

World • World Of Capacitive Sensors • Capaci



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## Capacitive Sensors

Capacitive sensors are an important, indispensable and constituent part in industrial automation. Capacitive sensors detect metals or non-metals, which exceed a certain capacity by approaching the active area.

The higher the dielectric constant is of the material to be detected, the higher is the achievable sensing distance. A further relevant aspect for the sensing distance is the electronic circuit and the assembly of the sensor electrodes. These specific sensor or general brand type physical and electronic differences are the decisive parameters that affect quality and performance, and separate the average capacitive sensor from High Performance Sensors.

## Capacitive Sensors - The main area of competence for RECHNER.

Since the founding of Rechner in the year 1965, we have developed and produced capacitive sensors. Early on we saw the endless possibilities for capacitive sensors and our efforts have played an important part in making them so successful. There still remains a huge potential to open up new markets.

## Principle of operation

Capacitive sensors, our abbreviation KAS, contain a transistor oscillator which is actuated when a defined capacitance is exceeded by the approach of metals, non-metals or liquids.

The smaller the dielectric permittivity  $\epsilon_r$ , the closer one has to approach the medium.

*Sensors for non-flush mounting have an exposed sensor head.*



This effect is also apparent when detecting through non-metal materials, if the dielectric permittivity of the material to be detected is higher (approx. factor 5).

Depending on the type the current change of the oscillator will be amplified to a streamlined output signal or output as a binary signal by a switching amplifier.

## Output signals

Output stages with npn or pnp transistors are available for DC operation. A transistor output stage or FET-output is integrated for AC connection

The output switching functions are NO, NC or change-over (antivalent), similar to mechanical switches.

*Sensors for flush mounting have no exposed sensor head.*

There are also variants with relay output, optionally with on- or off-delay.

## Decisive criterion for choosing the right capacitive sensor.

We have more than 3000 different models in our product range and for sure we have the optimal capacitive sensor for your application.

For the selection of the sensors first it is important to know if detection should be made with the sensor in contact with the material or at a distance or through a container wall.



Capacitive sensor with 4...20 mA analogue output

When in contact with the material it is typically an application for non-flush mountable sensors.

With measurements through a container wall or at a distance, flush mountable sensors are the right choice.

It is also relevant to know the maximum possible mounting dimensions for the application and the required sensing distance.

The RECHNER capacitive sensors with 20-turn spindle potentiometer allow sensitivity adjustment greater or less than the nominal sensing distance ( $S_n$ ). In addition we have models with EasyTeach Function with real text display.



## Processing of the output signal

Electronic circuits, PLC's, relays or contactors can be activated directly with our capacitive sensors.

## Chemical resistance of the housing material and application in the food industry

The chemical resistance of the proximity sensors is dependent on the housing material used. The available housing materials are:

PA, PBT, PPO, PC, PEEK, PTFE, PVC, PVDF; Brass (nickel-plated), Stainless Steel VA, Aluminium die cast and Ceramic.

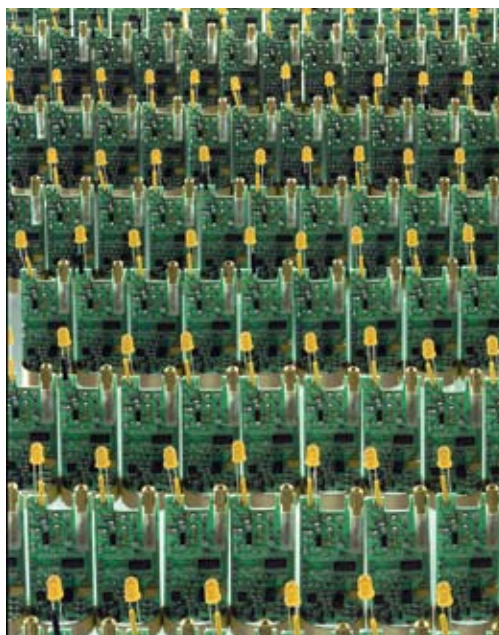
This variety allows versatile applications in all industries.

The components of the KAS are mounted in plastic or metal casings and encapsulated with epoxy casting resin.

By means of these measures all devices are insensitive to dirt, vibration (vibration stability: 30 g, 100...2000 Hz, 1 hour) and are watertight (depending on the type, up to IP 68 and IP 69K and pressure proof up to 25 bars).

## Pollution and adverse ambient conditions are no problem for the sensors

Only pre-tested electronic components, proven integrated circuits and hybrid circuits are used and produced with SMT.



The standard constant ambient temperature permitted is -25 up to +70 °C, and up to 90 °C for brief periods. High-temperature types for use from -200 up to +250 °C are also included in our general product line.

With non-contact detection no physical actuating force is required for operation. There is no contact bounce, no sensor wear, no maintenance and the service life is independent of the switching frequency.



