

## **Greenbank Bin and Silo level check Agenda**

1. Applications of a microwave barrier
2. How does it work?
3. What is unique about it?
4. Benefits
5. Available options
6. Technical data
7. Tips for Installation
8. References

# Typical applications of a microwave barrier



- A microwave barrier can be used to
  - **monitor the fill level** of silos, bunkers, crushers or heaps (point level detection),
  - **detect material jam or overflow on** conveyor belts or at transfer stations,
  - **position or count objects** or **hedge** dangerous areas.



# Typical applications of a microwave barrier



A microwave barrier is the best choice

- if measurement needs to be **contact-free**, e.g. through safety window or pipe walls,
- if the environment is **dirty** or **dusty**,
- if the the product tends to **build-up** on measurement equipment,
- if supervision shall be from or over a **distance of several meters**,
- if the measurement needs to be **100% reliable**.



# Typical applications of a microwave barrier



## - **Typical industries** for the LC 510 microwave barrier:

- Animal food
- Building materials
- Cement
- Ceramics
- Chemicals
- Detergents
- Food industry
- Glass
- Metal
- Mining
- Paint
- Pharmaceuticals
- Plastics
- Power plants
- Pulp and paper
- Recycling and waste incineration
- Rubber
- Textile

# Typical applications of a microwave barrier



## - **Typical applications** for the LC 510 microwave barrier:

- Animal feed production: prevent overfilling of animal feed containers
- Animal feed production: monitor min / max level in the hopper
- Cement industry: min / max control of dosage of fluff into the bunker
- Cement industry: position silo trucks at correct place at loading station
- Coal power plants: prevent backup or overfilling with coal of belt transfer stations
- Coal power plants: prevent overfilling of silos with lime milk (gas desulfurization)
- Ethanol plants: ensure minimum filling level of buffer silos with grain flour
- Glass production: ensure continuous supply to furnace by monitoring feed pipe
- Gravel and sand pits: monitor conveyor belt and automate stockpiling levels
- Gravel and sand pits: monitor filling level of rock crushers
- Mining: position the dumper truck correctly before the hopper
- Pet feed production: supervise conveyor with finished meat pellets
- Pulp and paper: prevent jamming of pulp bales on conveyor before the pulper
- Waste incineration: monitor minimum level in incinerator feed chute



# Microwave barriers – How do they work?

- The measurement principle of the LevelCheck LC 510:
  - Microwave barrier - works **similar to a photoelectric barrier**
  - An **emitter** sends out a **low-power, microwave beam with a non-invasive sensor**
  - The beam is **received by an opposite device**, which can be placed **up to 25 meter away**
  - **Any object between emitter and receiver** weakens the microwave signal and **is detected**
  - If a set value is reached, a **relay is switched**
  - The **switching point** can be adjusted by adapting **amplification, filter, hysteresis and delay**



# Microwave barriers – what are the general benefits?



- General benefits of microwave barriers:
  - **Very flexible**, can be used with any kind of solid, mineral-rich liquid or other objects
  - **Very reliable and precise measurement**, is not affected by material buildup, nor by dust
  - **Contact-free**, does not interfere with the process
  - Works perfectly **from a distance** (up to 25m between emitter and receiver)
  - Measures **through plastic, glass and all non-conductive materials**, sensor can be decoupled from the process
  - **Wear- and maintenance-free**, long lifetime, also with abrasive or aggressive material



# LevelCheck LC 510 – What is unique about it?



Compact design, only D75 x 146 mm, can be easily retrofitted into existing processes

