FMS 116, 117, 196, 197: Smart Sensor viaSens



FMS1**F121



FMS1**F121A

How energy efficiency is improved

Smart multi-sensors in a mesh network for recording movement/presence, brightness, temperature, humidity, air quality and sound pressure levels in rooms or room zones for energy-optimising room automation and for good, pleasant room air.

Features

- Measurement of indoor air quality (IAQ[1]), such as temperature, humidity and air quality (VOC[2], CO_2[3]).
- Measurement of indoor environment quality (IEQ[4]), such as motion/presence, brightness and sound pressure level
- Sensor values can be used for more precise information on the state of the room (sensor fusion)
- For ceiling mounting (recessed/surface-mounted)
- Minimal sensor wiring thanks to Bluetooth®[5] Mesh network
- Controllable coloured LED ring for displaying the room status to room users
- Parameterisable animation profiles for LED ring, e.g. room reserved/available, room air quality good/bad, room ready for cleaning, etc.)
- Bluetooth Beacon function for locating the room user with a smartphone and optimised use of SAUTER Mobile Building Services (Mobile Room Control app)
- IoT ready thanks to encrypted MQTT communication as MQTT client of FMS 19x sensor gateway
- For up to 16 sensors for an ecos504/505 room controller
- Simple integration into the SAUTER automation system with the FMS 19x sensor gateway thanks to CASE Suite and Bluetooth smartphone app
- Meshing of up to 15 FMS 116, 117 sensors via Bluetooth mesh technology to the FMS 19x sensor gateway

Technical data

Power supply		
	Power supply	12…34 VDC, typ. 24 VDC
	Current consumption	Max. 80 mA at 24 VDC
	Power consumption	Typ. 2 W
Parameters[6]		
Temperature (TDIG)	Measuring principle	CMOS technology (SHT40)
	Measuring range	0…40°C
	Resolution	0.1 K
	Time constant	Approx. 8 s (dew 63%)
Temperature (TFIR)	Measuring principle	Far infrared (MLX)
	Measuring range	15…40°C
	Resolution	0.1 K
	Measuring accuracy[7]	±1 K
	Emissivity	0...100%, parameterisable
	Field of view (FOV)	50°
Relative humidity (HUM)	Measuring principle	CMOS technology (SHT40)
	Measuring range	0...100%, typ. 20...80% rh
	Resolution	1%
	Measuring accuracy	±2% in 10…90% range at 25°C.
	Time constant	Approx. 8 s (dew 63%)
Air quality (VOC)	Measuring principle	CMOS technology (SGP40)
	Measuring range	1…500 VOC index
	Resolution	1 VOC index
	Time constant	< 10 s (dew 63%)

1) *IAQ: indoor air quality*
2) *VOC: volatile organic compounds*
3) *CO_2: Carbon dioxide concentration - FMS 117, 197 only*
4) *IEQ: indoor environment quality*
5) *The Bluetooth® word mark and logos are registered trademarks of Bluetooth SIG, Inc.*
6) *For explanations, see the "Abbreviations (sensor types and functions)" list*
7) *Thermal objects can affect the measuring accuracy*

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Air quality (CO_2) (FMS 117, 197 only)	Measuring principle	Photoacoustic NDIR (SCD40)
	Measuring range	400…2000 ppm
	Resolution	1 ppm
	Measuring accuracy	±50 ppm (±5% MV)
Motion, presence (PIR)	Measuring principle	Four-element IR detector (PYQ)
	Detection range[8)]	Ø 9 m and approx. 8 × 8 m area at 2.5 m fitting height, 360° tangential and radial
	Field of view (FOV)	120°
	Fresnel lens	34 zones
Brightness (LUX)	Measuring principle	Digital light sensor (APDS)
	Measuring range	0…16 000 lux
	Resolution	1 lux
	Field of view (FOV)	140°
Sound pressure level (SPL)	Measuring range	0...120 dB(A)
	Frequency spectrum	60…20 000 Hz
	Filter type	A weighting
	Sensitivity	−26 dB on the measuring range, ±1 dB tolerance
Technology	Processor	Dual-Core ARM Cortex, 32-bit, 240 MHz
Ambient conditions		
	Operating temperature	0…45°C
	Storage and transport temperature	−25…70°C
	Ambient humidity	10…80% rh, no condensation
Display and operation		
	Indicators[9)]	LED ring with 12 LEDs, RGB colours (red, green, blue; 6 bit RGB) Configurable animation profiles with 16 predefined colours
	Push-button, capacitive	Identification, service menu, restart, factory reset (front)
Interfaces, communication		
Bluetooth mesh	Network	Bluetooth mesh node (2.4 GHz), up to 8 TTL hops
	Radio frequency	2.4 GHz (5 dBm)
	Range[10)]	Up to 10 m
	Bluetooth mesh profile	FMS 116, 117: Bluetooth mesh relay node, sensor-node (sensor server model, V1.0) FMS 196, 197: Bluetooth mesh, sensor gateway (sensor server + client model, V1.0)
	Localisation	Bluetooth beacon (iBeacon), indoor position determination
Ethernet (FMS 196, 197 only)	Ethernet network	1 × RJ-45 connector
	10/100 BASE-T(X)	10/100 Mbit/s
	Communication protocol	MQTT client V3.1.1/V5, MQTT(S), TLS V1.2, WS(S) (ISO/IEC 20922)
	NFC (near field communication)[11)]	Product data and configuration parameters
	Slide switch[12)]	(De)activation of sound pressure level (rear)
	Serial port	UART for firmware update (point to point), 3.3 V TTL

