OLYMPUS®

Your Vision, Our Future

TUBE INSPECTION

Probes and Accessories

- Eddy Current
- Eddy Current Array
- Remote Field
- Near Field
- Magnetic Flux Leakage
- IRIS Ultrasound
- Accessories

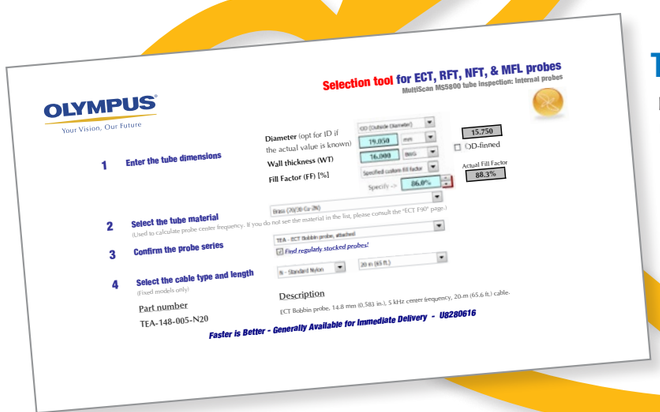
Olympus

Olympus Corporation operates in industrial, medical, and consumer markets, specializing in optics, electronics, and precision engineering. Olympus is a world-leading manufacturer of innovative test and measurement solutions that are used in industrial and research applications ranging from aerospace, power generation, petrochemical, civil infrastructure, and automotive to consumer products.

We invite you to browse through this catalog to learn more about Olympus probes for tube inspections and their applications.

Faster is Better — Request an Olympus Stock Probe

Do you have an unexpected job coming up? Do you require a tube probe ASAP? We manufacture and stock many tube probes for quick shipment. A list of stock probes with U8 is provided at the beginning of each product page for fast order placement. See the "Faster is Better" section headings throughout this new catalogue for quick and efficient solutions tailored to your specific needs.



Tube Probe Selection Guide

Because short delivery times are very important to most of our customers, the 3.0 Selection Guide now specifies probes that are available off-the-shelf. Use the probe parameters to locate regularly stocked probes. Additional selection parameters, like fill factor, have also been added, along with a probe finder. Download the tool in the tube probe section of the website to test these features!

www.olympus-ims.com/en/tube-inspection-probes/

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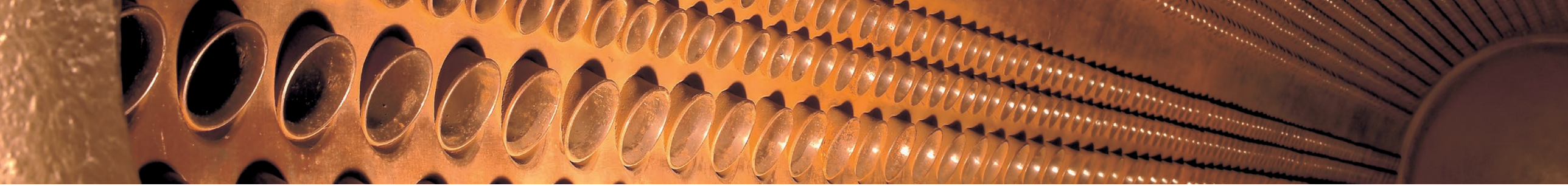


Technique Selection Matrix

No single inspection technique is adequate for all types of materials, and single-technology systems are only used for a narrow range of applications. The eddy current (ECT) technique is commonly used to inspect nonferromagnetic materials. Remote field testing (RFT), near field testing (NFT), and magnetic flux leakage (MFL) techniques are used for the inspection of ferromagnetic materials such as carbon steel tubing. The internal rotary inspection system (IRIS) ultrasound technique is used for tube profilometry and corrosion mapping and is also a reliable validation technique for eddy current, remote field, near field, and magnetic flux leakage inspections of any material.

To obtain good results during inspection, it is critical to select the right technique. The diagram below provides a quick overview of tube testing techniques and indicates their respective catalogue sections.

Step 1

Select your material.

Step 2

Select your technique.

IRIS

Internal Rotary UT

- Excellent resolution, C-scan imagery, and defect sizing capabilities.
- Tubes need to be kept extra clean and full of water during the inspection.

