



Sintrol Snifter mA+ RF

Manual

Version 1.2.4

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1 INTRODUCTION

This manual describes how to install and use SINTROL's Snifter mA+ RF dust monitor. Sintrol shall not be liable for any loss or damage whatsoever arising from use of any information or details therein, or omission or error in this manual, or any misuse of the product.

The instrument can be accessed by utilizing the DustTool Software.

The basic functionality of DustTool is to change the factory settings according to individual needs of the process.

Such functions for Snifter mA+ RF are for example:

- Perform the auto-setup according to process typical dust levels.
- Change the Alarm Limits and the logic of signals.
- Set 4 - 20mA output levels

The Software can be downloaded free of charge under the Sintrol web-site <http://www.sintrolproducts.com>

1.1 Safety

Snifter mA+ RF requires 12 - 24 VDC power supply. Although these voltage levels are considered safe, the process gas or dust particulates can be hazardous to health.



Take appropriate precautions when installing the monitor:

Unless the process conditions are known to be entirely safe, suitable precautions must be taken before any entry is made into the duct for installation or maintenance purposes.

- The unit may be installed in ducting, containing particulate, hazardous to health.
- The particulate may be inflammable, explosive or toxic
- The gas can be hot and pressurised

1.2 Product overview

The Snifter mA+ RF Dust monitor is a microprocessor-based, self-adjusting device, equipped with two independent and fully adjustable alarm signal, isolated 4 – 20 mA output loop and back light illuminated front cover.

The device is designed for filter bag leak detection and continuous filter condition management. It can also be used to detect blockage or stoppage in pneumatic

transport and bulk solids handling. It is a compact unit with the sensor and control electronics built into one IP65 enclosure, which has been specifically designed for easy installation and operation.

1.3 *How does it work?*

The Snifter mA+ RF uses Sintrol's proven and reliable inductive electrification technology where the interaction of particles with the sensor rod causes a small electrical charge to pass between the particulate and sensor.

It is this small electric charge that provides the signal monitored by the electronics, the signal generated is proportional to the dust level even if particles accumulate on the sensor. Experience has shown that this method of monitoring dust level in gasses, offers accurate results with minimum maintenance.

2 **INSTALLATION**

2.1 *Selecting the installation location*

The best location for installation is in a section of duct where the particulate has an even distribution and the flow is as laminar as possible. This is to ensure that the sensor rod comes into contact with a representative flow of particles.

The ideal position would be in a section of duct that has no bends, valves, dampers or other obstructions for a distance equal to at least three duct diameters downstream or upstream (preferable 5 x duct diameter).

Description of installation is presented in Figure 1 Recommended distance to duct bends (D = Duct diameter).

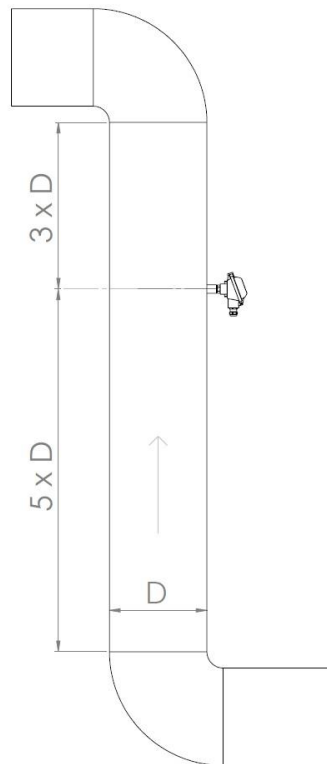


Figure 1 Recommended distance to duct bends (D = Duct diameter)

In some applications, a compromise must be made and the sensor will have to be fitted in a position that satisfies the majority of above requirements. The Snifter mA+ RF must be attached to metal ductwork so that the device will be electrically shielded from interference and has good ground reference.

1. The unit shall be installed in a position, where the gas flow passes the sensor rod in a 90° angle.
2. In round cross-section ducts, the unit can be installed in any position above the horizontal axis (between 9 o'clock and 3 o'clock). See Figure 2
3. For square cross-section ducts, the unit must be positioned in the middle of the top or in the middle of one of the sides. See Figure 3
4. Although the sensor is not affected by vibration, very high vibration levels should be avoided.
5. The units must not be installed in direct sunlight or in areas where the ambient temperature is above +40 °C.

The unit above
horizontal axis

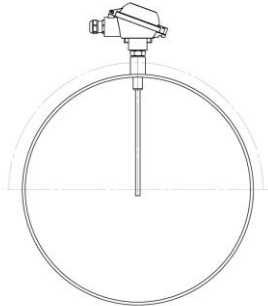


Figure 2 Round cross section duct

The mounting
socket in the

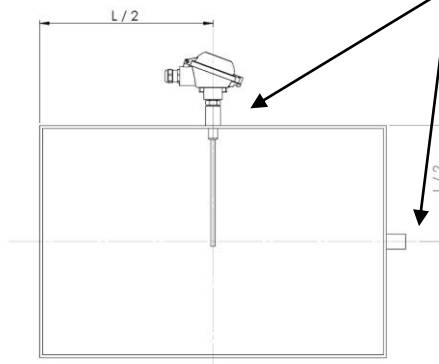


Figure 3 Square cross section duct

NOTE

The sensor must not contact the opposite wall or any other obstacle inside the duct. The only allowed interaction with sensor is dust particles.

2.2 *Installing the sensor*

Once the location of the unit has been selected, the Snifter mA+ RF with NPT 1/2" male thread can be installed to process with 1/2" female thread. Make sure the installation is in the right position, insert the sensor inside the adapter and rotate the Snifter until the connection is tight.

