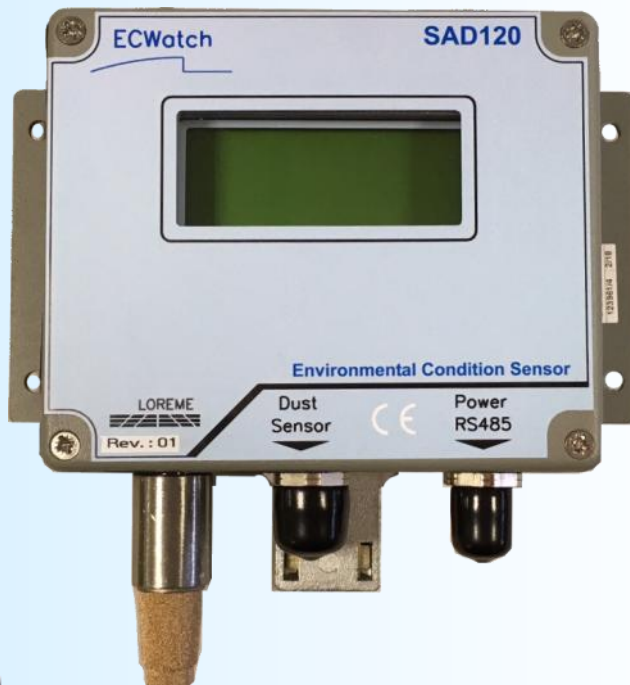


USER MANUAL

SAD120



CPO55



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DEVICE PRESENTATION	p3
SAD120 FRONT FACE USAGE	p4
VISUALIZATION	p4
CONFIGURATION	p4
1) Configuration access	p4
2) Language	p5
3) Communication	p5
4) Measures configuration	p5
4.1) Measures offset	p5
4.2) Measures response time.....	p6
5) Parameter save	p6
RS232 link configuration	p7
TERMINAL MODE	p8
VISUALIZATION	p8
CONFIGURATION	p8
1) Method	p8
2) SAD120 configuration	p9
2.1) Language	p9
2.2) Communication	p9
2.3) Measures response time	p9
2.4) End of configuration, parameters saving	p9
3) CPO55 configuration	p10
3.1) Language	p10
3.2) Operating mode	p10
3.3) Communication	p10
3.4) Measure response time	p10
3.5) End of configuration, parameter saving	p10
FIRMWARE UPDATE	p11
EMC CONSIDERATION	p12
MODBUS COMMUNICATION	p13
1) Specifications	p13
2) Communication DATA	p13
3) DATA registers for SAD120	p14
4) DATA registers for CPO55	p14
SAD120 CONNECTION TO A MODBUS NETWORK	p15
WIRING & OUTLINES	p16