Nonferromagnetic

- Aluminum
- Brass
- Copper
- Hastelloy
- Incoloy
- 300-series stainless steel
- Titanium
- Zirconium

Mildly Ferromagnetic

- Monel
- 3RE60
- SAE-CURE
- 400-series stainless steel
- Duplex-series stainless steel

Ferromagnetic

- Carbon steel
- Nickel
- 400-series stainless steel
- Chromoly 4130
- Iron

Fin-fan

ECT

Eddy Current

- Fastest pulling speed (1 to 2 m/s).
- Excellent detection and sizing capability (small pitting).
- Economic solution.
- Crack detection possible.

- ECT saturation probe (TEO).
- High-frequency RFT probe (15K).

RFT

Remote Field

- Medium pulling speed (0.1 to 0.6 m/s).
- Good sizing capability on volumetric defects.

NFT/MFL

Near Field

- Fast pulling speed (0.5 to 1 m/s).
- Very easy analysis.
- ID defects only.

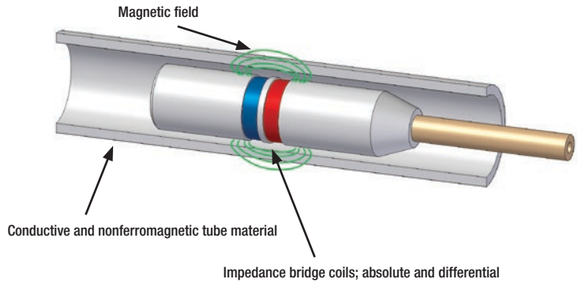
Magnetic Flux Leakage

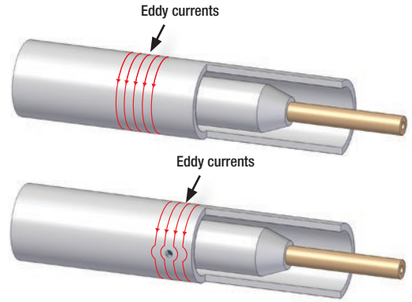
- Detects OD defects.
- Detection only.

Eddy Current Application

Eddy current is a noncontact method used to inspect nonferromagnetic tubing. In this technique, the probe is excited with an alternating current, inducing eddy currents in the part under inspection. Any discontinuities or material property variations that change the eddy current flow in the part are detected as potential defects by the probe. This technique is suitable for the detection and sizing of metal discontinuities, such as corrosion, erosion, wear, pitting, baffle cuts, wall loss, and cracks for nonferrous materials, including austenitic stainless steel such as SS304/SS316, brass, copper-nickel, titanium, copper-fin, and Monel.

During tube inspection, multifrequency eddy currents can locate and size defects under support plates and on the tube sheet. Olympus eddy current equipment is perfectly suited to the inspection of condensers, feedwater heaters, air conditioners, and surfaces.



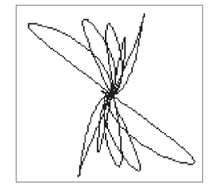


- Two coils are excited with an electrical current, producing a magnetic field around them. The magnetic fields penetrate the tube material and generate opposing alternating currents within the material. These currents are called eddy currents.
- Any defects that change the eddy current flow will also change the impedance of the coils in the probe.
- These changes in the impedance of the coils are measured and used to detect defects in the tube.

Probe Response

All TEx-series eddy current probes have a set of circumferential coils that can be operated simultaneously in absolute and differential bridge mode.

Absolute response



Differential response

Connector and Compatibility

All TEx-series eddy current probes have the widely used 4-pin Amphenol® connector. For a 6-pin Jaeger connector, add the letter J to the end of the probe or cable part number.

All of the TEx-series eddy current probes are compatible with most impedance bridge eddy current instruments. They are also compatible with the TC4700, TC5700, and MultiScan MS 5800™ tube inspection system.

Amphenol connector

Jaeger connector

ECT Probe Model Selection

[ ] -210-050-N15

The table below provides an overview of each ECT family to guide you in selecting the proper probe model for your application. Please note that ECT probes are only used for nonferromagnetic tubing inspection. Detachable probes require a separate TEZ cable (not included, see page 11).

