ABB MEASUREMENT & ANALYTICS | INFORMATION | INF09/020 REV. B

Navigator 600
Silica analyzers

Troubleshooting

Measurement made easy

1 Introduction

This publication details troubleshooting procedures for Navigator 600 series silica analyzers.

2 For more information

Further information is available from:
www.abb.com/analytical

or by scanning these codes:

Sales

Service

3 Troubleshooting Procedures

Note. If the procedures in this section do not resolve the problem, gather the information in IM/NAV6S, Section 10 and contact ABB Service.

3.1 Analyzer Malfunction

In the majority of cases any problems experienced are found generally to be associated with the chemistry (check reagents/solutions first) and the liquid handling section.

The most common problems are associated with the reagent or standard solutions. Any unpredictable problems may be due to the standard or reagent solutions or their flow through the analyzer. If any doubts exist regarding the integrity of these solutions, replace with freshly prepared solutions in the early stages of the fault finding investigations.

If the analyzer fails to produce expected results, the most likely cause is the standards; either contaminated when handled or made up with poor quality water, possibly containing high levels of silica. Incorrectly prepared reagents may give a poor calibration factor. If the solutions are from a proprietary chemical supplier, take care when storing the bottles; date stamp, use in strict rotation and do not use after their expiry date. When measuring trace levels, contamination can be avoided only by preparing and handling solutions with great care. Laboratory glassware is not to be used for solutions; use plastic instead.

Check mechanical components that are involved with the liquid handling systematically. For example, pumps, valves, tubing and tubing connections should be checked for correct operation and for leaks or blockages. Check that there have been no unauthorized modifications, for example, incorrect tubing fitted.

A calibration fail could be caused by the liquid handling section of the analyzer, including the solutions.

Noise may be due to air bubbles sticking in the pipework and cuvette. Degassing of the sample is normal due to pre-heating on entry into the liquid handling section. However, the analyzer is designed so this does not normally affect its performance.

If the problem is excessive, a manual chemical clean should be performed – see IM/NAV6S.

Note. The analyzer is not suitable for samples with very high levels of entrained gas. Additional external sample de-gassing may be required in these applications.

3.2 Single-Stream Mode for Maintenance

To carry out any maintenance it is necessary to switch to a single stream provided that a stream is available. If not, a solution can be introduced via the secondary calibration valve. This stops the multi-stream sequencing and enables the display and the current output to respond to immediate color changes in the cuvette. This mode is used to check the basic performance of the analyzer, such as response or drift, without waiting for the normal stream update.

Note. In a multi-stream analyzer, ensure that only 1 stream is enabled for maintenance – see IM/NAV6S.

Selecting more than one stream puts the analyzer into multi-stream operation.

3.3 Effects of Loss of Power to the Analyzer

The automatic action taken by the analyzer following an unforeseen loss of power is dependent upon the length of time the power was off and what was happening at the time of the power loss.

The following table shows the automatic functions that are performed:

Analyzer Status	Period of Loss of Power	
	< 24 hours	> 24 hours
Between calibration or clean sequences	Function: 1. Sample and reagent purge 2. Recovery	Function: 1. Sample and reagent purge 2. Clean sequence 3. Recovery
During clean sequences	Function: 1. Sample and reagent purge 2. Recovery 3. Restart/Clean 4. Recovery	Function: 1. Sample and reagent Purge 2. Clean sequence 3. Recovery

Table. 3.1 Automatic Functions by Status/Power Loss

3.4 Simple Checks

Note. Before carrying out tests on the multi-stream version, it is essential that only one stream is selected.

Caution. When carrying out the following procedures, take care not to overtighten the connectors as this can cause the tubes to distort and impede or block flow.

Tighten the tube connectors finger-tight and then add a further 1/4 turn using a 6 mm spanner.

