BALLUFF

PRECISION PRODUCTS FOR SEMICONDUCTOR, SOLAR AND DISPLAY MANUFACTURING

Semiconductor industry

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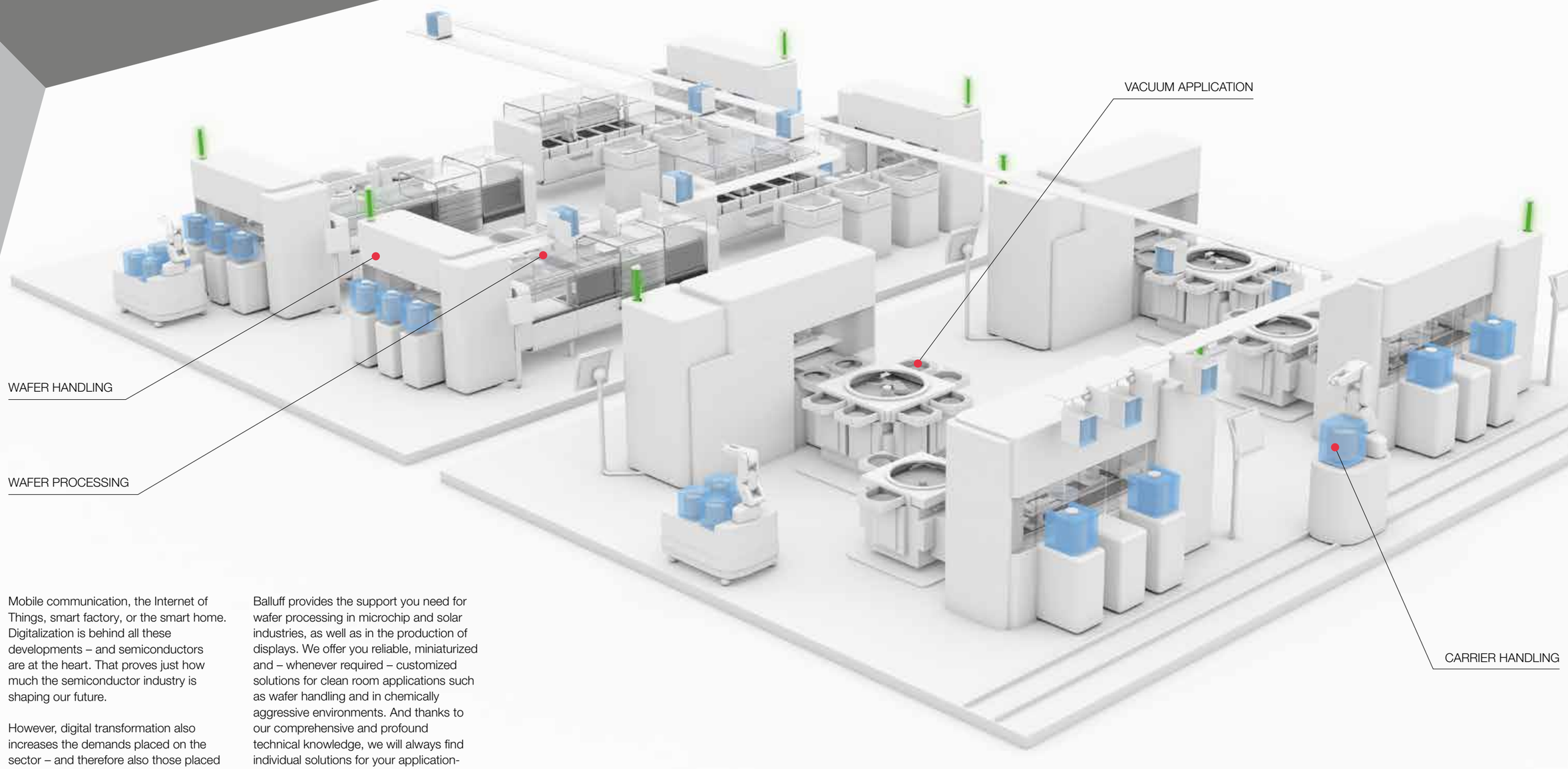
Balluff in the semiconductor industry

WE ARE AT HOME IN MANY INDUSTRY SECTORS

Balluff in the semiconductor industry

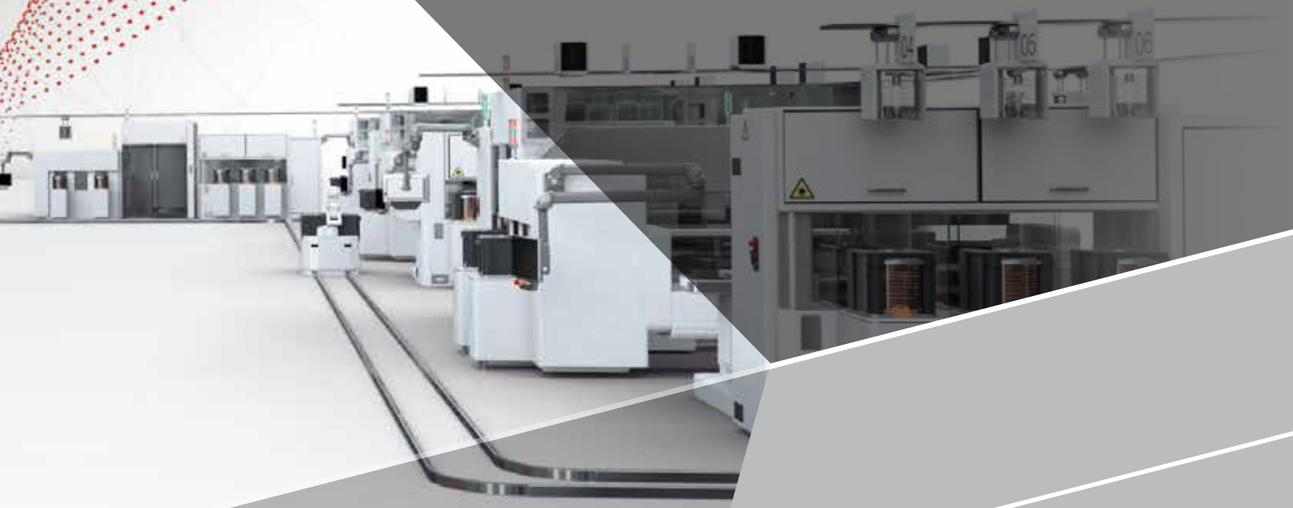
SOLUTIONS FOR WAFER PROCESSING AND DISPLAY MANUFACTURING



Mobile communication, the Internet of Things, smart factory, or the smart home. Digitalization is behind all these developments – and semiconductors are at the heart. That proves just how much the semiconductor industry is shaping our future.

However, digital transformation also increases the demands placed on the sector – and therefore also those placed on you. For instance, we expect more and more powerful semiconductor chips. At the same time, the highly complex and technologically demanding production of these chips must be managed as cost-effectively as possible.

Balluff provides the support you need for wafer processing in microchip and solar industries, as well as in the production of displays. We offer you reliable, miniaturized and – whenever required – customized solutions for clean room applications such as wafer handling and in chemically aggressive environments. And thanks to our comprehensive and profound technical knowledge, we will always find individual solutions for your application-specific requirements.



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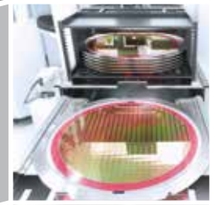

Precise, efficient and contactless

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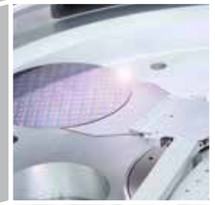

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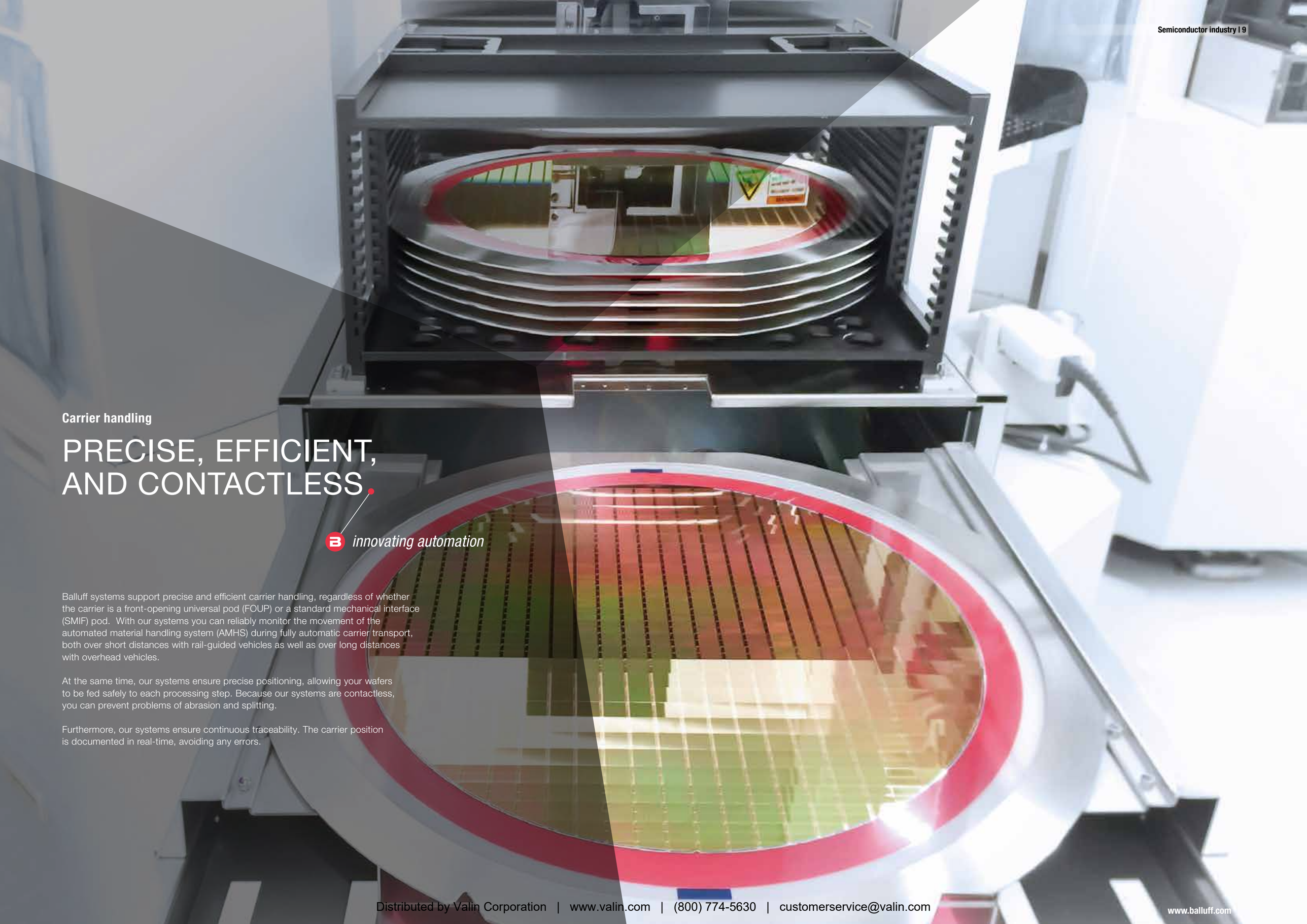