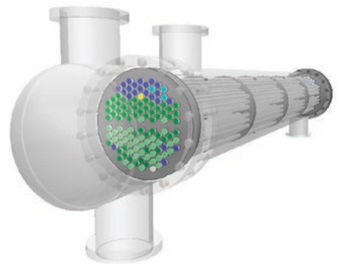
ECT Applications

Standard

TEA/TEB: Bobbin Probe (attached/detachable)
- The economic solution.

TEE/TEF: Titanium Probe (attached/detachable)
- Heavy-duty solution (casing made of titanium).

TEK/TEL: High Resolution (attached/detachable)
- High-resolution coils for thin-walled inspections (generally titanium tubes).



Finned Tubes

TEC/TED: AC probe (attached/detachable)
- Three-channel probe featuring a pancake coil array.
- Detects cracks in all orientations.

U-Bend

TEG: Flexible Bullet (attached)
- Inspection of U-bends (bend radius as low as 2 in.).

Mildly Ferromagnetic

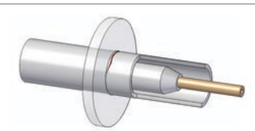
TEO: CARTER Mag. Bias (attached)
- ECT solution for mildly ferromagnetic tube inspection.

Semiautomated

TER: Airgun Probe (detachable)
- MPP04-01 airgun and TER probes are ideal for large-scale condenser inspections.
- Require special cable; not compatible with other standard cables.

Circumferential Cracks

TXE: Eddy Current Array Tube Probe (attached)
- Detection of circumferential cracks.
- Good inspection speed (1m/s).
- 2-D and 3-D C-scan representations.



ECT Probe Diameter Selection Based on Tube Size

TEA-[ ] -050-N15

Faster is Better — Alternate Diameter: ±0.2 mm

Although keeping a good fill factor is critical during eddy current testing, it is possible to successfully employ a probe whose diameter is slightly different from its optimal diameter. For example, a reduction of 0.2 mm on the probe diameter does not significantly affect performance. In fact, the difference is barely noticeable.

Olympus keeps the most commonly used probe diameters regularly stocked for optimum response time. If the diameter you require is not listed as a stock item, keep in mind that a ±0.2 mm difference from the optimal diameter will also work.

The following example illustrates signals using the optimal probe (left) vs. a 0.2 mm diameter reduction (right).

Test conditions
- Admiralty brass calibration tube
- 19.05 mm OD
- 16 BWG
- Manual pull
- F90 = 8 kHz

List of defects
- 4 x 20% FBH (Ø4.76 mm)
- 40% FBH (Ø4.76 mm)
- 60% FBH (Ø3.18 mm)
- 80% FBH (Ø1.98 mm)
- Hole (Ø1.32 mm)

Data files are available on our website: www.olympus-ims.com/en/tube-inspection-probes/ (in the data files subsection).

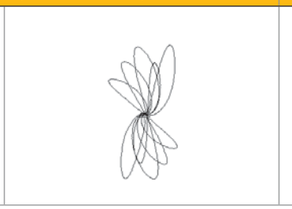
TEA-148-015-N20 (recommended)		TEA-146-015-N20 (alternate diameter)	
			
A90 channel	D90 channel	A90 channel	D90 channel

Table 1 — ECT Probe-Diameter Selection Guide for Common Tube Sizes

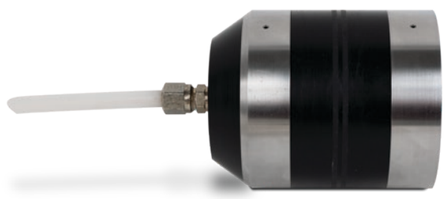
Warning: If your tubes are dirty, a smaller probe might be required for that inspection. Olympus is not responsible if you select a probe that is not compatible with your application. If you require assistance, please contact an Olympus representative. Keep in mind, your probe can be ±0.2 mm from the optimal recommended diameter.

