

# Upgrading the UltiMate 3000 RSLCnano System with ProFlow Technology



## Quick Installation Guide

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## 1. General Information

The ProFlow™ flow meter is designed for Thermo Scientific™ Dionex™ UltiMate™ 3000 RSLCnano systems equipped with NCS-3500RS or NCP-3200RS modules. Follow the steps given below to change from a Classic flow meter to the ProFlow flow meter.

### General Installation Steps

- Upgrade Chromeleon™ Chromatography Data System/ SII software
- Upgrade firmware as necessary
- Turn off the NCx pump
- Exchange the Classic flow meter with the ProFlow flow meter
- Exchange the capillaries and connections
- Install the solvent shut off valves and elbow connector solvent lines
- Turn on the NCx pump
- Re-configure (delete/add) the NCx-3x00RS module in the Chromeleon / SII Instrument configuration
- Purge and calibrate the system
- Run the Detailed Leak Test for the NCx pump to check flow connections are tight

*Parts required to upgrade NCS-3500RS or NCP-3200RS modules*

<b>Description</b>	<b>Part No.</b>
<b>ProFlow flow meter</b> , with thermal flow sensors for nano LC	6041.7850
<b>Upgrade kit for ProFlow flow meter</b> Including accessories required to upgrade an NCS-3500RS or NCP-3200RS module with the ProFlow flow meter: Solvent lines, elbow tubes, shut-off valves Capillaries for the NC pump (nanoViper, MP35N) Chromeleon 7.2 SR4 or later software DVD SII for Xcalibur™ software DVD Fitting plugs, Viper	6041.3003
<b>Note:</b> Firmware 1.40 or later is required to operate the ProFlow flow meter with NCx-3x00RS modules. <ul style="list-style-type: none"> <li>• Thermo Standard Instrument Integration (SII) for Xcalibur 1.2 and DCMSLink for Xcalibur can coexist on one PC.</li> <li>• Chromeleon 6.80 SR15b or later is needed to control RSLCnano systems with ProFlow technology (this is not included in the upgrade kit).</li> </ul>	

## 2. Software Installation to Support ProFlow Technology

**Note:** Install the software in accordance with the installation guidelines for the relevant software package and the operation instructions for the respective NCx-3x00RS module.

### 2.1 LC Setup

The following full Chromeleon license software versions are available

- Chromeleon 6.80 SR15b or later
- Chromeleon 7.2 SR4 or later

### 2.2 LCMS Setup

For LC-MS installations with the ProFlow flow meter and Thermo Scientific Mass Spectrometry (MS) instruments, the following software options are available:

- SII 1.2 for Xcalibur or later (an upgrade with Chromeleon 7.2 SR4 or later is required)

**Note:** SII can only be used for Thermo Scientific MS detectors which operate under Thermo Scientific Foundation 3.x or later.

**Note:** DCMSLink for Xcalibur **does not** support the ProFlow flow meter and cannot be used to control an UltiMate 3000 RSLCnano system fitted with ProFlow technology which is coupled to a Thermo Scientific MS detector.

- Chromeleon 7.2 SR4 or later for UltiMate 3000 RSLCnano systems coupled with:
  - Thermo Scientific Exactive series instruments
  - ISQ™ single quadrupole instruments
  - TSQ 8000™ triple-quadrupole GC/MS instruments
  - TSQ Endura™ quadrupole MS instruments
  - TSQ Quantiva™ quadrupole MS instruments

**Note:** The Thermo Scientific MS detector is directly controlled by Chromeleon in contrast to SII for Xcalibur.

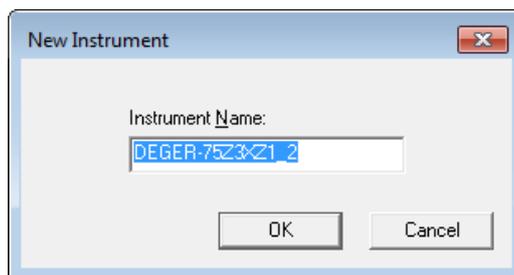
**Note:** Please check the list of supported hardware options in the software release notes or Chromeleon Help. A Chromeleon license is required to control the LC-MS system. Check the compatibility of Thermo Foundation and Xcalibur versions and Chromeleon 7.x for LC-MS control.

- DCMSLink 2.15 for HyStar™ or later
- DII for Empower™ 2.14 or later

### 3. Firmware Verification and Upgrade

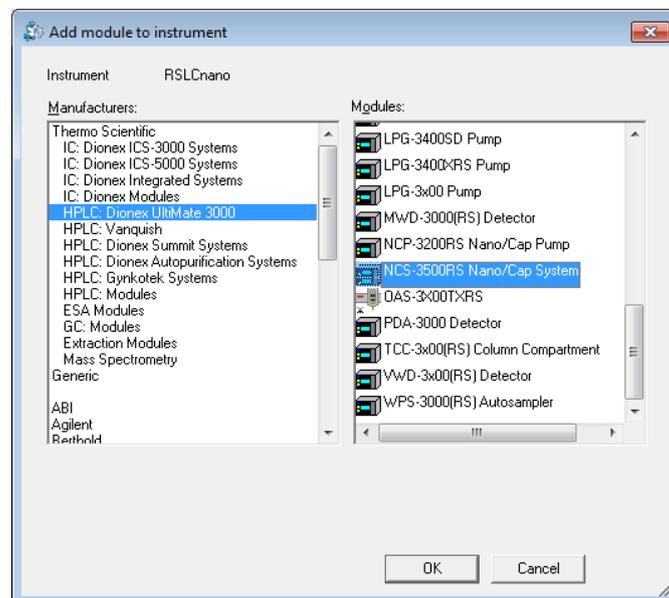
**Note:** Software screenshots and examples below show the system configuration in Chromeleon 7 or SII.

