Operating Instructions

ExactSonic P

Software status from 1.1.0.220325

Ultrasonic Massflow Measuring System for exact mass flow measurement

Contents

1 Safety Instructions

Danger to life, risk of injury and damage to material or property.
Read the Operating Instructions carefully before initial operation.
Observe general safety precautions as well as those included in various sections of these Operating Instructions

Hazard risks:
- non-observance of the Operating and Safety Instructions
- modifications to the device by the customer
- handling the device outside the specified operating conditions
- handling the transducers outside the specified operating conditions
- use of unsuitable power supplies and peripheral devices
- improper use of the device

Danger when installing the sensors in pressurized pipelines:
- sensors for use in pressurized pipelines are to be inserted or retracted only in depressurized con-di-tions; non-observance may result in serious injuries to personnel

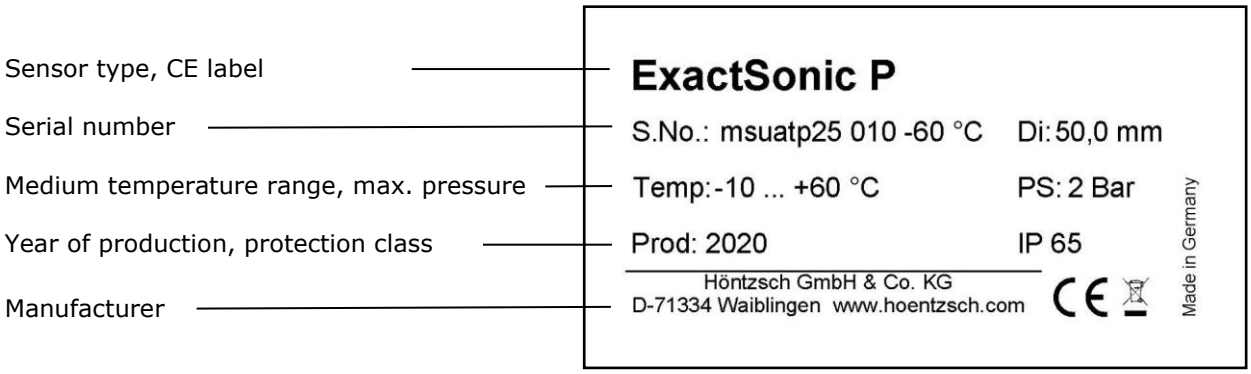
The pipelines for the gases to be measured must be insulated in such a way as to ensure that the electronic housing of the equipment does not reach a temperature higher than the maximum ambient temperature specified above, taking into account radiation and convection heat.

1.1 Special Instructions

- When connecting mains adapters, pay attention to the mains voltage.
- When operating outdoors, it must be ensured that the housing cover and the cablebushing are firmly screwed to the housing, otherwise protection class IP65 is not guaranteed.

1.2 Type Plate

Das following type plate is located on the housing:



1.3 Scope of Delivery

- Gas mass flow measuring system - ExactSonic P
- Operating Instructions ExactSonic P

Please check that everything listed in the Delivery Note / Technical Data Sheet is included in the delivery.

1.4 Technical Specifications

1.4.1 Operating Conditions

Measuring range	: -25 m/s … +25 m/s
Medium temperature	: -20 … +60 °C
Ambient temperature	: -20 … +60 °C
Protection class	: IP65, IEC 529 and EN 60 529 with housing cover firmly screwed on and the plug-in connectors firmly screwed on
Working pressure	: up to 2 bar overpressure, higher working pressure on request
Medium *	: pure gases and gas mixture such as air, nitrogen, methane, propane, butane, natural gas, argon, carbon dioxide, helium, hydrogen, oxygen, landfill gas, ...
Measured variables	: velocity [m/s], standard flow rate [Nm³/h], mass flow m/t [kg/h], absolute pressure [hPa], temperature [°C], rel. humidity [%][1]

* Preconditions: compliance with the explosion protection regulations.

