Smart Sensor viaSens

2023 - Roadshow



Roadshow 2023 - Agenda



- **Product**

- Applications

- Engineering

- Mounting Accessories
- Bluetooth Planning (Ranges PIR, Bluetooth)
- Commissioning Engineering (Integration with ecos)
- First projects

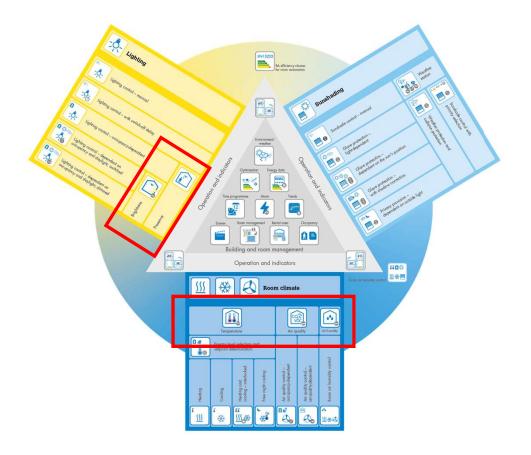
- Marketing Mix

- Outlook: CO₂
- $-\mathbf{Q}\mathbf{\&}\mathbf{A}$

Integrated room automation



Individual room control of temperature, humidity, lighting and window blinds

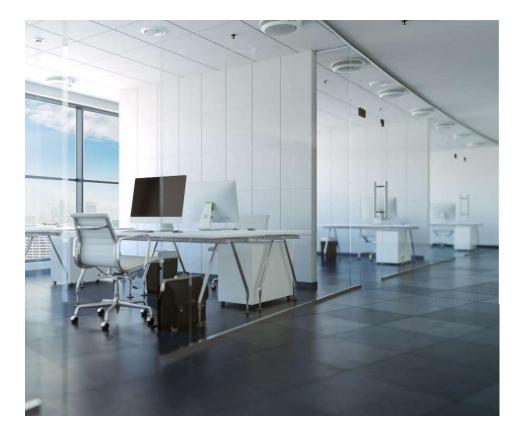




Application examples

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Flexible use of Smart Spaces





The common rooms are bustling with activity. Anyone looking for a free office is quickly notified:

Green LED ring = the desk is free.

Application examples

Further applications

Air quality in schools



Hotel: Control of room functions with the app



→ Mobile Room Control app

In full classrooms, the air quality quickly decreases.

Red LED ring = classroom should be ventilated.

Constant-light control at the workplace



Facility Management





Based on the brightness sensor, the lighting is adjusted to the natural daylight.

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Facility Management optimises the use of cleaning staff.

Blue LED ring = rooms that were occupied need to be cleaned.

Smart Sensor

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Multi-sensor for the room automation









Sensors:

- Temperature (TEMP)
- Humidity (HUM)
- Volatile Organic Compounds (VOC)
- Presence / motion (PIR)
- Brightness (LUX)
- Sound pressure level (SPL) / Noise level (MIC)

Status signalling:

- Visual display (RGB LED ring)

Indoor room quality

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Relevant measured values

Values		
Room temperature		
Measuring range	060 °C	
Measuring accuracy	1.0 °C	
Measuring resolution	0.1 °C	
Field of view (FOV for FIR)	50°(70°)	
Room humidity		
Measuring range	0100% rel. humidity	
Measuring accuracy	3%	
Measuring resolution	1%	
Room air quality		
Measuring range	0500 (VOC index)	voc
Measuring resolution	1 VOC index	

Sensors

- 1st measuring element: digital I²C sensor
- 2nd measuring element: Far-Infrared Sensor (FIR)
- Note: As of now only, either or.

- Measuring element: digital I²C sensor
- Option to calculate enthalpy
- Note: Needs to be calculated in ecos
- Measuring element: digital I²C VOC sensor
- Sensitivity to ethanol and other volatile organic compounds
- VOC index is the index for room air quality
- Note: Adapting during first hour to average value

Indoor room quality

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Relevant measured values

Values			
Presence and motion detection			
Passive Infrared Sensor	Diameter: ~ 9 m @ 2.5 m Area: ~ 64 m² @ 2.5 m, 360°		
Field-of-View (FOV)	~120°		
Fitting height	2.55 m		
Brightness in the room			
Measuring range	016,000 lx (@FOV~14		
Measuring accuracy	10 lx		
Measuring resolution	1 lx		
Noise level			
Measuring range	35120 dB		
Measuring accuracy	3 dB		
Measuring resolution	1 dB		

Sensors

- PIR (Passive Infrared Sensor) reacts to moving people based on temperature changes
- Note: Sensitivity can be parametrized

- Sensor for daylight-dependent control of lighting, including control of window blinds
- Note: Measurement can be calibrated (offset, slop) to illumination on desk
- Sound pressure level for WELL-certified indoor environment quality

Indoor air quality

VOC air pollutants and where they come from

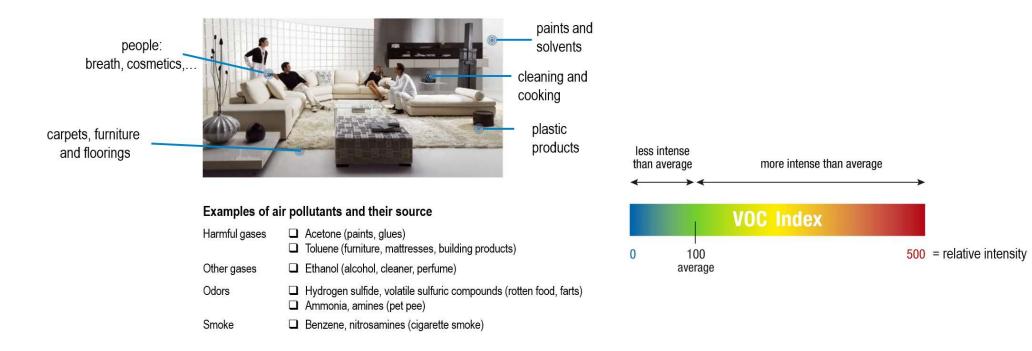
Volatile Organic Compounds (VOC)	Source
Acetone	Wall paint, adhesives
Toluene	Upholstered furniture
Ethanol	Detergents, fragrances
Hydrogen sulphide	Decaying food residues
Ammonia	Urine from pets, sweat
Benzene	Cigarette smoke



Indoor air quality

Volatile organic compounds measurement - VOC

VOC air pollutants and where they come from

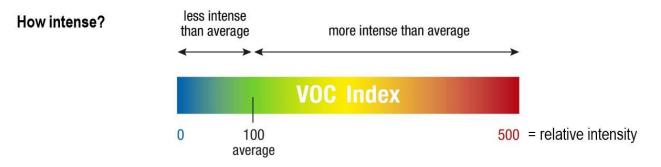


Indoor air quality

Volatile organic compounds measurement – VOC

Note:

→First hour the VOC index is adapting its measurement algorithm
 →Demand led air quality control strategy should consider this



VOC Index...

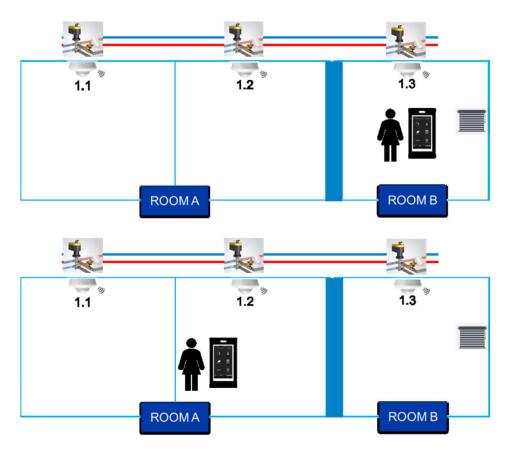
- ...shows changes of intensity relative to the history in the room
- ...is referenced to the average of VOCs present over the last 24 h in the room
- □ ...behaves similar to a human nose, a MOX sensor is not able to detect the absolute VOC concentration
- ...starts going back to average VOC Index after 3 h for very long events adapts to background

Smart Sensor

Localisation with iBeacon

Users in the room:

- iBeacon localisation
- MRC app loads room configurations
- Local room operation



Room change:

- New iBeacon localisation
- New room configuration from MBS
- Operation in other room

Smart Sensor

Room status signalled with LED ring

Examples					0
Room occupancy		Reserved	Free		
Air quality	Poor	Medium	Good		
Cleaning				Necessary	

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Using the coloured light signal, the state/status of the room is visualised.