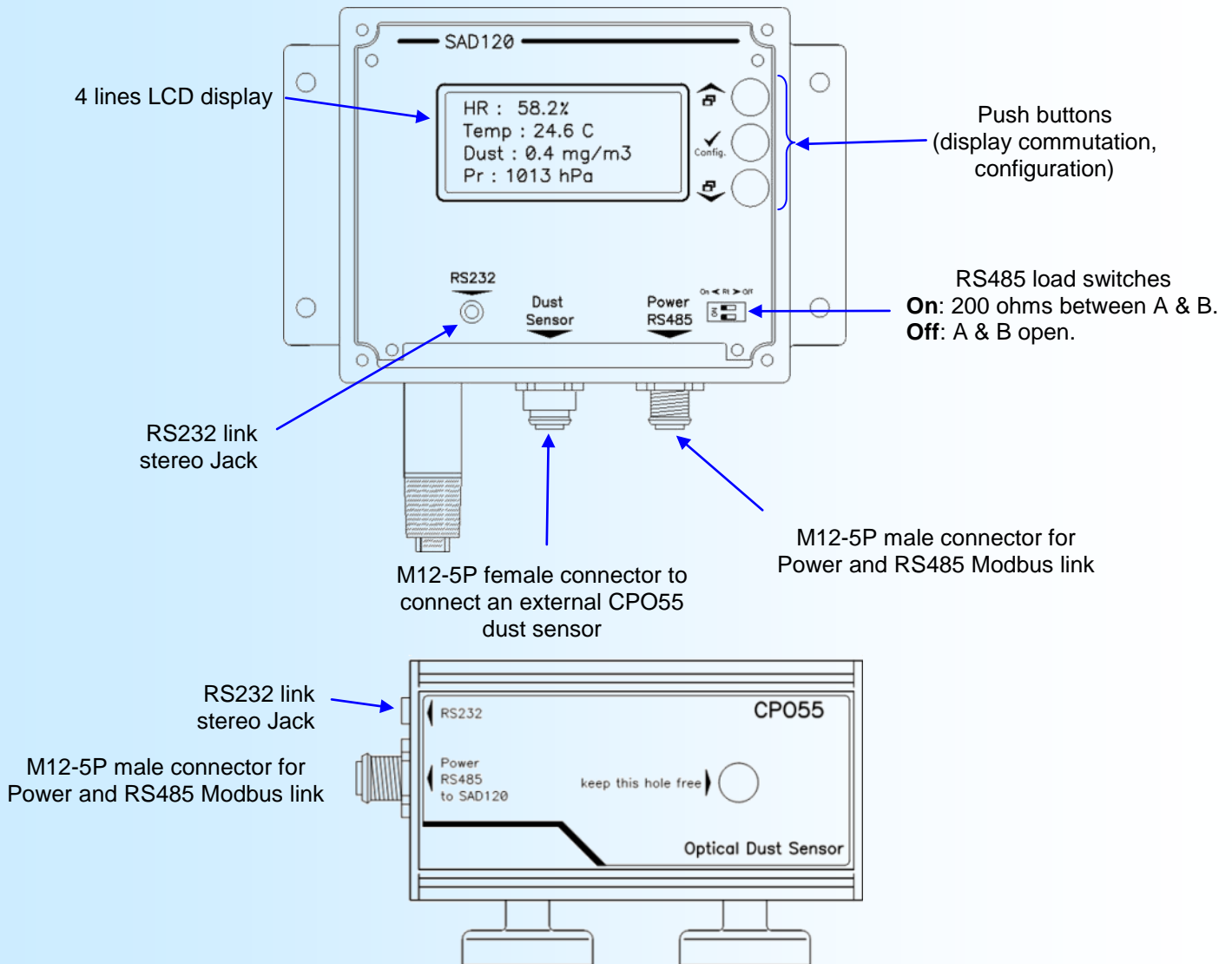
Device presentation

The SAD120 is a hardened sensor for control and traceability applications in controlled atmosphere room. It embedded sensors for humidity, temperature and absolute pressure measurement. It can also be equipped with an external CPO55 dust sensor, allowing dust density measurement in ambient air. A 4 lines LCD display allows to display measures and access to parameters configuration.

The CPO55 is a remote sensor with an optical measure sensor for density of dust in room air. With it's M12 connector who group the RS485 Modbus link and power line, it can be easily connected to SAD120 or be implemented in a communicating system.

The datasheet can be downloaded with this link : http://www.loreme.fr/fichtech/SAD120_eng.pdf

USER INTERFACE



Push button functions:

- ▲ Change the display page / response <YES> / increase value.
- ✓ Access to device configuration / Validation of display value.
'Config.'
- ▼ Change the display page / response <NO> / decrease value.

SAD120 front face usage

DISPLAY

At power on, the device displays its current Hard & Soft revision during about 1s.

REV1.0 The first number is the hardware version, the second is the software version

Then it displays the measures page:

HR: 35.0%
 T: 22.1°C/ 6°C
 Dust: 0.15 mg/m³
 Pr: 1008 hPa

Notes:

- In case of sensor issue, an **ERROR** message is displayed.
- When the dust sensor is not connected or with a communication error, an **ABSENT** message is displayed.

Pressing the buttons ▲ or ▼ allows to scroll-up or down from one page to another (to switch from the measurement page to the parameter page).

COMMUNICATION

ADDRESS: 1
 SPEED: 115.2k

CONFIGURATION

The SAD120 can be entirely configured from the front panel. Access to the configuration is done by pressing the '**Config.**' button.

