SpechtLab™
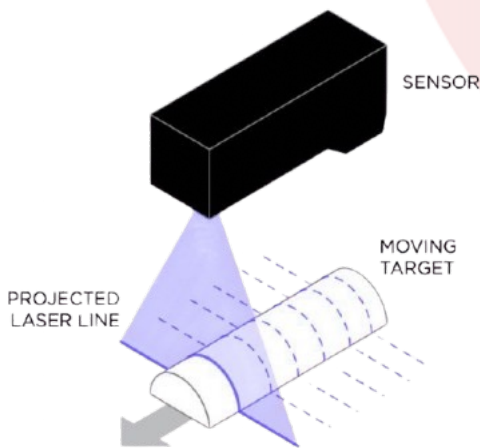
PM Series
Profile Sensors

SENSOR

MOVING TARGET

PROJECTED LASER LINE

Precision – Flexibility - Productivity

Optional Orientation and Cascaded System

Optional Water Cooling and Air Purging

Easy Installation and Maintenance

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Introduction

PM Series Profile Sensors are high resolution and real time surface profiling sensors designed for measurement of dimensional data. These sensors are perfect for in-line measurement, inspection, identification and guidance applications in various factory automation sectors such as steel, automotive, white goods, tires, electronics and semiconductor.

Main Features

- It provides the opportunity to obtain accurate and detailed measurements for critical applications up to 80µm precision.

- The flexible design allows measurement distance, field of view and micron level precision to be adapted to the specific needs of your application and target, ensuring optimal performance on your production line.

- The versatile design allows the sensor to be used as a single sensor, a dual-sensor system, or scaled up to a network of sensors, providing exceptional adaptability for your needs.

- Integrated tools offer a comprehensive set of measurement features designed to achieve diverse inspection requirements with ease.

- With interfaces tailored specifically to your needs, it delivers powerful tools that focus on addressing your requirements directly, without unnecessary complexity.

- Works on various materials, including metal, wood, and plastic, regardless of surface texture or color.
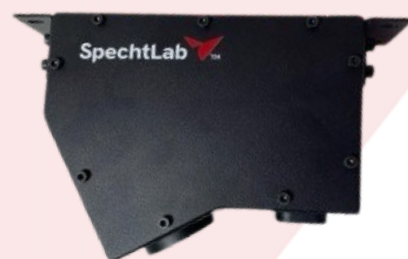
Operating Principle

The operation principle of PM series profile sensors typically involves laser triangulation, a precise and reliable method for capturing the shape, dimensions, and position of objects. Laser projects a line onto the target object's surface, and a high-resolution camera captures the reflected light. The system calculates the exact position of points along the laser line based on the geometry between the laser and camera. This data is processed into a 2D profile, and by moving the object or sensor, a complete 3D representation in point cloud is created.

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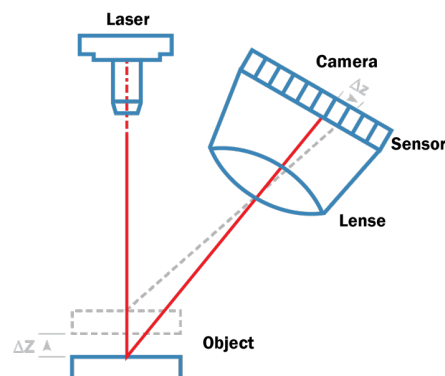
Measuring Tools

