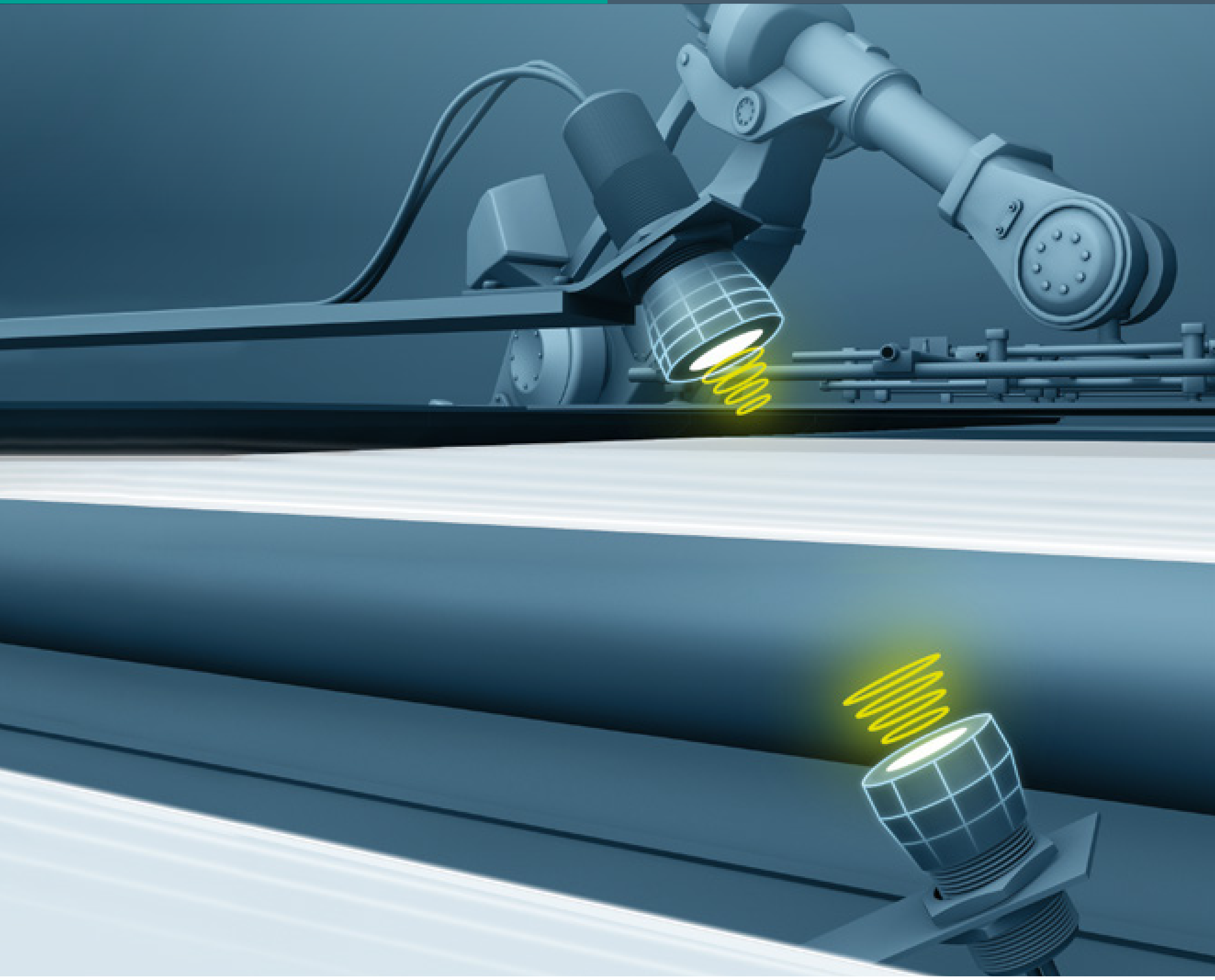
Technology Guide

Ultrasonic Double Material Detection



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PEPPERL+FUCHS

Technology Guide

Ultrasonic Double Material Detection

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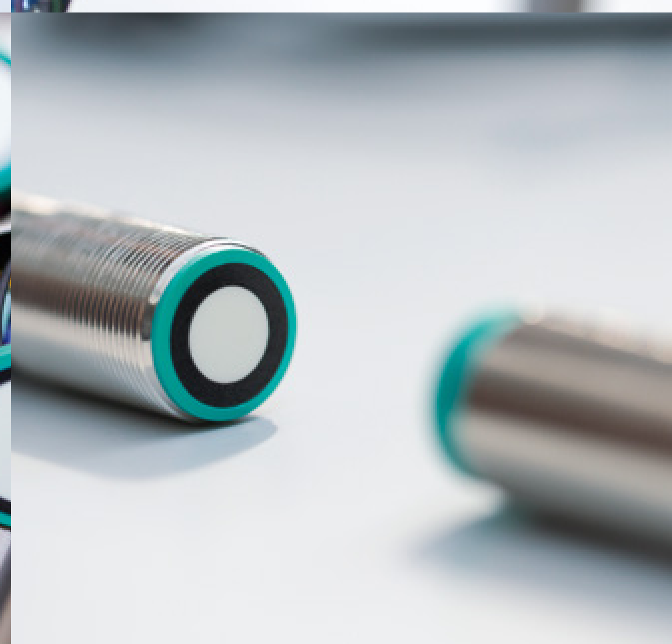
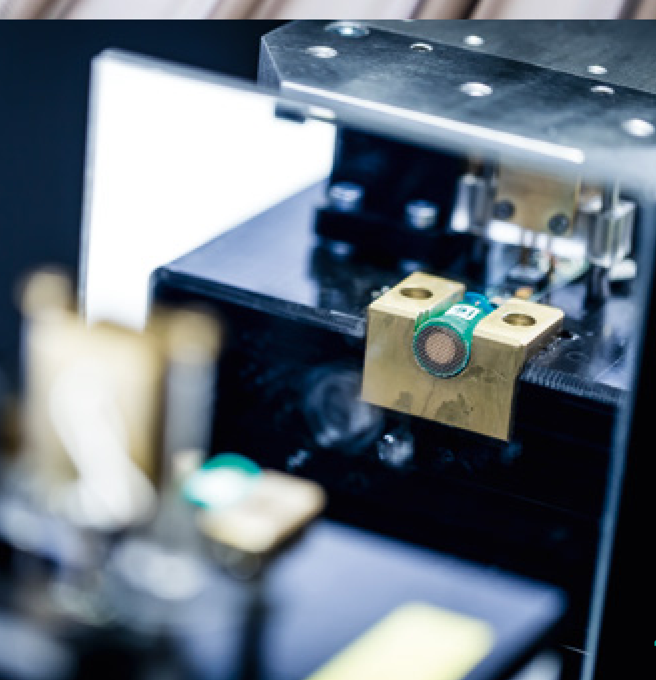




Innovation and Expertise from the Outset

With its unique development expertise and a high degree of vertical integration in the field of ultrasonic sensors, Pepperl+Fuchs is working on the application solutions of the future. The ultrasonic portfolio combines decades of in-house competence in ultrasonic transducers, a company-owned technology center, and comprehensive expertise for future-proof, application-oriented sensor solutions.

Top Quality and Performance—Ultrasonic Sensors from an In-House Technology Center

Ultrasonic sensors from Pepperl+Fuchs are built in the company's technology center with associated transducer development and manufacturing. For more than 30 years, our forward-thinking team of experts has been working continually to advance ultrasonic technology for the solutions of tomorrow. This means our customers always receive the highest-performance products on the market.

This approach has led to the broadest standard portfolio in the industry, supported by numerous patents and innovations for flexibility in product selection and optimal application solutions. In addition to the standard portfolio, Pepperl+Fuchs has the knowledge and infrastructure to quickly adapt to customer needs.

Ultrasonic Technology for Every Industrial Application

Pepperl+Fuchs' ultrasonic sensor portfolio not only includes sensors for object detection and distance measurement, but also a selection of sensors tailored to double material detection. They always ensure technically reliable and efficient solutions by combining advantages such as minimal response times, a huge range of materials, and lack of sensitivity to printed surfaces with a variety of housing designs.

For more information, visit
pepperl-fuchs.com/tx-double-material

Double Material Detection: Safeguarding Smooth Processes

A multilayer feed of materials such as paper, cardboard, metal, film, or labels can lead to downtime, process faults, and material waste. Ultrasonic sensors for double material detection prevent a faulty material feed while ensuring reliable processes and high availability.

Years of Experience in Advanced Sensor Solutions

Double material detection places unique demands on ultrasonic sensors and requires specialist expertise. Pepperl+Fuchs has more than 15 years of in-depth development and manufacturing competence in this field. It has already provided solutions for countless applications. Pepperl+Fuchs now offers tried-and-true technology that always delivers reliable solutions, even for the most demanding applications.

Ultrasonic technology is used to prevent an accidental multilayered feed of materials, ensuring continuous, error-free processes.

Ultrasonic technology has proven itself to be more reliable and less susceptible to problems than other non-contact technologies. For example, it is much less sensitive to changes in ambient conditions such as humidity or temperature. Ultrasonic technology can also detect a wider range of materials, including printed, shiny, transparent, and coated films or metals.

The devices used for double material detection are amplitude-measuring ultrasonic sensors. They do not carry out runtime measurements like the devices described in the “Ultrasonic Sensors Technology Guide,” but instead analyze the amplitude height of the ultrasonic signal they receive.

This technology can be used to detect double sheets, splices, and labels. Information about how it works, where it is used, and influencing factors is covered in detail below.

Double Material Detection—Technology

3.1 Operating Principle of Amplitude-Measuring Ultrasonic Sensors

Double material detection sensors measure the level of attenuation, or amplitude reduction, caused by the material present between the emitter and the receiver. Two separate ultrasonic transducers are used to send and receive the signals (thru-beam sensor principle).

These can be housed in one enclosure (fork design) or two.

3.2 Ultrasonic Double Sheet Detection

Double sheet detection systems are used when only one layer of a material should be fed into a machine. Double sheet sensors are commonly used in the printing industry to monitor the number of sheets being fed into printing machines. A fault in the print matrix or unprinted pages in the final printing product can result if multiple sheets are fed in.

Sensors are also used for double sheet detection in other sectors. Examples include detecting single and double metal sheets in presses and layers of chipboard, OSB panels, and parquet parts in sawmills.