A temporary message is displayed indicating the hardware & software revision of the device (Rev Hard.Soft).

CONFIGURATION

REV1.0

Note:

The device leaves the configuration mode after 90 seconds if no button is pressed and without saving the modifications. The modifications are saved only at the end of the configuration process.

1) Access to the configuration

Access to the configuration is protected by a four-digit password ('1234' by default).

PASSWORD? The digit is changed with the ▲ or ▼ buttons.
 ---- Accepted characters are the digits '0' to '9' and the letters 'A' to 'Z'. Digit validation is done by pressing the '**Config.**' button.

After the fourth digit and if the password is correct, the system swaps to the configuration mode. If the password is incorrect, the device displays the message **ERROR** and returns to measure mode.

2) Language configuration

LANGUAGE? Press ▲ (Yes) button to access the language configuration.
 (Y-N) Press ▼ (No) button to switch to the next topic.

LANGUAGE? Pressing the buttons ▲ or ▼ permits to change the selection.
 <FR> ENG Validation is done by pressing the '**Config.**' button.

- <FR> : French language selection.
- <ENG> : English language selection.

3) Communication configuration

COMMUNICATION? Press ▲ (Yes) button to access to communication parameters.
 (Y-N) Press ▼ (No) button to switch to the next topic.

ADDRESS? Press the button ▲ or ▼ to change address.
 1 Validation is done by pressing the '**Config.**' button.

SPEED? Press the button ▲ or ▼ to change communication baudrate.
 115.2k Validation is done by pressing the '**Config.**' button.

The address is configurable from 1 to 255 and 3 baud rates are available: 19.2 kbauds, 38.4 kbauds and 115.2 kbauds. The factory settings are: address = 1 and the speed = 115.2 kbauds.

4) Measure configuration

MEASURES? Press ▲ (Yes) button to access the measures setting (see 4.1 and 4.2).
 (Y-N) Press ▼ (No) button to switch to the next topic.

4.1) Measures offset setting

OFFSETS? Press ▲ (Yes) button to access to measure offset setting.
 (Y-N) Press ▼ (No) button to switch to the next topic.

When "YES" is selected, the user may set offset in the following order:
 Relative humidity,
 Temperature,
 Dust,
 Absolute pressure (Must be corrected according to altitude).

Example of relative humidity offset setting:

HUMIDITY	Header
OFFSET: 0%	Offset value.
MEASURE: 52.3%	Relative humidity measure plus offset.
	Press the button ▲ or ▼ to change the offset value.
	Validation is done by pressing the ' Config. ' button.

The other measures are adjusted in the same manner.

4.2) Configuration of response time

This parameter allows filtering a measure by using a moving average calculation. The parameter to be set for the calculation function is the response time in seconds. It is configurable from 0 to 60 seconds.

RESPONSE TIME? Press ▲ (Yes) button to access to the setting of measure response time.
 (Y-N) Press ▼ (No) button to switch to the next topic.

When "YES" is selected, the user may set measure response time in the following order:
 Relative humidity,
 Temperature,
 Dust.

Example of relative humidity response time:

HUMIDITY Header.

RESPONSE TIME?
 0s Response time value.
 Press the button ▲ or ▼ to change the response time value.
 Validation is done by pressing the 'Config.' button.

The other measures response time are adjusted in the same manner.

5) End of configuration and parameters saving

CONFIGURATION

OK This message indicates the end of the configuration and that the changes have been saved.

Note:
Warning! Changes are saved by completing the configuration up to "OK" is displayed.

USB/RS232 adapter installation under Windows

RS232 link setting



Step 1: Driver installation for USB / RS232 adapter



- download driver here:
http://www.loreme.fr/aff_produits.asp?rubid=53&langue=fr
- Click on the downloaded executable file to install the driver,
- Plug the cable on a USB port, Windows install a new serial communication port **COMx** (x >= 4).

Note:

The use of the cable on another USB port don't generates a new communication port. Use of another adapter generates another communication port number (COMx) and requires the reconfiguration of the HyperTerminal.

Step 2: Setting of terminal emulation software (PC with windows).

