PROCESS MEASUREMENT TECHNOLOGY

SINGLE-SOURCE TECHNOLOGIES AND SOLUTIONS

Gas analyzers, analyzer solutions, dust measuring devices

SICK
Sensor Intelligence.

MODERN PROCESS MEASUREMENT TECHNOLOGY

FORWARD-LOOKING SOLUTIONS FOR THE REQUIREMENTS OF PROCESS MEASUREMENT TECHNOLOGY

In these times of accelerated change, far-reaching changes and revolutions in economics, politics and climate protection, the products and supply chains, which have established themselves over many years, are being put to the test. The process industry is affected by these changes in two respects.

On the one side, the requirements placed on the industry are increasing. Scarcer resources and increasing costs for energy transport demand more efficiency. Environmental considerations are increasingly coming to the fore in the context of ever-tightening global regulations and laws. Globalization, as well as the increasing competition from emerging countries, offers the chance – but also the risk – of a worldwide market and competition.

On the other side, the process industry can play a key role in mastering these challenges. Numerous products, which are intended to provide a good and sustainable way of living for millions of people in the future, touch on processes that are still in the experimental stage or have not yet even been invented. Future scenarios are based on the development of plant-based raw materials, new insulating materials and novel coatings.

SICK is a competent partner in this change. On the one hand, SICK, with its proven products for process measurement technology and pronounced expertise, is able to support its customers and partners fully in order to jointly develop customized solutions for increased efficiency in production systems and processes.

On the other, SICK stands for innovation and technology leadership and, with its global sales and service network, is a strong and competent partner for the monitoring of new processes and measuring tasks.

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CONTENTS

Power plants

Modern gas analysis is becoming more and more important in the context of energy generation, particularly with fossil fuels. In addition to the processes introduced for the reduction of particulates, NO_x and SO_2 concentrations, gases such as HCl or SO_3 during the combustion of alternative fuels are gaining relevancy.

Waste incineration

For waste incineration plants as well as for the co-incineration of waste, it is essential to continuously measure the following pollutants according to the legal requirements and conditions: HCl, HF, NH_3, CO, NO_x (NO and NO_2), SO_2, C_{total}, dust and mercury. This includes the parameters H_2O, O_2, pressure and temperature.

Cement production

In plants for producing cement clinker and cement, as well as for firing and crushing lime, alternative fuels are gaining importance as a way of saving primary fuels. This requires the continuous and precise measurement and monitoring of all relevant processes.

Metals and steel production

Plants for calcination, melting or sintering ores as well as the production of non-ferrous metals have tough ambient environmental, such as high dust loads and strong vibrations. The gases produced during the procedures are processed further and must be measured and monitored accordingly.

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Chemicals, petrochemicals and refineries

In order to remain competitive and be able to produce profitably in chemical plants, an optimized process control is necessary. Through the targeted control of key components in the reaction sequence, plant capacity, yield and product quality can be improved and the energy expenditure reduced. Therefore, concentration measurements as control parameter of the system play a decisive role. Additional central themes are also plant safety and environmental protection. The online analytics play an increasingly important role for the efficient operation of the plant through proven measurements with low amortization times of only several months.

Inertization

Many storage and production processes require controlled and highly regulated gas atmospheres. Oxygen is frequently an undesired component due to its reactivity. During inertization, the atmospheric oxygen is replaced by inert gases. This process is applied, for example, during the storage and transport of perishable goods or for the prevention of the formation of explosive gas mixtures (explosion protection).

Fertilizer production

Fertilizers are inorganic bulk chemicals for use in agriculture which deliver valuable nutrients for all types of crops. The fertilizer market is profiting from the steady growth of the world population. However, the production volume must be adjusted to local demand and the right product mixture must be offered with the optimal quality. Ammonia, phosphates and potassium salts form the basis for fertilizer. It also requires intermediate products such as nitric acid, sulfuric acid and phosphoric acid. The corrosive and highly reactive properties of these substances pose a great challenge for all system parts. SICK offers a range of optimal solutions for process and emission applications.

Other fields of application

The industries listed are only a small selection of the application range. In many other application areas, the gas composition is a decisive parameter.
Other fields are, for example:

- Pharmaceutical plants
- Air separation facilities
- Process monitoring in enzyme production
- System control of composting plants
- Process monitoring of landfill gas and bio fermenters
- Chlorine chemistry

TECHNOLOGIES

In-situ gas analysis

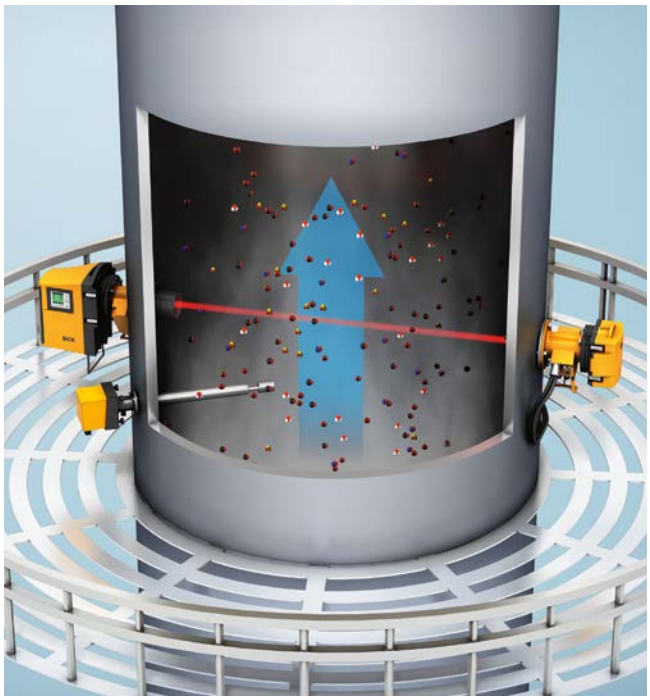
Thanks to SICK's innovative in-situ measurement technology, the measuring devices can be mounted at the measurement location directly in the duct through which the gas flows. This device solution features minimal maintenance requirements and very short response times.

SICK provides two in-situ versions

- Cross-duct version
  - for representative measurement results across the entire duct cross-section
- Measuring probes version
  - optimized for single-sided installation allowing simple integration into an extremely varied range of system conditions. For example, overpressure, wet gases or very high test gas concentrations or dust loads.

Advantages

- Continuous and direct measurement, no sampling
- True measurement results, detection of transient concentration fluctuations
- Cross-duct version for representative measurement results or measuring probe version for simple installation
- GMP measuring probe with open measuring gap or GPP gas diffusion probe



Extractive gas analysis

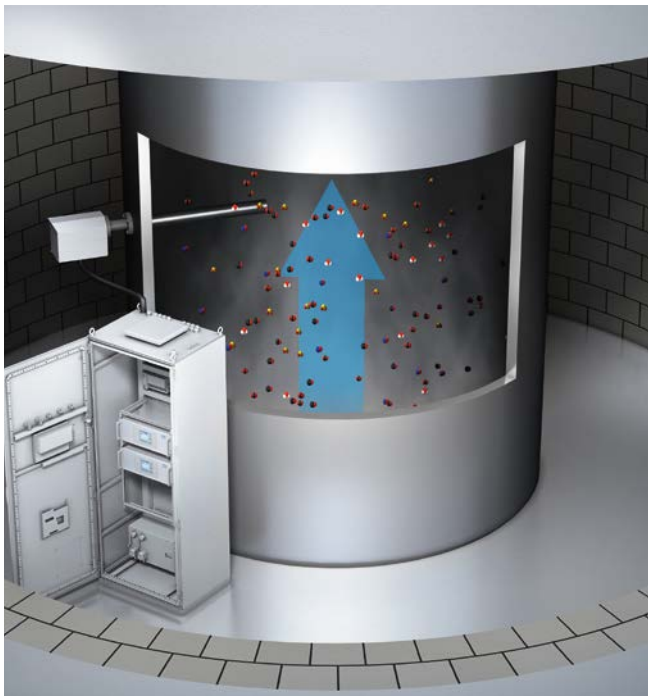
SICK's extractive gas analyzers can be used in a broad range of applications. A partial gas flow is extracted from the gas duct through selected probes, prepared and fed to the analyzer module under constant conditions. The entire gas treatment from the extraction and processing to the analysis is optimally designed for the measuring task.

Two variants of measurement technology are available

- Hot/wet extractive measurement technology
  - All components that come into contact with the test gas are heated and kept above the dew point. The analysis is done under constantly hot measurement conditions and yields accurate results, even with very narrow measuring ranges. Ideal for detection of multiple gas components as well as water-soluble components such as HCl, HF or NH_3.
- Cold/dry extractive measurement technology
  - The gas sampling is optionally designed with a heated or unheated test gas line. Gas drying is achieved with a high-performance gas cooler. The "cold" measurement is handled by the analyzer.

