

ABB MEASUREMENT & ANALYTICS

Millmate Strip Scanner systems

Reliable strip position and
width measurement



Millmate Strip Scanner systems

Imagine a position sensor with outstanding dependability

Among the most important parameters to measure in a rolling mill are the position and the width of the strip.

— 01 MSS edge sensors, two sizes.

— 02 The measurement is independent of material and pass-line variations and will stay accurate, stable and reliable – year after year.

If these are accurately determined, the strip can be guided in a correct and consistent lateral position in the mill and the roll actuators can be adjusted to reach the targeted flatness. Furthermore, edge trimming can be reduced to a minimum, and strip breakage due to overstressed edges can be eliminated.

Millmate Strip Scanner systems (MSS) are widely used to measure strip edge position, off-center and strip width in rolling mills as well as in processing lines.

System overview

The MSS system is based on the PEC (Pulsed Eddy Current) technology, which uses weak magnetic fields for the measurement. This makes the sensor completely insensitive to anything in the measuring zone except the metal strip. The MSS System will therefore produce accurate position measurement unaffected by coolant, dirt, steam, air temperature variations etc.

Increased mill uptime

In a production process running 24 hours a day, every minute of production time is precious. Even so, no production line runs without downtime. Threading of a new strip into the mill can be time consuming as the lateral position must be very accurate to achieve the required quality.

With Millmate Strip Scanner the threading time can be reduced to a minimum, thus leaving as much time as possible for real production.

Furthermore, thanks to its robust design, the MSS works consistently without any need for maintenance of delicate equipment such as cleaning of optics.