Tube Wall Thickness (WT)			Tube Outside Diameter - mm (in.)							
BWG	mm (in.)		12.7 (0.5)	15.87 (0.625)	19.05 (0.75)	22.22 (0.875)	25.4 (1.0)	31.75 (1.25)	38.1 (1.5)	50.8 (2.0)
24	0.56	(0.022)	108	140	168	200	228	290	352	476
23	0.65	(0.025)	106	136	168	200	228	288	350	474
22	0.71	(0.028)	106	134	166	196	228	288	348	474
21	0.81	(0.032)	104	134	162	194	224	286	346	472
20	0.89	(0.035)	102	132	162	192	224	284	346	470
19	1.07	(0.042)	098	126	162	188	220	280	342	466
18	1.24	(0.049)	094	126	156	186	216	278	338	462
17	1.47	(0.058)	090	122	152	182	212	274	334	458
16	1.65	(0.065)	086	118	148	180	208	270	330	454
15	1.83	(0.072)	084	114	144	174	204	266	328	452
14	2.11	(0.083)	078	108	140	170	200	260	322	446
13	2.41	(0.095)	N/A	102	134	162	194	256	316	440
12	2.77	(0.109)	N/A	096	126	156	188	248	310	432
11	3.05	(0.120)	N/A	090	122	152	182	242	304	426
10	3.40	(0.134)	N/A	084	114	144	176	236	298	420

Diameter availability differs for each model. Please refer to the page corresponding to the selected model to confirm availability.

Custom Diameter Probes

Probe diameters that are not listed in this catalog may, in some circumstances, be manufactured to meet specific requirements. Please contact your local Olympus representative for additional information and assistance. Note that the probe body of the most oversized range is made of plastic (acetal). The pictures below show examples of small/large custom versions.



TEA-980-005-N20 (98 mm)

TEA-064-050-N20 (6.4 mm)

If your tube dimension does not appear in the preceding chart, you can use the formulas below.

Note: Make sure that you select the right formula corresponding to the tube ID.

Tube ID < 0.5 in. (12.7 mm)	Standard Formula Tube ID ≈ 1 in. (25.4 mm)	Tube ID > 2.5 in (63.5 mm)	Where: **DIAM:** Probe diameter × 10 **ID:** Tube internal diameter
DIAM = 9.0 × ID (mm)	DIAM = 9.5 × ID (mm)	DIAM = ID (mm) - 2 mm	

Example: The tube OD is 18.2 mm and the wall thickness is 1.83 mm. Therefore, the tube ID is 14.54 mm (18.2 – 1.83 – 1.83). Since the ID is > 12.7 mm, the second formula is applied: DIAM = 9.5 × ID (mm) = 9.5 x 14.54 = 138.13. The 0.2 mm rounded-probe DIAM is 138; however, since the DIAM value can differ by ±0.2 mm, a 14mm (140) stock probe could be used instead.

ECT Frequency Selection and Simplification

TEA-210- [ ] -N15

Faster is Better — Why a Frequency Simplification?

Olympus used to recommend specific F90-tuned frequencies for eddy current probes. These probes have a broad frequency range, making it possible to use a greater number of frequency sets in addition to the F90, which the probe was originally intended for. To narrow down the quantity of standard frequency ranges, Olympus has replaced several tuned frequencies with a few common values.

A probe can be successfully driven at an F90 frequency that is different from its tuned frequency. For example, a probe meant to operate at 10 kHz can be used successfully at a 75 kHz F90 frequency. The same applies to a 150 kHz probe used at 75 kHz. Even if the operating frequency is near the practical limit of the probe, a slight gain increase will effectively compensate for any signal reduction.

The following example illustrates signals using the optimal probe (left) vs. 10 kHz and 150 kHz probes (right), all driven at F90 = 80 kHz.

