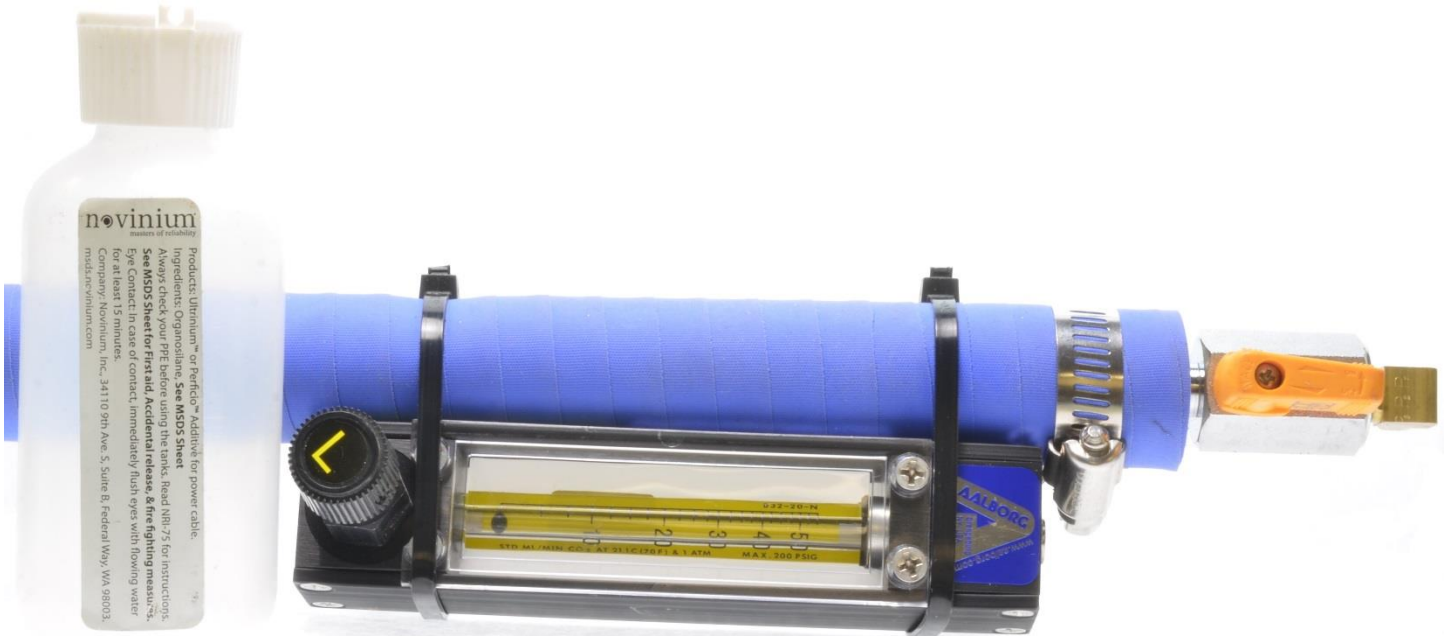


Rejuvenation Instructions

#282 – Flow & Pressure Tests – iUPR & SPR



This NRI covers the following:

- How to perform flow and pressure tests.
- How to determine the pneumatic resistance of the cable.
- How to interpret flow readings on an air flow meter.

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WARNING: It is dangerous working around energized high-voltage systems, pressurized systems, and chemicals. Always work in accordance to the Novinium Field Operations Safety Handbook (FOSH) or other local governing safety standards.

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Testing Progression

Level 0:	No testing
Level 1:	Termination Test with Air
Level 2:	Air Flow Test A → B
Level 3:	Air Flow Test B → A
Level 4:	Sustained Flow
Level 5:	N-REX™ Process

Table 1: Testing progression.

Flow and Pressure Tests

1. Flow test setup.

- a. Firmly tap the old connector down and twist the connector to open the strands.
- b. Create flow test valve assemblies for both ends of the cable.
 - The valve assembly includes an air flow meter to read the flow going in and coming from the cable.
- c. Connect a flow test valve assembly to both ends of the cable.



Figure 1: Flow test valve assembly.

2. Level 1: Termination test.

a. Set the test pressure according to the table below:

Cable / Injection Type	Test Pressure (psi)
#4 - 2/0 / UPR	20
3/0 - 4/0/ UPR	15
SPR flow (all sizes)	40
SPR splice detection (Use lower value)	lesser of 80 or Cable TIP

Table 2: Test pressure values.