1.4.2 Housing and Connection

Dimensions	: 240 / 160 / 134 mm (L / B / H)
Housing material	: aluminium, powder coated
Connections	: 3-pole socket for connection of supply voltage 5-pole socket for connection of analog output RJ45 socket for TCP communication USB socket for Backup/Restore

1.4.3 Electrical Data

Supply voltage	: 24 V DC +/- 10 %
Power consumption	: less than 15 W
Sensor v	: Ultrasonic UA – one-path, actual flow velocity v
Sensor t	: Pt100
Sensor p	: Precision absolute pressure sensor 0.1 % FSO 0 ... 1.6 bar abs., optional for higher absolute pressure
Sensor r.H.[1]	: 0 … 100% rel. humidity
Analog output	: 4 … 20 mA or 0 … 10V (linear) for flow value, update up to 0.5 ms, burden max. 500 Ohm
Interface	: RJ45 socket (8P8C) according to te standard ISO/IEC 11801
Protocol	: AK protocol according to the standards of „standardization of exhaust gas measurement" (Association of the German Automotive Industry)
LCD	: Touch intelligence - illuminated and built into the housing, for displaying various modes and parameterization levels, multi-level safety areas

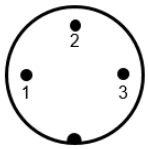
2 Initial Operation of the Measuring Device

For the installation and operation of the measuring system, the applicable national regulations for the installation and operation of electrical systems, as well as the general rules of technology and these operating instructions are decisive.

Galvanic isolation between power supply and analog output

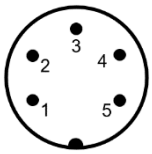
ground analog output = ground housing

2.1 Pin assignment supply voltage



Pin1: ground
Pin2: V- (0 V)
Pin3: V+ (24 V)

2.2 Pin assignment analog output



Pin1: 0-10 V analog output
Pin2: analog output GND (for 0-10V resp. 4-20mA)
Pin3: 4-20 mA analog output
Pin4: not connected
Pin5: not connected

2.3 Device parameterization

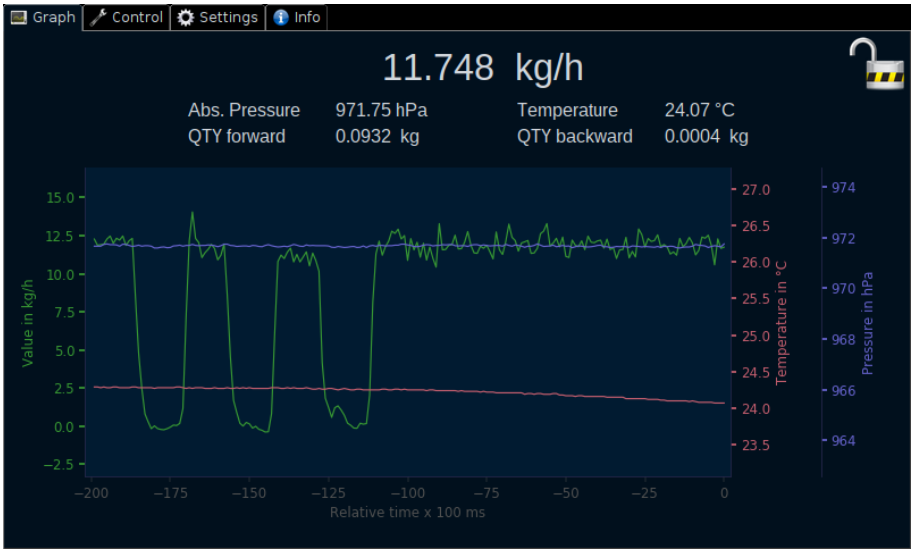
The device can be parameterized via the user interface (see chapter 3) or the TCP interface (see chapter 4).

3 User Interface

The user interface consists of an illuminated 7" touch display, which is embedded in the housing.
After starting, the tab graph is displayed. At the top, you can switch to the respective tab by tapping on the corresponding tab.

3.1 Tab Graph

Task: of the instantaneous values (textual and graphical) and the quantity counter. Locking and unlocking option of the user interface.