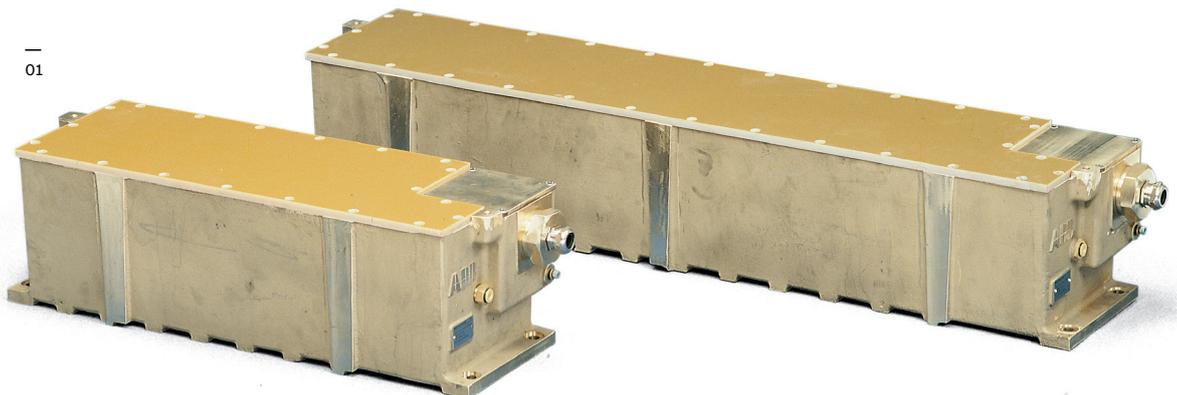
Better positioning in the mill

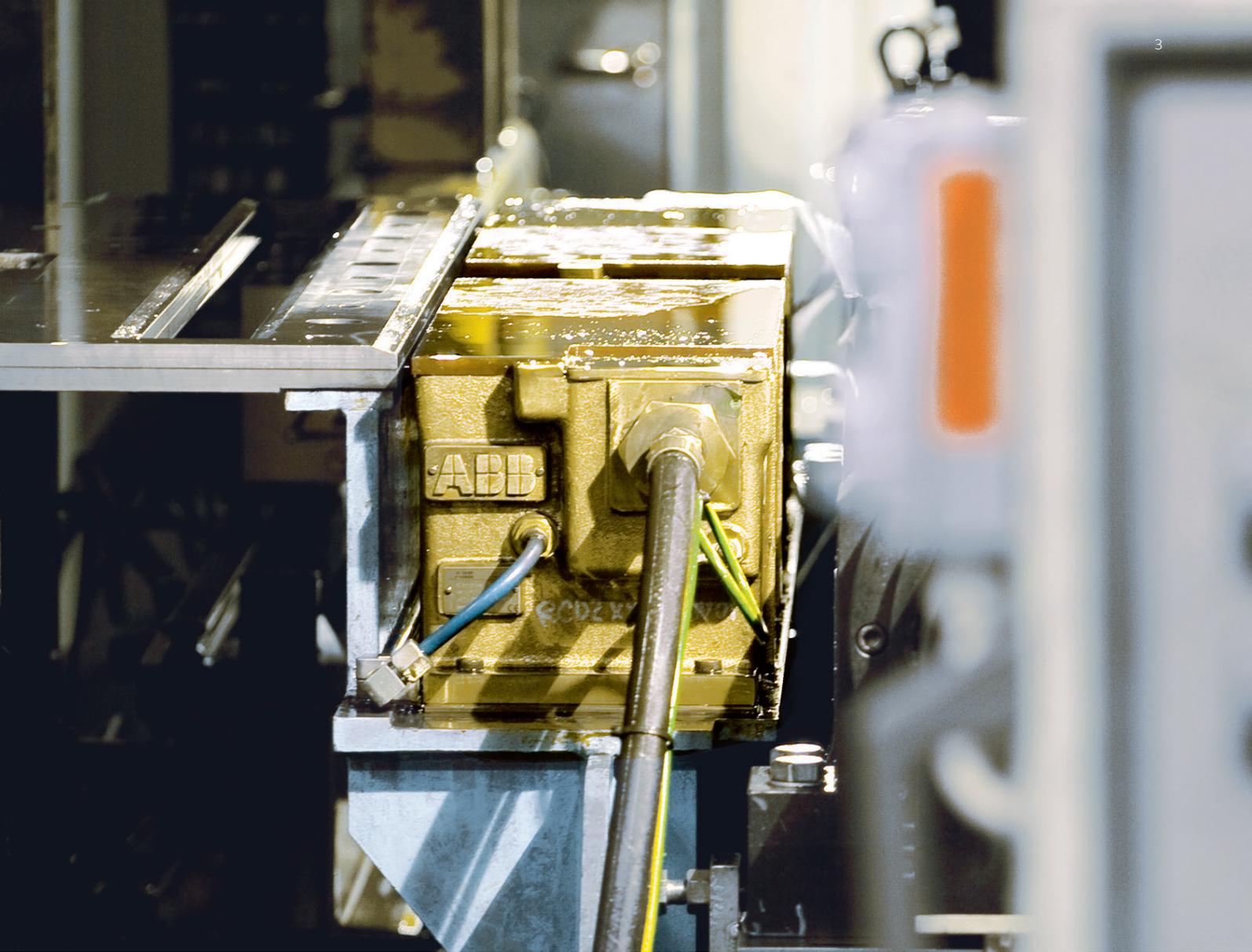
With MSS off-center measurement your guiding equipment can rely on accurate data at all times. As the sensor is unaffected by mill environment, the measurement is extremely stable, even during the worst conditions. Mill coolant, steam, heat and dust do not affect the measurement. This makes it possible to e.g. recoil without imperfections such as telescoping.

Minimized edge trimming

A non-trimmed strip from a hot mill has a varying width that can be in the order of magnitude of 25 mm, with the wider part in the beginning and in the end of the strip. The strip edges need to be cut to create a uniform strip, but economy requires that the scrap is minimized. MSS supplies an accurate strip width measurement, and thus the minimum required edge trimming can be determined.

— 01



**Tighter flatness tolerances**

With an accurately determined strip position, your flatness system can measure and control the strip flatness along the whole cross section of the strip, even at the very edges. This leads to better flatness control, tighter strip tolerances and less scrap. With MSS you can trust your flatness values all the way to the edges.

Less strip breaks

Even with a rather small unknown lateral displacement, the actual strip deformation may differ from the target, especially at the edges. This can result in over-stressed strip edges that easily introduce cracks and thus strip breaks. With MSS the guiding system can center the strip position accurately, and the number of strip breaks will be reduced or even eliminated.

Negligible cost for maintenance

Share the experience of a virtually maintenance free sensor with a large number of MSS users. A robust sensor design without fragile and ageing components makes this possible. No sensitive optical components or delicate precision mechanics that needs to be tended to.

Short payback time

Each application has potential for process improvement – leading to cost reduction and increased earnings.