8) As per IEC 63180:2020

9) Example application: Presence: LED ring off/blue, room climate/air quality: LED ring green/red

10) Depending on building and room structure; planning recommendation: max. 10 m between two Bluetooth mesh nodes

11) The function with NFC is not supported by the current version 2 of the «viaSens» app

12) Switching only takes effect when the power is off

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	WiFi (802.11 a/b/g/n)	WLAN client deactivated, can be temporarily activated for firmware update with app
Construction		
	Dimensions[13)]	Surface Ø × D: 103 × 30 mm Recessed Ø × D: min. 50 × 35 mm
	Housing material	Thermoplastic (PC, PC-ABS)
	Fitting[14)]	Recessed, surface and hollow ceiling mounting
	Fitting height	2.5…3.5 m (ceiling)
Standards, directives		
	Type of protection	IP20 (EN 60730)
	Protection class	III
	Environment class	3K3 (IEC 60721)
	Plastic fire classification	UL94
CE conformity[15)]	EMC-D 2014/30/EU (CE)	EN 301489 (EMC for radio equipment) EN 60730-1 (residential premises)
	LVD 2014/35/EU (CE)	EN 60730-1, EN 62311
	RED 2014/53/EU (CE)	ETSI EN 300 328 (V2.2.2), 2.4 GHz band
	RoHS-D 2011/65/EU & 2015/863/EU (CE)	EN IEC 63000

Overview of types

Type	Description	Weight	Housing
FMS116F121	Smart sensor with Bluetooth mesh, TDIG, TFIR, HUM, VOC, PIR, LUX, SPL	0.2 kg	Traffic white
FMS116F121A	Smart sensor with Bluetooth mesh, TDIG, TFIR, HUM, VOC, PIR, LUX, SPL	0.2 kg	Jet black
FMS117F121	Smart sensor with Bluetooth mesh, TDIG, TFIR, HUM, VOC, CO_2, PIR, LUX, SPL	0.2 kg	Traffic white
FMS117F121A	Smart sensor with Bluetooth mesh, TDIG, TFIR, HUM, VOC, CO_2, PIR, LUX, SPL	0.2 kg	Jet black
FMS196F121	Smart sensor with MQTT/ETH, Bluetooth mesh, TDIG, TFIR, HUM, VOC, PIR, LUX, SPL	0.3 kg	Traffic white
FMS196F121A	Smart sensor with MQTT/ETH, Bluetooth mesh, TDIG, TFIR, HUM, VOC, PIR, LUX, SPL	0.3 kg	Jet black
FMS197F121	Smart sensor with MQTT/ETH, Bluetooth mesh, TDIG, TFIR, HUM, VOC, CO_2, PIR, LUX, SPL	0.3 kg	Traffic white
FMS197F121A	Smart sensor with MQTT/ETH, Bluetooth mesh, TDIG, TFIR, HUM, VOC, CO_2, PIR, LUX, SPL	0.3 kg	Jet black

The Ethernet interface for types FMS 196, 197 is used as a sensor gateway for the Bluetooth mesh network and for integrating the sensor network in the automation system with MQTT via TCP/TCP+TLS (MQTT/MQTTS) or via web socket (WS/WSS)

Housing: matt, traffic white similar to RAL 9016, jet black similar to RAL 9005

Abbreviations (sensor types and functions)