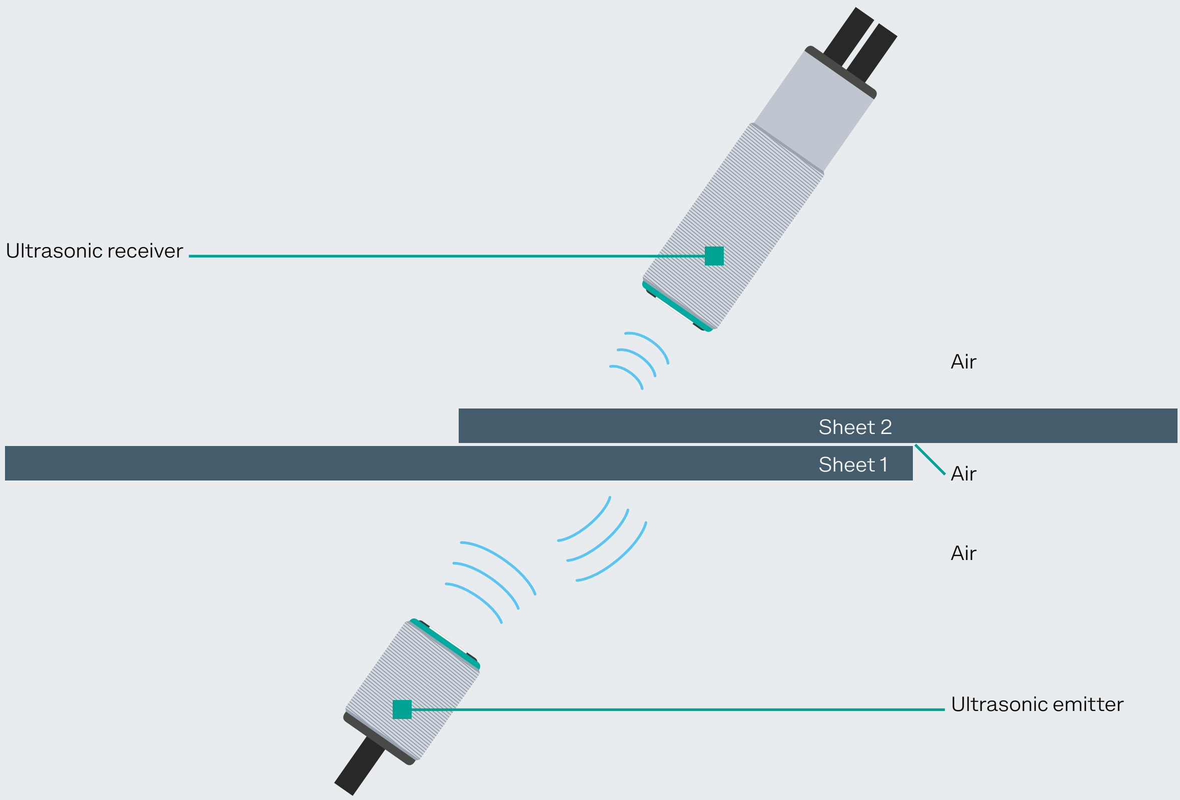
The technology can be used with many different materials and combinations of materials. For example, it is also possible to distinguish between single or double layers of glass sheets.

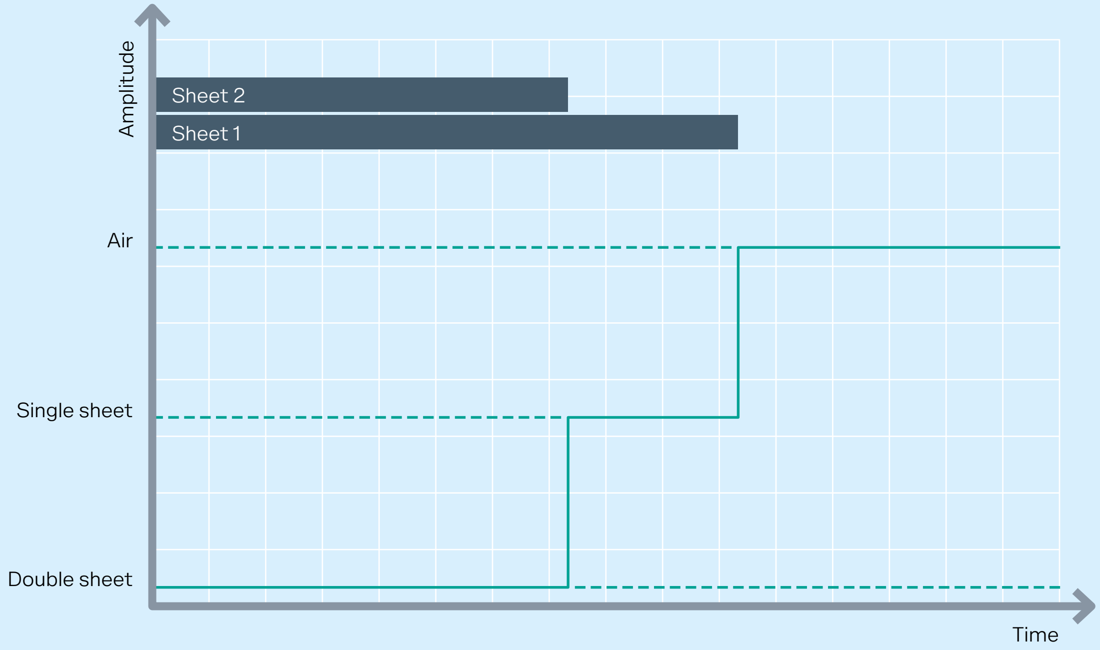
“Double sheet detector” has established itself as the term for this type of sensor on the market. Accordingly, the electrical sensor outputs are usually referred to as “air”, “single sheet”, and “double sheet”.

How Ultrasonic Double Sheet Detection Works

Ultrasonic double sheet detectors measure the attenuation of the emitted ultrasonic signal caused by the material introduced into the control. A switching output is used to indicate whether the material is a single or double layer. The state “no material infeed” can also be detected and relayed via a switching output.

The following diagram provides a visual overview of the measuring principle.





Simplified illustration of amplitude curve for double sheet detection

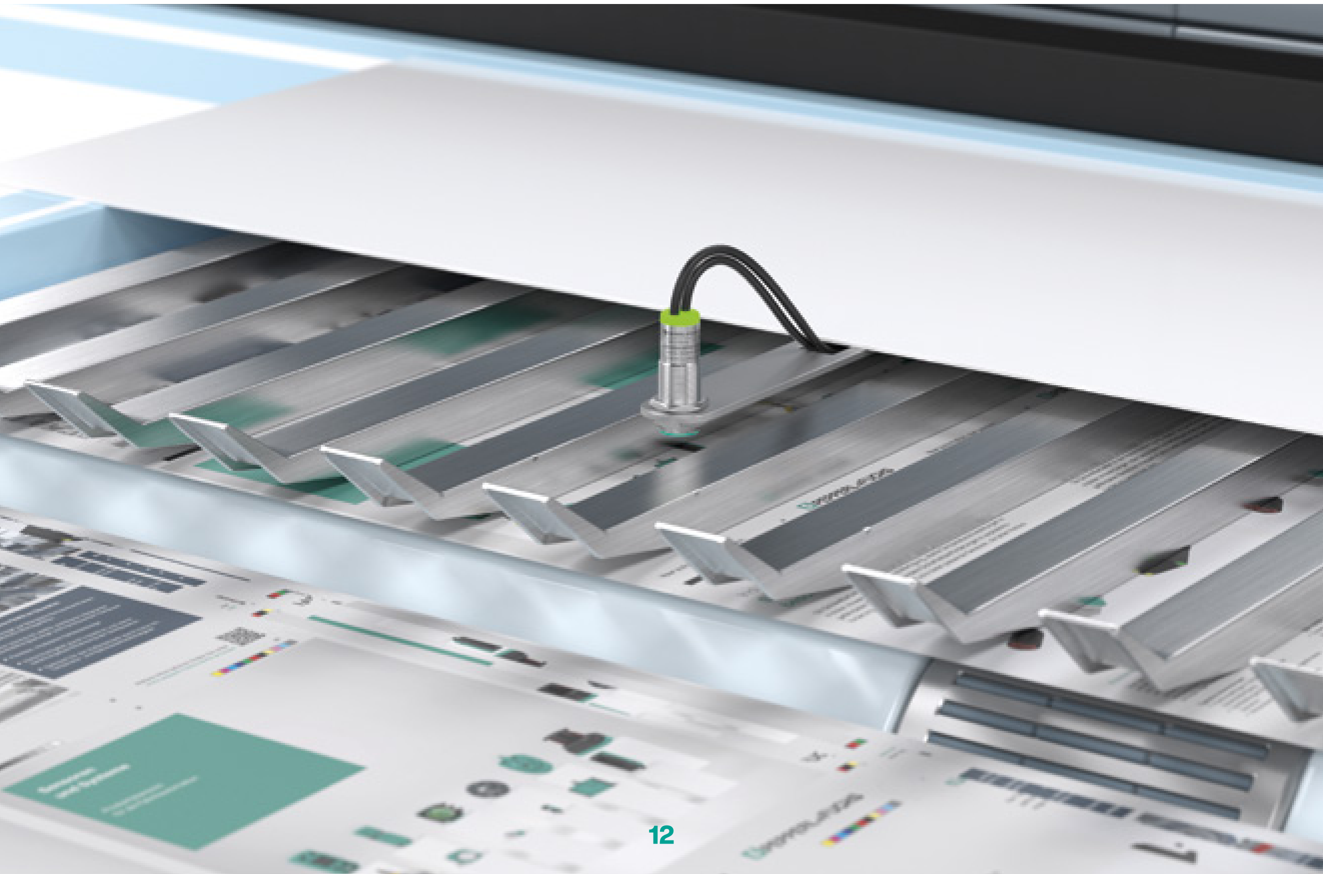
The ultrasonic transmitter emits sound. The sound waves are partially reflected by the surface of the material due to the different acoustic impedances of the surrounding air and the material introduced (e. g., paper). The remaining sound waves penetrate the material. In the transition from the material to the air, part of the sound stays in the material, while the remaining part is decoupled into the air.

A strong attenuation of the signal amplitude can be observed after the first sheet of material passes. The amplitude drops slightly higher or lower depending on the attenuation of the material. If there is another sheet of material, the procedure is repeated. The residual amplitude is then close to or at zero. The difference between a single and double sheet will always be sufficiently noticeable.

Because of the significant differences in measured amplitude, double sheet detection systems can distinguish between a single layer and "more than a single layer." The detected state is relayed via the switching outputs and used to control the machine.

The default settings for Pepperl+Fuchs' double sheet sensors are suitable for over 90 % of all usable materials. If necessary, it is also possible to quickly and easily switch between threshold sets or to program the devices for specific materials via the teach-in function.

Different synchronization modes enable several sensors to be used in a confined space without the sensors being affected by cross talk. For this purpose, the devices have the following modes: common, multiplex, and externally triggered. Excellent reliability is ensured in all scenarios.



