

PULP AND PAPER

# KPM Process Measurements

Innovative solutions for accurate measurement and process optimization



- Easy to use
- Low cost of ownership
- Self-diagnostic products
- Leading-edge design
- Local service
- High precision

Improve consistency to  
maximize quality



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# Successfully manage and control consistency

ABB's innovative products enable pulp and paper mills to successfully manage and control consistency as well as deliver reliable break detection on the paper machine. Our KPM measurement products represent the most progressive solutions in the field.

ABB has key competence concerning applications for consistency transmitters, samplers and sheet break detectors. The products are easy to use, offering several features for minimum maintenance and low cost of ownership. ABB's target is to introduce new revolutionary products to the market continuously to help customers improve their processes. Our KPM product line will help achieve considerable savings on fiber, energy and chemical costs, while improving production efficiency and paper quality. All products are supported by a global network of sales and support offices, which facilitates immediate support according to customers needs.

## **The best solution for accurate consistency control**

Our KPM consistency transmitters offer an application specific solution to manage and control consistency in the best possible way. Our comprehensive product range (including rotary, blade, microwave and optical) enables the best selection for each application without compromise. All KPM consistency transmitters are unique innovative products, covered by several patents.

## **High performance sampling**

With safe and representative sampling for screened and unscreened applications, ABB offers the widest portfolio of cost-effective, durable and versatile sample valves for all applications.

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We have the knowledge, products and experience to help customers achieve measurement objectives.

## **Reliable sheet break detection**

ABB's industry-leading sheet break detectors cover the needs of all mills with reliable break detection. The KB2 standard model is ideal for mills with minimal grade changes while the KB2 Ranger offers single calibration for all grades and colors, removing the need for complicated, grade-specific settings. The latter also offers a unique side installation for continuous, trouble-free operation.

With the electronics unit mounted outside the machine hood, both are the perfect choice for steamy, high temperature environments or where space is limited.





# KPM KC7 Microwave Consistency Transmitter



## True-phase method measurement

The KPM KC7 provides precise total consistency measurement of mixed pulps using the well-tested microwave true-phase technology. With a wide-range of options available, the flow-through model boasts the largest available diameter while the insertion-style's antennas have been designed to avoid microwave reflections in pipe and generate a self-cleaning effect. Mills get the most representative, accurate, reliable measurement unaffected by process variables or obstructions.

## Accurate, total consistency measurement

With a microwave signal utilizing phase vector modulation that contains a microwave-wide band sweep, KPM KC7 provides high accuracy measurement that is unaffected by variations in pulp species, fiber length, freeness and in process conditions, unlike optical and shear force technologies. KPM KC7 measures fibers and fillers for total consistency, making it ideal to measure mixed pulps and has single point calibration.

## Remote display unit

Remote electronics offers large display for easy operation and set-up. Intuitive, menu-driven interface features simple set-up, calibration and troubleshooting functions.

## Two versions for wide range of installation options

The inline, dual-plate design is uniquely equipped with an optional retractable temperature sensor for hard processes. The flow-through model fits pipes up to 16", the largest size on the market for the most representative results.

## No maintenance

KPM KC7 needs no preventive maintenance; it has no wearing parts at all. The flow-through models do not have measurement parts inside the pipe to be hit by foreign particles. Depend on KPM KC7 for a reliable and maintenance-free product.

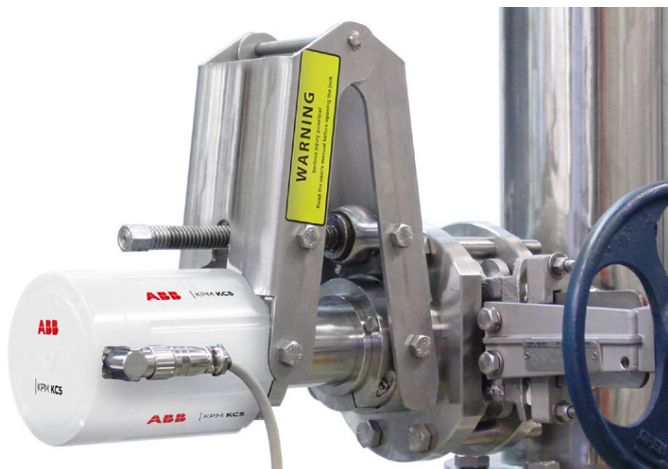
## Enhanced diagnostics

To further enhance the diagnostics features of the KPM KC7, all sensors will be equipped with an integrated pressure sensor, available as a spare part.

