

FLWSIC600

Ultrasonic Gas Flow Meter

FLOWgate™

SICK
Sensor Intelligence.

Described product

Product name: FLOWSIC600

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Original document

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1 About this document

1.1 Function of this document

This Addendum to the Operating Instructions describes:

- Use of operating software FLOWgate™ with ultrasonic gas flow meter FLOWSIC600.

1.2 Scope of application




This document supplements the up-to-date FLOWSIC600 Operating Instructions and is to be used only in combination with the Operating Instructions. It is not applicable for other SICK measuring devices. The standards referred to in these Operating Instructions are to be observed in the respective valid version.

1.3 Target groups

This Manual is intended for persons installing, operating and maintaining the device.

1.4 Symbols and document conventions

1.4.1 Warning symbols

Symbol	Significance
	Hazard (general)
	Hazard by voltage
	Hazard in potentially explosive atmospheres

1.4.2 Warning levels and signal words

DANGER:

Risk or hazardous situation which will result in severe personal injury or death.

WARNING:

Risk or hazardous situation which could result in severe personal injury or death.

CAUTION:

Risk or hazardous situation which could result in less severe or minor injuries.





NOTICE:

Hazard which could result in property damage.

Note:

Hints

1.4.3 Information symbols

Symbol	Significance
	Information on product condition with regard to explosion protection (general)
	Note on product properties with regard to Explosion Protection Directive ATEX 2014/34/EU
	Important technical information for this product
	Important information on electric or electronic functions

2 For your safety

2.1 Basic safety information

**WARNING:**

Read the associated Operating Instructions carefully before using the FLOWSIC600.
Observe all safety and warning notices!

3 Product description

The FLOWgate™ operating software allows user-friendly access to all measured values of the device.

+i For information on FLOWgate™ operating software, see “Software Manual FLOWgate™”. The Software Manual is available using the Help function of the FLOWgate™ operating software.

3.1 Overview

Software functions

- Measured values overview
- Diagnosis data
- Logbook and archive management
- Commissioning
- Parameter modification
- Session browser
- Calibration

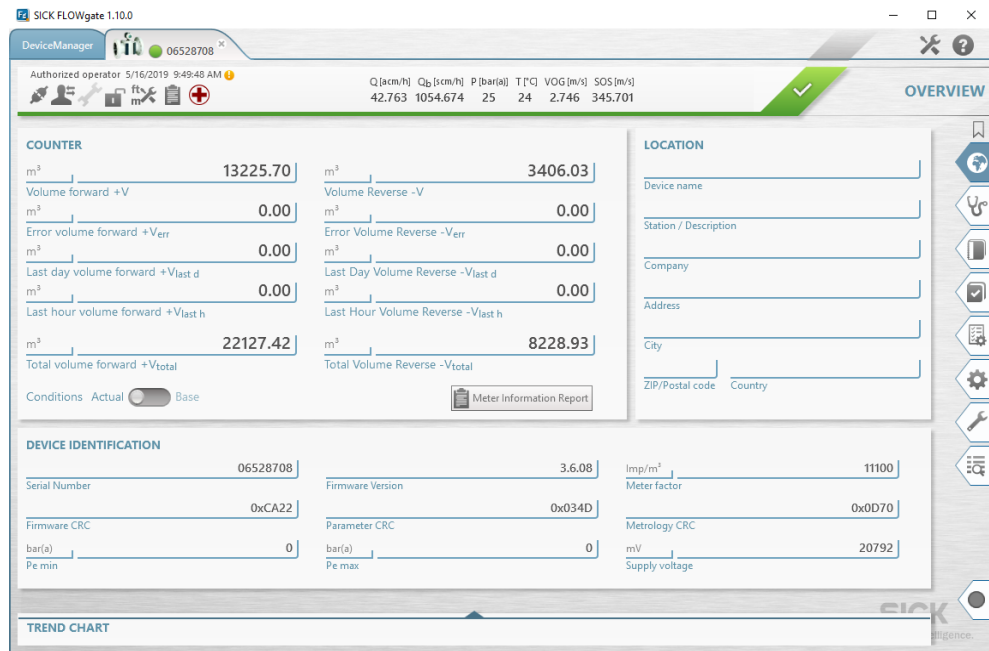


Fig. 1: Overview FLOWgate™ operating software

3.2 System requirements

- Microsoft Windows 7/8/10
- Min. 1 GHz CPU
- Min. 512 MB RAM
- About 100 MB free disk capacity (without .NET framework)
- USB or serial interface
- Recommended minimum screen resolution: 1024 x 768 pixels, optimum screen resolution 1368 x 768 pixels
- Microsoft .NET framework 4.6

