NEMA Standards Publication ICS 5, Annex F-2002

Industrial Control and Systems:
High Pressure Power Wash Test Procedure
For Self-Contained Control-Circuit Devices

Published by

National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
Rosslyn, Virginia 22209

www.nema.org

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CONTENTS

Page

Foreword ii

1 General 1
1.1 Scope and Object 1

2 Definitions 1

3 Classification 1

4 Characteristics and Ratings 2

5 Product Information 2
5.1 Marking 2
5.2 Label Survivability 2
5.3 Chemical Compatibility Information 2

6 Service and Storage Conditions 2

7 Construction and Performance Requirements 2
7.1 Materials 2
7.2 Performance Criteria 2
7.2.1 Chemical Compatibility Test 2
7.2.2 High Pressure Power Wash Test Procedure 3

8 Test Procedure 3
8.1 Chemical Compatibility Test (Check UL for Polymeric Tests) 3
8.1.1 Chemicals to be Tested 3
8.2 Power Wash Test 3
8.3 Test Sequence 3

Figures
F–1 Open Test Panel (Not to Scale) 4
F–2 Typical Power Wash Nozzle 5

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Foreword

This Standards Publication was prepared by a technical committee of the NEMA Industrial Automation Control Products and Systems Section. It was approved in accordance with the bylaws of NEMA and supersedes the indicated NEMA Standards Publication. This Standards Publication is an addition part to ICS 5-2000: *Control-Circuit and Pilot Devices* and will be included into that standards publication when it is next revised. Annex F provides test methods for evaluating the suitability of potential control-circuit devices when subjected to high-pressure power wash procedures.

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This standards publication was developed by the Industrial Automation Control Products and Systems Section. Section Approval of the standard does not necessarily imply that all section members voted for its approval or participated in its development. At the time it was approved, the Section was composed of the following members:

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Annex F

HIGH PRESSURE POWER WASH TEST PROCEDURE FOR SELF–CONTAINED CONTROL–CIRCUIT DEVICES

(Normative)

F.1 General

Food and beverage industries such as meat packing plants, breweries, bakeries, and food canning plants have stringent sanitation requirements. This is typically done with a daily power wash procedure consisting of applying a foaming cleaning detergent, power wash with clean water and then applying a germicidal sanitizer. This combination of chemicals and water at high pressures and temperatures creates a harsh environment for electrical devices.

The purpose of this test is to develop a method of evaluating the potential of electrical devices to perform satisfactorily under these conditions.

F.1.1 Scope and Object

High-pressure power wash procedure requirements for proximity switches, limit switches, and panel mounted control devices that include pushbuttons, pilot lights, and selector switches. The requirements shall include chemical compatibility tests. For food and beverage applications, these chemicals would typically be a self-foaming detergent and a germicidal sanitizer.

F.2 Definitions

self-contained control-circuit device: A control-circuit device with an integrally surrounding case constructed to provide a degree of protection to personnel against incidental contact with the enclosed live parts and to provide a degree of protection to the enclosed live parts against specified environmental conditions.

encapsulation: Process by which all components, conductors, and ends of integral cables are encased in an insulating compound by suitable means such as embedding or potting.

detergent: A surface-active chemical cleansing substance. (May or may not be self foaming.)

NOTE—Self-foaming detergent is widely used because the foaming action indicates that the cleaning process is being performed. After the foaming action dissipates this indicates the surface has been cleaned and the process of washing the surface off can now be performed.

germicidal sanitizer: Any antiseptic used to destroy germs and to make sanitary, germ free.

F.3 Classification

No classifications are included in this annex.

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F.4 Characteristics and Ratings

No ratings are included in this annex.

F.5 Product Information

F.5.1 Marking

Devices that comply with this test are permitted to be marked “PW12.”

F.5.2 Label Survivability

Upon completion of the tests the labeling and marking of the device that would be exposed to the chemicals and high-pressure wash down test shall be indelible and easily legible.

F.5.3 Chemical Compatibility Information

Consult manufacturer for chemical compatibility information.

F.6 Service and Storage Conditions

No service and storage conditions are included in this annex.

F.7 Construction and Performance Requirements

No construction requirements are included in this annex.