The PM Series Profile Sensors offer comprehensive measurement solutions designed to address a variety of inspection needs. With advanced capabilities, they are ideal for tackling complex measurement tasks in diverse applications. These sensors deliver precise and reliable results, ensuring high-performance performance for quality control and analysis. Their versatile design makes them suitable for solving a broad range of inspection challenges efficiently.
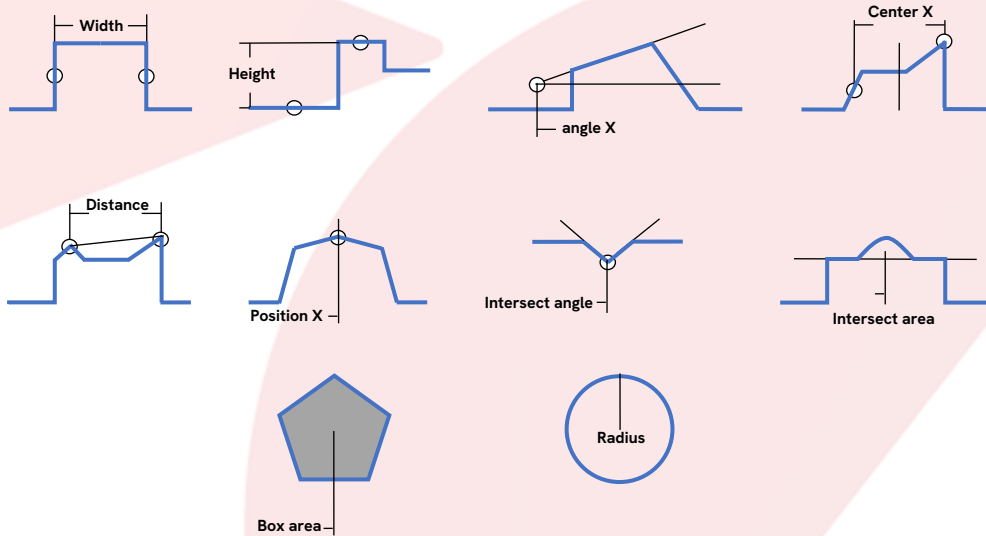
Profile Measurement

The PM Series profile tools analyze and identify feature points or fit lines within laser profile data. By comparing measurement values against predefined minimum and maximum thresholds, they ensure precise control decisions. This process enables reliable and accurate assessments for a variety of applications, maintaining high-quality standards.

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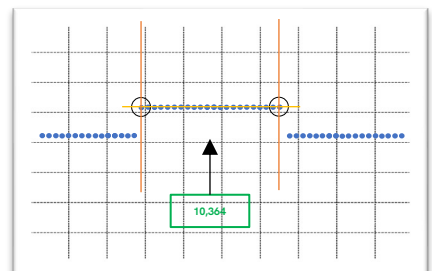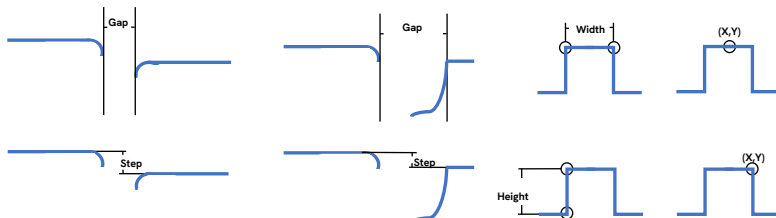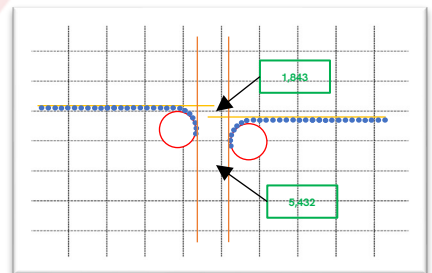
3D Surface Measurement

3D surface measurement focuses on evaluating surface properties like volume and height at specific positions. PM Series volumetric tools provide the flexibility to perform measurements across the entire surface, the complete object, or within a defined region of interest. This capability ensures precise analysis tailored to the application's needs, delivering accurate results relative to the object's surface.
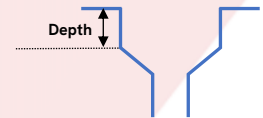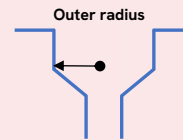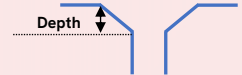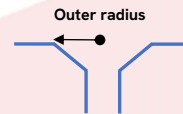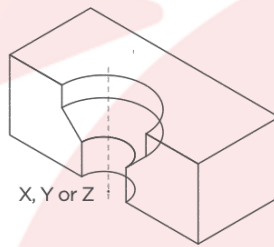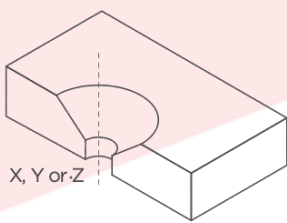
Flexible Application Options