3.3 Compatibility

FLOWgate™ can be used together with the FLOWSIC600 as from firmware version: 3.1.00 as well as hardware version: 2. The availability of the software features depends on the firmware version of the connected FLOWSIC600.

3.4 Installation

The software can be found on the Product CD or can be downloaded free of charge from the website www.sick.de (search FLOWgate).

After downloading the software, execute the Installer exe and follow the instructions of the installation Wizard.



Administrator rights are required for installation of FLOWgate™. Ensure that FLOWgate™ users have write access for the specified database path.

3.5 Access rights

FLOWgate differentiates between three different user levels. They support different setting and information depth within the program

The following functions are available depending on the active access level:

Device function	User	Auth. user	Service
Standard password	-	sickoptic	See Service Manual
Overview	x	x	x
Read parameters and measured values	x	x	x
Read archives	x	x	x
Change non-custody relevant parameters	-	x	x
Change custody relevant parameters	-	x	x
Airtest mode	-	x	x
Configuration mode	-	x	x
I/O check	-	x	x
Regional device adaptation	-	x	x
User management	-	-	x

Table 1: Overview of access rights

3.6 Operating modes and meter status

FLAWSIC600 has the following operating modes:

- Operation mode
- Configuration mode

Operation mode

FLAWSIC600 can have the following status during operation mode:

- Measurement valid
- Measurement invalid
- Maintenance request

In operation mode, the FLOWgate operates in one of three meter statuses depending on the measuring conditions.

Configuration mode

Configuration mode serves to protect against unintentional or unallowed parameter changes. Therefore configuration mode must be activated for most configuration handling or parameter changes. Changing parameters for certain modules (e.g. serial interface) is first active after configuration mode is deactivated. The measurement is marked as invalid when configuration mode is activated when the parameter locking switch is open.

4 Commissioning and operation

4.1 General information

- All activities described in the FLOWSIC600 Technical Information under Chapter 4 “Installation” must be completed before commissioning. A laptop/PC with the FLOWgate™ operating software installed is required for commissioning.
- Commissioning should be documented with a Commissioning Protocol. The document “FLOWSIC600 Commissioning Protocol” is content of the FLOWSIC600 scope of delivery and can be found on the Product CD. The completed Commissioning Protocol must be filed with the FLOWSIC600 device documentation.
- The FLOWSIC600 is zero adjusted or flow calibrated when delivered to the end user. The zero adjust comprises the 3-D measurement of the meter body, zero-flow and speed of sound test as well as other system specific tests which belong to the manufacturing and quality assurance process. The flow calibration is performed on a flow calibration test stand (calibration test facility).
- All parameters, determined by the aforementioned tests, as well as design specific data are preset and stored in the FLOWSIC600 in a non-volatile memory before delivery. Generally, the parameters are protected by a password. Additionally a parameter write lock in the SPU prevents custody relevant parameter changes.

**Note: Actions in a metrologically secured area**

If stipulated by national regulations, actions on the device in the metrologically secured area after commissioning may be carried out only under official supervision. This must be coordinated with the authorities before carrying out the actions. All actions must be performed on the basis of this Manual and, if necessary, the Service Manual for the product.

- In all other cases the output parameters of the FLOWSIC600 can be adapted on site by trained staff.
- The commissioning of FLOWSIC600 is supported by the field setup wizard in the FLOWgate™ operating software.

4.2 Connecting with the device

4.2.1 Connecting the FLOWSIC600 via RS485/USB converter

The FLOWSIC600 can be connected with the laptop/PC and configured using a separate RS485/USB.