CO_2	Measurement of carbon dioxide in the room air with digital measuring element
FOV	Field of view
HUM	Measurement of relative humidity with digital measuring element
LUX	Measurement of illuminance
MQTT/ETH	Ethernet interface for MQTT
PIR	Motion and presence detection with passive infrared sensor

13) *For dimensions of accessories, see fitting instructions*

14) *Recessed mounting with box at least 45 mm deep for FMS 116, 117 and at least 61 mm deep for FMS 196, 197 (Ethernet cable bending radius). Mounting in hollow ceiling with spring clamps, at ceiling thickness 2…20 mm hole diameter 68 mm; at 20…25 mm hole diameter 75 mm. Surface mounting with box 28 mm deep for FMS 116, 117 and 53 mm deep for FMS 196, 197*

15) *Explanation of abbreviations in the “Additional technical information” section of the product data sheet and in the appendix to SAUTER product catalogues*

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SPL	Measurement of sound pressure level
TDIG	Temperature measurement with digital measuring element
TFIR	Temperature measurement with far infrared temperature element
VOC	Measurement of volatile organic compounds

Accessories		
Type	Delivery quantity	Description
0940241101	1 pcs.	Mounting plate, recessed, white
0940241101A	1 pcs.	Mounting plate, recessed, black
0940241110	Set of 10	Mounting plate, recessed, white
0940241110A	Set of 10	Mounting plate, recessed, black
0940241201	1 pcs.	Mounting plate, surface, 53 mm, white
0940241201A	1 pcs.	Mounting plate, surface, 53 mm, black
0940241210	Set of 10	Mounting plate, surface, 53 mm, white
0940241210A	Set of 10	Mounting plate, surface, 53 mm, black
0940241301	1 pcs.	Mounting plate, surface, 28 mm, white
0940241301A	1 pcs.	Mounting plate, surface, 28 mm, black
0940241310	Set of 10	Mounting plate, surface, 28 mm, white
0940241310A	Set of 10	Mounting plate, surface, 28 mm, black
0940241420	2 sets of 10	Mounting spring, false ceiling
0940241510	Set of 10	PIR orifice plate, 180° angle (half), white
0940241510A	Set of 10	PIR orifice plate, 180° angle (half), black
0949360014	Set of 10	Terminal, 2-pin, push-in, @2×2P (green)

The sensors are supplied without mounting accessories. Accessory 0949360014 for power supply connection is supplied

Description of operation

The Smart Sensor viaSens is a communicative multi-sensor for room automation. As a ceiling sensor, the device operates as a motion detector and can thus detect room occupancy. The light sensor detects the brightness in the room. Together with automation, light functions are possible (constant light control, lighting control, dimming etc.). The room climate variables, temperature, relative humidity, an index for room air quality (VOC index) or CO_2 concentration, are used for automation (regulation or control) together with the actuators for heating, cooling and ventilation in the room. FMS 117, 197 also records the CO_2 concentration in the air.

The sound pressure level sensor measures the noise level in the room and can indicate occupancy in the room or characterise the room as a quiet zone.

The Smart Sensor has a controllable coloured LED ring on the edge of the housing. Commands to the sensor activate the LED animation profile configured in the sensor. The LED ring can indicate the room status defined with the animation profile to the user.

The FMS 116, 117 sensors are Bluetooth mesh relay nodes. The FMS 19x can integrate up to 15 FMS 116, 117 in a Bluetooth mesh sensor network as a Bluetooth mesh Ethernet sensor gateway. The information from the meshed sensor network is communicated to the ecos504/505 room automation station via the FMS 19x sensor gateway as an MQTT client via Ethernet.

The Bluetooth beacon function can be activated for location in the room. The Mobile Room Control app from Mobile Building Services can identify the beacon in the room. The appropriate configuration for the operation and view of the room is then loaded.

Intended use

This product is only suitable for the purpose intended by the manufacturer, as described in the “Description of operation” section.

All related product regulations must also be adhered to. Modifying or converting the product is not admissible.