SURFACE PLANE
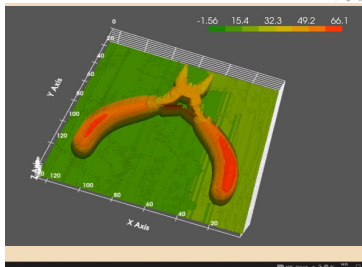
PART MATCHING

REAL TIME TRACKING

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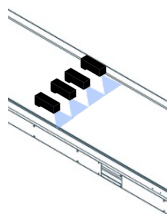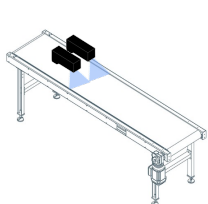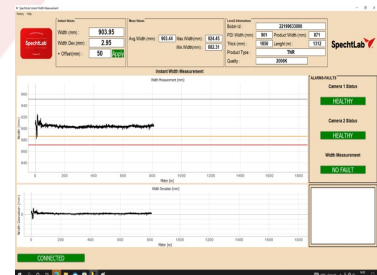
Product Specifications

Optical models, laser classes, and packages can be customized. Please contact us for special application and resolutions.

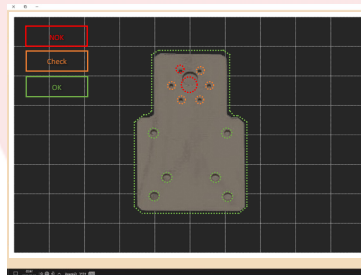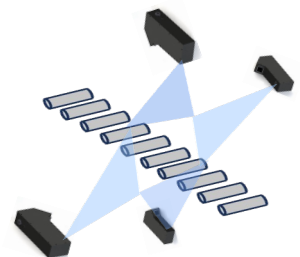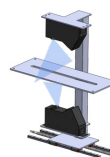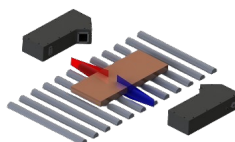| PM VGA SERIES	SP2M-B3B-35-30 175-VGA	SP2M-B3B-25-30 175- VGA	SP2M-B3B-16-30 175-VGA	SP2M-B3B-12-30 175-VGA	SP3M-B3B-12-30 250-VGA	SP3M-B3B-12-45 250-VGA	SP2M-B3B-12-60 175-VGA	SP3M-B3B-12-60 250-VGA
Data Points	640	640	640	640	640	640	640	640
Installation Height	110,5 mm	114,4 mm	122,3 mm	129,9 mm	185,6 mm	315,2 mm	404,1 mm	577,3 mm
Working Distance Z	96,8 … 110,5 mm	96,8 … 114,4 mm	96,8 … 122,3 mm	75,8 … 129,9 mm	108,3 … 185,6 mm	198,3 … 315,2 mm	235,8 … 404,1 mm	336,8 … 577,3 mm
Measuring Distance Z	13,7 mm	17,6 mm	25,5 mm	54,1 mm	77,3 mm	117 mm	168,3 mm	240,4 mm
Measuring Area X	21,1 … 21,8 mm	29,5 … 30,9 mm	46,1 … 49,2 mm	58,6 … 67 mm	83,8 … 95,7 mm	98,1 … 123,7 mm	90,3 … 135,4 mm	129 … 193,4 mm
Resolution Z	27,7 µm	35,6 µm	51,6 µm	109,5 µm	156,5 µm	236,8 µm	340,7 µm	486,7 µm
Resolution X	32 … 33,1 µm	44,8 … 46,8 µm	70 … 74,7 µm	89 … 101,7 µm	127,1 … 145,3 µm	148,9 … 187,7 µm	137 … 205,5 µm	195,7 … 293,5 µm
Laser Class	2M	2M	2M	2M	2M	2M	2M	2M
Laser Type	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red

