

SECTION _____

PNEUMATIC ROTARY VANE C541-08 VALVE ACTUATORS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish, install, startup, and test pneumatic rotary vane AWWA C541-08 compliant valve actuators and associated valves with required accessories as shown on the Plans and as specified herein. A single supplier shall provide the vane type pneumatic valve actuators and valves as one complete system. The valves shall be in accordance with Section _____.
- B. The CONTRACTOR shall furnish and install the required air tubing with fittings, connections, taps, pressure switches, electrical devices, wiring, and terminations necessary for a complete system and shall also install the valves with valve actuators. Each actuator shall have an isolation safety exhaust valve with locking handle provided at each branch airline to the actuator. Air tubing shall be furnished and installed from the compressor to the actuators. Air tubing and fittings shall be hard drawn copper and sized as shown on the Plans. Slope air headers to low points and provide moisture traps with drip legs at the low points. Branch connections off main line shall be made off the top of the main line. Furnish taps, isolation valves, and pressure switches on the air piping as shown on the Plans.
- C. The CONTRACTOR shall coordinate between the pneumatic valve actuator/control valve supplier and the control system supplier to provide complete and fully operational system. It will be the valve/actuator supplier's responsibility to provide actuators that are capable of sending and accepting the necessary signals from the control system. The valve/actuator supplier shall provide any limit switches, positioners or other devices necessary to enable the status of the valves (OPEN/CLOSE or position for modulating valves) to be monitored and controlled by the control system.

1.02 QUALITY ASSURANCE

- A. All equipment of each type specified in this section shall be supplied by a single supplier.
- B. The equipment supplier shall furnish a qualified field representative for a minimum of _____ working days total on _____ separate occasions to provide guidance with installation, inspect all equipment described herein after installation, to assist in troubleshooting, to advise the OWNER during startup and testing, and to train Owner's personnel in routine maintenance and troubleshooting procedures. This time period shall consist of a minimum of 8-hour days, and travel to and from the project site shall not be included. CONTRACTOR shall coordinate the scheduling of such training and startup assistance with Owner's personnel. Travel to and from the project site shall be the responsibility of and at the cost of the equipment supplier. OWNER may videotape training session.
- C. Supplier's installation report is required prior to final acceptance.
- D. Supplier shall maintain a complete stock of spare parts commonly needed for the equipment specified at a location, or shall furnish spare parts within 48 hours of request.
- E. All automated valve assemblies shall have an engraved Type 316 stainless steel manufacturer's nameplate securely affixed in a conspicuous place on the equipment showing

the ratings, serial number, model number, manufacturer and other pertinent nameplate data.

1.03 SUBMITTALS

- A. Submittals shall be prepared and submitted in accordance with Section _____.
- B. The following submittals are required at a minimum in addition to the applicable requirements of Section _____.
 - 1. Shop drawings and applicable product data specific to this project shall be supplied in electronic format or bound neatly in a single package per engineer's requirements. The following information shall be included as a minimum:
 - a. Part numbers of all equipment within this specification and a schedule showing all operators and valves furnished for this project.
 - b. Design performance characteristics, capacities, sizes, ratings, and other appropriate information.
 - c. Layout drawings including all proposed system components with dimensions, clearances required and sizes indicated, and arrangement and size of connections.
 - d. Listing of materials of construction for all components.
 - e. Complete information on all electric and instrumentation equipment and electric power requirements.
 - f. Complete wiring diagrams and data on controls to be furnished.
 - g. Manufacturer's instructions regarding delivery, storage and handling of equipment.
 - h. Adjustable settings with range provided for valve opening, closing, and emergency closing speeds.
 - 2. Location of nearest stocking distributor of spare parts
 - 3. Complete operation and maintenance data for all major equipment and ancillary items in accordance with specifications.
 - 4. Startup and test schedule.
 - 5. Equipment installation report with field test data and test records.
 - 6. Warranties and service agreements.
- C. All deviations from Contract Documents shall be clearly identified and submitted to the ENGINEER through the CONTRACTOR as a Contract Modification Request.
- D. Any other information necessary for ENGINEER to determine compliance with the specifications.
- E. ENGINEER will not review Partial or incomplete submittals.