External G 1½" thread for easy installation

Switching signal and error signal at two relay outputs

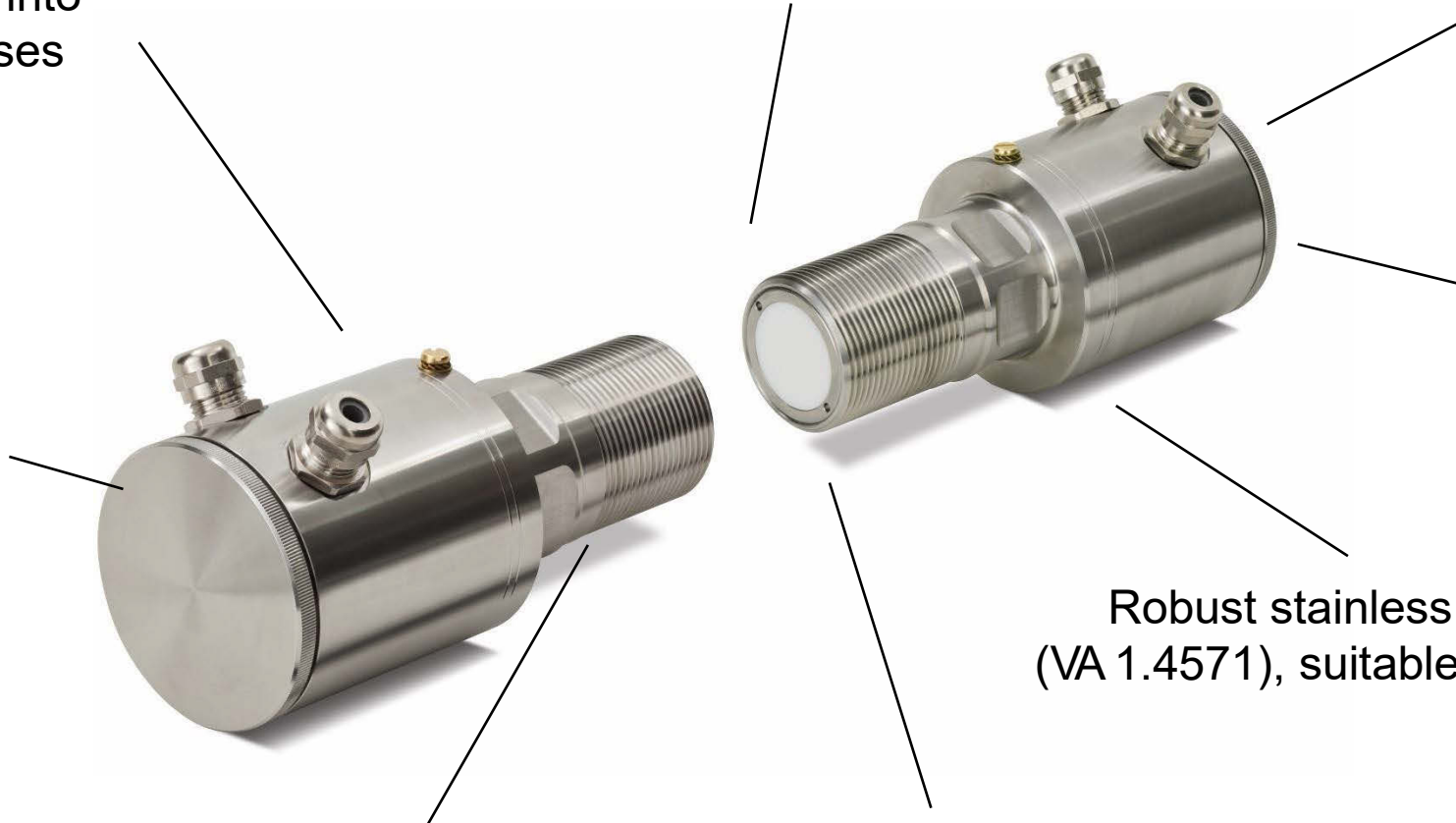
Well-protected design, insulation for IP65

Integrated control electronic, no separate transmitter

Robust stainless steel construction (VA 1.4571), suitable for most applications

7 different socket types for any application (steel, V2A, V4A with different lengths and angles)

Teflon or optional ceramic surface to withstand abrasive materials and for high pressure applications





# LevelCheck LC 510 – What is unique about it?



The measurement is visualized at the device using an easy-to-read LED bar

Active self-monitoring for increased reliability (e.g. cable brake of supply line), alarm signal is available on additional relay