Specifications	
Sensor type	Microwave consistency transmitter
Output signal	3 x analog outputs 4–20 mA + HART™ Foundation Fieldbus and Profibus PA with optional converter
Binary inputs	24 VDC, process stop, grade change (2) and sampler input
Binary output	12–48 VDC max 10 mA, dry contact
Serial communication	USB PC-Interface, HART™
Measurement range in	0–16% Cs
Repeatability	0.01%
Resolution	0.001% for sizes 50–400 mm (3–16") and insertion type (ITL)
Installation	Wafer type between flanges for all flow-type models Insertion type, Sandvik coupling NS110 mm
Length	100 mm (4") for all FT models
Pressure measurement range	0...10 bar (0...145 psi) ref
Pressure sensor accuracy	max 0,25% FS; 0.025 bar
Overpressure withstand	40 bar (580 psi) ref
Process temperature	0–100 °C (32–212 °F)
Process pressure	Pressure class PN25, recommendation >1,5 Bar (>22 psi), no air
Process pH	2.5–11.5 pH
Ambient temperature	Sensor -20–60° C (-4–140° F), display unit -10–60° C (-14–140° F),
Flow velocity	No effect, Insertion type max flow 5 m/s (16.4 ft/s)
Materials	Sensor: SS 316L; window: ceramic, display: polycarbonate
Approvals	EMC, CE, PED (Directive 2014/68/EU, Article 13,1,(b) substances and mixtures
Enclosure class	Sensor IP66 (Nema 4X), display unit IP65 (Nema 4X)
Power supply	86–264 VAC, 47–63Hz; 20 VA

Conductivity limits	50 mm (2")	80 mm (3")	100 mm (4")	150 mm (6")	200 mm (8")	250 mm (10")	300 mm (12")	350 mm (14")	400 mm (16")	Insertion type
	25 mS/cm	25 mS/cm	20 mS/cm	20 mS/cm	15 mS/cm	15 mS/cm	15 mS/cm	10 mS/cm	10 mS/cm	25 mS/cm

# KPM KC5 Rotating Consistency Transmitter



## Revolutionary Direct Drive Servo Motor

The KPM KC5 Rotating Consistency Transmitter requires no compromising. With excellent consistency measurement performance, light weight construction, simple installation, and dramatically reduced maintenance, KPM KC5 is the most advanced consistency transmitter in the market.

## Fast and accurate measurement

Through ABB's state-of-the-art torque measurement technology the KPM KC5 provides an accurate consistency measurement--instantly. Our sensitive, wide-range measurement sensor is applicable to all consistencies between 1.5-16 percent. Built-in temperature compensation assures performance in all process conditions.

## Low installation costs

KPM KC5 is easy to install. Replace your existing model rotary transmitter with KPM KC5 using our special adapter to fit your current rotary installation. For new installations, use the measurement chamber that is provided with the transmitter. All required hardware is included.

## No shutdown required

Built-in gate valve assembly allows you to extract transmitter on the fly, at full process pressure, without having to shut down or drain the line. Flange installation is also available as an alternate option.

## Dramatically reduced maintenance

With no drive belt to change, the Direct Drive Servo Motor rarely requires routine maintenance. Our unique mechanical seal system enables infrequent, low-cost maintenance. Simply replace the seals, on site, in an hour or less.

## Powerful self-diagnostics

Automatic maintenance features include reverse direction rotation to automatically loosen foreign objects. Calibration verification with Autozero is possible while the KPM KC5 is operating in the line.