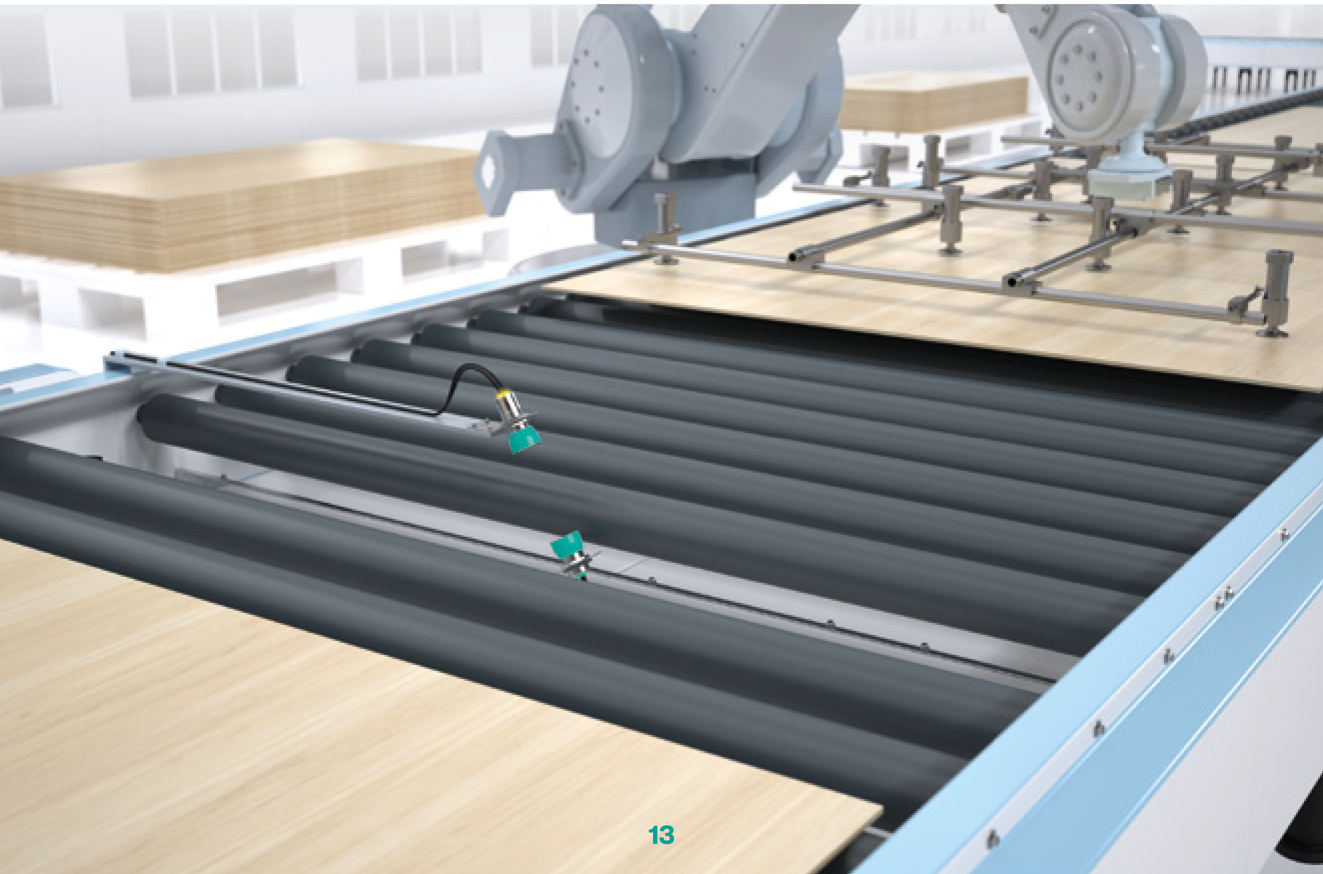
Ultrasonic Double Sheet Detection Applications

Ultrasonic double sheet sensors can check whether one or more layers of material are being fed into the machine, regardless of the material being used. In the case of offset and digital printing machines, the sensors ensure that only one sheet of paper passes through the paper feed.

The double sheet detection system is located directly behind the printing machine's sheet feeder for this purpose. If double sheets or missing sheets are detected, the printing process is stopped immediately. This prevents any damage to the delicate printing tools and guarantees the quality of the final result. In addition to printing machines, double sheet detection systems can be used in punching, collating, and folding machines.

Ultrasonic technology makes detection possible, no matter the sheet material—fine paper, transparencies, cardboard, and metal film can all be detected, irrespective of color, surface, texture, and possible reflections.

The same applies to other industrial sectors such as the wood processing industry. In sawmills and plants manufacturing furniture and parquet, the sensors can be used to detect single and double layers of chipboard, OSB panels, and parquet parts. The two sensor components are located above and below the conveyor rollers. The panels to be processed are usually inserted into automatic cutting machines by handling robots. Once the panels have been placed on the feed belt, it is important to check that the robot has not mistakenly laid more than one panel. If an error has occurred, the double sheet detection system sends a signal to the machine control system, and the process is stopped.



3.3 Ultrasonic Splice Detection

Many production machines in a wide variety of industrial sectors process rolls of material. When the material runs out, the roll must be replaced. To avoid the time-consuming process of threading another roll into the machine, the material from a new roll is bonded to the end of the previous roll.

Ultrasonic sensors for splice control detect the overlap between sheets of material, which is undesirable in further processes. The adhesive area can then be cut out before the next stage of the process. This is how splice detection sensors ensure a continuous flow of material and avoid process downtime in newspaper and web-fed printing or in packaging machines and the production of films and plastic bags.

How Ultrasonic Splice Detection Works

Ultrasonic splice detection sensors measure the difference in attenuation between “material” and “material with a splice” in the same way as double sheet sensors. The main difference between splice detection and double sheet detection is that the deviation between the two states is considerably smaller.

This is due to the absence of a layer of air between the two materials, which provides a strong attenuating effect when a double sheet is detected.

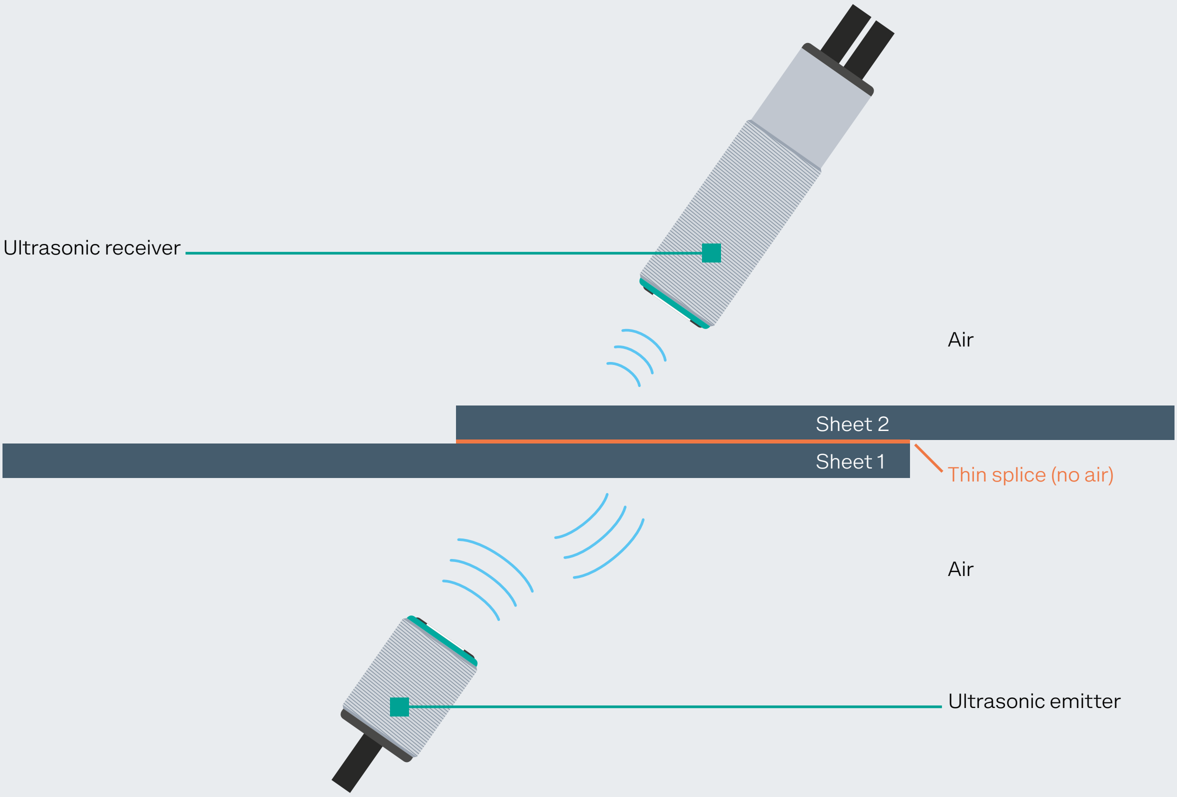
In the case of splices, the transition from material to adhesive tape is “filled” with adhesive. This adhesive has an acoustic wave impedance similar to that of the material, so the attenuation only increases very slightly at the layer boundary.

Two different splice types are typically used: the materials can either be bonded in overlap or end to end. If they overlap, the material from the new roll is bonded to the previous layer of material using adhesive tape. Either double-sided tape or normal adhesive tape is used to affix the end of the new layer of material to the layer that is about to run out.

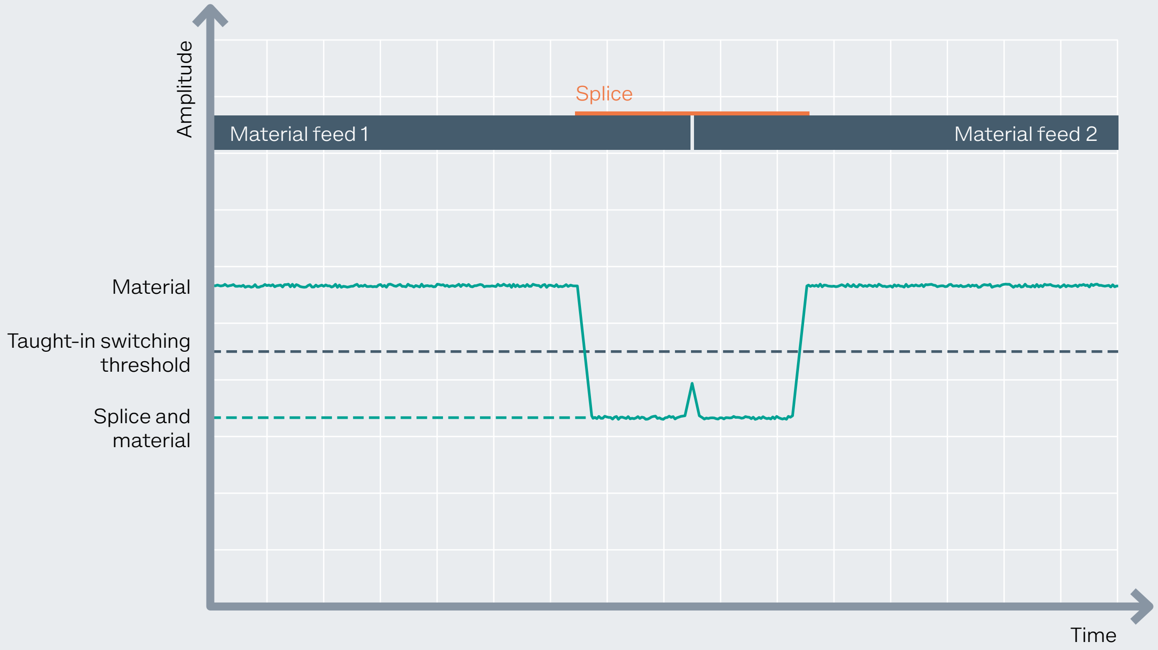
The figure on the right illustrates the principle of ultrasonic splice detection using the example of an overlapping bond with double-sided adhesive tape.

In the case of end-to-end bonding, the previous layer of material transitions into the new layer without any overlap. The adhesive tape covers the edge and ensures that the two layers are held together. Any gap between the two layers of material is also covered up using adhesive tape. All of the above can be detected using ultrasonic splice detection systems.

The attenuation difference between “material” and “material with adhesive tape” is quite low. In contrast to double sheet applications, in which various material configurations can usually be tested with just one threshold setting, the material fed through the machine must be taught in. This ensures reliable detection of the splice.



