Uniguard

Version 4.0.1.4

Getting Started

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99.03.01A.02/2/C	Excel 2010	2011-12-15
99.03.01A.02/2/D	Uniguard .NET	2013-10-04

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Preface

Introduction

Welcome to Uniguard, the software that allows you to perform healthcare monitoring of your CheckSonic™, FlareSonic™, MicroSonic™, P.Sonic®, Q.Sonic® or TwinSonic™ gas flow meter with your personal computer.
Uniguard can only be used with meters with series III, IV, or IV.a electronics. A meter configured with a remote unit is not in the scope of Uniguard and is therefore not supported.

Warranty

All software provided to purchaser is provided on an as-is basis. Elster NV/SA warrants that the program and media shall be free from defects in material and faulty workmanship. The warranty provisions stipulated in the manufacturer's general ***Terms of Delivery*** are applicable to the product.

The entire risk as to the quality and performance of the software is with the purchaser. Except as stated in the manufacturer's general ***Terms of Delivery***, should the software programs or any adaptations thereof prove defective, purchaser assumes the entire cost of all necessary servicing or repair or correction, and any incidental damages. In no event will Elster NV/SA be liable for direct, indirect, incidental or consequential damages resulting from:

- a defect in the software, or
- the unintentional or deliberate misuse of the software.

What Is Uniguard?

Uniguard is a software tool which allows easy healthcare monitoring of an ultrasonic gas flow meters from Elster NV/SA. It is recommended to perform a health care monitoring of your UFM on a regular basis (e.g. weekly or monthly). Using UniGuard on a regular basis can detect certain malfunctions before they develop into real problems. In addition the long term stability of the ultrasonic meter can be monitored.

UniGuard allows you to calculate physical properties, e.g. velocity of sound, density, superior calorific value, ... These calculations are made according to generally accepted standards: AGA 8 / 10 and ISO 6976.

What You Need to Run Uniguard

The minimum system requirements to run UNIGUARD are:

- Windows XP service pack 3 or later. (also newer operating systems: windows vista, 7 and 8 are supported).
- Microsoft .NET Framework 4.0 (this included in the package)
- Pentium IV 1GHz, 2 GB RAM and 2.0 GB free disk space
- Free disk space, should be minimum 500 MB
- No license is required for Uniguard
- Screen resolution of 1024x768 or higher.
- One free serial port (RS232 or TCP/IP depending on the connection settings with the UFM)
- An appropriate RS485 converter/interface when connecting to the UFM over longer distances. If necessary this can be obtained through Elster NV/SA.

Typographical Conventions

To help you locate and interpret information easily, this manual employs consistent visual cues, and a few standard text formats. You will find the following typographic conventions throughout this manual.

Type Style	Meaning
Italic or **bold**	Used to emphasise a word or phrase.
Initial Capitals	Menu items, command names, and dialog box names and options, for example, File Menu, or Save Command.
<Key>	The names of keys on a keyboard, for example <Esc>.
"`command`"	Typewriter style denotes text or characters that are to be literally input from the keyboard, and for responses from a device, for example a PC, or a flow meter.

Symbol	Meaning
▶	Signals the beginning of a procedure.
■	Signals a procedure that has only one step. Also used to signal the end of a multi-step procedure.
❶❷❸…	Signal the steps of a procedure.

Terminology

The following terms take on special meanings in the context of UNIGUARD. Your familiarity with them will make the concepts and procedures presented in this guide and in On-line Help easier to understand.

Choose: To use a mouse or key combination to pick an item that begins an action in Uniguard.

Click: To quickly press and release the mouse button.

Select: To mark an item by highlighting it with key combinations or by clicking it with a mouse.

Window: A rectangular region of the screen containing a set of controls that accept input from the user and display information to the user. Windows can perform many different functions, from representing the front panel of an instrument to allowing you to select a filename.

1 Installing Uniguard

1.1 Introduction

This section details the installation procedure. Follow the instruction carefully.

1.2 Pre-installation instructions

❶ Install latest windows updates.

❷ If you have an existing Uniguard installation on your computer you need to uninstall any old version before installing a new version.

❸ If you are installing from a memory stick, create a folder on the desktop, copy the installation files to the newly created folder and run the setup files from there. This folder may be deleted after the setup is complete.

1.3 Installing Uniguard

❶ Install .NET 4.0 Framework dotNetFx40_Client_x86_x64.exe in UniGuard Installation's DotNetFX40Client folder.
This will approximately take 10 minutes to complete. The progress bar will stall for a period, please be patient, you will receive a message to restart after the .NET install is complete.

❷ Install UniGuard Application (Setup.exe in UniGuard Installation folder).
This will take from 3-7 minutes to complete. You will receive a message for a password, this should be ignored. When the installing is complete, you might be asked to re-start the PC.

2 Using Uniguard

2.1 Introduction UNIGUARD

When the normal installing procedures are followed, Uniguard is installed at: C:\Program Files\Elster\Uniguard.

In case of 64 bit Operating System, the Uniguard will be installed at: C:\Program Files (x86)\Elster\Uniguard

A shortcut should have been generated on the desktop, use this to start Uniguard. Alternatively you can run UniGuard from the Start menu Figure 2-1 will appear on the screen:

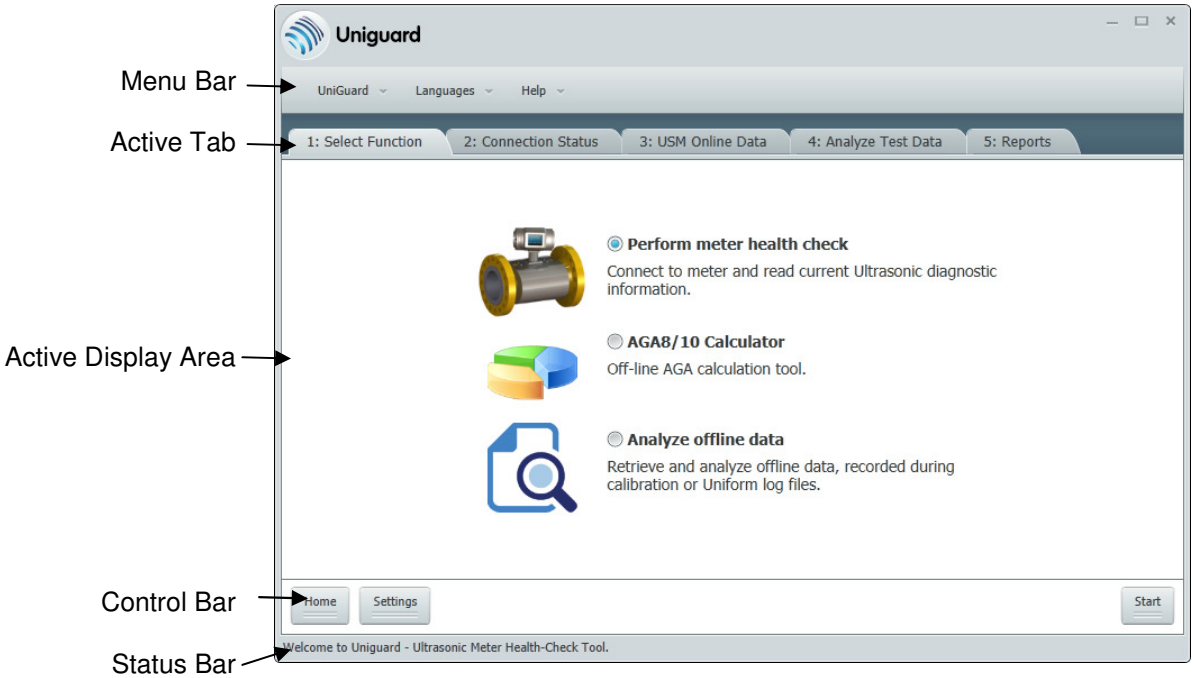


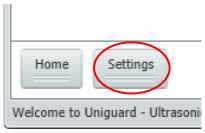
Figure 2-1: Opening screen

On every screen you find the <Home> button on the left bottom. When pressing this button you go back to the 'Opening screen'.

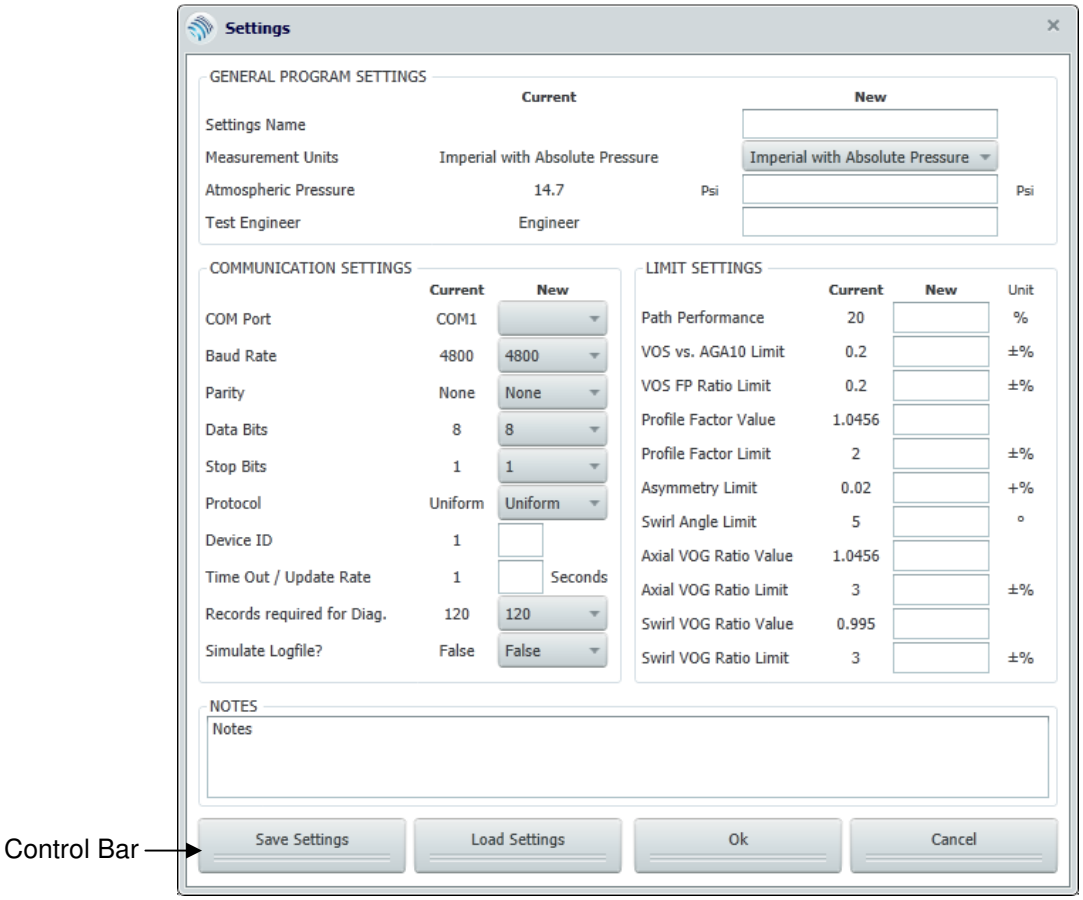
2.2 Modify settings

Before starting with the health care monitoring or the AGA 8/10 calculator, modify Uniguard to the desired settings.

▶ Modify settings



❶ When Uniguard is start-up, Figure 2-1 appears. Go to the "`Control Bar`" and click on the Settings Button. Following window, Figure 2-2, will appear.

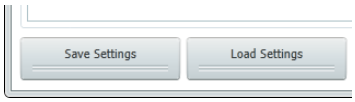


Control Bar →

Figure 2-2: Setting File

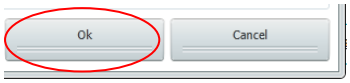
❷ Modify all the settings to the desired values.

Make sure the "Communication Settings" are filled in correctly; otherwise communication with the flow meter will not be possible! If your used COM Port is not listed and you have just installed COM Port or Devices, please restart your computer and/or UniGuard application to get updated COM ports displayed.



By using the buttons on the "Control Bar" it is possible to save or load your settings, so they can easily be loaded at the next session.

❸ When the settings are filled in correctly, click <OK> at the "Control Bar". Or press <Cancel> to keep the settings as they were when the Settings screen opened and you go back to the opening screen.



Note

When changing settings, it is possible that UniGuard needs some time to make the change.

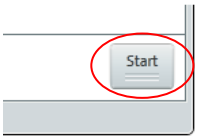
For each application specific Limit settings can be entered and stored. Setting those more accurate for a certain application improves the quality and reliability of the health care check. The default limits however provide a good start.

Changing the limits has only an effect on the Uniguard health check report. No real alarms will or can be altered through Uniguard.

2.3 Perform meter health check

▶ Meter health check

❶ Open Uniguard and ensure the settings are correct (see chapter: 2.2).



❷ When the main screen as seen in Figure 2-1 is displayed, select <Perform meter health check>. Proceed to the next step by clicking <START> at the "Control Bar".

❸ CONNECTING TO METER (Figure 2-3).