## Quattro<sup>EMC</sup>Protect™

Thanks to the Quattro<sup>EMC</sup>Protect™ Technology our sensors have fourfold protection

- Enhanced protection against electrostatic discharge (ESD)  
Up to 50 kV
- Enhanced protection against electromagnetic radiation  
Up to 15 V/m
- Enhanced protection against interference voltage  
Up to 2 kV
- Enhanced protection against transients (Burst)  
Up to 5 kV



Capacitive Sensors For The

## Chemical Industry and Semiconductor Industry

Capacitive Sensors with chemically resistant bodies, like PTFE or PEEK, are standard for us. We also have variants with ATEX certification for use in areas with danger of explosion within zone 1 and zone 20.

The great variety of products comprise sensors with 3 or 4 wires with switching output and also 2 wire NAMUR models.

The capacitive sensors detect chemical substances in liquid, paste powder or solid form.

For conductive substances that are often found in the semiconductor industry, we have modified sensors on offer.



Level control of liquids in Ampoule.

## Food Industry and Pharmaceutical Industry

For level control in the food industry where the sensors come in direct contact with the material to be detected, sensors with permitted housing materials are required. We offer our sensors with FDA conforming housing materials. Furthermore we provide the suitable process connections. We have a complete range from welded sockets to Triclamp, milk-tube



screw-ings, Varivent



Series 26 - Level control at circuit board production

## Plastic Industry

As pioneer of the capacitive level control in the plastic industry we offer capacitive sensors that are able to detect bulk materials with low dielectric constant (DC) and low material density. Excellent ESD protection and EMC characteristics which are far over the NORM values ordain these sensors for such kind of applications. With the use of antistatic plastic, like PTFE, for the sensor body, material



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tations are minimized. Model variants for ambient temperatures of 100°C, 125°C up to 250°C detect granulates from the dryer without risk of damage.



Level control in silos and containers.

## Packaging Industry

Our capacitive sensors detect the package units for position control or counting tasks. In the same way they detect the contents through the non-metal packages for quality control. The content can be in the package in liquid, granule, paste or solid form. They detect objects in packages, like tablets in blister packs.



Thanks to the large sensing distances even small objects can be safely detected.

## Wood Industry, Wood- and Pellet processing

The detection of wood even with large object distances is no problem for our capacitive sensors. For instance in the furniture industry our sensors are used for double layer control of wood panels or for edge position control for further processing.

Capacitive sensors are also used for level detection of hot melt with extreme product temperatures up to +250°C. Sawdust, wood chips or pellets can be detected in silos or during conveying for level control or for pile-up alert.



Pile-up control



Level control of wood chips

## Agriculture, Farming

Our series „95“ capacitive sensors are optimised to the needs of applications in the Agriculture and Farming industry. AC-or DC-supply is possible, potential-free relay contact for high switching currents up to 1 A and an optional integrated time delay make additional supply and control units unnecessary.

All kinds of products can be detected. It does not matter if they are in liquid, powder, paste or granulate form.

The ideal sensors for animal feeding systems.



Level control



Level control in silos

## Vehicles, Trains

In the range of utility vehicle and with rail vehicles our capacitive sensors are used for various tasks. They operate correctly and are reliable even under extreme conditions.

With utility vehicles the capacitive sensors serve as level control for the road salt, condensate liquids, oils, etc.

With rail vehicles they have the safety relevant task of the so-called dead man function.

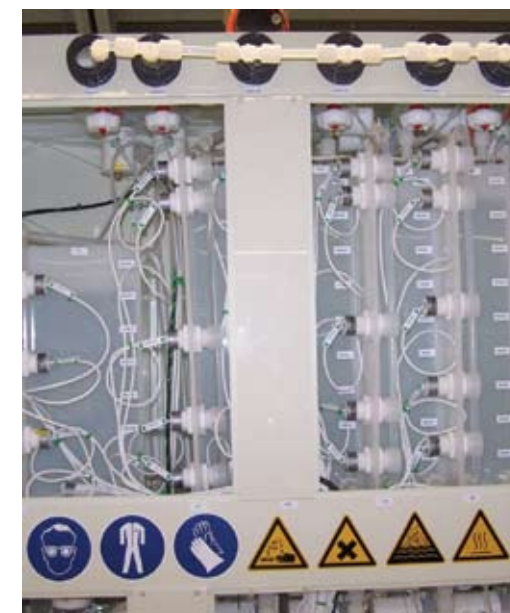
Also the level control of the water storage containers in trains is achieved with capacitive sensors.



## Ex Areas ATEX and IEC-Ex

Whether in the chemical, pharmaceutical, plastic or food industry, areas with danger of explosion are present everywhere.

We provide ATEX and IECEx certified sensors for the areas with danger of gas explosion zone 1 and also for those with danger of dust explosion zone 20. Even in the case where both areas exist together.



## High Performance

Capacitive Sensors of the High Performance series for high demanding detection tasks. They have outstanding technical characteristics, like:

- 3 times higher sensing distance than the norm
- Medium optimised sensing distance
- Less free area required at the active zone
- Temperature stability up to 100°C
- Excellent EMC characteristics
- 2-Colour LED
- Quattro<sup>Exc</sup>Protect™



## NormLine

Capacitive sensors are subject to a harmonised norm IEC 60947-5-2. All the main important technical data and features are stated within this norm. Meeting these standards makes life easy for the user with regard to selection and replacement of sensors.