Advantages

- Configurable analyzer modules for a wide range of applications
- Customized solutions designed for numerous possible measuring components
- Accurate and reliable measurement results
- Detection of aggressive, corrosive or combustible gases



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MEASUREMENT PRINCIPLES

IR photometry

Non-dispersive photometer principle

A radiation source sends light through a measurement cell. Interference and gas filters swiveled into the beam path on filter wheels then select the desired measurement and reference wavelengths. The highly precise detector receives the consecutive measurement and reference radiation. By offsetting the two signals, the photometer determines the extinction, which is largely independent of the changes in the optical properties of the photometer. This results in high long-term stability and reproducibility of the measured values. After possible disturbances have been corrected, the determined extinction is converted into a concentration value via the linearization function.

TDLS measurement principle

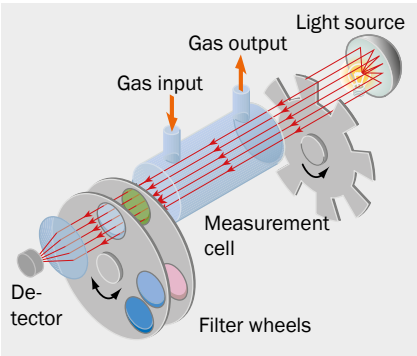
Tunable diode laser spectroscopy

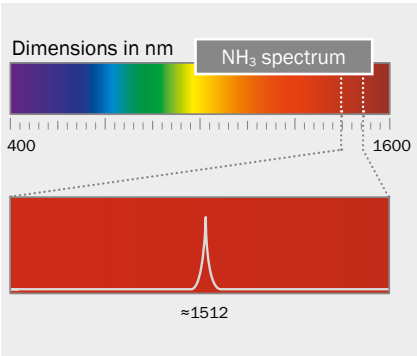
A sender's laser beam is sent through the sample gas to a reflector. From there, it is reflected to a highly sensitive detector (photo diode) in a sender/receiver unit. The wavelength of the laser diode is adjusted to a spectral line of the measuring gas component. This is scanned by modulating the wavelength and recorded by the photo diode of the detector. A signal evaluation then provides the gas concentration based on the wavelength-specific absorption of the measurement signal. The TDLS measurement principle therefore allows gas components in a gas mixture to be measured selectively.

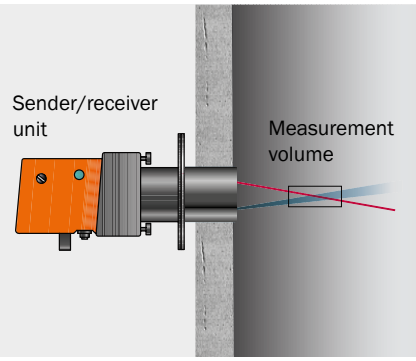
Scattered light backward

Dust measurement through laser-based backscattering

Even if the dust concentrations are very low, the measurement principle of SICK's laser-based backscattering detects the relevant values with great accuracy. A laser diode irradiates the dust particles in the measurement medium with modulated light in the visible spectrum. A highly sensitive detector detects the light scattered by the particles and transmits the measurement signal to an evaluation unit. The compensation for background radiation and ambient light, automated checking of the zero point and reference point, as well as a check for contamination mean the system yields stable and reproducible measurement results.







Overview of all measurement principles and evaluation methods

- Tunable diode laser spectroscopy (TDLS)
- Electrochemical cell
- Flame ionization detection (FID)
- FTIR spectroscopy
- Gas filter correlation
- Gravimetric analysis
- Interference filter correlation
- Scattered light backward
- Scattered light forward
- NDIR spectroscopy
- NDUV spectroscopy
- Paramagnetic dumbbell principle
- Temperature: PT1000, pressure: piezoresistive
- Transmittance measurement
- Ultrasonic transit time difference measurement
- UV spectroscopy
- Thermal conductivity measurement
- Zeeman atomic absorption spectroscopy
- Zirconium dioxide sensor

EVERYTHING FROM STAND-ALONE DEVICES TO COMPLETE ANALYZER SYSTEMS

SICK is able to supply application-oriented solutions through a combination of its extensive product range of analyzers and comprehensive experience. In addition to custom designs, there are also cost-optimized system housings, compact plug-and-play analyzers as well as complete systems for application-specific measuring tasks available. Moreover, we also plan, manufacture and supply complete analyzer systems such as ready-to-use analyzer containers, including all peripheral devices and commissioning.

The performance of an analyzer system depends not only on the quality of the analyzer used, it also depends significantly on the correct design of the sampling and preparation system. A precise matching of the analyzer to the process conditions is ensured in the application laboratories. For the optimal function, the analyzer is dependent on the interaction with the attached components such as sampling and preparation. Based on the process, the best-possible combination of analyzer and supporting periphery to the system is designed to be compatible and connectable. SICK handles the implementation of the entire analyzer system to allow the plant operator to focus on the realization of an efficient process.

TRANSIC100LP gas transmitter

Gas transmitters must be able to supply reliable process data directly on site under harsh process conditions even in potentially dangerous material concentrations. Reliable measurement procedures are needed here. With the TRANSIC100LP, SICK is introducing its own intrinsically safe laser measurement technology into the world of O_2 process transmitters, also suitable for explosion proof areas.

TRANSIC100LP
In-situ version in Ex zones 0, 1, 2, 21 (Class I, Div 2)
➜ Page 21

TRANSIC Extractive gas transmitter

TRANSIC Extractive is opening up new possibilities with respect to oxygen measurement. It is now possible to carry out calibrations and operational checks with an additional air supply without dismantling the device, as the procedures can be performed outside the monitored area. If required, TRANSIC Extractive can also keep an eye on multiple measurement points.

Thanks to the programmable measurement point switchover feature, multiple measurement points can be reliably monitored in turn.

TRANSIC Extractive
Extractive version for applications with high temperatures and pressures
➜ Page 26

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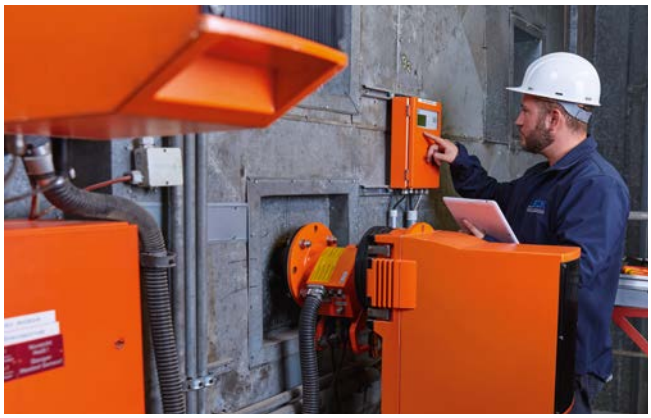
GM32 in-situ gas analyzer

In-situ measurement sites are realized when measurements need to be especially fast or where a distortion of the gas matrix can easily occur. The GM32 in-situ analyzer measures directly in the process and is also certified for use in explosion-hazardous areas.