Features:

- RGB ring with 12 RGB LEDs
- Controllable / configurable for different scenes
- On/Off, constant or flashing

Examples of use:

- Room occupancy
- Air quality
- Room cleaning

Noise Level Map

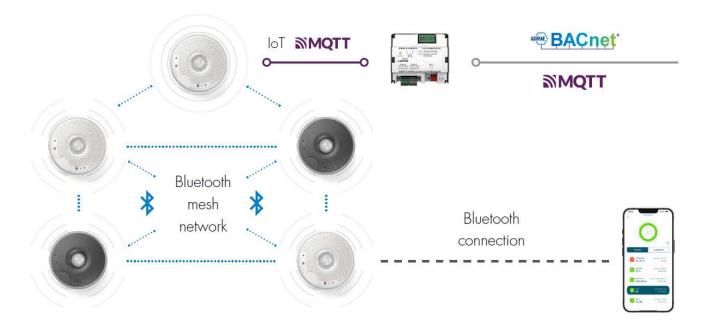




- WELL "Sound": <u>https://v2.wellcertified.com/en/v/sound</u>
- Limiting the noise level in the background:
 - https://v2.wellcertified.com/en/v/sound/ feature/2

Bluetooth Mesh network and communication





- Sensors connect to each other and form a mesh network with the gateway sensor
- Indoor geolocalisation using Bluetooth beacon technology (iBeacon)
- Gateway sensor forwards all values of the sensor mesh network with MQTTS (WSS/TLS) via Ethernet (IP) to SAUTER-compatible products such as ecos504/505

Smart Sensor types





	FMS116F121	FMS116F121A	FMS196F121	FMS196F121A
Interfaces	Bluetooth Mesh Relay, Beacon, NFC		Ethernet, Bluetooth Mesh, Beacon, NFC	
Ethernet protocol	-		MQTT client, MQTT WSS/TLS	
Profile/model Bluetooth Mesh	Sensor server		Sensor server and client	

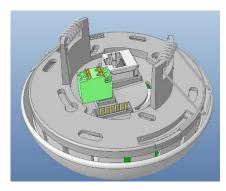
Installation and connectivity



Advantages of wireless technology

Simple installation

- Ceiling mounting (installation height: 2.5...3.5 m)
- Power supply: 24 V DC pluggable push-in terminal
- Accessories for hollow ceilings or surface mounting
- Wireless communication



Bluetooth Mesh technology

- Bluetooth Mesh for extended network in up to 16 smart sensors
- Bluetooth beacon for identification and communication with mobile app
- Integration with gateway sensor to local room automation station



Competitors



Multi-sensors - "IAQ and presence" ceiling sensors

STEINEL Multi-sensor AIR (KNX / DALI-2)

- Very comprehensive, incl. CO₂ and new with DALI-2
- Variants with Bluetooth mesh

LOYTEC MS2 / MS4 (DALI-2)

- Without CO₂, but IR operation, digital inputs
- good value

LUNATONE DALI-2 CS Integration THP-AQ (DALI-2)

- Without CO₂ (only eCO₂), but in 3 colors
- Mechanically not so stable

ESYLUX PD-ATMO 360i/8 O (KNX)

• Without CO₂, but with an acoustic sensor

SIEMENS WIDE multi UP258D51 (KNX)

• With CO₂ (ABC logic)



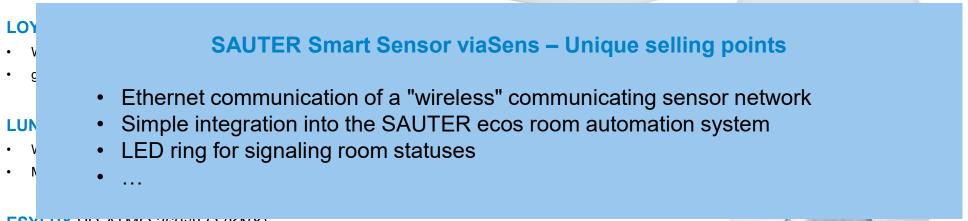
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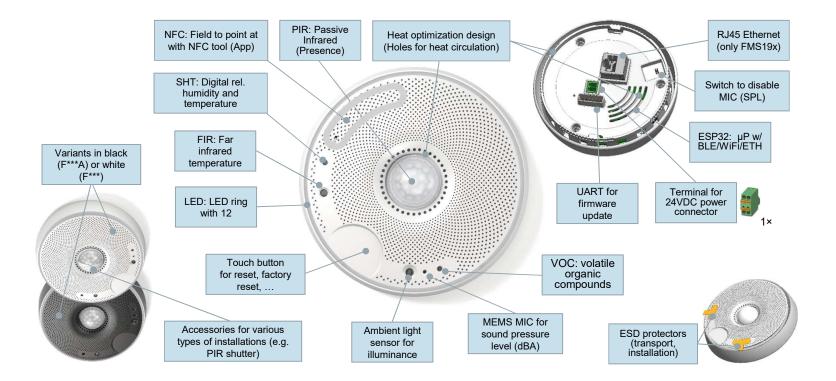
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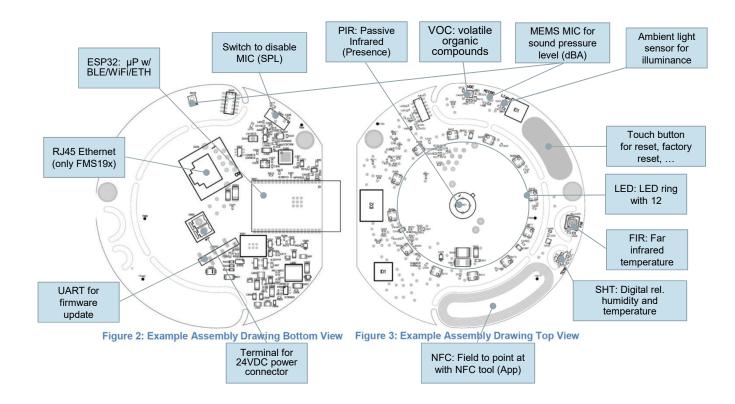
Product Design

Features – Overview (in detail)



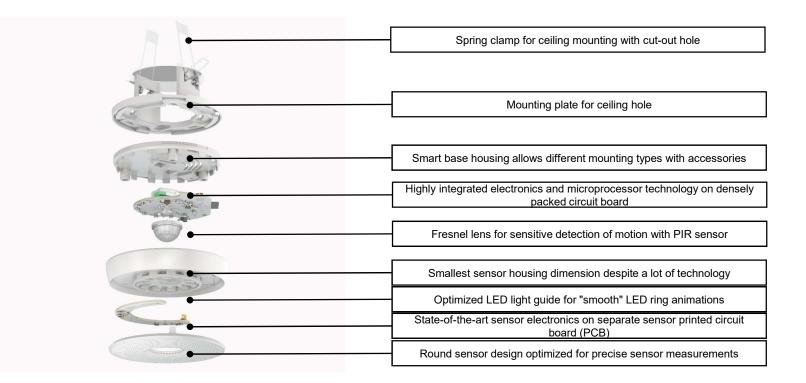
Product Design

Advanced Electronic Design (in detail)



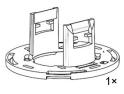
Product Design

Advanced Electronic Design

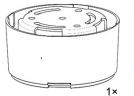




Mounting – Installation – Accessories











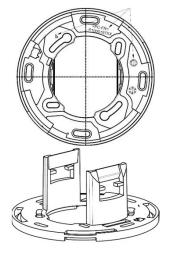
Mounting plate, flush, …	white, 1 pcs	black, 1 pcs	white, 10 pcs	black, 10 pcs
Order number / Type	0940241101	0940241101A	0940241110	0940241110A
Mounting spring, suspended ceiling,		20 pcs (10 pairs)		
Order number / Type		0940241420		
Mounting box, surface, 53mm,	white, 1 pcs	black, 1 pcs	white, 10 pcs	black, 10 pcs
Order number / Type	0940241 201	0940241201A	0940241 210	0940241210A
Mounting box, surface, 28mm,	white, 1 pcs	black, 1 pcs	white, 10 pcs	black, 10 pcs
Order number / Type	0940241 301	0940241301A	0940241 310	0940241310A
PIR shutter, semi, …	white, 1 pcs	black, 1 pcs	white, 10 pcs	black, 10 pcs
Order number / Type			0940241 510	0940241510A

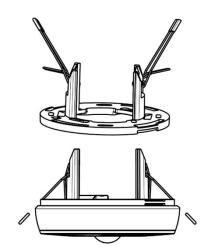
Mounting – Installation – Accessories

- · Due to ecological reasons required mounting parts needs to be purchased as accessory
- · Four different possibilities to mount Smart Sensor in the ceiling

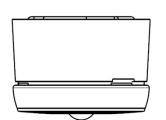
Note: Good preparation of a suitable installation location

- a) Mounting Plate with screws into flush-mounted box
- b) Mounting Plate with spring clamps and mounting plate into ceiling hole
- c) Surface-mounted box for on ceiling installation (FMS196 – with Ethernet cable)
- d) Surface-mounted box for on ceiling installation (FMS116 – w/o Ethernet cable)