Carrier handling

PRECISE, EFFICIENT, AND CONTACTLESS.

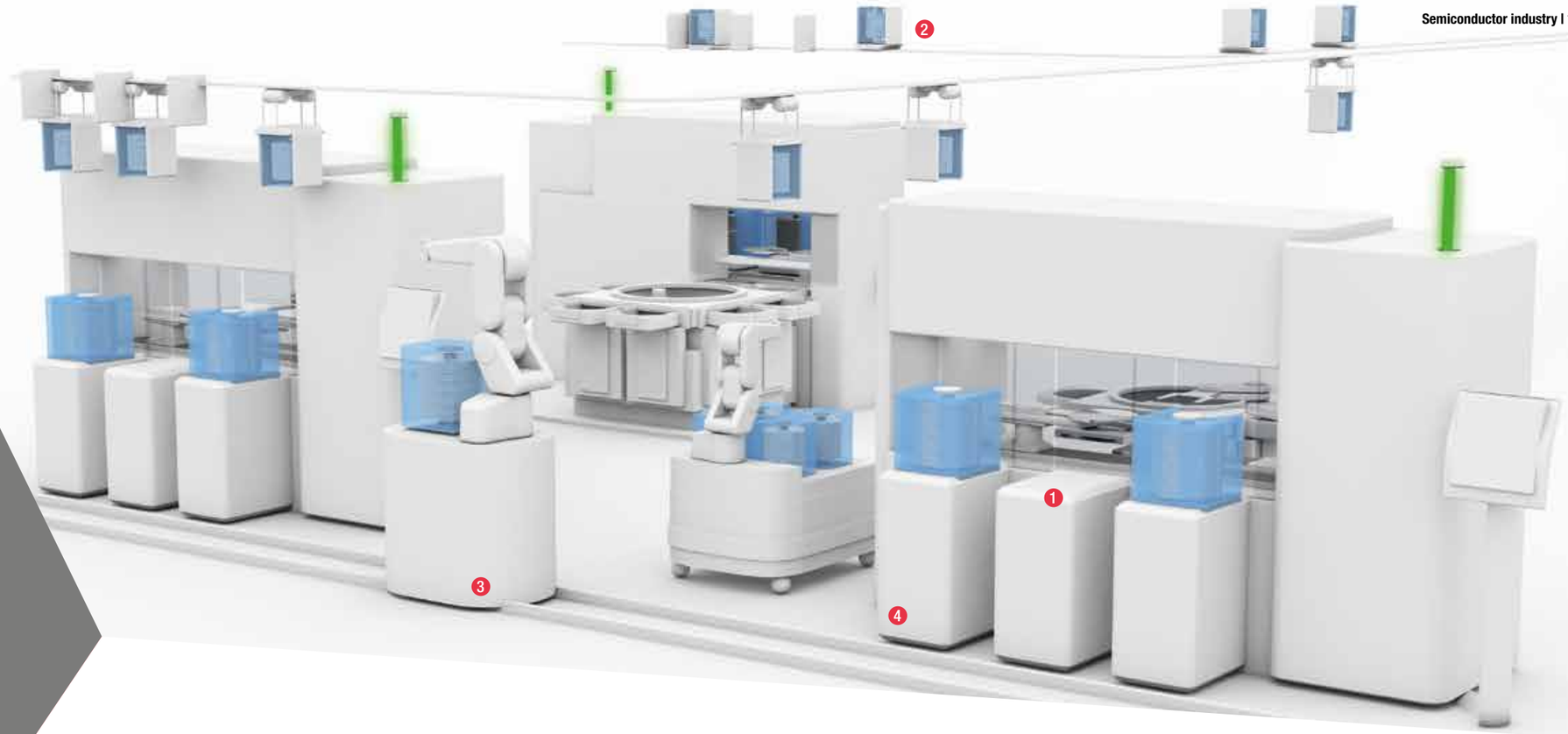
innovating automation

Balluff systems support precise and efficient carrier handling, regardless of whether the carrier is a front-opening universal pod (FOUP) or a standard mechanical interface (SMIF) pod. With our systems you can reliably monitor the movement of the automated material handling system (AMHS) during fully automatic carrier transport, both over short distances with rail-guided vehicles as well as over long distances with overhead vehicles.

At the same time, our systems ensure precise positioning, allowing your wafers to be fed safely to each processing step. Because our systems are contactless, you can prevent problems of abrasion and splitting.

Furthermore, our systems ensure continuous traceability. The carrier position is documented in real-time, avoiding any errors.

Solutions for carrier handling



VERIFY PRESENCE OF CARRIER
BOH photoelectric sensors

Our photoelectric sensors and photoelectric proximity switches are ideal for detecting the presence of a carrier on a load port. This way you can ensure that the machine only opens when a carrier is docked. The photoelectric sensors and photoelectric proximity switches can be optimally integrated due to their especially flat design. This makes it easy to remain within the small installation area on the load port, which is often not much larger than the transport box.

Features

- Very flat design
- Space-saving
- Individual focus

SECURE TRACKING OF CARRIERS
BVS optical ID sensors

In order to track carrier positions in the AMHS system, you must equip carriers with optically readable 2D codes. Our code readers read data matrix, QR and bar codes and, thus, verify every single movement of a carrier used for transport.

Features

- Reliable code reading with simple operation
- IO-Link as process and data interface, alternatively TCP or UDP
- Additional IIoT data interfaces: MQTT and REST API
- Additional condition monitoring information for production optimization

CONTINUOUS DETECTION OF THE AMHS POSITION
BML magnetically-coded sensors

You are always on the safe side with our magnetically-coded position measuring systems for continuous position detection of transport vehicles. These systems can be individually adapted to your measurement route. And they are highly precise, allowing the smooth transfer of your carriers to the load ports.

Features

- Contactless and wear free
- Extremely reliable and highly precise
- Versatile: cut-to-length magnetic tape up to 48 m

CONTROL OF THE AMHS END POSITION
BES inductive sensors

We offer a variety of solutions to monitor the end position of your vehicles used for transporting carriers. Depending on your requirements, we recommend inductive, capacitive or photoelectric sensors. These allow you to monitor whether the AMHS is correctly positioned for the precise transfer of your carriers to the load port.

Features

- Your individual requirements efficiently solved through technical diversity
- Wear-free due being contactless

Wafer Handling

HIGH PRECISION EVEN BETWEEN PROCESS STEPS.