Add up your existing costs for mill downtime, non-conforming material, maintenance, spare parts and calibration. Calculate the earnings you will get with MSS. You will find that MSS offers you a short and competitive payback time.

Unlike other sensors

Independent of the mill environment, material properties and operator and maintenance procedures

— 01 Complete Millmate Strip Scanner system

— 02 PEC measuring principle – Pulsed Eddy Current technology

— 03–04 MSS installation in Chinese stainless steel mill

— 05 The Millmate Strip Scanner System offers flexible solutions. Here, in a Swedish mill, the edge sensors are mounted upside down with connections from the bottom to achieve the best possible measurement results. The measurement is used for Center Position Control (CPC) in a continuous stainless steel mill.

— 06 MSS installation together with MTG Box Gauge in a Swiss aluminium mill.

— 07 MSS edge sensor mounted together with a Stressometer® flatness measurement roll gives perfect control of edge flatness.

The basic version of a Millmate Strip Scanner system comprises a pair of edge sensors (PMSG 123-A or PMSG 125-A) suitable for the measuring range together with a control unit Millmate Controller 400, including a Millmate Operator Unit 410 and an interface unit PMSA 122. Cables between interface unit and control unit and between interface unit and edge sensors are also included. The control unit can be installed in a floor-standing cabinet or a wall cabinet.

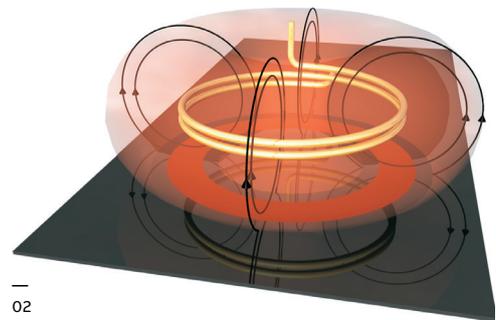
Millmate Strip Scanner in rolling mills with flatness measurement

A Stressometer® flatness measurement roll measures the edge stress even with a small coverage of the force sensor at the strip edge.

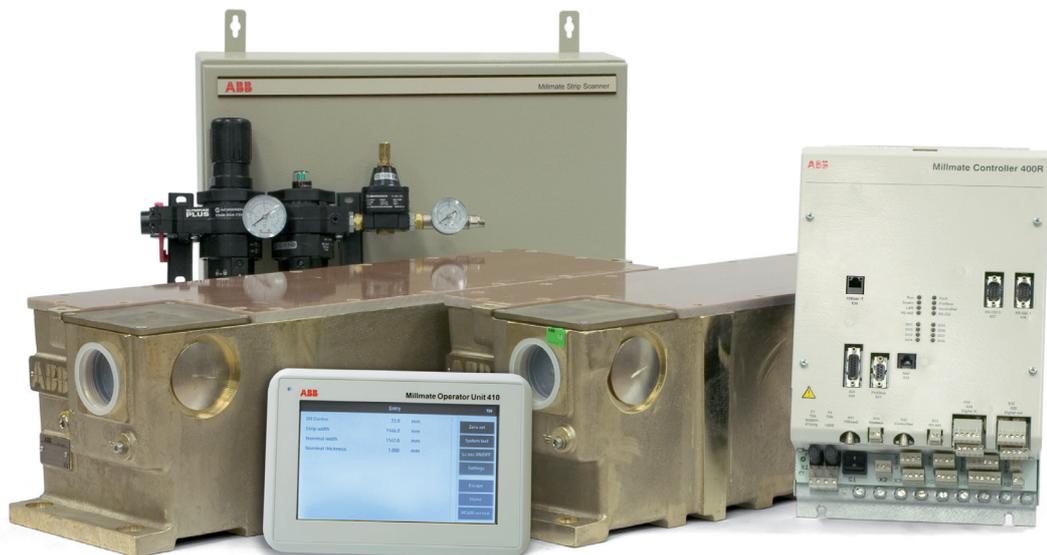
The output from the force sensor at the edge zone is a completely linear function of the strip coverage (edge position) of the zone. A zone covered with as little as a few millimeters can be compensated with high accuracy with the MSS strip edge position measurement system.