In the Tab Graph, the measured values in the available graphs are displayed averaged over a period of 100 ms. 200 measured values of 100 ms each are shown, which corresponds to an observation period of 20 seconds.

The graph offers different views, which can be switched through in the following order by tapping on the diagram itself.

- common graph for flow, temperature, pressure, humidity[1] with separate Y-axes
- graph for flow
- graph for temperature
- graph for absolute pressure
- graph for humidity[1]
- three separate graphs for flow, temperature, pressure and humidity[1]

Die unit of the flow value can be set in the Tab Settings (see chapter 3.3).

By tapping on the symbol or on the upper right edge, the interface can be locked or unlocked. To unlock the security code, which is „71334" by default, is required. It is recommended to change the security code directly after initial operating (see AK command „ESCO" in chapter 4.4.5) to protect the unit against unauthorised access. The interface is automatically locked again after the set "Display switch-off and TCP lock time" (see chapter 3.3 or AK command „EDTT" in chapter 4.4.5) has expired.

3.2 Tab Control

Task: Starting and stopping the measuring function, resetting the quantity counter, restarting and shutting down the unit.

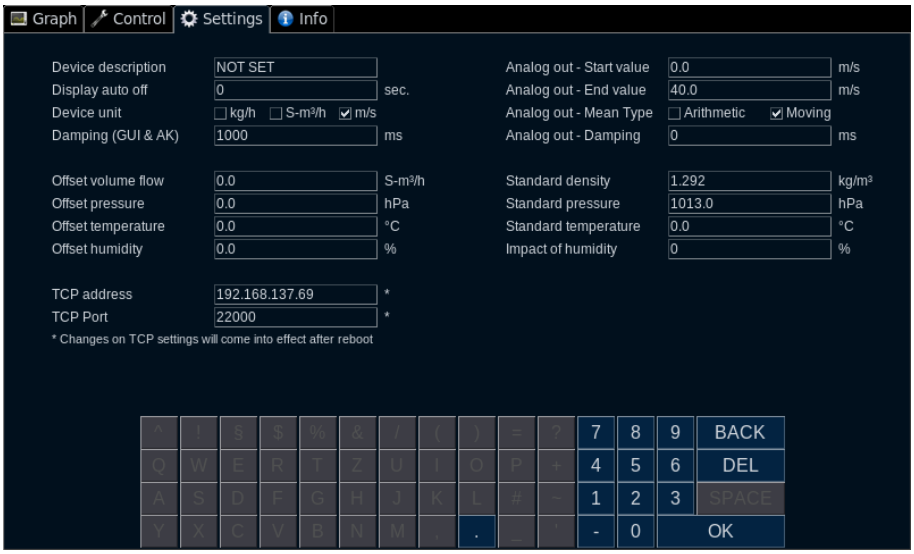
In Tab Control the measurement can be paused. The graph is no longer updated when the measurement function is stopped; the last measured value is permanently displayed. The measurement data via TCP interface also no longer change, the last measured values are always transmitted. The analog output is also frozen at the last value.

The quantity counter (forward, as well as backward) can be reset to 0 by tapping the "Reset" button.

To restart or shut down the unit properly, use the buttons in the lower section. It is always advisable to shut down the unit properly to avoid loss of data (settings, quantity counter, ...).

3.3 Tab Settings

Task: Displaying and changing device parameters.



In Tab Settings, the following settings of the device can be changed:

- Device description
  The device designation is a freely selectable name with a length of 15 characters for designating the measuring point.

- Display orientation
  Orientation of the display standard or rotated by 180°

- Display auto off
  Time in seconds until the display is automatically locked after the last touch. This time period is also used for the TCP lock (see also chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**).

- Device unit
  Flow unit switchable between kg/h, Nm³/h and m/s.

- Damping (GUI & AK)
  Damping in milliseconds for the graphic interface and the values via AK protocol.

- Offset volume flow
  Freely selectable offset for the value of the flow in the set unit.

- Offset pressure
  Freely selectable offset for the absolute pressure sensor.

- Offset temperature
  Freely selectable offset for the temperature sensor.

- Offset humidity[1]
  Freely selectable offset for the humidity sensor.