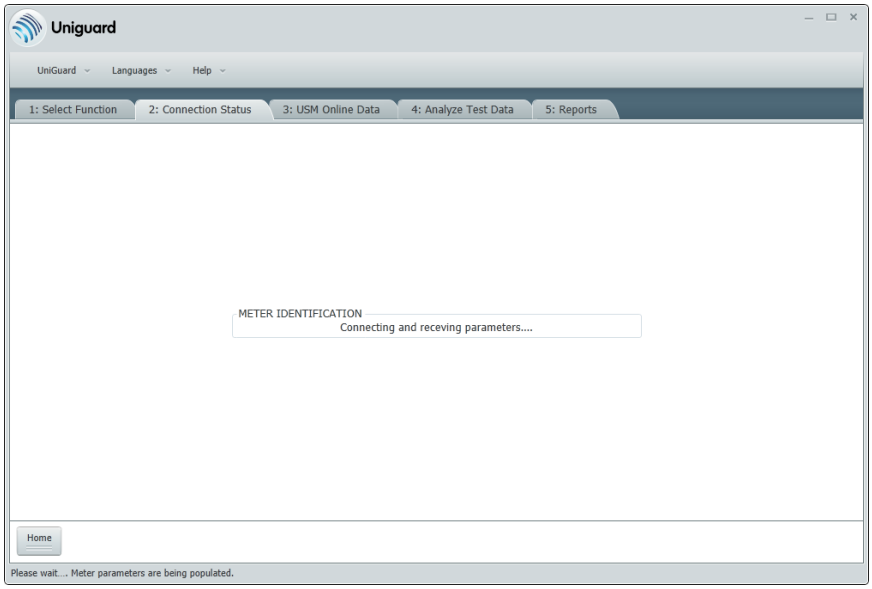


Figure 2-3: Attempting to connect the meter

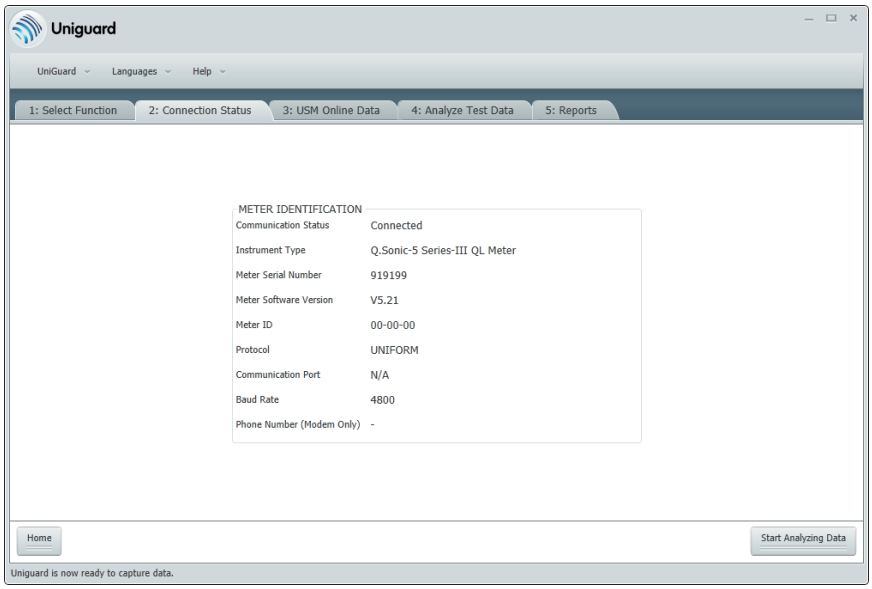
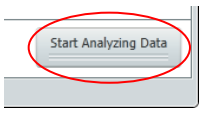


Figure 2-4: Uniguard is now connected to meter



If the connection setting are filled in correctly at the Setting step (see 2.2), Uniguard will try to connect the meter automatically (Figure 2-3.) and the meter data is displayed upon successful connection (Figure 2-4)

Proceed by clicking <Start Analyzing Data> at the "`Control Bar`".

❹ ULTRASONIC METER ONLINE DATA (Figure 2-5)