PM2.3 SERIES	SP2M-B3B-35-30 175-2,3MP	SP2M-B3B-25-30 175-2,3MP	SP2M-B3B-16-30 175-2,3MP	SP2M-B3B-12-30 175-2,3MP	SP3M-B3B-12-30 250-2,3MP	SP3M-B3B-12-45 250-2,3MP	SP2M-B3B-12-60 175-2,3MP	SP3M-B3B-12-60 250-2,3MP
Data Points	1920	1920	1920	1920	1920	1920	1920	1920
Installation Height	115,2 mm	121,1 mm	133,3 mm	145,3 mm	207,5 mm	353 mm	472,9 mm	675,6 mm
Working Distance Z	96,8 … 115,2 mm	96,8 … 121,1 mm	96,8 … 133,3 mm	64,8 … 145,3 mm	92,5 … 207,5 mm	177 … 353 mm	210,8 … 472,9 mm	301,2 … 675,6 mm
Measuring Distance Z	18,4 mm	24,3 mm	36,5 mm	80,5 mm	115 mm	176 mm	262,1 mm	374,5 mm
Measuring Area X	37,7 … 39,5 mm	52,8 … 56,2 mm	82,5 … 90,7 mm	102,6 … 125,1 mm	146,6 … 178,7 mm	168,5 … 237,9 mm	150,7 … 277,4 mm	215,3 … 396,2 mm
Resolution Z	15,3 µm	20,2 µm	30,4 µm	67,1 µm	95,8 µm	146,6 µm	218,4 µm	312 µm
Resolution X	19,6 … 20,6 µm	27,5 … 29,3 µm	43 … 47,3 µm	53,5 … 65,1 µm	76,4 … 93,1 µm	87,8 … 123,9 µm	78,5 … 144,5 µm	112,1 … 206,4 µm
Laser Class	2M	2M	2M	2M	2M	2M	2M	2M
Laser Type	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red

PM5.6 MP SERIES	SP2M-B3B-50-30 175-5,6MP	SP2M-B3B-35-30 175-5,6MP	SP2M-B3B-16-30 175-5,6MP	SP2M-B3B-12-30 175-5,6MP	SP3M-B3B-12-30 250-5,6MP	SP3M-B3B-12-45 250-5,6MP	SP2M-B3B-12-60 175-5,6MP	SP3M-B3B-12-60 250-5,6MP
Data Points	2600	2600	2600	2600	2600	2600	2600	2600
Installation Height	114,1 mm	119,9 mm	144,8 mm	161,6 mm	230,9 mm	395,9 mm	562,8 mm	803,9 mm
Working Distance Z	96,8 … 114,1 mm	96,8 … 119,9 mm	65 … 144,8 mm	54,4 … 161,6 mm	77,7 … 230,9 mm	157,9 … 395,9 mm	189,5 … 562,8 mm	270,7 … 803,9 mm
Measuring Distance Z	17,3 mm	23,1 mm	79,8 mm	107,2 mm	153,2 mm	238 mm	373,3 mm	533,3 mm
Measuring Area X	26,1 … 27,2 mm	37,3 … 39,5 mm	76,1 … 92,6 mm	99,6 … 129,4 mm	142,2 … 184,9 mm	160,7 … 254,4 mm	140,1 … 320,2 mm	200,2 … 457,4 mm
Resolution Z	8 µm	10,7 µm	36,9 µm	49,6 µm	70,9 µm	110,2 µm	172,8 µm	246,9 µm
Resolution X	10 … 10,5 µm	14,3 … 15,2 µm	29,3 … 35,6 µm	38,3 … 49,8 µm	54,7 … 71,1 µm	61,8 … 97,8 µm	53,9 … 123,2 µm	77 … 175,9 µm
Laser Class	2M	2M	2M	2M	2M	2M	2M	2M
Laser Type	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red