NOTE

Do not over tighten the Snifter mA+ RF with process connection - It may cause damage to sensor and electronics.

3 WIRING

The Snifter mA+ RF comes with two meter power and signal cable. There are 12 wires in the same cable, two wires for VDC power source, two for alarm signals, and one for automatic setup signal. Remaining wires are left for digital communication with Sintrol Dustlog software.

Connect the VDC power supply to pink (+) and GND to gray (-) wires. Blue and red wires are for alarm signals and they give the same voltage levels as power input voltage, when the alarm latches to high state.

PCB pin	Wire colour	Signal name
1	BLUE	Alarm signal 1
2	RED	Alarm signal 2
3	BLACK	4 – 20 mA +
4	YELLOW	4 – 20 mA -
5	GRAY	V- (GND)
6	PINK	V+ (VDC)
7	GREEN	Automatic setup
8	BROWN	RS 485 D+
9	WHITE	RS 485 D-
10	BLUE/RED	USB DM
11	GRAY/PINK	USB DP
12	VIOLET	USB VBUS

Table 1 Wiring and signals

Snifter mA+ RF can be powered by using only USB connection for the purpose of accessing and adjusting parameters with appropriate Sintrol PC software. More information about parameter adjustment can be found in section 8 of this manual.

3.1 Wiring and applications

Applying I/O signals

Alarm signals can be transferred as digital I/O signals using two dedicated wires. Signal levels conform to the power source voltage (V+ and V-).

Logic of the alarm and alert signals is described in section xxx, however this behavior can also be customized according to the end user application.

I/O signals are designed to be used as relatively short range triggers for logic implementation or even to drive relays. Long distance connections are discouraged due to the un-isolated nature of the I/O signals, sourced from the local power supply of the device.

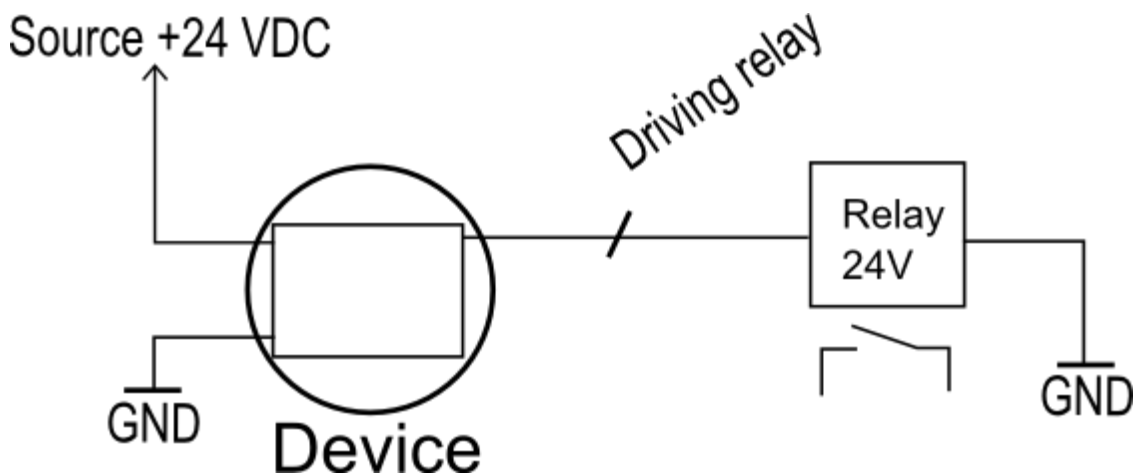


Figure 4 Driving a relay example

Applying of mA-output

mA-output signal (mA+ and mA-) is used to transfer analog 4...20 mA current signal describing the measurement value.

After the default autoseup procedure the normal signal level is set to be 5% of the scale i.e. 4,8 mA. Thus the max signal level of 20 mA indicates times 20 increase in dust level since the autoseup. The scale of mA-output can also be customized according to the end user application.

mA-output loop is intended to be used as a long range analog data transfer in hazardous industrial environment. The signal output is isolated to shield against local potential differences between the two end locations.

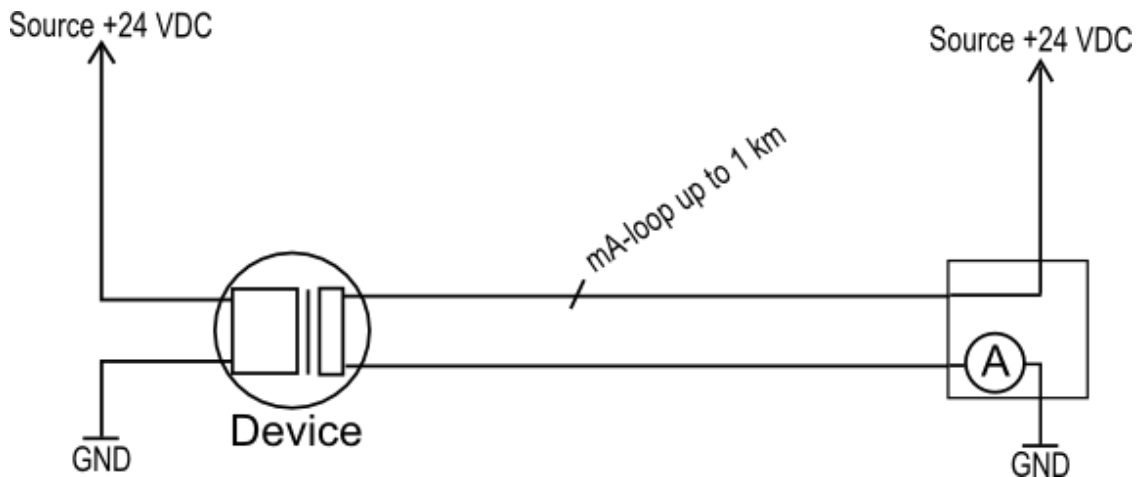


Figure 5 mA-loop application example

Applying TIA-485-A bus

TIA-485-A, also known as ANSI/TIA/EIA-485, TIA/EIA-485, EIA-485 or RS-485, is a standard defining the electrical characteristics of drivers and receivers for use in balanced digital multipoint systems. The standard is published by the Telecommunications Industry Association/Electronic Industries Alliance (TIA/EIA).