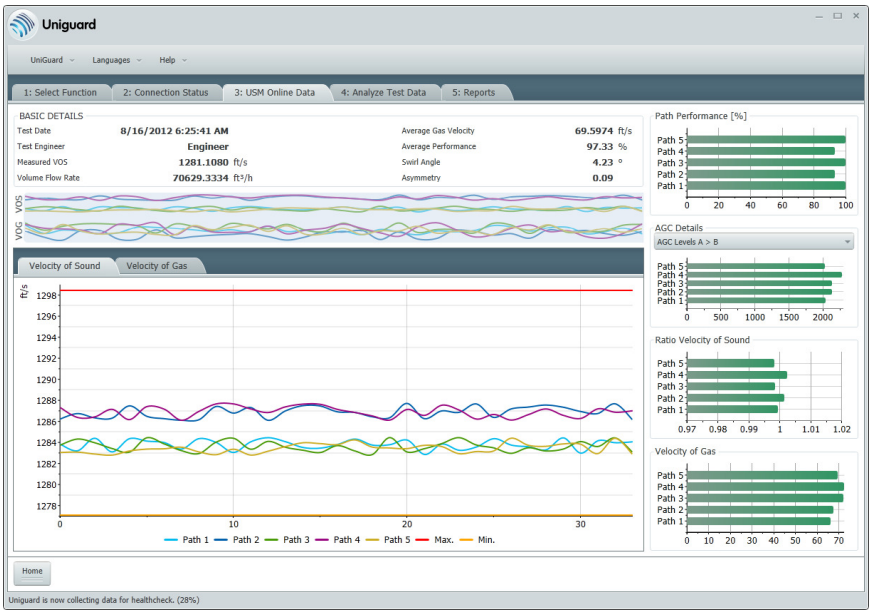


Figure 2-5: Ultrasonic Meter Online Data

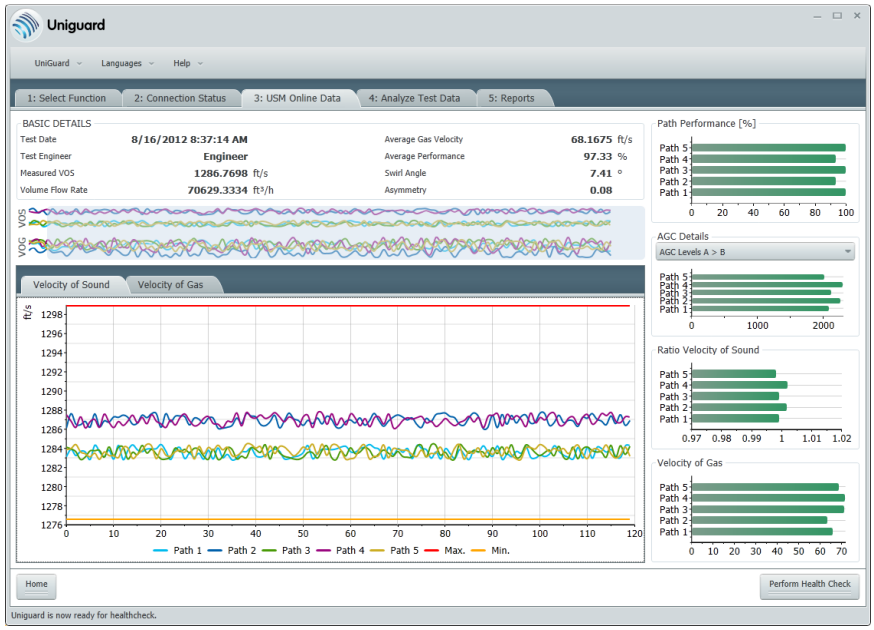
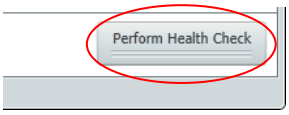


Figure 2-6: Ultrasonic Meter Online Data (Ready for Health Check)



Uniguard displays the most relevant data of the UFM on the screen. The status is also being displayed on "Status bar". When Uniguard will collect enough records to measure health care check, the <Perform Health Check> button will be displayed at the "Navigation bar". (See Figure 2-6). The health care check can be started by clicking on it.

Note

To have a better visualization of the flow profile in the meter, the axial paths are always presented in the middle of the graph. This is also the case for the report (see chapter 3).

For reliable results make sure you start logging data when the flow is stable, both gas velocity and Velocity of sound. During the two minutes it is important that the application remains stable as well. Uniguard will indicate a warning when the gas velocity exceeds the limits (red horizontal bars in the Gas Velocity trend.

When the gas velocity is low, Uniguard will indicate a warning message. A health care check is still possible, however keep in mind that some criteria (e.g. Path Velocity Ratios) may exceed the normal limit values.

❺ ENTER GAS COMPOSITION and PROCESS CONDITIONS
(Figure 2-7)

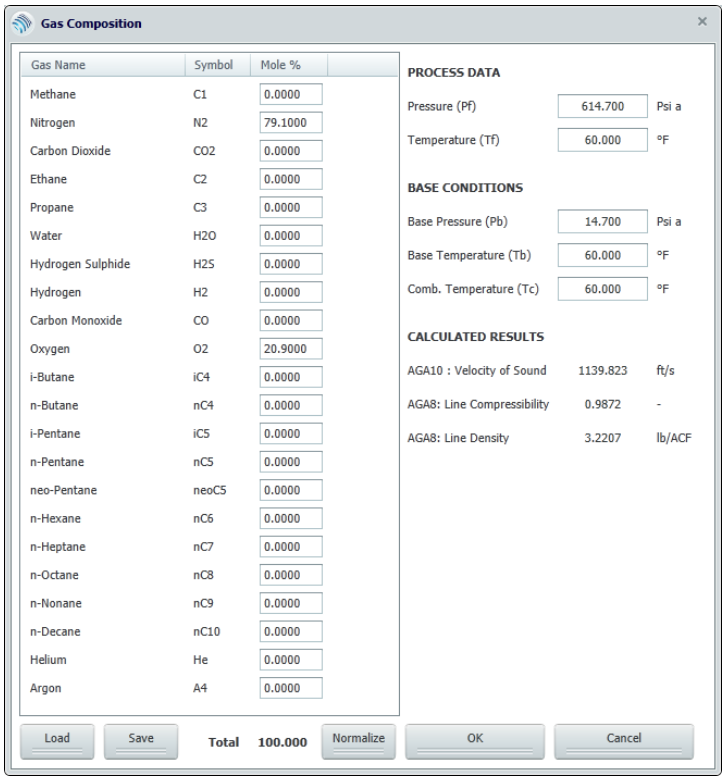
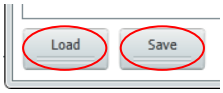


Figure 2-7: Enter Gas Composition & Process Conditions



Fill in the gas composition.
By using the buttons on the "Control bar", it is possible to save/load your gas composition to/from a CSV file.

Enter the process – and the base conditions, the most relevant physical properties will be calculated.

When gas composition and process data are filled in correctly, proceed by clicking <OK> at the "Control bar".

Note

The composition of your gas may change during a longer period of time. A reliable Velocity of Sound check is only possible when the ***exact*** gas composition, temperature and pressure at the time of performing the UniGuard health check are known!

❻ ANALYSE TEST DATA (Figure 2-8)

Figure 2-8: Analyze Test Data

All the gathered data is now analysed and compared to the preset limits (see chapter 2.2). It's possible to enlarge a graph by clicking on it. Click on it again to go back to 'analyze test data' screen.

Proceed by clicking <Show Report> at the "`Control bar`".

❼ REPORT (Figure 2-9)

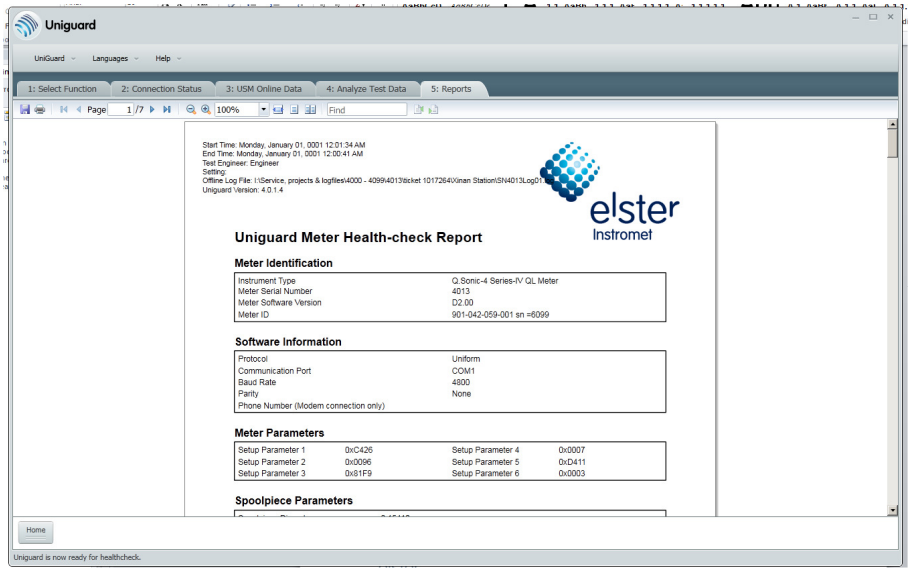
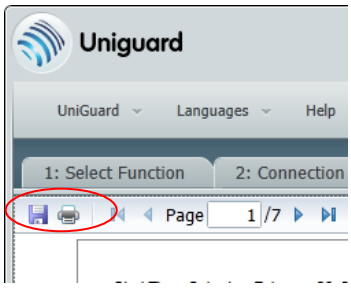


Figure 2-9: Report Screen



The top of the report, there is a small ribbon which has functionalities for save, print, navigate, zoom the report. When a report is saved a conformation window will pop-up, containing the name and place of the report.