Pulsed Eddy Current (PEC) technology

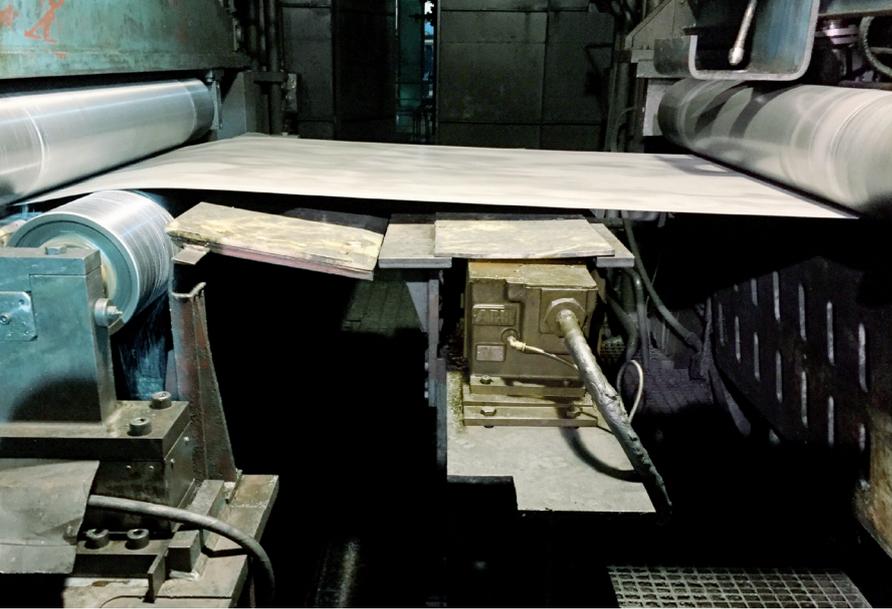
The Millmate Strip Scanner is based on the PEC technology, which uses magnetic fields for measurement of the strip position. The interaction between an applied magnetic field and the electrically conductive strip indicates the position – without influence from the material composition or conditions in the measuring zone.



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— 01



03

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”The MSS-sensors have been running perfectly for many years in operation. We are very satisfied with the performance of the Millmate Strip Scanner systems.”

Swedish stainless steel producer



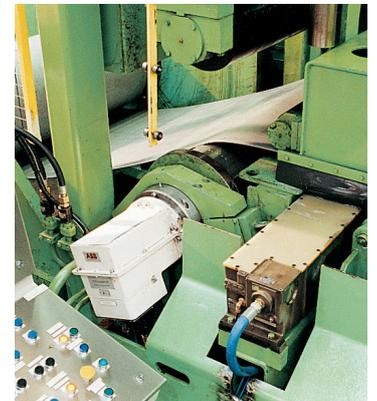
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05



06



07

Reference installations

We have done it before!

The fundamental requirements for measuring strip edge position with the Millmate Strip Scanner system is that the edge sensor should be positioned so that the edge of the strip runs over the active measuring area of the edge sensor. One edge sensor is required for each strip edge. The sensor is mounted in the cross line of the strip and ideally, the top of the sensor should be parallel to the surface of the strip.

Best measurement results

An outstanding measurement result will be obtained if the following points are borne in mind when installing the system:

- no metal objects in the zone immediately above the edge sensor other than the strip itself
- edge sensor to be protected from severe impacts from the end of the strip
- strip to pass close to the edge sensor at smallest possible distance, 20–40 mm recommended

Edge sensors

Opportunities you didn't know existed

—
01 Metal-free zone
above edge sensor

The Millmate Strip Scanner Edge Sensor is a brilliant solution to the problem of determining strip edge position during the rolling and post-treatment of metal strip. Satisfactory measurement and control of the edge position can lead to a significant improvement in production economy.

The Millmate Strip Scanner Edge Sensor is a complete unit, encased in corrosion-resistant bronze. In the edge sensor there are a number of electrical coils and certain circuits for signal processing. The interior of the edge sensor is well protected by the rugged case and tight-fitting cover. The sensor can easily withstand dirt, liquids and a corrosive environment. Measurement is not influenced in any way by mill coolants. The immunity means that the edge sensor can be placed very close to or even inside the mill stand. However, there must be a metal-free zone above the edge sensor.

Metal-free zone above edge sensor

There must be a metal-free zone above the edge sensor. Of course, this does not apply to the strip itself, which should run close to the edge sensor.

For full accuracy at maximum measurement distance there must not be any metal objects in the metal-free zone.