1. Start the Instrument Configuration Manager under Thermo Chromeleon 7 in the Windows® **Start** menu.
2. Click **Add Instrument** and create an **Instrument Name**. If an existing instrument configuration is to be modified to accommodate the ProFlow flow meter, go to the next step.



*Fig. 1: New instrument name window in Chromeleon Instrument Configuration Manager*

3. Add (or delete and add for existing Instrument configuration) the relevant NCx-3x00RS module to the instrument configuration.



*Fig. 2: The Add module to instrument dialog in the Chromeleon Instrument Configuration Manager*

- Verify that the correct firmware version is installed in the **Messages Instrument Controller** (Audit Trail) of the Instrument Configuration Manager. If the firmware version is 1.40 or later, proceed to step 6.

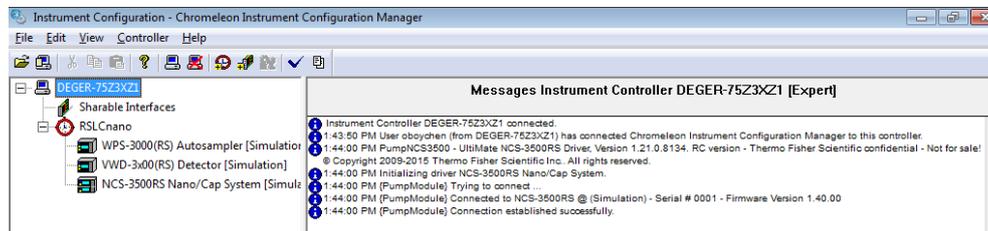


Fig. 3: Instrument configuration manager with the added NCS-3500RS module

- Open the **NCx Configuration** window and go to the **General** tab. Select firmware version 1.40 or later from the dropdown menu and click on **Install** to upload the firmware. Wait until the module reboots and the Audit Trail reports successful completion of the firmware download before proceeding.

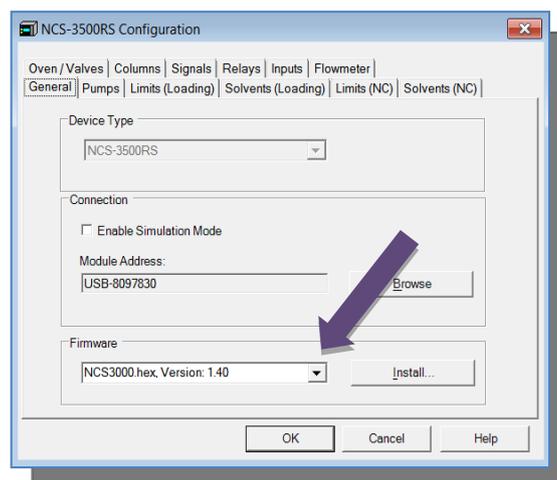


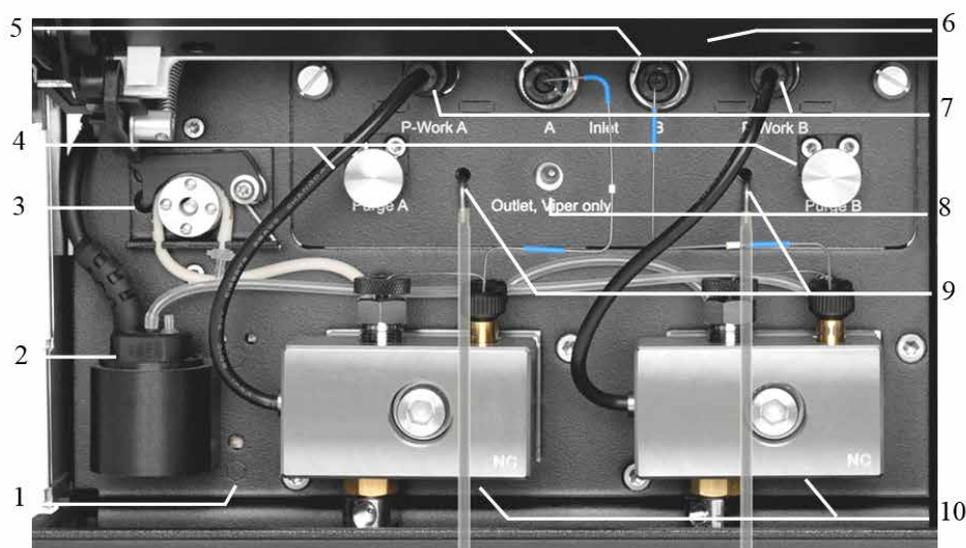
Fig. 4: The General tab for the Pump Device showing the firmware update

- Save the modified configuration to the Instrument controller (server).

## 4. Installation of the ProFlow Flow Meter

**⚠ Important:** To avoid damage from electrostatic discharge, wear appropriate earthing protection during the replacement procedure.

1. Turn off the NCx-3x00RS pump module by switching off the power switch on the rear of the module.
2. Disconnect the capillaries connected to the flow meter inlets and outlet.