F.7.1 Materials

External materials of construction must be compatible with chemicals used for cleaning and sanitizing. This can be established by either performing the chemical compatibility test or using established chemical compatibility data.

F.7.2 Performance Criteria

F.7.2.1 Chemical Compatibility Test

A visual inspection of the device shall show no evidence of mechanical degradation in form, fit, or function. A self-contained control-circuit device shall be considered to have met the requirements of this test if upon completion it does not show pitting, cracking, or other deterioration. For metal parts, this deterioration shall be no more severe than that resulting from a similar test on passivated American Iron and Steel Institute Type 304 stainless steel. Plastic parts shall not distort, crack, swell, or deform to a point at which they will no longer perform their intended use.

There shall be no evidence of electrical degradation. A full functional test followed by a dielectric test shall be performed.

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F.7.2.2 High Pressure Power Wash Test Procedure

Evaluation should be done within four hours of completion of the final power wash procedure cycle, once surface water has been removed, but before any moisture that has entered the device has had a chance to drain or evaporate.

A visual inspection of non-encapsulated devices shall show no water ingression. For encapsulated devices, an operational function test shall be performed followed by a dielectric test as specified in ICS 5, Part 4, 8.3.3.4.1.

A visual inspection of the device shall show no evidence of mechanical degradation in form, fit, or function. A self-contained control-circuit device shall be considered to have met the requirements of this test if upon completion it does not show pitting, cracking, or other deterioration. For metal parts this deterioration shall be no more severe than that resulting from a similar test on passivated American Iron and Steel Institute Type 304 stainless steel. Plastic parts shall not distort, crack, swell, or deform to a point at which they will no longer perform their intended use.

There shall be no evidence of electrical degradation. A full functional test followed by a dielectric test shall be performed. Mechanical operation of the device during the power wash test shall not be evaluated as a failure.

F.8 Test Procedure

F.8.1 Chemical Compatibility Test (Check UL for Polymeric Tests)

The test item, or front-of-panel operator, indicating light or other front-of-panel part of a complete device**,** is placed into a sealed chamber, which contains an open container with undiluted cleaning or sanitizing solution and exposed to the vapors for 200 hours. Use a ratio of 1 part solution for every 80 parts sealed chamber volume. For example, use 25 ml +/-10% of solution for 2000 ml of chamber volume. The test shall be performed at room temperature, 23ºC +/- 5ºC.

F.8.1.1 Chemicals to be Tested

The chemicals used in the chemical compatibility test shall be chosen by agreement between the manufacturer and user.

F.8.2 Power Wash Test

The test operating pressure shall be 8273 kPa +/- 689 kPa (1200 PSI +/- 100 PSI).

The test operating water temperature shall be 60ºC +/- 5ºC. The device under test shall be at room temperature, 23ºC +/- 5ºC.

The nozzle, with a 15º flat fan spray, shall deliver 3.8 liters per minute (1 gallon per minute). See Figure F-2 for typical nozzle dimensions. The spray shall be directed at the device from all directions from a distance of 228 to 330mm (9 to13 inches). The spray shall be directed from all angles; particularly joints, gaskets, cable entrances, mating components, etc.

One test cycle shall consist of a minimum of five minutes spray time, followed by a minimum of 30-minutes off-time. The test cycle shall be repeated five times.

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For panel-mounted devices see Figure F-1 for open test panel. Alternatively, a suitable enclosure is permitted to be used. For non-encapsulated devices mounted in an enclosure, the enclosure may be ventilated to permit the internal pressure to equalize with external pressure.

F.8.3 Test Sequence

The sequence of tests to be performed on a new sample is as follows:

Note - Each detergent or sanitizer chemical shall be tested and evaluated independently in the test sequence given below.

Test 1 – Chemical compatibility test if applicable. Chemicals to be used shall be defined by the end use application (See F.8.1.1).

Test 2 – High-pressure power wash test shall be performed on same sample after test 1 is completed.