1.04 EXPERIENCE REQUIREMENTS

- A. All equipment shall be furnished by a supplier or manufacturer having at least twenty (20) U.S. installations of the type being proposed, including coordination and assembly responsibility for the valve, actuator and associated devices for a complete package, each with a minimum of 5 years of satisfactory service.
- B. A list of similar installations shall be furnished with the shop drawing submittal, including names and telephone numbers of contacts.

1.05 DELIVERY, STORAGE AND HANDLING

Delivery, storage and handling shall be in full accordance with manufacturer's instructions.

1.06 WARRANTY

All actuator assemblies shall be warranted for a period of three (3) years from date of shipment. A certificate listing actuator serial numbers shall be provided prior to shipment in order to validate the warranty. Valve carries valve manufacturer's standard warranty.

PART 2 - PRODUCTS

2.01 PNEUMATIC ROTARY VANE C541-08 VALVE ACTUATOR DESIGN

- A. The actuator is essentially an integral part of the valve assembly.
- B. Actuator Design: Pneumatic actuators are to be of the vane type design with only one (1) moving part. Actuator shall have a vane position indicator milled into the output shaft. One side of the actuator shall be manufactured to ISO/NAMUR mounting standards for attachment of accessories (limit switches, indicators, positioners). Seals shall be double opposed lip seals with stainless steel expanders. Seal backing plates shall be steel. O-ring seals on vane will not be acceptable.
- C. Actuator Materials of Construction:
 - 1. Housing: Pressure die cast ADC1 or A356 aluminum casting with all surfaces coated with thermosetting polyester powder coat with Ultraviolet Inhibitor. Zinc housing will not be permitted. Actuator housing to include industry-standard NAMUR accessory mount interfaces as an integral part of the housing. The NAMUR VDI/VDE 3845 to be included on top of the actuators and on the solenoid manifold to allow for the easy installation of standard actuator control accessories.
 - (i) For highly corrosive installations and where specified in the Valve Actuator Schedule, the actuator manufacturer shall provide a Fluoropolymer final finish on both the actuator interior and exterior and on the complete vane and output shafts. Exterior-only coating will not be acceptable and manufacturer must have at least 5 years of successful installation history with the Fluoropolymer finish.
 - (ii) The Fluoropolymer coating shall have documented testing to chemical resistance to salt spray, ammonium hydroxide, hydrochloric acid, calcium hypochloride, sodium hypochloride, ferric chloride, among other chemicals for a period of six (6) months with no deterioration.
 - (iii) Vane actuator case halves will have Fluoropolymer coating prior to assembly. The case halves shall be Fluoropolymer coated on all surfaces including all tapped holes, untapped holes, flat face flange, and any other opening or ports.
 - (iv) Actuator vane shall be electro less nickel-plated finish prior to application of the Fluoropolymer coating on vane.
 - (v) All threaded fittings shall have a locking and sealing compound designed for metal tapered threads and fittings. All actuators shall be tested after assembly. Actuators shall not require more than three (4) psig to be cycled a complete stroke in each direction before they are connected to the valve. Test report documenting zero (0) cross vane leakage shall be submitted prior to shipment.
 - 2. Vane / Output Shaft: Steel ASTM A148 per AWWA C541-2, Grade 115-95, heat treated with electro less nickel plated finish. Ductile Iron vane / output shafts will not be acceptable.
 - 3. Vane Seals: HBNR highly-saturated Buna Nitrile, rated -5 to +300 degrees F., no exception.
 - 4. Shaft Seals: Buna N.
 - 5. Vane Seal Expanders: Stainless spring steel.
 - 6. Side Plates: Steel with all surfaces coated with thermosetting epoxy powder coat.