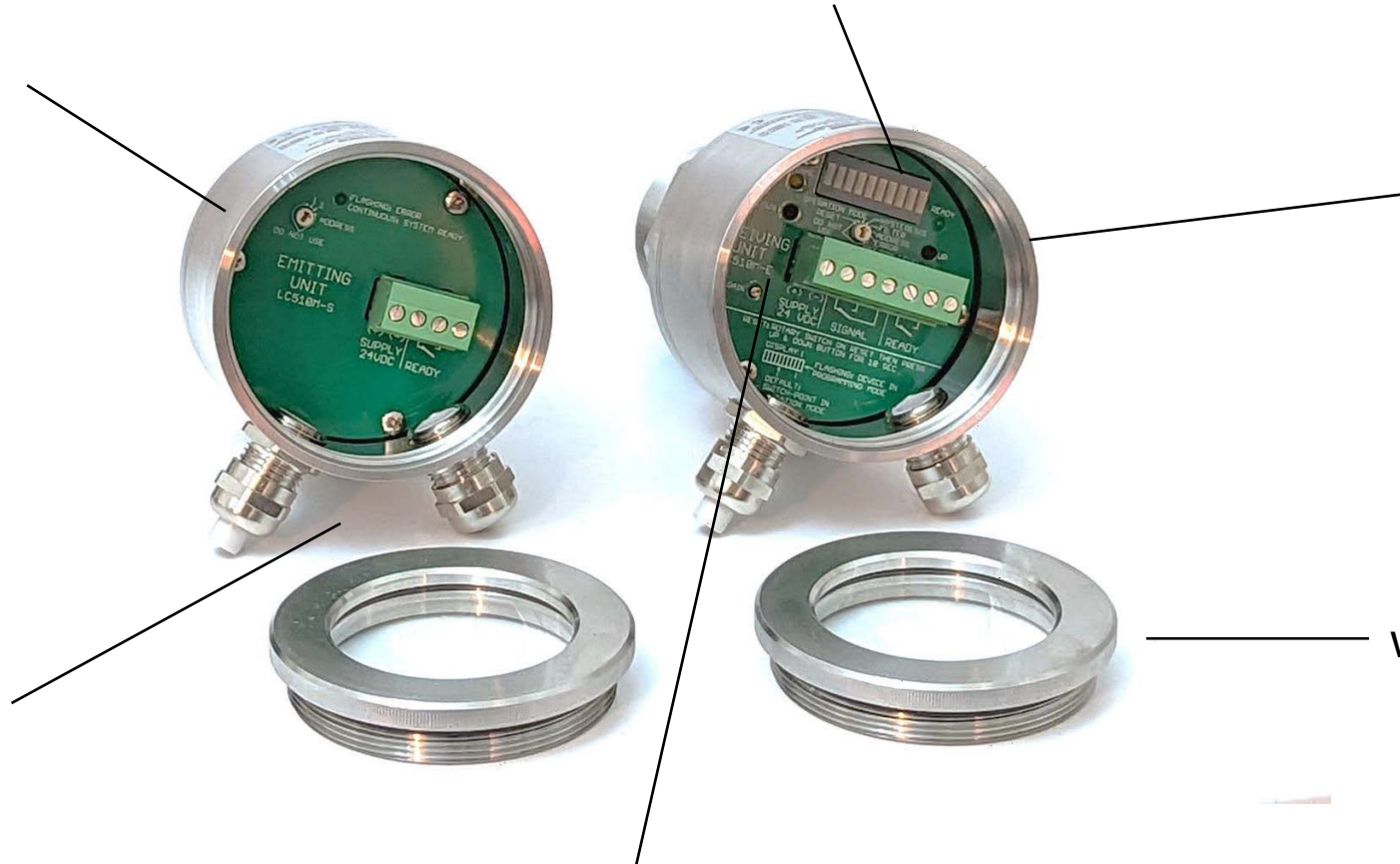
For process temperatures of -20°C to +85°C and pressure up to 6/12 or optionally 30/60 bar (permanently/ temporarily)

Emitter and receiver are coupled by selecting common address and identical polarizing angle. No electrical connection needed.

