

NEMA designates certain enclosure types, and the degree of protection against environmental intrusion that each affords. The more common of these enclosure types are **Open machines:** Drip-Proof (ODP), and Weather Protected (WPI/WPII); **Totally Enclosed machines:** Fan Cooled (TEFC), Pipe-Ventilated (TEPV), Air Over (TEAO), Non-Ventilated (TENV), Air to Air (TEAAC), Water to Air (TEWAC), and Explosion-proof (XP); and those with encapsulated or sealed windings.

ODP (Open Drip Proof)

Cooling air flows inside motor directly from the outside using fans built inside the motor. Water dripping at up to a 15 degree angle from vertical will not enter the motor. Suitable for most indoor or protected areas which have relatively clean environments.

WPI (Weather Protected I)

The addition of screens to an ODP motor prevents the ingress of large particles from entering the motor. Suitable for most indoor or protected areas which have relatively clean environments.

WPII (Weather Protected II)

Baffles on the inlet of the motor force air to change direction by 90 degrees 3 times. This prevents water and a certain degree of dust from entering the motor making it suitable for most outdoor applications or indoor applications which have water spraying from angles more than 15 degrees from vertical. WPII is designed to be suitable for outdoor applications with up to 100MPH winds driving rain at the motor.

TEFC (Totally Enclosed Fan Cooled)

This enclosure type has an external fan which blows air across the motor frame's external cooling fins. The air inside the motor recirculates and is cooled by heat transfer through the frame.

TEPV (Totally Enclosed Pipe Ventilated)

Sometimes referred to as TEFV – Totally Enclosed Forced Ventilated. Similar in construction to ODP but has external cooling air brought to the motor through ducts or pipes. Typically air is forced into the motor by an externally powered fan. The customer must provide airflow to the motor as specified by the manufacturer. Sometimes the motor is designed with internal fans that pull air into the motor. In this instance, the end user's external fan just has to overcome the static pressure of the supply and/or exhaust ducting. This allows clean outside air to flow through the motor in areas which are full of dust and other airborne contaminants.

TEAO (Totally Enclosed Air Over)

This enclosure is similar to TEFC but does not have its own cooling fan, rather it sits in an airstream such as in a ventilating duct. Most often, this motor is powering a direct-coupled fan and is mounted right in the air duct that it is blowing air through.

TENV (Totally Enclosed Non Ventilated)

Similar to TEFC but the motor is designed with a low enough temperature rise so that an external fan is not required for cooling, or duty is limited so the motor does not overheat.

TEAAC (Totally Enclosed Air to Air Cooled)

This enclosure type has an external fan which blows air through heat exchanger tubes in the motor frame. The air inside the motor re-circulates and is cooled by heat transfer through the heat exchanger tubes.

TEWAC (Totally Enclosed Water to Air Cooled)

This enclosure type uses cooling water running through a heat exchanger (much like the radiator in a car) to take heat away from the air circulating inside the motor. This enclosure type is commonly used on larger refiner motors.

XP (Explosion Proof)

Explosion-proof motors are intended for use in hazardous locations, which are classified according to the nature of the hazard. The CLASS designation indicates the type of combustible to be expected: Class I indicates combustible gases or vapors; Class II indicates combustible or electrically conductive dusts and Class III indicates easily ignitable fibers or flyings. Class I and II locations are further divided into two DIVISIONS, with the Division designation indicating the frequency and duration of the presence of the combustible gas or dust. A Division 1 location is one in which the hazardous gas or dust is expected to be present under normal operating conditions or may exist frequently. A Division 2 location is one in which combustibles are not normally expected to be present, but which, under certain (usually failure mode) conditions, may be present in hazardous concentrations. Atmospheric GROUP ratings are used to indicate the gas grouping. However, the Canadian Electrical Code and NFPA should be consulted for specific gas characteristics.