The Nordson EFD Pledge

We pledge that you will be completely satisfied with our products. We endeavor to ensure that every EFD product is produced to our no-compromise quality standards.

If you feel that you are not receiving all the support you require, or if you have any questions or comments, I invite you to write or call me personally.

Our goal is to build not only the finest equipment and components, but also to build long-term customer relationships founded on superb quality, service, value and trust.

Srini Subramanian, General Manager

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Introduction

The Square Wave 745NC high speed non-contact valve applies low-viscosity water soluble and solvent-based liquid fluxes in accurate, repeatable amounts on cell bus bars and solder-coated ribbon used in cell string attachment.

Specifications

Dimensions:  
(24 W solenoid)  
70.11 x 21.84 x 33.27 mm  
(2.76 x 0.86 x 1.31")

(4 W solenoid)  
80.48 x 21.84 x 33.27 mm  
(3.17 x 0.86 x 1.31")

Minimum cycle time:  
24 W solenoid — 2 ms (open and close once)  
4 W solenoid — 6 ms (open and close once)

Maximum cycle time:  
24 W solenoid — 15 ms (open and close once)  
4 W solenoid — Continuous

Minimum dispensing frequency:  
24 W solenoid — 50Hz  
4 W solenoid — Continuous

Maximum dispensing frequency:  
24 W solenoid — 500Hz  
4 W solenoid — 150Hz

Maximum fluid pressure:  
6.8 bar (100 psi)

Actuating operating pressure:  
4.8–6.2 bar (70–90 psi)

Electrical inputs:  
24 VDC — 24 W  
24 VDC — 4 W

Volume output:  
101.6 μm (0.004") nozzle — 0.030 μL — 0.30 μL @ 0.345 bar (5 psi)  
127 μm (0.005") nozzle — 0.040 μL — 0.48 μL @ 0.345 bar (5 psi)

Material with fluid contact:  
Fluid body: Type 303 stainless steel  
Shaft: 17-4 PH stainless steel  
Ball cage: 303 stainless steel  
Fluid seal: PTFE carbon filled type with 304 SS spring energized seal  
Valve ball: Tungsten carbide  
Valve seat: Cobalt stainless steel  
Nozzle: Type 303 stainless steel with ruby insert

Fluid inlet thread:  
M5 x 0.8

Mounting:  
M4 x 0.7

Weight:  
114 grams (4.02 oz)
Installation

1. Mount valve utilizing the M4 mount hole on actuation body.
2. Connect fluid supply line to fluid inlet fitting using 0.125" ID tubing.
3. Connect fluid supply line to reservoir.
4. Connect valve control air to a constant air source between 4.8–6.3 bar (70–90 psi).

The Square Wave 745NC valve is recommended to be actuated using a spike and hold driver circuit. The valve requires a 24 VDC pulse for 1 ms minimum to actuate the valve. This is then reduced to 5 VDC for the remaining period that the valve is open.

CAUTION

Failure to reduce the voltage will result in permanent damage to the actuation solenoid if the valve is left on longer than 30 ms.

To avoid damaging the actuation solenoid, do not cycle the valve at continuous high frequencies for periods greater than 30 minutes. The actuation solenoid requires periodic dwell time to protect coil integrity and performance.

Signal parameters:

- Minimum on time: 1 ms
- Minimum off time: 1 ms
- Spike voltage (supply): 24 VDC
- Hold voltage: 5 VDC
- High current magnitude: 1.0 Amp
- Maximum hold current: 300 mA

Minimum operating frequency:

100Hz (see Figure #1 below for frequency/duty cycle capability of 24W valve)

Maximum operating frequency: 500Hz

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
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<tr>
<td>500</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
Operation of a Spike and Hold Driver Circuit

a. The input signal source controls the valve actuation timing. The on-time, duty cycle, and operating frequency of the valve are determined from the input signal. When the input signal is low (0 VDC) the circuit is not energized. When the input signal goes high (5–24 VDC) the circuit will energize the spike and hold driver circuit.

b. The spike and hold driver circuit controls which voltage is supplied to the valve. When the spike and hold driver circuit receives a high input signal, the spike and hold driver circuit will apply the spike voltage to actuate the valve. The spike and hold driver circuit will apply the spike voltage from 1 to 30 ms before transitioning to the hold voltage.