PM100 SERIES	SP1M-B3B-50-60- 100-5,6MP	SP1M-B3B-35-60- 100-5,6MP	SP1M-B3B-25-60- 100-2,3MP	SP1M-B3B-16-60- 100-1,6MP	SP1M-B3B-16-60- 100-2,3MP	SP1M-B3B-16-60- 100-5,6MP	SP1M-B3B-16-60- 100-1,3MP	SP1M-B3B-12-60- 100-5,6MP
Data Points	2600	2600	1920	1440	1920	2600	1280	2600
Installation Height	197,1 mm	209 mm	211,4 mm	232,4 mm	239,1 mm	269,1 mm	268,6 mm	321,6 mm
Working Distance Z	173,2 … 197,1 mm	173,2 … 209 mm	173,2 … 211,4 mm	173,2 … 232,4 mm	173,2 … 239,1 mm	120,8 … 269,1 mm	173,2 … 268,6 mm	108,3 … 321,6 mm
Measuring Distance Z	23,9 mm	35,8 mm	38,2 mm	59,2 mm	65,9 mm	148,3 mm	95,4 mm	213,3 mm
Measuring Area X	26,1 … 28,8 mm	37,3 … 43,2 mm	52,8 … 61,7 mm	62,1 … 78,6 mm	82,5 … 106,9 mm	63,9 … 117 mm	85 … 121,8 mm	80,1 … 183 mm
Resolution Z	11,1 µm	16,6 µm	31,9 µm	54,8 µm	54,9 µm	68,6 µm	93 µm	98,8 µm
Resolution X	10 … 11,1 µm	14,3 … 16,6 µm	27,5 … 32,2 µm	43,1 … 54,6 µm	43 … 55,7 µm	24,6 … 45 µm	66,3 … 95 µm	30,8 … 70,4 µm
Laser Class	2M	2M	2M	2M	2M	2M	2M	2M
Laser Type	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red	Blue or Red

OTHER DATA	
Input Voltage (Power)	220V AC / 24V DC (Customizable according to application)
Interface	GigE
Transfer Rate	100/1000 Mbit/s
Connection Type	M12x1 8 Pin
Case Material	Aluminum
Protection Class	IP65
Ethernet Connection	Rj45 x 1
Optic Cover	Glass
Communication	TCP/IP
Triggering Type	Encoder/Free run
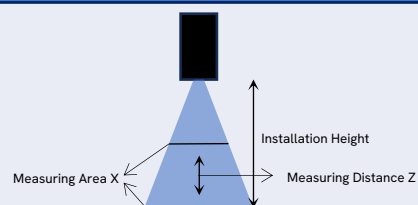
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Accessories and Options

*Profile Sensor	Included
Control Panel	Included
SpechtLab PM Software	Included
SpechtLab PM GUI	Optional
Operator PC, Mouse and Keyboard	Optional
Water Cooling	Optional
Air Purging	Optional
Linux Operating System	Included
Windows Pro Operating System	Optional
Cables for Ethernet, 8Pin 1x Male X-coded M12, 1xRJ45 connectors	10m(**Included**) 15m (Optional) 20m (Optional)
Cables for Power and I/O, 8 Pin 1x Male A-coded M12 connector with Open-end cable	10m(**Included**) 15m (Optional) 20m (Optional)
Installation and Assembly Unit (Aluminum Sigma Profile)	Optional
Retrospective Data Record	1 year (Included)
* Recommended spare parts	

End-user's Scope
- 220/230V power supply to Control Panel
- Encoder signal connection from the line (If there is no encoder, it can be ordered separately)
- Industrial water supply to Profile Sensor (10 L/m 25 °C ... 20 L/m 35 °C water)
- Industrial air supply to Profile Sensor
- Installation bridge and all other construction works.

Connection

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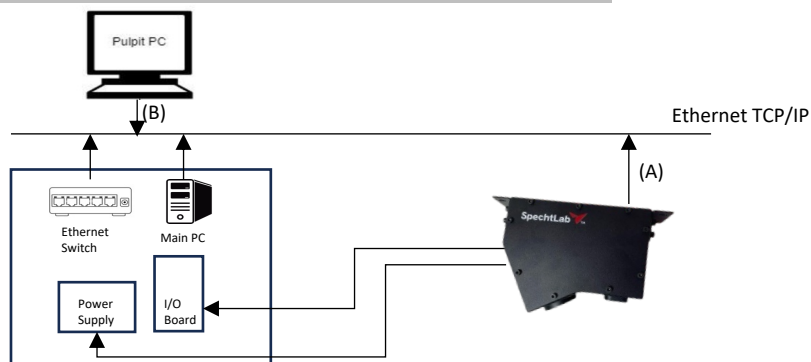
Choosing the Right Profile Sensor

For most people, purchasing a Profile Sensors is a new experience. This process is complex and confusing since each system has its own features and uses different technologies (laser, resolution, precision etc.). Profile Sensors are technology enables the automatic completion of tasks without physical contact, ensuring precision and efficiency in various applications. . Which sensor configuration is best suited for your particular application really depends on your needs. Therefore, the first step is to define what you want to achieve. Otherwise, you will have no method to evaluate whether the Profile Sensor you are considering will meet those requirements. Here are key questions you need to answer to help you with this process.