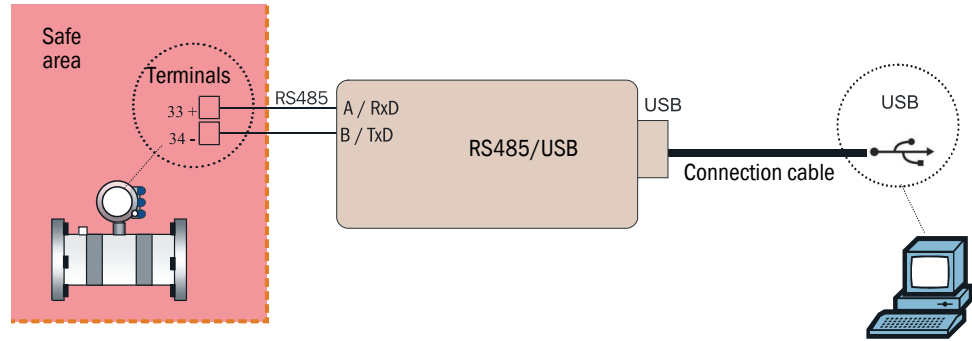


Fig. 2: Wiring example for “Interface set RS485/USB” non-intrinsically safe

+i Possible terminals for the RS485 connection are:

- 33 (+) and 34 (-)
- 81(+) and 82(-)

If necessary, the RS485 ports can be assigned to a specific bus address (Reg.#5020 “DeviceBusadress”). The service port always has the bus address “1”.

The RS485/USB converter is available from SICK using the following item number:

Description	Item number
"MEPA interface set RS485/USB" (Converter, cable, terminal plug, CD-ROM with software driver), non-intrinsically safe	6030669

Table 2: Interface sets for the connection of the FLOWSIC600 to a network

4.2.2 Connecting devices with FLOWgate™ for commissioning

- 1 Connect the RS485 cable with the FLOWSIC600.
- 2 Connect the USB cable with the laptop/PC.
- 3 Start FLOWgate™.
- 4 Add the FLOWSIC600 in FLOWgate™ to the device manager.
- 5 Login as “Authorized User”.

4.3 Identification

Checking identification, operation / design data and firmware version

Before commissioning, compare the FLOWSIC600 data with the data in the test protocols contained in the “Manufacturer Data Report” (MDR). This can be done using the LCD on the FLOWSIC600 (see Chapter 9.3 “Operation and menu structure of the SPU with LC display” in the FLOWSIC600 Technical Information) or using FLOWgate™.

- ▶ Open menu “Overview” and compare the data in Section “Device identification” with the test protocols in the MDR.

+i If the FLOWSIC600 is precalibrated, compare with the Calibration report and Parameter report instead of the MDR.

Firmware

The FLOWSIC600 firmware is stored in a non-volatile memory (FLASH PROM). The program codes for the signal processor and system micro-controller are identified by a version number (Reg. #5002 “FirmwareVersion”) and a checksum (Reg. #5005 “ProgramCRC”) and can be verified as mentioned above.



NOTICE: Type approval

If the FLOWSIC600 is used for fiscal metering, the approved firmware versions and the associated check sums are documented in the national pattern approval certificates.



Device identification

Fig. 3: Overview FLOWgate™

4.4 Field setup wizard



- Parameter changes are first written to the device when commissioning has been completed when using the field setup wizard.
- Configuration mode must be active to change parameters.

4.4.1 System + LCD

Date and time

- ▶ Enter the date and time or synchronize with the laptop/PC.

Identification

- ▶ Serves to enter an individual name for the device.

LCD settings

The display is preconfigured at the factory.

- ▶ Check the settings and adapt when necessary.

4.4.2 Operating parameters

Operating data

- ▶ Check the data and adapt when necessary.



The values are preset for high-pressure calibrated devices.

P+T via HART

When option HART® protocol is ordered, the checkbox “Optional reading of P and T via HARTBUS” can be activated. In this case the FLOWSIC600 operates with HART® communication in Master-Mode.

4.4.3 I/O setup

- ▶ Compare the data with the “Manufacturer Data Report” (MDR) and adjust if necessary.

4.4.4 I/O configuration

- ▶ Adjust the respective I/O interfaces if necessary.