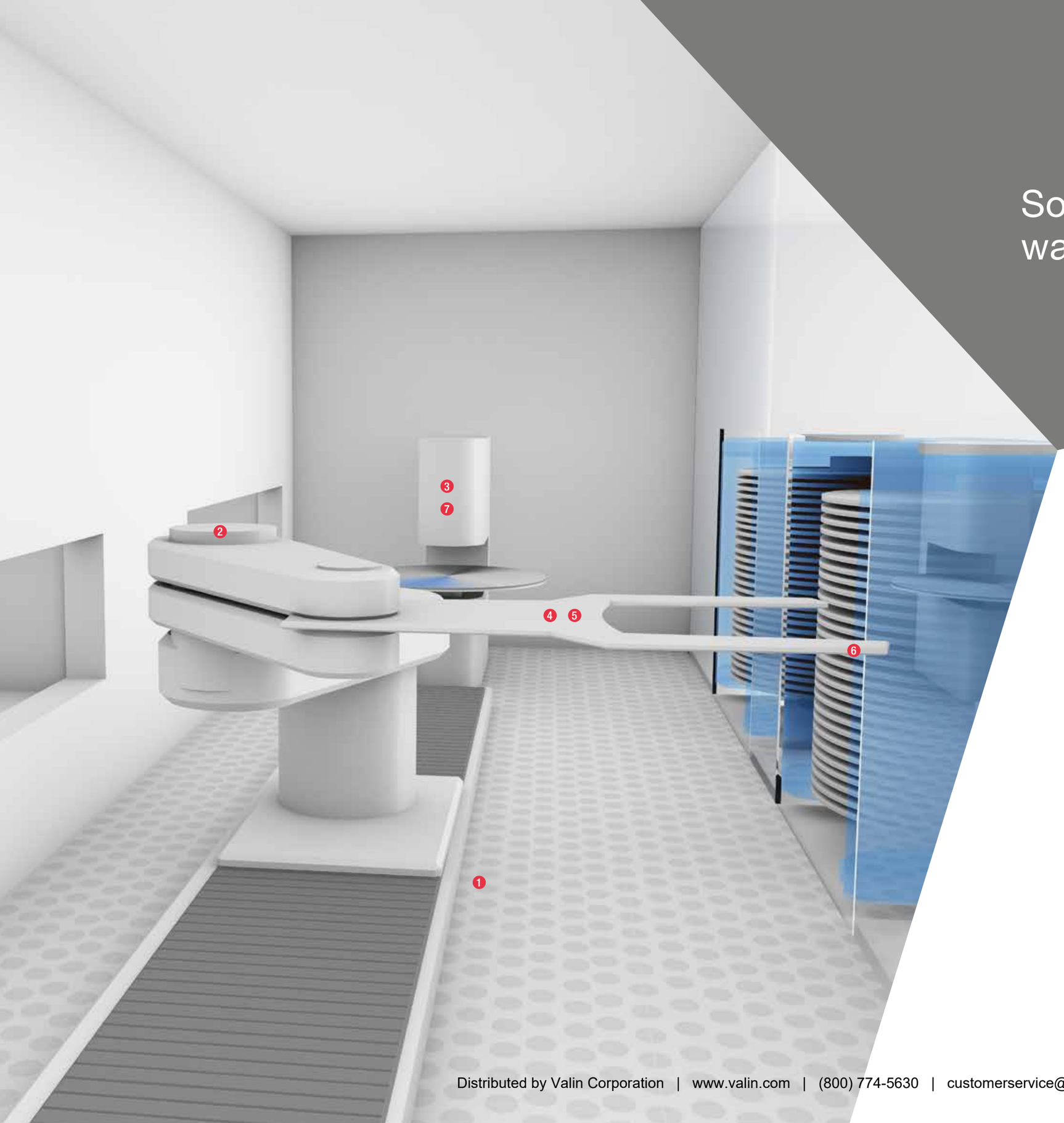
innovating automation

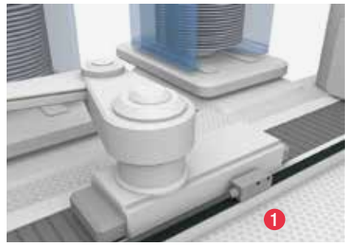
High precision is what you receive from Balluff for wafer handling in the equipment front end module (EFEM), such as on the end effector or the pre-aligner. Because high precision is demanded to position and feed wafers reliably to each individual processing step.

Our sensors and systems are available in compact designs, providing a simple solution to meet the high demands of machine integration. When conditions are especially difficult – after all, every end effector is different – we adapt our technology to your individual requirements.

Contactless measurement principles mean abrasion is avoided, guaranteeing clean-room class standards throughout the entire process. Benefit from reliably monitoring wafer handling, and safeguard your process.

Solutions for wafer handling





DETECT ROBOT POSITION
BML magnetically encoded position measuring systems

Reliably monitor the movement of your robot units throughout with our high-precision magnetically coded position measuring systems. Thanks to the possibility of individually cutting magnetic tape in the system to length, this is also, or especially, the case if you use multiple load ports or process chambers.

Features

- Contactless – no abrasion or splitting
- Versatile: cut-to-length magnetic tape up to 48 m

MONITOR ROBOT ROTATION
BML magnetically encoded angle measuring systems

Our magnetically coded angle measuring systems are ideal for positioning the end effector of the robot with absolute precision. They verify the rotational movements of the robot joints used to transport the end effector, bring it into final position and place the wafer.

Features

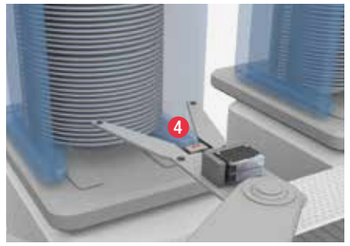
- Small sensor head: easy to integrate
- Lightweight, making it perfect for robotics
- Large distance between sensor and ring: simple to install and high operating reliability

WAFER PRE-ALIGNMENT
BLA light band sensors

Feed your wafers to the process chamber perfectly aligned by precisely positioning them in pre-aligner. We offer an outstanding solution for optical pre-aligners: a high-resolution light band with extraordinary homogeneity. Furthermore, it allows you to detect notch or flat for precise centering of the wafer. And you can easily integrate our light band into your pre-aligner.

Features

- Excellent homogeneous red light laser with outstanding resolution of 0.01 mm
- Different light lengths to meet your individual requirements
- Intuitive operation with plain text display
- Self-sufficient device: no additional equipment needed, such as controller or PC and software controller, PC or software

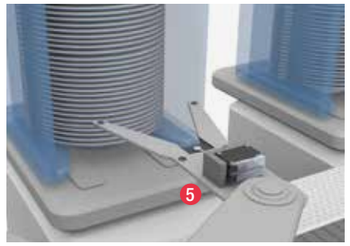


VERIFY WAFER PRESENCE ON END EFFECTOR
BOH photoelectric sensors

Our photoelectric sensors allow you to verify the presence of the wafer on the end effector with absolute reliability and therefore avoid collisions. These outgassing optimized sensors are made for clean rooms, as well as for vacuum environments when required. Thanks to their installation height of only 1.7 mm, they can also be perfectly integrated into extremely thin end effectors.

Features

- Extremely flat, perfect for the end effector
- Suitable for clean rooms: optimized for outgassing
- Simple remote adjustment via external amplifier

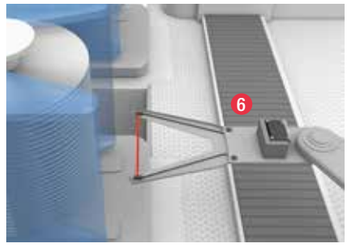


VERIFY WAFER PRESENCE ON END EFFECTOR
BCS capacitive sensors

Our capacitive sensors with PTFE coating allow you to monitor whether the wafer is on the end effector. These detect ultra-thin wafers extremely reliably, even if they sag. Installation height is only 2.5 mm, making these sensors easy to integrate into end effectors.

Features

- High precision in the smallest installation space
- Extremely flat – only 2.5 mm
- PTFE housing: suitable for a variety of surfaces
- Easy remote adjustment via external amplifier

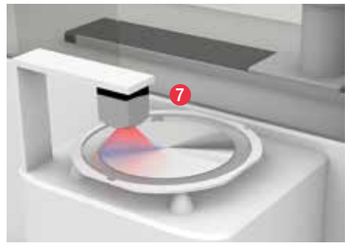


RELIABLE WAFER MAPPING
BOH photoelectric sensors

The extremely controlled and focused light spot of our Micromote sensors ensures superior precision.
This allows you to detect the edges of wafers with a thickness of just a few microns with absolute certainty. At the same time, our Micromote sensors ensure that full slots, double wafers or misaligned wafers are reliably detected at all times. Thanks to flexible cables and compact design forms, you benefit from high design freedom.

Features

- Outstanding precision for small spaces: minimum opening angle
- Adaptable to a wide variety of end effectors
- Modular construction system to meet your specific installation requirements



TRACE WAFER FRAMES
BVS optical ID sensors

Design your process transparently by using our code readers to track your wafer frames. Simply equip the frames with 1D, 2D or stack codes and the readers will reliably verify these.
This allows you to know at all times whether a wafer has already been ground back and separated.

Features

- Reliable code reading with simple operation
- IO-Link as process and data interface, alternatively TCP or UDP
- Additional IIoT data interfaces: MQTT and REST API
- Additional condition monitoring information for production optimization

Vacuum application

SUPPORTING PROCESS RELIABILITY.