Highly flexible with adjustable amplification, filter (0-16s), hysteresis (0- +/-40%), delay (0-16s)

Metal cover or glass window in front of LED bar and switches \*

\* Glass window only for Non-ATEX version

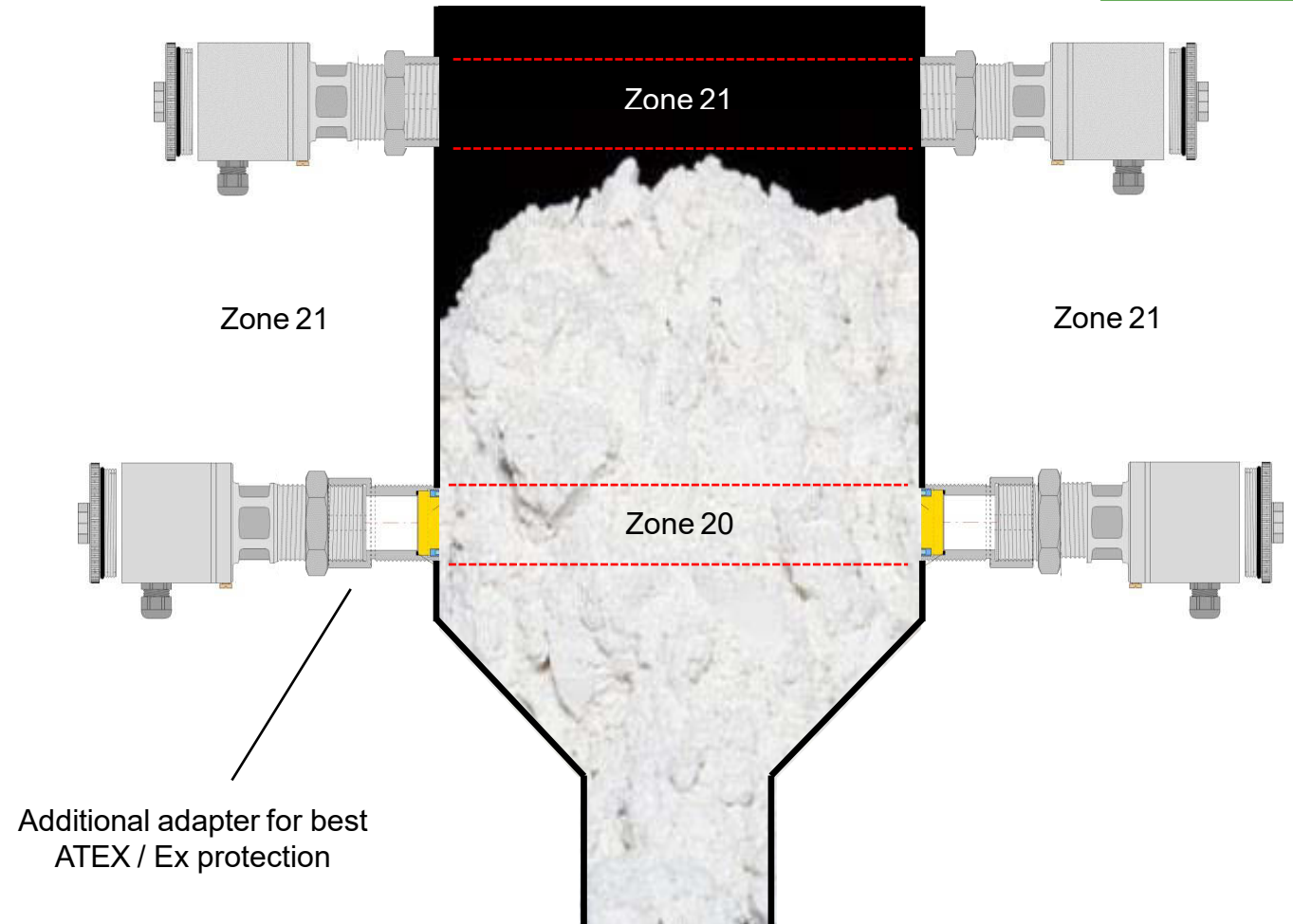


# LevelCheck LC 510 – What is unique about it?



Two options for use in ATEX / Ex-Zone available. The LC 510 offers the **best Ex protection in the market:**