4.4.5 Archives/Logbooks

Logbooks

- ▶ Configure the logbooks' behavior.
- **Overflow:** The oldest entries are overwritten when the logbook is full.
- **Hold:** A warning is output when the logbook is full.
- **Active:** Parameter changes are recorded.
- **Inactive:** Parameter changes are not recorded.

Hourly Log (Data Book 2) and Daily Log (Data Book 3)

As standard, the archives are configured so that the “Hourly Log” records hourly and the “Daily Log” daily in forward flow direction. Recording periods and recording direction as well as the data record type to be recorded can be configured:

- **Data record type:** Setting of the respective desired data record type. Refer to Chapter 2.8.3.8 “Data record types saved in the DataLogs” in the FLOWSIC600 Technical Information for detailed description of the data record types.
- **Measuring cycle:** Recording period
- **Rolling:** Behavior of archives (see logbooks)
- **Direction:** Recording direction
- **Storage timepoint:** Time for daily archive entry in full hours.

Diagnostics comparison

Refer to Chapter 2.8.4 “Diagnostics Comparison Log” in the FLOWSIC600 Technical Information for a detailed description of “Diagnostics comparison”.

- **Measuring cycle:** Recording period

4.4.6 Finishing

- ▶ First write the data to the device.



NOTICE:

The data must be written to the device before the report is created, otherwise the reports are created using the data before commissioning.

- ▶ If desired: Reset error counters and clear logbooks.
SICK recommends creating a Parameter and Maintenance report and archiving the reports with the delivery documentation.

4.5 Function check after commissioning

The major system parameters are configured at the factory. The default settings should allow error free operation of the FLOWSIC600. Nevertheless, correct meter operation should be verified on site when the meter is installed and subject to actual operating conditions.

Recommended checks:

- Checking the device status
- Checking performance
- Checking speed of sound
- Checking zero phase
- Comparing theoretical and measured speed of sound (see “Comparing theoretical and measured Speed of Sound (SOS)”, page 21)

4.5.1 Function check directly on the FLOWSIC600

Refer to Chapter 5.6.1 “Function check on FLOWSIC600 with LCD front panel” as well as Chapter 5.6.2 “Function check on FLOWSIC600 with LED front plate” in the FLOWSIC600 Technical Information for a detailed description of the function check directly on the FLOWSIC600.

4.5.2 Function check with FLOWgate™

Checking the device status




Status	Description
	Normal operation: Neither warnings nor errors exist on the device.
	Warning: The device has at least one warning, the measured value is still valid.
	Error: The device has at least one error, the measured value is invalid.

Table 3: Signaling of device state

Click on the symbol in the Status bar when warnings or errors exist. The current Status overview opens and shows details and information on how to proceed.

Checking performance

- ▶ Open tile “Meter values” in menu “Diagnostics”.

Check the performance rate of the individual paths (widget: Performance). The performance rate should be at least 75% on all paths. Performance values may be significantly lower when the velocity of gas is greater than 30 m/s (100 ft/s).

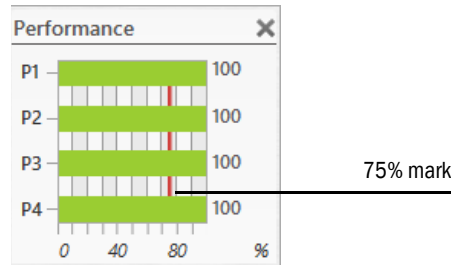


Fig. 4: Performance widget

Checking velocity of gas

- ▶ Open tile “Meter values” in menu “Diagnostics”.

Velocity of gas (VOG) should be evenly distributed over all 4 paths.

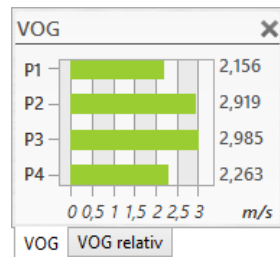


Fig. 5: Velocity of gas widget (VOG)

Checking speed of sound

- ▶ Open tile “Meter values” in menu “Diagnostics”.