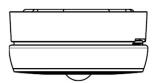










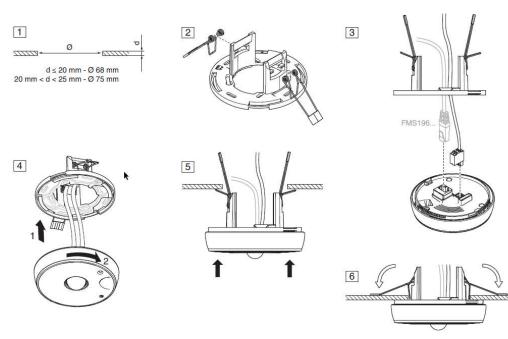




Mounting – Installation – Accessories

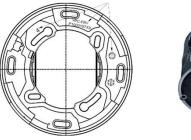
• Preparation of mounting location → see "MV"

b) Mounting Plate with spring clamps and mounting plate into ceiling hole



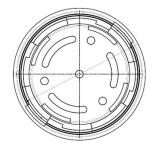


a) Mounting Plate with screws into flush-mounted box



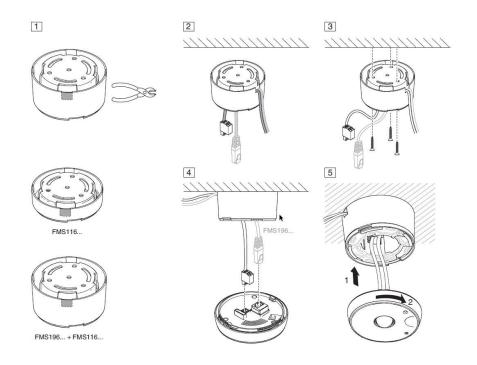


c) / d) Surface-mounted box for on ceiling installation





Mounting – Installation – Accessories







Planning – System and Integration (Planning the right location)

Network Topology: Up to 16 sensors per ecos (with presence detection)

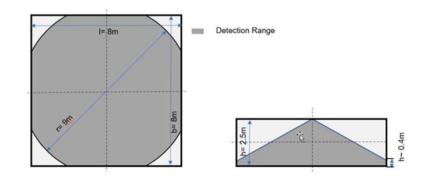
- max. 7 BTmesh hops (e.g. 4×4...2×8, gateway in center reduces hops)
- at least, one viaSens196 required as BTmesh gateway,
- no IoT-MQTT license required on ecos
- direct integration with "FMS module" in CASE Engine

Bluetooth Mesh - wireless and range:

- up to 10..15 m (node-to-node)
- Planning recommendation: max. 10 m (depends on building material, extension standard)
- e.g. max. 1 light wall; not trough concrete ceilings (only vertical or in-room radio propagation)
- overlapping recommended for network/device resilience
- choose Bluetooth mesh "Relay" node functionality appropriate

Presence detection and Field-of-Views ("on sight")

- ~8 × 8 meters, Ø 9 meters @ 2.5 m installation height
- PIR element and Fresnel lens, field of view (FOV): ~120° (installation "on sight")
- FIR detection area (FOV): ~50° (installation "on sight" for 70°)
- LUX measurement area (FOV): ~140° (no direct light, reflections)



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ADV (Not Relayed)

ADV (Low Power)

ADV Bearer

GATT Bearer

Friend feature (not used)

Node

Low Power node

Relay node Friend node

Bluetooth Basics

- Bluetooth Classic, Bluetooth LE (Low Energy), <u>Bluetooth mesh</u> → see <u>Bluetooth SIG</u>
- Bluetooth mesh «Overview» and «Protocol»
- Bluetooth mesh terminology



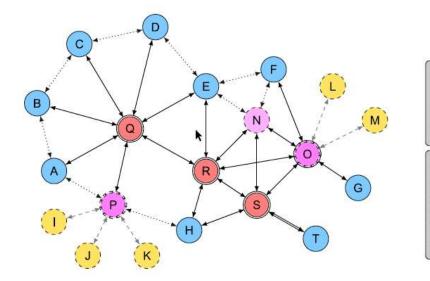


Figure 2.8: Example topology of a mesh network



Bluetooth Basics

- Bluetooth Classic, Bluetooth LE (Low Energy), <u>Bluetooth mesh</u> → see <u>Bluetooth SIG</u>
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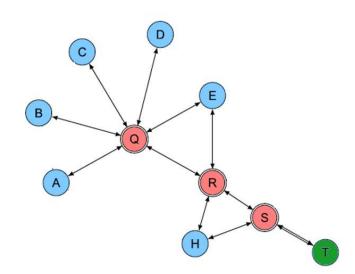
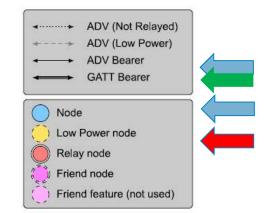


Figure 2.8: Example topology of a mesh network

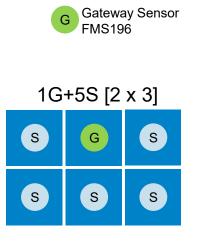


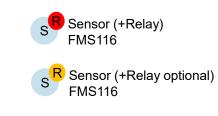


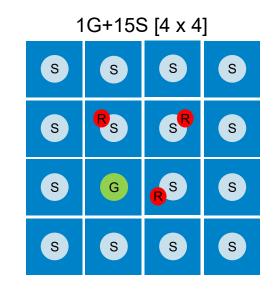
Bluetooth mesh - «Theoretical examples»

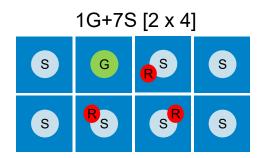
Sensor FMS116

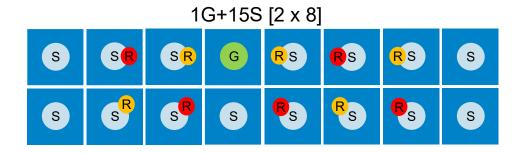
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Planning – System and Integration (Planning the right location)

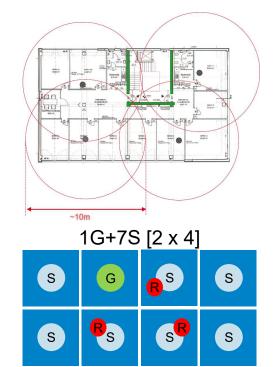
Bluetooth Mesh - wireless and range: Bluetooth radio range planning

- Floor plan of the rooms / room segments
- · Placement of all sensors in the scheme of "eight rooms"
- Definition of Bluetooth mesh networks
 - ideally 1 network per ecos (8 rooms)
 - max. 15 nodes (sensors)
- Definition of the sensor gateway (FMS196)
 - RULE 1: needs Ethernet, place in the middle of the area
- Definition of the sensor nodes (FMS116)
 - RULE 2: central nodes need relay enabled
 - RULE 3: border nodes might have relay disabled

Hints:

- Ration formula: FMS196 : FMS116 = 1 : 15 up to 16 : 0 per ecos
- If you use segmentation/axis on ecos, use at least one FMS196 gateway per ecos
 → do not use e.g. one FMS196 gateway for two ecos (16 axis)





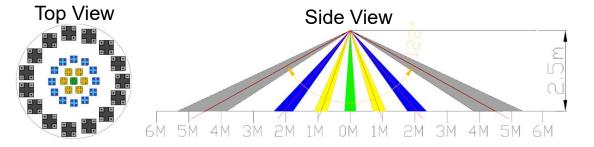
Planning – System and Integration

Motion detection - PIR

- Coverage, radial 360°: Ø 9 m @ 2.5m mounting height (63 m²)
- Field of view: ~120° (122°/119°)
- Lens: 4 x 34-zone Fresnel = 136 zones
- PIR sensor parameter: 3 sensitivities

Notes:

- \rightarrow set sensitivity to "high", and reduce to "medium", "low" if environment affords it
- → add accessory "PIR shutter" to reduce (half/quarter) 360° coverage (e.g. PIR for desk light at the edge to corridor)
- → PIR + SPL "fusion-ing" for "occupancy" is not yet implemented (use only "PIR" for "OccMode")



Mounting Hight	PIR Sensing Range
h = 2.5 m	Ø = 9.0 m
h = 2.7 m	(?)
h = 3.0 m	(?)
h = 5.0 m (max.?)	Ø = 18.0 m (?)



Planning – System and Integration

Temperature measurement – "TFIR"

- Far infrared (FIR) temperature sensor measures all heating sources around and gives a good perceived room temperature, independent on air flow or self-heating of device
- Accuracy: ± 1°C (@15...45°C)
- Field of view of 50° (with sensitivity of 50%)
- To increase accuracy, take care that the field of view is not obstructed by the installation, by objects (e.g. cooling ceiling panels).