Digital communications networks implementing the EIA-485 standard can be used effectively over long distances and in electrically noisy environments. Multiple receivers may be connected to such a network in a linear, multi-drop configuration. These characteristics make RS485 network useful in industrial environments and similar applications.

Currently available communication protocols over the RS485 bus are SINTROL NETWORK and MODBUS RTU.

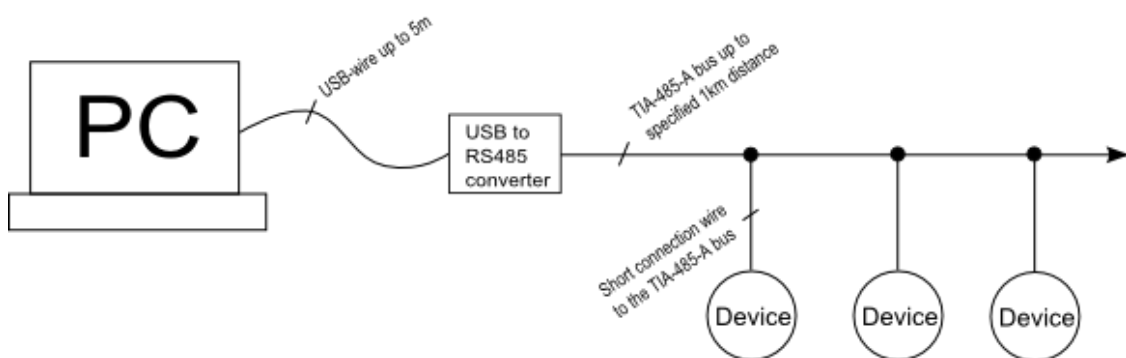


Figure 6 TIA-485-A bus application example

Applying local RF bus

Local area radio frequency bus operates within international license free ISM-bands. All Sintrol products equipped with RF-link operate as a part of the bus,

creating and routing data within the network. This feature in most cases eliminate any need for repeaters or manual configuration tasks.

RF bus is especially recommended to be used in industrial locations where bi-directional communication is required and/or a strong galvanic isolation is needed. Long distance connections up to 1 km without the line of sight can be acquired. Range can also be extended with accessories like directional antennas and/or separate repeater units.

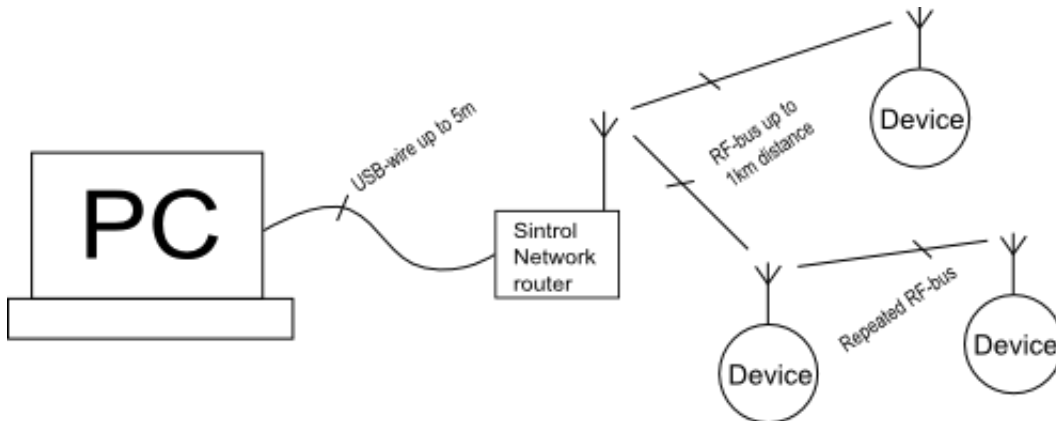


Figure 7 RF bus application example

Notes:

Sintrrol Network Router is needed to access the RF network of products.

Applying USB

Direct USB connection on products makes it easy to connect with Sintrol devices without any additional equipment. Devices can also get powered partly, using the USB as a power source, provided that the USB-port has the capability to source enough energy.

USB is intended to be used for easy parameterization of Sintrol products with dedicated complementary DustTool software. However, the USB is not suitable to operate or substitute a dedicated industrial bus and it is not intended to be used in industrial environment during the normal operation.

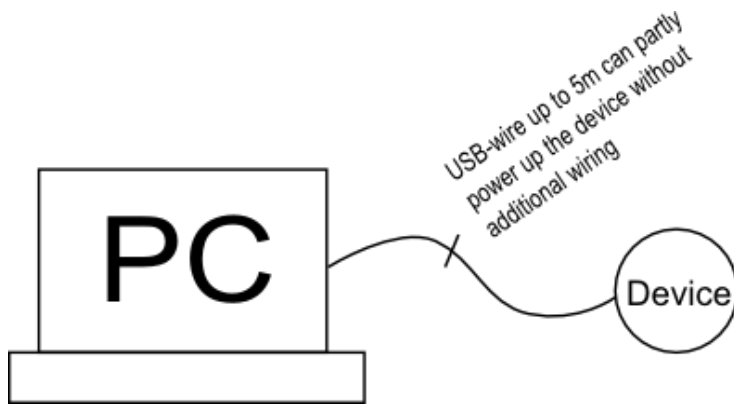


Figure 8 Parameterization of the device with only USB-connection.