⚠️ CAUTION
Not using a spike and hold driver circuit as recommended may cause permanent damage to the actuation solenoid.

c. The hold voltage should be set to 5 VDC to provide a safe voltage profile to prevent permanent damage to the actuation solenoid.

d. The spike voltage is set to 24 VDC for a minimum of 1 ms and no longer than 30 ms to actuate the valve to its open state.

⚠️ CAUTION
Failure to reduce the voltage will result in permanent damage to the actuation solenoid if the valve is left on longer than 30 ms.

To avoid damaging the actuation solenoid, do not cycle the valve at continuous high frequencies for periods greater than 30 minutes. The actuation solenoid requires periodic dwell time to protect coil integrity and performance.

Important note: We recommend use of a Zener bi-directional diode to ensure 24 VDC spike voltage dissipates quickly to maximize actuation solenoid performance.

(Step 5 starts on page 6)
Operation of a Spike and Hold Driver Circuit

5. Connect the 745NC Square Wave valve with a 4 watt solenoid to a ValveMate™ 8000 controller.

*IMPORTANT NOTE:* Only a 745NC valve installed with a 4 watt solenoid can be used with the ValveMate 8000 controller.

a. Follow steps 1 through 4 on page 4.

b. Connect the 745NC valve to the ValveMate 8000 controller using the solenoid wires supplied. See Figure 2.

NOTE: Installing the Dispense Valves

The ValveMate 8000 is supplied with an installation manual. The manual will explain the operation of the ValveMate 8000 and input / output connections for 745NC valve initiate.

6. Purge valve:

a. Set reservoir pressure to 0.275 bar (4 psi) as a minimum starting point.

b. Remove retaining nut to release nozzle plate.

c. Set valve stroke between 10–20 on reference ring.

d. Cycle valve at 50Hz minimum at 50% duty for purging.

**CAUTION**

For 24 watt solenoid only: Minimum dispensing frequency is 50Hz. Operating frequencies lower than the minimum requirement will cause solenoid failure.

- Cycle valve until fluid lines are free from air.
- Replace nozzle plate / retaining nut onto valve.

7. Set desired flow rate:

a. Set reservoir pressure to 0.275 bar (4 psi) as a minimum starting point.

b. Set valve stroke control to 1 hash mark (one click from zero) on stroke reference ring as starting point.

c. Set frequency / duty cycle to 100Hz and 50% duty to establish initial dispense volume. Adjust frequency/duty cycle to achieve desired flow rate.

**NOTE:** Refer to Figure 3 on opposite page as a guide for dispensing volume as a function of frequency and fluid pressure.
Figure 3

Dispensing volume as a function of frequency and pressure 101.6 μm (0.004") nozzle

NOTE: Use the blue and brown wires of the bullet solenoid cable for BackPack valve actuation. The wires are not polarized.

*Use with 4 W solenoid only.
Valve Disassembly and Reassembly Procedures

Before valve maintenance is performed, shut off valve actuation and fluid air pressures.

To thoroughly clean fluid body and replace fluid seal
1. Remove nozzle retaining nut and nozzle plate.
2. Remove (4) screws and remove chamber plate.
3. Remove fluid body from actuation body, and then remove spring-energized PTFE seal.
4. Clean needle with cloth dampened in solvent.
5. Replace with new spring-energized PTFE seal and reassemble valve in reverse order of disassembly.

To replace piston and needle assembly
1. Remove (4) screws to release stroke control assembly.
2. Remove return spring.
3. With small pliers on spring pilot, pull piston and needle assembly out of air cylinder.
   **NOTE:** The piston and needle assembly is one unit and cannot be disassembled.
4. With small pliers, remove U-cup seal.
5. Clean air actuation body wall. Replace with new U-cup seal, ensuring that seal groove is facing upwards and expanded fully in its groove.
6. Replace with new needle assembly. Insert into actuation body, ensuring that piston seal is not damaged.
7. Reassemble the upper stroke control plate and secure with (4) screws.
Valve Disassembly and Reassembly Procedures

To replace bullet solenoid

1. Remove spiral wrap (if used) around solenoid wires and air hose.
2. Unplug air line from valve.
3. Unthread the cable connector from the bullet solenoid.
4. Engage wrench flats on bullet solenoid and rotate counterclockwise to remove. When loose, pull bullet solenoid up slowly to release.
5. Place a light film of PTFE grease on O-rings of new bullet valve.