C. Actuator Position-Control Capability:

1. Open/Close Valves: Actuators shall be solenoid operated. Solenoids for smaller size actuators shall be standard ISO/NAMUR VDI/VDE 3845 direct mounted with the option to be remote mounting for increased accessibility. Solenoid coils shall be 120 VAC / 60 Hz, NEMA 4 rated. Speed control devices shall allow independent adjustment of OPEN and CLOSE cycling speed. Each solenoid valve to include detented pushbutton manual override to lock-and-hold valve in either the OPEN or CLOSE position in the event of a power outage. Exhaust air mufflers shall be standard. Provide 80 to 150 PSI clean, dry air to solenoid valve. Solenoid valves shall be K-TORK 'SIDEWINDER' Series.

Each Open/Close actuator shall include valve position feedback limit switches for remote OPEN and CLOSE indication. Two SPDT switches shall be housed in a NEMA 4/4X aluminum enclosure with polycarbonate lid and include a 3D Dome-style visual valve position indicator that can be seen from above and from the side. Green=Open and Red=Close. The switch box output shaft and fasteners to be stainless steel and shall mount to the actuator per NAMUR VDI/VDE 3845 with a stainless steel bracket. The two electromechanical switch contacts shall be rated 5A@250 VAC, 0.5A@24 VDC, resistive/inductive. Limit switches shall be adjustable by press, turn and release motion requiring the use of no tools. The limit switch assembly to be UL and CUL Listed and approved and shall be manufactured by Rotork / K-TORK 'SOLDO' Series.

The solenoid coil must be pre-wired to spare terminals labeled 'Solenoid Valve' inside the limit switch enclosure and all field connections for both the limit switches and solenoid valves shall be terminated inside the limit switch box.

2. Modulating Valves: The actuator shall be designed to control the valve in all positions from fully open to fully closed, and from fully closed to fully open with control in any intermediate position corresponding to the variable controls system input. Positioner shall consume a MAXIMUM of .070 SCFM while in the resting state. Positioners consuming greater than .070 SCFM will not be acceptable. Modulating actuators shall be supplied with intelligent SMART diagnostics. Positioners shall have ISO/NAMUR VDI/VDE 3845 standard output shaft to allow direct mounting to actuator without need for adaptors. The positioner will receive a 4-20 mA positioning signal from the control system for precision positioning control of the valve in all positions from closed to open. As standard, the positioner shall include an Auto / Manual switch to allow for local actuator control without removing the positioner cover. Additionally, the positioner will have four pushbuttons for local control located inside the enclosure. The positioner shall have auto-stroke / auto-calibration capability as standard for easy commissioning. LCD 0-100% visual indication of valve position will be located in the positioner cover. Where specified in the Valve Actuator Schedule, provide optically-isolated analog 4-20 mA position transmitter, (2) mechanical limit switches or both, mounted inside the positioner housing. Positioner construction shall be of Aluminum or Stainless Steel (optional), with NEMA 4/4X, IP66 rating and be suitable for -22° F. to +185°. Fasteners to be stainless steel. Provide 80-100 psi clean dry supply air to the positioner. Positioner shall be manufactured and supplied by the actuator manufacturer and shall be intended for use with the actuator provided for modulating application. Positioner shall be as manufactured by Rotork / YTC #3300R.
3. Mechanical Manual Override: Where specified in the Valve Actuator Schedule, actuator shall include a mechanical worm gear manual override de-clutch gearbox and hand wheel to be mounted between the valve and the actuator. The manual

override shall be able move and hold the valve in any position between full OPEN and full CLOSE. When the actuator is in 'AUTO' operation, the gear shall be de-clutched and will 'free wheel'. To use the override, isolate the incoming air supply and bleed all pressure from the actuator, then engage the worm to the segment. The engagement lever shall include a stainless steel legend plate clearly identifying the lever position with "AUTO" and "MANUAL". The manual override shall be capable of remaining on the valve and fully operational with the actuator removed and include two mechanical valve position stops. The manual override shall have a cast iron housing and stainless steel input shaft and fasteners, rated for IP68 / NEMA 4/4X environments. The manual override shall have an EPOXY NZ PRIMER and Polyurethane finish paint, both 40 – 60 microns. Hand wheel diameter to be selected to limit rim pull to a maximum of 80#. Include 3-way actuator vent valve(s) as required to bleed the actuator and isolate the supply air during manual operation. The 3-way vent valve(s) shall include "Auto" and "Manual" legend plate and the hand wheel shall include OPEN and CLOSE designations and directional arrows. The de-clutch manual override shall be manufactured by Rotork / K-TORK, the actuator supplier without exception.