1. What are you trying to measure?

Defining what you want to measure will determine what features are important when evaluating Profile Sensors. For example, a sensor that is great at scanning dull or opaque surfaces not be good for scanning shining or bright materials. Even color of the surfaces are important. The more specific you are at defining you want to measure, the easier you will be able to find a Profile Sensor that suits your particular application.

2. Which measurement data are you trying to get?

Identifying the specific type of measurement data, you need is crucial when selecting a profile sensor. For instance, are you looking to measure dimensions like width, height, or depth? Or do you need to analyze surface features such as angles, patterns, or volume? Different sensors are optimized for specific types of data, and choosing one that aligns with your requirements will ensure more accurate and efficient results. Additionally, understanding whether you need 2D profile data or 3D surface data will guide you toward the most suitable sensor for your application. The clearer you are about the data you need, the easier it becomes to select the right solution.

3. What is the size of the target object?

Most Profile Sensors are optimized for a particular measuring window (Field of view) or object size. Typically, you would need to use different sensors sizes to measure objects or particular area of the object of different sizes. For example, you would use a different Profile Sensors measuring gap between assembled parts versus a sensor optimized for measuring an entire object. Most Profile Sensors are optimized to scan objects or area from approximately a few inches to two feet. The further you go from this standard size, the higher the price the Profile Sensor will likely be.

4. How much accuracy are you looking in a measurement?

Accuracy refers to how closely the measured value aligns with the true value of the object. In the case of profile sensors, this is typically expressed as X and Z accuracy, which Z pertains to depth measurements and X to the lateral or horizontal measurement across the sensor's field of view (FOV). X and Z accuracies are the most prominently featured metric on a profile sensor's specification sheet. This is an important consideration because accuracy has a significant influence on the cost of the sensor. High accuracy is desirable but is also the primary driver of cost. For example, a profile sensor with a 50-micron accuracy might cost \$10,000, whereas one with 5-micron accuracy could exceed \$30,000. To optimize costs, it's recommended to choose the lowest accuracy that meets the needs of your application.

5. How much resolution are you looking for in a measurement?

Resolution determines the level of detail a profile sensor can capture during a measurement. It is typically defined as the smallest measurable distance between two points in the X (lateral) and Z (depth) directions. Higher resolution allows for finer details to be captured, which is essential for applications requiring precise measurements or inspection of small features. However, higher resolution sensors often come at a higher cost and may generate larger amounts of data, requiring more processing power. To make the best choice, consider the specific level of detail your application demands and balance it with your budget and system capabilities.

6. How many samples per second do you require, or more specifically, at what intervals along a moving line would you like to capture measurements—every meter, centimeter, or millimeter?

This question is critical because it helps determine the sampling rate or resolution required for your application. The sampling rate refers to how frequently the sensor collects data as the object moves through its field of view. For example, in high-speed production lines, capturing measurements at smaller intervals, such as every millimeter or centimeter, ensures greater accuracy and detailed inspection. However, higher sampling rates require faster sensors and more processing power, which may increase system costs. Choosing the right sampling interval depends on the precision you need and the speed of the moving line, balancing detail with system efficiency and cost.

7. What do you plan to do with the data once you finish the measurement?

Understanding how the measurement data will be used is key to selecting the right profile sensor and designing the system. Will the data be used for real-time decision-making, such as triggering an alert or rejecting defective parts? Or will it be stored for further analysis, quality control, or reporting? For instance, real-time processing may require a sensor with high-speed data output and compatibility with your existing control systems (e.g., PLCs or robots). On the other hand, storing large datasets for analysis might necessitate robust data storage and processing solutions. Defining your data usage clearly will help ensure the measurement system is aligned with your application needs.