Simplified representation of an amplitude curve for splice detection using the example of an overlapping adhesive bond with double-sided adhesive tape



Amplitude curve of splice detection, end-to-end bond

Since ambient conditions also affect the measured signal amplitude (see Section 4), it is advisable to adjust the threshold value to compensate for slow changes in these conditions—such as the temperature in a factory—over the course of a day. Pepperl+Fuchs' splice detection sensor systems therefore feature automatic switching threshold tracking.

Background Information

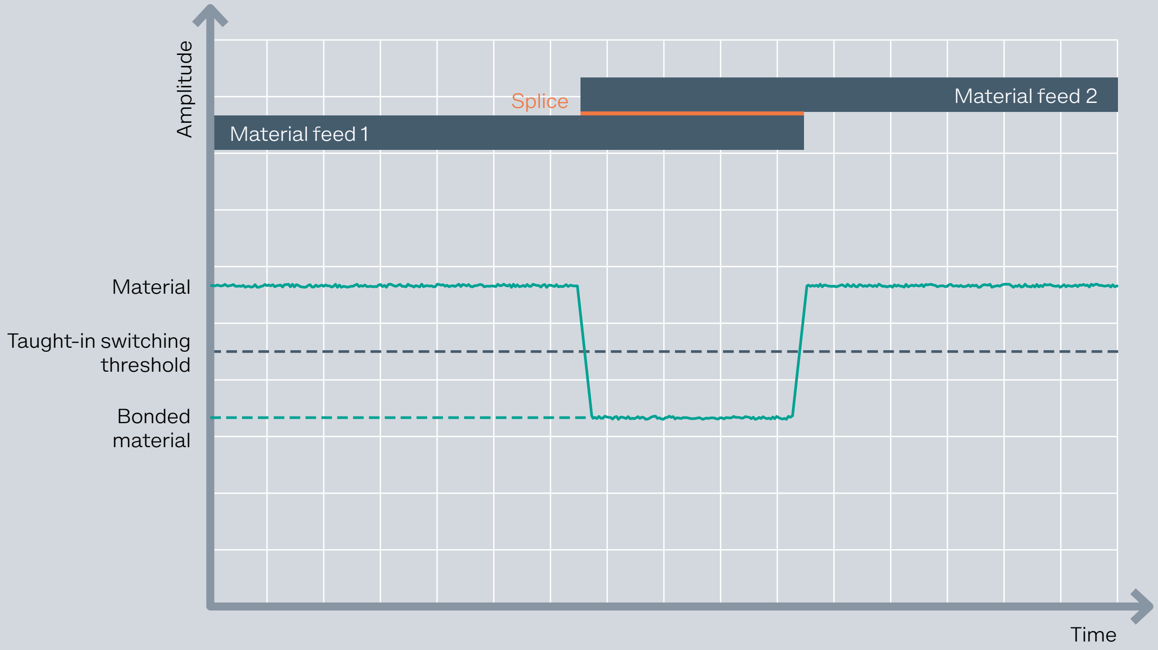
Automatic switching threshold tracking eliminates the negative influences of temperature and air humidity changes, particularly in splice and label detection applications.

If the machine's material feed stops, there may be instances where the threshold can be optimized by adjustment to a statically measured amplitude value. If this section of the material has particularly weak attenuating properties, for example, the threshold will be adjusted upwards.

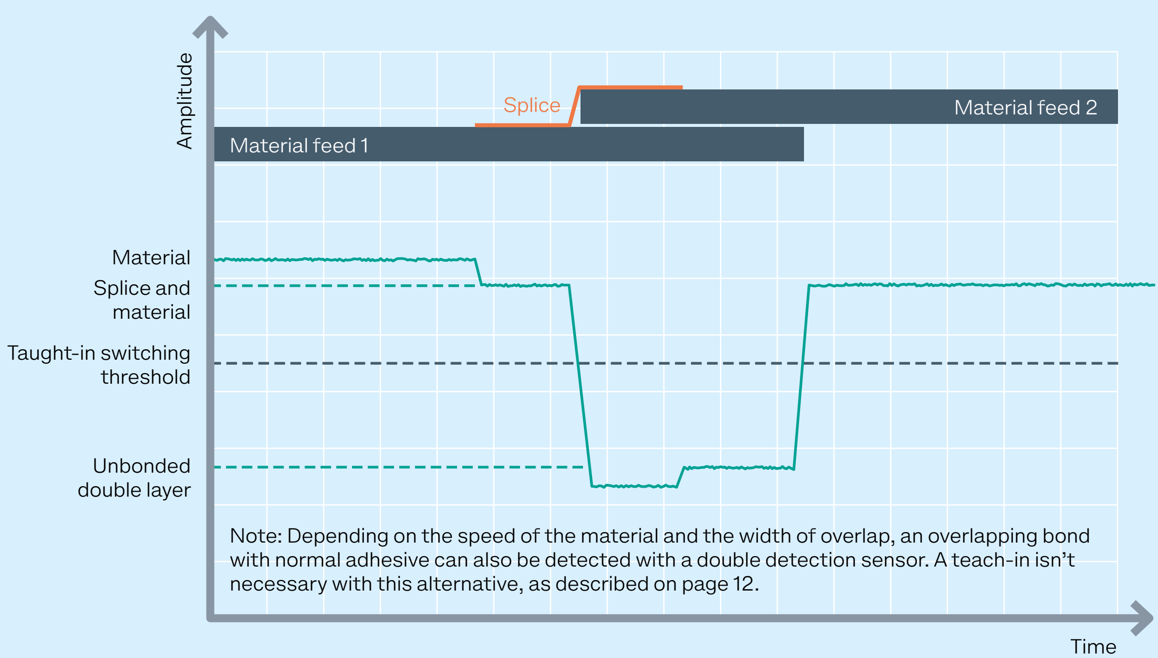
The material will move past the sensor with "normal" attenuation behavior when the machine starts up again, resulting in lower measured amplitudes. Since the threshold was automatically adjusted upwards during machine downtime, the detection system will now be triggered even though there is no splice near the sensor.

To ensure that sensors with automatic switching threshold tracking are functioning during restart, a new teach-in depending on the uniformity of the material being fed in is recommended or even mandatory.

A new teach-in isn't necessary in the case of extremely homogeneous materials, such as films, and after short downtimes during which the ambient temperature does not change. In cases like these, the machine can simply be restarted.



