A.4 Ex-Protection Techniques

In process areas or workplaces where the release of explosive substances cannot be eliminated, only the explosion protected equipment with at least one type of protection may be used in the hazardous classified areas. The types of protection for electrical equipment which are designed and manufactured according to NEC and IEC/ EN standards for any hazardous classified areas are listed below:

Explosionproof or Flameproof Control Box

Protection techniques for Class and Division areas (NEC)

Type of protection	Hazardous area of used	Main application
Explosionproof Apparatus	Class I, Div.1 or 2	Switchgear, control box, motor, lighting fixture
Dust Ignitionproof	Class II, Div.1 or 2	Terminal box
Dusttight	Class II, Div.2; or Class III, Div.1 or 2	Control box, lighting fixture
Purged and Pressurized	Any hazardous locations	Control cabinet, switchgear
Intrinsic Safety	Class I, Div.1 or 2; Class II, Div. 1 or 2; or Class III, Div.1 or 2	Measurement/ instrument, sensor, control device, data processing
Nonincendive Circuit*1	Class I, Div.2; Class II, Div.2; or Class III, Div.1 or 2	The circuit for equipment which is not capable to ignite the flammable gas or dust under test condition.
Nonincendive Component*1	Class I, Div.2; Class II, Div.2; or Class III, Div.1 or 2	A component having contact, installed in a very small volume, which is not capable to ignite the specific flammable materials.
Nonincendive Equipment*1	Class I, Div.2; Class II, Div.2; or Class III, Div.1 or 2	Hand-held calculator, battery-operated watches, hearing aids, low-power radio transceivers, solar cell-operated equipment
Oil Immersion	Class I, Div.2	Transformer, capacitor
Hermetically Sealed	Class I, Div.2; Class II, Div.2; or Class III, Div.1 or 2	Control device, signal unit, relay
Combustible Gas Detector	As specified for appropriate material group, or for specific gas or vapor to be encountered	Industrial building or cabinet with restricted public access. (Alarm and shutdown criteria shall be specified.)

*1) Nonincendive (circuit, component or equipment) means any arc or thermal effect produced is not capable to ignite the flammable gas, vapor or dust under test condition.

Protection techniques for Zone areas (IEC)

Type of protection	Zone area of used	Main application	Ref. standard
Intrinsic safety “i”	Zone 0, 1, 2 (ia) Zone 1, 2 (ib) Zone 2 (ic)	Measurement/ instrument, sensor, control device, data processing	IEC 60079-11, EN 60079-11
Flameproof “d”	Zone 1, 2	Switchgear, control station, motor, lighting fixture	IEC 60079-1, EN 60079-1
Increased safety “e”	Zone 1, 2	Terminal/ junction box, lighting fixture	IEC 60079-7, EN 60079-7
Encapsulation “m”	Zone 0, 1, 2 (ma) Zone 1, 2 (mb) Zone 2 (mc)	Control device, signal unit, relay	IEC 60079-18, EN 60079-18
Liquid immersion “o”	Zone 1, 2	Transformer, capacitor	IEC 60079-6, EN 60079-6
Pressurized “p”	Zone 1, 2 (p, px, py) Zone 2 (pz)	Control cabinet, switchgear	IEC 60079-2, EN 60079-2
Powder filling “q”	Zone 1, 2	Transformer, capacitor, fuse	IEC 60079-5, EN 60079-5
Type of protection “n”	Zone 2 (nA, nC, nR)	Lighting fixture, measurement, motor, non-sparking device	IEC 60079-15, EN 60079-15
Dust ignition protection by enclosure “t”	Zone 20, 21, 22 (ta) Zone 21, 22 (tb) Zone 22 (tc)	Control cabinet, switchgear, terminal box, lighting fixture	IEC 60079-31, EN 60079-31
Pressurized enclosure “p”	Zone 21, 22	Switchgear, control cabinet, motor	IEC 60079-2, EN 60079-2
Intrinsic safety “i”	Zone 20,21,22 (ia) Zone 21,22 (ib)	Measurement/ instrument, sensor, actuator, control device	IEC 60079-11, EN 60079-11
Encapsulation “m”	Zone 20,21,22 (ma) Zone 21,22 (mb) Zone 22 (mc)	Control and signal device, display unit, sensor	IEC 60079-18, EN 60079-18