1 The terminal emulation software for PC « HyperTerminal » is resident in windows up to XP version. For later versions, it is downloadable here: http://www.loreme.fr/aff_produits.asp?rubid=53&langue=fr
=> Run the downloaded software to install it (see next page).

2 Start a "hyper Terminal" connection :
- Click on "**START**" button
Up to XP version
- Go to "**Programs \ Accessories \ Communication \ Hyper Terminal**"
- Click on "**Hypertrm.exe**"
Or if the software was downloaded
- Go to "**All programs \ HyperTerminal Private Edition**"
- Click on "**HyperTerminal Private Edition**"

3 Enter name for the new connection


4 Choose the communication port related to the adapter.

5

Choose:
- 9600 bauds
- 8 DATA bits
- no parity
- 1 stop bit
- **XON/XOFF**

6 The PC is now in terminal mode, connect it to the device by plugging the RS232 cable.

7 When leaving Hyper terminal, the following window will appear. By saving, the terminal session will start with the same configuration.

Thus, the shortcut  LOREME.ht will permit to communicate with all LOREME devices.

Note: To modify the parameters of terminal mode whereas this one is connected, it is necessary to disconnect it, carried out the modifications and to reconnect it again so that the modifications are effective.

Terminal mode

DISPLAY

A) SAD120

After the power on of the SAD120, the relative humidity, temperature, dew point, density of dust and the absolute air pressure will be displayed with a cycle of about 2 s.

```
HR: 35.1 %
Temp: 22.8 °C
Dewpoint: 6.5 °C
Dust: 0.16 mg/m3
Pa: 1007 hPa
```

In case of a sensor breaking, the device displays: ERROR
 If the dust sensor CPO55 is not connected or does not answer, the device displays: ABSENT

B) CPO55

At the power on of the CPO55, it displays the dust density measure on the terminal with a cycle of about 2 s.

CONFIGURATION

To enter the configuration mode, press "**C**" key.

The first message displayed on the terminal is:

CONFIGURATION

REV x.y x and y represent the Hardware & Software revision of the device

1) Method

During the configuration process, the system will send questions to the user. For each one, several answers are possible. You will find below the detailed description of each case.

1.1) Menu selection

example: **INPUT** The user makes a choice by pressing the keys "**Y**" or "**N**".
 (Y-N) This choice allows to access to the different menus of configuration.

1.2) Parameter selection

example: **ENGLISH** or **ENGLISH**
 (Y-N)YES (Y-N)NO

Previous choice = YES: - pressing "**Y**" => choice validation = YES,
 - pressing "**Enter**" => choice validation = YES,
 - pressing "**N**" => choice changing = NO.

Previous choice = NO: - pressing "**N**" => choice validation = NO,
 - pressing "**Enter**" => choice validation = NO,
 - pressing "**Y**" => choice changing = YES.

1.3) Value acquisition

example: **ADDRESS**
 4

Two choices are possible:
 - validation without modification, press "Enter" key,
 - value modification on keyboard (simultaneous display), followed by validation by pressing "Enter" key.

Notes:

- If a typing error is done during a value acquisition, before validating it, it is possible to go back by pressing the backspace key. The instruction is displayed again without taking account of the typo.
- In configuration mode, when no action is taken, the device returns to operating mode after a two-minute delay without taking account of the modifications made before.
- In configuration mode, to return to measure mode without keeping the last modifications, press on "Escape" key.

2) SAD120 configuration

On the LCD, instead of measures, the device displays the message:

CONF BY RS232
IN PROGRESS!

2.1) Language configuration

LANGUAGE? Access to the language configuration (French or English).
(Y-N)

2.2) Communication configuration

The communication parameters include the address of the slave MODBUS and the communication speed.

COMMUNICATION? Access to the communication parameter setting.
(Y-N)

ADDRESS Address configuration.
1 Address value input with simultaneous display (1 to 255)

SPEED? Speed configuration.
115.2 kbds
(Y-N)YES

2.3) Configuration of measure response time

This parameter allows filtering of the measurement (see 4.2 from the front face configuration). It is configurable from 0 to 60 seconds.

