TERMONOLOGY

Pneumatic Actuator

An air operated mechanical device used to open and close or modulate a valve. The actuator, which is mounted to the valve by a bracket and coupled to the stem, is designed to convert air pressure into mechanical force sufficient to operate the valve.

Double-Acting Pneumatic Actuator

Any pneumatic actuator which uses air to drive the actuator output shaft in both the open and close direction. The air supply is piped to one side of a piston-drive or a diaphragm while the air contained on the opposing side is exhausted.

Spring-Return Pneumatic Actuator

Any pneumatic actuator which contains a single coil spring or group of coil springs to oppose the movement of a piston or diaphragm. As air moves the piston or diaphragm the spring is compressed. When the air supply is discontinued and exhausted, the spring extends and drives the piston or diaphragm in the opposite direction. This type of actuator is normally used for applications where it is necessary for the valve to move to the open or close position upon loss of air supply, whether by design or by system failure.

Fail-Open-Spring return pneumatic actuator is applied to the valve such that the spring will drive the valve to the open position upon loss of air (may be termed air-to-close)

Fail-Closed-Spring return pneumatic actuator is applied to the valve such that the spring will drive the valve to the close position upon loss of air (may be termed air-to-open)

Electric Actuator

An electro-mechanical device used to open and close or modulate a valve. The actuator (which is mounted and coupled to the valve in similar fashion as the pneumatic actuator), operates the valve using an electric motor driving a gear train. While the basic function of the electric actuator is similar to the pneumatic, there are distinct differences in the application and flexibility of the two types, and these differences should be considered to select the proper type.

Electric Failsafe Actuator

Electrically driven actuator that contains an internal spring to close the valve on loss of electricity.

Actuator Accessory and Rating Terminology

Nema Rating-National Electrical Code Ratings for electrical component enclosures.

Most Commonly Applied to Actuation Products:

Nema 4-Weather-proof enclosure suitable for indoor/outdoor applications to protect from windblown dust, rain or hose-directed water.

Nema 4x-Offers the same protection as Nema 4 with the addition of corrosion resistance.

Nema 6-Enclosure that may be submerged up to six feet for 30 minutes.

Nema 7-Enclosure for hazardous locations must be capable of withstanding an internal explosion of gases so as not to ignite an external gas-air mixture.

COMPLETE LISTING

NEMA ratings.

There are many NEMA ratings available for enclosures. Below, is an brief explanation of each NEMA rating.

NEMA 1

Type 1 enclosures are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment or locations where unusual service conditions do not exist.

NEMA 2

Type 2 enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling
water and dirt.

NEMA 3

Type 3 enclosures are intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet; and to be undamaged by the formation of ice on the enclosure.

NEMA 3R

Type 3R enclosures are intended for outdoor use primarily to provide a degree of protection against falling rain; and to be undamaged by the formation of ice on the enclosure.

NEMA 4

Type 4 enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose directed water; and to be undamaged by the formation of ice on the enclosure.

NEMA 4X

Type 4X enclosures are intended for indoor and outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose-directed water; and to be undamaged by the formation of ice on the enclosure.

NEMA 6

Type 6 enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against the entry of water during temporary submersion at a limited depth; and to be undamaged by the formation of ice on the enclosure.

NEMA 7

Type 7 enclosures are for indoor use in locations classified as Class I, Groups A, B, C, or D, as defined in the National Electrical Code.

Type 7 enclosures shall be capable of withstanding the pressures resulting from an internal explosion of specified gases, and contain such an explosion sufficiently that an explosive gas-air mixture existing in the atmosphere surrounding the enclosure will not be ignited. Enclosed heat generating devices shall not cause external surfaces to reach temperatures capable of igniting explosive gas-air mixtures in the surrounding atmosphere. Enclosures shall meet explosion, hydro-static, and temperature design tests.

NEMA 9

Type 9 enclosures are intended for indoor use in locations classified as Class II, Groups E, F, or G, as defined in the National Electrical Code.

Type 9 enclosures shall be capable of preventing the entrance of dust. Enclosed heat generating devices shall not cause external surfaces to reach temperatures capable of igniting or discoloring dust on the enclosure or igniting dust-air mixtures in the surrounding atmosphere. Enclosures shall meet dust penetration and temperature design tests, and aging of gaskets (if used).