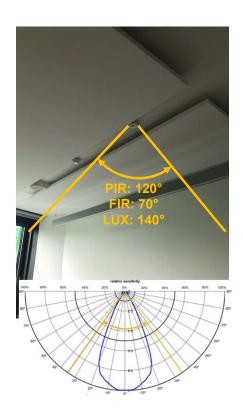
Take care that no obstruction is in a cone of at least 70° wide (e.g. heating/cooling sources, larger amount of people, ...)

Notes:

- \rightarrow Situation adapted obstruction/disturbances might need "a filter" on FIR temp measurement
- → Emissivity parameter "TmpIREmis" of 90...95% is at first a good practicable value

Note on "TDIG" (SHT):

The I²C digital temperature element (SHT) measures too high, caused by self-heating of whole sensor device (static offset "TmpOfs" could be used). This temperature measurement cannot be used without restrictions.



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Planning – System and Integration

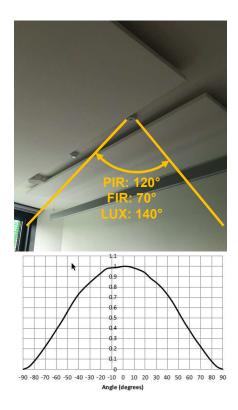
Ambient Light Sensor – Brightness – Illumination (LUX)

- The "LUX" sensor measures the influence on brightness all the light and gives a illumination value of the light available at the ceiling.
- Accuracy:
- Field of view is ~140° as be product design (hole on cover). FOV of the sensor element is 180°, but with decreasing sensitivity. Relevant FOV<120°...140°.
- Light sources or light reflections within a FOV of up to about 120°(..140°) can significantly
 influence the value measurement

• ...

Note:

- → LUX sensing element is not in the center; mounting and orienting of the hole might be important if FOV with its angle needs to be optimized.
- → To adapt the LUX value measured on the ceiling to its LUX measurement at the office desk, you might make a linearization calibration with the FMS function block parameters "LghtCalSl" (Slope a) and "LghtCalOfs" (Offset b)





Planning – System and Integration

VOC sensor for indoor air quality applications

• Sensirion MOX sensor (SGP40)

• ...

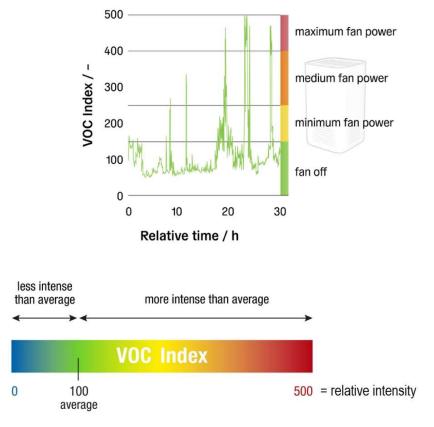
Notes:

 \rightarrow First hour the VOC index is adapting its measurement algorithm

How intense?

→ Demand led air quality control strategy should consider this





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Engineering – Step-by-Step

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Commissioning

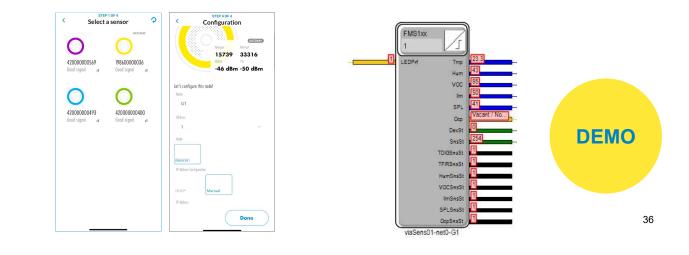
Commissioning is done with CASE Engine (Parametrization) and viaSens-Cx App (Addressing)

The sensor needs to be «provisioned» **from Bluetooth to a Bluetooth mesh** network. Once the sensor is lock'd into Bluetooth mesh it does not communicate 1:1 with the viaSens-Cx App. The App generates all the mesh security keys (net, node) which is mandatory for BTmesh.

There might be two principles: Top-Down or Bottom-Up - most likely in project top-down is used

- Collecting all the data about topology (wireless), devices-to-location, ... (Hint: write down maybe S/N-to-location)
- Define a addressing-naming-location schema; share (manually) the configuration data between CASE Engine and viaSens-Cx App

Synchronization between viaSens app and CASE Engine modules





Commissioning

Commissioning is done with CASE Engine (Parametrization) and viaSens-Cx App (Addressing)

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- · Define a addressing-naming-location schema; share with CASE Engine/viaSens-Cx App

Bottom-Up principle:

- 1. Start with viaSens-Cx App
- 2. Enter new project, network
- 3. Search for devices and assign (manually) proper addresses
- 4. Lock devices to the meshNet
- 5. Export configuration to be used within CASE Engine
- 6. Create corresponding CE plan with FMS blocks
- 7. Extend CE plan with full room automation functions

Top-Down principle:

- 1. Start with CASE Engine (V5.1) [CB not yet supported]
- 2. Create CE plan with sensors and FMS block (parameters, addresses)
- 3. Export viaSens-Configuration for viaSens-Cx App
- 4. Import configuration file in viaSens-Cx App [not yet supported]
- 5. Search for devices and assign (manually) addresses to the sensors
- 6. Lock devices to the meshNet
- 7. Extend CE plan with full room automation functions

Commissioning

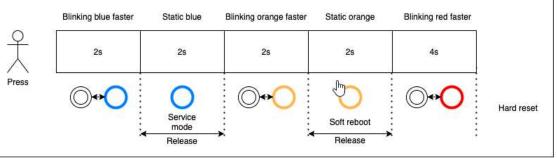
Touch button functions

Resetting or Testing the sensor

- Hard reset
 - Push button for >12 sec
 - Note: Is required to bring device back from Bluetooth mesh to Bluetooth (1:1)
- PIR testing
 - Push button 2..4 sec (=Service mode)
 - Push again to be in "menu 1" (=PIR Test)
 - Note: PIR testing with sensitivity "high"

Reboot/Reset sequence

LED menu details



Static blue	Quarter 1 blue	Quarter 2 blue	Quarter 3 blue	Quarter 4 blue	LEDs Off
	1 press	2 presses	3 presses	4 presses	5 presses
Service mode active	PIR Test	TBD	TBD	TBD	Service mode left
0				1	\bigcirc
O	Presence	1		R.	\bigcirc
	: 0.			:	
		•		5	

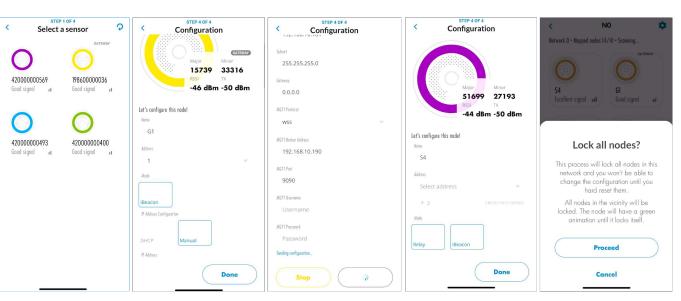


Engineering

viaSens Cx-App

Screenshots to the important parameters:

- 1. Select a sensor
- 2. Confirm
- 3. Verify correct sensor
- 4. Configure parameters
- 5. Lock nodes to Bluetooth mesh



Hints:

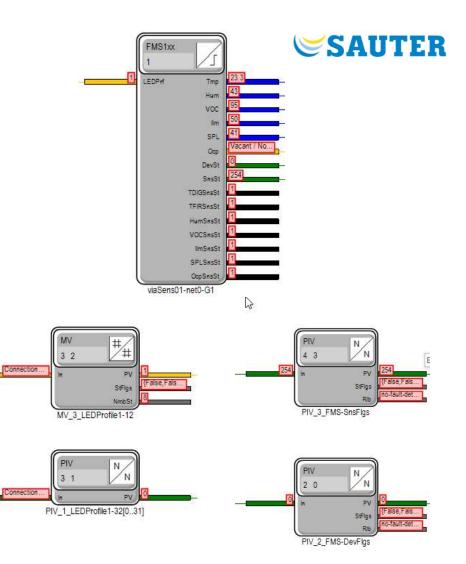
- · Choose MQTT protocol «wss», by scrolling down in the app
- Use MQTT port 9090 (or as configured in CASE Sun)
- Do not (yet) use any «user» or «password» entries to be connected to ecos (V5.0)
- Bluetooth mesh function «Relay» can be set only during provisioning



Engineering

CASE Suite 5.1

- Smart Sensor requires ecos504/505 firmware version 5.0.0 and CASE Engine 5.1 (CASE Sun 5.1)
- Easy integration with "FMS1xx" function block (with FI=23)
- Up to 16 FMS blocks are possible per ecos504/505



Hints:

- Use beta versions only for labor testing, evaluation of sensor, teaching and for specific pilot projects
- Use CASE Suite 5.1 for projects with ecos504/505 and Smart Sensor; it is recommended to convert projects used with beta versions to release versions, when versions are available.