- TCP address
  IP address for TCP interface. Input in the usual format of IPV4 addresses.
  A restart of the unit is required to apply the change.

- TCP port
  Port address for TCP interface.
  A restart of the unit is required to apply the change.

- Analog out - Start value
  Start value of the analog output in the set unit. The start value must be smaller than the end value, otherwise the value at the analog output is invalid.

- Analog out - End value
  End value of the analog output in the set unit. The end value must be greater than the start value, otherwise the value at the analog output is invalid.

- Analog out - Mean Type
  Type of averaging of the analog output. Arithmetic mean value or moving average value in the set damping time (see „Analog out - Damping" here in this chapter).

- Analog out - Damping
  Damping in milliseconds for the analog output.

- Standard density
  Standard density of the gas to be measured - is required for the calculation of the mass flow.

- Standard pressure
  For Höntzsch, the standard conditions are 294.2 K (+21 °C / +70 °F) and 1014 hPa (14.7 psia).
  Any standard base can be set via the parameters standard pressure.
  Input in hPa

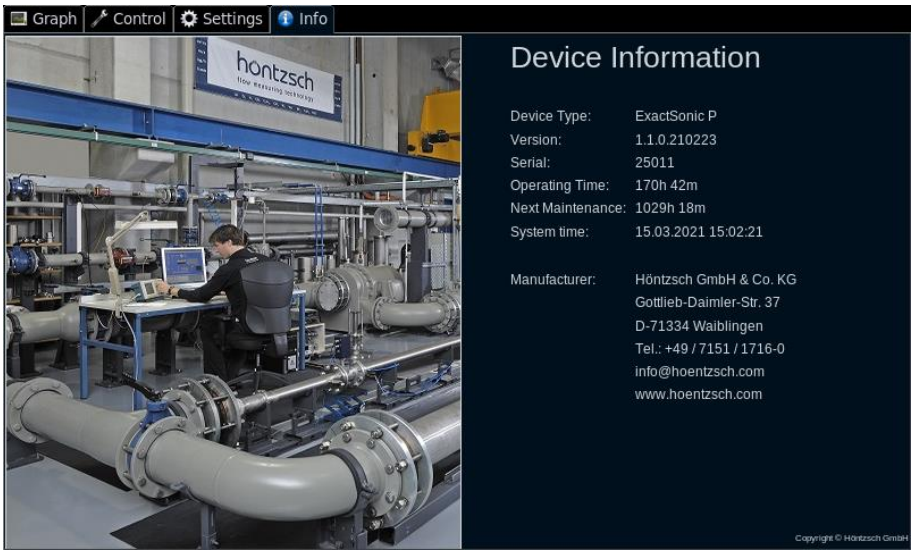
- Standard temperature
  For Höntzsch, the standard conditions are 294.2 K (+21 °C / +70 °F) and 1014 hPa (14.7 psia).
  Any standard base can be set via the parameters standard temperature.
  Input in °C

- Impact of humidity[1]
  Percentage influence of the humidity value on the measured value.

- Restore factory settings
  Restoring the factory settings of the device.

3.4 Tab Info

Task: Dispal of device information



The tab Info contains the device name, the version number, the serial number, the device time and the contact details of Höntzsch GmbH & Co KG.
The device's time is set automatically when there is an internet connection. If the network in which the ExactSonic P is integrated does not have access to the Internet or the device has no authorization, the date and time can be set using the AK protocol (see AK command „ESYT" in chapter 4.4.5).

3.5 Status LED

Task: Display of various statuses independent of the display

Colour/state	Description
Off	Permanent: Power supply interrupted
Red	1 x short flash, 2 seconds off: error in evaluation of ultrasonic data 2 x short flash, 2 seconds off: error in user-interface 3 x short flash, 2 seconds off: error in analog output 4 x short flash, 2 seconds off: error in temperature-, pressure- or humidity sensor 5 x short flash, 2 seconds off: calculation error
Green	Permanent: user interface started, device in operation
Blue	Permanent: boot process
Yellow	Permanent: device is busy

4 TCP Interface

4.1 Communication between evaluation unit and ExactSonic P

The communication between the evaluation unit and the ExactSonic P takes place via TCP via the built-in RJ45 socket. In this communication, the master is the evaluation unit, the ExactSonic P is the slave. The master sends a command, whereupon the slave responds accordingly. The protocol, which is referred to here as the AK protocol, was implemented according to the VDA standards of the "Standardisation of Exhaust Gas Measurement Technology".