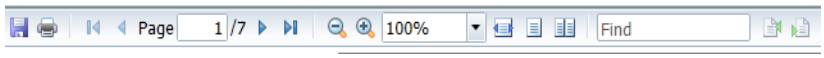
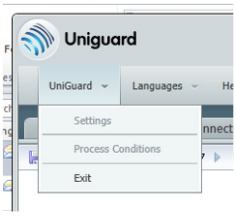


Figure 2-10: Report Navigation Ribbon

The icons on the PDF viewer which corresponds to “Save” and “Print” the report is used to save the report. The UniGuard will also save the raw data used to generate report in “.CSV” format while saving the PDF report on the disk.

An example of a report is shown chapter 3. This contains 7 pages containing:
Page 1 & 2: Parameter set-up of the UFM
Page 3 & 4: Test results of the health check
Page 5 & 6: Test results of the health check, visualized in graphs.
Page 7: AGA 8/10 calculation

Note
A printer needs to be installed on the PC to be able to generate the report. When the printer installed is a black and white printer, the preview report is displayed in greyscales.



❽ QUIT UNIGUARD

Quitting Uniguard is done by pressing the UniGuard - > Exit – from the “Menu bar”.

Note
Closing Uniguard can take some time!

2.4 Simulation mode

For practice, it’s possible to run UniGuard in ‘Simulation Mode’. This is done by selecting “SIMULATOR” as a Communication Port from the settings. (see figure Figure 2-2).

Press <START> on the navigation bar and UniGuard will go to ‘Ultrasonic Meter Online Data’ (see Figure 2-5). The data displayed is simulated by UniGuard. Step 4 until step 9 from chapter 2.3 should be followed to complete the simulation.

2.5 Analyze results meter health check

All the following checks are visualized in the health care check report (see chapter 3)

2.5.1 Path Performance

Number of approved signals compared to the number of sent out signals.
This decreases with higher gas velocities. When it drops below 20% all the pulses (including the approved) will be dismissed.
Limits can be altered.

2.5.2 VOS Fingerprint (Footprint)

Velocity Of Sound of each path compared to the overall Velocity Of Sound.
Limits can be altered.

2.5.3 Path Velocity Ratios

Velocity Of Gas of each path compared to the overall Velocity Of Gas.
With normal flow profiles the axial paths should have a slightly higher ratio (around 4%) than the swirl paths.
Limits can be altered.

2.5.4 Path AGC Ratio

AGC limit of each transducer compared to the AGC level of that transducer.
This will decrease with higher gas velocities. When this drops to 4 measurement will become very difficult.
Limits are fixed.

2.5.5 AGC Ratio – Swirl A/B, Axial A/B

The AGC ratio each transducer compared to the AGC ratio of the transducer with the same path type (axial or swirl) and of the same side (A or B).
This should be close to 1.
Limits are fixed.

2.5.6 VOS Ratio Meas. to AGA10[%]

Overall VOS compared to the calculated VOS.
This is only possible if the exact gas composition, temperature and pressure are known. If one of this items is not known, ignore this result.
Limits can be altered.

2.5.7 Profile Factor [Ax/Sw]

Velocity Of Gas of the Axial paths compared to the Velocity Of Gas of the swirl paths (or visa versa).
With a normal flow profile the axial path should be around 4% higher as the swirl paths.
Limits can be altered.

2.5.8 Asymmetry

Velocity Of Gas of the axial paths compared to each other.
When they are not close to each other, asymmetry might be in the flow profile.
Limits can be altered.

2.5.9 Swirl Angle [°]

Velocity Of Gas of the swirl paths compared to each other.
When they are not close to each other, swirl might be in the flow profile. The picture next to the graph in the report (see paragraph 3) shows the direction of the swirl.
Limits can be altered.

2.5.10 Turbulence

To have an idea about the turbulence an approximation calculation is used. Ideally this should be lower than 1% above Qt and lower than 2% between Qmin and Qt.

2.5.11 Velocity Of Sound

A graph with the Velocity Of Sound of each path during the entire logfile is shown.

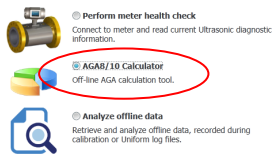
2.5.12 Velocity Of Gas

A graph with the Velocity Of Gas of each path during the entire logfile is shown.

2.6 AGA 8 /10 Calculation

▶ AGA 8/10 Calculation

❶ Open Uniguard and ensure the settings are correct (see chapter: 2.2).



❷ Select <AGA 8/10 Calculator> from the main menu, see also Figure 2-1. Proceed to the next step by clicking <START> at the "`Control bar`".

❸ ENTER GAS COMPOSITION AND PROCESS CONDITIONS
(See Figure 2-7)

See Paragraph 2.3, step 5

❹ GENERATE REPORT (Figure 2-9)

See Paragraph 2.3, step 8

The report contains only 1 pages:
Page 1: AGA 8/10 calculation

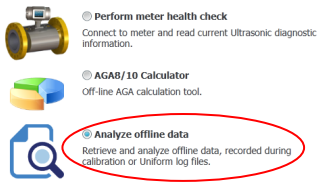
❹ QUIT UNIGUARD

See Paragraph 2.3, step 9

2.7 Analyze offline data

▶ Analyze offline data

Logfile taken with UNIFORM can be examined by Uniguard. This can be done offline, so the meter doesn't have to be connected to the meter.



❶ Open Uniguard and ensure the settings are correct (see chapter: 2.2).

❷ Select < Analyze offline data> from the main menu, see also Figure 2-1. Proceed to the next step by clicking <START> at the "`Control bar`".