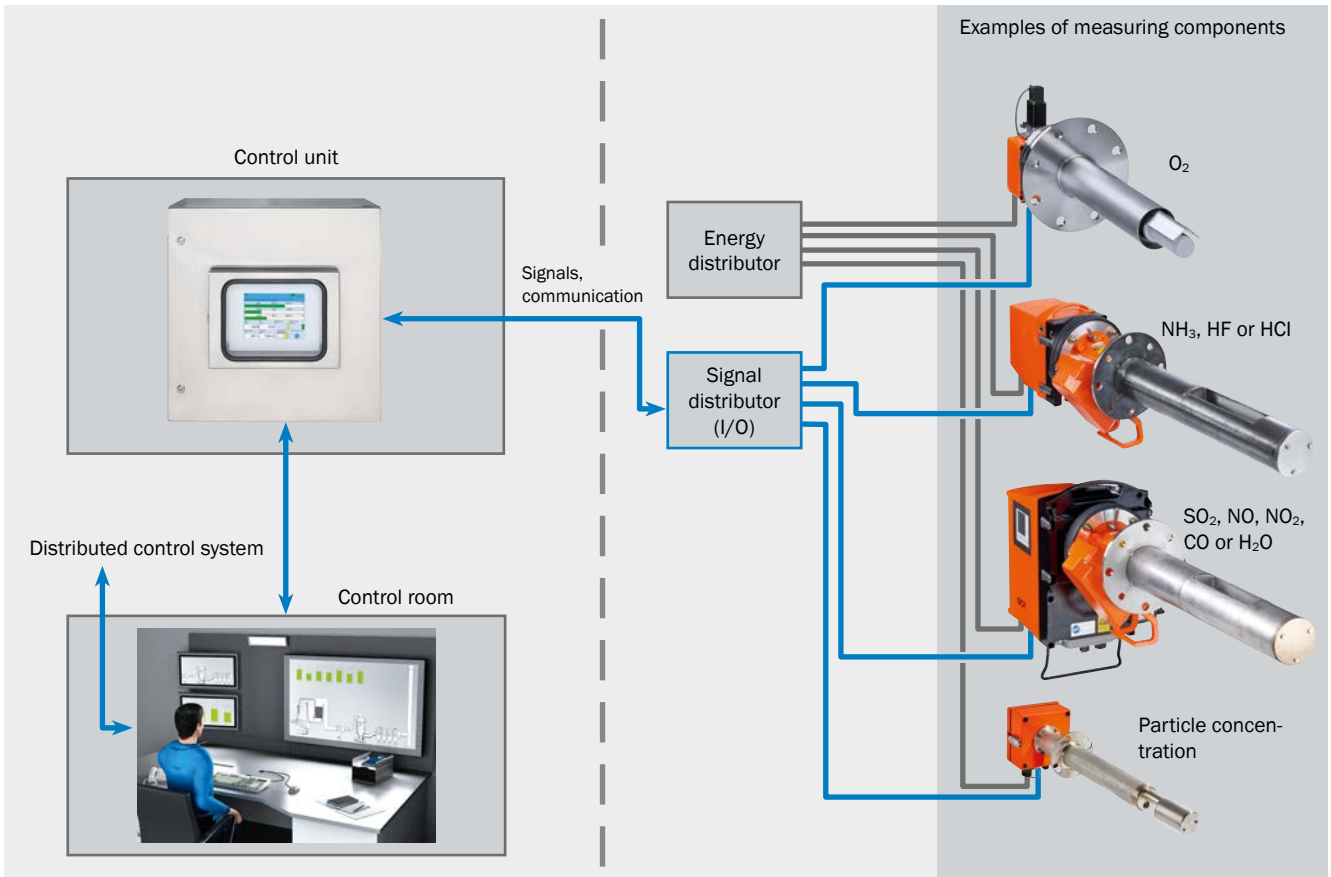
GM32 Ex
Cross-duct version for Ex applications with zone 2
➜ Page 20

A combination of in-situ devices

To combine the advantages of in-situ technology for a large number of measuring components, SICK offers solutions combining in-situ analyzers and dust and volume flow measuring devices. Communication and control for the distributed control system/peripheral system components are carried out by a single interface.

Your benefits:

- 1 interface for several measuring devices
- Quick measurements, representative measured values
- True measurement results by measuring directly in the process in the flow-through channel
- Accurate measurement, even of transient concentration fluctuations



GMS800 extractive gas analyzers

The GMS800 cold/dry extractive gas analyzers facilitate the realization of measuring tasks both in tough industrial environments as well as in the Ex zones 1 and 2 (ATEX). Individual device versions for individual measurement sites and complete solutions for different applications or multiple analyzer lines are configured and supplied as ready-to-use systems. These, both for process measurements as well as emission measurements, are available as complete analyzer cabinets or containers. Depending on the requirements, the modern analyzers are available in wall-mount housing (Type GMS815P), in Ex-d housing (Type GMS820P) or in a closed sheet-steel housing (Type GMS840).

GMS820P
Pressure-resistant encapsulated housing for use in Ex zone 1
➜ Page 22

GMS815P
Wall housing, can optionally be used in Ex zones 1 and 2
➜ Page 22

GMS840
Wall housing, can optionally be used in Ex zone 2 (Class I, Div 2)
➜ Page 22

Multi-component analyzer system

SICK offers complete analyzer systems which, in addition to the gas analyzer, include a sampling system and gas conditioner. They are very straightforward to handle and easy to install and commission on site. Additionally equipped with state-of-the-art communication options, such as Ethernet, Modbus or Meeting Point Router MPR-LAN, these systems are suitable for modern communication and equipped for future requirements.

Designed as complete analyzer systems, they are equipped with high-quality serial modules and components that can be optimally tailored to the specific requirements thanks to their configurable design.

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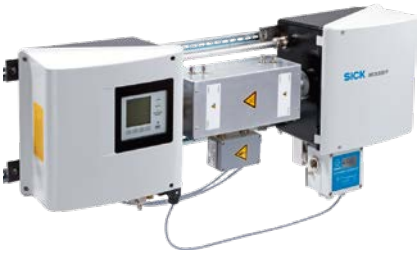
MCS300P extractive process gas analyzer

The MCS300P process gas analyzer is suitable for a variety of application possibilities (gases and fluids) and features very low maintenance requirements, high reliability and long-term stability. The explosion-protected version of the MCS300P Ex is particularly suitable for process applications. To prevent a drop below the dew point, SICK also integrates this analyzer into complete hot/wet extractive analyzer systems if needed.



MCS300P Ex
Wall housing, can optionally be used in Ex zones 1 and 2
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Ready-to-use analyzer containers

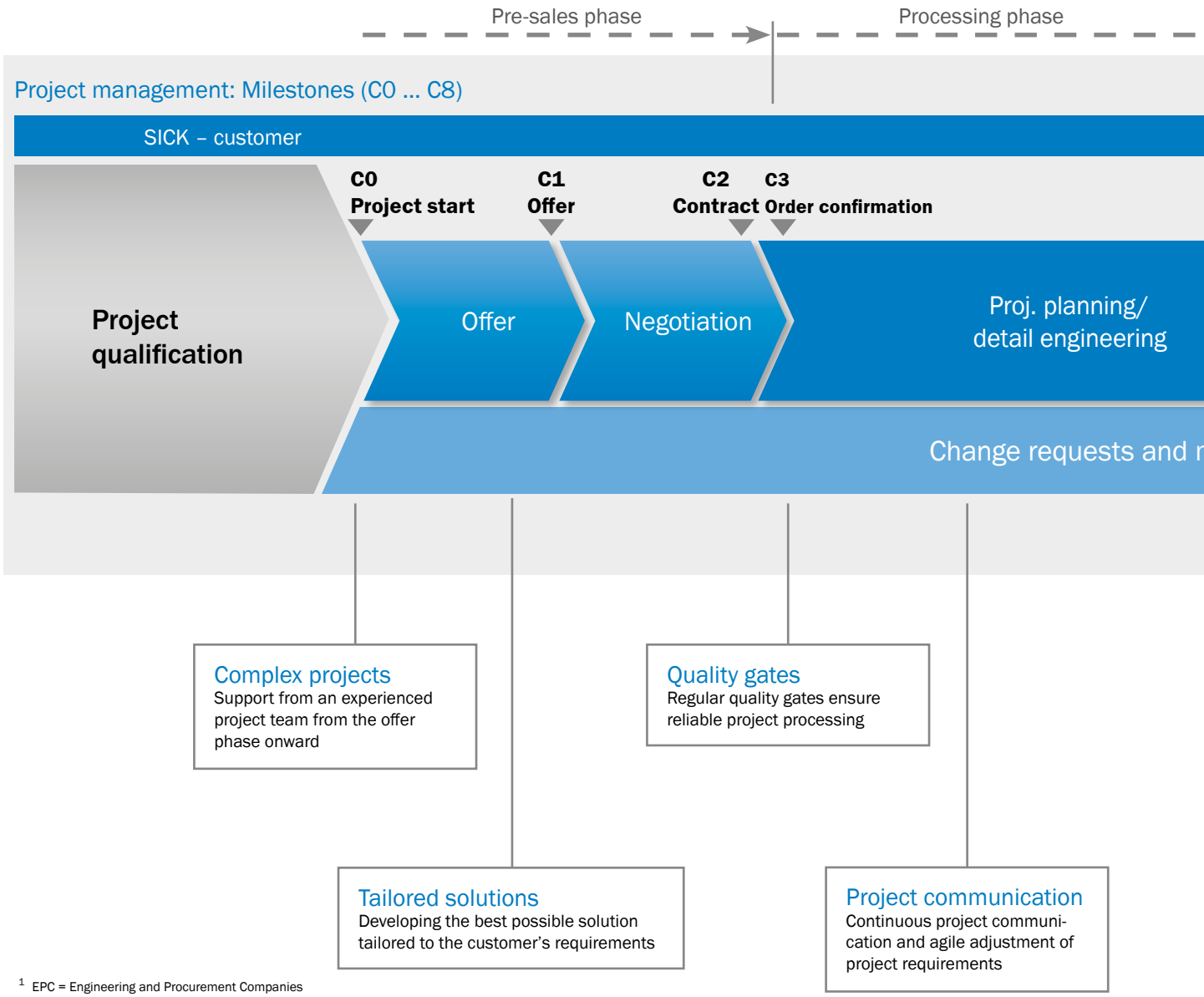
Whether they are used for emissions or process measurements, the analyzers should be installed in the immediate vicinity of the measurement location. Analyzer containers are used to protect the analyzers, measuring devices as well as signal and data processing instruments against harsh on-site conditions in the industrial plant. Upon request, SICK offers climate-controlled containers that are designed for sea freight and therefore facilitate transport.

