

Rotating Systems

Eddy current inspection for longitudinal defects

Today's rod, bar and wire industry requires testing procedures that recognize longitudinal surface defects of small depth. The eddy current inspection method shows a high sensitivity to surface defects and is therefore ideal for this purpose. Rotating systems spirally scan the surface of the test material and are far superior to conventional encircling coils in the identification of longitudinal cracks and tears.

System sizes

Test piece Ø	Rotating system
3–35 mm	RS 35
5–65 mm	RS 65
20–130 mm	RS 130

Features

- Integration into production lines and in the final offline testing of rod, bar and wire
- High sensitivity. Minimum defect depth depends on the surface structure.
- Range of probe types available
- System compensates for variations in lift-off between probe and oval test piece
- Robust design for rigorous industrial environment
- Straightforward operation and easy service



Simple operation and service

Precise test piece guidance

Built-in centering

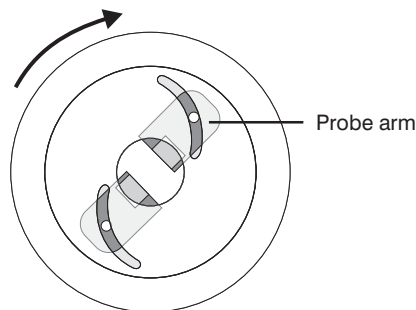
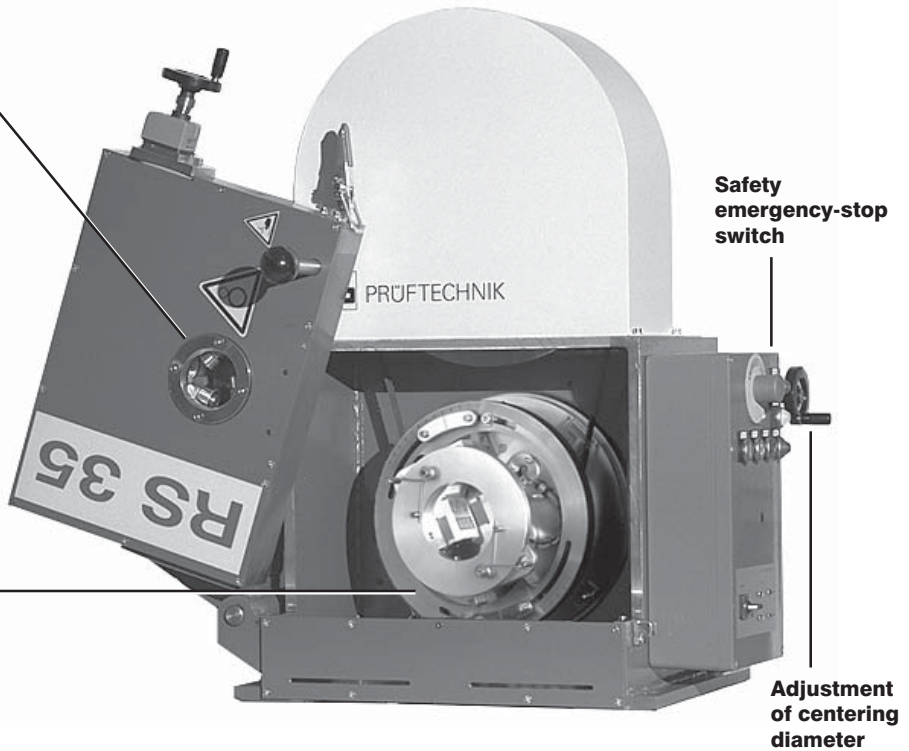
The solidly-built, 3-roller centering guarantees precise guidance to an accuracy of 0.1 mm. It is located on both sides of the system and is externally adjustable.

Auxiliary guide sleeves

More accurate and narrow guidance is required for small diameter material to prevent test material from hitting the sensors. Special guide sleeves attach internally at the infeed and/or outfeed for this purpose.

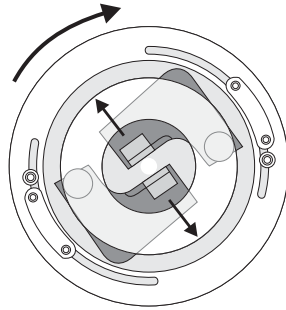
Robust inspection unit

The inspection unit consists of a sleeve shaft construction with a robust, industrial spindle bearing, a non-contact signal transmitter and a heavy-duty probe head.



Inspection unit, Type I

Only for RS 35 and RS 65. The probe arms are fixed.



Inspection unit, Type II

To safeguard the rotating system and probes, the lever arms give way to test material (in the direction shown by the arrows). Probes are specially protected to keep wear and tear to a minimum.

