

Thinking about hazardous location motors?

Think

DISAI
Automatic Systems
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According to API 546

Synchronous Machines
Outputs up to 50,000 kW
(67,000 HP) Voltages up to 13.8 kV
300 to 1800 rpm

WHAT IS AN EXPLOSIVE ATMOSPHERE?

An atmosphere is considered explosive when a flammable liquid produced vapor, combustible liquid produced vapor, combustible dust, or ignitable fibers and flyings mix with air in certain concentrations where they may burn or explode when exposed to hot surfaces or high energy sparks. Motor enclosure types and ingress protection techniques are selected to:

- 1) Prevent an internal explosion from igniting the surrounding atmosphere and/or
- 2) Prevent exposed surfaces from exceeding the auto ignition temperature of the potential combustible material, combustible dust, or ignitable fibers and flyings.

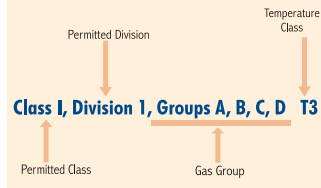
WHAT IS A COMBUSTIBLE MATERIAL?

A combustible material describes a flammable gas, flammable liquid produced vapor, or combustible liquid produced vapor mixed with air that may burn or explode. (Reference NFPA 497-2004). Combustible materials are grouped based on their explosive characteristics:

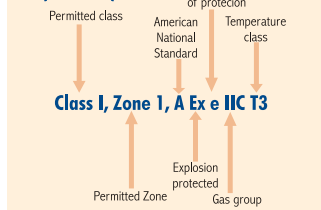
(Reference NFPA 497-2004)
Maximum Experimental Safe Gap (MESG)
Minimum Ignition Current Ratio (MIC ratio)
Minimum Ignition Energy (MIE)

EX MARKING

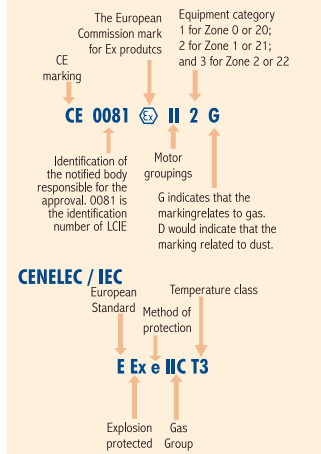
US (NEC 500)



US (NEC 505)



ATEX



The information on this poster is provided for general guidance only. It does not relieve the user from their responsibility of ensuring that equipment is installed in accordance with the appropriate codes and standards.

MOTOR STANDARDS

Standard	IEEE 841-2001	API 547	API 541 rev. 4	API 546
Title	IEEE Standard for Petroleum and Chemical Industry - Severe Duty Totally Enclosed Fan Cooled (TEFC) Squirrel Cage Induction Motors - up to and Including 370 kW (500HP).	General Purpose Form Wound Squirrel Cage Induction Motors - 250 HP and Larger	Form-Wound Squirrel Cage Induction Motors - 500 HP and Larger	Brushless Synchronous Machines - 500 kVA and Larger
Induction Generator Application	No	No	Yes	No
Design Standards	ANSI, NEMA, IEEE	ANSI, NEMA, IEEE, IEC, ISO	ANSI, NEMA, IEEE, IEC, ISO	ANSI, NEMA, IEEE, IEC, ISO
Power Range	0.75 - 370 kW (1 - 500 HP)	2P TEFC <600 kW (1000HP) 2P - WP II <930 kW (1250 HP) 4-6-8 P TEFC or WP II 185 - 1500 kW (250 - 3000 HP)	370kW and larger (500HP and larger)	500 kVA and Larger
Rating	Continuous duty Sized for 1.0 SF, with 1.15 SF on nameplate	Continuous duty Sized for 1.0 SF	Continuous duty Sized for 1.0 SF	Continuous duty Sized for 1.0 SF
Voltage Ratings	50 Hz 60 Hz 200 230 460 575 2300 4000	50 Hz 60 Hz 3000 2300 4000 6600	50 Hz 60 Hz 3000 2300 4000 6600 10000 11000	50 Hz 60 Hz 3000 2300 4000 6600 10000 13800
Speed-pole number	2, 4, 6 & 8 pole	2, 4, 6 & 8 pole	All pole numbers	All pole numbers

WHAT ARE HAZARDOUS (CLASSIFIED) LOCATIONS?

Standard	Class	Division/Zone	Group	T Codes
NEC Article 500	Class I Flammable Gases or Vapors	Division 1 Division 2	A B C D	T2 300°C T2A 280°C T2B 260°C T2C 230°C T2D 215°C T3 200°C T3A 180°C T3B 165°C T3C 160°C T4 135°C
	Class II Combustible Dusts	Division 1 Division 2	E F G	200°C 150°C 200°C 120°C 165°C (as required)
NEC Article 505	Class I Gases or Vapors	Zone 0 Zone 1 Zone 2	IIA IIB IIB + H2 IIC	T2 300°C T3 200°C T4 135°C (as required)
NEC Article 506	Class II Combustible Dust* Class III Ignitable Fibers & Flyings	Zone 20 Zone 21 Zone 22		(as required)
IEC	Gases or Vapors	Zone 0 Zone 1 Zone 2	I IIA IIB IIB + H2 IIC	T2 300°C T3 200°C T4 135°C (as required)
	Combustible Dust* or Ignitable Fibers & Flyings	Zone 20 Zone 21 Zone 22		(as required)