NEMA 12

Type 12 enclosures are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids.

NEMA 13

Type 13 enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and noncorrosive coolant.

NEC RATINGS

NATIONAL ELECTRICAL CODE (NEC) RATINGS

Hazardous Classifications:

CLASS I: Areas in which flammable gases or vapors may be present in the air in sufficient quantities to be explosive

Group A: Atmospheres containing acetylene
Group B: Atmospheres such as butadiene, ethylene oxide, propylene oxide, acrolein, or hydrogen (or gases or vapors equivalent in hazard to hydrogen, such as manufactured gas)
Group C: Atmospheres such as cyclopropane, ethyl ether, ethylene, or gas or vapors of equivalent hazard
Group D: Atmospheres such as acetone, alcohol, ammonia, benzene, benzol, butane, gasoline, hexane, lacquer solvent vapors, naphtha, natural gas, propane, or gas or vapors of equivalent hazard

CLASS II: Areas made hazardous by the presence of combustible dust

Group E: Atmospheres containing combustible
metal dusts, regardless of resistivity
dust of similarly hazardous characteristics having a resistivity less than 100 kO-cm
electrically conductive dusts
Group F: Atmospheres containing combustible
carbon black, charcoal, or coke dusts having more than 8% total volatile material
dusts so sensitized that they present an explosion hazard, and dusts having a resistivity greater than 100 O-cm but less than or equal to 1 x 108 O-cm
Group G: Atmospheres containing combustible
dust having resistivity equal to or greater than 100 kO-cm
electrically nonconductive dusts

CLASS III: Areas made hazardous by the presence of easily ignitable fibers or dust, but which are not likely to be in suspension in the air in quantities that are sufficient to ignite

Division 1: Atmospheres where hazardous concentrations exist continuously, intermittently, or periodically under normal operating conditions
Division 2: Atmospheres where hazardous concentrations exist only in case of accidental rupture or breakdown of equipment

Explosion-proof: Enclosures or housings are designed to withstand internal explosions and prevent the spread of fire to the outside.

Intrinsically-safe: Systems designed in which electrical energy in the circuits is not present at levels that would ignite a flammable mixture of a gas and air.

ACTUATOR ACCESSORIES LIST NOTES

SOLENOIDS

.An electro-magnetically operated valve which enables electrical control of the air supply to a pneumatic actuator. Double-acting actuators require a four-way solenoid, while the spring-return actuators require a three-way solenoid to achieve the proper supply-exhaust air flow patterns.

The purpose of a solenoid is to actuate the valve electronically. Air is supplied to the solenoid 24/7 then a button is pushed creating a current allowing the air to flow to the valve opening or closing it

LIMIT SWITCHES

Electrical switches which may be applied to manual or automated valves to signal that the valve cycle has been completed. When applied to manual or pneumatically actuated valves, it is most common to provide two switches in a Nema Rated Enclosure. Each switch is activated by an adjustable tripping device driven by the actuator or valve system. Normally one switch is adjusted to trip in the open position and one is adjusted to trip in the closed position. Optional additional switches are available to perform other functions; i.e., pump start-up or shut-down. All electric actuators have Open/Close limit switches

The purpose of a limit switch is to indicate valve position remotely

MECHANICAL LIMIT SWITCH

Any limit switch, usually plunger or lever type, which is mechanically activated by the tripping mechanism making physical contact with the switch, and are normally used for remote valve position indication.

PROXIMITY LIMIT SWITCH

A solid state switch is electrically tripped without mechanical contact being made. This type of switch is generally used to interface with computer or microprocessor controls.

POSITIONERS

Instrument attached to a pneumatic valve actuator, providing accurate, automatic modulating control of the valve between the open and closed positions by increasing, decreasing, and balancing the air supply to the actuator as determined by a varying input signal generated by an external instrument source. While the operation positioners may vary, the basic function will be either the pneumatic positioner, designed to receive a 3 to 15 PSI signal, or the electro-pneumatic, designed to receive a 4 to 20 milliamp signal.

A positioner allows the user to position the valve in any position between open and closed, electronically.