Amplitude curve of splice detection, overlapping bond with double-sided adhesive

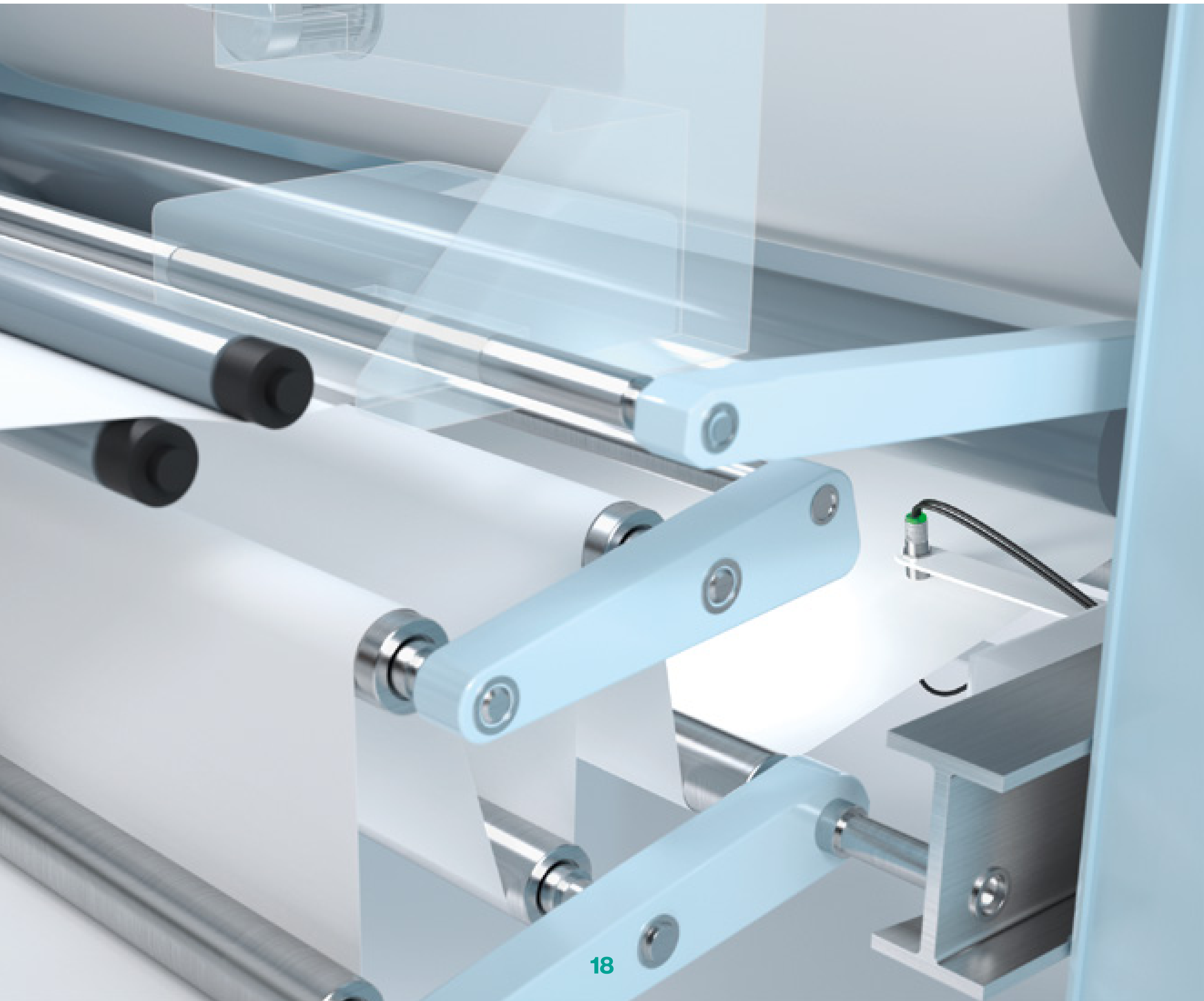


Amplitude curve of splice detection, overlapping bond with normal adhesive

Ultrasonic Splice Detection Applications

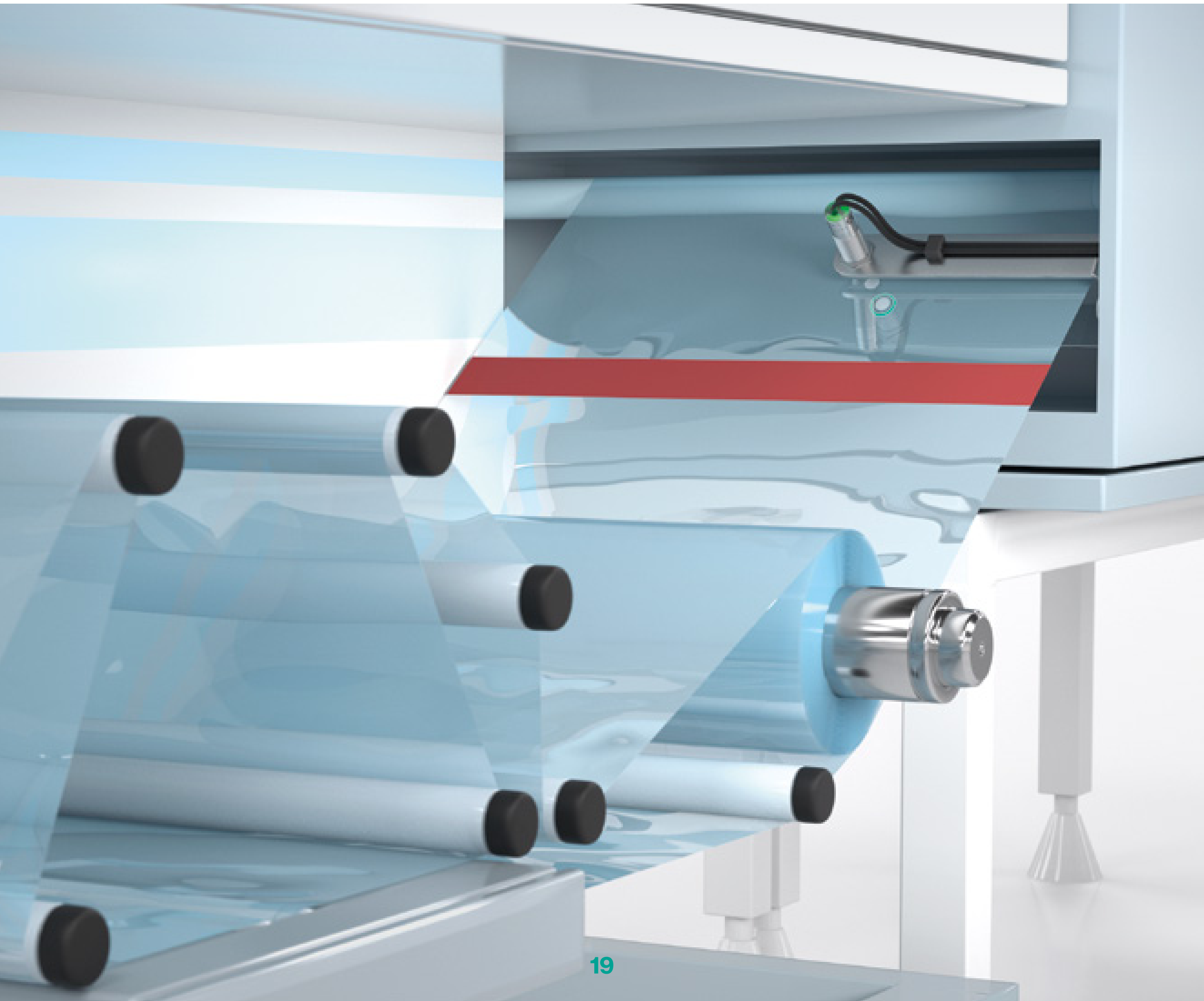
Alongside sheet-fed printing, web-fed printing is one of the most commonly used printing techniques. The rotation speeds of the rolls used for web-fed printing are particularly high. When a roll needs to be replaced, the new roll must be brought to the same speed and quickly attached with a splice to the roll that has almost run out.

Ultrasonic splice detection sensors detect this unwanted transition between different materials and ensure that it can be cut out of the material sheet before the process continues. This not only ensures an uninterrupted material feed, but also that the splice is removed from the final product.



In addition to the printing industry, splice detection systems are frequently used in packaging machines that process films, plastic bags, and flow packs. The material is again unwound from rolls before it is shaped into something like a flow pack.

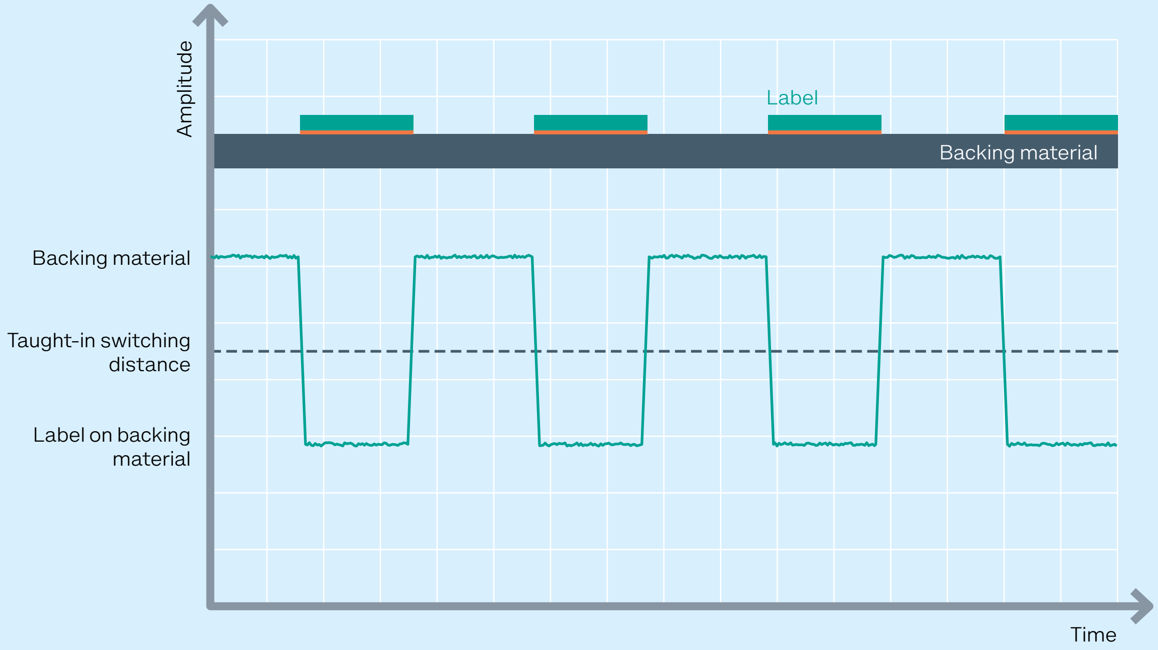
The often shiny and reflective surface of plastic films and aluminum foils can be detected with high reliability, because ultrasonic detection technology works regardless of color and surface composition. This allows for uninterrupted packaging of countless products, including very small parts such as screws and dowels, food items such as chips, sweets, pasta, vegetables, and garden soil or building materials in large packages.



3.4 Ultrasonic Label Detection

With ultrasonic label detection sensors, labels can be counted during production and numerically recorded and positioned in labeling systems. Once the sensors have been taught in, they can detect labels on almost all materials, even at high speeds.

The advantage of ultrasonic technology is that both the color and material of the label and backing, as well as the width of the gap between the two labels, are irrelevant—the ultrasonic label sensors work just as well with highly transparent labels as they do with reflective, metalized, or brightly printed labels. Even a gap between two labels that are created in one punch can be detected with ultrasonic label detection.

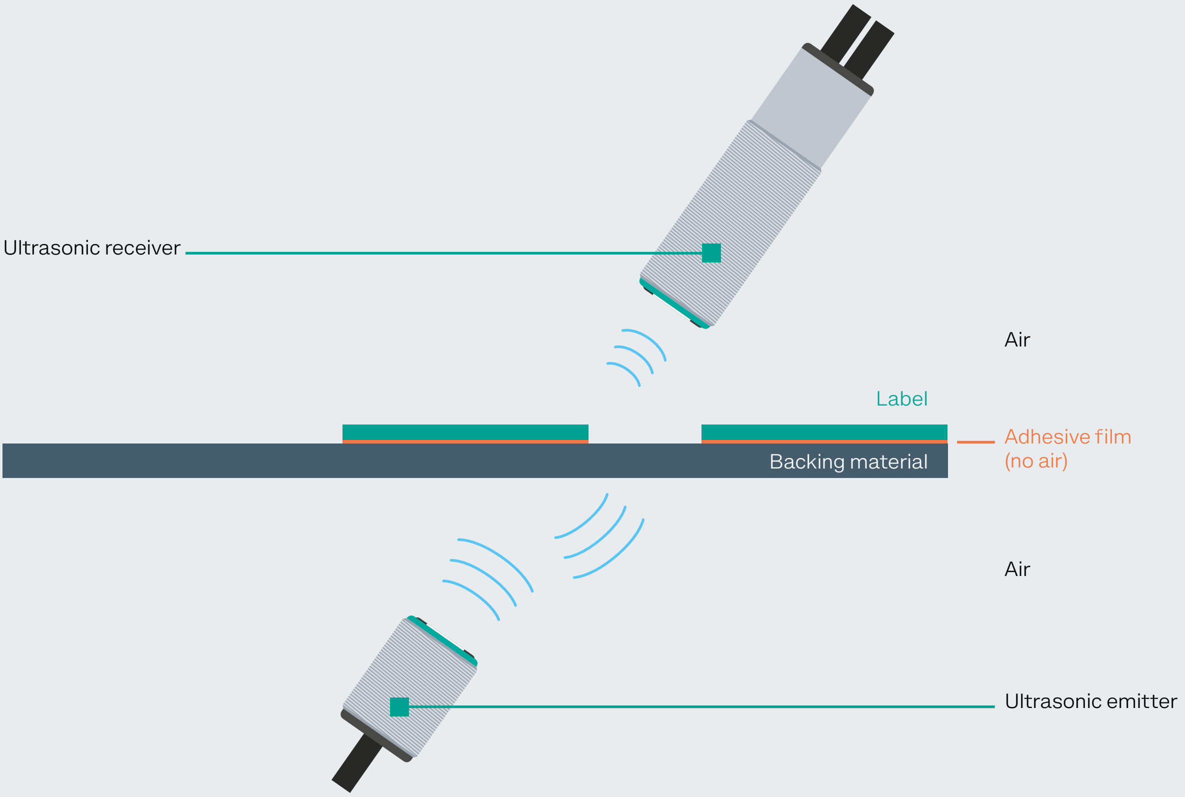


Amplitude curve of label detection

How Ultrasonic Label Detection Works

Label detection systems operate similarly to splice detection systems. In the case of labels, there is also a very small difference in attenuation between “backing material” and “backing material with label” because of the adhesive film found between them. This makes it necessary to teach in the combination of label and backing material during label inspection. The main difference between label and splice detectors lies in the type of evaluation, since the base material is in the front of the sensor for a long time for the detection of splices and increased damping occurs briefly due to a passing splice. In the case of label detection, on the other hand, labels and the gaps between them usually pass the sensor in rapid succession.

Like splice detection systems, Pepperl+Fuchs label detection systems are equipped with an automatic switching threshold adjustment feature (see page 16 for more information).