CUSTOMER PROJECT MANAGEMENT

In order to ensure that the best possible solution is provided for complex customer requirements, SICK focuses on project management activities. Based on internationally recognized management methods and years of expert experience, SICK offers a standardized procedure (Customer Project Management, CPM) for processing customer projects, even on an international level.

SICK's international project teams supply customized solutions around the world.

SICK provides experienced project managers to ensure a successful and efficient project process. They ensure a better understanding and implementation of the customer requirements. From evaluating the requirements to realizing and completing the project: Our project managers use their extensive expertise to support the respective measures and customers throughout the entire project process.



[1] EPC = Engineering and Procurement Companies

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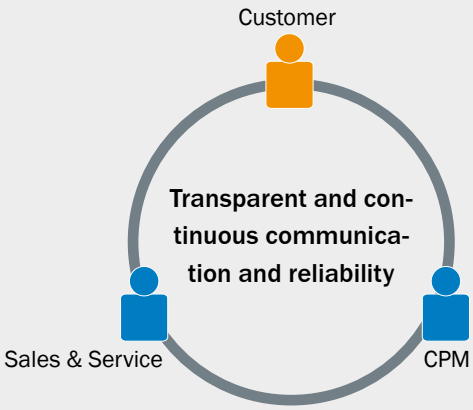
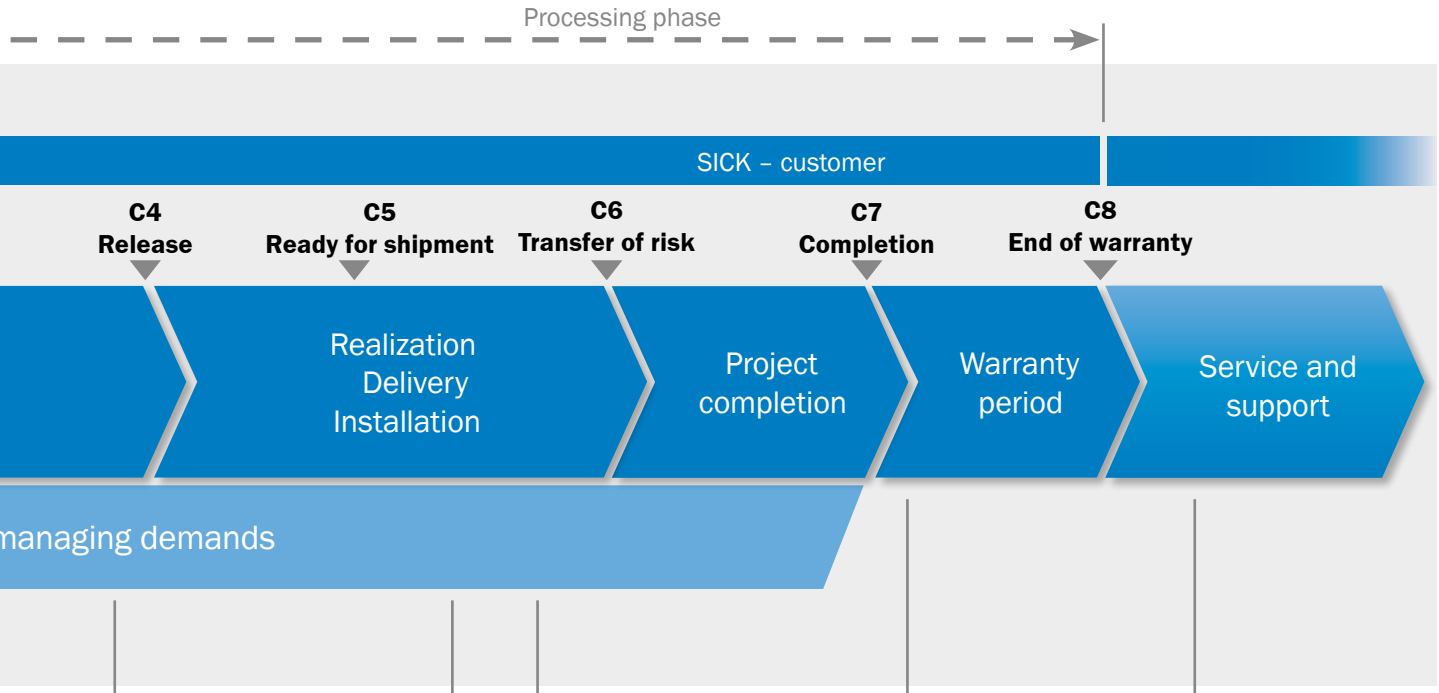
Our strengths – your benefits

- **Our strength**
  International project teams with many years of project experience in a global network
- **Our goal**
  Professional advice and responsible processing throughout the entire project
- **Your advantage**
  From the first contact to the fulfillment of all project goals – SICK as a professional end-to-end partner





Project documentation
Comprehensive project documentation according to customer requirements (EPC standard[1])

Site acceptance test (SAT)
Acceptance and thorough check of the devices and systems at the customer's installation site (site acceptance test)

Contacts
Specified contacts during the warranty period and after project completion

Factory acceptance test (FAT)
Thorough check for completeness of the devices and systems at the factory (factory acceptance test). Upon request, functional test with documented test results (test log, acceptance log).

Handover on site
Handover of the project details to the service organizations for after-sales support.

CUSTOMER-SPECIFIC COMMUNICATION

Ideally, all data, measured values and parameters will always be available for evaluation and can be conveniently viewed and adjusted. This is precisely why standardized data communication for digital control systems and the company management level are available when SICK products are used. Moreover, this is available from the system network across systems. This makes it possible to have convenient access to installations even in remote areas.

Protocols

SICK OPC server

OPC technology is used to exchange data between field devices and Windows-based applications. OPC is suitable only for non-deterministic communication.

The free SOPAS OPC server from SICK follows the OPC-DA specification and therefore can be used on Windows operating systems. In addition to the standard data types, our OPC server also supports methods that enable unlimited access to the SICK sensors from an HMI[1)].

Modbus TCP/RTU

Modbus has become established alongside other fieldbus protocols as a de facto standard for industrial communication. A stable specification and a widely available base technology enable fast and reliable data transfer.

Compared to other fieldbus concepts, Modbus is supported by almost all device manufacturers and is widely accepted among users. Further advantages include low investment costs and little need for training.

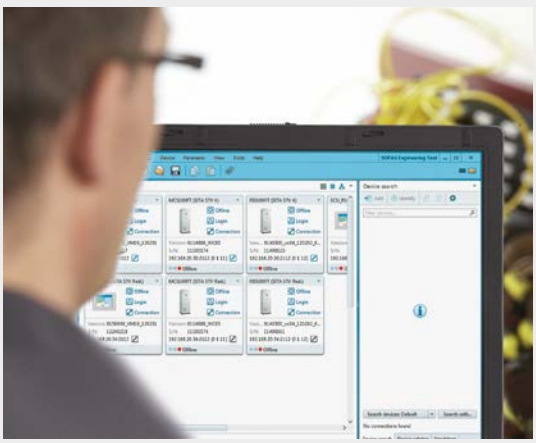
Analog and digital signals and other protocols

Of course the measuring devices and analyzer systems from SICK also include analog and digital signals and interfaces.

Additional protocols, such as PROFIBUS DP, are available upon request.

[1)] HMI = Human Machine Interface.

SICK SOPAS ET – powerful configuration and diagnostic software



- Available as a free download
- Enables user-friendly configuration, diagnostics and maintenance of SICK devices
- Projects with multiple SICK devices can be easily managed and edited
- Provides an intuitive user interface and a structured device catalog
- Search for and find all connected devices with just a single click
- Always provides an optimum overview of the project with various viewing options (panels, lists, topologies)
- Only one data format for project management and data set management