4 WIRELESS

Snifter mA+ RF can be connected wirelessly. To create wireless connections, the simplest way is to apply the Sintrol Network. By using the Sintrol Network, the actual connection will be created automatically. In this case no additional installation work like parameterization of network addresses or similar is needed.

If required, each device can be named before the installation. In this way, the device will be easily identified by the given name, when the network is otherwise automatically created. Naming is quite simple.

1. Run Sintrol DustTool or DustLog PC software on the computer
2. Connect with USB the device to PC. Device appears automatically in the software, when the USB is connected.
3. Write the name into the device at the parameters tab and then press save button.
4. Disconnect the USB cable.

NOTES

Not even an additional power source is needed, since the device will use USB as the power source during the parameterization. See also Sintrol cBox2 product at <http://www.sintrolproducts.com> to make the connection between Snifter mA+ RF cable signals and USB connector easily.

4.1 *Wireless base station*

To apply the wireless network, at least one additional unit is needed. This unit is used as the communication base station which converts the physical signals into the radio network and back. The base station can also be connected to the PC computer via USB, where it is then possible to run Sintrol DustLog data collection software to manage and operate the network online.

Within Sintrol Network repeaters are normally not needed. All Sintrol Network devices operate automatically as repeaters within the network, should there even be any need for it.

4.2 *Network options*

Sintrol Wireless solution is part of the whole Sintrol Network system. For this reason the wireless RF connection operates transparently with RS 485 network, if needed.

Figure 9 presents one example of the working Sintrol Network. In this illustration both wireless and wired connections are used just to illustrate the seamless and extraordinarily flexible operation between both physical communication methods.

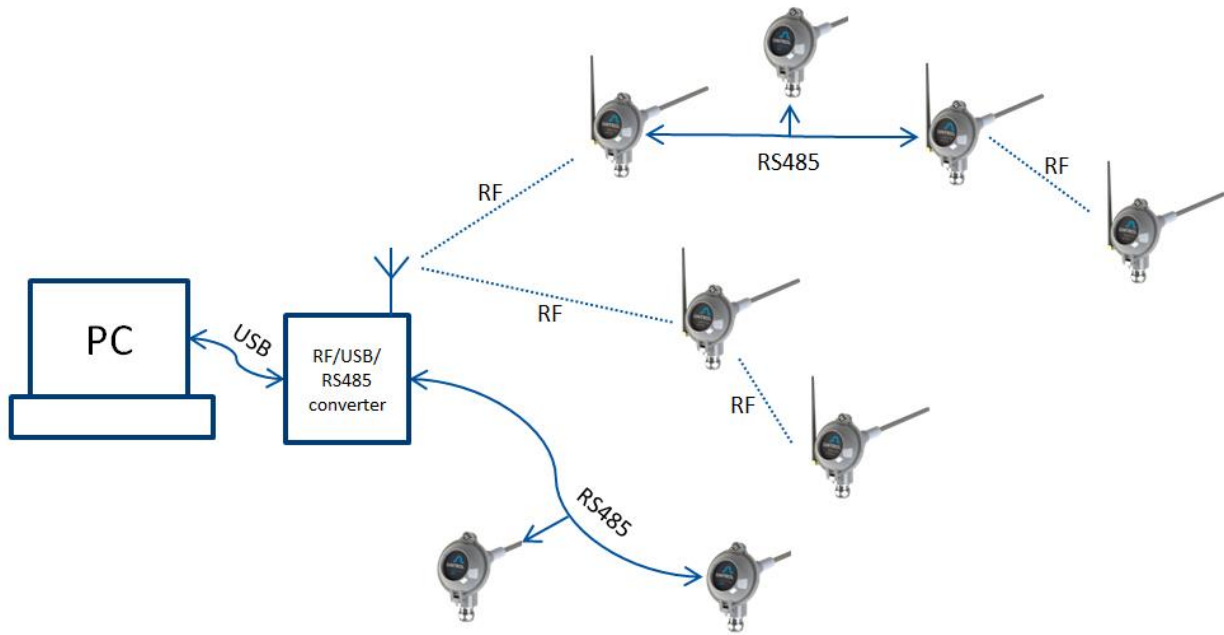


Figure 9 Sintrol Network topology

5 TECHNICAL SPECIFICATION

Product name	Snifter mA+ RF
Measurement Objects	Solid particles in a gas flow
Particle Size	0.3 µm or larger
Measurement Range	From 0.1 mg/m ³
Measurement Principle	Inductive Electrification
Protection Category	IP65
Sensor Length (total/measuring)	250 mm / 185 mm
Power Supply	12-24 VDC
Power Consumption	3 W
Cable Connection	2 meter cable, 12 wires
Process Connection	NPT 1/2" male thread
Output Signals	<ul style="list-style-type: none"> • Two output signals (100 – 280 mA) • Isolated 4 - 20 mA output loop • Back light illuminated front cover
Communication Interface	<ul style="list-style-type: none"> • Serial communication RS-485 • USB • Radio frequency (RF) (optional)
Communication Protocol	<ul style="list-style-type: none"> • Modbus RTU (RS-485) • SNT network (USB, RF and RS-485)
Alarm settings	<ul style="list-style-type: none"> • Set automatically by auto-setup based on average measured dust flow: 5 times and 20 times of reference dust flow. • User selectable
Signal Averaging Time	<ul style="list-style-type: none"> • Default at factory, 100 s • Adjustable from 0 – 6000 s
Alarm delay time	<ul style="list-style-type: none"> • Default at factory, 30 s • Adjustable from 0 – 60 000 s
Alarm hysteresis time	<ul style="list-style-type: none"> • Default at factory, 0s • Adjustable from 0 – 25 s