4.2 Interface Specification

The interface is an RJ45 socket (8P8C) according to the ISO/IEC 11801 standard. Any standard network cable can be used, which is also commonly used with PCs..

4.3 Security

Access to the device via TCP is provided with a security code. This is set to "71334" at the factory. This should be changed directly during initial operation in order to protect the device from unauthorized access (see AK command „ESCO" in chapter 4.4.5).
The query commands (Axxx) can be used at any time without entering the security code. To query or change the settings or to control the device, it must first be unlocked with the "STLK" command and the security code. The device is blocked again after the blocking time for display and TCP (see command EDTT in chapter 4.4.5), as well as after a restart.

4.4 Protocol Description

Each telegram begins with an STX (Start of Text) as the first byte. The second byte can be any ASCII character, the blank character is preferred for reasons of readability. This is followed by four bytes of the AK command. This is followed by a blank as the 7th byte, a capital "C" as the channel identifier, the channel number (see respective AK command), another blank and then the data bytes.
If no data bytes are sent to the device, the command is interpreted as a read command. If the command contains one or more data bytes, it is considered a write command. Each command is concluded with an ETX (End of Text).).

The AK commands are divided into three categories.

- query commands (Axxx)
- setting commands (Exxx)
- control commands (Sxxx)

The response telegram no longer contains the channel identifier "C" and the channel number. The error status is contained in its place, which signals no error with "0" and an error with unequal "0". Measured values for which the error status signals an error should not be used for evaluation, but discardedIf the error status permanently shows an error, the device must be restarted or checked..

4.4.1 Command - Telegram

	Character	Details
1. Byte	STX	ASCII Code 02
2. Byte	BLANK	any ASCII character, blank preferred
3. Byte	FUNCTION CODE 1	1. character of the AK command e.g. A of ABCD
4. Byte	FUNCTION CODE 2	2. character of the AK command e.g. B of ABCD
5. Byte	FUNCTION CODE 3	3. character of the AK command e.g. C of ABCD
6. Byte	FUNCTION CODE 4	4. character of the AK command e.g. D of ABCD
7. Byte	BLANK	blank
8. Byte	C	channel identifier
9. Byte	Kanalnummer	0 - 9
10. Byte	BLANK	blank
D		data byte 1
A		data byte 2
T		data byte 3
E		data byte 4
…		further data bytes
N		Last data byte
n. Byte	ETX	ASCII Code 03

4.4.2 Response - Telegram

	Character	Details
1. Byte	STX	ASCII Code 02
2. Byte	BLANK	any ASCII character, blank preferred
3. Byte	FUNCTION CODE 1	1. character of the AK command e.g. A of ABCD
4. Byte	FUNCTION CODE 2	2. character of the AK command e.g. B of ABCD
5. Byte	FUNCTION CODE 3	3. character of the AK command e.g. C of ABCD
6. Byte	FUNCTION CODE 4	4. character of the AK command e.g. D of ABCD
7. Byte	BLANK	blank
8. Byte	ERROR STATUS	error status byte 0 = no error > 0 = error
9. Byte	BLANK	blank
D		data byte 1
A		data byte 2
T		data byte 3
E		data byte 4
…		further data bytes
N		Last data byte
n. Byte	ETX	ASCII Code 03

4.4.3 Error handling

If an unknown command is sent to the device, if settings are to be changed without authorisation, or if the device is otherwise unable to respond to the request, the device will respond with various error codes.