Improper use

The product is not suitable for:

- Outdoor use and use in areas where there is a risk of condensation
- Use in transport vehicles or vessels

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- Safety applications: The device is not failsafe

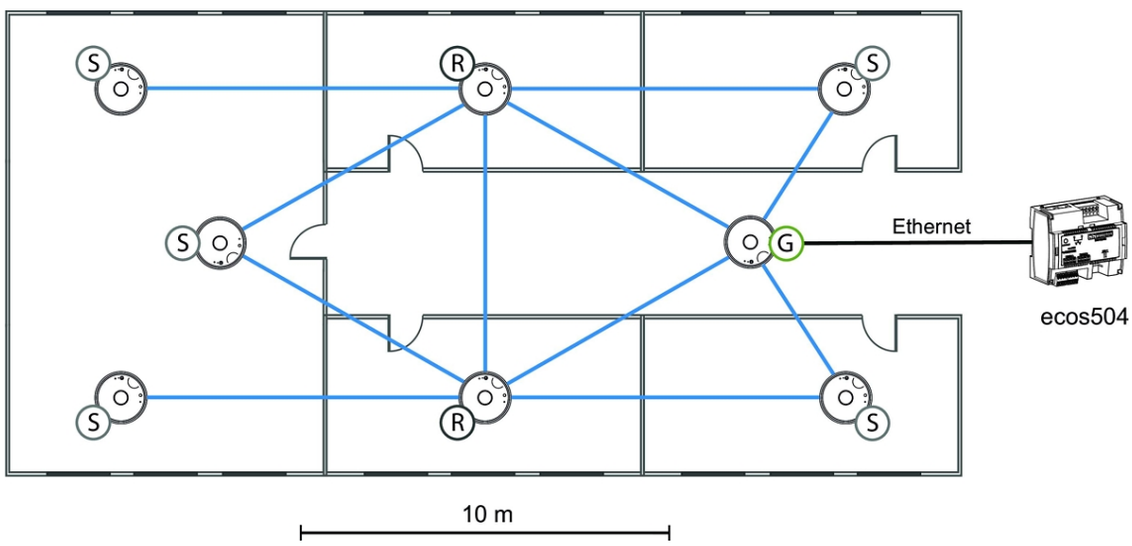
The product is not a measuring instrument in accordance with the Measuring Instruments Directive 2014/32/EU.

Engineering and fitting notes

NOTICE!
Connection and fitting may only be carried out by an authorised electrician. The regulations and rules of electrical installation must be observed.

The Bluetooth mesh range is approx. 10 metres. The individual smart sensors must be placed within this range. Walls or other objects can reduce the range. Ideally, the FMS 19x sensor gateway should be positioned in the centre of the Bluetooth mesh zone. The FMS 116, 117 sensor nodes installed on the edge of the zone must disable the Bluetooth mesh relay function. In order for the Bluetooth mesh network to be established securely, some of the selected FMS 116, 117 sensor nodes must activate the relay function.

Mesh network with 8 smart sensors and a room automation station



(G) FMS 196, 197 gateway
(R) FMS 116, 117 sensor with relay function
(S) FMS 116, 117 sensor

For the fastest possible transmission of Bluetooth mesh information, especially when transmitting motion detection, the latencies caused by the «hops» (relay function) must be kept as low as possible.

Electrical connection

The Smart Sensor is designed for operation with safety extra low voltage (SELV/PELV). The technical data for the devices applies when they are connected to the power supply. The Smart Sensor is supplied with a 24 VDC voltage of approx. 2 watts. The supplied T-connector can be used as a push-in terminal for series wiring.

The Smart Sensor is supplied from the factory with ESD protection on the openings of the measuring elements. These ESD protective pads must be removed and disposed of in an environmentally friendly manner before commissioning.

NOTICE!
Electronic components can be damaged by electrostatic discharge (ESD).
► Do not touch the PCB, exposed sensor elements and connections.

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The Smart Sensor has an electrical power loss that can affect the individual sensor elements. The sensor values can be adjusted accordingly with offset values or linearisation parameters in the automation station.
For further information, see the fitting instructions.

Fitting
The following fitting variants are possible for ceiling mounting:
- Recessed on ceiling installation box with recessed mounting plate.
- Installation in hollow or suspended ceiling with mounting plate and mounting spring
- Surface-mounted with surface mounting box
  - FMS 116, 117: 28 mm or 53 mm
  - FMS 196, 197: 53 mm

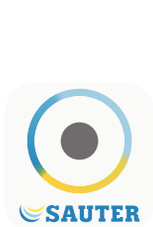
The appropriate accessories for the fitting variant must be ordered separately. Further information on using and fitting the sensor with accessories can be found in the fitting instructions for the sensor.