5.1 Process Conditions

Temperature	Max 250 °C
Pressure	Max 200 kPa
Gas Velocity	Min 3 m/s
Humidity	Max 95 % RH (non-condensing)

5.2 Ambient Conditions

Starting temperature	-20...+40 °C
Running temperature	-40...+60 °C
Humidity	Max 95 % RH (non-condensing)

5.3 Materials and Weight

Probe (wetted part)	Stainless steel (AISI 316L)
Process Connection (wetted part)	Stainless steel (AISI 316L)
Enclosure	Aluminum
Probe Insulation (wetted part)	PEEK
Weight	0.6 kg

5.4 Wireless communication

Frequency band	868/915 MHz (license free ISM band), 15 channels
Transmit power	Up to 400 mW (+26 dBm), user adjustable
Receiver sensitivity	-110 dBm
Communication protocol	Proprietary Sintrol Network protocol
Typical range (no line of sight)	Up to 1300 m in urban environment Up to 11 km with directional antennas

Table 2 Technical specification

6 DIMENSIONS

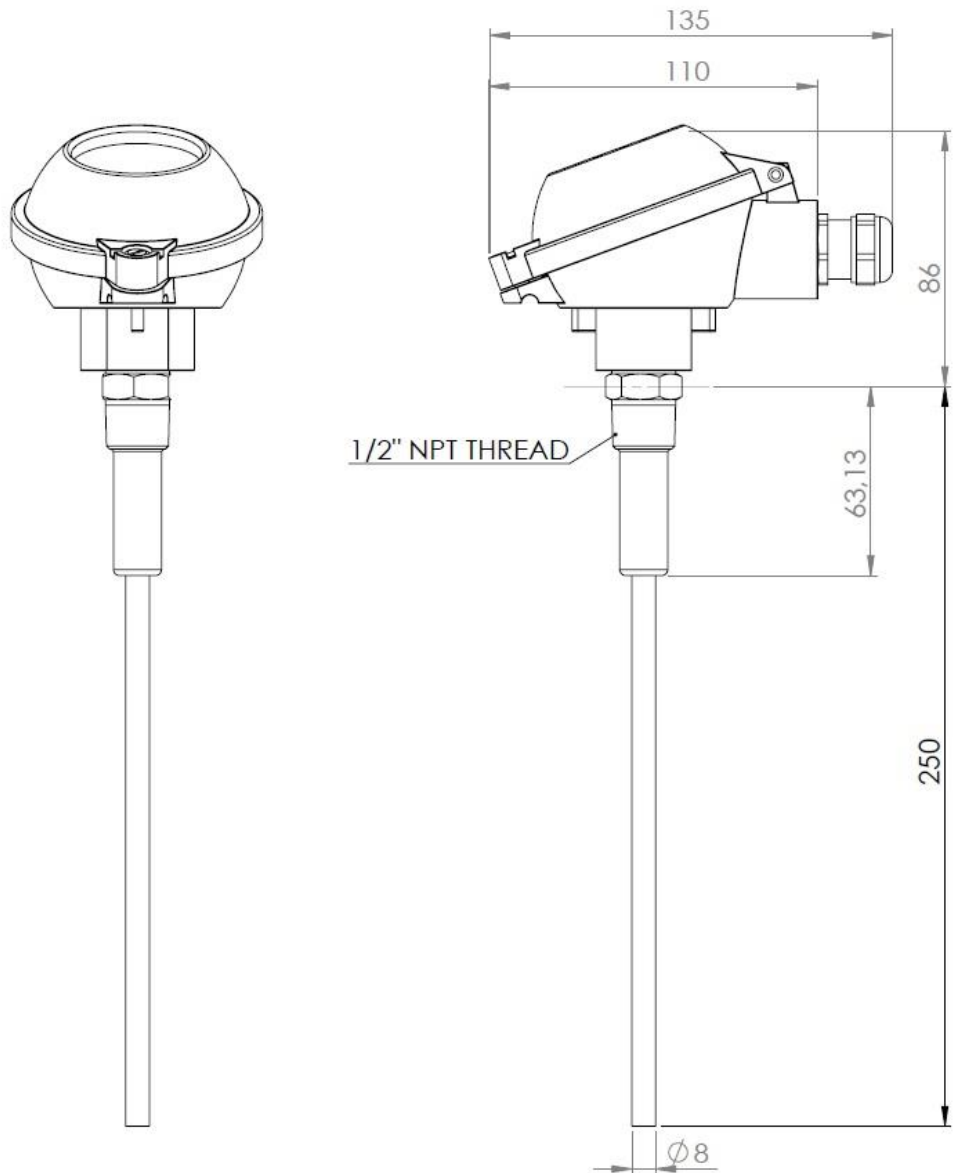



Figure 10 Structure and dimensions

This instrument conforms to the following standards

	<p>Product standard - electrical equipment for measurement, control and laboratory use – EMC requirements</p>	<p>Reference standard IEC 61326-1:2005 (First Edition)</p>
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7 OPERATION

The Snifter mA+ RF Dust Monitor measures the dust level in a gas flow by using inductive electrification technology which is based on AC measurement of moving particles which carry a charge.