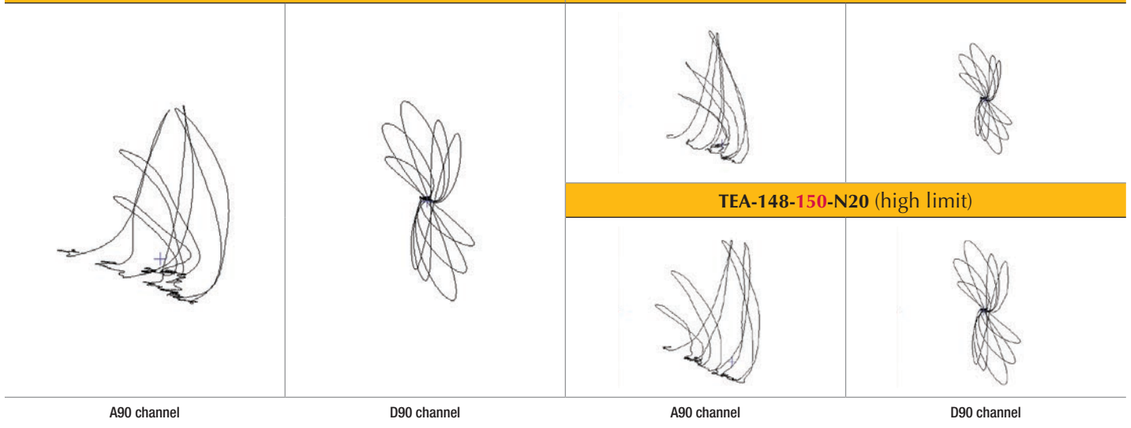
Tests conditions

- Stainless steel 316 calibration tube
- 19.05 mm OD
- 16 BWG
- Manual pull
- F90 = 80 kHz

List of defects

- 4 x 20% FBH (Ø4.76 mm)
- 40% FBH (Ø4.76 mm)
- 60% FBH (Ø3.18 mm)
- 80% FBH (Ø1.98 mm)
- Hole (Ø1.32 mm)

Data files are available on our website: www.olympus-ims.com/en/tube-inspection-probes/ (in the data files subsection).



Frequency Ranges

The new probe frequency ranges cover the different center frequencies offered by various probes. The table below indicates the more commonly stocked new Olympus standard frequencies. Other frequencies are also available, but are not regularly stocked.

Faster is Better - 015, 050, 250: The Most Commonly Stocked Frequency for ECT Probes.

Range Name	Center Frequency	Effective Frequency Range	Replaces… (Tuned Frequencies)
Ultra Low	001	250 Hz to 5 kHz	L50, L75, 001, 002
Low	**015**	2 kHz to 60 kHz	005, 010, 015, 025, 030
Medium	**050**	10 kHz to 250 kHz	025, 030, 050, 075, 100, 125
High	**250**	50 kHz to 500 kHz	125, 150, 250, 300
Ultra High	600	200 kHz to 1.2 MHz	500, 600

The prefix "L" stands for "low-frequency," and represents the central frequency in Hz × 10. Therefore, "L50" = 500 Hz.

Example: The TEA-120-100-N20 is not in stock and has a 7-day lead time, but can easily be replaced with a TEA-122-050-N20 (which is regularly stocked) without affecting the quality of the inspection.

Central Probe Frequency Selection Based on Tube Material

Table 2 — ECT Probe Frequency Selection for Different Tube Materials and Thicknesses

Tube Wall Thickness (WT)			Material														
BWG	mm (in.)		Aluminum	Aluminum bronze	Brass (Admiralty)	Brass (70/30 Cu-Zn)	Brass (85/15)	Brass (95/5)	Copper	Copper nickel (70-30)	Copper nickel (90-10)	Hastelloy C	Inconel 600	Monel	Stainless steel (304/316)	Titanium 99%	Zirconium
24	0.56	(0.022)	015	250	050	050	050	050	015	250	250	600	600	600	600	600	250
23	0.65	(0.025)	015	050	050	050	050	015	015	250	250	600	600	250	600	250	250
22	0.71	(0.028)	015	050	050	050	015	015	015	250	250	600	600	250	250	250	250
21	0.81	(0.032)	015	050	050	050	015	015	015	250	050	600	600	250	250	250	250
20	0.89	(0.035)	015	050	015	015	015	015	015	250	050	600	250	250	250	250	250
19	1.07	(0.042)	015	050	015	015	015	015	015	050	050	250	250	250	250	250	050
18	1.24	(0.049)	015	015	015	015	015	015	001	050	050	250	250	050	250	050	050
17	1.47	(0.058)	015	015	015	015	015	015	001	050	015	250	250	050	050	050	050
16	1.65	(0.065)	001	015	015	015	015	001	001	050	015	250	050	050	050	050	050
15	1.83	(0.072)	001	015	015	015	015	001	001	050	015	250	050	050	050	050	050
14	2.11	(0.083)	001	015	015	015	001	001	001	015	015	050	050	050	050	050	015
13	2.41	(0.095)	001	015	015	001	001	001	001	015	015	050	050	015	050	015	015
12	2.77	(0.109)	001	015	001	001	001	001	001	015	015	050	050	015	050	015	015
11	3.05	(0.120)	001	015	001	001	001	001	001	015	015	050	050	015	015	015	015
10	3.40	(0.134)	001	001	001	001	001	001	001	015	015	050	015	015	015	015	015