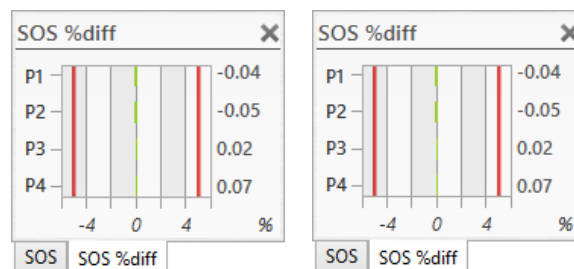


Fig. 6: Speed of sound widgets

The speed of sound values must be almost identical on all paths and may only differ by less than 0.1%. When moving the mouse over the bar graphs, the current measured values are shown in the diagram.

In the case of very low gas velocities (< 1 m/s or 3 ft/s), there may be more significant differences between the sound velocities of the paths due to thermal stratification. In this case, larger differences between the paths can also occur. Ensure the measured SOS deviates no more than 0.3% from a theoretical SOS which is calculated from gas composition, pressure and temperature, see “Comparing theoretical and measured Speed of Sound (SOS)”, page 21.

Checking zero phases

Properly adjusted zero phases of the individual paths are the basis for accurate measurement of the ultrasonic signals' runtime. An adjustment coordinated with SICK Service is recommended when the zero phases do not meet the specified criteria.

- ▶ Open tile “Path Diagnosis” in menu “Diagnostics”.
- ▶ Check “Runtime”. The “Runtime” (red circle) must be within the “Runtime plausibility area” (green strip)

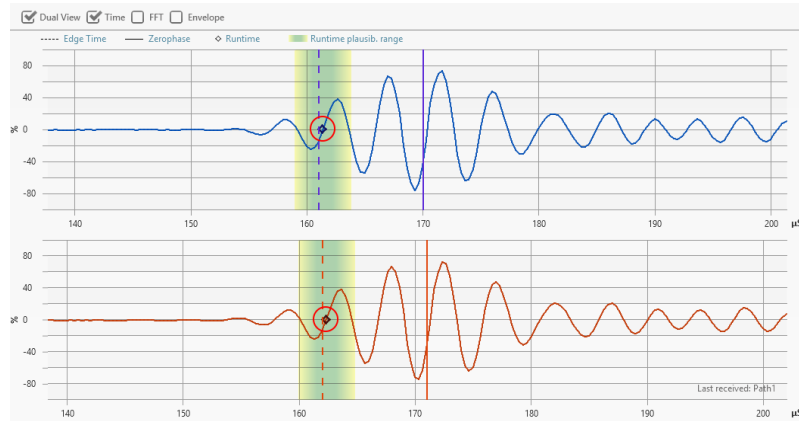


Fig. 7: Zero phase check

+i Perform check of zero phases for each individual path of the FLOWSIC600.

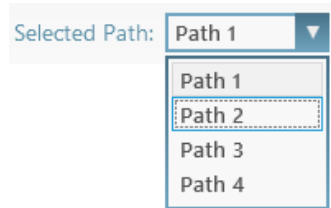


Fig. 8: Selection of path to be checked

5 Maintenance

5.1 General notes



The stated routine checks only apply to working with FLOWgate™. Refer to Chapter 6 “Maintenance” in the FLOWSIC600 Technical Information for direct work on the FLOWSIC600.

The FLOWSIC600 does not contain mechanically moving parts. The meter body and ultrasonic transducers are the only components that come into contact with the gaseous media. Titanium and high-quality stainless steel ensure that these components are resistant to corrosion, provided that the meter is installed and operated in accordance with the relevant specifications. This means that the FLOWSIC600 is a low-maintenance system.

User Warning Limits can be configured to provide early warnings for possible issues with contamination or blockage. Maintenance is limited mainly to routine checks to determine the plausibility of the measured values and diagnostic results produced by the system.

We recommend creating and filing Maintenance reports on a regular basis. Over a period of time, this provides a comparison data base useful when diagnosing problems.



The operating conditions (gas composition, pressure, temperature, flow velocity) of the individual Maintenance Reports should be comparable or documented separately and taken into account when the data is analyzed.

5.2 Routine checks with FLOWgate™

+i FLOWSIC600 must be connected with FLOWgate™ for the following routine checks.

5.2.1 Function check (device status)




Status	Description
	Normal operation: Neither warnings nor errors exist on the device.
	Warning: The device has at least one warning, the measured value is still valid.
	Error: The device has at least one error, the measured value is invalid.