There are two alarm signal outputs to indicate two different alarm conditions. In addition to this, the front cover illumination will blink to inform about the current alarm condition.

7.1 The alarm threshold factory setting values:

Alert: > 5 times normal dust level (during automatic setup)

Alarm: > 20 times normal dust level (during automatic setup)

4 - 20 mA output: After auto-setup, the dust level is set to 5 % of total scale ie. 4.8 mA

ALARM SIGNALS	DUST LEVEL	mA LOOP 4 - 20mA	FRONT COVER ILLUMINATION	OPERATION
S1: LOW S2: LOW	-	-	OFF	Power OFF, failure or auto- setup failed
S1: LOW S2: HIGH	Dust level < Limit1	4 – 8 mA	ON	Normal operation
S1: HIGH S2: LOW	Limit1 <= Dust level < Limit2	8 – 20 mA	BLINKING COUNT IS ONE (B)	Alert
S1: HIGH S2: HIGH	Dust level >= Limit 2	20 mA	BLINKING COUNT IS TWO (C)	Alarm

Table 3 Default operating configuration on factory settings

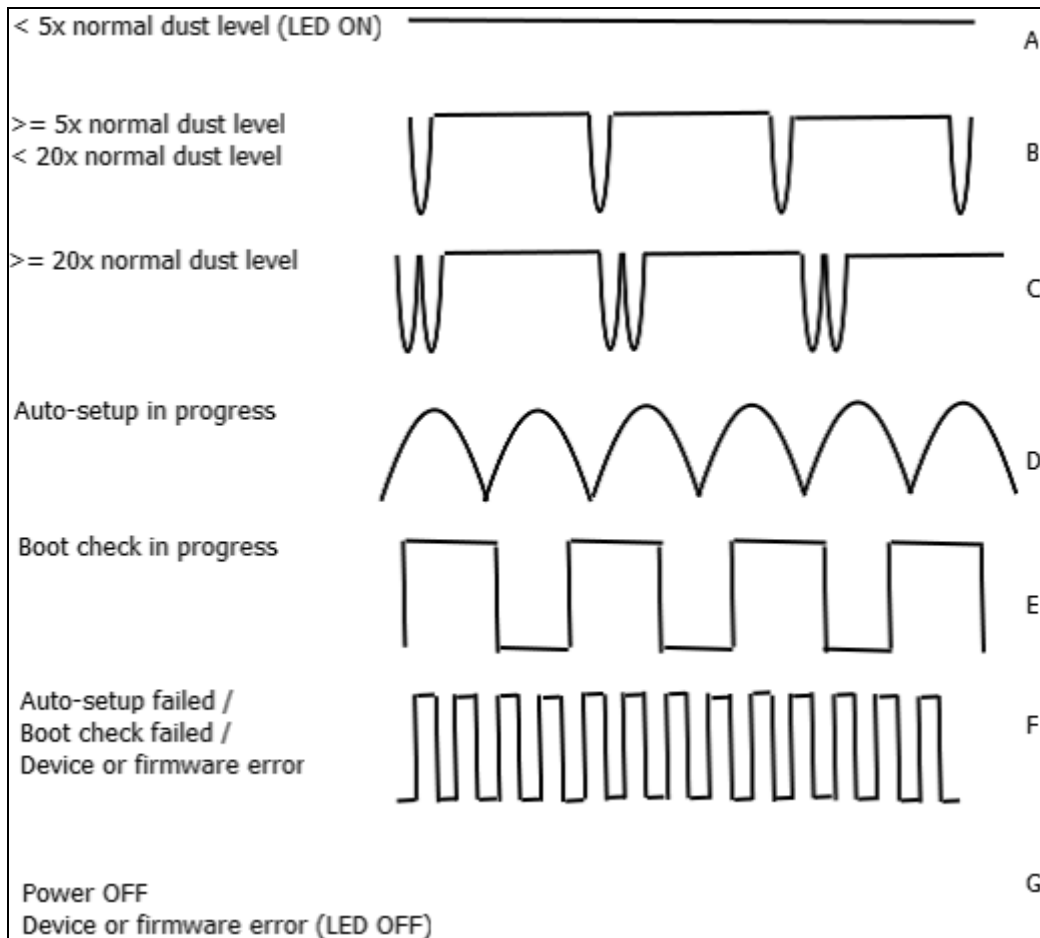


Figure 11 Description of Snifter mA+ RF cover illumination sequences.

8 ADJUST PARAMETERS

Since every industrial process is different Snifter mA+ RF is designed so that parameters which are important to customer can be easily adjusted. Adjustment of parameters can be done by using USB, RS-485 or optionally with RF communication. Depending on the chosen communication method set to the device, the adjustments can be done either with Sintrol PC software or standard Modbus RTU master unit.

By default, the communication mode of the device is set to work with Sintrol PC software. To use MODBUS RTU communication, appropriate network parameters needs first to be set into the device.

8.1 *Signal averaging time*

Snifter mA+ RF damping time has been adjusted to 100 seconds in factory but it can be adjusted freely between 0 second and 6000 seconds (1 h 30 min).

8.2 *Alarm level settings*

Default Snifter mA+ RF alarm signal levels have been adjusted to 5 and 20 times, compared to the process dust level during the automatic setup. These parameters and signal logic can be adjusted freely to be any levels required by the customer's process monitoring demands.

8.3 *Alarm delay time*

It is possible to set delay time for Snifter mA+ RF alarm signals to avoid false alarms caused by dust concentration peaks which appear naturally in process. On factory settings, alarm delay is set to 30 seconds but it can be adjusted freely between 0 and 60 000 seconds.