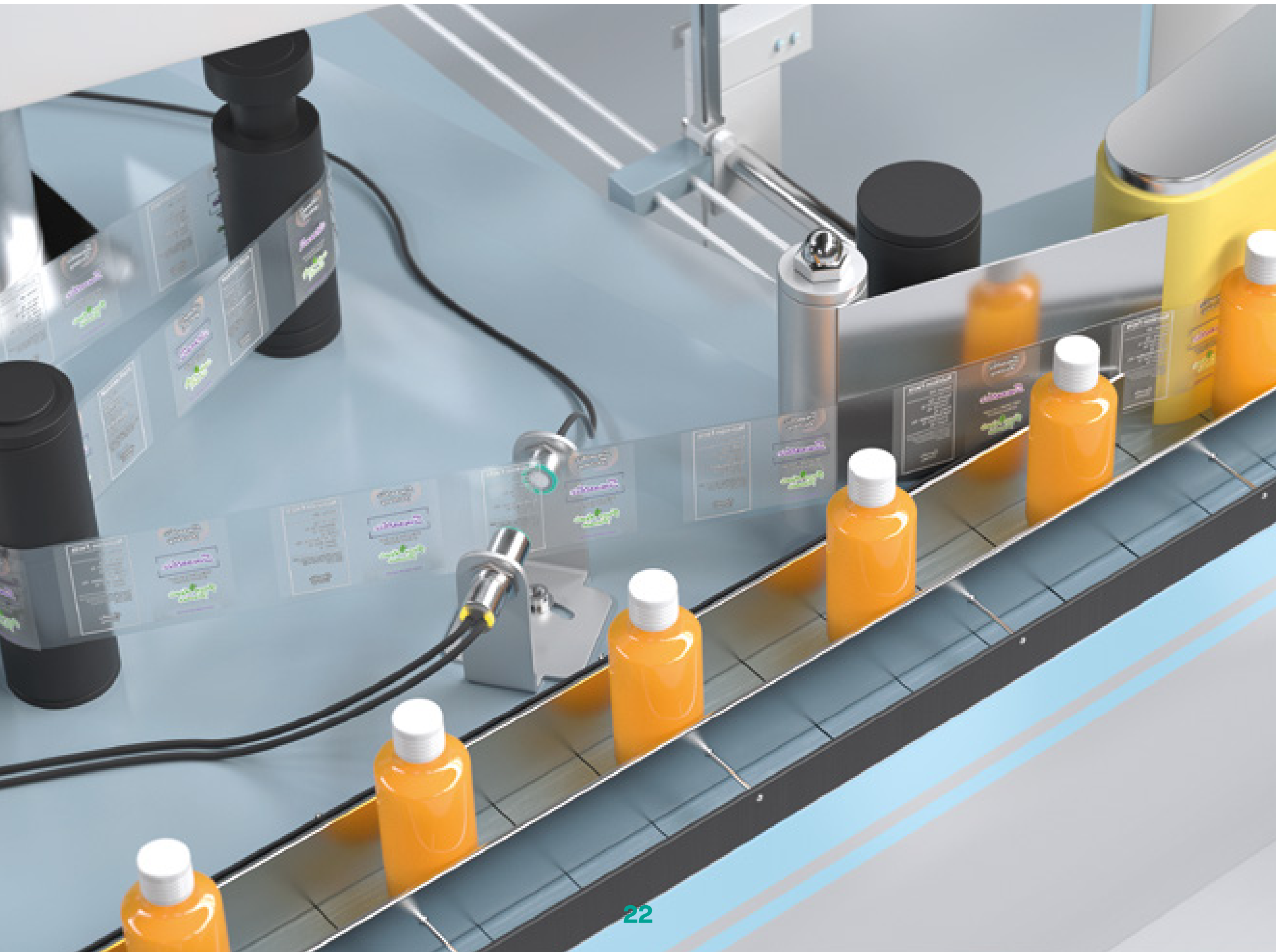
Simplified representation of the sensor principle for label detection

Ultrasonic Label Detection Applications

Folding boxes, bags, and bottles: the way products are packaged is as varied as the labels that mark them. Labels are generally multicolored and made from plastic, aluminum foil, or paper. These conditions present sensors with a challenge because reliable detection is required at all times to check, position, and record the number of labels during manufacturing and processing.

During the labeling of shower gel and shampoo bottles, label detection systems are placed in front of the discharge unit to check that the labels are present and correctly positioned on the backing material. This ensures that the feed is triggered at the correct time and the object is positioned accurately on the product. If a label is missing, the sensors emit a switching signal and prevent bottles without labels from leaving the packaging line. This reduces production waste and ensures quality.

The same applies when labeling bottles in the food and beverage industry. The bottles being filled are mainly transparent glass or plastic, and the labels are often also (semi)transparent. Ultrasonic label detection systems accurately detect the gap on the backing material, allowing labels to be positioned correctly on a wide variety of containers.



Double Material Detection—Summary

Comparing the uses for double material detection systems makes it clear that the differences in amplitude between the possible states (single sheet/double sheet) are very large in double sheet applications. This means that it is possible to reliably monitor a whole range of materials in double sheet applications using just a single setting.

Differences in amplitude are, however, much lower for splice and label detection applications. Therefore, a teach-in to the material to be detected is always necessary in these applications.

Additional Information

Users frequently ask whether splice detection systems can be used for label detection applications or vice versa.

Despite their amplitude-related similarity, they are not interchangeable because the two differ significantly in the decisive detail of the switching threshold adjustment. In label detection applications, “labels” and “gaps” follow each other in quick succession. In splice detection applications, only the base material is in front of the sensor for a long time before a splice suddenly passes by.

This explanation makes it clear that different algorithms need to be used for switching threshold adjustment and that it is impossible to use a splice detection system for label applications and vice versa.

Factors That May Influence Double Material Detection

4.1 Environmental Influences

Air temperature, air humidity, barometric pressure, and even the distance above sea level can influence the signal amplitude measured by the receiving unit of the sensor.

Changes in air temperature and barometric pressure have the largest influence on measurement results. The influence of changes in humidity and operating altitude above sea level is negligible.

In double sheet detection applications, the difference in measured amplitude between single and double sheets is significant, as described above. As a result, the above influences will affect the height of the measured amplitude and need to be taken into account by the user when configuring or selecting the working range for detection. However, they are easy to handle in most applications.

In the case of splice and label detection applications, these influences are eliminated by the teach-in procedure for the relevant material and subsequent automatic adjustment.

4.2 Material-Related Influences

In addition to environmental influences, various properties of the material to be detected also affect the measured sound amplitude. These include, for example, inhomogeneities in the paper, the grammage and volume of the cellular material, and the proportion of recycled material.

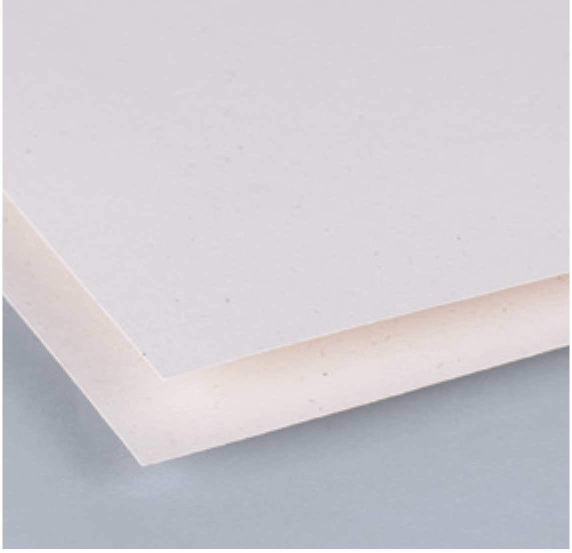
Therefore, it is often impossible to directly conclude the expected measured amplitude at the ultrasonic receiver based on the actual thickness of the material.

Homogeneity

From the perspective of double sheet detection systems, each paper exhibits mild to severe inhomogeneities owing to the irregular distribution of fibers in the interior of the paper. For example, there are certain areas in the paper where the fibers accumulate, and others that contain more air than fiber.

If you hold a sheet of paper up to the light, fiber distribution can be seen to a certain extent with the human eye. But what we see does not always correspond directly with the measured ultrasonic amplitudes.

An irregular distribution of fibers means that different areas of the material attenuate the sound amplitude of the double sheet detection differently. As a general rule, the measured amplitude values also vary significantly.



Paper

Cardboard

Grammage

Grammage is a common variable used to classify cellulose products. As far as ultrasonic double sheet detection systems are concerned, it is fair to say that higher grammages tend to mean that the ultrasonic signal will be attenuated to a greater extent. This is easy to understand, since a larger grammage means more sound-absorbing material in the path of the ultrasonic signal. For example, a thick sheet of cardboard will absorb the sound signal more than a thin sheet of paper.

Volume

Together with grammage, the volume of the paper has a major effect on the absorption of the ultrasonic signal. The higher the volume of the paper, the more air can be found between the individual fibers. This leads to high-volume paper, such as that used to print high-quality novels, having greater sound absorption than copy paper, for example.

Recycled Content

Environmental regulations and the increasing importance of reusing raw materials mean that the proportion of recycled paper in cellulose products is rising continuously. As far as amplitude-measuring ultrasonic sensors are concerned, this is an ever-increasing challenge, since an increase in the use of recycled fibers also increases the inhomogeneity of the material from the perspective of the ultrasonic sensor (see the section “Homogeneity”).

Material-Related Influences for Films and Sheets

Films and sheets are much less susceptible to the above material-related influences. As a general rule, the level of attenuation for films and sheets is relatively easy to estimate on the basis of material thickness. Films and sheets exhibit much lower fluctuations in amplitude than papers and cardboard since they have a more homogeneous structure.

Composite Materials

Composite materials or composites like those used when manufacturing beverage cartons do not generally affect the reliability of double material detection systems. They are recognized by the sensors as a single layer based on their structure. This also makes it possible to distinguish between one layer of composite material and more than one layer of composite material.

Perforations, Holes, and Folds

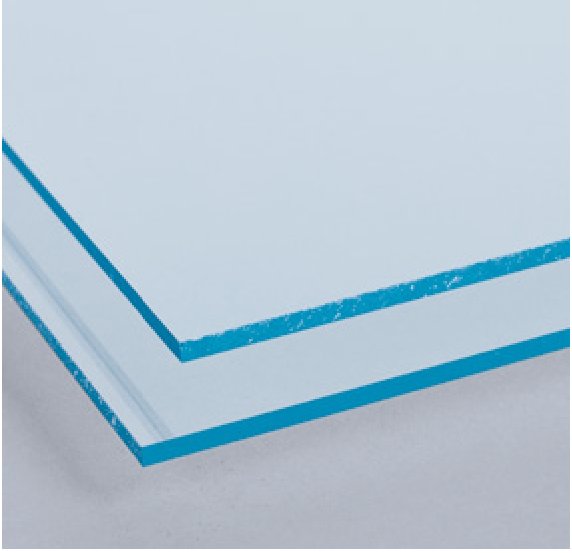
Any perforation lines, holes, or openings in the material should be kept out of the detection range of the sensors, since sound waves or portions thereof will pass through them without attenuation, preventing the reliable detection of double layers.

However, perforations are useful in some applications. In the production and counting of plastic bags on a roll, for example, there is a perforated line between each bag that is used to tear individual bags from the roll. In this particular application, the layer structure of the folded bag, the feed speed, the winding tension, and the type of perforation are important. Individual assessment is needed to solve this type of application with ultrasonic double material detection.

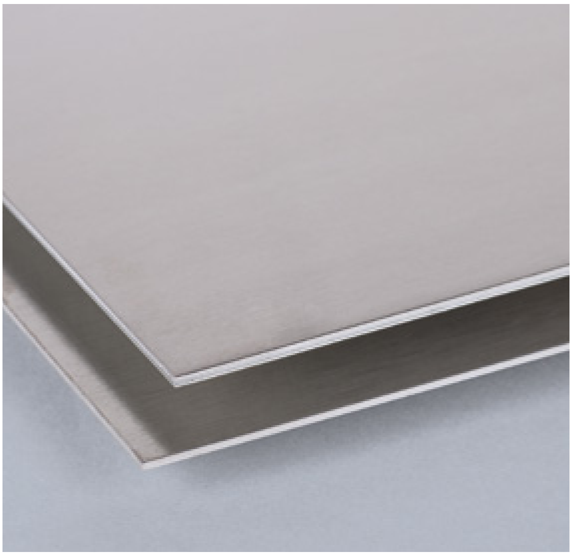
Folds or creases in the material also affect the signal amplitude measured at the receiver. These do not normally influence measurements in the case of double sheet sensors. However, in the case of splice and label detection systems, which are much more sensitive, folds and creases in the material can result in detection errors and unnecessary switching at the output.