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DRIVING YOUR INDUSTRY 4WARD – MAKING GREAT STRIDES INTO THE FUTURE

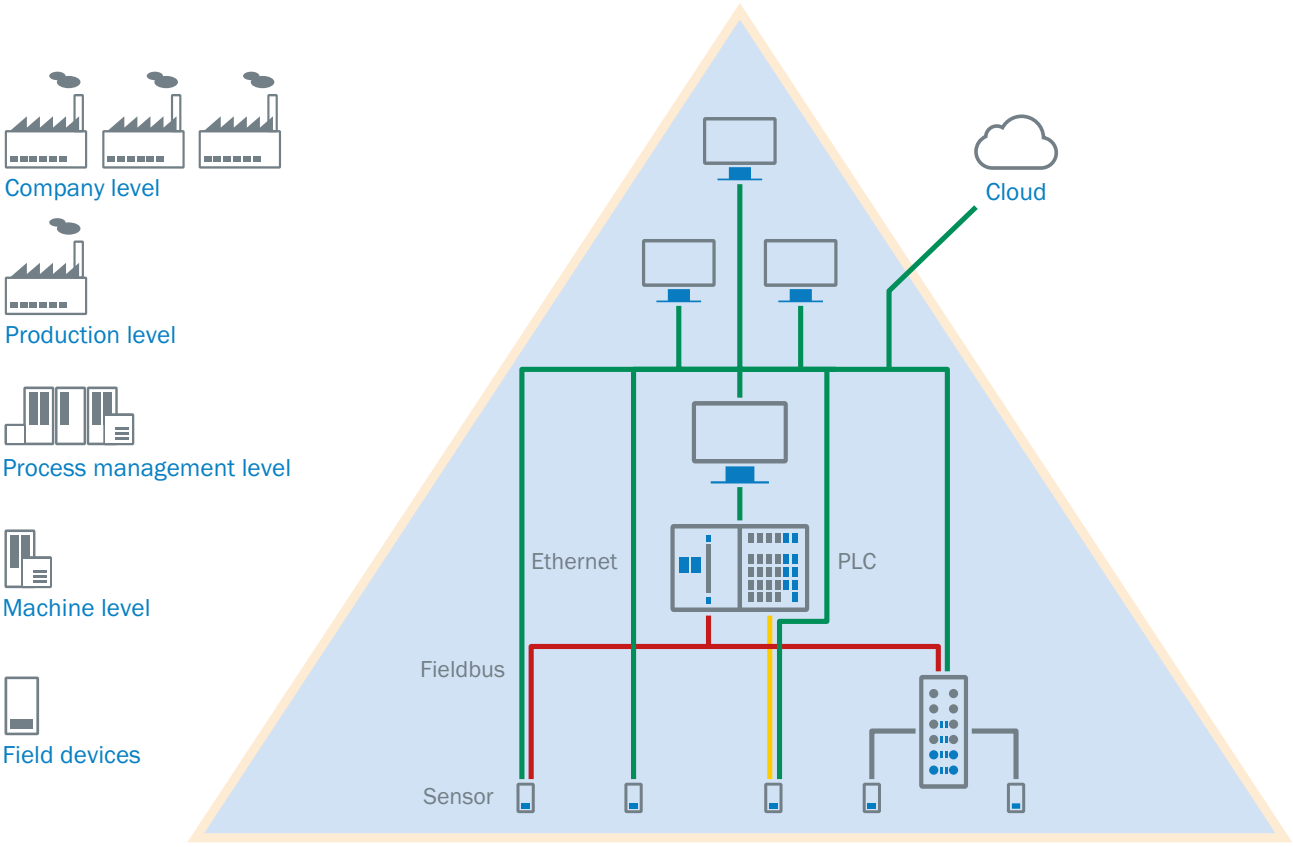
Industry 4.0 also offers new opportunities when it comes to data-based analysis and process measurement technology: Reliable data which is communicated in real time is essential, as deviations, e.g., in the case of emission levels, can lead to severe consequences. SICK thus provides intelligent solutions for waste incineration plants, power, steel and cement plants, oil and gas industry applications, as well as for chemical and petrochemical plants. Together, these solutions make an important contribution to protecting our environment.

Safe remote access

As it moves toward Industry 4.0, SICK is focusing particularly on data management and remote maintenance services in addition to its products: Quick and secure Internet connections, tamperproof authentication methods, and intelligent sensors and controls are the cornerstone for individualized online support for sensors and plants. Industry 4.0 increases the potential of these networked services. Fast and secure networks not only allow specialists to intervene for maintenance purposes, but also enable them to provide continuous support for an application remotely and monitor processes in real time.

Reliable data for networked process control

The emissions data management solutions from SICK constantly capture, store, visualize and evaluate emissions data. For gas measurements, SICK offers options for gas volume conversion, event logging, parameter logging and reports using state-of-the-art technology. Each module combines high-precision measurement technology, fast digital signal processing, abundant processing power, versatile data communication and high storage capacity.



SICK LIFETIME SERVICES – THE RIGHT SERVICE FOR ANYTIME AND EVERYWHERE

With SICK at your side, you will have a service partner that you can rely on. During all phases of the product life cycle – and always in your neighborhood.

Every process automation system is different, and places differing requirements on the support services required. Thanks to our modular service concept, you can create your own individualized service contract, and also have flexibility in setting the contract period. This way you can ensure that the support services are tailored to your specific needs, and that you will only incur those costs that are absolutely necessary.

FLEXIBILITY AND INDIVIDUALIZED SERVICE CONCEPTS

An important aspect of SICK LifeTime Services is the modular service concept, which enables every company to put together its own individualized service contract from a selection of standardized service modules. SICK's primary concern is always to ensure the optimal performance and best possible availability of your measurement systems.

Three building blocks make up the foundation of every service contract from SICK: prevention, availability and quality assurance. These are individually constructed from suitable service modules based on your service strategy. Every tailored-made contract assembled by this means can also be supplemented and expanded with optional components.

With more than 600 service technicians worldwide, SICK offers you:

- A complete service portfolio from a single source
- Globally available service network – on the mainland or off the coast
- Competent product and servicing training
- Assistance and advice with official inspections
- Maximum peace of mind, even outside regular office hours (24 hours per day, 7 days a week), via remote maintenance or on-site
- Round-the-clock service to guarantee the availability of your measuring devices

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OPTIMUM AVAILABILITY AND TROUBLE-FREE OPERATION – WITH THE DIGITAL REMOTE SERVICES FROM SICK

Quick, qualified, and comprehensive advice and troubleshooting by competent experts delivered online, with no expensive travel costs or significant time delays: This is SICK's comprehensive online service offering for individualized sensor or system support.

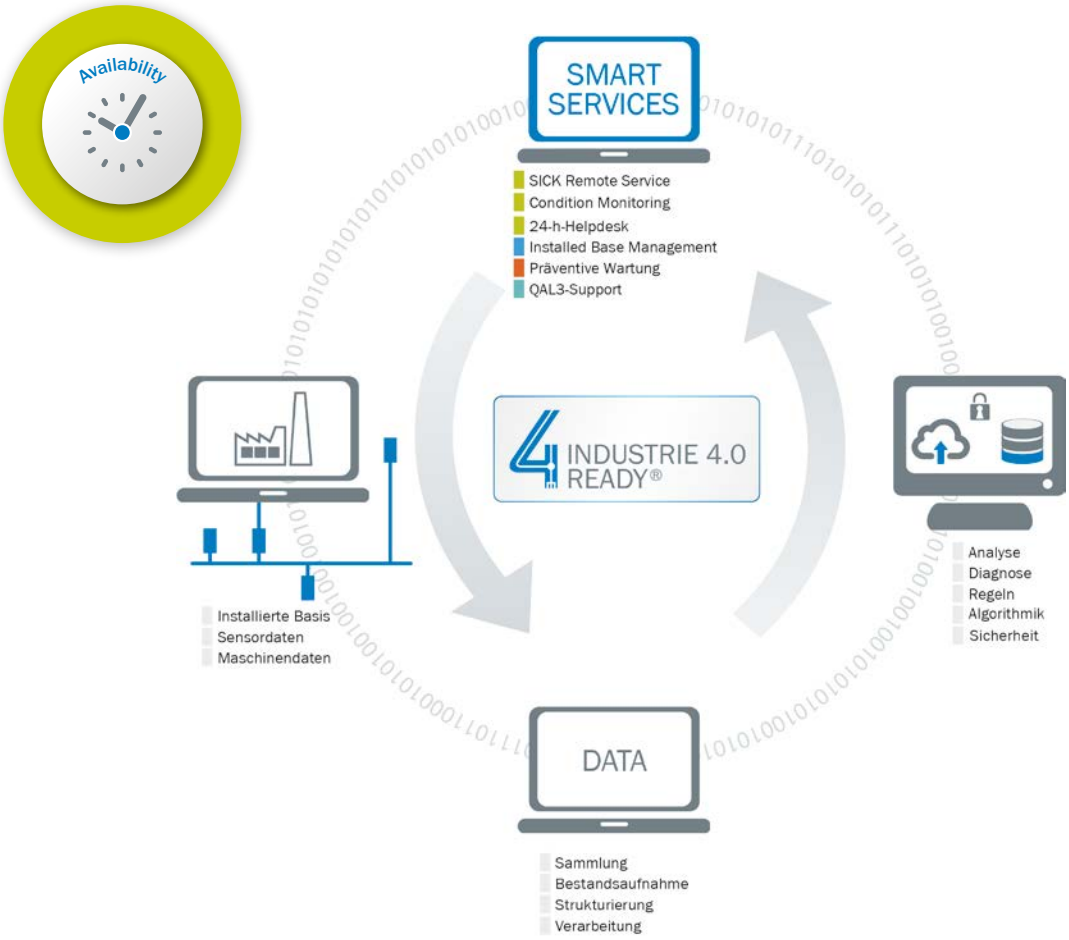
On the path to Industry 4.0 with SICK

The 24-hour helpdesk, remote service, and condition monitoring service modules combine to form a strong team: they enable an efficient and seamless support of your machines and systems.