❹ SELECT FILE TO ANALYSE

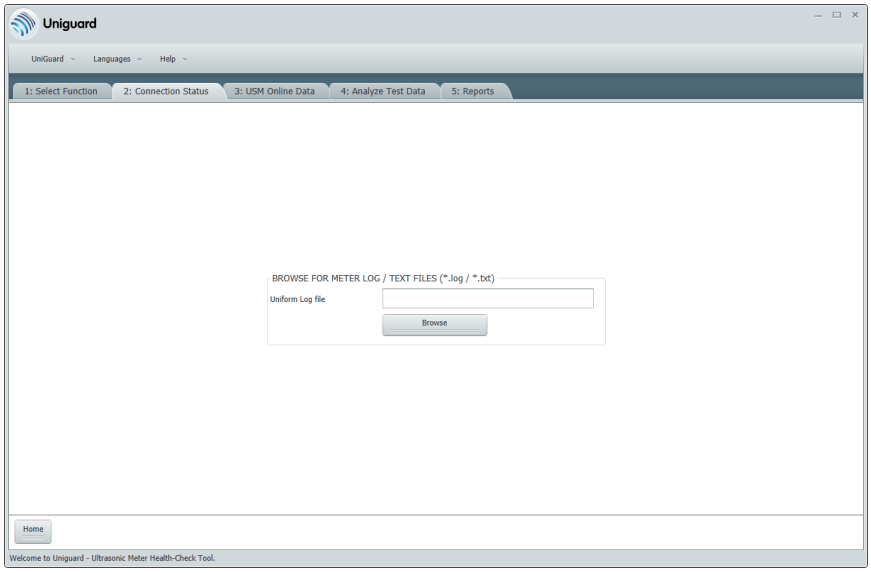


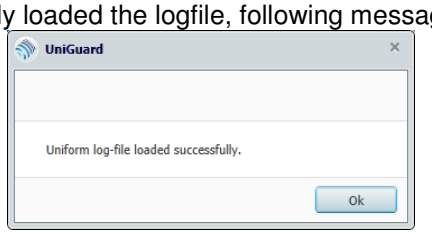
Figure 2-11: Select file to analyze

Click <BROWSE> to select the desired logfile. This can be a '.log' or a '.txt' file. Press <Start Analyzing Data> when the right logfile is selected.

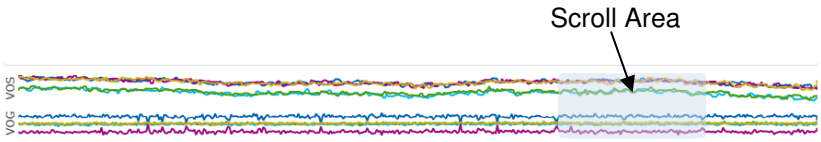
Note

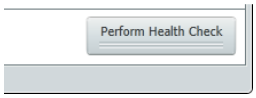
The logfile needs to be at least 120 seconds. Smaller logfiles cannot be examined by Uniguard. When loading smaller logfile an error message will appear.

When successfully loaded the logfile, following message will appear:



All the records will be loaded and last 120 (or as configured in settings) records will be selected automatically to be displayed on USM Online Data screen. The required set of records can be selected by scrolling over the combined graphs as shown in below figure:





❹ When required set of records are selected, click on <Perform Health Check> at the "`Control bar`".

Note

To have a better visualization of the flow profile in the meter, the axial paths are always presented in the middle of the graph. This is also the case for the report (see chapter 3).

It is not necessary to wait until the entire logfile has been showed on Uniguard. When proceeding before 2 minutes have been passed, Uniguard will automatically load the rest. A message regarding this will appear.

When the gas velocity is low, Uniguard will indicate a warning message. A health care check is still possible, however keep in mind that some criteria (e.g. Path Velocity Ratios) may exceed the normal limit values.

❷ ENTER GAS COMPOSITION AND PROCESS CONDITIONS (Figure 2-7)

See Paragraph 2.3, step 5

❼ GENERATE REPORT (Figure 2-9)

See Paragraph 2.3, step 8

❽ QUIT UNIGUARD

See Paragraph 2.3, step 9

3 Example: Uniguard report

Start Time: Monday, January 01, 0001 12:01:34 AM
End Time: Monday, January 01, 0001 12:00:41 AM
Test Engineer: Engineer
Setting:
Offline Log File: I:\Service, projects & logfiles\4000 - 4099\4013\ticket 1017264\Xinan Station\SN4013Log01.
Uniguard Version: 4.0.1.4

Uniguard Meter Health-check Report

Meter Identification

Instrument Type	Q.Sonic-4 Series-IV QL Meter
Meter Serial Number	4013
Meter Software Version	D2.00
Meter ID	901-042-059-001 sn =6099

Software Information

Protocol	Uniform
Communication Port	COM1
Baud Rate	4800
Parity	None
Phone Number (Modem connection only)	

Meter Parameters

Setup Parameter 1	0xC426	Setup Parameter 4	0x0007
Setup Parameter 2	0x0096	Setup Parameter 5	0xD411
Setup Parameter 3	0x81F9	Setup Parameter 6	0x0003

Spoolpiece Parameters

Spoolpiece Diameter	0.15410 m		
Density	28.000 kg/m³		
Dynamic Viscosity	1.3E-05 Pa.s		
Path Length Path 1	0.39720 m	Path Angle Path 1	50.77 °
Path Length Path 2	0.44680 m	Path Angle Path 2	63.44 °
Path Length Path 3	0.44680 m	Path Angle Path 3	63.44 °
Path Length Path 4	0.39740 m	Path Angle Path 4	50.77 °

V_Module Parameters

Lower Limit Speed Of Sound	300.00 m/s	Timing Constant 1	590.00
Upper Limit Speed Of Sound	500.00 m/s	Timing Constant 2	700.00
Lower Limit Velocity Of Gas	-40.00 m/s	Timing Constant 3	0.00
Upper Limit Velocity Of Gas	40.00 m/s		
Sample Rate	15.00		
Pulse Length	10.00		

Output Parameters

Frequency Output Mode	OFF
Frequency Output Value Range	0.0 - 2400.0 m/s
Frequency Range	0 - 3000
Meter Factor	4500.000000 Pulses/m³

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End Time: Monday, January 01, 0001 12:00:41 AM
Test Engineer: Engineer
Setting:
Offline Log File: I:\Service, projects & logfiles\4000 - 4099\4013\ticket 1017264\Xinan Station\SN4013Log01.log
Uniguard Version: 4.0.1.4

Profile Correction

Axial Path Coefficient 1	3792.0000	Swirl Path Coefficient 1	3401.0000
Axial Path Coefficient 2	26.0000	Swirl Path Coefficient 2	66.0000
Axial Path Coefficient 3	0.7502	Swirl Path Coefficient 3	1.0037
Axial Path Coefficient 4	0.9711	Swirl Path Coefficient 4	1.0068
Axial Path Coefficient 5	0.0231	Swirl Path Coefficient 5	0.0175
Axial Path Coefficient 6	-3.3190	Swirl Path Coefficient 6	-3.2090