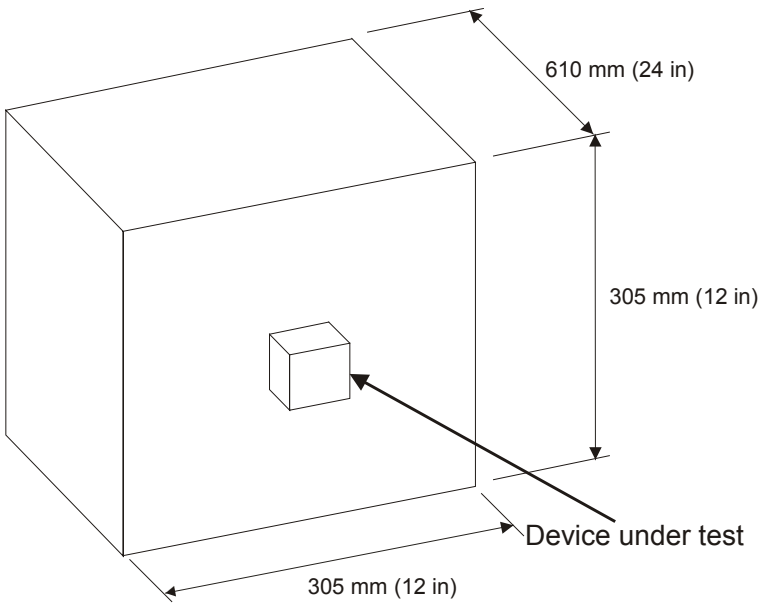


Figure F-1

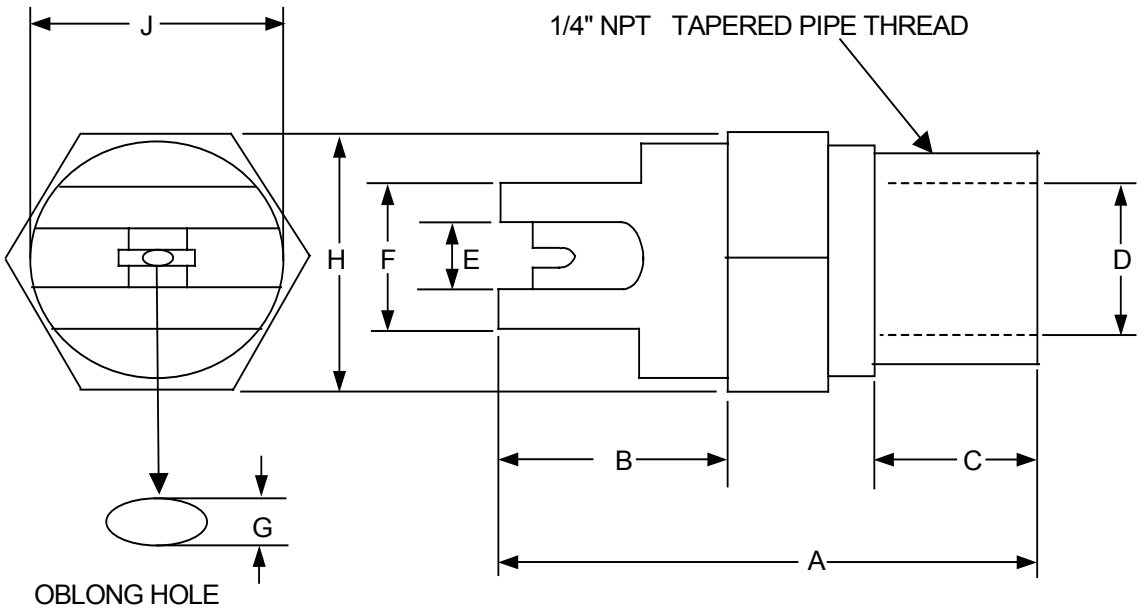
Open test panel (not to scale)

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Figure F-2

Typical power wash nozzle



15 DEGREE FLAT FAN SPRAY NOZZLE
FLOW RATE 3.8 LITER / MIN. (1 GAL / MIN.) at 8273 kPa (1200 psi)

ITEM	mm	inch
A	22.2	7 / 8
B	7.9	5 / 16
C	9.5	3 / 8
D	6.7	0.263
E	3	0.118
F	8.1	0.318
G	0.68	0.027
H	14.3	9 / 16
J	12.7	1 / 2

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