*Fig. 5: NC pump with Classic flow meter (detailed view)*

No.	Description
1	Leak sensor
2	Rear seal wash system detector
3	Peristaltic pump
4	Purge screw
5	Flow meter inlet
6	Pump lights (hidden by the front panel door in this figure)
7	Connector for the pressure transducer cable (working pressure of the pump head)
8	Flow meter outlet
9	Purge outlet
10	Pump head

3. Unplug the pressure transducer cables.

4. Loosen the two screws that attach the flow meter and pull the flow meter out toward the front.
5. Install the ProFlow flow meter.  
**Note:** Be careful not to pinch any tubing.
6. Fasten the attaching screws on the flow meter and plug in the pressure transducer cables.
7. Exchange the capillaries and U tubes on the NC pump, with the capillaries from the upgrade kit. This includes:
  - Capillaries from the working cylinder to the equilibration cylinder (U-tube) on both pump heads of the NC pump.



*Fig. 6: U-tube for the NC pump of NCx-3x00RS module*

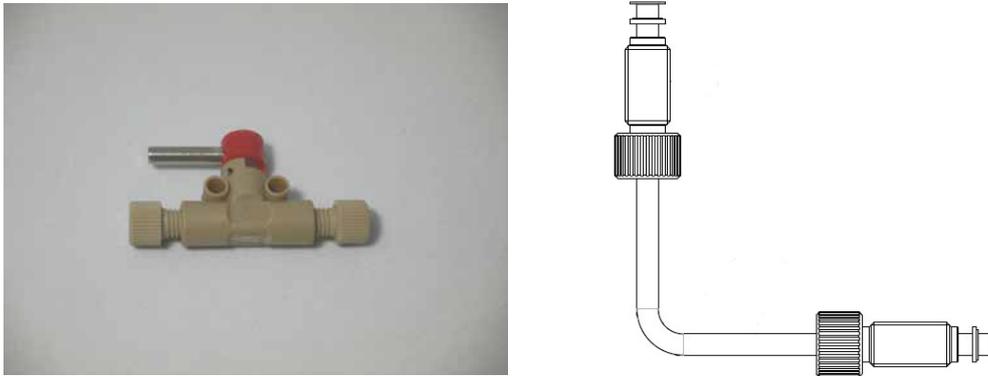
- The capillary from the right pump head to the flow meter inlet.
- The capillary from the left pump head to the flow meter inlet



*Fig. 7: Capillary from the pump head to the flow meter inlet*

**Tip:** The new capillaries can also be used with a Classic flow meter.

8. Install the solvent shut off valves and elbow pieces on solvent lines A and B.



*Fig. 8: Solvent shut-off valve and example schematic of an elbow piece*

- i** **Tip:** With the ProFlow flow meter, the shut off valves are required during the Zero Balance Adjustment. The shut off valves allow the solvent flow through the system to be shut off at the solvent reservoir, for example, to prevent solvent from flowing through the system when a pump flow of zero is required for a long period, such as during calibration.

9. Turn on the module by pressing the power switch on the rear of the module.

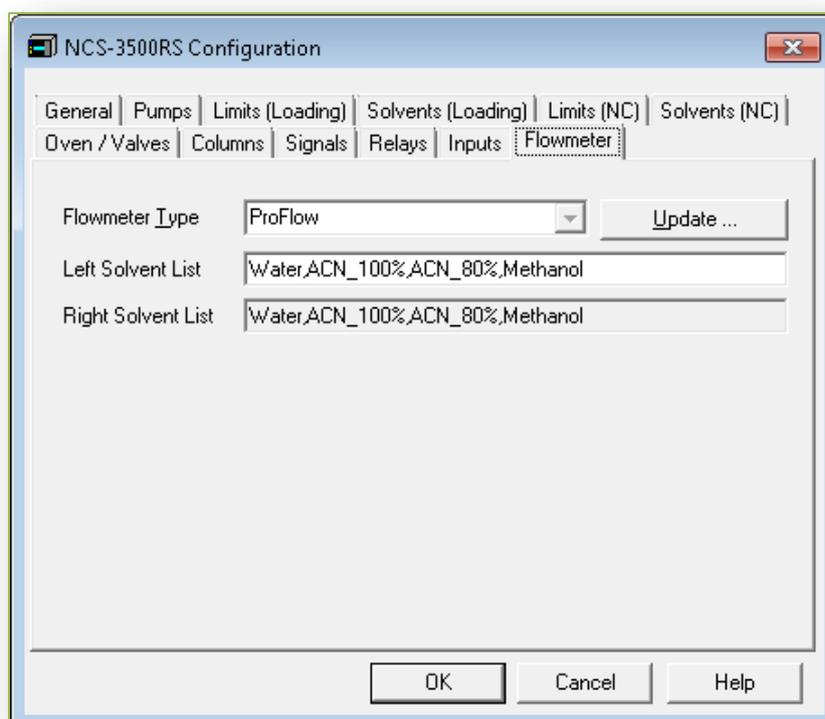


*Fig. 9: Detail view of NCS-3500RS pump module with installed ProFlow flow meter*

