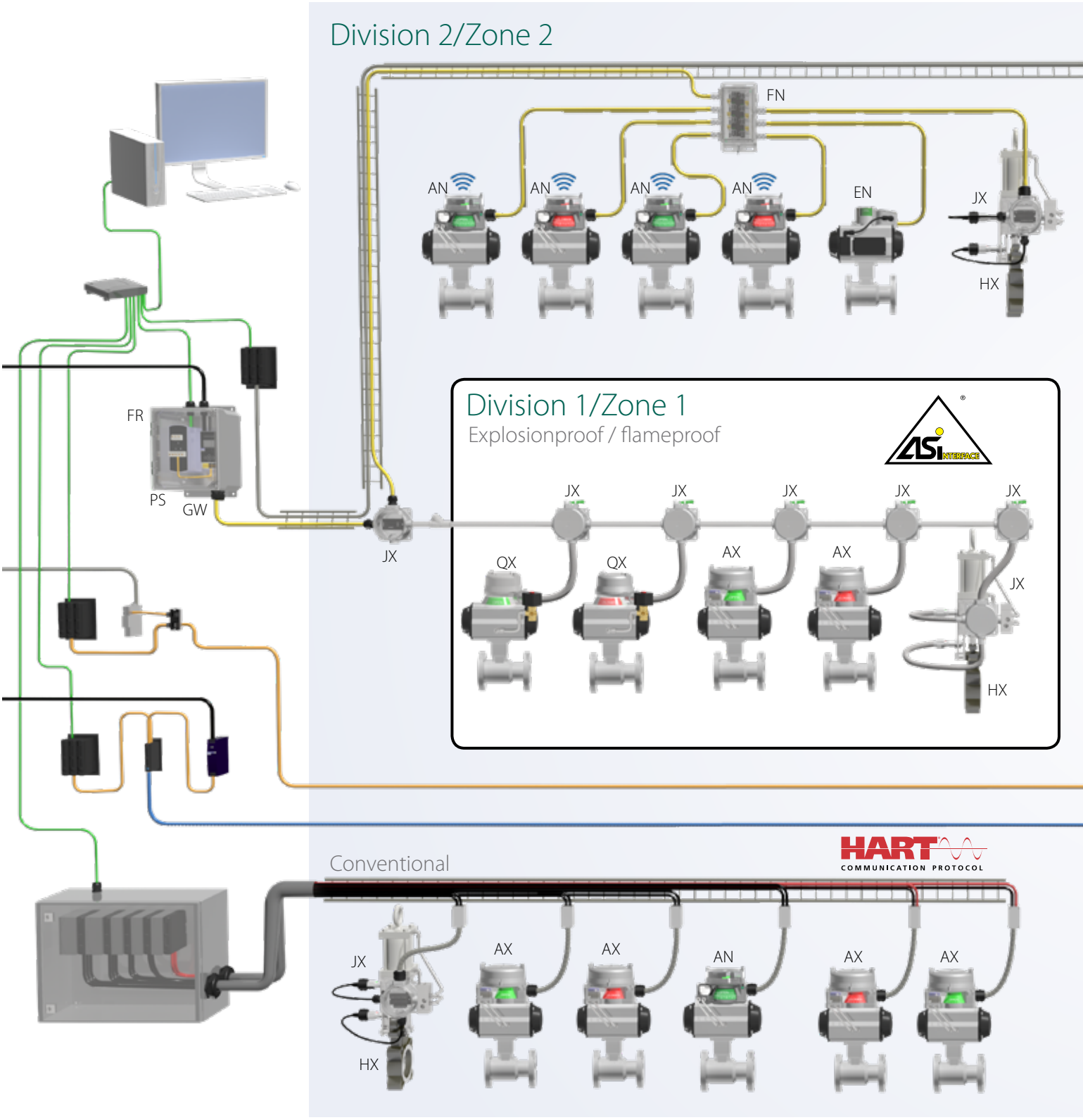
Chemical	Aluminum	Polycarbonate	Stainless Steel	Epoxy	Polysulfone
Acetic acid	A	B	A	B	A
Acetone	A	FC	A	U	B
Acetylene	A	--	A	A	--
Alcohol, amyl-	B	FC	A	A	A
Alcohol, butyl-	B	FC	A	A	A
Alcohol, ethyl-	B	FC	B	A	B
Ammonia, liquid	A	--	A	A	A
Ammonium hydroxide	B	FC	B	A	B
Beer	A	A	A	A	A
Benzene	B	FC	A	B	U
Boric acid	B	A	B	A	U
Brine	U	B	B	--	A
Bromine	U	FC	U	U	U
Calcium carbonate	U	--	B	A	--
Calcium chloride	B	A	B	A	A
Carbon tetrachloride	U	FC	B	A	A
Chlorine	B	FC	B	--	U
Chromic acid	U	B	U	B	U
Citric acid	U	B	A	A	A
Creosote	B	FC	B	--	--
Ethyl chloride	--	--	A	A	U
Ethylene	A	--	A	--	A
Ethylene oxide	U	--	B	A	A
Fluorine	B	--	A	U	U
Freon (and other similar refrigerant)	B	--	A	A	B
Gasoline	A	FC	A	A	B
Heptane and hexane	A	B	A	A	A
Hydrochloric acid, 10%	U	A[1]	U	A	A
Hydrogen (gas)	A	--	A	--	--
Hydrogen peroxide	A	A	B	B	A
Hydrogen sulfide	B	A	A	A	--
Isopropyl ether	A	A	A	U	A
Jet fuel (JP 4,5,6)	A	--	A	A	B
Kerosene	A	--	A	A	B
Methane	A	--	B	--	--
Methyl chloride	U	FC	A	A	U