The basis for this is the data that the intelligent sensors from SICK deliver, which can be evaluated, checked or further processed anywhere in the world. The connection to the web-based SICK Remote Service service platform is established exclusively by customers, and is always made via highly encrypted data channels and using the HTTPS and SSH authentication standards.

The digital remote services from SICK are therefore modern, cost-effective and future-proof in keeping with the Industry 4.0 approach.

The economic value-add of digital remote services can be quickly recognized financially: with just a single click, remote maintenance can be initiated independent of time and location, and faults evaluated immediately after they arise. This saves no end of time and money. High plant availability, improved first time fix rate, and reduced unplanned maintenance work will maintain your productivity at the highest levels.



PRODUCT SELECTION

	Measurement method		Ex protection										Fields of application						
	In-situ	Extractive	ATEX zone 0	ATEX zone 1	ATEX zone 2	ATEX zone 21	ATEX zone 22	Type of gas	Temperature class	IEC Ex	Class I, Division 1	Class I Division 2	Power plants	Waste incineration	Cement production	Metals and steel production	Chemicals, petrochemicals and refineries	Inertization	Fertilizer production
Gas analyzers																			
GM32	■												■	■	■	■			■
GM32 Ex	■				■			IIC	T3	■			■	■	■	■	■		■
GM700	■												■	■	■	■			■
GM700 Ex	■				■			IIC	T4				■	■	■	■	■		■
TRANSIC100LP	■		■	■	■	■		IIB, IIIC	T4, T85 °C	■		■				■		■	
ZIRKOR200	■												■	■	■	■	■		■
GMS800[3]		■		■	■			II, IIC	T4, T6	■		■	■		■	■	■		
MCS300P		■												■	■	■	■		■
MCS300P Ex		■		■	■			IIC	T4					■	■	■	■		■
GME700		■											■	■		■			
EuroFID3010 (LEL)		■		■				$IIB+H_2$								■			
Analyzer solutions																			
MCS100E HW		■											■	■	■				
MCS300P HW		■		■										■	■	■	■		■
System solutions																			
MKAS [4]		■											■	■	■				
TOCOR700		■												■			■		
METPAX300		■	■	■				IIB, IIC, IIIC	T4, T85 °C	■						■			
Dust measuring devices																			
DUSTHUNTER SP100	■												■	■	■	■	■		
DUSTHUNTER SP100 Ex	■					■	■	IIC, IIIC	T6, T85 °C				■	■	■	■	■	■	■
FWE200DH		■											■	■	■	■	■		■
Ultrasonic gas flow measuring devices																			
FLOWSIC100 Flare	■			■	■						■	■	■	■	■	■	■	■	■
FLOWSIC100 Process	■			■	■						■	■	■	■	■	■	■	■	■

[1] VOC = Volatile Organic Compounds.
[2] TOC = Total Organic Compounds.
[3] Depending on analyzer module used.
[4] Depending on analyzer used.

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	Measuring components																		Communication, protocols					Page
	CO	NO	NO_2	SO_2	NH_3	CO_2	N_2O	HCl	HF	CH_4	IR components	Cl	H_2O	O_2	Hg	VOC [1] / TOC [2]	Dust	Flow	Modbus TCP	OPC	Modbus RTU	PROFIBUS DP	Meeting Point Router MPR- LAN	
		■	■	■	■														■	■	■		■	→ 20
		■	■	■	■														■	■	■		■	→ 20
					■			■	■													■	■	→ 20
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														■									■	→ 21
	■	■	■	■	■	■	■			■	■	■		■					■	■	■		■	→ 22
	■	■	■	■	■	■	■	■	■	■	■	■	■	■					■	■			■	→ 22
	■	■	■	■	■	■	■	■	■	■	■	■	■	■						■			■	→ 22
					■			■	■													■	■	→ 23
																■ [1]								→ 23
	■	■	■	■	■	■	■	■		■	■	■		■					■	■			■	→ 24
	■	■	■	■	■	■	■	■		■	■	■	■	■					■	■			■	→ 24
	■	■	■	■		■	■			■	■	■		■					■	■	■		■	→ 26
																■ [2]								→ 26
	■	■	■	■	■	■	■	■		■			■	■		■ [1]			■	■	■		■	→ 27
																	■		■	■	■	■	■	→ 28
																	■		■	■	■	■	■	→ 28
																	■		■	■	■	■		→ 28
																		■	■	■	■	■	■	→ 29
																		■	■	■	■	■	■	→ 29

IN-SITU GAS ANALYZERS

		
	GM32, GM32 Ex	**GM700, GM700 Ex**
	Measure aggressive gases directly and quickly – even in hazardous areas	Efficient process analysis – even under difficult conditions
Technical data		
Measurands	NO, NO_2, NH_3, SO_2, CH_3SH, $(CH_3)_2S$, $(CH_3)_2S_2$, H_2S, TRS	NH_3, HF, HCl, H_2O, NH_3, H_2O
Measurement principles	Differential optical absorption spectroscopy (DOAS), chemometric data evaluation (CDE)	Tunable diode laser spectroscopy (TDLS)
Process temperature	GMP measuring probe: ≤ +550 °C GPP measuring probe with ceramic filter: ≤ +430 °C; GPP measuring probe with Teflon filter: ≤ +200 °C Cross-duct: ≤ +650 °C	GMP measuring probe, standard: –40 °C ... +430 °C GMP measuring probe, Ex version: –40 °C ... +200 °C GPP measuring probe, HCl: +130 °C ... +430 °C GPP measuring probe: NH_3: +300 °C ... +430 °C Cross-duct: ≤ +250 °C, with heated purge air
Process pressure	GMP measuring probe: –60 hPa ... 60 hPa; relative GPP measuring probe: –60 hPa ... 200 hPa; relative Cross-duct: –60 hPa ... 200 hPa	GMP measuring probe: depending on purge air unit GPP measuring probe: 120 hPa
Hazardous area	Nonhazardous areas Hazardous area: Ex zone 2 (Ex zone 1, Class 1 Division 2)	Nonhazardous areas Hazardous area: Ex zone 2
Enclosure rating	IP65, IP69K, IP54	IP65
Device versions	Cross-duct version, measuring probes version	Cross-duct version, measuring probes version
Test functions	Internal zero point check, control cycle for zero and reference point acc. to QAL3 Internal zero and reference point check	Automated control cycle for zero and reference point (only for NH_3 and HCl)
At a glance		
	• Direct, fast in-situ measurement • No gas sampling, no gas transport, no gas conditioning • Up to eight measurands at the same time, plus process temperature and pressure • DOAS and CDE evaluation process • Numerous independent measuring ranges with consistent accuracy • Automated self-test function (QAL3) without test gases • Overpressure encapsulated version for Ex zones 1 and 2	• High selectivity due to high spectral resolution • Short response times • No calibration required • No moving parts: minimal wear and tear • No gas sampling or conditioning required • Overpressure encapsulated version for Ex zone 2
Detailed information	➜ www.sick.com/GM32	➜ www.sick.com/GM700

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	TRANSIC100LP	ZIRKOR200
		
	The right nose for oxygen	Already has the innovation in the cells
	O_2	O_2
	Tunable diode laser spectroscopy (TDLS)	Zirconium dioxide sensor
	–20 °C ... +80 °C	Measuring probe: ≤ +600 °C Measuring probe with cooling protection tube: ≤ +1,600 °C
	800 hPa ... 1,400 hPa	–100 hPa ... 100 hPa
	Nonhazardous areas Hazardous area: Ex zones 0, 1, 2, 21 (Class I, Division 2)	Nonhazardous areas
	IP66	IP65, IP66
	Measuring probes version, version with measurement cell FM version, Ex version	Measuring probes version
	Adjustment with ambient air or test gases Contamination check	Semi-automated and automated adjustment (1-point or 2-point adjustment)
	• O_2 transmitter based on high-performance laser spectroscopy (TDLS) • For use in explosion-hazardous areas (FM, ATEX and IECEx approvals) • Measurement directly in-situ or extractive using a sample gas cell (option) • Designed for heavy-duty industrial applications • Compact design and easy to operate • Long-term stability • No moving parts	• Measurement cell with extremely long service life due to innovative protection mechanism • Measurement cell self-monitoring • Fully automated adjustment mechanism integrated into the control unit • Version for high temperatures available • ZIRKOR remote app for remote access to analyzer • Very short response time • Suitability-tested according to EN 15267 • Easy connection of distributed control systems
	➜ www.sick.com/TRANSIC100LP	➜ www.sick.com/ZIRKOR200