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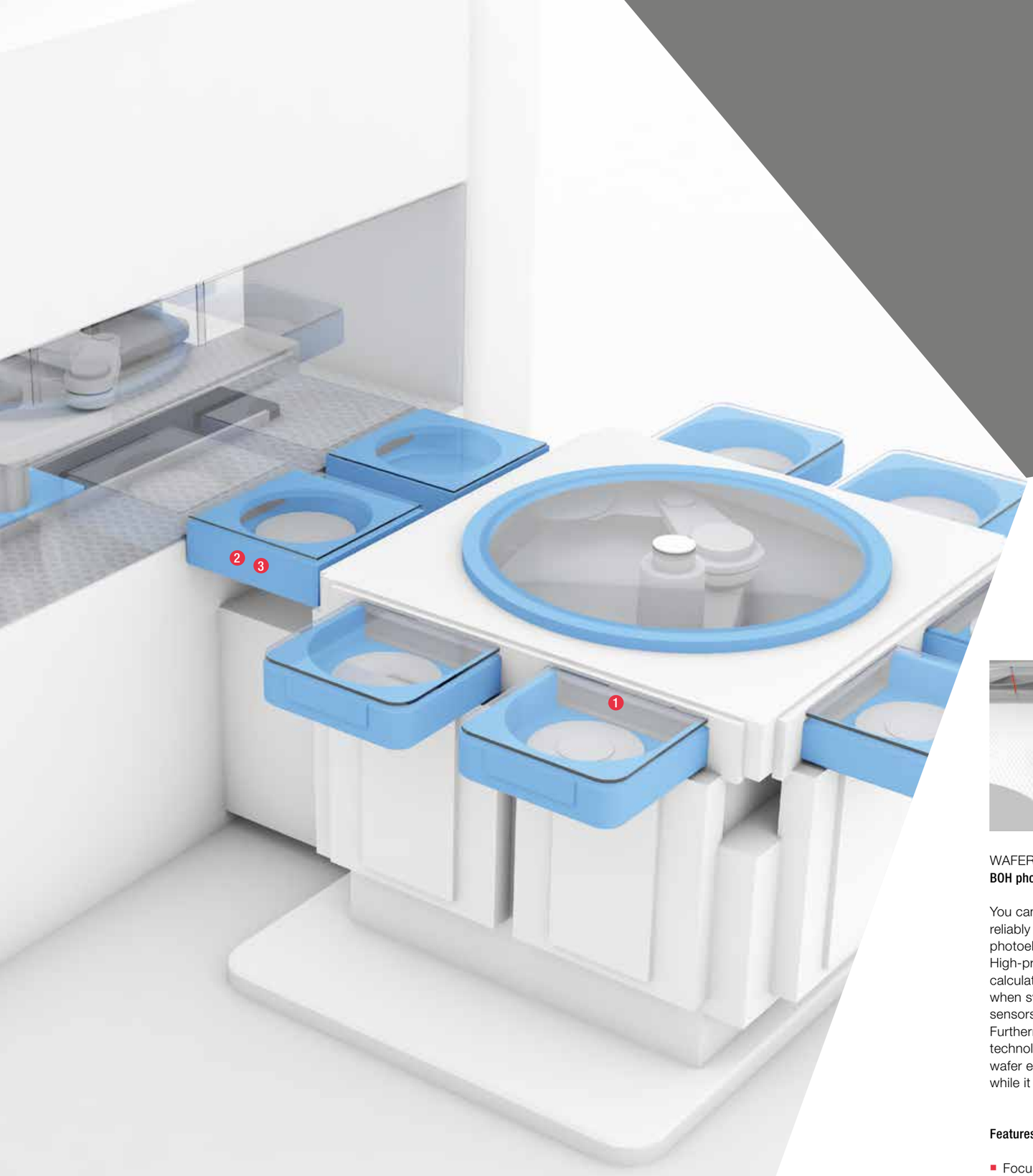
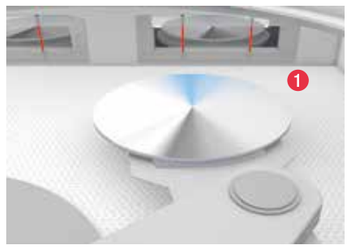
Due to their outstanding design features, sensors from Balluff offer you the option of direct use in vacuum. For example, you can use our sensors when the wafer is centered on the fly in the vacuum lock during alignment, or when you need to monitor its presence.

We offer screw-in versions with a sealing function as well as sensors for installation directly in high vacuum. Sensor signals are safely fed out via electrical lines through cable bushing. And you will be especially reassured to know that your process remains safe, because we use outgassing optimized for the sensor. Furthermore, we also manufacture sensors in materials you request.



SOLUTIONS FOR VACUUM APPLICATIONS

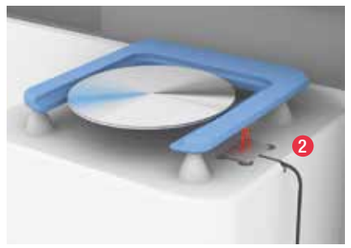


WAFER CENTERING
BOH photoelectric sensors

You can align a wafer on-the-fly reliably with two or more Micromote photoelectric light barriers. High-precision signals allow you to calculate the offset for the ideal line when switching of the two photoelectric sensors is not simultaneous. Furthermore, because our Microspot technology accurately detects sharp wafer edges, you can correct the wafer while it is still moving.

Features

- Focused LED spot with outstanding homogeneity
- Small, space-saving designs
- Customer-specific designs possible

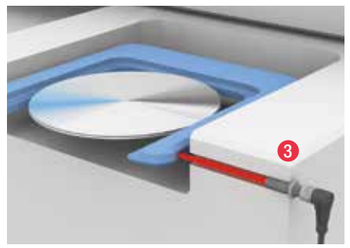


WAFER PRESENCE DETECTION
BOH photoelectric sensors

Make your processes safe by monitoring the presence of a wafer or carrier with our light sensors optimized for outgassing. These infrared light sensors with external amplifiers are suitable for use in vacuum. An ultra-flat design with an installation height of only 1.7 mm and a small contact area make it an ideal choice for the limited space inside a vacuum chamber.

Features

- Space-saving due to ultra-flat design
- No dead zone
- Very robust with stainless steel housingl housing



WAFER PRESENCE DETECTION
BOH photoelectric sensors

Using special optics with a small light spot, our photoelectric sensors with remote electronics detect the presence of a wafer or carrier through a viewing aperture. Simply thread the vacuum compatible light sensor with stainless steel housing into your process chamber. The chamber is then sealed and no cable feed-through is needed.

Features

- Micro optics with small light spot
- Robust stainless steel housing with sealing function
- For vacuum applications up to 1 × 10 – 9 mbar

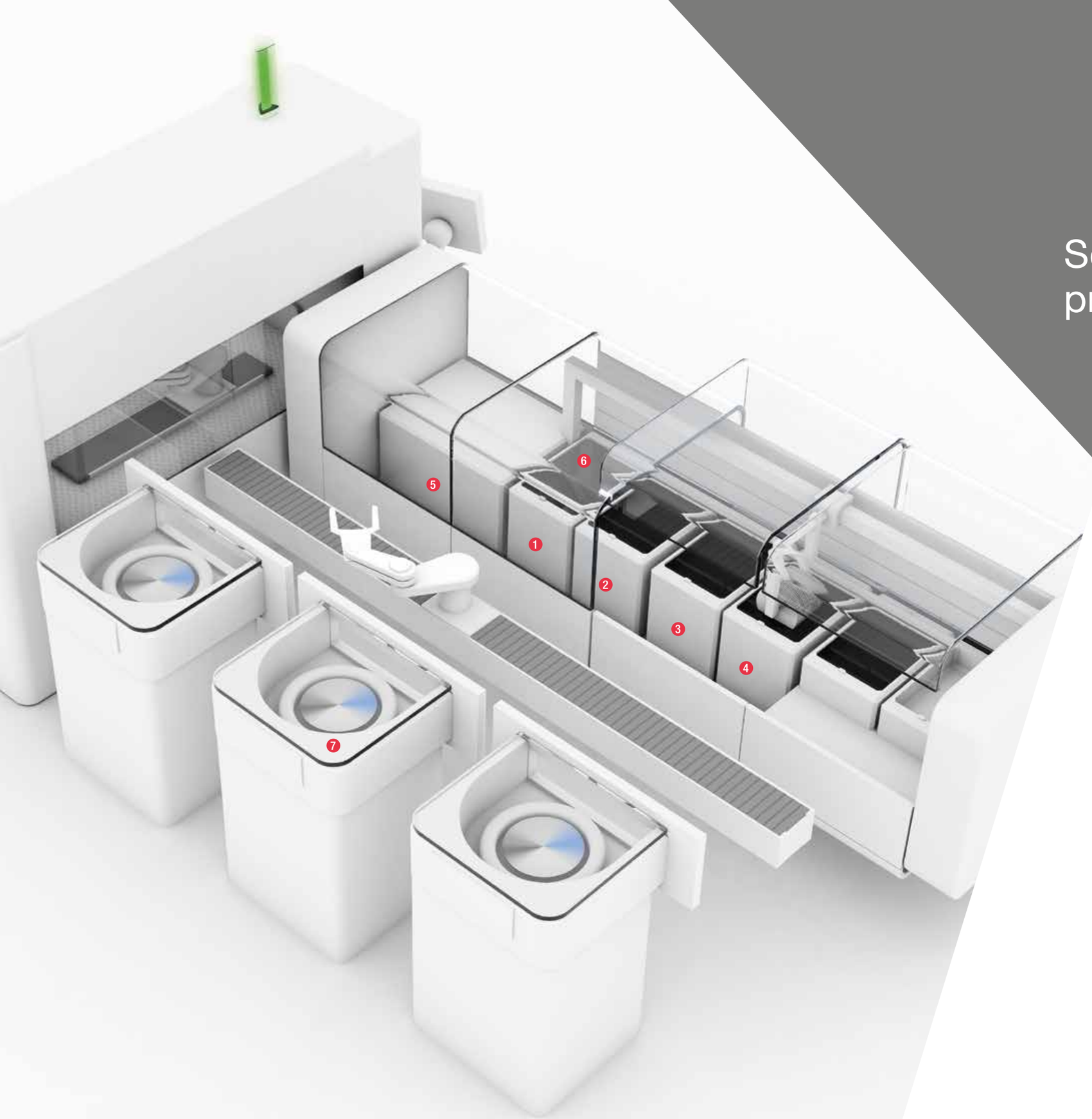
Wafer Processing

RELIABLE IN CHEMICAL ENVIRONMENTS.

innovating automation

Balluff provides you with optimal solutions for processes in wet chemistry, allowing you to meet the specific requirements of semiconductor manufacturing. Special PTFE housings enable you to reliably monitor level, such as during etching, wafer cleaning, or coating and development in lithography. Our reliable temperature sensors also ensure that the process temperature is correct.

Furthermore, with our sensors you can control valve stroke in order to produce homogeneous, ideal layers in the deposition process.



Solutions for wafer processing

CONTACTLESS DETECTION OF FILL LEVELS THROUGH CONTAINER WALLS
BCS capacitive sensors

Ensure a smooth process chain in wet chemistry by achieving the ideal fill level of acid, alkalis, and ultrapure water tanks with our capacitive sensors. These reliably detect the level through glass and plastic walls up to 10 mm thick. For highly conductive media such as acids, use our capacitive high-end sensors, which also mask foam and build-up.

Features

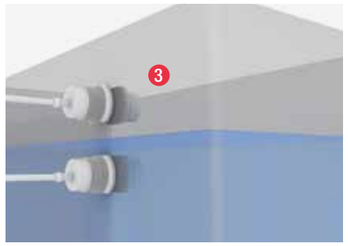
- For acids, alkalis, ultrapure water and slurry
- Without bypasses

CONTACTLESS LEVEL MONITORING ON BYPASS TUBES
BCS capacitive sensors

By monitoring tank level with the help of bypass tubes, you can prevent tanks with aggressive chemicals from overflowing, or a tank level that is too low. All you need to do is mount our compact capacitive sensors simply and cost-efficiently on the bypass tube using cable ties. To compensate for foam and build-up of deposits, we offer high-end versions that reliably detect highly conductive media such as alkalis.