- b. Push air into the cable.
- c. Hold the flow meter vertically and fully open all valves on the test assembly.
- d. Monitor the flow at the inlet side of the cable until the flow stabilizes.
- e. Use the table below to interpret the flow readings seen.

Level 1 (Termination Air Flow) Flow Readings	
Flow Meter Reading:	Indicated Condition:
High (50+) reading, with no decrease.	Unrestricted Termination and Cable
High (50+) reading, with gradual decrease to a steady value of 20 or higher.	Unrestricted Termination
High (50+) reading, with near-instantaneous decrease to a low, non-zero value.	Restricted Termination
High (50+) reading, with near-instantaneous decrease to zero.	Blocked Termination
High (50+) reading, with slow decrease to zero.	Blockage at intermediate length in the cable.

Table 3: Level 1 flow interpretations.

3. Level 2: Cable flow test.

- a. On the proposed receiving end of the cable, place a buffer tank between the flow test valve assembly and the air flow meter.
 - ☉ This will protect the flow meter from any water or solids that come out of the cable.
- b. Record the feed pressure being supplied to the inlet of the cable.
- c. Hold the air flow meter on the inlet end vertically and adjust its needle valve until it reaches a flow of 50cc/min.
 - ☉ Leave the valve fully open if it does not reach 50cc/min.
- d. Wait until flow reaches the cable outlet – there may be a delay depending on the cable length.
- e. When flow on the outlet end stabilizes, record the outlet flow.
 - ☉ It should be higher than the inlet due to the pressure difference.
- f. Allow pressure to bleed from the cable and reverse flow following steps a. through d.
- g. Determine the flow direction with the least resistance.
 - ☉ This will show the direction of fastest injection.
- h. Enter the inlet pressure and outlet flow into Knomentous.



Figure 2: Buffer tank.

▼ Flow Test Data		
Air Flow Test	From Term 1	From Term 2
Feed Pressure (psig)	<input type="text" value="0"/>	<input type="text" value="0"/>
Outlet Flow Rate (cc/min)	<input type="text" value="0"/>	<input type="text" value="0"/>
Visual Air Flow	<input type="checkbox"/>	<input type="checkbox"/>
Flow Resistance	<input type="text"/>	<input type="text"/>

Figure 3: Air flow test entries.

4. Level 2: Pressure test.

- a. Close the valve on the outlet end of the cable or push air from both cable ends.
- b. Set the test pressure, using Table 2 as a reference.

- Use field judgement when determining test pressures for splices.
- c. Wait for the cable to pressurize.
 - If there are no leaks, the flow rates on the ends pushing air will drop slowly to zero.
- d. If the flow rate does not drop to zero, use leak detection fluid or soapy water to check all inlet and outlet tubing and hardware.
- e. Repair any leaks found.
- f. If there are no leaks at the terminations, the cable is leaking from either a fault or a splice.



Figure 4: Using leak detecting fluid.

5. Level 3 test.

- a. If the pneumatic resistance in the cable is high, a level 3 flow and pressure test can be done by repeating in the opposite direction.
 - Cables will often flow better in one direction than the other.
 - Use field judgement to determine if the time spent is worth it.
- b. A cable that has any outlet flow may be injected.
- c. Enter all flow data into Knomentous.
- d. If the cable's flow is too low to register on an air flow meter, swap out for a low air flow meter and resume testing.
- e. If the flow is still too low, submerge the tubing connected to the outlet end to a container of liquid.
 - Look for bubbles as a visual test.
 - If bubbles are present, check the "Visual Air Flow" box in Knomentous.
- f. Cables that have any flow and pass a pressure test may be injected at the technician's discretion.



Figure 5: Submerge tubing into fluid and look for bubbles.

Level 4 and 5 Tests

1. Level 4: Sustained flow test.

- If the pneumatic resistance in both directions is high and the circumstances warrant, gas can be permitted to continue to flow over a sustained period to remove water or other fluids and debris from the strands.
- It is required to periodically monitor the flow rate to determine when there is no more benefit to the sustained flow.
- Contact Engineering when reaching this test level.

2. Level 5 test.

- If testing reaches level 5, contact Engineering again.
- Level 5 is applying the N-Rex™ process to the cable.