⚠️ CAUTION
Installing and threading solenoid into actuation chamber too quickly may cause damage / breakage of O-rings, leading to air leaks and bullet solenoid malfunction.

6. Install the replacement bullet solenoid by rotating the solenoid clockwise until it is fully tightened.
7. Reconnect the bullet solenoid cable and the air line.
8. Turn air pressure ON.
Replacement Parts

- Stroke control assembly 7028724
- Piston assembly 7028726
- Piston insertion tool (includes instructions) 7360948
- U-cup seal Buna N 7028737
- Fluid seal PTFE 7028727
- Fluid body SS 7028729
- Chamber seat plate 7028728
- Fluid body O-ring Buna N 7028738
- Nozzle, 0.004" 7028731
- Nozzle, 0.005" 7028732
- Nozzle, 0.006" 7028733
- Nozzle, 0.007" 7028734
- Nozzle retaining nut 7028730
- Actuator body 7028735
- Air inlet fitting 7361412
- Bullet solenoid cable, 3 pin, M8 7361124
- Bullet solenoid, 24V, 4 W, 3 pin 7361123
- Bullet solenoid, 24V, 24 W, 3 pin 7361121
- Fluid inlet fitting M2 8X 7028736
- Air inlet fitting 7028730
- Kit, straight M5 fluid inlet fitting and fluid tubing extension 7362088

Note: Use the blue and brown wires of the bullet solenoid cable for BackPack valve actuation. The wires are not polarized.
## Troubleshooting Guide

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fluid flow</td>
<td>If valve operating air pressure is too low, the valve will not open. Increase air pressure to 4.8 bar (70 psi) minimum.</td>
</tr>
<tr>
<td></td>
<td>The reservoir air pressure may not be high enough. Increase pressure.</td>
</tr>
<tr>
<td></td>
<td>The valve stroke adjustment may be closed. Open stroke adjustment.</td>
</tr>
<tr>
<td></td>
<td>Material may have clogged the fluid body or outlet nozzle orifice. Clean the valve / nozzle plate.</td>
</tr>
<tr>
<td></td>
<td>Inspect cable wires from bullet solenoid to make sure they are not loose or damaged.</td>
</tr>
<tr>
<td></td>
<td>Bullet solenoid may not be actuating. Replace solenoid.</td>
</tr>
<tr>
<td>Steady drip</td>
<td>A steady drip can be caused by a worn needle and seat, or a particle holding the needle off the seat. Clean and inspect the needle and seat for wear. Replace worn or damaged parts.</td>
</tr>
<tr>
<td>Fluid leaks out drain hole</td>
<td>Fluid leaking out the drain hole on the side of the valve indicates that the spring energized fluid seal is worn. Replace seal.</td>
</tr>
<tr>
<td>Inconsistent deposits</td>
<td>Inconsistent deposits can result if the air pressure controlling the valve and / or supplying the reservoir is fluctuating or is less than 4.8 bar (70 psi). Check that air pressures are constant and valve operating pressure is 4.8 bar (70 psi).</td>
</tr>
<tr>
<td></td>
<td>The time the valve is open must be constant. Check to be sure the valve controller is providing consistent output.</td>
</tr>
</tbody>
</table>

If trouble cannot be corrected or if you need further assistance, please contact us.
NORDSON EFD ONE YEAR LIMITED WARRANTY

All components of EFD Dispense Valves are warranted for one year from date of purchase to be free from defects in material and workmanship (but not against damage caused by misuse, abrasion, corrosion, negligence, accident, faulty installation or by dispensing material incompatible with equipment) when the equipment is installed and operated in accordance with factory recommendations and instructions. EFD will repair or replace free of charge any part of the equipment thus found to be defective, on authorized return of the part prepaid to our factory during the warranty period. In no event shall any liability or obligation of EFD arising from this warranty exceed the purchase price of the equipment. This warranty is valid only when oil-free, clean, dry, filtered air is used.

EFD makes no warranty of merchantability or fitness for a particular purpose. In no event shall EFD be liable for incidental or consequential damages.