Features

- For acids, alkalis, ultrapure water and slurry
- Foam and build-up compensation through Smart Level technology



DETECTING PROCESS LIQUIDS IN CONTACT WITH THE MEDIUM
BCS capacitive sensors

Our capacitive sensors in PTFE housings are the right choice whenever the vessel wall doesn't allow detection from the outside. These detect the level of highly conductive media, such as acids and alkalis, in direct contact with the process liquid. This allows, for example, etching or resist application, development after lithography, chemical-mechanical polishing or wafer cleaning to start as planned.

Features

- High chemical resistance due to PTFE housing
- For acids, alkalis, ultrapure water and slurry
- Foam and buildup compensation through Smart Level technology

CONTINUOUS CONTACTLESS LEVEL DETECTION
BCW capacitive sensors

Using our capacitive sensor heads with amplifiers, levels can be continuously detected over the entire range, allowing you to detect a minimum or maximum level transgression with just one sensor. Particularly practical is that you can cut the self-adhesive flexible sensor head to size and simply stick it to the container wall.

Features

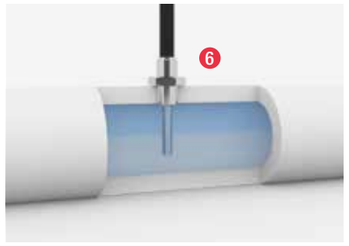
- Continuous level detection
- Integrated adhesive surface
- Detection range from 108 mm to 850 mm

DIRECT LEAKAGE MONITORING
BCS capacitive sensors

Our extremely compact capacitive sensors ensure that even the smallest leakage quantities are reliably detected. With the supplied holder, you attach the sensor to the bottom of a tool at a distance of 2 mm. After that, all you need to do is set it. With this, if aggressive chemicals, such as hydrofluoric acid, should leak out, you can take appropriate measures immediately.

Features

- Easy to install thanks to the holder provided
- Detects even the smallest amounts of leakage
- Reliable detection of various chemicals

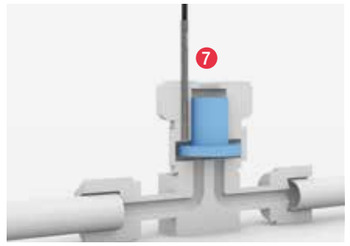


MAINTAIN WAFER TEMPERATURE AT EVERY PROCESS STEP
BFT temperature sensors

Our wetted temperature sensors help you maintain the heat level of your process media in temperature-controlled processes – in liquid or gaseous media. You can control critical process conditions such as limit temperatures or continuously monitor temperature values. Whatever the application, these sensors make a significant contribution to process reliability.

Features

- Easy mounting due to screw-in function
- Measure temperature directly in liquid or gaseous media
- Compact design



RELIABLY MONITOR FLOW VALVES
BES pressure-rated inductive sensors

Whenever the regular flow of a medium into the process chamber is controlled by a valve, you must be able to rely on it – after all, the flow helps keep the process on track. With our inductive sensors, you can monitor the valve reliably. Robust and available in small designs such as M5, these sensors can be integrated particularly well into the valve.

Features

- Suitable for operating temperatures up to 135 °C
- Oil pressure resistant up to 10 bar
- Good integration due to small M5 designs
- LED at the sensor end visible at all times
- No external amplifier necessary

Our special strengths

HIGH PRECISION AND COMMUNICATION EXPERTISE

innovating automation

At Balluff we make sure you always have future-proof, innovative approaches to optimally implement your individual requirements in wafer processing and display manufacturing. Taken from our broad, high-quality range of solutions, here we present our Micromote technology and our comprehensive IO-Link portfolio.

Micromote technology is a top performer exclusively from Balluff. Our Micromote sensors deliver optical high-precision that is second to none and a unique modular system that gives you exceptional flexibility. This outstanding performance is available for extremely small spaces, allowing you to solve your demanding tasks perfectly.

The open standard IO-Link is the world's first standardized IO technology that communicates down to the lowest automation level. And more: In combination with intelligent network technology, IO-Link ensures faster, more flexible and more efficient production through a powerful infrastructure that safely handles the growing volume of data. This transports your data through the entire manufacturing process and ensures continuous communication from the sensor to the internet. IO-Link is therefore the interface for improved process quality.

The modular system for exceptional flexibility

MICROMOTE - HIGH OPTICAL PERFORMANCE FOR EXTREMELY SMALL SPACES.

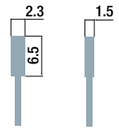
innovating automation

The interplay of optical and mechanical properties of Micromote sensors offers you a unique solution package that can be optimally adapted to your specific application. They offer unsurpassed flexibility — especially in applications where design-in and miniaturization play an important role.

Features

- High degree of miniaturization and individual specification offer great design freedom
- Flexible sensor cable suitable for drag chains
- Adaptable to a wide variety of applications via different light types and wavelengths
- Wide monitoring range due to light band sensors
- Cable with 90 kg tensile load capacity

THE SIZE

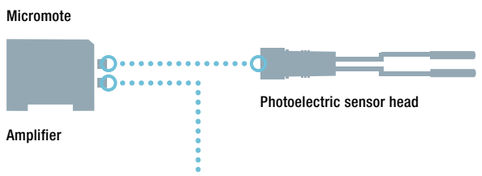


The Micromote system was developed for applications in which conventional optical sensors reach their limits in terms of size and performance. It requires no optical fibers – small, powerful and innovative.

THE MODULAR SYSTEM

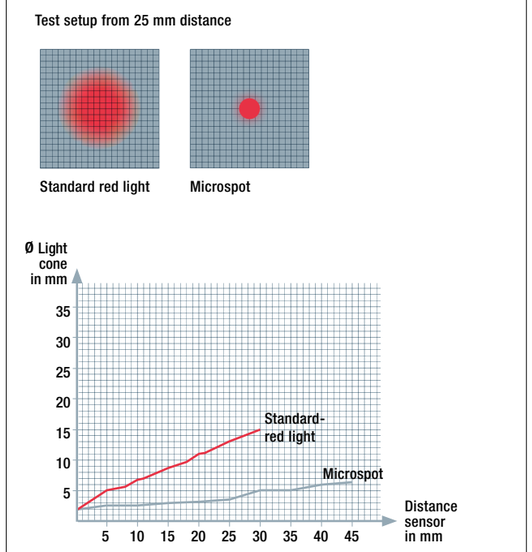
The modular system of Micromote sensors using innovative sensor elements meets your individual requirements. Any sensor can be operated with any amplifier. A wide range of housing designs ensures a particularly high degree of design freedom, even in the tightest of spaces.

MINI DESIGNS



Due to their size, Micromote sensors from Balluff are extremely versatile, making them an ideal alternative to fiber optics. They combine an external evaluation unit (amplifier) with an exceptionally small photoelectric sensor head. A highly flexible connection cable links the amplifier and sensor head.

MICROSPOT



Precise micro-photoelectric components ensure high process accuracy for every application. In series production, we can manufacture LEDs in infrared and red light with aperture angles of 3° and circular light spots. And the most important thing: The specimen scatter is minimal.

Customized Sensor Solutions

TAILORED TO YOUR REQUIREMENTS.

innovating automation

Digital transformation, automation, IIoT: Industry is constantly changing, and with it the requirements for your production and the solutions you use. Therefore, even the most high-quality standard solution is sometimes not enough. That's why Balluff offers you, in addition to our very comprehensive portfolio of standard products, customized solutions to precisely meet your requirements – no matter how complex these may be.

Whether you require sensors, systems or equipment accessories for your application, with our customized solutions you get the most out of your processes and systems.

Customized quality

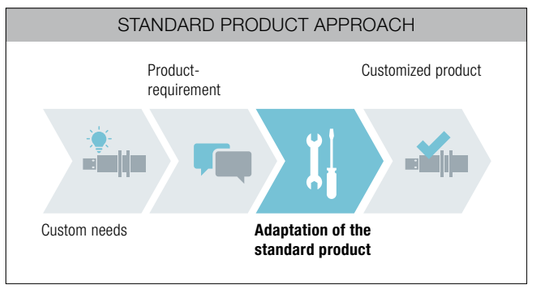
Our offer of customized solutions ranges from pure housing modifications, engineering services and pre-assembly to complex programming for photoelectric sensors, capacitive sensors, RFID, machine vision, magnetically coded sensors, inductive sensors, and more. Starting up production is faster thanks to pre-assembled products tailored to your application. Gone are the days of test runs with failures due to malfunctions. This significantly increases your system efficiency.

Your advantages

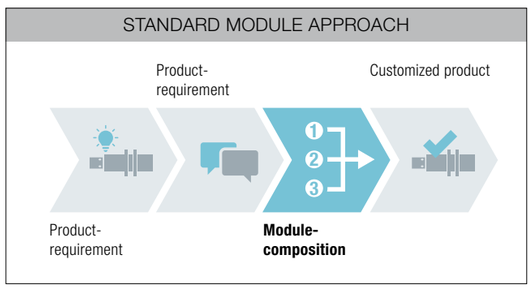
- Expert support for everything from plant inspection to accessories
- Detailed documentation of all proposed solutions with product overview, alternatives and recommendations
- Optimal mechatronic approaches through customer-specific sensor design
- A personal contact person for the duration of the project

The most efficient path to an individual solution

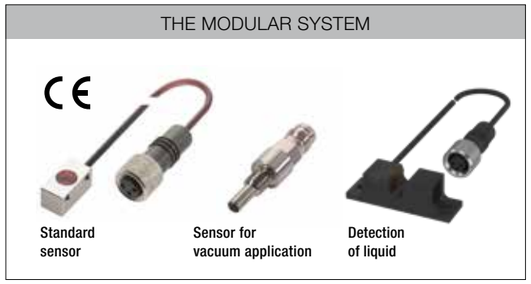
During an initial fast, professional feasibility assessment, we determine and evaluate your needs. After reviewing the required specifications, we develop a plan to deliver a functional prototype for your test phase. We can do this faster than would be possible for in-house development within your own company – regardless of whether we start with a standard product or completely bottom-up with standard modules.