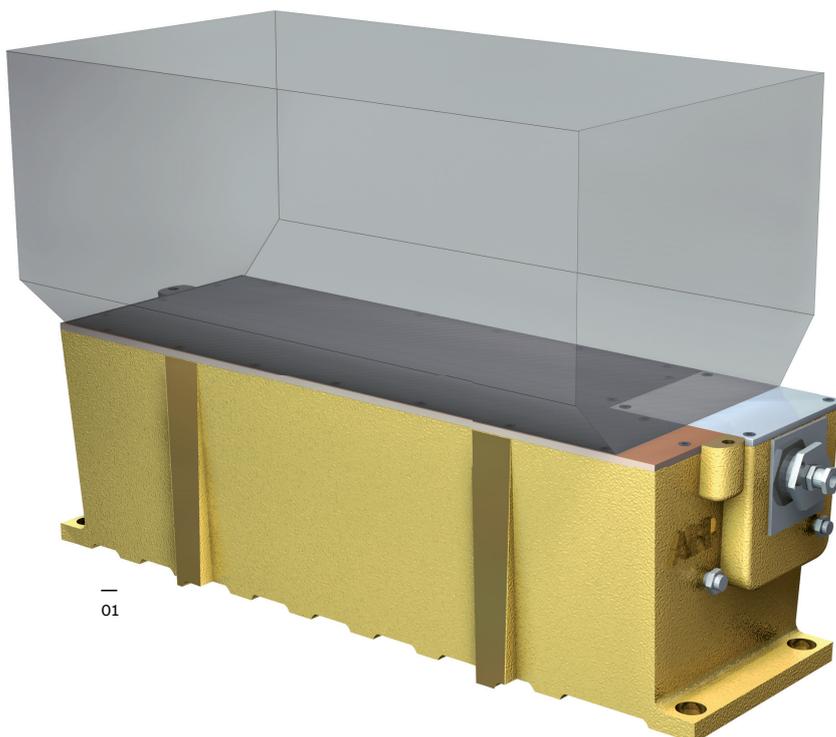
Air pressure for guaranteed sealing

Sealing of the edge sensor is further guaranteed by an over pressure, achieved by connecting a regulator to a standard industrial air supply, between 2–16 bar. The over pressure is reduced to 0.5 bar by the regulator, which contains an extra filter. The air consumption is about 1 dm³/s for each edge sensor.

Connection cable

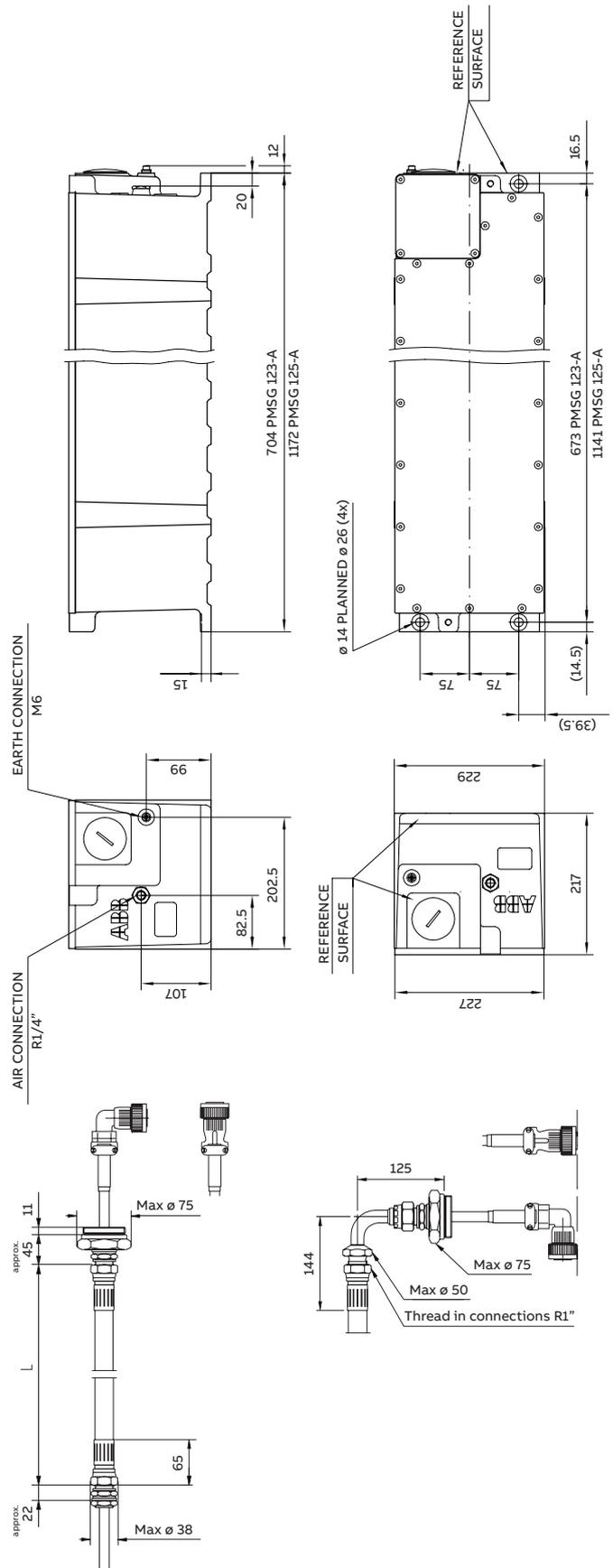
The connection cables are used to get a mill-proof connection between the edge sensors and the interface unit. Standard and kerosene-resistant versions are available. The cables are pre-assembled for one of three connection directions to the edge sensor.