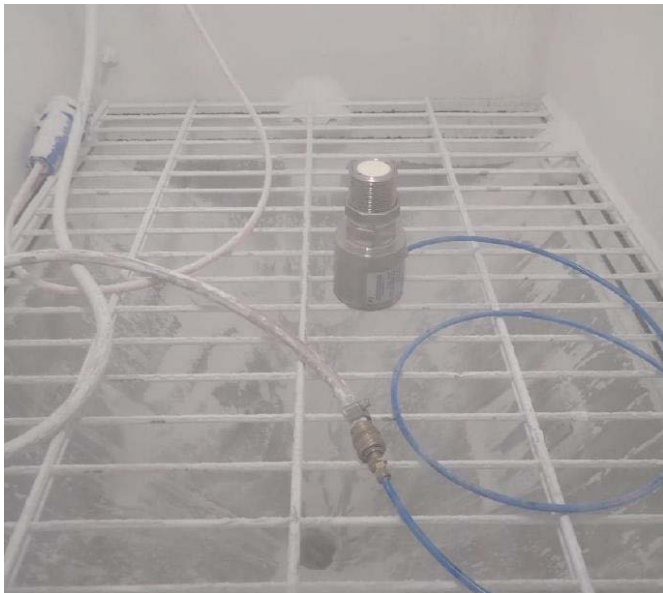
- ATEX Zone 21 or
- ATEX Zone 20 / 21 (with additional adapter and socket)



# LevelCheck LC 510 – What is unique about it?



**Most robust system in the market –**  
it was built and tested for extreme environments



*Dust test of LC 510*



*Waterjet test*



*Overpressure test*



*Tested until 100bar*



## Benefits of LevelCheck LC 510



- **Very sensitive**, works **up to 25 meter distance**
- **Robust design**, well protected for years of operation in a harsh environments
- **100% operational safety** due to **active self-monitoring** and second relay output
- **Highest pressure level** (up to 30/60 bar) possible - for operation in extreme environments
- Best-in-class **Ex / ATEX protection** (up to zone 20)
- **Stepless adjustment**, with variable settings for amplification, filter, hysteresis and delay
- **Compact and easy to install** and retrofit into existing installations, supported by multiple welding flanges and mounting plates
- **Fast commissioning** with intuitive LED bar



# Options available for LevelCheck LC 510



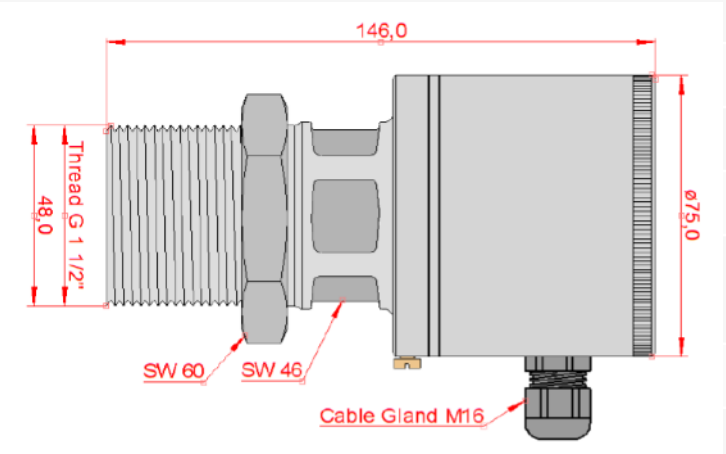
LevelCheck LC 510			
Sensor material	Teflon / PTFE (standard) Ceramic (140004)		
Cover plate	Stainless steel without window (standard) Stainless steel with glas window (optional for Non ATEX version)		
Pressure	0 - 6 bar permanently, 12 bar temporarily 0 - 30 bar permanently, 60 bar temporarily (140018)		
Ex / ATEX	Non ATEX (standard) Ex / ATEX for zone 21 (V14037) Ex / ATEX for zone 20/21 (V14037) and special adapter AD 510 (V14038) necessary		
Installation	<div><div><div>Welded socket type 1 (180000): 22.5mm long ; material: steel</div><div>Welded socket type 2 (140019): 22.5mm long ; material: V4A stainless steel</div><div>Welded socket type 3 (140013): 48.0mm long ; material: steel</div><div>Welded socket type 4 (140023): 48.0mm long ; material: V4A stainless steel</div><div>Mounting plate with socket type 7 (V14031): socket to 99.5mm * 99.5mm mounting plate; material: V2A stainless steel</div></div><div><div>→</div><div><div></div></div></div><div><div>Type 1-4 for installation into steel silo flush with wall. Type 7 for installation in a plastic silo.</div></div></div>		