Place of installation
The Smart Sensor viaSens is designed for ceiling mounting. The TFIR, LUX and PIR sensor elements have a field-of-view (FOV) in the room. To ensure that the individual sensor elements measure correctly and without obstruction, the Smart Sensor must be positioned such that its field of view is free of disturbances.
Avoid:
- Significant sources of heat or cold directly under the device (e.g. radiators, heaters, temporary gatherings of several people)
- Direct light shining on the device from lamps or highly reflective objects
- Large objects in the field of view

The field of view of the motion and presence detector can be reduced to a maximum of 180° using the PIR aperture 0940241510(A), or to the cut angle of the aperture. This can be used to limit the detection of movements in the room, for example passageways can be hidden.

Configuration

The «viaSens« commissioning app for iOS and Android is available for configuring the Smart Sensor and the Bluetooth mesh network (download from the AppStore or PlayStore).







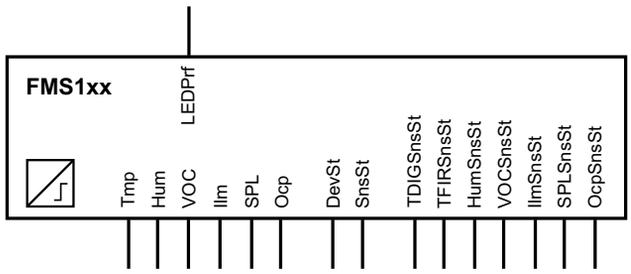
The app supports commissioning with the following functions:
- Create projects and their Bluetooth mesh networks
- Search, identify and configure the Smart Sensors as node and gateway
- Setting of parameters such as Bluetooth mesh network ID, node ID, IP address, MQTT protocol, MQTT broker, activation of relay function and iBeacon function, etc.
- Switching Smart Sensors from Bluetooth Low Energy to Bluetooth Mesh (locking)
- Triggering firmware updates via WiFi for all Smart Sensors in the vicinity of the smartphone (temporary WiFi access point)
- Demo mode for easy demonstration and explanation of all sensor functions in Bluetooth Low Energy Mode

Communication with ecos504/505

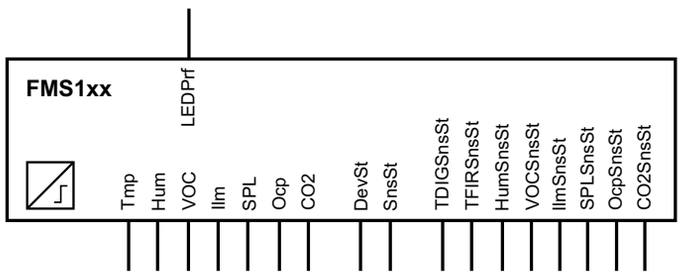
Together with CASE Suite (from version 5.1) and the «FMS1xx» function module of CASE Engine, the Smart Sensors can be easily integrated into the room automation functions of the ecos504/505 (from firmware version 5.0).
The «FMS1xx» function block is used to define the individual parameters of the Smart Sensor. These are loaded onto the sensors via a plan download or a partial block download.

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FMS 116, 196



FMS 117, 197



The main parameters are:
- PIR: Hold time, sensitivity (low, medium, high; standard: high)
- LUX: Correction parameters (slope, offset)
- TFIR: Emissivity (standard: 90%00)
- TDIG: Offset
- SPL: Ceiling type

Additional parameters: Source for Tmp output, presence detection mode, iBeacon transmission capacity.
All analogue sensor values xxx («Tmp», «Hum», «VOC», «Ilm», «SPL») can be configured with the following parameters:
- xxxCOV («Change of Value»: grid threshold until value is transmitted)
- xxxRT («Report Time»: time to transmit the value again)
- xxxDT («Dead Time»: time to not transmit the value faster)

These three parameters influence the Bluetooth mesh and MQTT communication and should be selected in the best possible way to ensure optimal radio utilisation and the necessary control tasks.

Parameter settings (with typical values)

Parameter	Value	Description
NodeID	1	Sensor node ID
NetID	1	Network ID
OcpDetHT	5	Presence detection hold time
OcpDetSens	High	Presence detection sensitivity
TmpSrc	FIR	Temperature measurement source
OcpMode	PIR	Presence detection mode
TmpOfs	0	Temperature offset in 'C
CeilTyp	Other	Ceiling type
LghtCalSl	1	Light correction gradient
LghtCalOfs	0	Light correction offset
IBcnTxPwr	0	iBeacon TX voltage
TmpIREmis	90	Infrared temperature emissivity in %
TmpCOV	0.5	Temperature grid threshold in °C
TmpRT	120 s	Temperature reporting time
TmpDT	5 s	Temperature dead time
HumCOV	5	Air humidity grid threshold
HumRT	120 s	Air humidity reporting time
HumDT	5 s	Air humidity dead time
VOCCOV	10	Air quality grid threshold
VOCRT	60 s	Air quality reporting time