Adjust Factor Parameters

Adjust Mode	1.0000		
Adjust Factor Forward	0.0000		
Adjust Factor Reverse	0.0000		
Algorithm Coefficient Forward 0	0.0000	Algorithm Coefficient Reverse 0	0.0000
Algorithm Coefficient Forward 1	0.0000	Algorithm Coefficient Reverse 1	0.0000
Algorithm Coefficient Forward 2	0.0000	Algorithm Coefficient Reverse 2	0.0000

Substitution Parameters

Substitution Mode	0.0000
Substitution Parameter 1	0.0000
Substitution Parameter 2	0.0000
Substitution Parameter 3	0.0000

Calibration Parameters

Coefficient Row 1	0.1650	0.8350	0.0300	0.0000
Coefficient Row 2	0.0300	0.0200	0.0500	0.0000
Coefficient Row 3	0.0500	0.0060	0.0000	0.0000
Coefficient Row 4	0.0300	0.0000	0.0000	0.0000
Coefficient Row 5	0.0000	1.0000	0.0424	0.0000
Coefficient Row 6	1.0000	0.0000	0.0000	0.0000

Low Pass Filter

Filter Mode	Disabled
Time Constant	0

Low Flow Cut Off

Cut Off Mode	Enabled
Threshold	0.0300 m/s

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Uniguard Version: 4.0.1.4

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Performance

	Limit	Measured	Value	Status
Number of acquired samples		15		
Percentage accepted pulses Path 1	20.00 %	100 %		PASS
Percentage accepted pulses Path 2	20.00 %	100 %		PASS
Percentage accepted pulses Path 3	20.00 %	100 %		PASS
Percentage accepted pulses Path 4	20.00 %	100 %		PASS

Velocity of Sound

	Limit	Measured	Value	Status
Velocity of Sound		419.41 m/s		
AGA10 Calculted		419.46 m/s		
Deviation VOS Average to Path 1	0.20 %	0 %	1.00001	PASS
Deviation VOS Average to Path 2	0.20 %	0.01 %	1.00013	PASS
Deviation VOS Average to Path 3	0.20 %	0 %	1.00000	PASS
Deviation VOS Average to Path 4	0.20 %	0.01 %	0.99986	PASS
Deviation Avg VOS Measured to AGA10	0.20 %	0.01 %	0.99989	PASS

Velocity of Gas

	Limit	Measured	Value	Status
Velocity of Gas		8.02 m/s		
Axial VOG Ratio Value		1.0456		
Swirl VOG Ratio Value 1		0.9950		
Swirl VOG Ratio Value 2		0.9950		
Deviation VOG Average to Path 1	3.00 %	-0.76 %	1.05359	PASS
Deviation VOG Average to Path 2	3.00 %	-0.92 %	1.00418	PASS
Deviation VOG Average to Path 3	3.00 %	0.83 %	0.98677	PASS
Deviation VOG Average to Path 4	3.00 %	-0.23 %	1.04799	PASS

Profile Factor

	Limit	Measured	Value	Status
Profile Factor Value		1.0456		
Profile Factor (AX/SW)	2.00 %	0.95 %	1.05557	PASS
Profile Factor (SW/AX)	2.00 %	0.94 %	0.94738	PASS

Swirl Angle

	Limit	Measured	Value	Status
Swirl Angle	5.00 °	-0.42 °		PASS

Asymmetry

	Limit	Measured	Value	Status
Asymmetry	0.02	0.01		PASS

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Test Engineer: Engineer
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Uniguard Version: 4.0.1.4

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Axial Path Level Ratio

	Minimum	Maximum	Measured	Status
1A/4A	0.50	2.00	0.97	PASS
1B/4B	0.50	2.00	0.95	PASS

Swirl Path Level Ratio

	Minimum	Maximum	Measured	Status
2A/3A	0.50	2.00	0.97	PASS
2B/3B	0.50	2.00	0.99	PASS

Elevated Level

	Minimum	Maximum	Measured	Status
Path 1A	-	40000	31017	PASS
Path 1B	-	40000	30836	PASS
Path 2A	-	40000	31445	PASS
Path 2B	-	40000	31877	PASS
Path 3A	-	40000	32319	PASS
Path 3B	-	40000	32049	PASS
Path 4A	-	40000	31857	PASS
Path 4B	-	40000	32433	PASS

Limit/Level Ratio

	Minimum	Maximum	Measured	Status
Path 1A	2.00	-	16.05	PASS
Path 1B	2.00	-	17.33	PASS
Path 2A	2.00	-	16.47	PASS
Path 2B	2.00	-	14.52	PASS
Path 3A	2.00	-	19.92	PASS
Path 3B	2.00	-	20.17	PASS
Path 4A	2.00	-	14.37	PASS
Path 4B	2.00	-	16.76	PASS

Level A vs. B Mismatch

	Minimum	Maximum	Measured	Status
Path 1	0.50	2.00	1.01	PASS
Path 2	0.50	2.00	0.99	PASS
Path 3	0.50	2.00	1.01	PASS
Path 4	0.50	2.00	0.98	PASS

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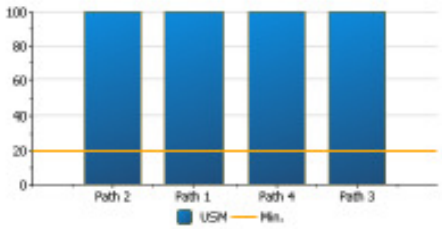
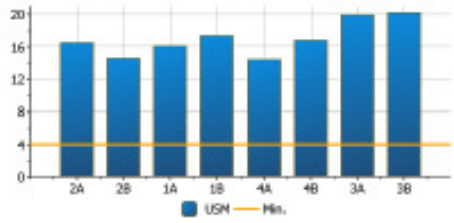
Test Engineer: Engineer
Setting:
Offline Log File: I:\Service, projects & logfiles\4000 - 4099\4013\ticket 1017264\Xinan Station\SN4013Log01.log
Uniguard Version: 4.0.1.4



Path Performance [%]