Specifications	
Sensor type	Rotating consistency transmitter
Output signal	Analog output 4 - 20 mA + HART®, Foundation Fieldbus and Profibus PA with optional converter
Binary inputs	24 VDC (supplied from DCS), three for built-in calibration curves, one for process stop, one for sample button
Binary output	Alarm output; 24 VDC, 2A; Opening or closing dry contact
Power requirements	85 - 264 VAC, 47 - 63 Hz, 320W, Single phase
Motor	Integrated Direct Drive Servo Motor
Measuring range	KPM KC5/5-S: 2-16% consistency KPM KC5/5-100: 1.5-5%
Sensitivity	Better than 0.003% Cs
Pressure rating	Sensor PN25 Gate valve DN80 for KC/5-S: PN10, PN16 or PN25, Gate valve DN125 for KC/5-100: PN16
Process temperature	0 - 120 °C (32-248°F)
Ambient temperature	Sensor 0 - 60°C (32-124°F), Display unit 0 - 50°C (32-122°F)
Flow velocity	0 - 5 m/s (0-15 f/s)
Seal water	Mill seal water, 6-8mm hose connection (1/4")
Housing	IP66 (better than NEMA 4X) enclosure
Cabling	10m (32ft) interconnect cable from Sensor to Display Unit; 20m (65 ft) and 30m (98ft) optional DN80 (3") AISI 316L standard, 254SMO and titanium available. PN10, PN16 or PN25 DN125 (5") AISI 316L, PN16
Gate valve	Measurement chamber fits pipe diameters of 150 mm (6") and larger (KC/5-100, 200mm or larger), AISI 316L standard, SAF2205, titanium. Adapter available for other manufacturer's measuring vessels. All required installation hardware included in the delivery
Process connection	
Sensor material	Wetted parts AISI 316L or titanium
Dimensions (L*H*W) and weights	Sensor: 520 x 140 x 180 mm (20.5 x 5.5 x 7.1"), 14,8 kg (33 lbs); KC5-100, 19kg (42 lbs) Display Unit: 200 x 300 x 150 mm (7.9 x 12 x 6"); 6 kg (13 lbs) Installation assembly: 430 x 560 x 200 mm (17 x 22 x 8"), 19 kg (42 lbs) ; KC5-100, 28kg (62 lbs)

## KPM KC3 Blade Consistency Transmitter



### Reliable, damage resistant transmitter

KPM KC3 provides reliable and maintenance-free measurement. With its patented, shock resistant and seal-less transfer mechanism, KPM KC3 is the only transmitter in the market with no moving parts. It also boasts titanium parts for the wetted areas and an unbreakable diaphragm to stop process from entering transmitter.

### Measures a wide consistency

KPM KC3 fits all applications, measuring a consistency range of 2-16 percent. Plus, the unique and highly-sensitive eddy probe accurately measures shear force.

### Remote display unit

Remote display unit can be mounted to any desirable location. It has a large display and intuitive, menu-driven user interface, which features simple set-up, calibration and troubleshooting functions.

### Simple calibration

One-touch calibration sequencing makes sampling, set-up and calibration easy. Built-in features include: time-stamping of samples for later evaluation and calibration, calibration calculation with multiple points and statistics, and remote selections for different pulp grades.

### Low installation and lifetime costs

The installation is done via standard stainless steel mounting saddles, with titanium options available for upgrade. Service requirements are low because of the seal-less transfer mechanism with no moving parts or O-rings. All parts are field changeable without shutting down the process and emptying the process line.

<b>Specifications</b>	
Sensor type	Blade consistency transmitter
Output signal	2 - wire, 4 - 20 mA + HART®, Foundation Fieldbus and Profibus PA with optional converter
Measuring range	2 - 8% with standard blade 6 - 16% with medium consistency blade 2 - 3% with low consistency blade 2 - 8% with recycled unscreened blade
Sensitivity	Better than 0.01 % Cs
Process pressure	Max. 25 bar
Process temperature	0 - 120 °C
Ambient temperature	0 - 65 °C
Storage temperature	-50...+80 °C
Flow velocity	0.5 - 5 m/s (1.6 - 16 ft/s) standard blade 0.5 - 5 m/s (1.6 - 16 ft/s) medium consistency blade 0.5 - 5 m/s (1.6 - 16 ft/s) low consistency blade 0.5 - 5 m/s (1.6 - 16 ft/s) recycled unscreened blade
Weight	Transmitter 2.3 kg (5 lbs), Display unit 2.2 kg (4.9 lbs)
Process connection	Clamp connection to NS70 mounting saddle. Saddle welded onto process pipe. All required hardware included with the transmitter
Process pipe size	100 mm (4") diameter or larger
Materials	All wetted parts titanium or Stainless steel. Mounting gaskets PTFE, Mounting saddle SS316L, SMO, Duplex, Titanium or FRP
Low voltage & emc	IEC 6100-4-3 and CISPR 11
Enclosure class	Sensor unit IP 66 (better than NEMA 4X), Display unit IP65 (NEMA 4X)
Damping	1 - 99 sec.
Calibration	Memory for 10 samples (FIFO). Built-in calibrator.
Build in curves	Seven (7) built-in calibration curves for softwood, hardwood, TMP, CTMP, groundwood, recycled, eucalyptus + one (1) user specific
Binary inputs	Three (3) to select calibration curve and one (1) for sample button

## KPM KC9 Optical Consistency Transmitters



### Widest consistency range

Optical consistency transmitters are typically the only choice for measuring total consistency range below 2 percent. ABB offers the latest design in optical consistency transmitters covering the widest consistency range for inline and bypass installations. The variety of sensors utilizing different measuring principles ensures that each application can be covered cost effectively without compromising measurement accuracy.