EXTRACTIVE GAS ANALYZERS

		
	GMS800	**MCS300P, MCS300P Ex**
	Tailor-made gas analysis for process and emission monitoring	Simultaneous process monitoring of up to 6 measuring components
Technical data		
Measurands	Ar, CH_4, CH_3OH, C_2H_2, $C_2H_2F_4$, C_2H_4, C_3H_6, C_3H_8, C_4H_6, Cl_2, CO, CO_2, $COCl_2$, COS, CS_2, H_2, H_2S, He, NH_3, NO, N_2O, NO_2, O_2, SF_6, SO_2, additional components available on request	Br_2, CCl_4, C_2Cl_4, CCl_2F_2, C_3F_6, CH_4, CO, CO_2, $COCl_2$, HCl, HCN, HF, H_2O, NH_3, NO, N_2O, NO_2, SO_2, additional IR-active/VIS-active gases and fluids on request
Measurement principles	NDUV spectroscopy, UVRA spectroscopy, NDIR spectroscopy, electrochemical cell, paramagnetic dumbbell principle, thermal conductivity measurement	Interference filter correlation, Gas filter correlation
Process temperature	Input analyzer: 0 °C ... +45 °C	+50 °C ... +200 °C
Process pressure	Hosed gas lines: –200 hPa ... 300 hPa Piped gas lines: –200 hPa ... 1,000 hPa	0.8 bar ... 60 bar
Hazardous area	Nonhazardous areas Hazardous area: Ex zones 1, 2 (Class 1, Division 2)	Nonhazardous areas Hazardous area: Ex zones 1, 2
Enclosure rating	IP40, IP65, IP66	IP65 Measuring cuvette depending on version
Device versions	19" rack, wall mounting housing, pressure-resistant encapsulated housing	Version for horizontal and vertical wall mounting
Test functions	Self-test and fault diagnosis	Automated control cycle for zero and reference point
At a glance		
	• 6 different analyzer modules: DEFOR (NDUV, UVRAS), MULTOR (NDIR), OXOR-E (electrochemical O_2), OXOR-P (paramagnetic O_2), THERMOR (TC) and UNOR (NDIR) • 4 different types of housing • Gas module with sample gas pump and/or control sensors • Housing type for quick and easy integration in analyzer systems • Remote diagnosis via Ethernet with SOPAS ET software	• Simultaneous measurement of up to 6 components • Process cells up to 60 bar and 200 °C • Automated sample point switching • Integrated adjustment unit (optional) • Safety devices for measurement of toxic or flammable mixtures • Extended operation via PC and SOPAS ET software • Flexible I/O module system
Detailed information	➜ www.sick.com/GMS800	➜ www.sick.com/MCS300P

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	GME700	**EuroFID3010 (LEL)**
	Sophisticated process analysis “brought into line”	Reliable LEL monitoring in processes
	HCl, HF, NH_3, H_2O	% LEL
	Tunable diode laser spectroscopy (TDLS)	Flame ionization detection
	+50 °C ... +210 °C	≤ +350 °C
	600 hPa ... 1,200 hPa	–50 hPa ... 50 hPa
	Nonhazardous areas	Nonhazardous areas Hazardous area: Ex zones 1
	IP20	IP22, IP65, IP20, IP65
	19" rack	Inline version Version for Ex zone 1
	Automated control cycle for zero and reference point	–
	• High selectivity due to high spectral resolution • No calibration required • No moving parts: minimal wear and tear • Heated multipath measurement cell • Hot-wet measurement technology	• Gas warning device for volatile organic compounds • Certified according to EN 50271 • Inline version for direct coupling to the process • Housing for use in Ex zones 1 and 2 as an option • Modular structure for flexible installation • Integrated dilution of sample gas • All gas paths are heated • No moving parts
	➜ www.sick.com/GME700	➜ www.sick.com/EUROFID3010

ANALYZER SOLUTIONS

MCS100E HW

Emission and raw gas monitoring with hot measuring technology

Technical data	
Measurands	CH_4, CO, CO_2, H_2O, HCl, N_2O, NH_3, NO, NO_2, O_2, SO_2
Measurement principles	Interference filter correlation, gas filter correlation, zirconium dioxide sensor
Process temperature	≤ +1,300 °C Depending on sample probe
Process temperature	≤ +220 °C
Process pressure	900 hPa ... 1,100 hPa Atmospheric
Hazardous area	Nonhazardous areas
Enclosure rating	IP43
Device version	Steel sheet cabinet
Test functions	Automated control cycle for zero and reference point Internal calibration filter for QAL3 drift test without test gas (option)

At a glance

- Extractive measurement of up to 8 IR-active gas components
- Additional oxygen and total hydrocarbon analyzer as option
- Gas lines heated throughout
- Sample gas infeed on gas sampling probe or analyzer
- Back-purging of gas sampling probe for filter cleaning
- Rapid measured gas exchange to minimize adsorption and desorption processes
- Automated sample point switching

Detailed information → www.sick.com/MCS100E_HW

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MCS300P HW

Simultaneous process monitoring of up to 6 measuring components

CO, CO_2, HCl, H_2O, NH_3, NO, NO_2, N_2O, SO_2, O_2
Interference filter correlation, gas filter correlation, zirconium dioxide sensor
≤ +1,300 °C Depending on sample probe
≤ +220 °C
800 hPa ... 1,200 hPa
Nonhazardous areas
IP43: Versions with NO_x converter (option)
Steel sheet cabinet
Automated control cycle for zero and reference point

- Simultaneous measurement of up to 6 components plus O_2
- Measurement gas flow monitoring and measurement gas pressure detection
- Temperature of the system components up to 220 °C
- Automated sample point switching for up to 8 sample points (optional)
- Automated adjustment to the zero and reference point
- Integrated adjustment of the device without test gas (optional)
- Extended operation via PC and SOPAS ET software
- Flexible I/O module system

➜ www.sick.com/MCS300P_HW

SYSTEM SOLUTIONS

		
	TRANSIC Extractive	**TOCOR700**
	Oxygen measurement for every application	Reliable monitoring of organic water pollutants
Technical data		
Measurands	O_2	C_{org} (TOC/TC)
Measurement principles	Tunable diode laser spectroscopy (TDLS)	TOC/TC measurement through thermal or UV oxidation of C to CO_2 with subsequent CO_2 measurement by means of NDIR photometry
Process temperature	–20 °C ... +200 °C Other temperatures on request	+5 °C ... +45 °C Other temperatures on request
Process pressure	800 hPa ... 50,000 hPa Higher pressures on request	900 hPa ... 1,100 hPa
Enclosure rating	IP66	–
Hazardous area	Nonhazardous areas Hazardous area: Ex zones 0, 1, 2, 21 (Class I, Division 2)	Nonhazardous areas Hazardous area: Ex zones 1, 2
Device versions	Version for wall mounting	Steel sheet cabinet
Test functions	Contamination check	Automated testing and adjustment with test gases Manual adjustment with test gases
At a glance		
	• Reliable measurement results, even in difficult measuring conditions and in contaminated gases • Minimal maintenance work due to slim gas conditioner • Can be used in explosion-hazardous areas • Easy to use and install • Low operating costs	• TOC determination according to official requirements • Flexible installation as it does not require a connection to expensive carrier gas and various Ex versions are available • Customized sample preparation adapted to the application for trend analysis or accurate value determination • Shorter downtimes during maintenance due to the rapid changeover function with a second thermal reactor
Detailed information	➜ www.sick.com/TRANSIC_Extractive	➜ www.sick.com/TOCOR700

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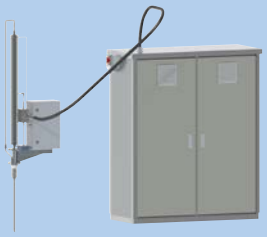
	MKAS	METPAX300
		
	Analyzer systems for process and emission-related applications	Increased efficiency and safety
	CO, CO_2, NO, NO_2, N_2O, O_2, SO_2 (depending on analyzer installed)	CO, CO_2, O_2, H_2O, H_2 (optional), VOC (optional), many other IR-active/VIS-active gases and fluids
	Depending on analyzer installed	Tunable diode laser spectroscopy (TDLS), interference filter correlation, gas filter correlation, flame ionization detection, thermal conductivity measurement
	0 °C ... +900 °C Depending on sample probe; other temperatures on request	≤ +1,750 °C Other temperatures on request
	–	800 hPa ... 15,000 hPa Higher pressures on request
	IP54, IP34	IP54 With additional dust protection
	Nonhazardous areas Ex version on request	Nonhazardous areas
	Steel sheet cabinet, glass-fiber reinforced plastic cabinet	Sheet steel or stainless steel control cabinet
	Manual (test gas infeed via hand valve) or automated (via solenoid valves), automated via sample probe	Adjustment with ambient air or test gases Contamination check
	• Due to the modular design, it can be adjusted individually to the measuring task • Use of highly proven system components ensures high reliability • Supplementary service packages available (incl. installation and commissioning)	• Early detection to prevent explosions which can arise due to water leakage or excessive CO levels in exhaust gas • Fine tuning of burners (ratio of CH_4 to O_2) • Reduces energy consumption through optimally adjusted O_2 injection and optimal CO combustion in the furnace • Accurate measurement of the CO/CO_2 ratio provides information on the carbon content in the melt • Accurate measurement of the ratio of CO to CO_2 and O_2 provides valuable information about the slag quality
	➜ www.sick.com/MKAS	➜ www.sick.com/METPAX300