## 5. Instrument Configuration with the ProFlow Flow Meter

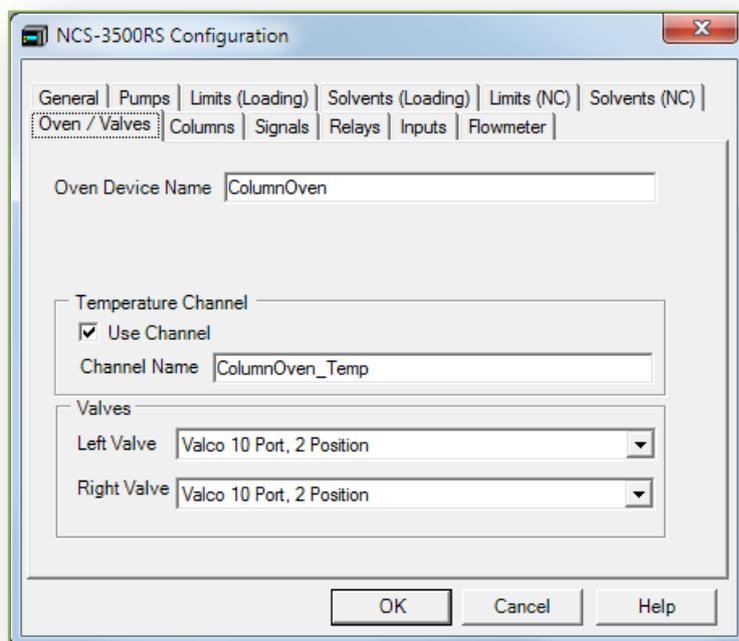
### 5.1 System Configuration

1. Start the Instrument configuration manager under Thermo Chromeleon 7 in the Windows **Start** menu.
2. Remove the NCx-3x00RS pump module from the configuration and then add it again. This will ensure that all new features are available for the ProFlow flow meter.
3. Verify the following settings:
  - The flow meter type (flow meter tab) is set to **ProFlow**.
  - The solvent lists show the predefined solvents (Water, ACN\_100%, ACN\_80%, MeOH).
  - The signals page shows the signal channels for the ProFlow flow meter as **Enabled (NC\_Pump\_Flow, NC\_Pump\_Flow\_LeftBlk, NC\_Pump\_Flow\_RightBlk)**.



*Fig. 10: NCS-3500RS module configuration window with the Flowmeter tab active in the Chromeleon Instrument Configuration Manager*

4. Customize the configuration of your module with the ProFlow flow meter as required.



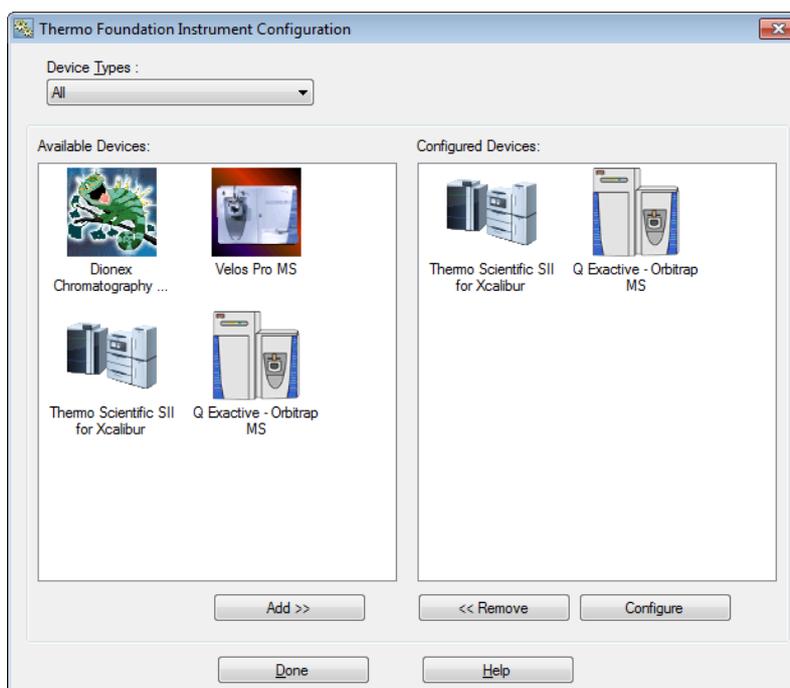
*Fig. 11: NCS-3500RS module configuration window with active Oven/Valves tab in the Chromeleon Instrument Configuration Manager*

5. Add the other relevant modules of your RSLCnano system to reflect the installed hardware.
6. Save the modified configuration to the Instrument controller (server).

## 5.2 Client Access in SII (no LC-MS control)

If Chromeleon is used for LC-MS control, proceed to section 5.3, page 12.

1. Start the instrument configuration under the Thermo Foundation 3.x folder in the Windows **Start** menu and add SII for Xcalibur to **Configured Devices**.



*Fig. 12: Thermo Foundation Instrument Configuration window*

The image above shows the Thermo Foundation Instrument Configuration window: Left side displays installed drivers (available devices) for DCMSlink for Xcalibur, Thermo Scientific SII, Velos<sup>TM</sup> Pro mass spectrometer and Q Exactive<sup>TM</sup> – Orbitrap<sup>TM</sup> mass spectrometer; right side displays the devices configured for operation.