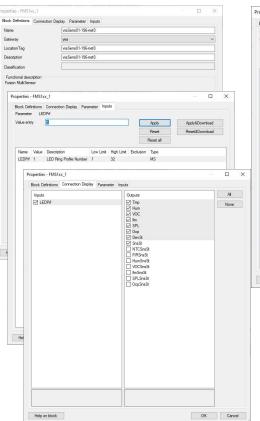
Engineering

CASE Suite 5.1

- Important properties
- Bluetooth mesh network (NetID) and node addresses (NodeID)
- Parameters for different modes, for all 6 sensors
- Parameters for analog measurement values:
 - Change-of-value (COV)
 - Dead Time (DT: fastest update with COV changes) → e.g. 1s
 - Report Time (RT: resending value without COV) → e.g. 60s

Hint:

- Choose relaxed values to «control» mesh flooding, depending on the control applications this could be, e.g.:
 - COV:: TMP=0.5, HUM=5, VOC=25, LUX=50, SPL=5
 - DT:: TMP=(1..)5, HUM=10, VOC=10, LUX=(1..)5, SPL=10 [sec.]
 - RT:: 60 (for all) [sec.]



ock Definition	s Conne	ction Display Parameter Inputs				
arameter N	lodeID					
alue entry	1			Apply	Apply&Down	load
	-					
				Reset	Reset&Down	load
				Reset al		
Name	Value	Description	Low Limit	High Limit	Exclusion	Туре
NodelD	1	Node ID	0	65535		u16
NetID	0	Network ID	0	65535		u16
OcpDetHT	1	Presence detection hold time	0	65535		u16
OcpDetSens	Mittel	Presence detection sensitivity	met			u8
TmpSrc	FIR	Temperature measuring source				u8
OccMode	PIR	Präsenzerkennungsmodus				u32
TmpOfs	0	Temperature offset in "C	-3.402823444E	+38 3.40282344	4E+38	f32
CelTyp	Anderer	Deckentyp				u32
LghtCalSI	1	Steigung Lichtkorrektur	-3.402823444E	+38 3.40282344	4E+38	F32
LghtCalOfs	0	Offset Lichtkorrektur	-3.402823444E	+38 3.40282344	4E+38	F32
IBcnTxPwr	0	IBeacon TX Power				u32
TmpIREmis	90	Infrared temperature emissivity in %	0	100		u8
TmpCOV	0.2	Temperature COV in 'C	-3.402823444E	+38 3.40282344	4E+38	F32
TmpRT	1	Temperature report time	0	86400		Time sU
TmpDT	1	Temperature dead time	0	43200		Time sU
HumCOV	5	Humidity COV	-3.402823444E	+38 3.40282344	4E+38	f32
HumRT	60	Humidity report time	0	86400		Time sU
HumDT	1	Humidity dead time	0	43200		Time sU
VOCCOV	10	VOC Index-COV	-3.402823444E	+38 3.40282344	4E+38	f32
VOCRT	60	VOC report time	0	86400		Time_sU
VOCDT	1	VOC Index dead time	0	43200		Time_sU
ImCOV	5	Illuminance-COV	-3.402823444E	+38 3.40282344	4E+38	f32
ImRT	60	Illuminance report time	0	86400		Time_sU
ImDT	1	Illuminance dead time	0	43200		Time_sU
SPLCOV	5	Sound pressure level-COV	-3.402823444E	+38 3.40282344	4E+38	f32
SPLRT	60	Sound pressure level report time	0	86400		Time_sU
SPLDT	1	Sound pressure level dead time	0	43200		Time_sU
Help on block					ок	Cancel



Engineering

CASE Suite 5.1

- Device status and sensor status are outputs of the FMS function block. It can be used to observe the health of the MQTT communication and the Bluetooth nodes and validity of the sensor values.
- Note: device/sensor status is transmitted every 5 min. Fault detection on ecos needs two cycles (→ 10 min.)
- DevSt (Byte-Integer) :=
 - $-0 \rightarrow$ device is alive and working (payload is OK and timely, presence topic = 1)
 - $-1 \rightarrow$ network communication error (presence topic = 0)
 - $-2 \rightarrow$ node communication error (packet not received on time)
- SnsSt (Byte-Integer) :=
- Examples: SnsSt

- bit7 temperature NTCbit6 temperature FIR
- bit5 humidity
- bit4 VOC
- bit3 illuminance
- bit2 noise level
- bit1 occupancy
- bit0 (n/a)

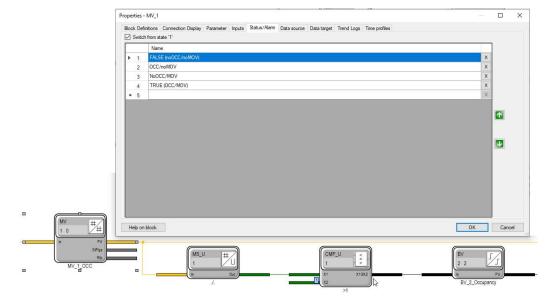
- **Examples.** Shisst
- 126 (0111'1110)
 = all actual sensors "okay", with FIR

 110 (0110'1110)
 = most sensors "okay", VOC improving
 - (adjusting first hour after power on device)

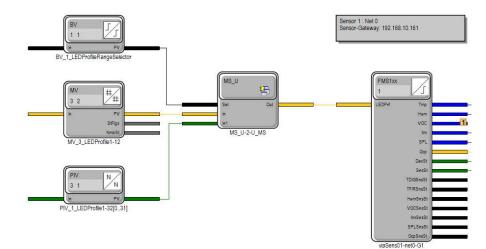
Engineering

CASE Suite 5.1

- «Occupancy» Ocp: Multi-state (similar to «DALI»)
 - 1: no occupancy / no movement (FALSE)
 - 2: occupancy / no movement
 - 3: no occupancy / movement
 - 4: occupancy / movement (TRUE)



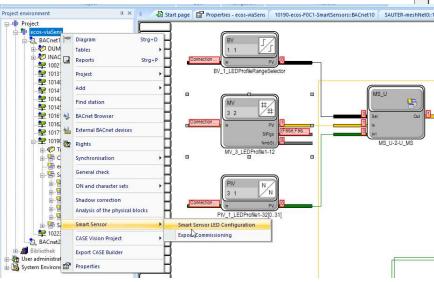
- «LED Profile» LEDPrf:
 - 1..12: with Multi-state
 - 1..32: with PIV (conversion U_MS)



Engineering

CASE Suite 5.1

- «LED Profile» LEDPrf:
- Configuration unique for the whole project



LEDPrf Description Pattern Period (sec) Colour1 Colour2 Colour1/Colour (χ) 1 Clear Image: Clea	IAQ=Excellent Full 0 I Light gre • IAQ=Gut Full 1.5 Yellow • Orange • 60 • IAQ=Gut Full 1.5 Yellow • None • 50 • IAQ=Schlecht Full 0 Red • • Reinigung nötig Haff - atemating • 1 Blue • White • 50 • Anim1 Running light - counterclock • 0.25 Blue • Yellow • 50 • Anim2 Running light - clockwise • 0.25 Red • None • 50 • Clear • Clear • • • •	1 Clear Light gre+ 2 IAQ=Excellent Full 0 Ight gre+ 3 IAQ=Gut Full 1.5 Yellow + Orange + 60 4 IAQ=Mittel Every other -flashing + 1 Yellow + None + 50 5 IAQ=Schlecht Full 0 Red + 6 Reinigung nötig Half - alternating 1 Blue + White + 50 7 Anim 1 Running light - counterclock+ 0.25 Blue + Yellow + 50 8 Anim2 Running light - clockwise + 0.25 Red + None + 50 9 Clear 10 Clear	Clear Clear Light gre * IAQ=Excellent Full 0 Light gre * IAQ=Gut Full 1.5 Yellow * Orange * 60 * IAQ=Mutel Every other -flashing * 1 Yellow * None * 50 * IAQ=Schlecht Full 0 Red * * * Reinigung nötig Haf - atemating * 1 Blue * White * 50 * Anim1 Running light - counterclock * 0.25 Blue * Yellow * 50 * Anim2 Running light - clockwise * 0.25 Red * None * 50 * Clear Clear Clear Clear <th>LEDPrf & Description & Pattern & Period (sec) & Colour1 & Colour2 & Colour1/Colour</th> <th></th> <th>LEDPrf Secretion Pattern Secret Colour1 Colour2 Colour1/Colour</th> <th>LEDP/f S Description Pattern Period Colour1 Colour2 Colour1/Colour</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>_</th> <th></th>	LEDPrf & Description & Pattern & Period (sec) & Colour1 & Colour2 & Colour1/Colour		LEDPrf Secretion Pattern Secret Colour1 Colour2 Colour1/Colour	LEDP/f S Description Pattern Period Colour1 Colour2 Colour1/Colour							_										
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Engineering

