

May 1996

NC-600DA Rev. D

Nupro DA Series Diaphragm Valve Technical Report

SCOPE

This technical report provides data on Nupro® DA Series diaphragm valves. It documents:

- P and PX surface finish specifications
- static particle counting
- moisture analysis
- hydrocarbon analysis
- ionic cleanliness
- lab cycle testing

Particle counting, moisture and hydrocarbon analysis, and ionic cleanliness data show test results from valves cleaned with deionized (DI) water according to the techniques described in Swagelok® Ultra-High-Purity Specification SC-01.

SAFE COMPONENT SELECTION

When selecting a component, total system design must be considered to ensure safe, trouble-free performance. Component function, materials compat-

ibility, adequate ratings, and proper installation, operation, and maintenance are the responsibility of the system designer and user.

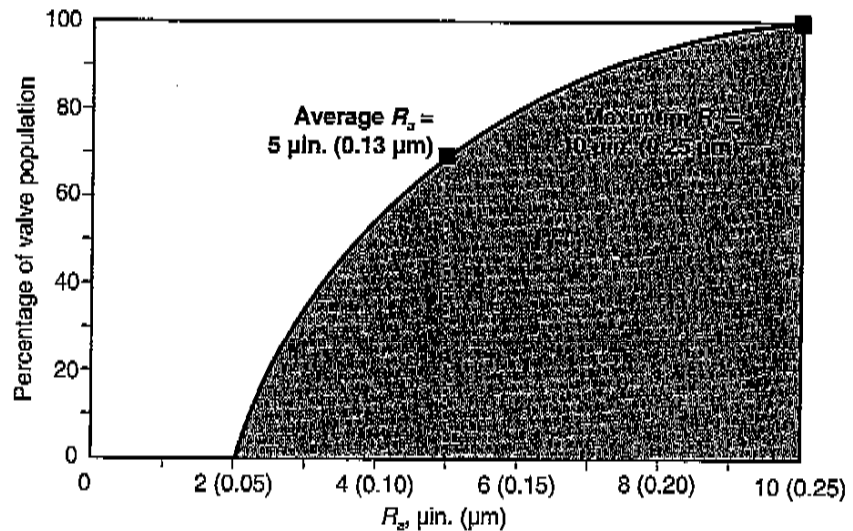
SURFACE FINISHES

Statistical process control (SPC) allows Nupro to provide consistent surface finishes, as described in Specification SC-01. The surface finish distributions at right illustrate the roughness average (R_a) specifications we have established for the wetted surfaces of DA Series diaphragm valves manufactured with P and PX finishes.

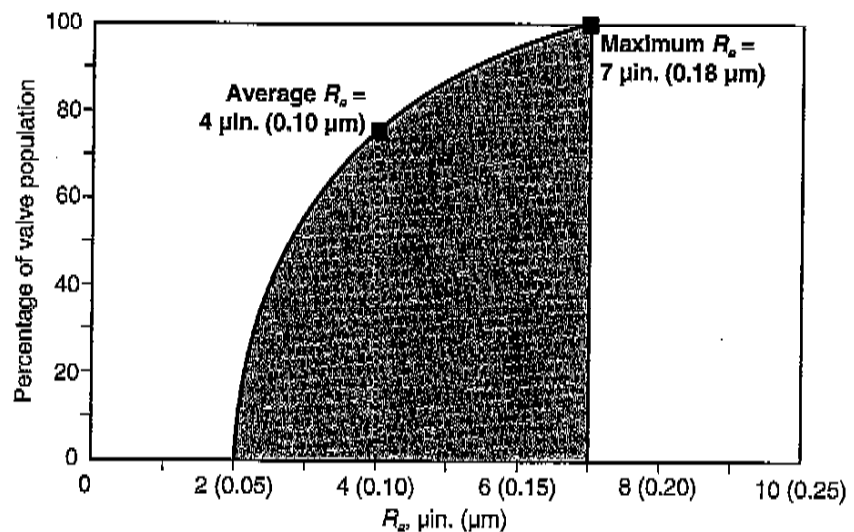
P finish. The P finish will provide surface roughness of 5 $\mu\text{in.}$ (0.13 μm) R_a on average and will not exceed 10 $\mu\text{in.}$ (0.25 μm) R_a .

PX finish. The PX finish will provide surface roughness of 4 $\mu\text{in.}$ (0.10 μm) R_a on average and will not exceed 7 $\mu\text{in.}$ (0.18 μm) R_a . The PX finish provides additional fine surface finishing that results in wetted surfaces with higher luster and reflectivity than those resulting from the P finish.