In the standard product approach, we focus on delivering a solution for the basic application. Once you confirm the functionality, we start a custom project. This way, we ensure seamless integration with your device and always keep an eye on cost control.



Our standard module approach covers the most demanding applications. If we don't have a standard product that meets the required basic functionality, we look at the modules of the basic components and from these we build a new, perfectly customized solution.



Customized capacitive sensors BCS

Capacitive sensors from Balluff detect objects as well as levels extremely precisely and reliably. The fields of application and uses are versatile, as the sensors are suitable for a wide variety of objects and media. And, with our know-how, they can also be modified for individual applications.

Customized Photoelectric Sensors

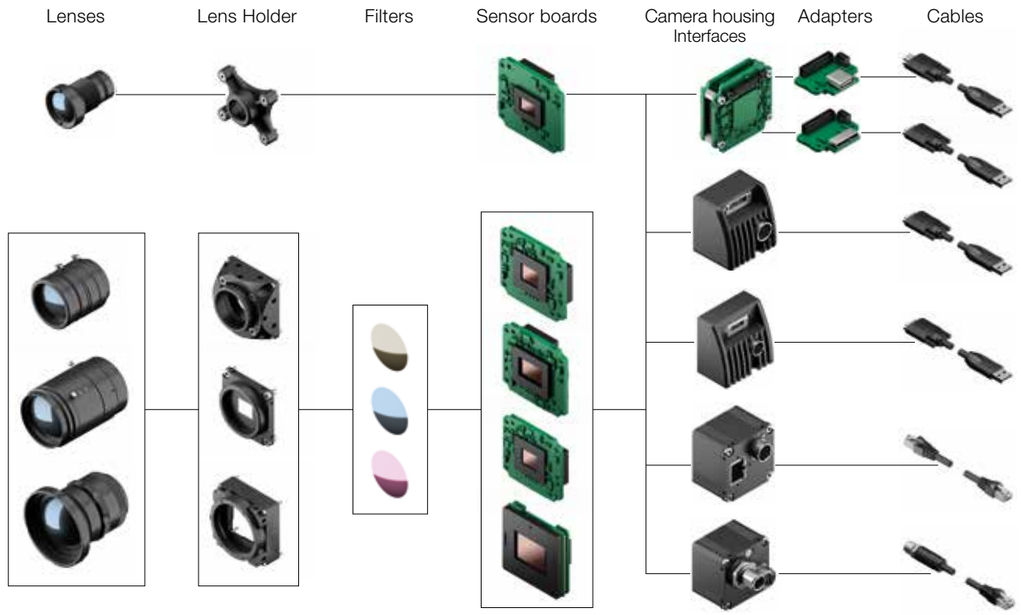
Our ophotoelectric sensors are true specialists in object detection with a wide range of applications. Our particularly small and therefore very flexible Micromote system meets even the most individual requirements.

Customized magnetically-coded sensors

Highly accurate, robust and fast: Our magnetically-coded sensors have been developed for precise positioning and speed detection in very dynamic applications. Our variety of options beyond standard solutions mean that you receive the best solution for your specific task.

Customized Camera Systems

Limited space, additional interfaces or special image sensors, optics and filters: The requirements for industrial cameras are often so individual that even the multitude of standard cameras is not sufficient. In that case, the modular camera system from MATRIX VISION (part of the Balluff Group) is the ideal basis for customer-specific solutions.



With our support, you can quickly and flexibly assemble the right industrial camera for your requirements from individual or modified components, and significantly shorten your time-to-market. If you wish, we can also provide complete assemblies consisting of camera and lens, along with adjustment and calibration, or implement customer-specific quality assurance processes.

Connection technology and interfaces

We offer special connectors according to your needs, e.g. angled to reduce the required installation space. We can modify the I/O modules and expand the interfaces so that you can also easily control the peripherals — motors, lighting, optics, etc.

Lens Holder

The camera front can be adapted to accept low-cost lenses (S-mount). Higher quality mounts for the use of precision or special lenses are also possible. The housing can of course be designed to meet your protection requirements — and your wishes regarding shape, color and logo printing.

Sensor Heads

For unusual viewing directions, we make it possible to separate the image from the camera electronics and to flexibly connect the two. Rigid-flex boards ensure a space-saving and cost-efficient design.

Form Factors

According to your specifications we change the board form factor, adapt the electronics to given housing shapes or re-design the camera boards.

Embedded Solutions

We integrate our camera(s) into existing assemblies. Thereby we adapt form factor, connection technology and interfaces according to your specifications.

Software

In the field of camera software, we implement your specific optimizations as well as comprehensive special developments. For example, we extend camera functionality with additional real-time pre-processing. And we reduce hardware expenditure and costs by adding smart features. If you wish, we will implement complete camera assemblies, including image sensors and camera electronics.

Industrial cameras in semiconductor applications

RELIABLE INSPECTION AND MEASUREMENT.

innovating automation

Industrial cameras are used in a variety of applications in the semiconductor industry, including automatic optical inspection (AOI) for 2D or 3D image acquisition. Our industrial cameras deliver high-resolution, low-noise images with a high dynamic range. This makes it possible, for example, to identify defects such as scratches, damage, particles, and so forth, with exceptional reliability during wafer inspection or to verify critical dimensions during wafer metrology.

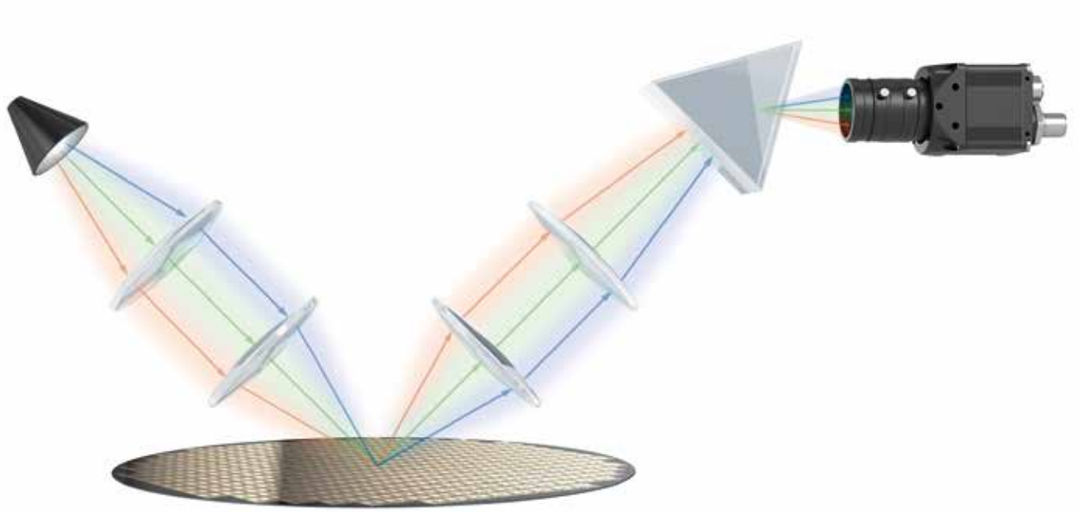
Your advantages

- State-of-the-art CMOS image sensors
- Suitable for the most difficult lighting conditions: rolling shutter or global shutter with back side illumination
- Reduced computing power required due to data pre-processing on FPGA in the camera
- Individual customization to the respective application
  - Customized housing
  - Customer-specific connections
  - Individual customization of pre-processing functions

When the limits of conventional methods are reached

The semiconductor wafer manufacturing process of takes place in several layers, which makes it necessary to monitor the overlay – the alignment from layer to layer. Because the structures on the wafer are extremely small, conventional imaging methods reach their limits. The solution is diffraction-based methods, made possible by our industrial cameras.

The diffraction pattern of the object is imaged and analyzed at different angles and for different wavelengths. The structure of the pattern can be precisely and reliably calculated from this.



Modular control concepts

WHY IO-LINK IS THE FAST LANE.

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From parallel wiring to fieldbus protocol

Replacing parallel wiring with the fieldbus was a huge step: it successfully eliminated the immense installation effort required using expensive copper cables, and significantly reduced costs. But fieldbus protocols are not without their pitfalls.