Tuned Frequency Probes

Tuned frequencies are still available; however, they have longer lead times. The value (in kHz) is calculated for F90 using the equation shown below. The central frequency (in kHz) should be as close as possible to the F90 frequency required for a given tube material and wall thickness. The F90 frequency is considered to be the best operating frequency because it provides the appropriate phase lag between defects while maintaining good signal amplitude. At "F90" there is an approximate 90° phase lag between the internal shallow defect (ID groove 10%) and the external shallow defect (OD groove 20%).

F90 Calculation

$$f_{90}\,(\text{kHz}) = \frac{3\rho\,(\mu\Omega\text{cm})}{t^2(\text{mm})}$$

f_{90} = recommended driving frequency (kHz)

p = resistivity (μΩcm)

t = tube thickness (mm)

The prime frequency is 2 × F_{90}.

ECT Probe with Attached Cables

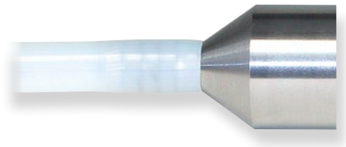
TEA-210-120-

Faster is better — Order the N20 Cable Probes

The available lengths for most attached tube probes are 15, 20, and 30 m. The 20 m cable (N20), which is the most requested model, is included with regularly stocked attached probes. Stock detachable cables are also available for customers who require other lengths. See the detachable cable section below for more information.

Other Attached Cables (Made to Order)

With the exception of TEG probes, all attached ECT probe cables are made entirely from nylon. Available lengths are 15 m (50 ft), 20 m (65 ft), and 30 m (100 ft). TEG cables are only available in the 25 m (80 ft) length and can be made from either nylon (N25) or HDPE, which is more flexible (H25).



TEA-210-120-N20
(Attached nylon cable)

Cables for Detachable Probes

Detachable cables offer even more possibilities. Standard nylon (BBS) and kink-resistant (BBK) detachable cables are available for TEB, TEF, and TEL detachable probes. These cables are also adapted to TED AC probes (see ACS and ACK). The kink-resistant model has a reinforced stainless steel braid. Airgun probes must be used with an Airgun cable (BBG) containing a Kevlar® braid to support hard probe pull.

ECT detachable probes and cables are sold separately.

TEZ-BBS-N15
(Standard detachable connector)

Faster is Better — Detachable Stock Cables

Cable Number	Item Number	Description
TEZ-BBS-N15	U8800526	15 m (50 ft) standard-type cable for TEB, TEF, and TEL probes.
TEZ-BBK-N20	U8800498	20 m (65 ft) kink-resistant cable for TEB, TEF, and TEL probes.
TEZ-BBS-N30	U8800528	30 m (100 ft) standard-type cable for TEB, TEF, and TEL probes.

TEZ-BBK-N20
(Reinforcement braid)

Standard/Custom Cables (Made to Order)

Cable Number	Available Lengths (N15 = 15 m cable)
TEZ-BBS-NXX	15 m (50 ft), 20 m (65 ft), 30 m (100 ft).
TEZ-BBK-NXX	15 m (50 ft), 20 m (65 ft), 30 m (100 ft).
TEZ-ACS-NXX	15 m (50 ft), 20 m (65 ft), 30 m (100 ft).
TEZ-ACK-NXX	15 m (50 ft), 20 m (65 ft), 30 m (100 ft).
TEZ-BBG-NXX	20 m (65 ft), 30 m (100 ft).