Convenient service





The centering unit lifts up and away, allowing frontal access for diameter adjustment, exchange of probes and service.

Eddy current probes

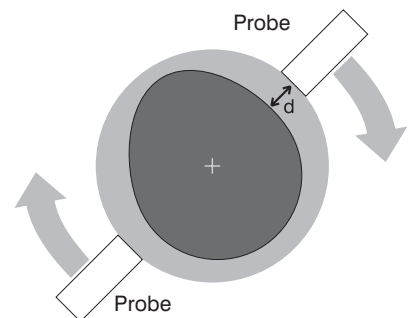
The exchangeable probes are well protected and easily replaced. The probe case holds 1 or 2 differential probes and a lift-off probe.

Lift-off compensation

The probes of the rotating system are very sensitive to the gap, or *lift-off*, between probe and test piece. The smaller the lift-off, the larger the defect signal. If the test piece is not round (as shown) or off-center, the lift-off varies. Thus, defects of the same size may produce different signal amplitudes. A lift-off compensation system corrects for this effect and accounts for differing gaps. The compensation works for a gap ranging from 0.5 to 3 mm (using standard probes).

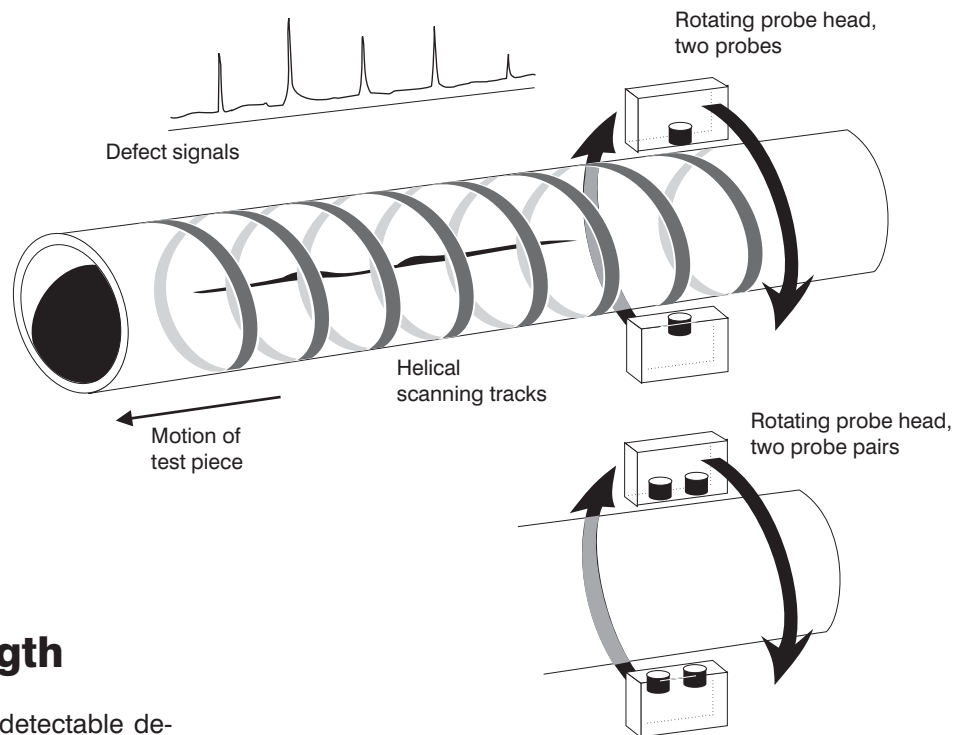
-  Gap control range
-  Test piece, not round
-  Center of probe path
-  Gap (distance between probe and test piece)

Cross-sectional view
Ovality exaggerated for clarity



How does the rotating system work?

The rotating system consists of two or four probes that circle around the test material, scanning it in a helical pattern. Every time a probe crosses a crack, it generates a defect signal. Thus, the rotating system yields a great number of consecutive signals that identify the flaw as a crack. (An encircling coil gives few or even no signals when passing along a crack.)



Minimum defect length

The minimum defect length that is detectable depends on the conditions under which the rotating system scans the test piece.

Complete surface testing

The surface of the test piece is completely tested when the probes cover every part of it without leaving any untested spaces as they rotate. The third column in the table at the back shows the maximum throughput at which testing is complete.



Partial surface testing

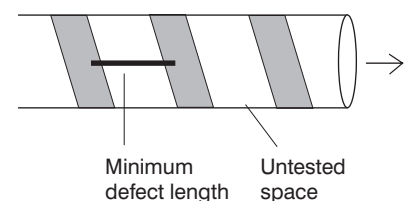
Under certain testing conditions, portions of the surface may remain unscanned. Small defects that fall within these untested spaces cannot always be detected. The minimum defect length depends on the spacing width which, in turn, depends on the factors shown in the box. From the table at the back you can find the minimum defect length for your testing configuration.