2. Click on the **Configure** button.

3. Select the configured RSLCnano system with ProFlow flow meter.

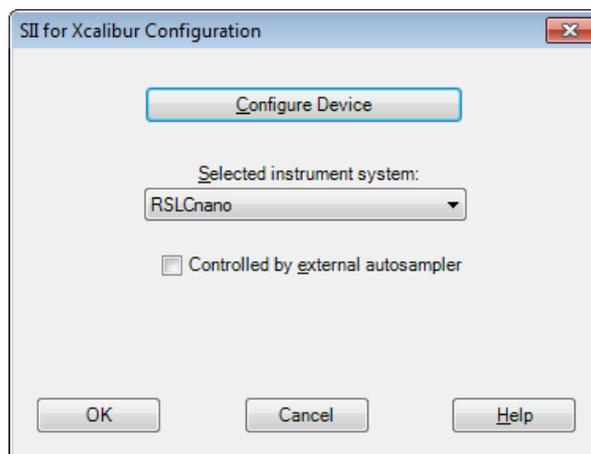


Fig. 13: SII for Xcalibur Configuration window with selected RSLCnano system

4. Open Xcalibur in the Thermo Xcalibur folder in the Windows **Start** menu.
5. Click on the **Direct Control** button to open the ePanels for direct control of the RSLCnano system.

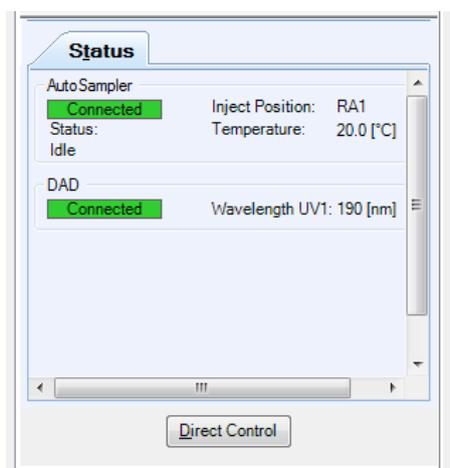


Fig. 14: Xcalibur window segment with the configured RSLCnano system and Direct Control button to access the Chromeleon ePanels

6. Select the NCx-3x00RS Pump ePanel in the Chromeleon Console.

### 5.3 Client Access in Chromeleon

1. Start Chromeleon 7 in Thermo Chromeleon 7 folder in Windows **Start** menu.
2. Click on Instruments in Category Bars (lower left corner in the Console).
3. Select the NCx-3x00RS Pump ePanel.

## 6. ProFlow Flow Meter Purging and Calibration

1. Purge both pump heads of the NC pump for about 15 minutes.

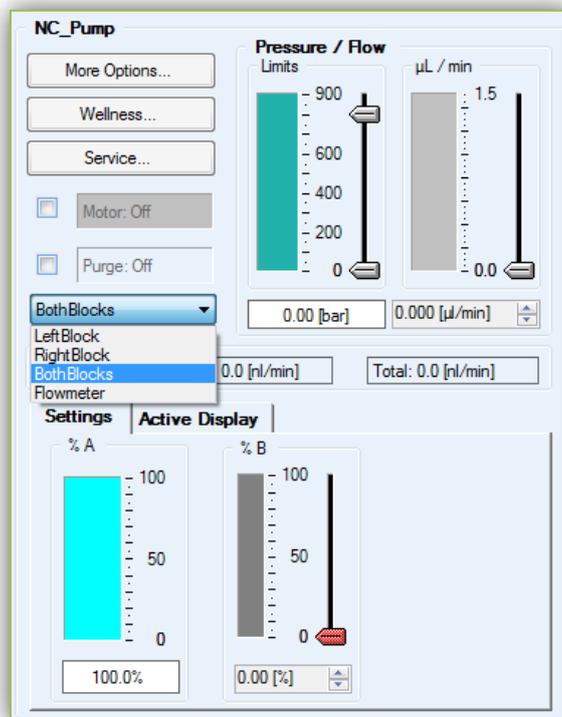


Fig. 15: NC\_pump segment of NCx-3x00RS ePanel with installed ProFlow flow meter

**Note:** Follow the instructions in the **Ready Check Results** window and open both purge screws.

**Tip:** The partial flows for channel A and B are displayed along with the total flow on the **NC\_Pump** segment of the ePanel.

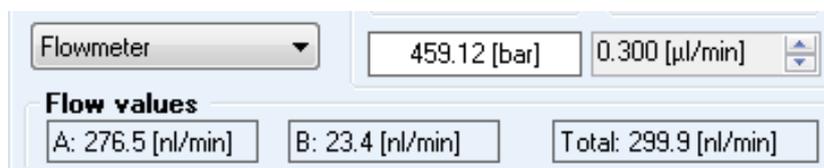
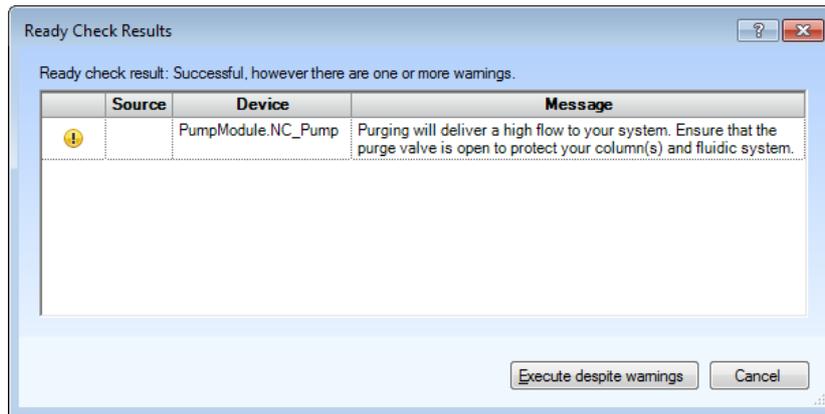