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Parameter	Value	Description
VOCDT	5 s	Air quality dead time
CO2COV	50	CO_2 grid threshold
CO2RT	60 s	CO_2 reporting time
CO2DT	5 s	CO_2 dead time
IlmCOV	10	Brightness grid threshold
IlmRT	60 s	Brightness reporting time
IlmDT	1 s	Brightness dead time
SPLCOV	5	Sound pressure level grid threshold
SPLRT	120 s	Sound pressure level reporting time
SPLDT	1s	Sound pressure level dead time

Further information is provided in the help section for CASE Engine

MQTT communication

The FMS 19x sensor gateway supports all four MQTT transmission types as an MQTT client (MQTT: TCP, MQTTS: TCP/TLS, MQTT/WS and MQTT/WSS) and can subscribe to an MQTT broker. From firmware version 5.0, the ecos504/505 room automation station offers a local MQTT Broker (WSS), which means that the sensor gateway with the complete sensor network can publish the information via WSS (self-signed certificates). The room automation station can support up to 16 smart sensors, i.e. an FMS 196, 197 with up to 15 FMS 116, 117 as a Bluetooth mesh network or up to 16 FMS 196, 197 as MQTT clients without Bluetooth mesh nodes.
For more information, see the online documentation: https://support.iot.sauter-cloud.com/fms-manual

Additional technical information

Fitting instructions	P100019729
Declaration on materials and the environment	MD 94.411
Room automation station, ecos504/505	PDS 94.112

Abbreviations used

CE	Manufacturer’s Declaration of Conformity for the European Union (EU)
EMC-D	Electromagnetic Compatibility Directive 2014/30/EU
LVD	Low Voltage Directive 2014/35/EU
RED	Radio Equipment Directive 2014/53/EU
RoHS-D	Restriction of Hazardous Substances in Electrical and Electronic Equipment Directives 2011/65/EU & 2015/863/EU

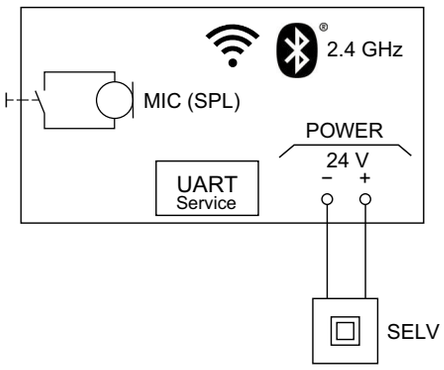
Disposal

When disposing of the product, observe the currently applicable local laws.
More information on materials can be found in the Declaration on materials and the environment for this product.

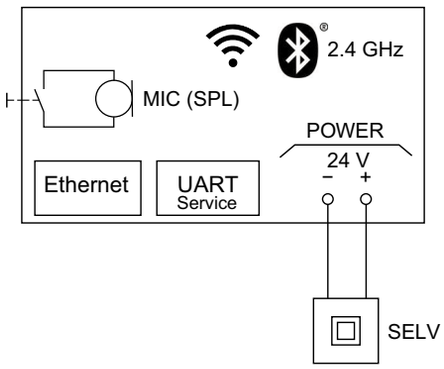
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Interface and connection diagram

FMS 116, 117

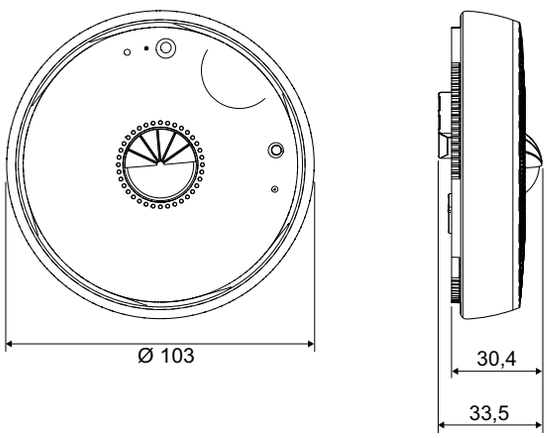


FMS 196, 197



Dimension drawing

All dimensions in mm.



For further dimension drawings with fitting accessories, see fitting instructions

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