- E. Accessories such as limit switches, positioners, solenoid valves, speed controls, piping and tubing, as required by the specification, shall be mounted and tested by the actuator manufacturer to the actuators prior to shipment to the jobsite.
- F. Torque Capability: The rated torque capability of each actuator shall be sufficient to seat, unseat, and rigidly hold, in any intermediate position, the valve disc it controls under the operating conditions specified herein. Torque safety factors shall conform to AWWA Standards and in no case be less than 1.25 times the valve manufactures specified torques based on operating conditions.
- G. Safety Factor: Actuator housings, supports, and connections to the valve shall be designed with a minimum safety factor of 5, based on the ultimate strength, or a minimum safety factor of 3, based on the yield strength of materials used.
- H. Stop-Limiting Devices: Valve actuators shall be equipped with adjustable mechanical stop-limiting devices to prevent over-travel of the valve disc in the open and closed positions. Position stops shall provide, at minimum, 80 to 100 degrees of adjustable travel.
- I. The pneumatic actuators shall have a working pressure of 150 psig per AWWA C541-08 standards with an overload pressure of 220 psig. Actuators with a published 100 psig maximum operating pressure rated will not be acceptable.
- J. Actuators shall be equipped with adjustable flow-control devices controlling the operating air exhausting from the actuator. The devices shall be located at or near the actuator or on the solenoid valve. The opening and closing speeds shall be nominally set for a range of 30 to 90 seconds, variable with valve sizes. Final adjustments shall be made by the purchaser to minimize line surges during normal operation.
- K. Actuators shall not require more than three (4) psig to be cycled a complete stroke in each direction before they are connected to the valve.
- L. Actuator Testing:
 - 1. Performance Tests: Each actuator and valve assembly shall be cycled a minimum of three (3) times prior to assembly to the valve and in the field using the start and stop controls from the fully closed to the fully open position to demonstrate that the complete assembly, including controls, operates properly.
 - 2. Test Certification: Certification of tests and copies of test or certificate of

conformity reports shall be provided on request if the request is made prior to the time of testing.

P. Bracket and Couplings:

1. Custom fabricated bracket to adapt the actuator to the new or existing (retrofit) valves shall be heavy wall rectangular carbon steel tube and shall retain the valve stem packing or provide for use of the original draw-down packing gland as required.
2. All brackets and couplings shall have electro statically applied fusion bonded polyester powder coated finish.
3. Couplings shall be made of bar stock carbon steel with keyway and stainless steel setscrew.

Q. Acceptable Manufacturers:

1. K-TORK Actuators & Controls, a Rotork company, 10410 Vista Park Road, Dallas, Texas 75238 Telephone number (214) 343-9980
2. Engineer Pre-Approved equal

2.02 OPERATOR AIR TUBING

Air tubing on valve operators shall be rubber or stainless steel. Air tubing shall be sized according to actuator size.

2.03 VALVE ACTUATOR SCHEDULE

Valve Tag / Service	Valve Type	Size	Qty.	Actuator Type	Actuator Finish	Manual O-ride	Fail Position	Limit Switch	Position Transmitter
Sample Valve	BFV	12"	6	O/C	FP	Y	C	Y	N

Abbreviations:

- | | |
|--------------------------|--|
| 1. Valve Type: | BFV=butterfly valve, EPV=eccentric plug valve, BV=ball valve |
| 2. Actuator Type: | O/C=Open-Close, MOD=Modulating |
| 3. Actuator Finish: | PC=Powder Coat, FP=Fluoropolymer |
| 4. Manual O-ride: | Indicates mechanical manual override declutch gearbox, Y=Yes, N=No |
| 5. Fail Position: | Based on loss of power or control signal, C=Close, O=Open |
| 6. Limit Switch: | Suitable for O/C or MOD actuators, Y=Yes, N=No |
| 7. Position transmitter: | 4-20 mA output, used on MOD actuators only, Y=Yes, N=No |

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Complete equipment installation with controls, safety devices and auxiliary support systems necessary to start the equipment and verify that the equipment functions correctly under no load conditions. Turn rotating equipment by hand to check. Complete cleaning and testing of

pipng systems. Inspect and clean equipment, devices, piping, and structures of debris and foreign material.

- B. Remove temporary bracing supports and other construction debris that may damage equipment.
- C. Remove protective coatings and oils used for protection during shipment and installation.
- D. Flush, fill, and grease lubricated systems in accordance with Manufacturer's instructions.
- E. Install temporary connections and devices required to fill, operate, checkout and drain the system. Provide temporary valves, gauges, piping, test equipment, and other materials and equipment necessary to conduct testing and startup.
- F. Check equipment for correct direction of rotation and freedom of moving parts.
- G. Align equipment to Manufacturer's tolerances. Adjust clearances and torques.
- H. Check installation prior to start-up for conformance to Manufacturer's instructions.
- I. Adjust or modify equipment to ensure proper operation.
- J. Correct any deficiencies or problems noted in Manufacturer's representative's installation reports.

3.02 FIELD QUALITY CONTROL

Verify that structures, equipment, pipes, valves, fittings, and other appurtenances are compatible. Coordinate field devices, voltages, signal types, power needed, and programming with valve operator to provide proper functioning system.

3.03 MANUFACTURER'S REPRESENTATIVE

- A. The services of the manufacturer's technical representative shall be provided for pre-startup installation checks, startup assistance, training of Owner's personnel, troubleshooting, acceptance testing, and other services as required within these Contract Documents.
- B. Manufacturer's representative shall:
 - 1. Approve installation in writing to Engineer before operation.
 - 2. Verify conformance to all specified requirements.
 - 3. Fully instruct all designated personnel for the plant on proper care, maintenance, and operation of all equipment and appurtenances.
 - 4. Perform specified acceptance tests and operate system to verify satisfactory operation of all equipment in presence of Owner's personnel and Engineer.
 - 5. Check all equipment for excessive noise or vibration, proper alignment, general operation, etc.
 - 6. Operate the equipment through the design performance range consistent with available flows. Adjust, balance, and calibrate and verify that the equipment, safety devices, controls, and process system operate within the design conditions. Each safety device shall be tested for proper setting and signal. Response shall be checked for each equipment item and alarm. Simulation signals may be used to check equipment and alarm responses.
 - 7. Place each piece of equipment in the system in operation until the entire system is functioning. All components shall continue to operate without alarms or shutdowns, except as intended, for 8 consecutive hours to be considered started up.
 - 8. Submit certified written field reports as required by Section 01301.

9. Provide a certificate by the valve actuator supplier indicating proper installation and start-up procedures have been followed. This certificate shall be required and included as part of the final operation and maintenance manuals in order to validate the specified three (3) year warranty.
10. Revisit job sites as often as necessary beyond minimum services specified to correct deficiencies to satisfaction of ENGINEER.

3.04 ACCEPTANCE TEST

- A. Upon completion of the installation of each valve actuator, an acceptance test will be conducted to verify the satisfactory operation and performance of each actuator. Each valve shall be opened and closed using the plant control system as applicable (AUTO) and manually. The control valves shall also be tested under power loss to verify proper closure.
- B. The test shall be conducted in a manner approved by and in the presence of the ENGINEER. The equipment and piping will be completely checked for leakage, general operation, etc.
- C. Each valve actuator must perform in a manner acceptable to the ENGINEER before the OWNER will make final acceptance.

END OF SECTION