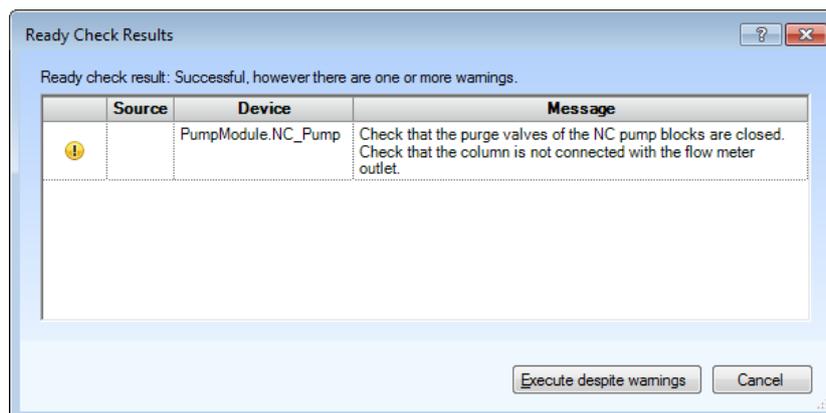
Fig. 16: A part of the NC\_pump segment of an NCx-3x00RS ePanel



*Fig. 17: Ready Check Results window appears after the NC pump blocks purge is executed*

2. After purging the pump heads, purge the ProFlow flow meter for about 10 minutes.

**Note:** Follow the instructions in the Ready Check Results window and close both purge screws.



*Fig. 18: Ready Check Results window appears after the flow meter purge function is executed*

3. Start the Adjust Zero Balance test on the NC Pump Wellness tab. A wizard will guide you through the procedure.

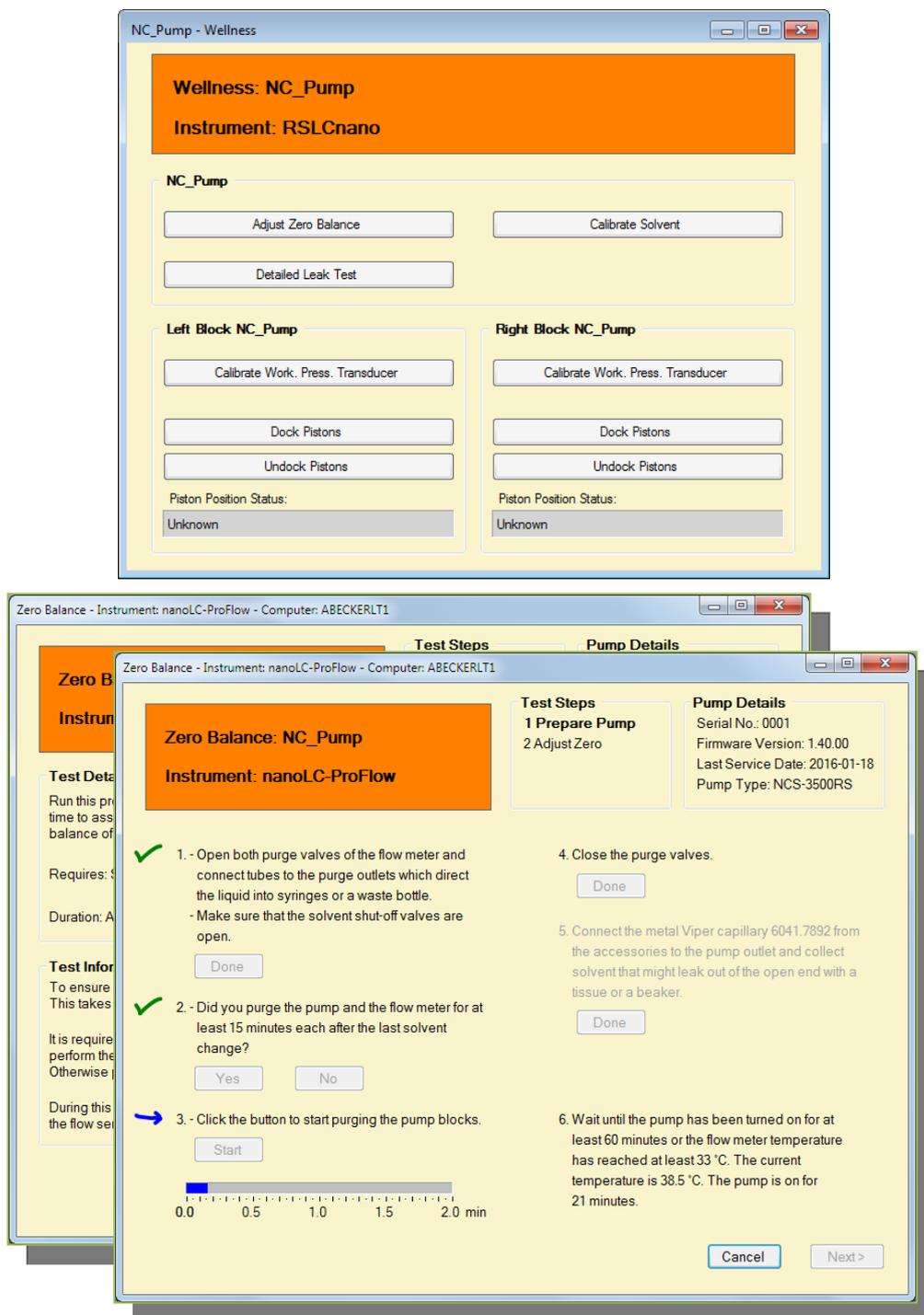


Fig. 19: Wellness window in NC\_pump segment and Zero Balance wizard

4. Set the solvent types for the left and right block to match your application in the **More Options** tab of the NC\_pump group of NCx-3x00RS ePanel.