### Robust design in AISI 316 steel & sapphire

KPM KC9 sensors are constructed of a stainless steel measurement cell and sapphire glass lenses to withstand the harsh process environments. The display unit and sensor have protection class of IP65 (Nema 4X).

### KPM KC9 Inline Sensors

The KPM KC9 inline sensors can be installed directly to process pipe by using Sandvik NS40 process coupling. The sensor is available with optional retraction system, enabling sensor maintenance without interrupting the process. The inline consistency sensors are developed to measure single component fiber consistency in liquids from 0-14 percent.

### KPM KC9 Bypass sensors

The bypass consistency sensors measure consistency in liquids from 0-5 percent. KPM KC9-25 and KPM KC9-50 are suitable for single component fiber consistency and KPM KC9-25 LC for very low consistency applications. KPM KC9-P is ideal for multicomponent stock total consistency measurement. KPM KC9-A includes additional ash consistency measurement.

### Remote Display unit for operation

The sensors are pre-calibrated for quick and easy start up. After installation, one-point adjustment is performed against a laboratory test. The display unit has four selectable calibration models for applications with varying furnishes.





## KRA and KRT Retention Measurement



Retention control is important to papermakers due to the large influence it has on paper quality variability reduction. ABB's ultimate solution for monitoring and control of paper or board machine retention is KPM KRA and KRT Retention Measurement.

### Benefits

- MD variation reduction in:
  - Basis weight
  - Moisture content
  - Ash content
- Web break reduction
- Faster grade changes and start-ups
- Optimization of retention chemicals

### Retention Measurement System

ABB offers two options for paper and board machine retention monitoring and control: the KPM KRA sensor measures total consistency and ash consistency, while the KPM KRT sensor is for total consistency only. The measurement range for total consistency is 0-2.0 percent Cs and 0-1.0 percent for ash consistency.

### Robust design and construction

The sensor is constructed of 316SS with an unbreakable stainless steel measurement cell, enabling the sensors to withstand harsh environments. The display unit and sensor have protection class of IP65 (Nema 4X) and do not need protective housing to withstand difficult conditions at the paper machine wet end.

### Maintenance-free operations

Automatic flushing with water can be included to keep the sensors clean without maintenance. The optical sensor has a 3 mm gap between the lenses, which produces a self-cleaning effect due to the increased velocity. The white water sensor also has self-cleaning due to an automatic backflushing module.

**Technical specifications – KPM KRA/KPM KRT retention sensor**

Sensor type	Blade consistency transmitter
Output signal	2 -wire, 4 - 20 mA + HART®, Foundation Fieldbus and Profibus PA with optional converter
Measuring range	2 - 8% with standard blade 6 - 16% with medium consistency blade 2 - 3% with low consistency blade 2 - 8% with recycled unscreened blade
Sensitivity	Better than 0.01 % Cs
Process pressure	Max. 25 bar
Process temperature	0 - 120 °C
Ambient temperature	0 - 65 °C
Storage temperature	-50...+80 °C
Flow velocity	0.5 - 5 m/s (1.6 - 16 ft/s) standard blade 0.5 - 5 m/s (1.6 - 16 ft/s) medium consistency blade 0.5 - 5 m/s (1.6 - 16 ft/s) low consistency blade 0.5 - 5 m/s (1.6 - 16 ft/s) recycled unscreened blade
Weight	Transmitter 2.3 kg (5 lbs), Display unit 2.2 kg (4.9 lbs)
Process connection	Clamp connection to NS70 mounting saddle. Saddle welded onto process pipe. All required hardware included with the transmitter
Process pipe size	100 mm (4") diameter or larger
Materials	All wetted parts titanium or Stainless steel. Mounting gaskets PTFE, Mounting saddle SS316L, SMO, Duplex, Titanium or FRP
Low voltage & emc	IEC 6100-4-3 and CISPR 11
Enclosure class	Sensor unit IP 66 (better than NEMA 4X), Display unit IP65 (NEMA 4X)
Damping	1 - 99 sec.
Calibration	Memory for 10 samples (FIFO). Built-in calibrator.
Build in curves	Seven (7) built-in calibration curves for softwood, hardwood, TMP, CTMP, groundwood, recycled, eucalyptus + one (1) user specific
Binary inputs	Three (3) to select calibration curve and one (1) for sample button