Table 4: Signaling of device state

Click on the symbol in the Status bar when warnings or errors exist. The current Status overview opens and shows details and information on how to proceed.

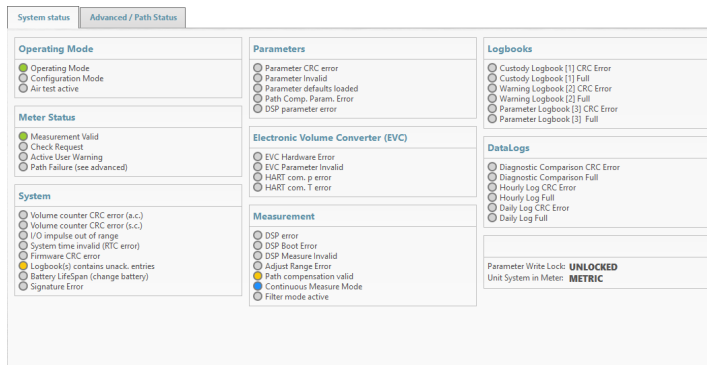


Fig. 9: Overview of system status

The “Diagnostics” menu shows under tile “Meter values” in various profiles all diagnostics values providing information on the status of the device.

5.2.2 Comparing theoretical and measured Speed of Sound (SOS)

The Speed of Sound Calculator (SOS Calculator) available in the FLOWgate™ operating software calculates a theoretical SOS for a specific gas composition at a specified temperature and pressure (Fig. 40). The calculation of thermodynamic properties is based optionally on the “GERG-2008” or “AGA10” algorithm.

- ▶ Open tile “SOS Calculator” in menu “Diagnostics”.
- ▶ Select the gas composition and confirm with “Apply”. The gas composition can be entered manually or loaded as file.
- ▶ Enter the current process conditions and select “Calculate SOS”.

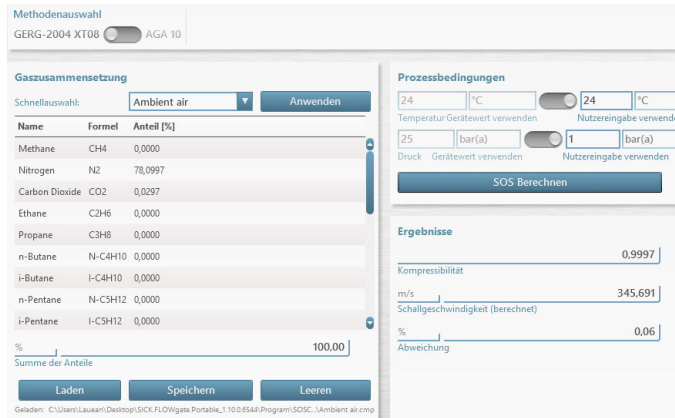


Fig. 10: SOS Calculator

- ▶ Compare the theoretical speed of sound with the speed of sound measured with the FLOWSIC600. The deviation of the measured SOS from the calculated SOS is shown for each path in the “Deviations Per Path” area.

Deviations Per Path			
Path	SOS meas. [m/s]	SOS calc. [m/s]	Deviation [%]
Global	345,817	345,69	0,04%
AvgC1	345,677	345,69	0,00%
AvgC2	345,606	345,69	-0,02%
AvgC3	345,897	345,69	0,06%
AvgC4	346,088	345,69	0,11%

Fig. 11: Deviation per path

- ▶ The deviation between the two speeds of sound should be less than $\pm 0.1\%$. If the deviation exceeds 0.3%: Check the plausibility of the pressure, temperature and gas composition values.

5.2.3 Time synchronization

All entries in logbooks or datalogs saved in the meter’s memory (FRAM) are written with a time stamp containing the meter time. Date and time can be synchronized in the FLOWgate™ operating software with the connected PC during commissioning or in menu “Parameter Modification” and “System/User”.

+i A synchronization causes a logbook entry in the Custody logbook [1] only if the time change is greater than 3% of the time elapsed since the last synchronization.

- ▶ Open tile “System + LCD” in the menu “Parameter Modification”.