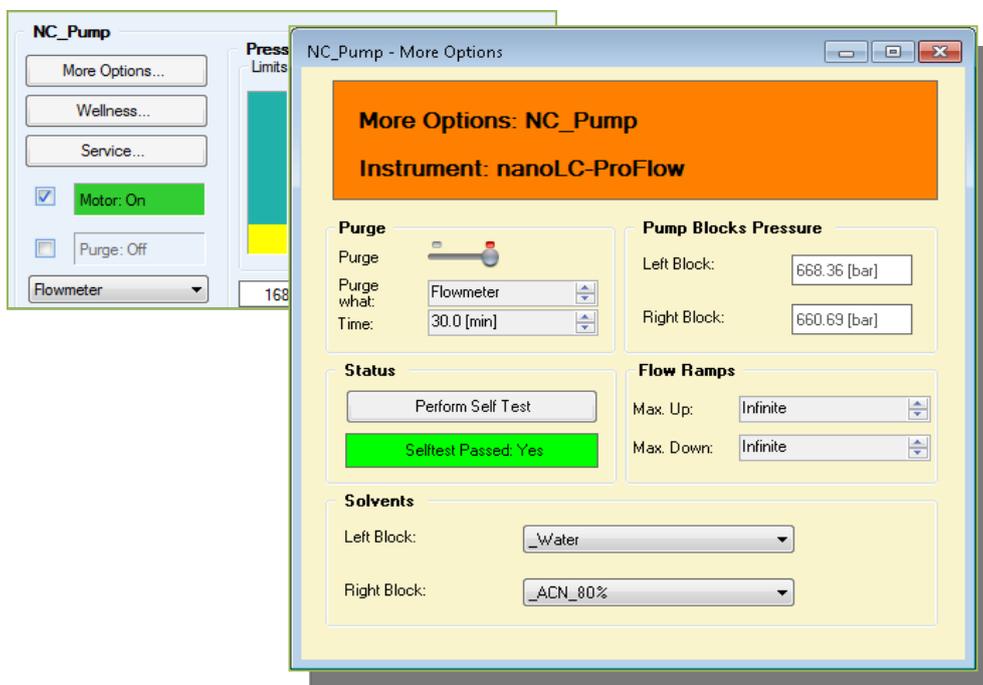


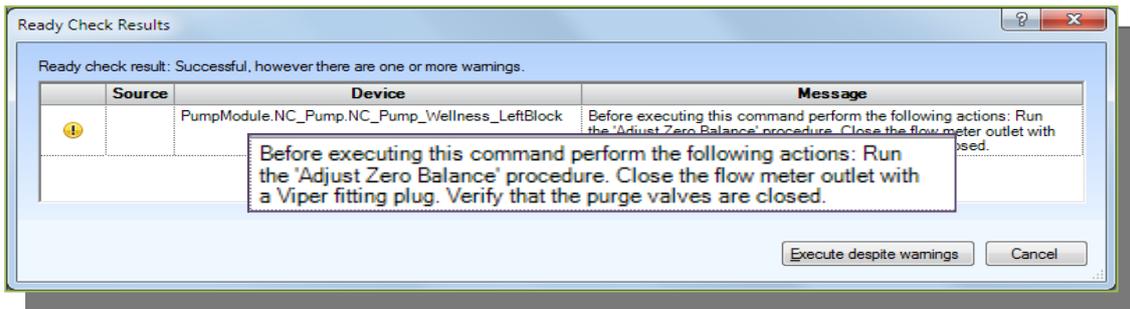
Fig. 20: More Options window of the NC\_Pump segment in the NCx-3x00RS module ePanel

**Tip:** The ProFlow flow meter comes pre-calibrated for the four standard solvents: Water, 100% Acetonitrile, 80% Acetonitrile with 20% Water, and 100% methanol (MeOH). The calibration values for these solvents are valid for the entire life time of the ProFlow flow meter. A re-calibration of the solvent types is **not** necessary if the ProFlow flow meter is removed from the system and installed in another NCx-3x00RS pump module.

**Tip:** Separate solvent calibrations are **not** required with the addition of up to 2% of a solvent additive (e.g. for 2% acetonitrile / 98% water, the solvent type ‘\_Water’ can be used. Similarly, small amounts of phase modifiers (<1%) e.g TFA, FA do not need to be taken into account for the solvent calibration.

**Tip:** A solvent calibration is **only** necessary for a solvent composition that differ significantly from pre-calibrated standard solvents and has not previously been calibrated for the ProFlow flow meter. Once a solvent type calibration has been made, the solvent calibration is valid for the lifetime of the ProFlow flow meter. Click Solvent calibration on the Wellness tab in NC\_pump section of NCx-3x00RS module to access a Wizard that will guide you through the procedure. The procedure will take around 1 hour and will require manipulation with fluidics.