## KPM KS Pulp Samplers



### High performance sampling for screened and unscreened applications

With high performance sampling for screened and unscreened applications, ABB offers the widest portfolio of cost-effective, durable and versatile sample valves for all applications. The KPM KS2 covers low consistency screened applications. KPM KS4 and KPM KS6 samplers handle unscreened extractions with a cutting piston.

### Manual & pneumatic versions available

KPM KS2 is available in manual and pneumatic versions; KPM KS4 and KPM KS6 are pneumatically operated only.

Saddle and threaded mounts are options for KPM KS2 and KPM KS4 samplers, while KPM KS6 is saddle mounted only.

### Safe and representative sampling

The KPM KS-line sampler heads penetrate the water layer inside the pipe, eliminating dewatering from the sampling process. KPM KS4 and KPM KS6 have stroke depth adjustment for sample flow, ensuring reliable operation with unscreened pulp.

### Water flushing

A separate water connection allows cleaning of the sample valve after a collection. Flushing ensures a repeatable and representative sampling procedure.

### Reduced maintenance costs

All KPM KS samplers have seal-less construction, allowing a maintenance-free operation.

### Pneumatic operating valve

All pneumatic KPM KS samplers are equipped with an operation valve. An optional electric switch detects the pistons position.

### Options

Electric position indicator for sampling pistons enables time stamping in the DCS.

Specifications	
Consistency range	KPM KS2: Low consistency 0 - 8%Cs screened pulp KPM KS4: Low consistency 0 - 8%Cs screened and unscreened pulps, no knots KPM KS6: Medium consistency 0 - 18%Cs screened and unscreened pulps
Process connection	KPM KS2: NS40 Sandvik saddle or threaded NPT1½" (Materials: AISI316L, titanium Gr2, 254SMO, SAF2205) KPM KS4: NS40 Sandvik saddle or threaded NPT1½" (Materials: AISI316L, titanium Gr2, 254SMO, SAF2205) KPM KS6: NS70 Sandvik saddle or (Materials: AISI316L, titanium Gr2, 254SMO, SAF2205, titanium saddle for FRP-pipes DN80 flange AISI316L, titanium Gr2, 254SMO, SAF2205)
Flush water connection	KPM KS2: R¼" internal thread, compatible with NPT¼" KPM KS4: R½" external thread, compatible with NPT½" KPM KS6: R½" external thread, compatible with NPT½"
Flush water pressure	2 - 10 bar (30 - 150 psi)
Air pressure (P-models)	KPM KS2: 2 - 10 bar (30 - 150 psi), KPM KS4: 2 - 10 bar (30 - 150 psi), recommendation min 4 bar (60 psi) KPM KS6: 5 - 10 bar (30 - 150 psi), recommendation min 5 bar (75 psi)
Sample outlet connection	KPM KS2: 38mm, (1 ½") hose connection KPM KS4: 38mm (1 ½") hose or welded hard pipe connection KPM KS6: 50mm (2") hose or welded hard pipe connection
Process pressure	Maximum pressure: 25 bar (370 psi) The minimum operating pressure required is a function of the sample consistency. KPM KS2 and KS/4 min. process pressure: KS/6 min. process pressure: 0 - 3 % 0.5 bar (7 psi) below 8% 1.0 bar (15 psi) 3 - 5 % 1.0 bar (15 psi) over 8% 2.0 bar (30 psi) 5 - 8 % 2.0 bar (30 psi)
Sample flow	The sample flow is a function of process pressure, fiber type and consistency. The flow diminishes at higher consistencies. KS/4 and KS/6 piston stroke opening and piston orientation are adjustable.
Materials	KPM KS2: AISI 316L, titanium Gr2, 254SMO KPM KS4: AISI 316L KPM KS6: AISI 316L, titanium Gr2
Materials	Transmitter 2.3 kg, display unit 2.2 kg KPM KS2-M: 1.8 kg (4.0 lbs) KPM KS2-P: 2.0 kg (4.4 lbs) KPM KS4: 2.3 kg (5.1 lbs) KPM KS6 Sandvik: 3.7 kg (8.2 lbs) KPM KS6 Flange: 5.0 kg (11 lbs)
Weight	
Options	Electric position switch of sampling piston for stamping the time in the DCS

# KPM Sheet Break Detectors: KB2 and KB2 Ranger



While both units have the electronics mounted outside the machine, the KB2 Ranger (right) offers a long-detection reach to sit outside the paper machine.

