

IP, NEMA and Ex Rating

Quick reference for instrumentation and control engineers



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IP code: first digit (solids)

Digit	Protection
0	None
1	Objects over 50 mm
2	Objects over 12.5 mm (fingers)
3	Objects over 2.5 mm
4	Objects over 1 mm
5	Dust protected
6	Dust tight

IP code: second digit (water)

Digit	Protection
0	None
1	Vertically dripping water
2	Dripping water, tilted 15°
3	Spraying water up to 60°
4	Splashing from any direction
5	Water jets (6.3 mm nozzle)
6	Powerful jets (12.5 mm nozzle)
7	Immersion to 1 m, 30 min
8	Continuous immersion beyond 1 m (as specified)
9	High pressure, high temperature jets

IEC 60529. IP68 conditions are set by the manufacturer.

NEMA types and nearest IP

NEMA	Use	IP
1	Indoor	IP10
2	Indoor	IP11
3	Indoor or outdoor	IP54
3R	Indoor or outdoor	IP14
3S	Indoor or outdoor	IP54
4	Indoor or outdoor	IP66
4X	Indoor or outdoor	IP66
5	Indoor	IP52
6	Indoor or outdoor	IP67
6P	Indoor or outdoor	IP68
12	Indoor	IP52
12K	Indoor	IP52
13	Indoor	IP54

NEMA to IP is one way only: a NEMA type meets at least that IP, not the reverse.

Zones and EPL (IEC 60079-10)

Zone	Hazard present	EPL
0 / 20	Continuously or for long periods	Ga / Da
1 / 21	Likely in normal operation	Gb / Db
2 / 22	Not likely, short periods only	Gc / Dc

Zones 0, 1, 2 for gas; 20, 21, 22 for dust.

Gas and dust groups

Group	Example
IIA	Propane
IIB	Ethylene
IIC	Hydrogen, acetylene
IIIA	Combustible flyings
IIIB	Non conductive dust
IIIC	Conductive dust

IIC equipment may be used in IIB and IIA areas.

Temperature classes

Class	Max surface °C
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

Ex protection concepts

Code	Concept	Zones
ia	Intrinsic safety	0, 1, 2
ib	Intrinsic safety	1, 2
d (db)	Flameproof enclosure	1, 2
e (eb)	Increased safety	1, 2
p	Pressurised	1, 2
m	Encapsulation	0 to 2 (ma)
ec / nA	Non sparking	2
t	Dust protection by enclosure	21, 22

Example marking

Gas	Ex db IIC T4 Gb
Reading	Flameproof, hydrogen group, max 135 °C, Zone 1
ATEX	(Ex) II 2 G = group II surface, category 2 (Zone 1), gas