Code	Designation	Details
XCBM	ERROR_COMMAND_BLANK_MISSING	failed to check necessary blanks
XCCB	ERROR_COMMAND_CHANNELBYTE	channel byte missing or channel number incorrect
XCDF	ERROR_COMMAND_DATA_FORMAT	incorrect data format
XCDR	ERROR_COMMAND_DATA_RANGE	data out of valid range
XCDT	ERROR_COMMAND_DATATYPE	data type unsuitable, e.g. float expected, String received
XCLE	ERROR_COMMAND_LENGTH	command lenth incorrect
XCNA	ERROR_COMMAND_NOT_ALLOWED	command not allowed
XCUN	ERROR_COMMAND_UNKNOWN	command not known
XGPE	ERROR_GENERAL_PROTOCOL_ERROR	general protocol error – check format
XSCI	ERROR_SECURITY_CODE_INVALID	security code incorrect
XSCN	ERROR_SECURITY_CODE_NEW_MISMATCH	security code and confirmation do not match
XSEM	ERROR_COMMAND_STX_ETX_MISSING	STX or ETX is missing
XSTL	ERROR_SECURITY_TCP_LOCKED	access via TCP blocked, see STLK
XTFD	ERROR_COMMAND_TOO_FEW_DATABYTES	too few data bytes received
XTMD	ERROR_COMMAND_TOO_MANY_DATABYTES	too many data bytes received
XUNK	ERROR_UNKNOWN	unknown error

4.4.4 AK commands – Query Commands (reading only)

Code	Channel	Description	Data format
AKEN	0	device description	string "ExactSonic P"
ALMT	0	last maintenance time	integer value in hours. operating time of the device, on which the last maintenance of the device was performed.
AMFR	0	measured flow rate	float value with 4 decimal places e.g. "849.1212" – unit see EDUN
AOLT	0	operating time	integer value in hours
APAB	0	absolute pressure in hPa	float value with 2 decimal places
AQTB	0	quantity counter in reverse direction	float value with 6 decimal places
AQTF	0	quantity counter in forward direction	float value with 6 decimal places
ARHU[1]	0	rel. humidity in %	float value with 2 decimal places
AROT	0	remaining operating time until next maintenance	integer value in hours
ATEM	0	temperature in °C	float value with 2 decimal places e.g. "21.95"
AVAL	0	measured values complete	flow rate (unit see EDUN), temperature, absolute pressure and rel. humidity[1], separated by semicolon e.g. "849.1212;21.95;1013.12;70"

AVER	0	device version	integer value main version integer value minor version integer value patch level integer value build number each separated by dot, e.g. "1.1.25.103"

4.4.5 AK Commands – Setting Commands

Code	Channel	Description	Data format
EAOA	0	startin value analog output	float value, unit see EDUN e.g. "100.0"
EAOD	0	damping analog output	0 <= integer value in milliseconds <= 10000 0 = damping off
EAOE	0	end value analog output	float value, unit see EDUN e.g. "1000.0"
EAOM	0	type of averaging at the analog output	integer value 0 = arithmetic mean integer value 1 = moving average always at the set interval (see EAOD)
EDES	0	device name	string, max. 15 characters e.g. "TEST BENCH 1"
EDMP	0	damping (GUI & AK protocol)	damping for display and value via AK protocol 0 <= integer value in milliseconds <= 10000 0 = damping off
EDTT	0	display switch-off and TCP lock time	0 <= integer value <= 3600 in seconds 0 = display permanently on and TCP lock permanently off
EDUN	0	unit flow value	integer value 0 = mass flow in kg/h integer value 1 = flow rate in Nm³/h integer value 2 = flow velocity in m/s
EMIN	0	maintenance interval	maintenance interval recommended by the manufacturer integer value in hours
EOFF	0	offset flow value	float value, unit see EDUN e.g. "1.500" restart necessary after change
EOFH[1]	0	offset rel. humidity	float value in % e.g. "2.5"
EOFP	0	offset absolute pressure	float value in hPa e.g. "10.2" restart necessary after change
EOFT	0	offset temperature	float value in °C e.g. "1.25" restart necessary after change
EPOR	0	TCP port	port range 0 - 65535 - default 22000 restart necessary after change
ESCO	0	security code	To change the security code, the old password and twice the new password, each separated by a semicolon, must be sent to the device. e.g. 71334;54321;54321 default: 71334
ESER	0	serial number	serial number of the device e.g. 12345 reading only
ESTD	0	standard density	0 < float value in kg/m³ < 10.0 e.g. 1.2041 for dry air at 20°C
ESTP	0	standard pressure	0 < float value in hPa <= 20000.0
ESTT	0	standard temperature	-273.15 < float value in °C < 1000.0