In order to prevent unwanted sensor behavior, folds and creases should be kept outside the detection range of the sensor wherever possible.

Wood



Plastic



Metal

4.3 Influence of Sensor Alignment

If the emitting and receiving units of the double material detection system are located in two different housings, the alignment accuracy of these two components also plays a crucial role. The transducer emits a sound wave where the maximum intensity is located in the center of the beam.

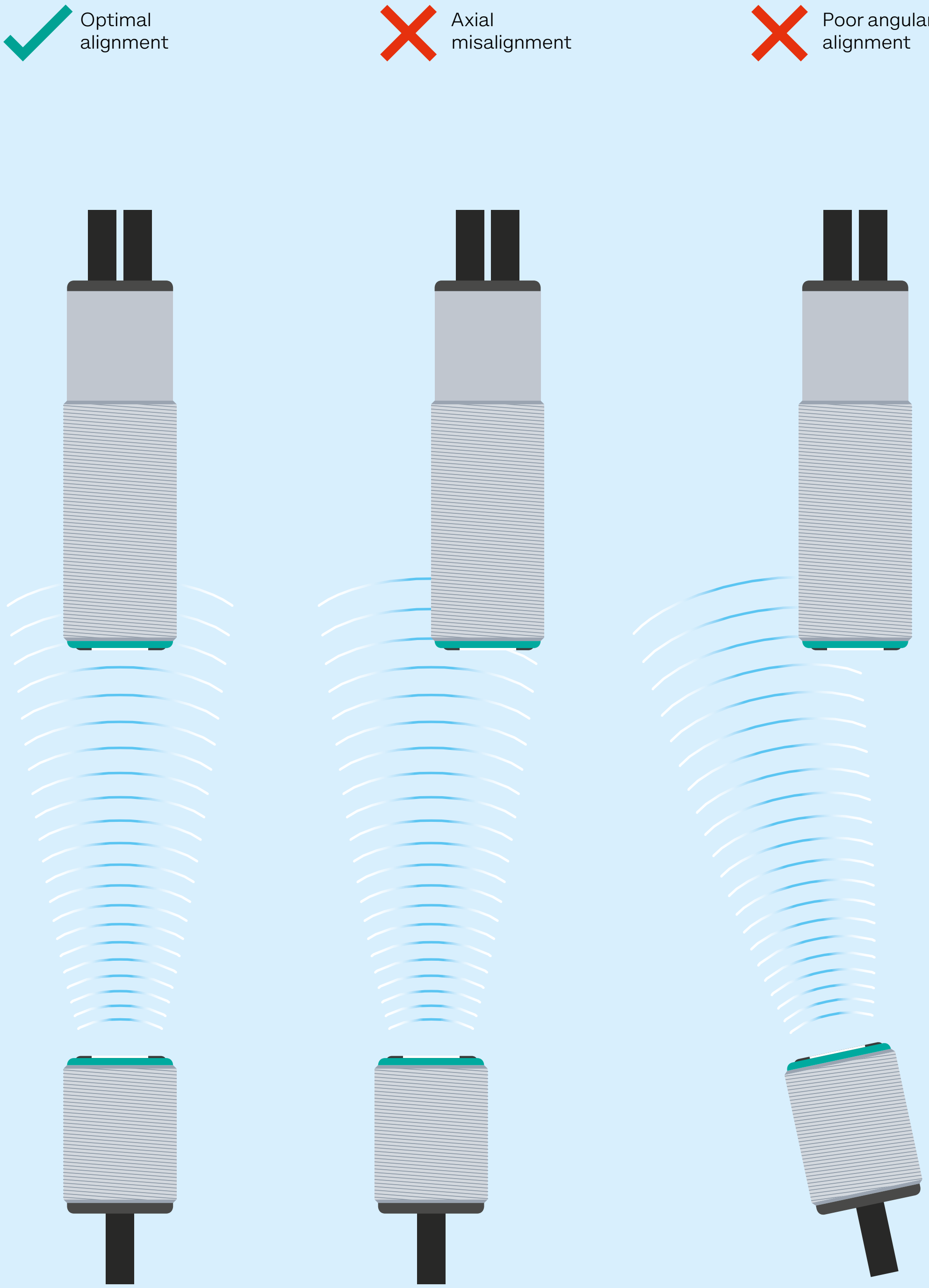
The most sensitive area of the ultrasonic sensor is the center of the transducer. Care should be taken to ensure that the center of the sound beam is aligned with the center of the receiving transducer in order to measure the largest possible amplitude and reach the widest possible range of materials and the largest possible reserve of tolerances.

For devices with a cylindrical M18 design, a maximum shaft offset of ± 1 mm and a maximum angular deviation of ± 1° should be observed in order to guarantee maximum performance.

These considerations are irrelevant to fork housings, because both ultrasonic transducers are located in the same housing and have already been aligned with sufficient precision by the manufacturer.

Pepperl+Fuchs offers mounting brackets that ensure automatic alignment of the emitter and receiver—for cylindrical models as well. If these mounting brackets cannot be used because of structural conditions, a bracket must be designed by the user. Use of the mechanical alignment aid (AA-UDB-18GM-01) from Pepperl+Fuchs is recommended when mounting and aligning a self-designed bracket.

1: MH-UDB01 mounting bracket
2: MH-UDB02 mounting bracket
3: AA-UDB-18GM-01 mechanical alignment aid



Optimal and poor alignment of the sensors

Sensor Selection Criteria

5.1 Sound Frequency, Sound Pressure, and Range of Materials

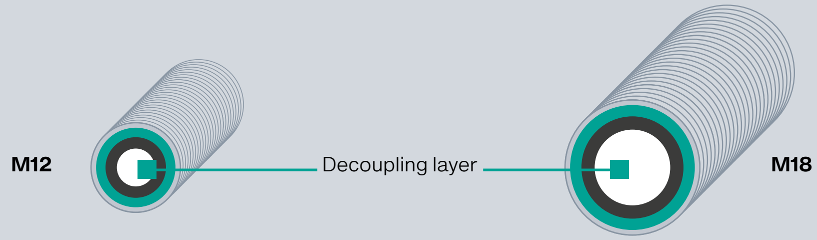
The laws of physics dictate that the sound frequency of the ultrasonic transducer being used has a decisive influence on the penetration of materials: the lower the frequency of the sound, the better the penetration. This effect is recognized by the human ear when loud music penetrates through walls, for example. The bass tones are much easier to hear than the treble tones, since their lower frequency penetrates walls more effectively. In addition to being influenced by sound frequency, material penetration is also influenced by another factor: as the sound frequency drops, the diameter of the decoupling layer of the ultrasonic transducers increases. This in turn makes it possible to generate an even higher sound pressure, resulting in even better penetration.

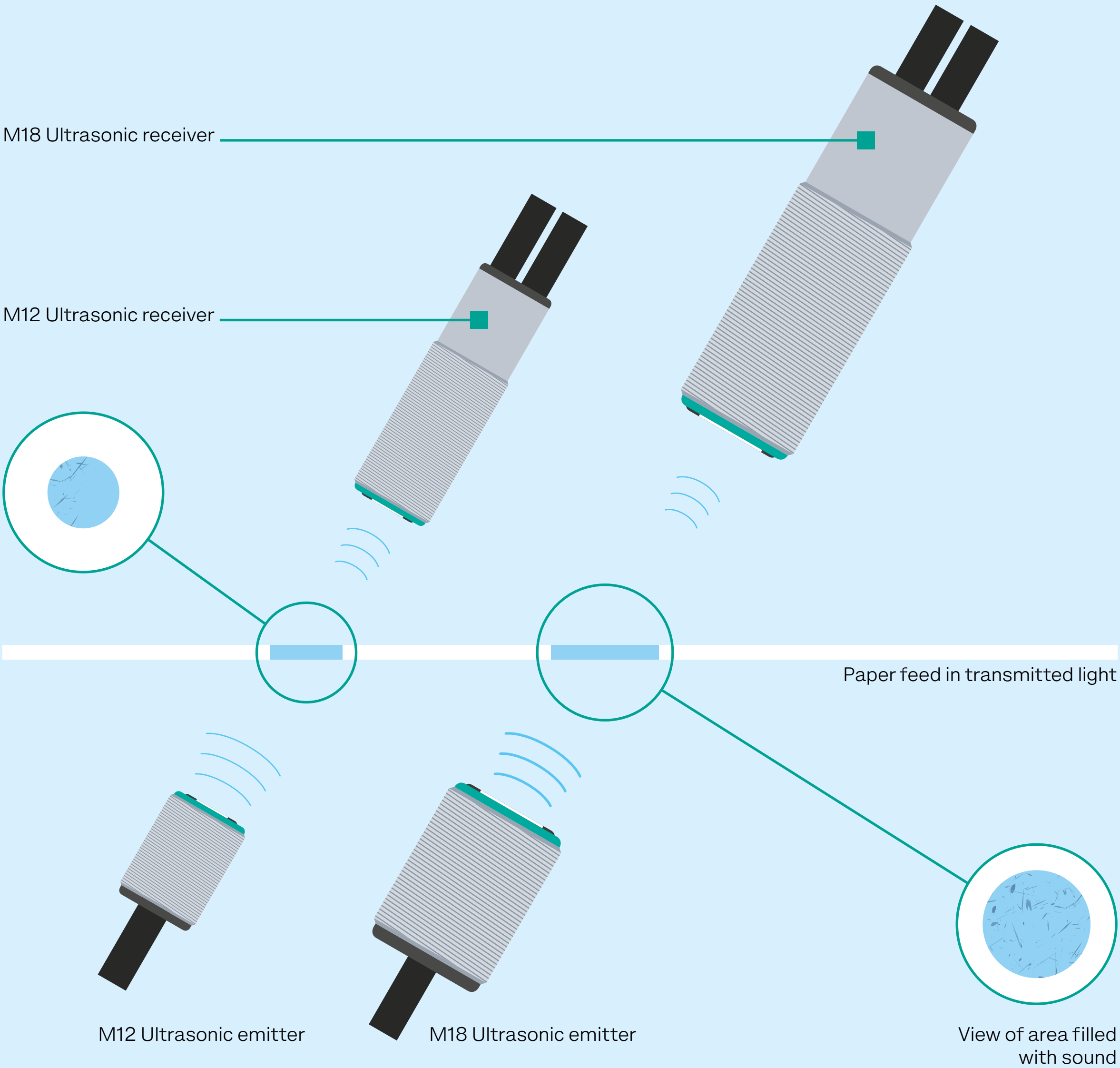
Pepperl+Fuchs has identified the ideal transducer frequencies for the various applications of double sheet detection. In the printing and packaging industry, devices with an M18 housing design use ultrasonic frequencies between 200 and 400 kHz to detect paper and film. In applications with thicker materials, like corrugated cardboard or metal-processing presses, devices with an M30 housing design use frequencies of around 85 kHz.