8. What is your measuring environment and the availability for installation?

The measuring environment is crucial in selecting the right profile sensor, as factors like temperature, humidity, dust, vibrations, and lighting conditions can significantly affect sensor performance. For instance, harsh or industrial environments might necessitate sensors with protective housings, sealing capabilities, or resistance to contaminants like oil, water, or steam. Additionally, outdoor environments might require sensors designed to handle ambient light interference.

Equally important is the availability for installation. Consider how easily the sensor can be integrated into your existing system and infrastructure. Does the sensor fit within the available space? Can it be installed with minimal modifications, or are special accommodations required? Assessing both the environment and installation requirements ensures that you select a sensor that can operate effectively and be installed with minimal disruption to your process.

9. What is your budget?

Your budget is a key factor in determining the type of profile sensor that is most suitable for your application. High-performance sensors with greater accuracy, faster sampling rates, and advanced features tend to come with a higher price tag. However, it's important to balance the sensor's capabilities with the actual needs of your application. For example, while a sensor with ultra-high accuracy may be desirable, it may not be necessary if your measurements don't require that level of precision. By defining your budget upfront, you can narrow down your options to sensors that meet your performance requirements without exceeding your financial constraints. This ensures a cost-effective solution that delivers the necessary value for your operations.

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Inquiry Form (1/2)

Company:	
Competent:	
Title	
Tel:	
E-mail:	
Project City and Country:	

1. What goals are intended to be achieved with the Profile Sensors? (Please briefly summarize your expectations or existing problems).

2. What measurement data would you like to access?

3. Is there any measuring device installed on the existing line that fully or partially meets your measurement expectations stated above?

4. Is there a project budget or will there be a budget approval process?

INFORMATION ABOUT PRODUCTION LINE AND PRODUCT

1.	Name of line and installation point	
2.	Width of the line (mm)	
3.	Minimum and maximum allowed installation height (mm)	
4.	Material type	☐ Steel ☐ Aluminum ☐ Rubber ☐ Other……………………………
5.	Line Speed (m/s) Please specify if there is no line	
6.	Minimum and maximum width of the material (mm)	
7.	Minimum and maximum thickness or height of the material (mm)	
8.	Minimum and maximum length of the material (mm)	☐ Continuous ☐ Other ……………………………
9.	Is there any deviation or oscillation of the material from the axis?	
10.	Is there available encoder signal on the line?	

PRECISION REQUIREMENTS

1.	Required measurement precision (mm or mic.)	
2.	Desired measurement or scanning frequency (2 measurements/sec or /m)	

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ENVIRONMENT CONITIONS

1.	Max/Min ambient temperature of the area (°C)	
2.	Is there dust/dirt in the air?	
3.	Maximum installation height allowed on the line (mm)	
4.	Allowed max./min. cable distance between installation point and panel (m)	
5.	Cable distance between panel and operator monitoring room (m)	
6.	Is there vibration or material fluctuation when the material flows on the line?	

ADDITIONAL INFORMATION
Please fill below part for requested optional equipment

1.	**SpechtLab PM GUI**	☐
2.	**Operator PC, Mouse and Keyboard**	☐
3.	**Water Cooling**	☐
4.	**Air Purging**	☐
5.	**Windows Pro Operating System**	☐
6.	**Cables for Ethernet, 8Pin 1x Male X-coded M12, 1xRJ45 connectors**	☐ 15m ☐ 20m
7.	**Cables for Power and I/O, 8 Pin 1x Male A-coded M12 connector with Open-end cable**	☐ 15m ☐ 20m
8.	**Installation Unit (Aluminum Sigma Profile)**	☐
9.	**Retrospective Data Record**	☐ 3 Years ☐ 5 Years

NOTES

- Including any photos of production line and product will speed up evaluation process of inquiry.
- Modular architecture of the PM Series allowing easy extension and implementation effective solutions with end user. For additional requirements or special applications please contact us.
- Spechtlab reserves all rights to change information contained in this document without notice.

Signed By _____