8.4 *Alarm hysteresis time*

Snifter mA+ RF contains alarm hysteresis time parameter which sets the minimum frequency for alarm signal to change its stage. On a factory settings hysteresis time is set to 0 seconds but it can be set freely between 0 and 25 seconds.

9 AUTO-SETUP

To be able to detect variations in dust flow, and to set the alarm so that it will go off if there is excessive dust flow, you must determine the typical dust flow in the application when the process is operating normally.

The unit has an auto-setup function. With this, you can set the measuring range of the dust monitor so that a typical dust flow in the application corresponds 5% (4.8 mA) of the output scale.

Before running the auto-setup it is necessary to know that the process is running with normal dust flow. When initiated, auto-setup sets the dust measuring parameters based on the normal dust flow.

After the auto-setup, by default alarm signals are set as follows:

- alert when the dust concentration exceeds 5 times the typical dust level.
- alarm when the dust concentration exceeds 20 times typical dust level.

In addition, the following key parameters will also be affected.

- 4 -20 mA high level is set to 20 times typical dust level and low level is set to 0
- Dust signal averaging time is set to default.
- Signal hysteresis and delay times are set to default.

For more information, see Table 3 Default operating configuration on factory settings.

NOTE

As the auto-setup procedure can also be altered by the user, this section only describes the actions of factory default auto-setup.

9.1 How to do the auto-setup?

Follow the procedure below to run the auto-setup.

1. Connect the sensor to the duct, connect the power to the device and wait for 10 minutes the process to stabilize.
1. Then start the auto-setup procedure either:
 - 1.1 by connecting the automatic setup signal (green wire) to the V+ signal (wire) for a period of 1 second. The automatic setup will initiate and the front panel light will start to blink slowly (sequence D in Figure 11 Description of Snifter mA+ RF cover illumination sequences.).

Then Release the automatic setup signal, by disconnecting the green wire from V+.

1.2 or initiating auto-setup remotely using remote communication options.

Auto-setup procedure takes 10 times the signal averaging time ie. with the default parameters, this will be 1000 seconds (approx. 17 min) to complete. When the front cover lighting stops blinking, the auto-setup is finished and the Snifter mA+ RF is ready for use.

10 MAINTENANCE

Snifter mA+ RF dust monitor needs very little or practically no maintenance. We recommend checking the status of the sensor after the first 2 months of operation. If no notable build-up of contamination can be observed, the recommended maintenance interval is 2 years.

However, if the particles in the gas are sticky and tend to build up, the cleaning needs to be done more often. The need for maintenance depends on the process.

The maintenance is done by removing the unit from the process and cleaning the sensor rod to prevent signal leakage to ground. Opening the enclosure during the maintenance is unnecessary and will terminate the warranty.

11 TROUBLESHOOTING

11.1 *No output signal*

- Check the power and signal wiring are connected correctly.
- Check that there is power on (cover glows).
- Do the auto-setup

If the monitor is not giving any output signal after these checks, contact your local distributor.

11.2 *No response after auto-setup*

- Check that there is normal process going on during auto-setup.
- Check that the power and signal wiring are connected correctly.
- Check that the signal is not leaking to ground.
 - There is NO contact between metal sensor probe and duct wall.
 - Ensure that the gas is not condensing (causes signal leakage).
 - Check that the sticky dust does not build up on the base of the sensor and no bridging between sensor probe and duct wall.

NOTE

Front cover illumination sequence F is on (10 Hz rate), when signal leaking to the ground is permanent.

11.3 *Boot check*

If green wire for starting automatic setup is connected before 15 seconds has elapsed from the power ON, boot check is initiated. Test takes some seconds and it is indicated with a sharply blinking front cover illumination sequence E (1 Hz rate).

If test fails, sequence F is initiated (10 Hz rate).

12 Appendix A: Sintrol PC software

The instrument can be controlled with Sintrol PC software provided they have appropriate bus interface available.

12.1 *DustTool*

DustTool is complementary software to help you to get easily control of the parameters and features of your Sintrol products.

The hardware requirements to run the software are:

- Windows XP, Vista or 7
- Screen resolution of 1024x768 pixels or more
- Minimum memory starting from 512 MB

The DustTool PC-software can be connected directly to the meters via USB. By using converter also connections over RS 485 and RF are supported.

NOTE:

When customer uses PC-software to lock the device with *lock password* feature, changing any device parameters and running auto-setup is disabled. **If this password is set and lost, there is no way to unlock the device without contacting the manufacturer for the device specific master password.**

Preview

When DustTool software opens it looks for USB-connected Sintrol products. In case any products are connected, they will appear within the software and can directly be managed.

The main view of the software is illustrated below.

The list of connected products and the connection type icon, lets you easily select the device you need to control.

Tab area to manage product related features, like device parameters, auto-setup controls and of course the monitor view to quickly provide you a clear visualization of the current process condition..

From the **settings view** you can have full control over software parameters, like network access and language selection.

Description of the product with the default type name, serial number and picture.

Info area on the bottom helps you all the time by giving actively information about a number of fields and items on screen. All you need to do is to move mouse over the item, parameter or title you wish to know more about.

Help view will give you direct access to the manuals and documentation related to devices currently connected. In case you should allow the internet network connections, DustTool will automatically provide you with the latest and printable documentation for your convenience.