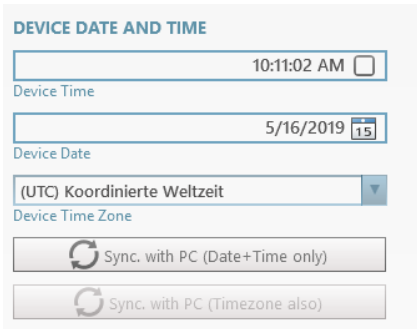


Fig. 12: Date and time parameter modification

5.2.4 Maintenance report

It is advisable to regularly create and archive a Maintenance report. This serves to create a comparison database and supports diagnostics.

+i The operating conditions (gas composition, pressure, temperature, flow velocity) of the individual Maintenance Reports should be similar. When the individual reports are compared, it is recommended to evaluate and document deviations.

- ▶ Click on “Create Status Report” (clipboard icon) in the Status bar.
- ▶ The “Maintenance Report” dialog opens.
It is recommended to set the duration of data collection to 5 minutes, but it can also be changed in the selection list.



Fig. 13: Status Report

- ▶ After the end of data collection, the report opens automatically and can be printed, saved as PDF document or sent via e-mail.
- ▶ Finally close the report with the “Close” button.
- ▶ It is recommended to file the printed report with the device delivery documentation.

5.2.5 Optional data backup



To prevent an overflow of the logbooks and possible data loss, logbook entries can be saved to the meter database with the FLOWgate™ operating software. The entries on the meter can then be deleted.

Logbook check and data backup

Menu “Logbooks” provides an overview and a general introduction to the logbooks. The following functions are available here:

- Reading the respective logbooks from the device.
- Loading the respective logbooks from the database.
- Acknowledging entries.
- Deleting logbooks in the device or in the data base.
- Outputting logbooks as CSV file.
- Outputting a report of the respective logbook.

Checking the data archives (data logs)

The FLOWSIC600 is equipped with a Diagnostics Log, an Hourly Log and a Daily Log. The measured data archives are saved accordingly in the non-volatile memory of the device.

Menu “Archive Management” provides an overview and a general introduction to the logbooks.

The following functions are available here:

- Reading the respective archive from the device.
- Loading the respective archive from the database.
- Deleting entries.
- Deleting archive in the device or in the data base.
- Outputting archive as CSV file.
- Outputting a report of the respective archive.

6 Troubleshooting

6.1 Creating a diagnostic session with FLOWgate™

- ▶ Click “Start Diagnostic Session” (red cross icon) in the Status bar to start a diagnostic session.
- ▶ Select the desired data collection time.
It is recommended to select a minimum data collection time of 5 minutes and to load the logbooks archives (set checkmark at “Load logbooks”).

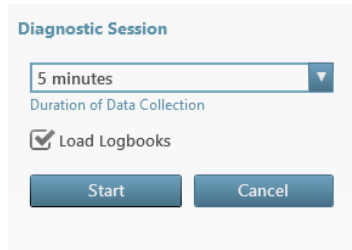


Fig. 14: Starting a diagnostic session

- ▶ Click “Start” to start recording.
The following message with the current storage location of the data collection is shown after successful creation of the diagnostic session.

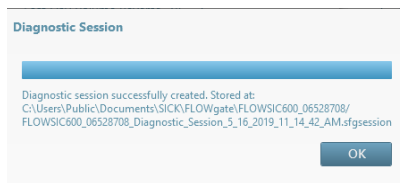


Fig. 15: Diagnostic session finished

- ▶ Click “OK” to confirm the message.
 - Click “Save as” to select a storage location for the diagnostic recording.
 - Click “E-mail” to send the file per e-mail. The file is appended to an e-mail when an e-mail client is available.
 - Click “Close” to leave the file at the standard storage location.

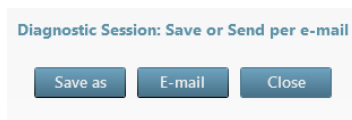


Fig. 16: Saving the diagnostic session

+i The diagnostic sessions are saved as files with the ending .sfgsession. The files are saved by default under:
C:\Users\Public\Documents\SICK\FLOWgate
The name of the storage folder consists of device type and serial number of the device.

Fig. 17: User warnings (“Configuration mode” view)

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