The **minimum reproducible defect length** is equal to the length of a test defect whose signal amplitude is reproducible.

Factors affecting minimum defect length

1. Speed of test piece

The tracks separate further and the untested space widens at high speeds.



2. Number of probes

Four probes have a greater track width than two probes (dashed lines).



3. Rotational speed

The untested space between the tracks narrows at higher rotational speeds.



Applications

Material under inspection

- Tube, pipe, bar, wire
- Ferrous, nonferrous and austenitic metals
- Temperature range of test piece: -20 – 70°C (-4–160°F)

Material dimensions

- RS 35: Ø 3–35 mm (1/8–1 1/4")
- RS 65: Ø 5–65 mm (3/16–2 1/2")
- RS 130: Ø 20–130 mm (3/4–5 1/8")

Production line

- Continuous production with cut-off
- Continuous production without cut-off (e.g. drawing line)
- Testing of cut lengths

Defect resolution

- Min. defect length: see table below
- Min. defect depth: >30 µm (depend. on surface conditions)

Eddy current instruments available

EDDYCHEK® S, EDDYCHEK® 4, EDDYCHEK® 5

Rotating systems

Number of probes

- 2 or 4 differential probes on two test heads
- Optional lift-off compensation; max. lift-off: 3 mm
- Probe type dependent on throughput and surface

Guidance system/Centering

- Various bushings; optional motorization
- Additional roller guides available

Rotations per minute

- RS 35/65: 3000/6000 ·RS 130: 1500/3000

Motor

Asynchron. 4-pole switchable motor with mechanical brake

Power supply

- 400V, 50/60 Hz, 2.5kVA. Different voltages possible with isolating transformer.
- 115/230V, 0.5kW, 50/60 Hz

Demagnetization

Demagnetization for material with > 10 A/cm recommended

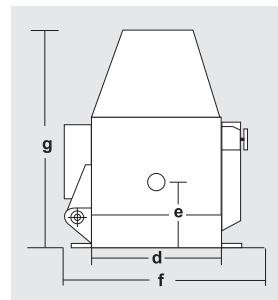
PLC

A variety of signals are provided for automation and are compatible with any existing control system

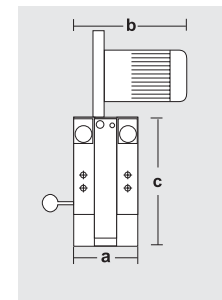
Dimensions in mm (inches)

System	a	b	c	d	e	f	g	h	Weight
RS 35	410 (16.1)	620 (24.4)	465 (18.3)	490 (19.3)	230 (9.0)	790 (31.1)	890 (35.0)	890 (35.0)	340 kg (748 lb)
RS 65	410 (16.1)	620 (24.4)	465 (18.3)	490 (19.3)	230 (9.0)	790 (31.1)	890 (35.0)	890 (35.0)	350 kg (770 lb)
RS 130	512 (20.2)	705 (27.8)	640 (25.2)	632 (24.9)	300 (11.8)	985 (38.8)	1003 (39.5)	853 (33.6)	650 kg (1430 lb)

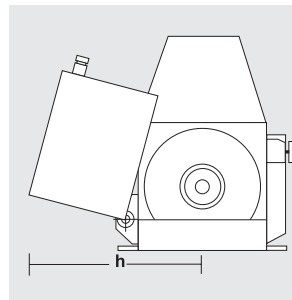
Front view



Side view



Open view



Rotating system	Order number
RS 35	LAB 6000
RS 65	LAB 6100
RS 130	LAB 6200

Throughput of material passing through rotating system (m/s)*

Number of probes**	RPM	Complete surface testing	Partial surface testing											
		4mm	Minimum defect length											
			6mm	8mm	10mm	12mm	14mm	16mm	18mm	20mm	25mm	30mm	35mm	40mm
Throughput (m/s)														
2	1500	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.3	1.5	1.8	2
	3000	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2	2.5	3	3.5	4
	6000	0.8	1.2	1.6	2	2.4	2.8	3.2	3.6	4	5	6	7	8
4	1500	0.27	0.45	0.5	0.55	1.2	1.3	1.4	1.5	1.6	1.85	2.1	2.35	2.6
	3000	0.53	0.9	1	1.1	2.4	2.6	2.8	3	3.2	3.7	4.2	4.7	5.2
	6000	1.07	1.8	2	2.2	4.8	5.2	5.6	6	6.4	7.4	8.4	9.4	10.4

*Throughput for two probes (1 per arm) = Number of probes x min. defect length (mm) x rpm /60,000 **Track width of probe = 4mm

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