# Technical Data LevelCheck LC 510

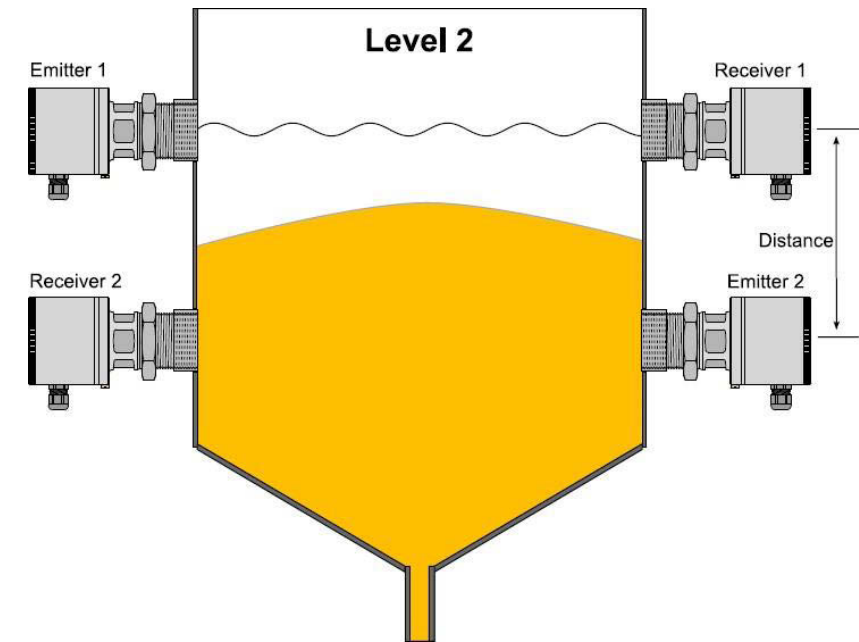


LevelCheck LC 510	
Supply voltage	24 VDC (18 VDC – 30 VDC); max. 80 mA
Output	1x changeover signal contact; 1x normally open monitoring / „ready“ contact
Switching voltage, power, current	30 V AC/DC; min. 10 µA & max. (2A); 30 VA or 30 W
Cable inlets & connection	2x M16; cable glands, plugable screw terminals
Cable length	No cable supplied
Connection	G 1 ½“ external thread to screw into a socket and to be fixed with a nut
Housing material	Stainless steel (V1.4307)
Sensor surface	Teflon (PTFE), ceramic as option
Transmission frequency and power	24.125 GHz (24.00 GHz - 24.25 GHz); 10 dBm
Dimension & weight	D75 x 146mm; 1,3 kg
Ambient temperature	-20°C to +60°C (non-condensing)
Process temperature	-20°C to +85°C
Pressure	0 - 6 bar (30 bar as option) permanently 0 - 12 bar (60 bar as option) temporarily
Protection class	IP 65
Ex-area / ATEX zone	Zone 21 or Zone 20/21 as option
Measuring range	15 cm to 25 m
Adjustment	Manual adjustment of amplification, filter (0-16s), hysteresis (0- +/-40%) and delay (100ms - 50s)