CASE Suite 5.1

- FMS1xx Table view
- Configuration and overview of FMS addresses in Smart Sensor table (incl. Group structure)

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Smart Sensor Addressing

• Online view supported in Smart Sensor Addressing table

Project View		Open Diagram P Tables Connections Wizard Reports Strg+P AS Labels	wor	Edit
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Engineering

CASE Suite 5.1

New Open Save

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Project View

FMS1xx Table view ٠

> Diagram Tables

C Reports

AS Labels

Connections Wizard

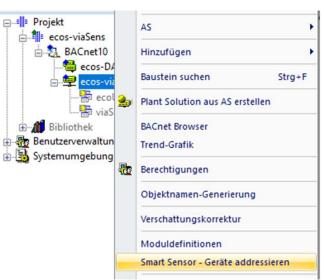
Strg+P

Sensor FMS block can be addressed for AS groups ٠

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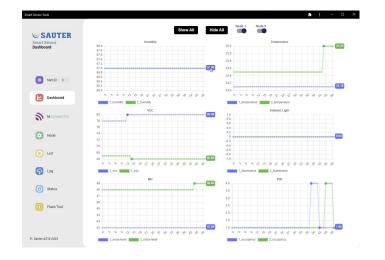
Engineering

Engineering – Support, Troubleshooting

Smart Sensor Dashboard

PNA

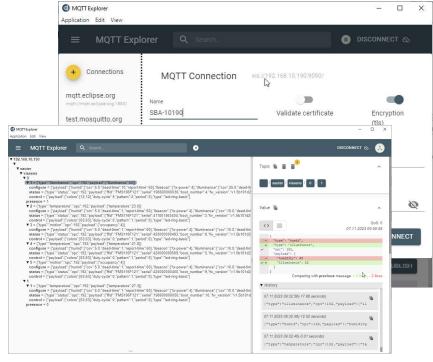
- Internal Tool MQTT Client as PWA
- Progressive Web Application (<u>PWA</u>)
- Supports firmware update (USB-UART)
- Supports MQTT subscription to MQTT broker for online sensor value view



Troubleshooting tools – any MQTT Client

MQTT

• MQTT Client, e.g. MQTT Explorer e.g. with ws://192.168.10.190 with Encryption (TLS)



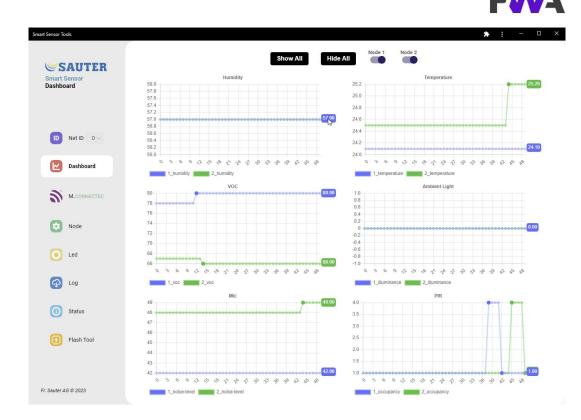
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Engineering

Engineering – Support, Testing

Smart Sensor Dashboard

- Internal Tool MQTT Client as PWA
- Progressive Web Application (<u>PWA</u>)
- Supports firmware update through UART (FTDI cable required - <u>TTL-232R-3V3</u>)
- Supports MQTT subscription to MQTT broker for online sensor value view
- As of now: <u>https://fms.iot.sauter-cloud.com/</u>
- Not yet defined if it will be public
- Next: viaSens App supports WiFi FW Update



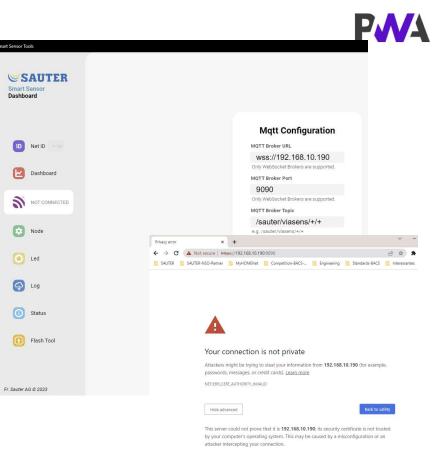
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Smart Sensor Tool

- Workaround «Security»
- Following steps are required:
 - 1. Enter «https://<ecos-IP:9090>» e.g. https://192.168.10.190:9090/
 - Proceed to <IP> (unsafe) This accepts «unsecure» web certificate for the PWAApp
 - 3. Call: https://fms.iot.sauter-cloud.com/
 - 4. Set IP (MQTT broker) from ecos



Proceed to 192.168.10.190 (unsafe)

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Troubleshooting tools

- MQTT Client, e.g. MQTT Explorer ws://192.168.10.190 with Encryption (TLS)
- Topics are structured into
 - \sauter\viasens\...
 - meshNet ID
 - Node ID
- Payloads are transmitted in structured topics
 - latest changed value (see history)
 - «configure» payload (FMS Block)
 - «control» payload (LED command)
 - «status» payload (device information)

	MQTT Explorer Application Edit View			- 🗆 X	
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Engineering

First Projects / Pilot Projects

• For testing, pilot or first projects we need qualified feedback; please report following:

– Pilot plant:	(Name, Location, Customer)
– Time window:	(FromTo)
 Project manager: 	(PL of NVO/NL)
 Technician: 	(Names of involved technicians)
– Topology:	Which, how many ecos504/505, smart sensors and other hardware will be used IMPORTANT: Floor layout with dimensions and wall construction, planed Bluetooth mesh topology, …
 Application: 	Which applications/functions will be realized (constant light control with DALI, additionally publishing MQTT to the "cloud").

- Once, you've provided those information, we help and advise for proper design, recommendation for parameters...
- Use following versions: CASE Suite 5.1 Release; ecos504/505 FW V5.0.0 Release; viaSens116/196 FW V1.6 Release

Hint (for technicians):

- Once, you are up to install the sensor, please ask about the latest firmware ("shipping" V1.2 \rightarrow V1.6 is now released)
- viaSens App (actual version 1.0.0 commit "f87b576", with OTA WiFi Update support for V1.2 and higher)
 will be soon available on app stores

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Known Issues – Not yet available

Known Issues for pilot projects, testing projects :

- PIR sensor does not fulfill FOV of 120° → fixed with viaSens-FW V1.4 or higher (V1.6 is released)
- Bluetooth mesh Relay function is not yet optimized for up to 16 (4x4 topo) sensors → next version (>V1.6, April 24) Good to know:
- External PIR testing as of IEC 63180:2020 was successful
- Tested Bluetooth mesh topologies: 1G+3S, 1G+9S(w/o fast LED), 1G+5S
- Bluetooth mesh communication tested: up to 10..12 meters even through 2 glass doors, up to 6...8 meters even through 1 concrete wall (30 cm)

Not yet tested, approved:

- Full mesh network topology with up to 16 sensors (15 nodes + 1 gateway with up to 7 hops)
- Installation height of up to 5 m (working up to 3m)

Not yet implemented

- MBS or other iBeacon Tools might require fully configurable iBeacon ID (UUID/Major/Minor) → (>V1.6, April 24) [automatic generated, fixed: UUID = Fr.SauterAG ¦ Major + Minor = Serial number]
- NFC Read/Write not supported with Cx-App viaSens



Firmware Update on Sensor

There are two possible ways to update the sensors.