5.2 Housing Design

Double material detection systems are available in a wide range of designs. Cylindrical (M18, M30) and fork designs have established themselves as the standard housings. Fork designs can only be used on the edge of the sheet and therefore require a uniform side stop for all sheet sizes. Cylindrical sensors can be mounted much more flexibly, even in the center of the sheets.

The size of the sensors is determined by the ultrasonic transducer used and its frequency: as the sound frequency decreases, the size of the decoupling layer—thus the size of the transducer—increases. Double sheet sensors with a low transducer frequency therefore typically have larger dimensions than sensors with a higher transducer frequency.





Size comparison of sound spot on material with M12 and M18 devices

5.3 Sound Beam Width

A larger decoupling layer with the same typical aperture angle automatically results in a larger sound beam or measuring spot on the material. Particularly in the case of inhomogeneous materials, this ensures that material-related fluctuations in amplitude can be averaged as effectively as possible. This leads to more stable measurement values and increased reliability, even in the case of inhomogeneous materials.

For these reasons, M18 designs have proven more popular than smaller cylindrical designs for typical double sheet detection applications such as printing, folding, and collating machines.

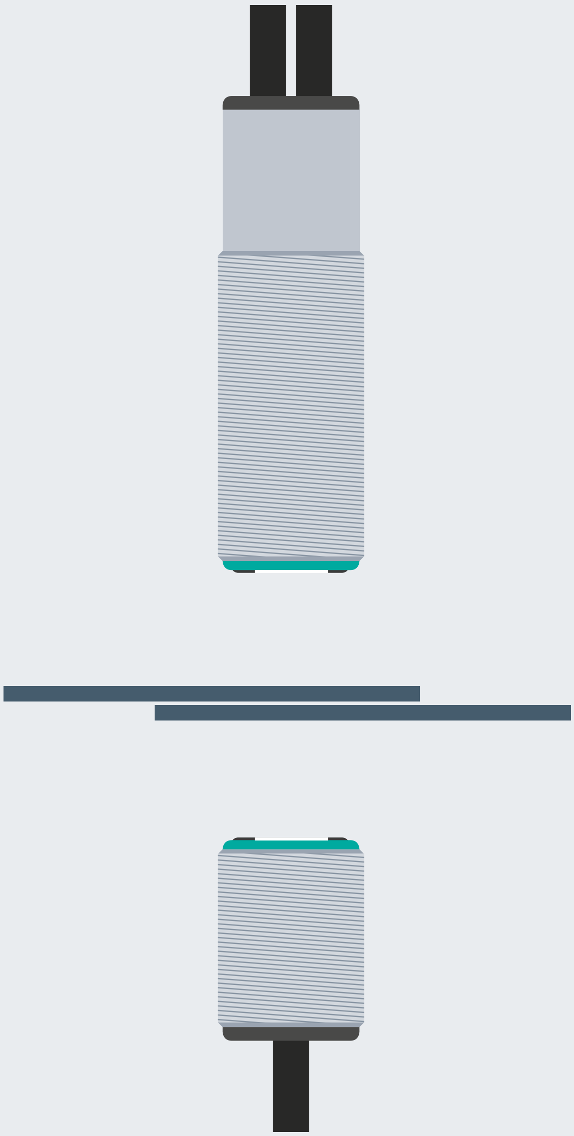
5.4 Minimum Object Size

The size of the sound beam varies depending on the ultrasonic transducers used in the sensors—a choice that generally depends on the design.

Since double material detection sensors analyze the attenuation of amplitude by a material, the object to be detected must be a certain size. This is the only way that a stable change in signal attenuation can be detected by the sensor.

If the dimensions are below the minimum size, the majority of the sound emitted will pass the object to be detected with almost no attenuation. This has a huge impact on the amplitude used for evaluation at the receiving end. Detection of a double layer (received sound amplitude of close to 0) becomes impossible. Typical object size minimums for a centric feed are around 40 × 40 mm for devices with an M18 design and 150 × 150 mm for devices with an M30 design.

When monitoring one edge of web or sheet materials, care must be taken to ensure that they are completely captured by the sound beam so that an appropriately stable level of attenuation can be detected. Typical values for the minimum immersion depth are 20 mm or 75 mm (M18 or M30 sensors)—each is measured from the center axis of the sound path on the material feed.



Possible perpendicular mounting of double sheet detection with normal delay time

5.5 Response Delay

A key feature of double material sensors is the response delay—in other words, the reaction time—of the sensor. The response delay indicates how quickly an event (e. g., a double sheet) is reported at the sensor output after it has been detected. This typically happens in a matter of milliseconds for double sheet sensors and in a matter of several hundred microseconds for splice and label detection systems.

When selecting an appropriate sensor, care must be taken to ensure that the response speed has been adjusted to actual speeds required in the machine. The unnecessary use of devices that are "too fast" can result in limitations and risks.

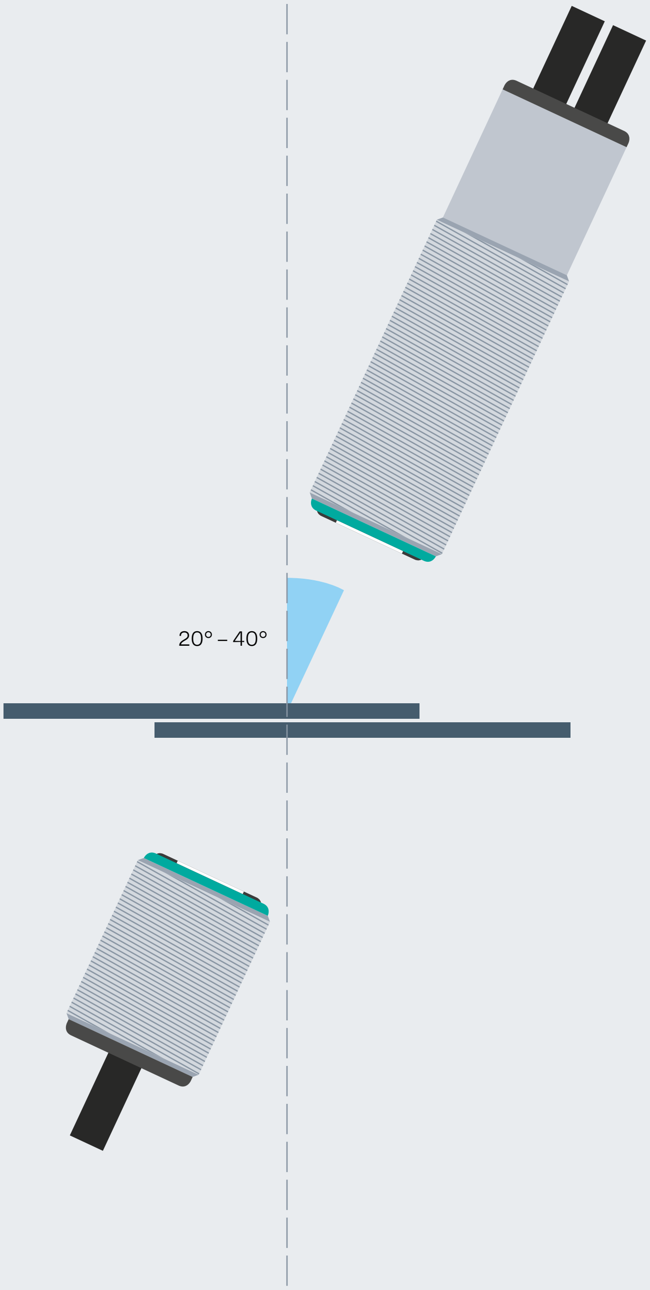
Electromagnetic interference typically has a greater effect on devices with a very short response delay. Even if this problem can be solved with design measures and evaluation procedures for the fastest devices from Pepperl+Fuchs, detection reliability reserves will nevertheless be reduced due to the laws of physics and electricity.

5.6 Mounting Options

Vertical installation in relation to the material is generally possible when using double material sensors from Pepperl+Fuchs with a response delay of 6 ms or more (the typical value for a standard sensor is 15 ms), which greatly simplifies mounting and alignment.

For devices with a response time shorter than 6 ms, vertical mounting does not make sense due to the laws of physics. Otherwise, standing waves between the ultrasonic transducer surfaces or other interferences of the ultrasonic signals are formed, which leads to unstable measurement results. In order to achieve stable measurement results, devices of this kind must be mounted at an angle between 20° and 40° to the vertical of the material.

Incline mounting should generally be given preference over vertical mounting in order to achieve maximum performance and the broadest possible range of materials for each threshold adjustment for double sheet sensors. The performance loss for vertical installation when using devices with a response time of 15 ms or slower is, however, marginal.



Double sheet detection systems with a very short response time must be mounted on an incline

Double Material Detection Systems from Pepperl+Fuchs

6 Double Material Detection Systems from Pepperl+Fuchs

Optimized Portfolio for a Wide Range of Applications

Pepperl+Fuchs' optimized double material detection portfolio is sure to include the ideal sensor solution for your application. Sensors are available for all areas—double sheet, splice, and label detection—and can be tailored exactly to the necessary range of materials and mounting situations.

The M18 and M30 standard designs of double material sensors from Pepperl+Fuchs allow a wide range of mounting options due to their especially short housing. Furthermore, PCB versions are available for use in embedded applications (e. g., for office scanners, copiers, etc.).

The preset threshold set enables the sensors to handle a wide variety of materials and thicknesses using just one configuration. If necessary, it is possible to change to another set of threshold values or to adapt the devices to the application via the teach-in function. The IO-Link interface ensures high machine availability and enables access to all sensor parameters, diagnostic data, and process data. The automatic synchronization function provides maximum process safety when using several sensors in a confined space.

Your Benefits at a Glance

- Versatile in use: from paper to metal—simple double material detection with just one setting
- High machine availability: integrated IO-Link interface enables access to sensor parameters, diagnostic and process data
- Fast commissioning via predefined threshold set, IO-Link, or simple teach-in with feedback
- Maximum process reliability: automatic sensor synchronization when using multiple sensors in a confined space

Ultrasonic Technology Guide Available for Download

Get detailed information about the principles behind ultrasonic technology, its advantages, and plenty of application examples with the comprehensive Technology Guide from Pepperl+Fuchs.
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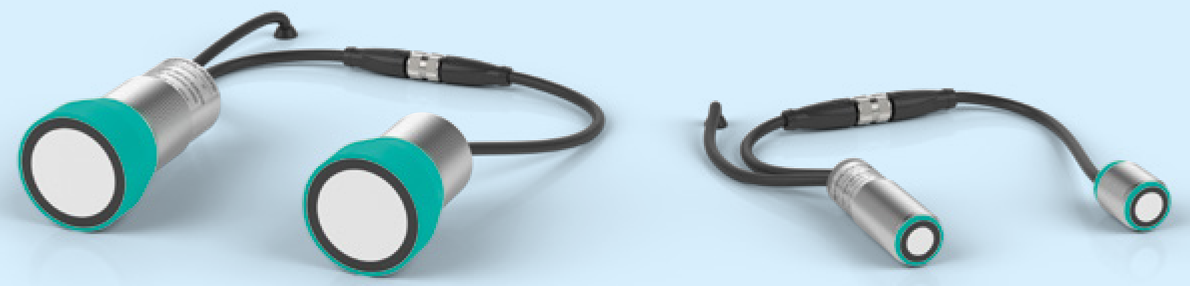

The entire double material detection product portfolio from Pepperl+Fuchs, including accessories, is available online at **pepperl-fuchs.com/tx-double-material**

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