The cable connector is protected in a separate compartment in the edge sensor. Together with the cable protection hose the result is a rugged and well proven solution.



Edge sensor		
Strip thickness range	Aluminium	0.005 to 20 mm
	Steel	0.1 to 20 mm
	Stainless steel	0.3 to 20 mm
Strip width		300 (200) to 3200 mm
Edge position variations	PMSG 123-A	350 mm
	PMSG 125-A	820 mm
Measuring distance		0 to 50 mm
Inaccuracy at	10 to 40 mm	0 to 10 mm
		40 to 50 mm
Weight	Off-center	±0.5 mm ±1 mm
	Edge position	±0.5 mm ±1 mm
	Width	±1 mm ±2 mm
Weight	PMSG 123-A	50 kg
	PMSG 125-A	75 kg
Operation temperature		+5 to +70 °C
Protection		IP 65
Measurement start time		300 ms at strip head
Measurement time constant		$\tau \geq 10$ ms (selectable)
Air consumption		1 dm ³ /s at 0.5 bar

Connection cable	
Dimensions (Ø)	29 mm
Min. bending radius	120 mm
Max. length	20 m
Weight	1 kg/m



Control unit

Millmate Controller 400

—
01 Millmate Controller
with Operator unit

The control unit communicates with the edge sensors, processes the measurement values and communicates the result to other systems. Communication can take place via digital inputs/outputs, analog inputs/outputs, TCP/IP communication, RS-232 and as an option, via high-speed fieldbus.

The control unit can be manually operated using the Millmate Operator Unit 410 and by external units via a serial interface or digital/analog inputs. Setup and commissioning are easy following step-by-step menus.

Measured values are displayed on the operator unit, connected to analog outputs or transmitted via a serial interface to an external display or to other external units.

Features

The Millmate Controller 400 has been designed to offer a lot of functionalities and at the same time very easy to use.

The control unit covers all edge sensor installation possibilities. This means the user only has to follow the step-by-step menus in order to set up the control unit and to have correct strip edge, center position and width calculated.

Some examples of the built-in functionalities:

- Calculates true strip position and width in relation to the mill
- Filter times from 10 ms
- Easy configurable analog/digital inputs/outputs
- Digital edge position level detectors
- Digital min. and max. width level detectors
- Unit selection (mm, inch)
- Self-diagnostics test system including continuous edge sensor test
- Simulation mode for easy check of system integration



External connections:

- 2 or 4 analog inputs
- 4 analog outputs, voltage or current
- 8 digital inputs for control signals
- 8 digital outputs
- +24 V supply for external units, max 0.5 A
- Ethernet for connection to:
 - other Millmate control and operator unit
 - other control systems with VIP protocol
- 2 serial interfaces of type RS-232 for external displays, control, etc.
- High-speed Profibus (optional)

Vendor Internet Protocol (VIP)

Other control systems can send control data and monitor measurement data with TCP/IP-communication. The Ethernet connection together with the Vendor Internet Protocol (VIP) is used for communication. The protocol uses configurable predefined data telegrams and the Millmate Controller 400 acts as a server. The sending procedure is cyclic and the receiving procedure reacts on incoming messages.