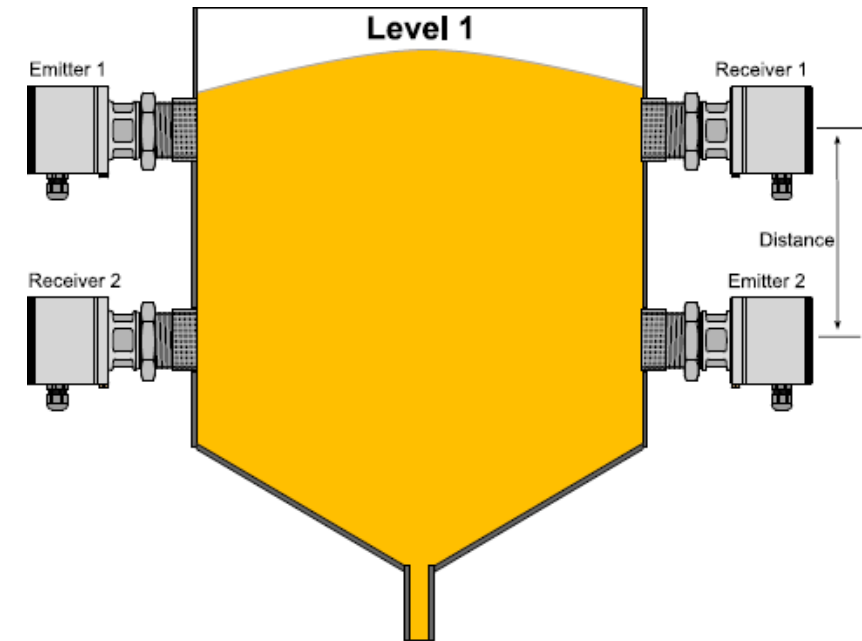
## Tips for installation

- Sensors are mounted on an optical axis
- Maximum distance of 25 meter
- The filling flow (into the silo) should to be far away from the measurement / optical axis
- If the wall is of non-microwave-permeable material, e.g. steel, a hole is required, otherwise the sensors are installed from outside measuring through the wall
- Installed flush with the interior wall (e.g. in a silo)
- To decouple adjacent pairs, one sensor pair is turned by at least  $30^\circ$ , better  $45^\circ$  to change its polarization and reduce any distraction by reflected microwaves. A pair is always turned in the same direction.