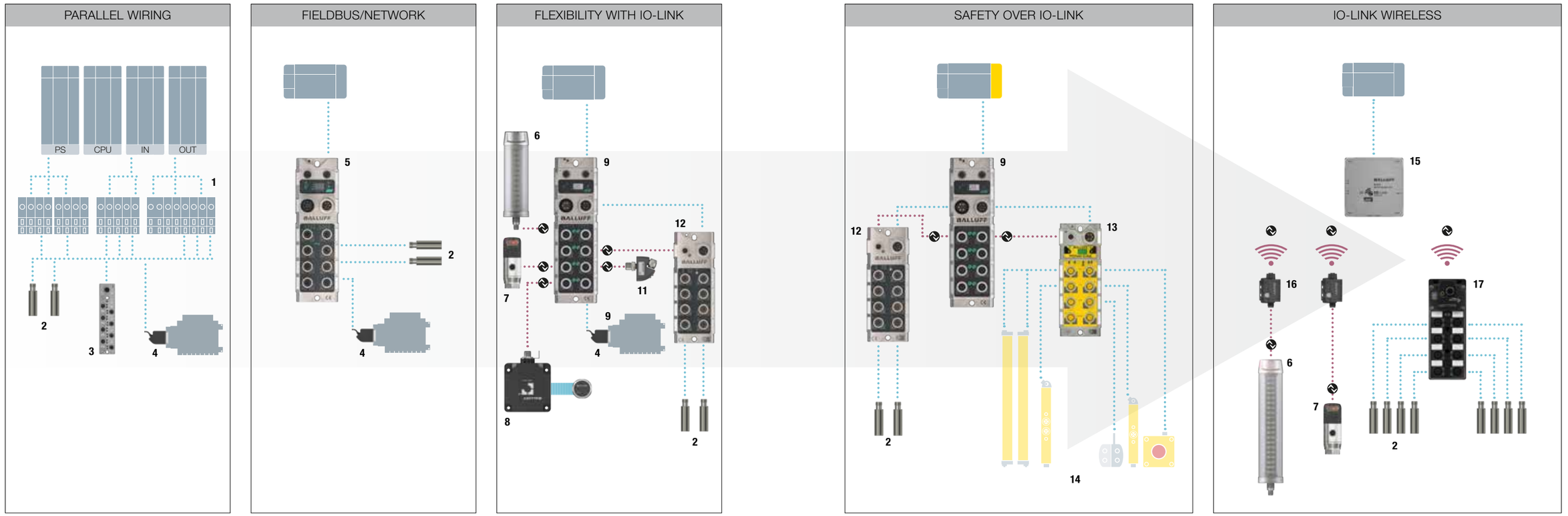
Universal, simple and flexible: IO-Link!

With IO-Link, the weaknesses of the fieldbus protocol are a thing of the past. The unshielded, three or four-core standard industrial cables you require are highly flexible and suitable for many bending cycles. They are easy to connect, cost-effective, and connection is standardized with M5, M8 or M12 connectors. You can therefore use IO-Link to access an established standard in order to integrate a wide variety of devices. IO-Link guarantees you extremely flexible control designs. It is because of this versatility, simplicity and high performance that IO-Link is referred to as a universal interface – like USB – for automation systems.

However, IO-Link takes flexibility much further. With Safety over IO-Link, Balluff offers you the first safety solution that can be integrated with IO-Link to combine safety and automation technology in a single system. Safety over IO-Link provides both sensor/actuator details and secure information, so you can benefit from the best of both worlds with our safety concept.

IO-Link: Now also available in wireless

Our wireless system consisting of master, hub and bridge is a new wireless standard that meets the high demands of factory automation. The wireless master does not receive its data via cable as usual, but receives the sensor data via a bridge or a hub by radio. This brings decisive advantages over a wired system, including simpler planning and installation, greater flexibility in design and mobility, and no wear and tear on connectors or cables. And it comes with the proven reliability and performance of wired IO-Link.



1 Clamping block
2 Sensors
3 Junction block
4 Valve interface
5 Fieldbus module
6 IO-Link SmartLight
7 IO-Link pressure sensor
8 Industrial RFID system
9 IO-Link master
10 IO-Link analog converter
11 IO-Link valve interface
12 IO-Link sensor hub
13 IO-Link safety hub
14 Safety components
15 IO-Link Wireless master
16 IO-Link Wireless bridge
17 IO-Link Wireless hub

Greater efficiency, lower costs

IO-LINK SAVES TIME AND MONEY.

innovating automation

Simple installation

In addition to the IO-Link master, you only need a standard industrial cable in order to install this universally applicable interface. This allows you to rapidly integrate the intelligent communication standard into the world of fieldbus. It makes integrating even complex devices easy. And you will be especially interested to know that digital communication ensures immunity to interference even without expensive shielded cabling. Analog signals are digitized without any conversion losses whatsoever. Where classic data transmission was previously impossible or only possible with difficulty, the IO-Link Wireless standard offers a new, promising solution for the factory of the future.

High machine availability

IO-Link enables fast, fault-free sensor replacement and prompt commissioning. This enables you to significantly reduce downtime, because the parameters of an IO-Link sensor you replace are automatically written from the IO Link master or from the controller to the new sensor. Commissioning, format changes and recipe changes can be performed centrally via the function modules of the control. This saves time and reduces error potential to a minimum. Another advantage for you: IO-Link devices cannot be mistakenly swapped, since they can be identified automatically via IO-Link.

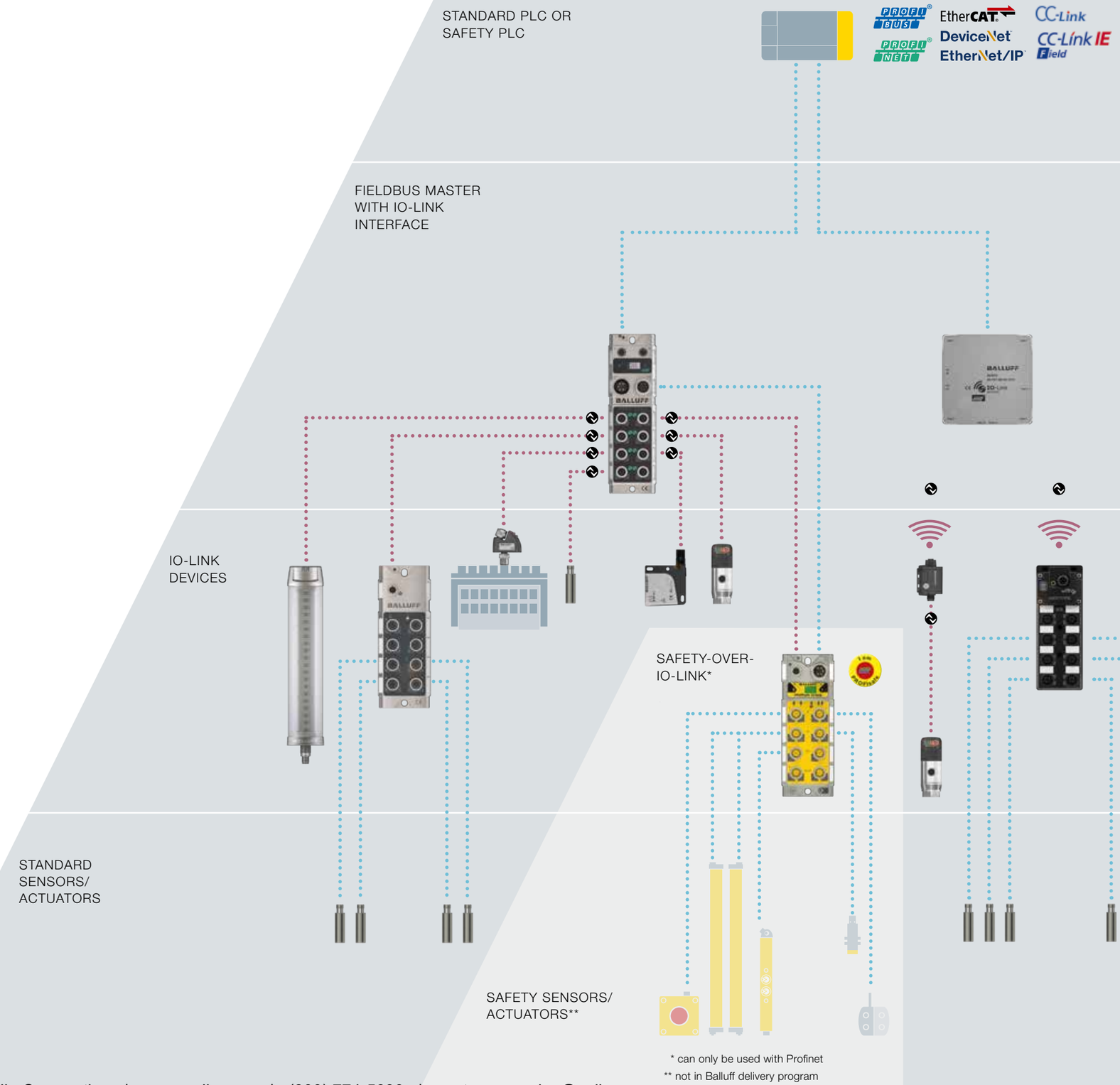
Demand-based maintenance

Continuous diagnostic data of the entire process extends your service intervals, because automatic readjustment via IO-Link means you need to maintain equipment and machines much less often. Predictive error detection is now also possible because the complete process parameters are continuously displayed in the control system.

Efficient operation

With IO-Link you can optimally position sensors directly in the machine as the process requires, because accessibility is no longer a factor. Process monitoring, configuration and error analysis of the IO-Link devices now takes place in the controller. This optimizes machine process time considerably. In addition, signal delays and distortions are reliably eliminated because digital data transfer ensures high signal quality.

A broad range of application demands can be easily achieved with IO-Link because you can use both binary and analog standard devices with IO-Link sensors / actuators at the same time.



INNOVATIVE SOLUTIONS FOR ALL YOUR INTRALOGISTICS REQUIREMENTS

PRODUCT OVERVIEW.

