



Understanding NEMA 4, 4X, and 6 Ratings for Industrial Sensors and Switches

Introduction

In industrial environments, the **National Electrical Manufacturers Association** (NEMA) ratings define the level of protection an enclosure provides against external elements like dust, water, and corrosion. For sensors and switches such as those used in **Whitman Controls' Red Seal technology**, choosing the correct rating is the difference between a long-lasting installation and a premature system failure.

NEMA 4: Watertight and Dust-Tight

NEMA 4 enclosures are designed for both indoor and outdoor use. They provide a high level of protection against environmental hazards but are not intended for prolonged submersion.

Protection includes:

- Windblown dust and rain
- Splashing and hose-directed water
- External ice formation, the housing must remain undamaged by ice buildup on its exterior

Common use case: Standard outdoor power washdown areas or locations subjected to heavy rain and wind.



A sealed enclosure or junction box being sprayed with a hose in a washdown area.

NEMA 4X: All of NEMA 4 - Plus Corrosion Resistance

NEMA 4X provides the exact same physical protection as NEMA 4 but adds a critical requirement: **corrosion resistance**.

- **Material standard:** Enclosures are typically constructed from **316L Stainless Steel** or specialised plastics that withstand salt spray and corrosive chemicals.
- **Chemical defence:** Designed to survive environments where standard metals would pit or degrade such as chemical processing plants or offshore platforms.

Common use cases: Marine environments with salt fog, food processing facilities using caustic cleaners, and wastewater treatment plants.



A 316L stainless steel enclosure installed near chemical tanks or in a marine setting, showing the material and environment clearly.

NEMA 6 and 6P: Submersible Protection

NEMA 6 ratings move beyond splashing and hose-directed water into the realm of actual submersion.

- **NEMA 6:** Protected against occasional, temporary submersion at a limited depth.
- **NEMA 6P (Prolonged):** The "P" indicates protection against prolonged submersion at limited depths.

Whitman Controls' Red Seal potted sensors are built to meet NEMA 6 standards, allowing them to function reliably even if a tank overflows or a pit floods.

Common use cases: Below-ground utility vaults, quarry equipment, and reservoirs where the sensor may be occasionally submerged.

NEMA 4 vs. 4X vs. 6

Feature	NEMA 4	NEMA 4X	NEMA 6
Indoor/Outdoor Use	Yes	Yes	Yes
Dust & Windblown Dust	Yes	Yes	Yes
Hose-Directed Water	Yes	Yes	Yes
Corrosion Resistance	No	Yes	No (Unless specified)
Limited Submersion	No	No	Yes

About Whitman Controls and Industrial Control Solutions

Whitman Controls, part of **Industrial Control Solutions**, has been manufacturing precision vacuum, temperature, pressure, and liquid level switches and sensors for over 40 years. What

began as a focused instrumentation manufacturer has grown into a trusted name across some of the most demanding industries in the world - aerospace, defense, medical, and industrial automation.

As a **Service-Disabled Veteran-Owned Small Business**, Industrial Control Solutions was built on the same principles that define military service: tireless dedication, rigorous quality standards, and an unwavering commitment to the mission. That foundation isn't marketing language, it shapes how we engineer every product, handle every order, and support every client relationship.

We don't offer off-the-shelf compromises. Every sensor solution we build is configurable to your exact application, accounting for media environment, pressure range, temperature exposure, mounting constraints, and dozens of other specifications. If a standard product doesn't meet your requirements, we build one that does and we back it with full documentation and traceability at every step.

Every product ships with full traceability documentation under our **ISO 9001:2015 certification**, giving customers confidence that internal processes, materials, and finished products have all met the highest standards of quality and regulatory compliance.

At Industrial Control Solutions, our most loyal clients have been with us for the entirety of our 40+ years in business. That kind of partnership isn't accidental. It is the direct result of a commitment to delivering exactly what we promise; high-quality products, built to specification, backed by people who stand behind their work.

Our product portfolio spans four specialized USA-manufactured lines:

- [Whitman Controls](#) - Vacuum, pressure, temperature, and liquid level switches engineered for precision and durability in extreme environments
- [Load Controls](#) - Pump load controls, compact power sensors, fast-response load controllers, current sensors, and VFD-compatible solutions
- [Thomas Products](#) - Flow switches, level switches, pump controls, multi-level switches, and visual indicators
- [Duro-sense](#) - High-quality platinum and noble thermocouples, RTDs, and ISO 17025 calibrated wire

Frequently Asked Questions

Q: What is the difference between NEMA 4 and NEMA 4X? NEMA 4X includes all the same protection as NEMA 4 - dust, rain, and hose-directed water plus a certified corrosion resistance requirement. NEMA 4 alone does not protect against salt spray or caustic chemical exposure.

Q: Can a NEMA 4X enclosure be submerged? No. NEMA 4X does not cover submersion. For applications where submersion is possible, NEMA 6 or 6P is required.

Q: What does "potted sensor" mean in relation to NEMA 6? A potted sensor has its internal components encased in a protective resin compound, sealing them from water ingress. This construction method allows sensors to meet NEMA 6 submersion standards.

Q: Are NEMA ratings the same as IP ratings? No. NEMA and IP (IEC Ingress Protection) ratings are related but not directly interchangeable. NEMA ratings often carry requirements such as corrosion resistance in NEMA 4X, that have no direct IP equivalent.

Q: Which NEMA rating is right for food processing environments? NEMA 4X with 316L stainless steel is the typical specification for food processing, as these facilities use caustic cleaning agents that NEMA 4 enclosures are not rated to resist chemically.