The PROFIBUS option

As an option the control unit can be equipped with PROFIBUS. The Profibus interface in the Millmate Controller 400 is updated with a new complete set of measuring values every 12 milliseconds.

Millmate Controller 400		PFXA 401
Dimensions (H x W xD)		380 x 235 x 90 mm
Weight		5 kg
Protection class ¹⁾		IP 20
Main voltage		85 to 264 V, 100 (-15 %) to 240 V (+10 %)
Power consumption		140 VA
Operating temperature		0 to +70 °C
Storage temperature		-40 to +70 °C
Analog inputs		0 to 10 V, ±10 V differential inputs
Analog outputs (insulated as one group)	Voltage	0 to ±10 V
	Current	0 to ±20 mA, 4 to 20 mA
	Step response	20 ms (0 to 90 %)
Digital inputs		0/+24 V insulated as two groups, 4 + 4
Digital outputs		0/+24 V insulated as two groups, 4 + 4

1) According to IEC 529, EN 60-529

VIP

Network	10 Mbit/s Ethernet
Communication rate	10 messages/s
Error handling	Automatic retransmission

Profibus-DP

Station type	Slave
Maximum speed	12 Mbit/s
Configuration	Printable GSD-file in control unit

Accessories and options

Data for Interface Unit PMSA 122



Power supply to edge sensors

Mains voltage	110 to 127 V / 200 to 250 V
Mains frequency	50/60 Hz
Output voltage	+7 V / ± 18 V / -26 V
Power consumption	Max. 65 VA

Communication modem

Type	RS-485, 375 kbit/s
Cable requirements	Shielded, twisted pair, 110 to 150 Ω , FLFR 2 x 2 x 3.5, IBM type 1 or equivalent
Distance to control unit	Max. 200 m

Data for Air regulator



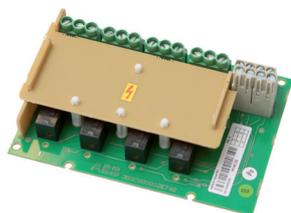
Supply pressure	3 to 16 bar (44 to 232 psi)
Nominal output pressure	0.5 bar (7 psi)
Air consumption for one edge sensor	1 dm ³ /s (2 cfm)
Air quality requirement	Acc to PNEUROP
Particle class 3	Particle size max 1 μ m (40 μ in), particle content max 5 mg/m ³
Oil content class 3	Max. 1 mg/m ³
Condensation class 3	Condensation at +10° C (50 °F)

Data for Insulation amplifier PXUB 201



Signal range	Input	Output
	0 \pm 10 V	0 \pm 10 V
	0 to 5 V	4 to 20 mA
	0 to 10 V	4 to 20 mA
	0 to 5 V	0 to 20 mA
	0 \pm 10 V	0 \pm 20 mA
Max. load		10 mA for voltage output 500 Ω for current output
Rise time		50 μ s or 50 ms, selectable
Rated insulation voltage		600 V, basic insulation
Insulation test voltage		4 kV

Relay board PFVK 128



No. of channels		4
Contact function		Changeover
Rated voltage, contacts		250 V AC
Breaking current	at 250 V AC	Max. 8 A
	at 48 V DC	Max. 1.2 A
	at 220 V DC	Max. 0.2 A
Rated insulation voltage		250 V AC

Data for Millmate Operator Unit 410

Power supply voltage	+24 V DC (18 to 32 V DC)
Power consumption	Max. 14 W
Degree of protection	Sealing front: IP65, NEMA 4X/12 and UL type 4X/12 Sealing back: IP20
Dimensions (L x W x D)	204 x 143 x 50 mm
Weight	0.8 kg
Temperature range	-10 to +60 °C operation -20 to + 70 °C storage

Data for Cabinets**Wall cabinet, small**

Dimensions (D x W x H)	200 x 400 x 500 mm
Protection	IP65

Wall cabinet, large

Dimensions (D x W x H)	200 x 600 x 658 mm
Protection	IP65

**Floor cabinet MNS Select (including circuit breaker)**

Dimensions (D x W x H)	600 x 700 x 2225 mm
Protection	Ventilated IP21 / Sealed IP54
Mounted in the Stresometer cabinet	Optional





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