NormLine sensors guarantee a free trade in the common market, ensure excellent quality, and reduce down time in industry.

All these demands are met by NormLine sensors, the recommended types are ideal for



standard applications, meeting international standards giving the user off the shelf items and latest technology for an economic price.

Where the application demands more from the sensor, such as use in high temperature areas, ATEX applications, pharmaceutical, chemical or food industry, please refer to our high performance standard series of high-tech capacitive sensors.

## Capacitive sensors with relay output - Series 95

The capacitive sensors with potential-free relay output are incredibly versatile level probes. The universal supply voltage range



from 20...250 V AC/DC, the simple mounting and installation are all key benefits for the user. Further advantages are:

- High Performance Technology
- Intelligent micro controller technology
- Optional adjustable time delay (from 1 sec. up to 10 min.) and switchable on- or off-delay
- Low power consumption of only 2 mA.
- body sizes M30 x 1,5; M32 x 1,5 or in a slightly tapered smooth body with 32 mm diameter.
- A PG 36 pressure type connection is available as an accessory.
- The sensors can be connected to PLC's or the user can connect directly for control purposes to a max. 1 A.

Application examples are level detection of:

- powder, granules, pastes, liquids and pellets for instance.
- Sand in storage containers.
- Fodder in the farming industry
- Foil scraps or pellets in recycling and size reduction systems.
- ...and much more

## Series 26 Capacitive sensors are convincing in both form and function

The 26 series from RECHNER was originally designed to cope with the problems of very adhesive products. It turns out that these sensors have excellent characteristics for general use in level control. Typically they overcome the problems caused by products sticking to the sensor and the need for continual re-adjustment. The semi round sensor tip is a striking feature of this series.

Further features are:

- Quattro<sup>Exc</sup>Protect™
- High Performance Technology
- Housing material PTFE, PEEK or PP



- Chemically resistant and FDA conforming housing
- Several options of process connections, like Triclamp, G1" and M22.
- CIP/SIP 121°C
- As an option available with PP body with up to 2000 mm in length.
- Process connection G1½"
- With EasyTeach function
- The clear text display assists with the adjustment.

Application areas are:

- Level control of liquids and bulk material handling.
- Often used in the chemical, pharmaceutical and food industry.

## Capacitive Mini Sensors

About 25 years ago on customer demand we started with the development of capacitive Mini Sensors for the detection of Wafer-Discs. These were the first capacitive Mini Sensors world-wide. In the meantime it grew to a considerable product range.

No matter whether for space reasons or for detection of small objects or for copper wires or for the level control of small containers. Our capacitive Mini Sensors fulfil their detection tasks with perfect reliability.

Further advantages are:

- Variants in PTFE and PEEK-bodies.
- Chemically resistant designs and version which can be used for food applications
- Variants with ATEX and IECEx certification for Zone 1



## Rectangular Sensors - the compact

The flat and compact size distinguishes the rectangular sensors.



Moreover these capacitive sensors provide the same technical characteristics as the cylindrical versions, notably:

- High Performance Technology or NormLine Technology **Quattro<sup>etc</sup>Protect™**
- Housing Material PBT or PTFE
- Easy mounting
- Model dependent for 20...250 V AC/DC or 10...35 V DC and with NPN or PNP switching output available

Application examples are

- Level control of powder, granules, pastes, liquids, pellets, etc.
- Level control at bypass tubes
- Animal food in the farming industry

## Capacitive Sensors, NAMUR DIN EN 60947-5-6 for ATEX Zone 1

We have a wide reaching program of Ex-protected sensors. The product family comprise capacitive and inductive proximity sensors in cylindrical size from 6.5 to 40 mm in diameter.

The ATEX-certified units are available for areas with danger of gas explosion (Zone 1) and for areas with danger of dust explosion (Zone 20).

Application examples are:

- Level control of powder, granules, and liquids in areas with danger of explosion.
- Level control in powder coating equipments



So-called LEAK-Sensors for detection of leaks are also included in this range.



*Leak-Sensor - for detection of leaks*

## Capacitive Sensors for ATEX Zone 20 „All in one“

- no separate amplifier required

Dust-explosion protected capacitive sensors with integrated evaluation electronics. This series - a classic - is used in Mills and areas where there exists the danger of dust explosion in the course of processing of cereals or similar products.

The sensors of this series are certified for the use in zone 20

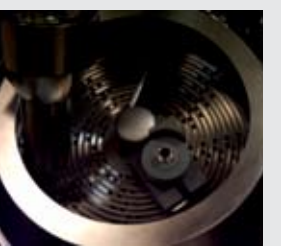
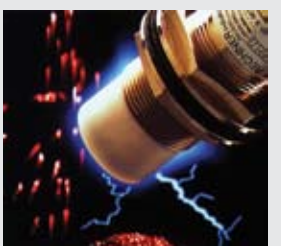
Advantage:

- ATEX- and IECEx certificate
- All in one - no separate evaluation unit required
- Available with body size M30 x 1 and M32 x 1,5



Being an ATEX certified firm, RECHNER can also offer sensors with a manufacturer's declaration for both of these explosion danger areas.

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SENSORS**

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