## Non-contact optical measurement

With hundreds of installations worldwide, the KPM Sheet Break Detector is recognized as the best sheet break detector on the market. Both the KB2 and the KB2 Ranger models offer a non-contact sensor that is suitable for dirt, steam and high-temperature installations or where space is limited. The air-purged sensor head stays clean while monitoring for sheet breaks in the harshest environments.

The KB2 Ranger is designed to monitor sheet breaks from the side of the paper web and works with all machine set-ups; against felt/wire/cylinder and open draw. The non-contact, adjustable sensor head can be positioned with free angle towards the paper web, making it the most flexible sensor available on the market. It is also immune to all colors, grades, ambient light changes and high-intensity LED camera lights.

## Easy to set up

Both models have large display units with a logical user interface that allows easy setup of the break detection by selecting the measurements that give the highest signal difference.

Break and maintenance alarms are wired to the PLC or DCS.

The KPM KB2 Ranger has a single, one-button calibration during startup removing the need for complicated, grade-specific settings. The KB2 Ranger's proprietary software looks for changes in the RGB profile during a sheet break and updates the profile automatically. 4-20 mA current outputs for the signal levels are available as an option.

## Fast break detection

Both the KB2 and KB2 Ranger have digital signal processing technology that measures all signals at a 1,000 times per second, making them immune to ambient light changes by measuring the backlight intensity. The break detection delay is a minimum of 15 milliseconds, and thanks to the digital filtration, the user can select how many measurement cycles are used for the break alarm.

## RGB and infrared light measurement

KPM KB2 has RGB or infrared light sources to perform superiorly on all paper and board grades and applications, regardless of color. The RGB color measurement can handle all sheet, wire and felt colors providing reliable break detection. In addition to open-draw applications, the breaks can be detected against felt, wire, or even against a cylinder.

## Electronics located outside harsh environment

While the sensor head can be exposed to high temperatures, the electronics unit is mounted outside of the paper machine hood, ensuring reliability - even in a 100% humidity environment. The fiber optic cables can be supplied in various lengths, up to 12 meters.



Specifications	
Ambient temperature	Sensor head and fiber optic cable: -10 to 180 °C (15 °F to 356 °F) Electronics unit: -10 to 60 °C (15 °F to 140 °F)
Fiber optic cable	KB2/6: 6 m (20'), KB2/9: 9 m (30') or KB2/12: 12m (40')
Fiber optic cable conduit	Requires flexible airtight conduit 19 mm (3/4") ID min, available as an option
Conduit connection	19 mm (3/4 ") BSP
Installation	Sensor distance from the web 5...30 cm (2...12")
Led pulse frequency	1 kHz
Power supply	90 - 264 VAC, 50/60 Hz or 24 VDC
Power consumption	15 W
Enclosure class	IP 66 (Nema 4X)
Purge air connection	Dry instrument air, 6/4 mm (1/4") connector, normal consumption 80l/min
Digital outputs	2 x Closing or opening contact max. 250 VAC, 2A; 220VDC, 2 A for Break signal and Maintenance alarm
Alarm output delay	Min. 15 ms from the actual break
Analog outputs	Optional 3 pcs 4 - 20 mA max 600 ohm, Isolated
Dimensions (L x H x D) and weight	Electronics Unit 323 x 237 x 70 mm (12,7 x 9,3 x 2,8"), 3 kg (6,6lbs) Sensor head Ø 33 mm (1 1/4 ") SS316, pipe 1500 mm (59") long, 4 kg (9lbs)



The full KPM portfolio is comprised of applications for consistency control, sampling and sheet break detection, respecting the most progressive solutions in the field. Every KPM instrument is individually verified before implementation to ensure high accuracy and reliability. All products are supported by ABB's global network of sales, technical support and expert consultancy services.



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