* Conductive Dusts are excluded

AREA CLASSIFICATION OF COMBUSTIBLE MATERIALS, COMBUSTIBLE DUSTS, AND IGNITABLE FIBERS AND FLYINGS

	Present Continuously (>1000 Hrs/Year)**	Present Intermittently (10 to 1000 Hrs/Year)	Present Abnormally (<10Hrs/Year)
NEC 500 Gas, Vapor	Zone 0	Division 1	Division 2
NEC 505 Gas, Vapor	Zone 0	Zone 1	Zone 2
NEC 506* - Dust, Fibers, Flyings	Zone 20	Zone 21	Zone 22
IEC * - Gas, Vapor	Zone 0	Zone 1	Zone 2
IEC * - Dust, Fibers, Flyings	Zone 20	Zone 21	Zone 22

* Conductive Dusts are excluded

** Motors are not generally installed in Zone 0 locations

Induction Motors
Outputs up to 50,000 kW
(67,000HP) Voltages up to 13.8 kV*
Speed from 300 to 3600 rpm.
* TEFC motors up to 11 kW.

TEFC (IC411)



TEAAC (IC611)



According to API 541 and API 547

MATERIAL CLASS AND GROUP

Gas/Dust/Fiber	MIE (mJ) MIC Ratio MESG (mm)	Auto Ignition Temperature	NEC 500 CEC	NEC 505/506	IEC
Acetylene	0.017 0.28 0.25	305°C	Class I Group A	Class I Group IIC	Group IIC
Hydrogen	0.019 0.25 0.28	520°C	Class I Group B	Class I Group IIB + H2	Group IIB + H2
Ethylene	0.070 0.53 0.65	450°C	Class I Group C	Class I Group IIB	Group IIB
Propane	0.25 0.82 0.97	450°C	Class I Group D	Class I Group IIA	Group IIA
Methane	0.28 1.00 1.12	630°C	Class I Group D (Minima)*	Class I Group I	Group I
Metallic Dust		20°C and up	Class II Group E	None	None
Coal Dust		170°C 180°C	Class II Group F	Class II Zone 20,21,22	Zone 20,21,22
Grain Dust		120°C 680°C	Class II Group G	Class II Zone 20,21,22	Zone 20,21,22
Fibers			Class III	Class III Zone 20,21,22	Zone 20,21,22

* For mining application refer to MSHA

PROTECTION CONCEPTS

Method of Protection	Symbol	Permitted Zone	ATEX Category	CENELEC Std.	IEC Std.
Flameproof	Ex d	1 & 2	2 & 3	EN50018	79-1
Enclosed Break	Ex nC	2	3	EN50021	79-15
Powder Filled	Ex q	1 & 2	2 & 3	EN50017	79-5
Increased Safety	Ex e	1 & 2	2 & 3	EN50021	79-7
Non Sparking	Ex nA	2	3	EN50021	79-15
Intrinsic Safety	Ex ia	0, 1 & 2	1, 2 & 3	EN50020	79-11
Energy Limitation	Ex ib	1 & 2	2 & 3	EN50020	79-11
	Ex nL	2	3	EN50021	79-15
Purged/Pressurized	Ex p	1 & 2	2 & 3	EN50016	79-2
Encapsulation	Ex m	1 & 2	2 & 3	EN50028	79-18
Oil Immersion	Ex o	1 & 2	2 & 3	EN50015	79-6
Restricted Breathing	Ex nR	2	3	EN50021	79-15
Special	Ex s	0*, 1 & 2	1, 2 & 3	EHSR	

* Must state "suitable for Zone 0"

ACRONYMS

NEC National Electrical Code
IEC International Electrotechnical Commission
CENELEC European Committee for Electrotechnical Standardization
BSHA Mine Safety and Health Administration
CSA Canadian Standards Association
API American Petroleum Institute
ISO International Organization for Standardization
CEC Canadian Electrical Code
ATEX Atmosphère Explosible

INGRESS PROTECTION (IP) CODES

First number	Second number
Protection against solid bodies	Protection against liquid
0 - No protection	0 - No protection
1 - Objects greater than 50mm	1 - Vertically dripping water
2 - Objects greater than 12mm	2 - 75° to 90° dripping water
3 - Objects greater than 2.5mm	3 - Sprayed water
4 - Objects greater than 1mm	4 - Splashed water
5 - Dust-protected	5 - Water jets
6 - Dust-tight	6 - Heavy seas
	7 - Effects of immersion
	8 - Indefinite immersion

Approximate US Enclosure Type Equivalent to IPXX

Type	IP	Type	IP	Type	IP
1	10	35	54	6 & 6P	67
2	11	4 & 4X	55	12 & 12K	52
3	54	5	52	13	54
3R	14				

LV Ex d
Motors also available



WP - II (IC01)



TEWAC (IC81W)



According to API 541 and API 547

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