Figure 12 DustTool main window

On the parameters page, user can modify the operating parameters of the connected Dust meter. The basic operating principle to change parameters is:

1. Change parameter to the desired value
2. Press "Save" button to save the changes into the memory of the instrument. If the "Save" button is not pressed, the changes will not be sent to the device and the values will be lost at program shut down or when device is detached.
3. By pressing "Read", the parameters which are currently saved in the instrument will be loaded from the device.

On the monitor view of the DustTool software it is possible to follow online the dust levels. Monitor view is intended to help user in decision when setting up parameters manually.

In order to further save measurement data, create additional signals and alarms and/or generate reports and history, commercial DustLog software is required.

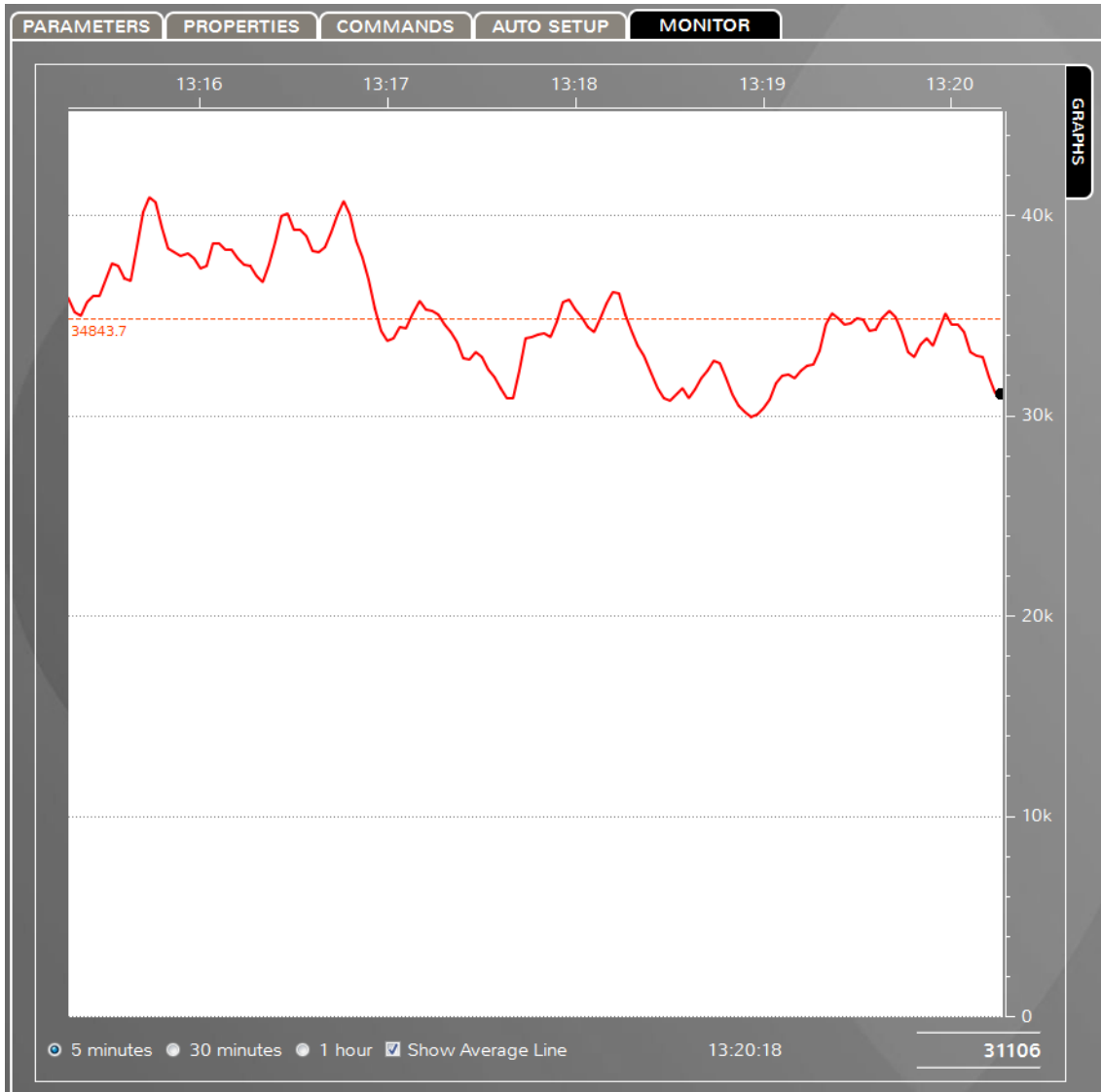


Figure 13 DustTool monitor view

12.2 *DustLog*

DustLog software starting from version 8, is a commercial product intended to meet real time data acquisition, storage and reporting needs for all Sintrol products and a variety of applications. DustLog software covers all the easy to use features available in the complementary DustTool software.

We recommend the use of Dustlog software for:

- comprehensive data storage
- data export option to third party software (f.ex. MS Excel)
- measurement history and reporting functionality
- history based calibration actions
- offsite data storage into multiple supported database servers.
- in the need of real time virtual signals and alarms
- when setting up or managing the whole measurement networks of
 - multiple different instruments
 - multiple different physical connections (RF or wires) within the same installation.
- professional real time monitor views from a number of different measurement points with powerful visualization and grouping options.

A wide range of reports can be generated to see historical trends in the measurement with the ability to generate monthly, daily or hourly averages charted on self-explaining graphs. Additionally, the easy user interface gives the plant the full control of the device's parameters so they can be read, sent or configured directly from the control room. After installation of the monitor, all access to the monitor controls can be done remotely using the Dustlog 8.

Further information regarding functionalities and costs of DustLog 8 can be obtained by our local distributors or under **<http://www.sintrolproducts.com>**

NOTES

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