Option 1: UART Update via FDTI cable

This option is for sensors not yet provisioned, out from the box or initialized with a hardware reset (touch button >15s)

Option 2: WiFi Update via commissioning app "viaSens" and smartphone's WLAN-hotspot function This option is for sensors already provisioned and working in the field

Notes:

- Only latest firmware is provided, for normal use cases and are recommended to be used
- No downgrade is supported via WiFi Update
- To "downgrade" a sensor you need to use Option 1

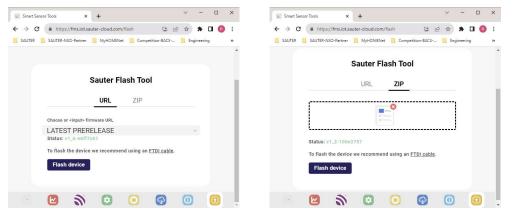


Firmware Update on Sensor – UART (1)

Option 1: UART Update (1-by-1 with "USB-FTDI cable")

Prerequisite: Sensor is not yet provisioned, not in Bluetooth mesh network

- Get a FTDI cable (<u>https://ftdichip.com/products/ttl-232r-3v3/</u>)
- Get Chrome browser's PWA plug-in "SmartSensor Dashboard" (<u>https://fms.iot.sauter-cloud.com/</u>), go to "Flash Tool"
- Do not power sensor with 24VDC (!), but connect FTDI cable to sensor ("black" wire to Service pin ▲, at the back of the sensor)
- Use "LATEST RELEASE" (or "LATEST PRERELEASE") via "URL" and click "Flash device" (optionally via "ZIP" menu a specific version, provided as .zip file can be loaded to the flash tool Use cases: a) for downgrading to an older version, b) for testing beta versions, not yet available on dashboard URL/app)





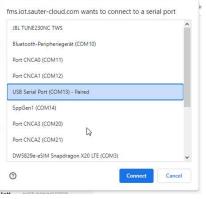


Firmware Update on Sensor – UART (2)

Option 1: UART Update (1-by-1 with "USB-FTDI cable")

- Follow the instruction, "Connect" USB Serial Port (check on "Paired"),
- Follow instruction step-by-step (do not select "Erase device")..., last about 2 minutes.

Device Dashboard X	Erase device Do you want to erase the device before Installing Smart Sensor Firmware? All data on the device will be lost. Erase device	Do you	I Smart Sensor Firmware want to install Smart Sensor are v1_2-106e2757? BACK INSTAGE		
	BACK NEMT		Installing Smart Sensor Firmware	Installing Smart Sensor Firmware	Installation complete!
			Installing This will take 2 minutes. Reep this page visible to prevent slow down	18% This will take 2 minutes. Keep this page visible to prevent slow down	NEXT



Note: If update does not start within couple of seconds, start over and plug-in UART cable to the sensor again



Firmware Update on Sensor – WiFi (1)

Option 2: WiFi Update (1-to-many with smart phone "hotspot")

Prerequisites:

- Sensor is provisioned, in Bluetooth mesh network, e.g. already running in ٠ the field
- Smartphone needs to support WiFi-Hotspot "to be a temporary WiFi access ٠ point" (usually this requires a SIM card in your smartphone)
- **VERY IMPORTANT:** ٠ Hotspot needs to have following name: sauteriot, and password: sauteriot

Notes:

- In case of iPhone you need to change (temporarily) the iPhone device name to "sauteriot"
- Make sure only one technician around WiFi radio distance has enable this "hotspot"

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14:53	al 🕈 🚺	09:25 🖬 📲 📲
Allgemein	Info	Zurück Persönlicher Hotspot
Name	sauteriot >	Der persönliche Hotspot auf dem iPhone bietet eine Internetverbindung für andere Geräte, die bei deine iCloud-Account angemeldet sind, ohne dass du das Passwort eingeben musst.
iOS-Version	17.0.3 >	
Modellname	iPhone Xr	Zugriff für andere erlauben
Modellnummer	MRY42ZD/A	WLAN-Passwort sauterion
Seriennummer	DX3CK9U9KXK1	Erlaube anderen Benutzer:innen oder Geräten, die ni bei iCloud angemeldet sind, dein geteiltes Netzwerk "sauteriot" zu suchen, wenn der persönliche Hotspo- eingestell its, oder wenn du es im Kontrollzentrum
Abdeckung	>	aktivierst.
		Kompatibilität maximieren
Titel	1	Bei Aktivierung kann für Geräte, die mit deinem
Videos	68	Hotspot verbunden sind, die Internetleistung verring werden.
Fotos	2'326	ÜBER WLAN VERBINDEN
Apps	112	 1 Wähle "sauteriot" von den WLAN-Einstellu auf deinem Computer oder anderem Gerä 2 Gib bei Aufforderung das Passwort ein.
Kapazität	64 GB	UBER BLUETOOTH VERBINDEN
Verfügbar	10.55 GB	1 Koppele das iPhone mit deinem Computer
veriugbai	10.00 68	2 Tippe auf dem iPhone auf "Koppeln" oder den auf deinem Computer angezeigten C ein.
WLAN-Adresse	EC:CE:D7:79:DB:D4	3 Stelle vom Computer eine Verbindung zu iPhone her.
Bluetooth	EC:CE:D7:7A:7B:AB	ÜBER USB VERBINDEN
Modem-Firmware	6.00.00	1 Schließe das iPhone an deinen Computer 2 Wähle "iPhone" in der Liste der Netzwerk dienste in den Einstellungen aus,

- ÜBER BLUETOOTH VERBINDEN 1 Koppele das iPhone mit deinem Computer. 2 Tippe auf dem iPhone auf "Koppeln" oder gib den auf deinem Computer angezeigten Code Stelle vom Computer eine Verbindung zum iPhone her.
- ÜBER USB VERBINDEN Ŷ 2 Wähle "iPhone" in der Liste der Netzwerk-dienste in den Einstellungen aus.



Firmware Update on Sensor – WiFi (2)

Option 2: WiFi Update (1-to-many with smart phone "hotspot")

Prerequisites: VERY IMPORTANT: Hotspot needs to have following name: sauteriot, and password: sauteriot

Example screenshots:

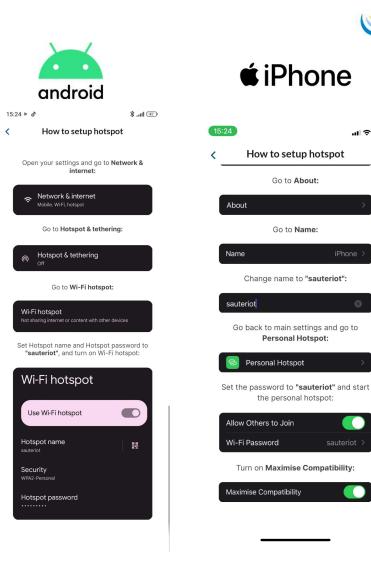
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iOS-Version	17.0.3 >			Persönlicher Hotspot		Netzwerkname	saute
Modellname	iPhone Xr	Zugriff für andere er	erlauben	sauteriot			
Modellnummer	MRY42ZD/A	WLAN-Passwort	sauteriot >	Hotspot einrichten	>	Passwort	sauteriot
Seriennummer	DX3CK9U9KXK1	bei iCloud angemeldet sin	r:innen oder Geräten, die nicht nd, dein geteiltes Netzwerk enn der persönliche Hotspot	QR-Code teilen	>		
Abdeckung	>		du es im Kontrollzentrum	Einmaliges Datenlimit		Sicherheit	WPA2-Person
		Kompatibilität maxin	mieren	Das Datenlimit wird angewen Hotspot das nächste mal ein		Gerätekennu ng	Persönlicher Hotsp
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Videos	68	werden.	, die internetieboteng vernigert	Hotspot automatisch aussch keine Geräte mehr verbunden		verstecken	AL
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Apps	112	auf deinem Cor	iot" von den WLAN-Einstellungen mputer oder anderem Gerät aus. derung das Passwort ein.	USB-Tethering USB nicht verbunden			
Kapazität	64 GB	UBER BLUETOOT	TH VERBINDEN	Bluetooth-Tethering			
Verfügbar	10.55 GB	2 Tippe auf dem	Phone mit deinem Computer. n iPhone auf "Koppeln" oder gib m Computer angezeigten Code	Gemeinsame Nutzung der Int dieses Telefons über Bluetoo	ternetverbindung		
WLAN-Adresse	EC:CE:D7:79:DB:D4		mputer eine Verbindung zum	Ethernet-Tethering	rtphones über		
Bluetooth	EC:CE:D7:7A:7B:AB	ÜBER USB VERBI 1 Schließe das iP	BINDEN Phone an deinen Computer an.	Ethernet freigeben			
Modem-Firmware	6.00.00	2 Wähle "iPhone"	e" in der Liste der Netzwerk- is Einstellungen aus.			_	

iDhana

Firmware Update on Sensor – WiFi (3)

Option 2: WiFi Update (1-to-many with smart phone "hotspot") Prerequisites: VERY IMPORTANT: Hotspot needs to have following name: sauteriot, and password: sauteriot

Smartphone hints:





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Firmware Update on Sensor – WiFi (4)

Option 2: WiFi Update (1-to-many with smart phone "hotspot")

Following steps can be taken to update via WiFi:

- Get latest Cx-App "viaSens" from the app store
- Choose Bluetooth mesh network, in the project, where sensors needs to be updated (Note: each mesh network (=sensors per gateway sensor) needs to be initiated for an update individually)
- Click on "Update nodes in this network >"