MEASURES RESPONSE TIME? Access to the configuration of the measure response time.
(Y-N)

TEMPERATURE?
0 s Temperature response time value input with simultaneous display (0 to 60 s)

HUMIDITY?
0 s Humidity response time value input with simultaneous display (0 to 60 s)

DUST?
0 s Dust response time value input with simultaneous display (0 to 60 s)

2.4) Password

This section allows to change the password for the front panel configuration access.

PASSWORD CONFIGURATION? Access to the configuration of the password.
(Y-N)

PASSWORD?
1234 Password input with simultaneous display.

2.5) Parameter save

OK This message indicates the end of the configuration and that the changes have been saved.

3) CPO55 Configuration

3.1) Language configuration

LANGUAGE? Access to the language configuration (French or English).
(Y-N)

3.2) Operating mode configuration

OPERATING MODE? Access to the operating mode configuration
(Y-N)

SAD120?
(Y-N)YES SAD120 mode chosen.

STANDALONE?
(Y-N)YES Standalone mode chosen.

In SAD120 mode, the CPO55 can be directly connected to a SAD120. The communication parameters are fixed to: address = 1, speed = 19.2 kbauds. The response time is fixed to 0.1 s.

In STANDALONE mode, the communication parameters and the response times are configurable.

3.3) Communication configuration (Standalone mode)

The communication parameters include the address of the slave MODBUS and the communication speed.

COMMUNICATION? Access to the communication parameters configuration.
(Y-N)

ADDRESS Address configuration.
1 Address value input with simultaneous display (1 to 255).

SPEED? Speed configuration.
19.2 kbds
(Y-N)YES Speed possibilities are: 19.2 kbauds, 38.4 kbauds and 115.2 kbauds.

3.4) Configuration of measure response time (Standalone mode)

This parameter allows filtering of the measurement.
 It is configurable from 0 to 60 seconds.

RESPONSE TIME CONFIGURATION? Access to the response time configuration.
(Y-N)

RESPONSE TIME?
0.1 s Response time value input with simultaneous display (0 to 60 s).

3.5) End of configuration, parameters saving

OK This message indicates the end of the configuration and that the changes have been saved.

FIRMWARE update (SAD120 & CPO55)

To access to the firmware update function, you must first open an HyperTerminal session on a PC, connect the device to the PC with the RS232 link cable and then power on the device.

The following character is send to the terminal:

> <————— The device sends this character then it waits the « F » key during 0.5 s.

If the user has pressed the « F » key in the allowed time, the following message is displayed in the HyperTerminal windows:

**FIRMWARE LOADER Rev3
READY TO TRANSFER...**

The device is in “file waiting” mode. This file is provided by LOREME and contains the firmware code in intel HEX format. Selected the « Transfer », « Send a text file ... » in the HyperTerminal menu. Select the directory and open the file. The HyperTerminal program begins to send the file to the device.

**FIRMWARE LOADER Rev3
READY TO TRANSFER**

***** <————— The star characters appears to show the progress of the uploading.

At the end of data loading, the message « **PROGRAMMING OK !** » is displayed if no error occurs. Otherwise, one of the following messages can be displayed:

- **SERIAL COM ERROR !** Error during data transfer.
- **SERIAL TIMEOUT !** Time elapsed.
- **PROGRAMMING FAILED !** Programming error in the internal flash memory.

Notes:

If an error occurs during the programming process, the device will be non-functional. It is then necessary to restart all of the procedure.

To have a correct power up of the CPO55, it is necessary to disconnect the RS232 cable, wait at least 15 seconds and then reconnect the cable.

EMC Consideration

1) Introduction

To meet its policy concerning EMC, based on the Community directives **2014/30/EU** & **2014/35/EU**, the LOREME company takes into account the standards relative to this directives from the very start of the conception of each product.

The set of tests performed on the devices, designed to work in an industrial environment, are made in accordance with **IEC 61000-6-4** and **IEC 61000-6-2** standards in order to establish the EU declaration of conformity. The devices being in certain typical configurations during the tests, it is impossible to guarantee the results in every possible configurations. To ensure optimum operation of each device, it would be judicious to comply with several recommendations of use.