ESYT	0	system time	year, month, day, hour, minute, second in format "yyyy.MM.dd HH:mm:ss" (HH = 24h) e.g. "2019.07.15 16:37:00" Only for devices that do not have an internet connection.
ETCP	0	TCP address	IP address in standard notation e.g. "192.168.0.1" - default "192.168.137.69" restart necessary after change
EVHI	0	influence humidity value	percentage influence of the humidity value on the measured value 0 <= float value in % <= 100

4.4.6 AK Commands – Control Commands

Code	Channel	Description	Data format
SANA	0	Analog output on/off	integer value 0 = analog output off integer value 1 = analog output on
SDIS	0	display on/off	integer value 0 = display off integer value 1 = display on
SDLK	0	display lock	integer value [security code] = off integer value 1 = on
SHUT	0	switch-off the device	integer value 1 = switch-off
SMES	0	measurement on/off	integer value 0 = stopped integer value 1 = started
SQRS	0	reset quantity counter to 0	integer value 1 = reset
SREB	0	restart the device	integer value 1 = restart
STLK	0	TCP lock	integer value [security code] = off integer value 1 = on

[1] humidity sensor optional

5 Troubleshooting

Error	Reason	Troubleshooting
Device shows no function	Power supply insufficient	Check power supply and connector
	Elektronics defective	Return to the factory
No measured value	Sensor dirty	Check and clean the sensor
	Incorrect measurement settings	Comparison and correction of the settings according to the specifications in the Technical Data Sheet
No display of the absolute pressure	No connection	Check cable and connector on pressure sensor
	Elektronics or display defective	Return to the factory
No indication in the display	Power supply insufficient	Check power supply and connector, check status LED (see chapter 3.5)
	Elektronics or display defective	Return to the factory
Display cannot be operated	User interface locked	Unlock the user interface according to chapter 3.1
Incorrect value at analog output	Incorrect settings for analog output	Check the settings according to chapter 3.3 or chapter 4.4.5
Measured value too low	Sensor dirty	Check and clean the sensor
	Incorrect measurement settings	Comparison and correction of the settings according to the specifications in the Technical Data Sheet
Measured value too high	Incorrect measurement settings	Comparison and correction of the settings according to the specifications in the Technical Data Sheet
No TCP communication	No connection	Check cables and connectors, check accessibility via ping test
	IP address set incorrectly	Check the settings according to chapter 3.3 or chapter 4.4.5
	Port set incorrectly	Check the settings according to chapter 3.3 or chapter 4.4.5

6 Declaration of Conformity, Declaration of Incorporation

We Höntzsch GmbH & Co KG
Gottlieb-Daimler-Str. 37
D-71334 Waiblingen

bearing sole responsibility, hereby declare that the product

ExactSonic P
Ultrasonci Massflow Measuring System

referred to in this declaration, is in conformity with the following standards or normative docu-ments:
:

Provisions of the Directive	**Reference and date of issue**
2014/30/EU: Electromagnetic Compatibility	EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6 EN 61000-4-16 EN 61000-4-29 EN 55011 Rad. EN 55011 Cond.
2014/53/EU: Radio Equipment Directive	EN 301489-1 EN 301489-17 EN 300328 EN 62311:2008
2011/65/EU: Hazardous substances in electrical and electronic equipment	

Waiblingen, 28.06.2022

Jürgen Lempp / Geschäftsführer

INDUSTRIE AUTOMATION GRAZ Ing. W. Häusler GmbH AUTALER STRASSE 55 A-8074 RAABA-GRAMBACH
TEL: +43 316 405 105 FAX: +43 316 405 105 22 E-MAIL: OFFICE@IAG.CO.AT WWW.IAG.CO.AT