DUST MEASURING DEVICES

		
	DUSTHUNTER SP100, SP100 Ex	**FWE200DH**
	Probe design with forward scattered light measurement	Reliable dust measurement in wet gases

Technical data		
Measurands	Scattered light intensity, dust concentration (according to gravimetric comparative measurements)	Scattered light intensity, dust concentration (according to gravimetric comparative measurements)
Measurement principles	Scattered light forward	Scattered light forward
Process temperature	–40 °C ... +220 °C, –15 °C ... +220 °C High temperature DHSP-T4xx: –40 °C ... +400 °C	PVDF probe: ≤ +120 °C Hastelloy probe: ≤ +220 °C
Process pressure	With MCU-P control unit: –50 hPa ... 10 hPa With external purge air unit: –50 hPa ... 30 hPa With instrument air: –100 hPa ... 100 hPa	With SLV7 2BH1100 purge air unit: –20 hPa ... 20 hPa
Hazardous area	Nonhazardous areas Hazardous area: Ex zone 2, 22	Nonhazardous areas
Enclosure rating	IP66, IP54	IP54, IP65
Device versions	Measuring probes version	Version for wall mounting
Test functions	Automated self-test (linearity, contamination, drift, aging), contamination limit values: warning at 30%, fault at 40%, manual linearity test via reference filter, low-pressure monitor (switching point –35 hPa)	Automated self-test (linearity, contamination, drift, aging), contamination limit values: warning at 30%, fault at 40%, manual linearity test via reference filter

At a glance		
	• One-sided installation • For very low to medium dust concentrations • Automated check of zero and reference point • Contamination check • Hastelloy probe available for corrosive gases • For small to medium duct diameters • Device version for Ex zone 2	• For very low to medium dust concentrations • Gas sampling and return combined in one probe • Contamination check • Automated check of zero and reference point • Simple parameterization and convenient operation – optionally via an additional remote display • Integrated system monitoring to detect the need for maintenance at an early stage
Detailed information	➜ www.sick.com/DUSTHUNTER_SP100	➜ www.sick.com/FWE200DH

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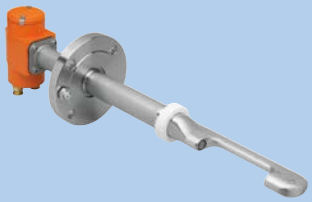
VOLUME FLOW MEASURING DEVICES

	 **FLOWSIC100 Flare**	 **FLOWSIC100 Process**
	Reliable gas flow measurement in flare gas applications	Reliable and precise volume flow measurement in processes
Technical data		
Measurands	Gas velocity, gas temperature, gas volume and quantity, mass flow, molecular weight, volume flow a.c., volume flow s.c., speed of sound	Gas velocity, mass flow, volume flow a.c., volume flow s.c., speed of sound, gas temperature
Gas temperature	Standard: –70 °C ... +180 °C High-temperature zone 1: –70 °C ... +280 °C High-temperature zone 2: –70 °C ... +260 °C Low temperature: –196 °C ... +100 °C	-40 °C ... +260 °C
Operating pressure	–0.5 bar (g) ... 16 bar (g)	–0.5 bar ... 16 bar Depending on device version
Nominal pipe size	4" ... 72" Depending on the gas composition and device version	0.15 m ... 1.7 m Depending on device version
Hazardous area	1G, 2G, 3G, Class I Division 1, Class I Division 2	3G
Enclosure rating	IP65, IP67 IP65, IP65/67 IP66, IP20, IP66, IP66	IP65
Test functions	–	Automated control cycle for zero and reference point, extended device diagnostics via SOPAS ET software
At a glance		
	• High-resolution measurement and short response time • Innovative sensor design for very high gas velocities • Optimal signal transmission even under atmospheric pressure • Detached installation of the control unit up to 1,000 m away • Single-path and multi-path configuration, optional probe version • Zero point test in the field according to factory standard • Control cycle for automated self-diagnosis/ signal optimization	• Corrosion-resistant transducer made of stainless steel or titanium • Up to 16 bar process pressure • Explosion-protected version for applications in Ex zone 2 (ATEX) available • Hermetically sealed ultrasonic transducer • Measurements practically free of pressure loss and without influencing the process • Automated operational check with zero and reference point test
Detailed information	➜ www.sick.com/FLOWSIC100_Flare	➜ www.sick.com/FLOWSIC100_Process

Ammonia production

Ammonia is the key component for the production of fertilizer. In order to synthesize it, hydrogen is first created in several steps. The hydrogen is then mixed with nitrogen and converted into ammonia under high pressure. The high reaction speed and material throughput necessitates efficient process control in every step. Continuously measuring gas analyzers can monitor H_2, CH_4, CO, CO_2 and NH_3 and offer significant advantages compared to gas chromatographs thanks to their short cycle times. Since CO and CO_2 act as catalyst poisons and cause salt formation, they must be detected in the low ppm range.

Recommended products

GMS800 extractive gas analyzers 22

Urea production

Urea systems are often located in the direct vicinity of ammonia system since they provide raw materials CO_2 and NH_3. At high pressure, these components react to form ammonium carbamate, which, as an intermediate product, breaks down into urea and water. Since carbamate solutions are highly corrosive, small amounts of air are continuously added to form a passive oxide layer to protect the metal surface. SICK offers solutions for monitoring the passivation process as well as the emission of dust, ammonia and water at the stack.

Recommended products

GM700 laser gas analyzer. 20

Ammonium phosphate production

Mono- and diammoniumphosphate (MAP, DAP) are created by the reaction of ammonia with phosphoric acid. The resulting solution is concentrated and then added to a spray crystallization or granulation process, from which the solid, dry product emerges. The exhaust gases created in this process can contain NH_3, HF and dust, which are typically separated in a scrubber. The remaining NH_3, HF and dust in the exhaust gas must be monitored to ensure compliance with emission requirements. Each analyzer system must be designed for high salt formation in order to ensure reliable operation.

Recommended products

FWE200DH scattered light dust measuring device. . . 28

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Sulfuric acid production

Sulfuric acid is an important bulk chemical which is used in the production of fertilizer. The intermediate products SO_2 and SO_3 that are created during the production process are highly corrosive. These oxides and their acids exhibit increased dew points, which is a challenge for analysis after extraction from the process. When it comes to both process control and emission monitoring, modern hot/wet extractive processes are superior to cold/dry extractive processes. Typical applications are the analysis of SO_2 and O_2 at the inlet of the contact ovens as well as SO_2, SO_3 or H_2SO_4 at the stack with the MCS300 HW.

Recommended products

MCS300P process gas analyzer 23

Inertization processes

Most raw materials and end products are stored in large tank farms in the petrochemical industry. Since many of the substances are flammable, there is direct explosion risk when oxygen is present. In order to prevent an explosive atmosphere, pipes and storage tanks are rinsed and pressurized with inert gases such as CO_2. This inertization or blanketing is typically monitored with an oxygen analyzer which detects all remaining oxygen. At the same time, the inert gas consumption as well as the duration of the inertization process can be minimized by the analyzer.

Recommended products

TRANSIC100LP gas transmitter 21

$DeNO_x$ and $DeSO_x$ systems

Energy-intensive processes such as thermal cracking in olefin plants and continuous decoking in FCC units in refineries cause high NO_x emissions. The NO_x amount is often reduced by using ammonia in a $DeNO_x$ system in order to comply with local requirements. The challenge in this process is dosing the correct amount of ammonia. The remaining amount of NO_x must be minimized while preventing the emission of excessive ammonia at the same time. In-situ analyzers are excellent for the monitoring NO_x amounts and ammonia slips.

Recommended products

GM32 in-situ gas analyzer 20

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SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 8,800 employees and over 50 subsidiaries and equity investments as well as numerous agencies worldwide, SICK is always close to its customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents, and preventing damage to the environment.

SICK has extensive experience in various industries and understands their processes and requirements. With intelligent sensors, SICK delivers exactly what the customers need. In application centers in Europe, Asia, and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes SICK a reliable supplier and development partner.

Comprehensive services round out the offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

That is "Sensor Intelligence."

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