2) Recommendations of use

2.1) General remarks

- Comply with the recommendations of assembly indicated in the technical sheet (direction of assembly, spacing between the devices, ...).
- Comply with the recommendations of use indicated in the technical sheet (temperature range, protection index).
- Avoid corrosive gas and high source of heat.
- Avoid disturbed environments and disruptive phenomena or elements.
- If possible, group together the equipment in a zone separated from the power and relay circuits.
- Avoid the direct proximity with power switches, contactors, relays, thyristor power groups.
- Do not get closer than fifty centimeters from a device with a transmitter (walkie-talkie) of a power of 5 W, because the latter can create a field with an intensity higher than 10 V/M for a distance under 50 cm.

2.2) Power supply

- Comply with the features indicated in the technical sheet (power supply voltage, frequency, allowance of the values, stability, variations ...).
- The power supply should come from a system with section switches equipped with fuses for the instrumentation element. The power supply line should be as close as possible the section switch.
- Avoid using this power supply for the control of relays, of contactors, of electrogates.
- If the switching of thyristor statical groups, of engines, of speed variator, causes strong interferences on the power supply circuit, it would be necessary to put an insulation transformer earthed.
- The installation should have a good earth system. It is recommended that the voltage in relation to the neutral should not exceed 1V, and the resistance be inferior to 6 ohms.
- If the installation is near high frequency generators or installations of arc welding, suitable section filters have to be installed.

2.3) Inputs / Outputs

- In harsh conditions, use sheathed and twisted cables whose ground braid will be linked to the earth at a single point.
- Isolate the input / output lines from the power supply lines in order to avoid the coupling phenomena.
- Limit the lengths of data cables as much as possible.

Modbus communication

1) Specifications

Protocol:	MODBUS RTU
Link:	RS485 half duplex
Baudrates:	19200, 38400 and 115200 bauds
Format:	8 bits of data, 1 stop bit, no parity
Address:	1 to 255
Connector:	M12
Reading codes:	03, 04
Data type:	Temperature, relative humidity, absolute pressure, dust and Dewpoint measures.
Data format:	Measures in 16 bits integer and 32 bits IEEE floating point format.

2) Communication data

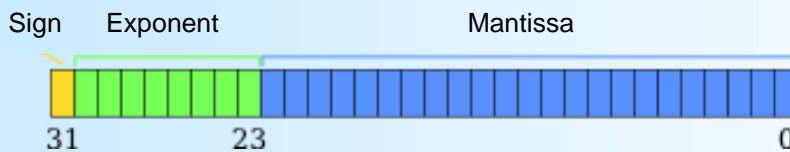
2.1) Data type

- All the measures are accessible in:
- 2 words, 4 bytes, for the 32 bits IEEE floating point format,
 - 1 word, 2 bytes, for the 16 bits integer format.

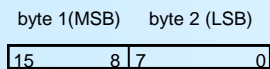
→ Consult the tables enclosed for details of datas.

2.2) Data format

- Data in 32 bits IEEE floating point format
- Data are transmitted Most Significant byte first, 4 bytes or 2 words long.
 \$FFFFFFFF = sensor breaking.



- Data in 16 bits integer format.
- Data are transmitted most significant byte first, 2 bytes or 1 word long.
 The 16-bit integer value correspond to the measure multiplied by a coefficient depending on the type of the measure.
 \$7FFF = sensor breaking.



3) Modbus exception response

When a client sends a request to a server device, the latter expects a normal response. One of this possible events can occur:

- The server receives the request without error, handles the query normally and returns a normal response.
- The server receives the request with a frame error (stop bit, CRC,...). No response is returned.
- The server receives the request without error but cannot handle this query. The server will return an exception response.

The exception response has two fields:

- Function code field: the function code sends in the request "+ 80 hexadecimal",
- Data field: the exception code (see below).

Only 3 exceptions codes are supported:

- 01 : ILLEGAL FUNCTION The function code is not supported (only codes 03 and 04 are supported).
- 02 : ILLEGAL DATA ADDRESS The address of the data is out of scope (see tables next page).
- 03 : ILLEGAL DATA VALUE The address field (start address + number of data) is out of scope.