3.4.1 Unstable or Erratic Readings, Calibration or Zero Factors

Check/Symptom	Action
Visual check for air bubbles	Check for air bubbles in the reaction block and in the tube feeding the optical unit. If bubbles are found, check if they are present in the sample line or originate from one or more of the reagents. 1. From the sample line: a. Check tube connections from the constant-head unit to the pump assembly – tighten if necessary. b. Check the solenoid valves and ensure the screws on the reverse side are tight. 2. From the reagent line(s): a. Check the pump tube connections. b. Check the reagent bottle caps. 3. In the reaction block and tubing: a. If bubbles in the reaction block and tubing are flowing smoothly, the problem is likely to be a poor seal on one or more of the tube connectors. b. Tighten tube connections as above. If the problem persists, replace the affected tubing assembly. 4. If bubbles are pulsing: a. Check if there is a blockage or partial blockage. Blockages can be caused by overtight tube connectors. b. Check the tightness of all connectors in the sample or reagent line affected.
Degassing in cuvette	To check for degassing in the cuvette: 1. Check the optical measurement mV values – see IM/NAV6S. 2. If the mV values are unstable, carry out a Manual System Clean – see IM/NAV6S.

3.4.2 Low/High Calibration Factors

Follow the guidance in the Operation – General Information section – see IM/NAV6S. If this does not rectify the situation, perform the following checks:

Check/Symptom	Action
Secondary calibration valve	To check the valve: 1. Manually energize the secondary calibration valve – see IM/NAV6S ('Manual Test Settings'). 2. Check that the LED on the main board is lit and that there is an audible click from the solenoid valve.
Secondary calibration solution flow	To check the secondary calibration solution: 1. Unscrew the lid on the secondary calibration solution bottle and withdraw the level sensor assembly to introduce some air so that it is possible to see if the solution is flowing. 2. De-energize the secondary calibration valve and replace the bottle lid. If solution is not flowing or it is pulsing: a. Check the sample connections on the lid and the solenoid valve; ensure they are not overtightened. b. Check the pump tubing and capstan, replace if necessary.

3.4.3 Analyzer Stability and Response Test

If the analyzer exhibits short term drift or instability, see IM/NAV6S, Appendix 3.4.1 for an overview of possible causes.

If this action does not help to resolve the problem, run the analyzer on a fixed concentration silica solution (see below) to establish if the analyzer is unstable or if the drift or changes in the reading are real changes in the sample.

Check/Symptom	Procedure and Action
Short term drift or instability	Run the analyzer on a fixed concentration silica solution. To perform this procedure: 1. Manually energize the secondary calibration valve and exit 'Manual Test Settings' in 'Test' mode. 2. Change the operator view to show the chart screen – see IM/NAV6S. 3. Run the analyzer in this way for as long as required to check for instability or drift. 4. De-energize the secondary valve when finished. 5. Follow the checks and procedures detailed in 'Unstable or Erratic Readings' – see IM/NAV6S. 6. If the above checks do not resolve the issue, carry out a 'Manual System Clean' – see IM/NAV6S.

3.4.4 Checking the Optical Unit

If the analyzer fails to perform calibrations and normal measurement routines correctly, check the Optical Unit against outputs as a diagnostic/remedial procedure.

Check/Symptom	Action
Excess mV values	To check excess mV values: 1. Press ▤ and select 'Diagnostic Information', 'Measurement Status'. The 'Measurement Status' window is displayed and a mV signal value is displayed for the cuvette and the cuvette reference sensors. 2. If the mV values are unstable and are moving by more than ± 10 mV over a short period of time, there could be bubbles developing within the cuvette. 3. If bubbles are confirmed in the cuvette, check the tube connections – see IM/NAV6S and if the problem is not resolved by this procedure, perform a manual system clean – see IM/NAV6S.
Optical photocells	If there is no response or calibrations fail, check the output of the optical photocells as follows: 1. Empty the cuvette of reacted chemicals: a. Press the ▤ key. b. Select 'Calibration & Maintenance'. c. Select 'Manual Test Settings'. d. Select 'Test Pumps'. e. Switch the reagent pump off and increase the speed of the sample pump to 5 rpm. f. Run the sample pump at the increased speed for 5 minutes. g. After 5 minutes have elapsed, set the sample pump speed back to its normal (previous) speed. 2. View the mV values in the 'Measurement Status' window. 3. If the optical unit is functioning correctly, the mV values are within the following ranges: – Cuvette: 1000 to 2300 mV – Cuvette Ref: 1000 to 2300 mV 4. If the Cuvette Ref signal is low, replace the optical unit – part number AW600 091. 5. If the Cuvette signal is low, perform a manual system clean – see IM/NAV6S. If this does not resolve the problem replace the optical unit – part Number AW600 091.

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INF09/020 Rev. B 08.2018