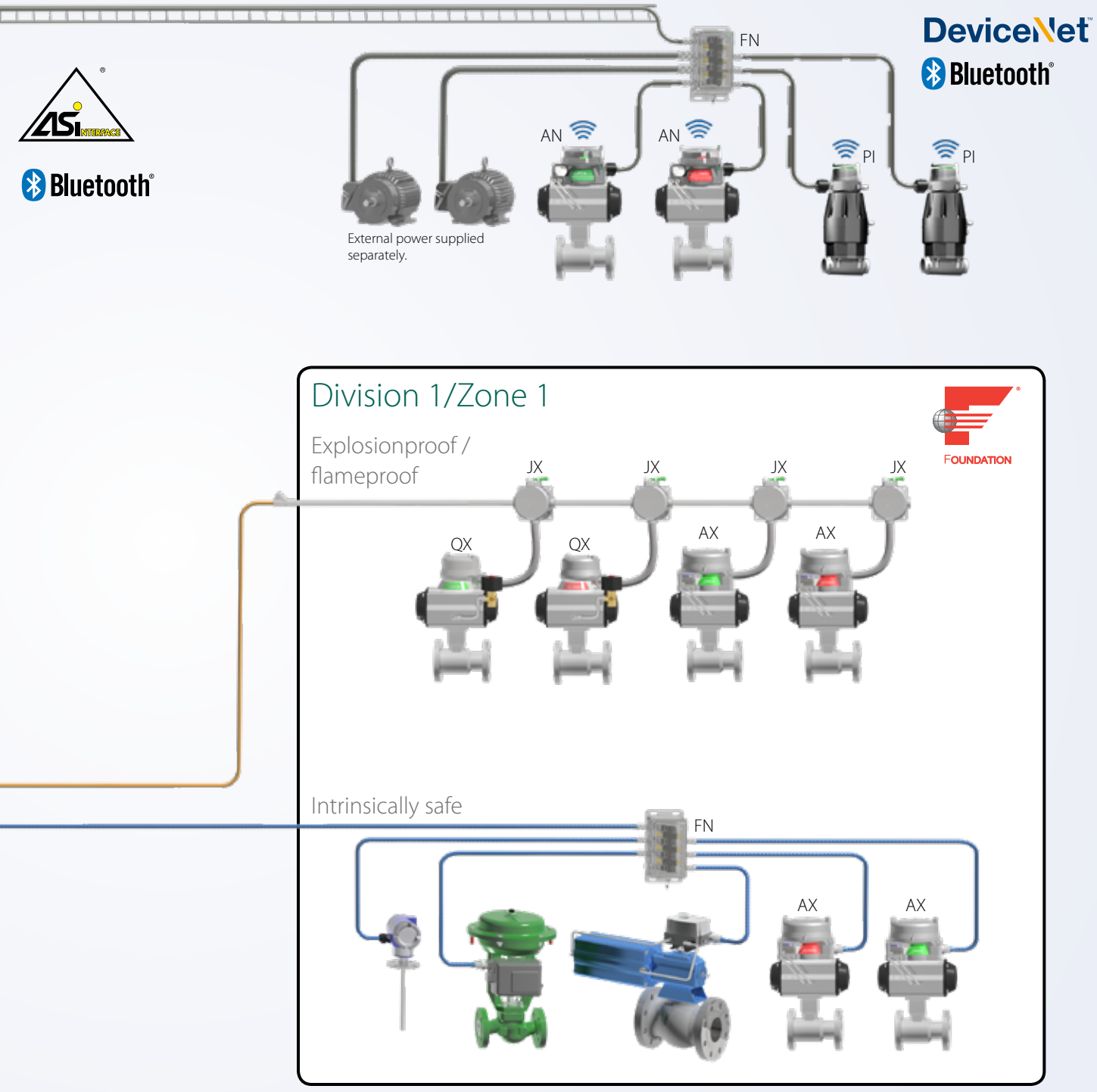
[1] Temperatures less than 30° C

Chemical	Aluminum	Polycarbonate	Stainless Steel	Epoxy	Polysulfone
Methyl ethyl ketone	B	FC	A	B	U
Methylene chloride	B	FC	A	A	U
Naptha	A	FC	B	A	A
Natural gas	A	--	A	--	--
Nickel chloride	U	FC	B	A	--
Nitric acid (10%)	B	A	A	A	A
Nitric acid (80%)	U	B	B	U	U
Nitrous oxide	U	--	B	--	--
Oils (animal)	A	B	A	A	--
Oil (diesel)	A	A	A	A	A
Oil (mineral)	A	B	A	A	A
Phosphoric acid (85%)(air free)	U	B	U	B	A
Potassium chloride	U	A	B	A	A
Potassium hydroxide (10%)	U	FC	A	A	A
Potassium hydroxide (70%)	U	FC	A	A	A
Potassium phosphate	U	---	A	--	--
Propane (LP gas)	A	A	B	A	B
Soaps and detergents	B	B	A	A	A
Sodium chloride	B	A	B	A	A
Sodium hydroxide (10%) (caustic soda)	U	B	A	A	A
Sodium hydroxide (50%) (caustic soda)	U	FC	B	A	A
Sodium phosphate (monobasic)	U	--	A	A	--
Sulfur dioxide	B	B	A	A	B
Sulfuric acid (7-40%)	U	A	U	A	A
Tannic acid	B	B	B	A	A
Toluol and toluene	A	FC	A	B	U
Turpentine	B	B	B	B	B
Urea	B	A	B	--	B
Vinyl Chloride	B	--	B	--	--
Water, salt	U	--	B	A	A

Multiple solutions for integrating your automated valves

To operate at optimum performance all components of your process need to be effectively integrated with your control system. We work with your design team and control systems suppliers to define and create the right communication and control interfaces for your discrete valves. Then we recommend the right StoneL components to fit your system and make it work together effectively.





Protection concepts shown are for illustration purposes. Final acceptance of installation including wiring practices is subject to the authority having jurisdiction.