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viaSens by Sar Further: informatic Build informa App version: 11.0 Commit: 167-03 Built on: 3 Nover Imprint Fr. Sauter AG Im Surinan 55 Postfach Fr. Sauter AG Im Surinan 55 Postfach Phome: +41 of 59 Contact www.sauter-cont Legal Notice Privacy Statemen Open Source Lieg	n and technical data	GITS Locked 53 Locked	S2 Lacked	N3 Network ID: 3 Address: wss://192.168.10.140:3090	
				Update nodes in this network >	
© 2023 Fr. Sauter AG			+ Add	Save	

Firmware Update on Sensor – WiFi (5)

Option 2: WiFi Update (1-to-many with smart phone "hotspot")

Following steps can be taken to update via WiFi:

- Get latest firmware from "Cloud" (needs access to internet) with "Download latest", and continue with "Cancel" Note: Delete cached firmware before downloading
- Choose version you want to upgrade to (v1.6)
- Enable Hotspot (make sure it is still active)
- Start update process
 - This triggers with a beacon signal (Bluetooth LE) all the sensor in this net to enable WiFi function on the sensor
 - Sensor connect with the hotspot of smartphone (WiFi) and pulls down the firmware (→ flashing sensors)
 - Sensors reboots automatically after update process (→ Sauter colors during reboot of sensor)
- "Stop update" manually after couple of minutes

Note: If sensor do not flash, they where not in BLE trigger range or do not connect to WiFi hotspot, or have already appropriate, latest version \rightarrow Retry, Redo, check version

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starting the update. Set your SSID to "sauteriot" and password to "sauteriot".	starting the update. Set your SSD to "sauterief" and password to "sauterief".	
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		Devices being updated will show an
The hotspot is enabled	Update info	animation on the LED ring. They will reboot automatically upon update.
	This update will update the following:	
	Hardware index A to v1.6	
	ок	Stop update

M.Emst 02.11.2023 SAUTER Schritt 1 APP Bluetooth Beacon Wifi Aktivierung für Updatevorgang durch Bluetooth Beacon WLAn Bereich Schritt 2 Hotspot Update über Wifi Wifi Aktivierung für Updatevorgang durch Bluetooth Beacon Schritt 3 Wifi Aktivierung für Updatevorgang Bluethooth Update Zustand Feedback über LED durch Bluetooth Ring Beacon FMS, die nicht im Empfangsbereich des WLAN sind werden nicht upgedatet Versionsprüfung über MQTT Explorer je Ecos mit Laptop Salve FMS, die nicht im Empfangsbereich des Beacon sind werden nicht upgedatet

Engineering – Firmware Update

Firmware Update on Sensor – WiFi (6)

Graphical explanation by ERM@SCU. Thanks.

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Firmware Update – Check Version of sensors

The only way to check installed firmware version on smart sensor, it via MQTT client, subscribing to the "status" topic.

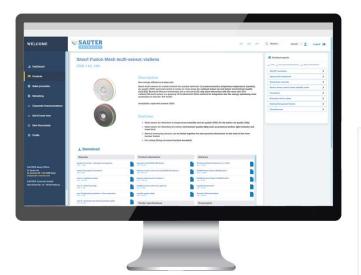
Option 1: MQTT Explorer (Open source MQTT Client connecting to ecos "Local Broker")

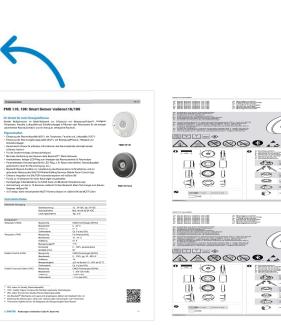
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Option 2: SmartSensor Dashboard (SAUTER Tool – browser PWA plug-in – as MQTT client)

Marketing Mix 1/2

Technical Documentation





SAUTER

- Product Data Sheet
- Installation Sheet
- Tender Text

SAUTER

PMB104P121A PMB104P121A PMB104P121 PMB104P121A

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ERE ⊂ € 255

PMB104F12 PMB10F1212 PMB104F1212

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- Product Information
- Price Information (only shared by email)
- Manual for engineering and commissioning (incl. App) (planed)



Marketing Mix 2/2

Promotion





- Sales Presentation
- Flyer
- Landing Page (www.sautersmartsensor.com)
- Product Video
- Advert, Roll-Up Banner, Web Banner
- Media Release
- FACTS Article (published 2022)
- Sales Demo Kit YXE196F001 (availability planed for Nov '23)
- <u>www.sauter-digital.com</u> as digital SAUTER booth (will be updated as EN version)

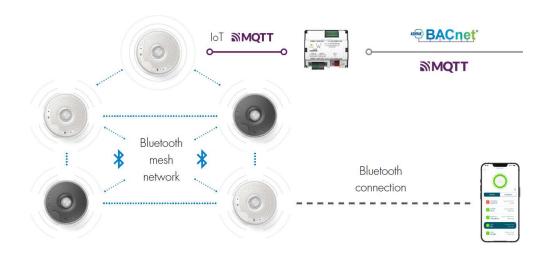
SAUTER Smart Sensor viaSens

Good to Know

Key Facts

- Multi-sensor for
 - temperature, humidity, air quality (VOC)
 - Presence/motion, brightness, sound pressure level
- Bluetooth mesh communication
- iBeacon localization
- Colored LED ring for room status indication
- IoT-Ready (MQTT)
- Provisioning and configuration via smartphone app (BLE, NFC)
- Easy system integration to SAUTER ecos with CASE Suite

System Overview



SAUTER Smart Sensor viaSens

«USP» - Benefit for your customer



The features	Your benefit	
Multi-sensor	 Sensors as the basis for room automation and digital services Reduction of devices, reduces commissioning effort No room units necessary thanks to MRC app via MBS For "open space" office with "moving wall" of ecos, increases control quality for room climate 	
LED ring	 Interaction with room users Room state profiles for different users 	
Wireless	Easier commissioningLess cabling effort	
Bluetooth + Beacon	 Use of smartphone app for commissioning Worldwide frequency band Implementation of beacon technology for localisation 	
«IoT Ready» with MQTT	 Integrated in CASE Suite "tool chain", optimized engineering Fits SAUTER room automation ecos504/505 Future potential for "Automation-in-the-Cloud" 	

SAUTER Smart Sensor viaSens

SAUTER

Outlook



Smart Sensor viaSens with CO2 (FMS1x7)

Smart Sensor with CO₂: viaSens117/197 (FMS117, FMS197)

- Smart Sensor with integrated CO₂ meas. element (SCD40)
- FW V1+: iBeacon configurable, stability, Relay (4x4)

Room air quality (CO ₂)		CO2
Range	4002000 ppm	
Accuracy	50 ppm (± 5% MV ppm)	
Response time (T63%)	60 s	

- Price: not yet defined (is competitive)

Roadmap 2024

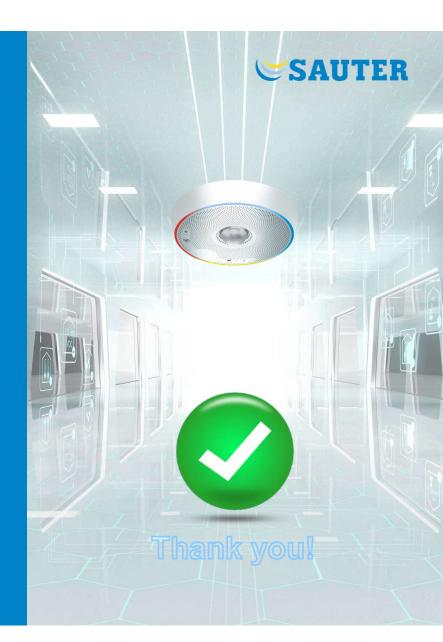
- Q1 / 2024 first samples for extending sensor firmware
- Q2 / 2024 first pilot series for internal testing (QA/QS)
- Q3 / 2024 from summer, pilot plants, first projects
- Sept./Oct. 2024 Series production release
- November 2024 Devices ex stock
- → Pilot plants / first projects can be equipped with appropriate pilot devices from summer '24 if required

	Projects	Oct	202 No		Dec	Jan	₽	eb	Mar	Apr	May	Jun	2024	Jul	Aug		Sep	Oct		Nov	C	Dec
\triangleright	Smart Sensor V1.0	Field b-Test	Ramp	up								Delivery										
\triangleright	Smart Sensor Firmware V1.6			Develop	ment				Field b-Test							Delivery	l					
	Smart Sensor w/ CO2							Devel	lopment						Fi	<mark>eld b-Te</mark>	est	ra	amp up		De	elivery

Smart Sensor viaSens

"SAUTER's sensor, Sith master of might, LED ring glows, like a lightsaber at night. Bluetooth Mesh weaves, room status clear, IoT-ready, viaSens, the space-monitoring seer."

[As "Darth Vader" aka ChatGPT would say.]



Q&A



Questions and Answers





Thank you!

Contact

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