DA Series Diaphragm Valves: P Finish

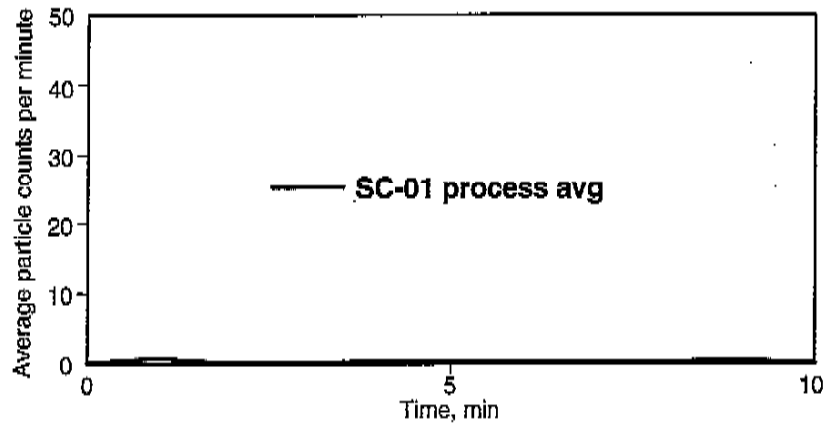


DA Series Diaphragm Valves: PX Finish



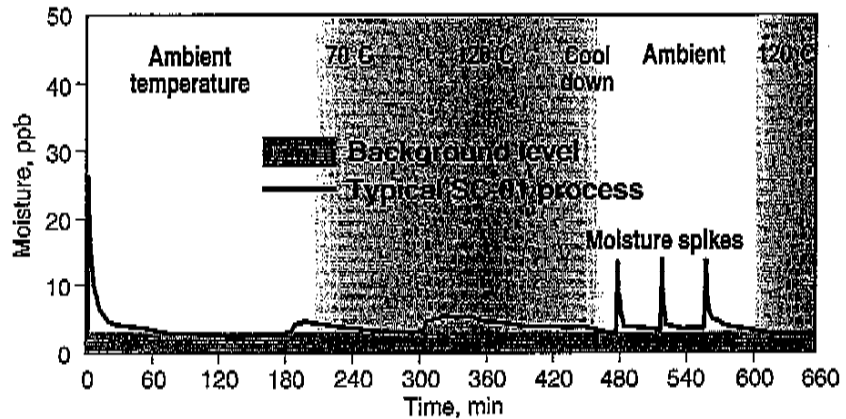
PARTICLE COUNTING

Static particle counts from SC-01 processed DA Series valves are very low. Particles greater than 0.014 μm in size are detected.



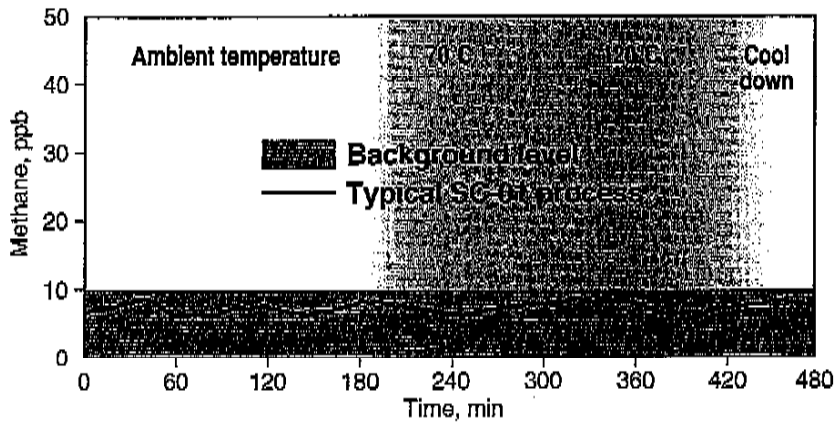
MOISTURE ANALYSIS

SC-01 processed valves dry down very quickly to the background level produced by the test instrument. The valves also recover quickly following the introduction of moisture spikes.



HYDROCARBON ANALYSIS

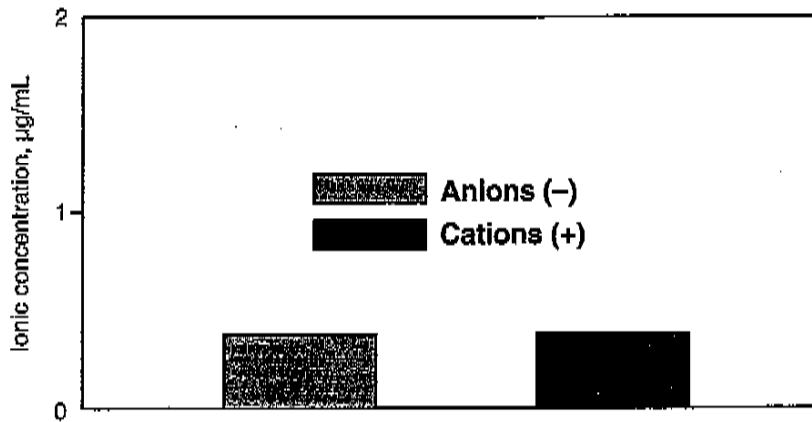
Test results for hydrocarbon residues in SC-01 processed valves fall entirely within the background level produced by the test instrument.



IONIC CLEANLINESS

Residual ionic contamination is very low for SC-01 processed valves.

Anions (-)	Cations (+)
Fluoride	Ammonium
Chloride	Sodium
Nitrate	Calcium
Phosphate	Potassium
Sulfate	Magnesium



LAB CYCLE TESTING

DA Series Diaphragm Valve Cycle Test Conditions

The DA Series valve was tested to determine an estimated cycle life of the valve under a set of controlled laboratory conditions (table at right).

Standard DA Series air-actuated valves with Elgiloy diaphragms were tested. Valve cycle life was evaluated at regular intervals by tests for leakage to atmosphere. Failure was defined as a helium leak rate greater than 4×10^{-9} std cm³/s for envelope (inboard) or seat leakage.

All 40 test valves passed envelope and seat leakage test requirements for more than 5 million cycles. No valves failed; tests were stopped at predetermined cycle levels.

In addition, a total of 102 production valves passed envelope life tests ranging from 1.5 to 10.7 million cycles. There were no envelope failures before the tests were ended.

These tests are not a guarantee of a minimum number of cycles in service. They indicate that in tests under these laboratory conditions the probability of early failure is low. Laboratory tests cannot duplicate the endless variety of actual operating conditions and cannot promise that the same results will be realized in service.

Quantity	20 normal closed air-actuated valves
Gas	Dry Nitrogen
Temperature, F/C	70 (20)
Inlet pressure, psig (bar)	20 (1.5)
Outlet pressure	atmosphere
Actuator pressure, psig (bar)	70 (5)
Cycle rate, cpm	30



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