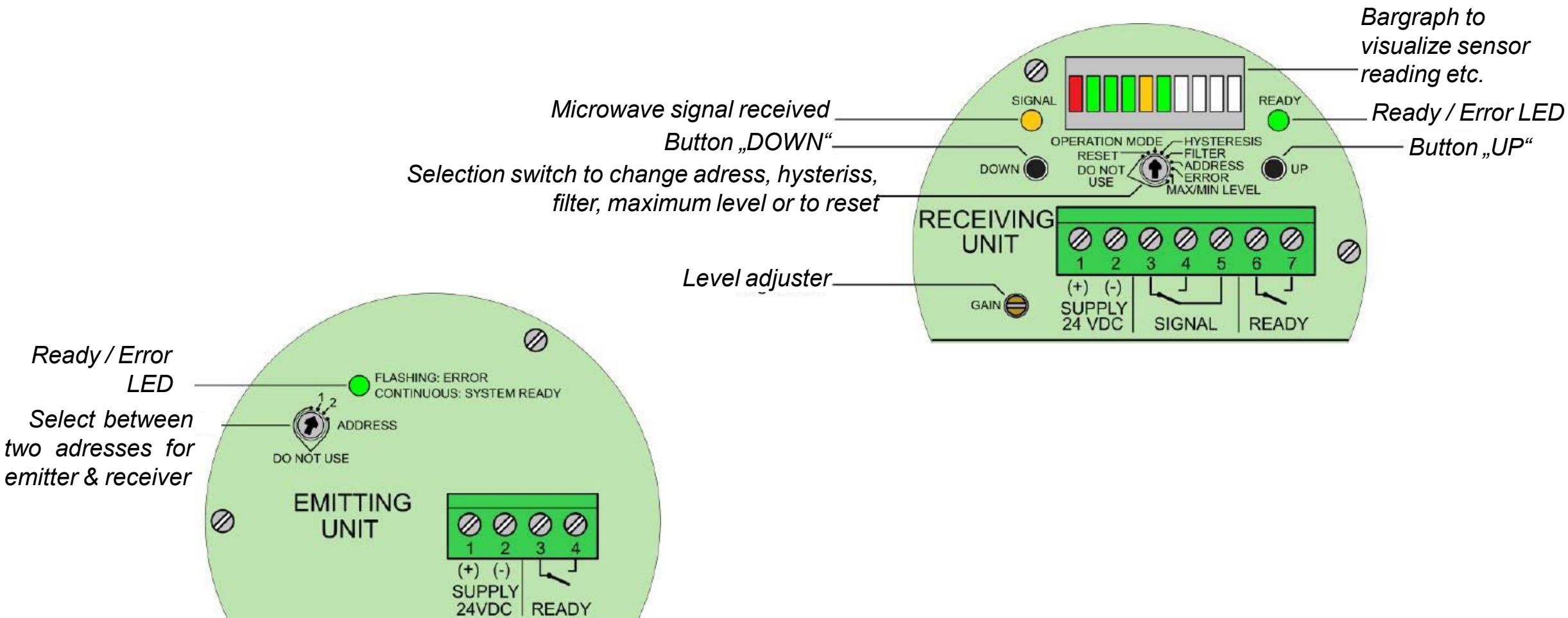


## Tips for installation

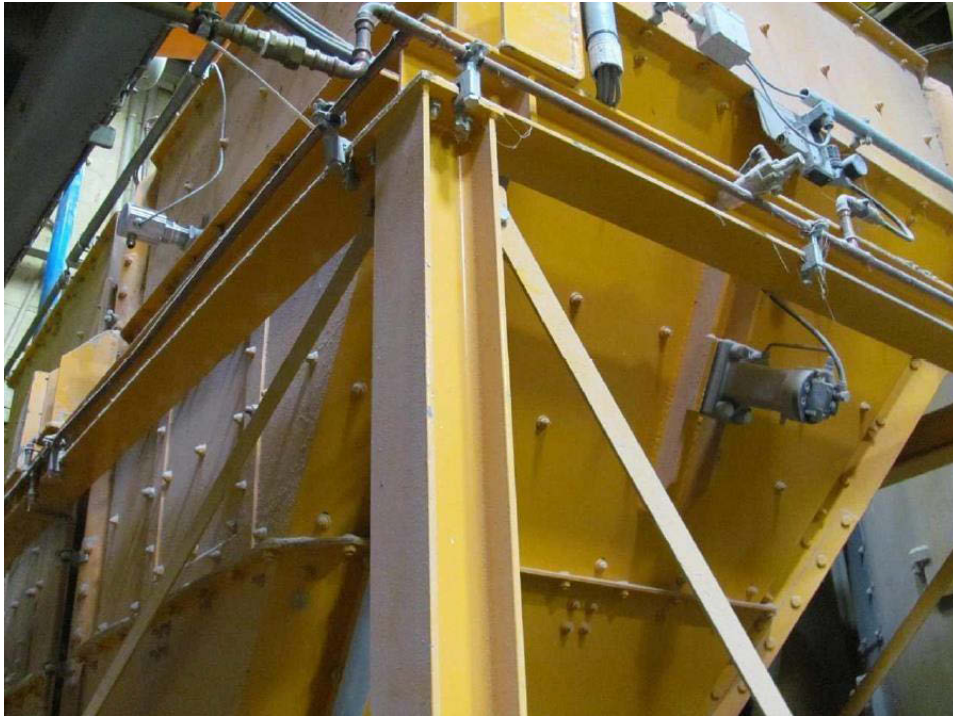
- Two sensor pairs should be placed at least 0,25 times of the monitored distance apart
- The housing of all sensors must be earthed
- To prevent water from entering the cable gland, these should be pointing downwards
- Use of shielded cables is recommended
- Cascade the “Ready” contacts, and position the emitter first to give it a higher priority



# Tipps for installation – Possible adjustments



# References



*Microwave barrier with LC 510 for level monitoring  
of fattening feed in the hopper*

- Una Hakra - Hanseatische Kraftfuttergesellschaft mbH, Germany
- Produces all sorts of feed for pigs
- Microwave barrier LC 510 was installed on a hopper to ensure correct filling level with raw materials
- Dosing is switched off if the desired level is reached
- Heavily dust-laden ambient air does not distract the microwave barrier
- Ensures continuous supply with raw material while preventing an overfilling