4) Table of 32 bits floating format measures (SAD120)

Decimal (Hexadecimal) Word address	Designation	Format
00:01 (\$00:\$01)	Temperature measure (°C)	32 bits IEEE floating point
02:03 (\$02:\$03)	Relative Humidity measure (%)	32 bits IEEE floating point
04:05 (\$04:\$05)	Absolute pressure measure (hPa)	32 bits IEEE floating point
06:07 (\$06:\$07)	Dust measure (mg/m ³)	32 bits IEEE floating point
08:09 (\$08:\$09)	Dewpoint (°C)	32 bits IEEE floating point

5) Table of 16 bits integer format measures (SAD120)

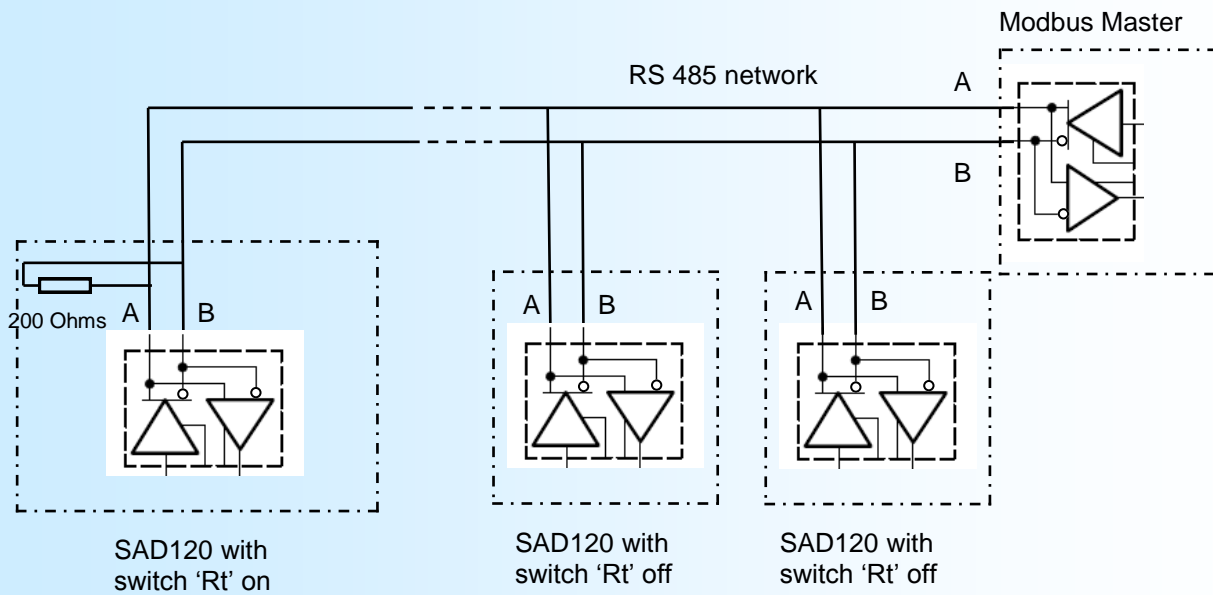
Decimal (Hexadecimal) Word address	Designation	Format
100 (\$64)	Temperature measure x10 (°C)	16 bits signed integer
101 (\$65)	Relative Humidity measure x10 (%)	16 bits unsigned integer
102 (\$66)	Absolute pressure measure x1 (hPa)	16 bits unsigned integer
103 (\$67)	Dust measure x100 (mg/m ³)	16 bits unsigned integer
104 (\$68)	Dewpoint x10 (°C)	16 bits signed integer

6) CPO55 table of measure

Decimal (Hexadecimal) Word address	Designation	Format
100 (\$64)	Dust measure x100 (mg/m ³)	16 bits unsigned integer
101 (\$65)	Not used	-
102:103 (\$66:\$67)	Dust measure (mg/m ³)	32 bits IEEE floating point

SAD120 connection to a MODBUS network

The last device on the network has the Rt switch on (termination resistance off the network).



Wiring & Outlines