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Application	Product group	Example	Functions, interfaces and features
CARRIER HANDLING			
Verify presence of carrier	BOH photoelectric sensors	BOH002C	Optical sensor heads Micromote, 13 × 3 × 13.5 mm, through-beam sensor, range 0...500 mm, microSPOT-LED red light, housing material aluminum, for switching amplifier
		BOH002L	16 × 4 × 8.5 mm, photoelectric proximity switch, range 3...15 mm, microspot-LED red light, housing material brass, for switching amplifier
	BAE amplifier for optical sensor heads	BAE00R6	switching frequency 10 kHz, slide switch 4 positions, M8 connector, teach mode
		BAE00Y7	Switching frequency 3 kHz, auto-synchronization, alarm threshold, M8 connector, teach mode
	BOS photoelectric sensors, through-beam sensor	BOS021P (receiver), BOS021T (transmitter)	20 × 32 × 9 mm, through-beam sensor, range 0...2.2 m, LED red light, housing material stainless steel 1.4404, connection 2 m PUR cable
Secure tracking of carriers	BVS optical ID sensors	BVS0061	1.2 MP (1280 x 960 pixels), range 50...600 mm, field of view 30 x 23 mm ...305 x 230 mm, LED white light/infrared, IO-Link 1.1, REST API, MQTT, housing 56 x 56 x 59 mm
Continuous detection of the AHMS position	BML magnetically-coded sensors	BML041H	Absolute magnetic encoded position measuring system, 16 × 18.5 × 80.3 mm, interface SSI/analog Sin/Cos (1 V_{pp}), resolution 1 µm, up to 48 m
	BML tape measures for magnetic coded sensors	BML-M02/03-A55-AX-M...-E*	Suitable strip dimension body up to 48 m
Control of the AMHS end position	BES inductive sensors	BES01TH	Standard inductive sensors, preferred types, 59 × 8 × 8 mm, range 3 mm, PNP normally open contact, housing material zinc die-cast, connection M8 plug, 3-pin
	BCS capacitive sensors	BCS00PU	Capacitive sensors for object detection, M12 × 1, range 1...4 mm, PNP normally open contact, housing material PBT, connection 2 m PUR cable
	BOS photoelectric sensors	BOS0228 (receiver), BOS021R (transmitter)	Photoelectric sensors, through-beam sensors, 20 × 32 × 9 mm, through-beam sensor, range 0...2.2 m, NPN normally open contact, LED red light, light emission Ø 3 mm, housing material stainless steel 1.4404, connection 0.2 m PUR cable with M8 connector, 3-pin

* Please contact our sales department to configure your product.

Application	Product group	Example	Functions, interfaces and features
WAFER HANDLING			
Detect robot position	BML magnetically encoded position measuring systems	BML08F1	Absolute magnetic encoded position measuring system, 16 × 18.6 × 54 mm, reading distance 0.01 ... 1.3 mm, interface SSI/analog Sin/Cos (1 V_{pp}), resolution ≤ 1 µm, up to 8 m
	BML tape measures for magnetic coded sensors	BML-M02/03-A55-AX-M...-E*	Suitable strip dimension body up to 48 m
Monitor robot rotation	BML magnetically encoded angle measuring systems	BML07PY	Incremental magnetic encoded displacement encoder, 12 × 13.1 × 35 mm, interface digital A/B (RS422), resolution 1 µm, for rotary applications
	BML ring gauge for magnetically encoded sensors	BML002K	Suitable ring dimension body, pole number 228, pole width 1 mm, without reference mark, housing material Hartferrit
Wafer pre-alignment	BLA light band sensors	BLA000A	Light band, CCD technology, range 0...2 m, laser red light, analog output 2 × analog voltage 0...10 V/ analog current 4...20 mA, switching output 3 × PNP normally open contact
Verify wafer presence on end effector	BOH photoelectric sensors	BOH00A0	Optical sensor heads Micromote, 1.7 mm mounting height for perfect integration into end effector, LED technology, needs remote amplifier
	BAE, amplifier for optical sensor heads	BAE00R6	Switching frequency 10 kHz, slide switch 4 positions, M8 connector, teach mode
		BAE00Y7	Switching frequency 3 kHz, auto-synchronization, alarm threshold, M8 connector, teach mode
Verify wafer presence on end effector	BCS capacitive sensors	BCS001A	Capacitive sensor heads for BCS switching amplifier, 2.5 mm mounting height for perfect integration into end effector, PTFE coating, requires remote amplifier
	BAE amplifier for capacitive sensor heads	BAE00LA	0.3 m PUR cable with M12 connector, analog output, teachable, various programmings possible
Reliable wafer mapping	BOH photoelectric sensors	BOH000C	Optical sensor heads Micromote, Ø 2 × 8.6 mm, through-beam sensor, range 0...500 mm, Microspot-LED red light, housing material stainless steel, for switching amplifier
	Amplifier for optical sensor heads	BAE00R6	Switching frequency 10 kHz, slide switch 4 positions, M8 connector, teach mode
		BAE00Y7	Switching frequency 3 kHz, auto synchronization, alarm threshold, M8 connector, teach mode
Trace wafer frames	BVS optical ID sensors	BVS0061	Wafer frames, 1.2 MP (1280 x 960 pixels), range 50...600 mm, field of view 30 x 23 mm ...305 x 230 mm, LED white light/infrared, IO-Link 1.1, REST API, MQTT, housing 56 x 56 x 59 mm

* Please contact our sales department to configure your product.

PRODUCT OVERVIEW.

innovating automation

Application	Product group	Example	Functions, interfaces and features
VACUUM APPLICATIONS			
Wafer centering	BOH photoelectric sensors	BOH009U	Optical sensor heads Micromote , Ø 9.5 × 55.5 mm, through-beam sensor, range 0...300 mm, LED red light, housing material stainless steel, screw-in solution for sealing the chamber, for switching amplifier
		BOH000C	Optical sensor heads Micromote, Ø 2 × 8.6 mm, through-beam sensor, range 0...500 mm, Microspot-LED red light, housing material stainless steel, for installation behind sight glass, for switching amplifiers
Wafer presence detection	BOH photoelectric sensors	BOH00CM	Optical sensor heads Micromote, 9 × 7 × 1.7 mm (for perfect integration into the end effector), energetic photoelectric proximity switch, range 0...10 mm, infrared, housing material stainless steel, suitable for vacuum, 2 m PTFE leads, for switching amplifiers
Wafer presence detection	BOH photoelectric sensors	BOH009R	Optical sensor heads Micromote, Ø 9.5 × 35.5 mm, photoelectric proximity switch, range 0...12 mm, infrared, housing material stainless steel, screw-in solution for sealing the chamber, for switching amplifiers
For all vacuum applications	BAE amplifier for optical sensor heads	BAE00R6	Switching frequency 10 kHz, slide switch 4 positions, M8 connector, teach mode
		BAE00Y7	Switching frequency 3 kHz, auto-synchronization, alarm threshold, M8 connector, teach mode

Application	Product group	Example	Functions, interfaces and features
WAFER PROCESSING			
Contactless detection of fill levels through container walls	BCS capacitive sensors	On request	Capacitive level sensors without media contact, Ø 50 × 10 mm, flush mountable, media dependent adjustable, PNP normally open contact, foam and buildup compensation by Smart Level technology, housing material PTFE , connection 2 m PTFE cable
Contactless level monitoring on bypass tubes	BCS capacitive sensors	BCS0133	Capacitive sensors for object detection, 40 × 40 × 10 mm, flush mountable, range 1...20 mm, PNP normally closed/normally open, ambient temperature -5...85 °C, housing material PBT, can be attached to the bypass pipe with cable ties, connection 2 m PUR cable with M8 connector, 3-pin
Detecting process liquids in contact with the medium	BCS capacitive sensors	BCS0077	Capacitive level sensors with media contact, M30 × 1.5, non-flush mountable, media-dependent adjustable, PNP normally open contact, foam and buildup compensation by Smart Level technology, housing material PTFE, connection 2 m PTFE cable
Continuous contactless level detection	BCW capacitive sensors	BCW0004	Self-adhesive capacitive sensor head, 33 × 2 × 850 mm, vertical installation, teachable to level application teachable, stick to vessel wall, cut to suitable length, up to 6 mm vessel wall thickness, for switching amplifier
	BAE amplifier for capacitive sensor heads	BAE00KJ	2 m PUR cable, analog output, teachable, various programmings possible
Direct leakage monitoring	BCS capacitive sensors	BCS012L	Capacitive level sensors without media contact, 34 × 16 × 8 mm, media-dependent teachable, detects highly conductive substances by Smart Level technology, spacer for simplified mounting, NPN normally closed contact, housing material PP, connection 2 m PUR cable
Maintain wafer temperature at every process step	BFT temperature sensors	BFT0001	Temperature sensors in contact with the medium, process connection G¼", pressure resistance max. 50 bar, installation length 25 mm, connection M12 plug, 4-pin
		BFT0005	Transmitter, M12 plug, process connection G¼", pressure resistance max. 270 bar, installation length 25 mm, connection M12 plug, 4-pin
Reliably monitor flow valves	BES pressure-rated inductive sensors	BES05K2	M5 × 0.5, flush mountable, range 0.8 mm, PNP normally closed contact, housing material stainless steel/ceramic, pressure resistant up to 10 bar, connection 0.05 m PUR cable with M5 plug, 4-pin

Balluff

YOUR PARTNER FOR SUCCESS IN AUTOMATION

Balluff is a leading supplier of high-quality sensor, identification and image processing solutions including network technology and software for any automation requirement. Family owned for more than 100 years, Balluff currently employs about 3600 people in 37 subsidiaries with sales, production and development facilities around the world to ensure your success. Together with our representatives, we guarantee the highest quality standards in 61 countries so that you always get the best.

We perform top services to increase your competitive ability. We deliver a consistent digital focus, manufacturing expertise, and high personal dedication.

We adhere to our motto "innovating automation" as pacesetters of automation, refiners and new developers, and technological trailblazers. In our strategic incubation programs (SIPs), we develop new future-proof business models according to the lean startup principle. Open exchanges with associations, universities and research institutes also help us in this process. In this way and in close contact with our customers, we create innovative industry solutions for the world of automation. In doing so, we dedicate ourselves not only to the classic automation areas, but also to the development of digitalization and IIoT applications for a digital and networked world.

We always have the future firmly in view in everything we do. We plan with foresight, handle resources carefully and can thus offer you long-term prospects.

You can rely on us, our commitment to you and Balluff quality — all in the spirit of a mutually beneficial partnership.

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