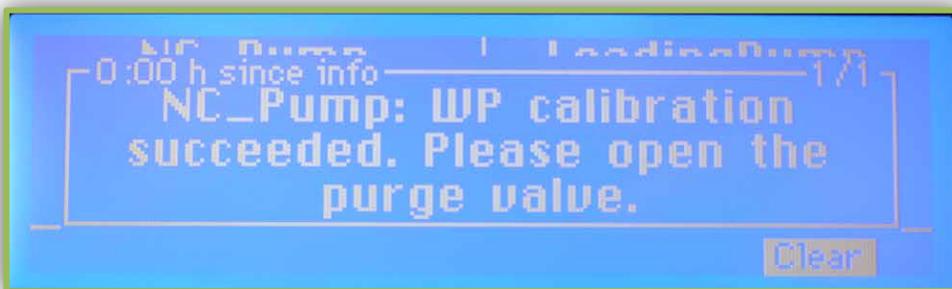
5. Calibrate the working piston pressure transducers of the left and right blocks as follows:
  - Click on the **Wellness** tab In the NC\_pump group.
  - Select either the left of the right NC pump block one of the Calibrate Work. Press. Transducer buttons to start the procedure.
  - A Ready Check message is displayed.



*Fig. 21: Ready check results window appeared after commencing the working pressure transducer calibration*

- Close the flow meter outlet with the Viper plug.
- Close the purge valves.
- Press **Execute** despite warnings.

**i** **Tip:** Successful completion of the WP calibration will be reported on the instrument display panel and in the Chromeleon Audit Trail.



*Fig. 22: The message that shows the result of Working Pressure transducer calibration on the NCx-3x00RS module*

	Date	Time	Retention Time	Device	Message
	1/14/2016	9:11:12 PM +01:00	1.599		End While
	1/14/2016	9:11:12 PM +01:00	1.599		While \$PmpL.Flowmode=Running: No
	1/14/2016	9:11:12 PM +01:00	1.590	PumpModule.NC_Pu...	Calibration of the working piston sensor of the left nano pump block finished.
	1/14/2016	9:11:12 PM +01:00	1.590	PumpModule.NC_Pu...	WP calibration succeeded. Please open the purge valve.
	1/14/2016	9:09:52 PM +01:00	0.261		While \$PmpL.Flowmode=Running: Yes
	1/14/2016	9:09:47 PM +01:00	0.177		While \$PmpL.Flowmode=Running: Yes

*Fig. 23: Audit trail zoom in that confirms successful calibration of working pressure transducers*

6. Repeat the Calibrate Work. Press. Transducer routine for the second block (repeat the procedure described above).
7. Perform a Detailed Leak Test to check that all NC\_Pump flow connections are tight.
  - Click on the **Wellness** tab in the NC\_pump group.
  - Select the **Detailed Leak Test** and follow the instructions given in the wizard.

**The system is now ready for operation!**

## 7. Supporting Information

### Documents that are available for further reference.

- Operating Instructions for the UltiMate 3000 modules
- Installation Qualification manual for installation of the UltiMate 3000 RSLCnano system
- RSLCnano Standard Applications Manual
- Viper™ Capillaries and Finger Tight Fitting System Installation and Operation Guide
- Nano Connector for UltiMate 3000 RSLCnano Systems Installation Instructions
- Application/technical notes provided on the Thermo Scientific website

**Table 1. Spare Parts**

<i>Item</i>	<i>Part No.</i>	<i>Quantity in the kit</i>
<b>Upgrade kit for ProFlow flow meter, including</b>	6041.3003	
Capillary, nanoViper, MP35N (0.25 x 155 mm I.D. x L) To be used, for example, for calibrating solvents with the ProFlow flow meter or establishing the solvent viscosity with the Classic flow meter or for purging the flow meter.	6041.7892	1
<b>NCS Pump head Capillaries</b>		
Capillary from working cylinder to equilibration cylinder (U-tube)	6041.7888	2
Capillary from left pump block to flow meter inlet	6041.7890	1
Capillary from right pump block to flow meter inlet	6041.7893	1
<b>Viper Fitting Plugs</b>		
Fitting plug (Viper, titanium, biocompatible)	6040.2303	2
<b>Solvent Shutoff Valves</b>		
Solvent shut off valve	2265.0010	2
PTFE elbow tubing piece 1.0x3.0x100mm ID x AD x L	6040.8122	2
<b>Software</b>		
SII for Xcalibur Service Release DVD	4780.0384	1
Chromeleon 6.80 Service Release DVD*	4580.0316	1
Chromeleon 7 Service Release DVD	4580.0720	1

\*This item is not included as part of the upgrade kit.

**Table 2. nanoViper tubing matrix**

<b>Length (mm)</b>	<b><i>I.D.[Color code] and corresponding part number</i></b>				
	<b><i>20 <math>\mu</math>m [Orange]</i></b>	<b><i>50 <math>\mu</math>m [Brown]</i></b>	<b><i>75 <math>\mu</math>m [Black]</i></b>	<b><i>100 <math>\mu</math>m [Red]</i></b>	<b><i>150 <math>\mu</math>m [Purple]</i></b>
70	6041.5120	6041.5123	6041.5126	6041.5810	6041.5817
150	6041.5121	6041.5124	6041.5127	6041.5811	6041.5818
250	-	-	6041.5730	6041.5812	6041.5819
350	6041.5240	6041.5540	6041.5735	6041.5813	6041.5820
450	-	-	-	6041.5814	6041.5821
550	6041.5260	6041.5560	6041.5760	6041.5815	6041.5822
650	6041.5275	6041.5575	6041.5775	-	-
750	6041.5280	6041.5580	6041.5780	6041.5816	6041.5823
950	6041.5122	6041.5125	6041.5128	-	-