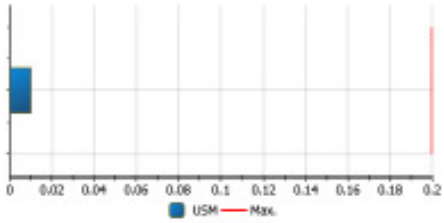
VOS Fingerprint

Path Velocity Ratios

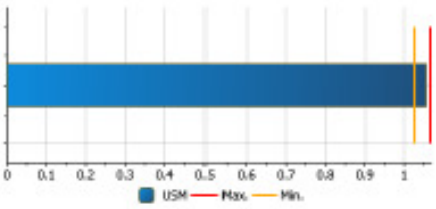


Path AGC Ratio

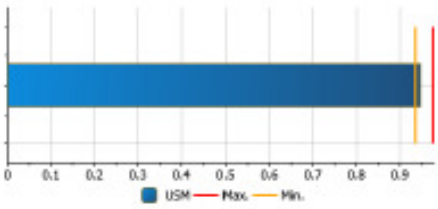
AGC Ratio - Swirl A/B, Axial A/B



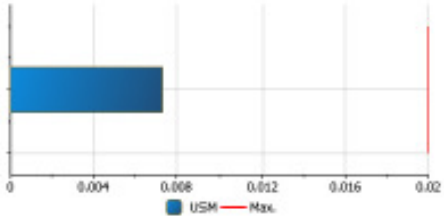
VOS Ratio Meas. To AGA10 [%]



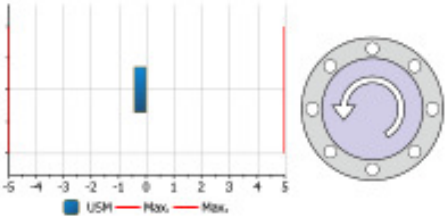
Profile Factor [Ax/Sw]



Profile Factor [Sw/Ax]



Asymmetry



Swirl Angle [°]

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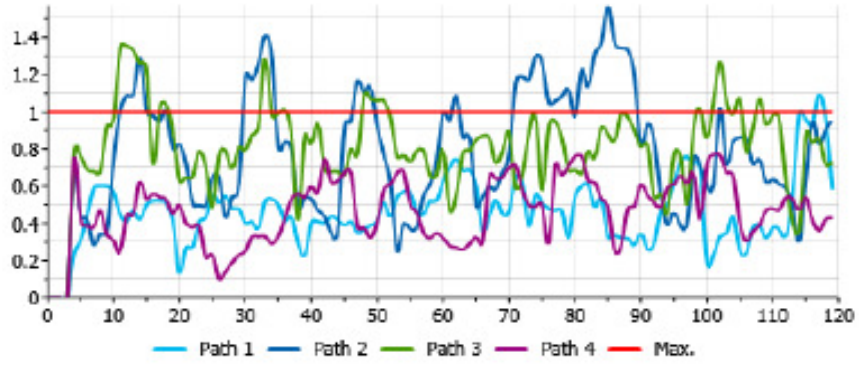
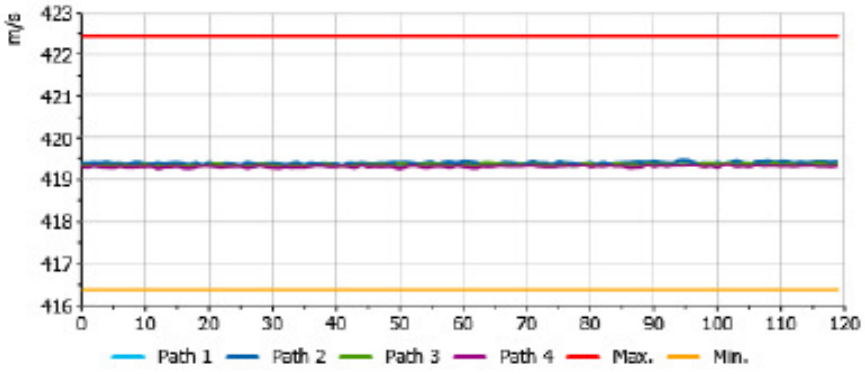
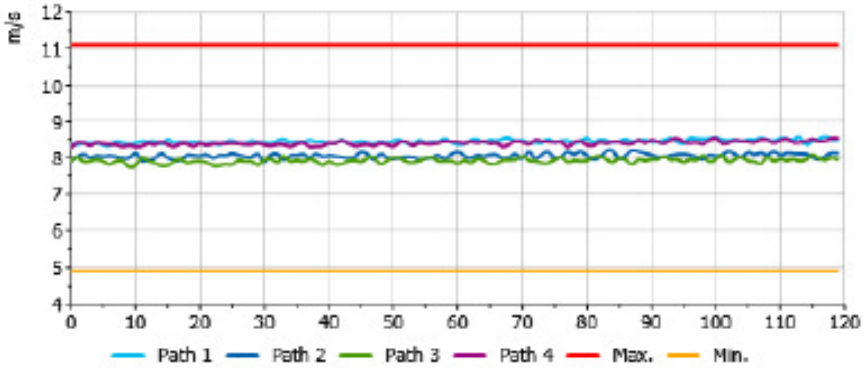
Test Engineer: Engineer
Setting:
Offline Log File: I:\Service, projects & logfiles\4000 - 4099\4013\ticket 1017264\Xinan Station\SN4013Log01.log
Uniguard Version: 4.0.1.4



Turbulence



Veloity Of Sound



Velocity Of Gas

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Test Engineer: Engineer
Setting:
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Uniguard Version: 4.0.1.4

Gas Composition

Symbol	Name	mol %
C1	Methane	85.0000
N2	Nitrogen	5.0000
CO2	Carbon Dioxide	3.0000
C2	Ethane	5.0000
C3	Propane	2.0000
H2O	Water	0.0000
H2S	Hydrogen Sulphide	0.0000
H2	Hydrogen	0.0000
CO	Carbon Monoxide	0.0000
O2	Oxygen	0.0000
IC4	I-Butane	0.0000
nC4	n-Butane	0.0000
IC5	I-Pentane	0.0000
nC5	n-Pentane	0.0000
neoC5	neo-Pentane	0.0000
nC6	n-Hexane	0.0000
nC7	n-Heptane	0.0000
nC8	n-Octane	0.0000
nC9	n-Nonane	0.0000
nC10	n-Decane	0.0000
He	Helium	0.0000
A4	Argon	0.0000
	Sum	**100.0000**

Process Conditions

PT	Pressure	60.000 Bar a
TT	Temperature	51.000 °C

Base Conditions

Pb	Base Pressure	20.000 Bar a
Tb	Base Temperature	15.556 °C
Tc	Comb. Temperature	15.556 °C

AGA10

Velocity of Sound	419.460 m/s

AGA8

Line Compressibility	0.918
Line Density	45.470 kg/m³

Calculated Viscosity

Calculated Viscosity	1.4E-05 Pa.s

Notes

Notes

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