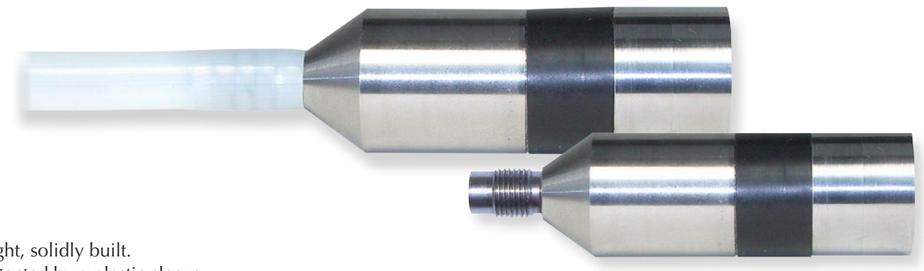
TEZ-ACS-N20
(Nylon cable for AC probes)

TEZ-BBG-N20
(Kevlar cable - Airgun only)

Eddy Current Probes

TEA/TEB — Bobbin Probe | Attached/Detachable

An economic solution for nonferromagnetic tubing used in condensers, heat exchangers, and feedwater heaters.



Features

- Lightweight, solidly built.
- Coils protected by a plastic sleeve.
- An economical solution.
- Stainless steel wear guides at front and rear ends.
- Ideal for heaters, coolers, heat exchangers, and more.

Faster is better — Available for short delivery times

The probes listed below are regulary stocked for quick delivery. If the probe you require is not indicated, consider the alternate options with slight diameter and frequency variations, which won't affect the quality of your results (see the Faster is Better sections on pp. 7 and 9 for more details).

TEA (Attached) Stock Probes

Part ID	Item Number	Diameter		Center Frequency kHz
		mm	in.	
TEA-118-015-N20	U8280510	11.8	0.465	15 (Low)
TEA-118-050-N20	U8280623	11.8	0.465	50 (Mid)
TEA-122-050-N20	U8280614	12.2	0.480	50 (Mid)
TEA-126-015-N20	U8280615	12.6	0.496	15 (Low)
TEA-140-005-N20	U8280446	14	0.551	5 (Very Low)
TEA-140-050-N20	U8280447	14	0.551	50 (Mid)
TEA-140-250-N20	U8280214	14	0.551	250 (High)
TEA-148-005-N20	U8280616	14.8	0.583	5 (Very Low)
TEA-148-050-N20	U8280439	14.8	0.583	50 (Mid)
TEA-148-250-N20	U8280212	14.8	0.583	250 (High)
TEA-156-015-N20	U8280474	15.6	0.614	15 (Low)
TEA-156-250-N20	U8280624	15.6	0.614	250 (High)
TEA-158-015-N20	U8280625	15.8	0.622	15 (Low)
TEA-158-050-N20	U8280450	15.8	0.622	50 (Mid)
TEA-158-250-N20	U8280451	15.8	0.622	250 (High)
TEA-162-050-N20	U8280626	16.2	0.638	50 (Mid)
TEA-180-050-N20	U8280618	18	0.709	50 (Mid)
TEA-188-050-N20	U8280452	18.8	0.740	50 (Mid)
TEA-200-050-N20	U8280453	20	0.787	50 (Mid)
TEA-200-250-N20	U8280218	20	0.787	250 (High)
TEA-208-050-N20	U8280454	20.8	0.819	50 (Mid)
TEA-208-250-N20	U8280216	20.8	0.819	250 (High)
TEA-228-600-N20	U8280627	22.8	0.898	600 (Very High)

TEB (Detachable*) Stock Probes

Part ID	Item Number	Diameter Frequency		Center Frequency kHz
		mm	in.	
TEB-132-250	U8280455	13.2	0.520	250 kHz (High)
TEB-134-050	U8280457	13.4	0.528	50 kHz (Mid)
TEB-140-050	U8280566	14	0.551	50 kHz (Mid)
TEB-148-015	U8280459	14.8	0.583	15 kHz (Low)
TEB-148-050	U8280628	14.8	0.583	50 kHz (Mid)
TEB-158-015	U8280461	15.8	0.622	15 kHz (Low)
TEB-158-250	U8280629	15.8	0.622	250 kHz (High)

*Use with a TEZ-BBS or TEZ-BBK cable. Cable information for TEB probes is available on page 11.

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TEA-224-050-N20

Probe Type	Probe Diameter	Center Frequency	Cable Length
TEA = Bobbin probe	224 = 22.4 mm	050 = 50 kHz	N20 = 20 m

Probe Type	Probe Diameter* (use mm in part ID)		Center Frequency (refer to Table 2 — ECT Probe Frequency Selection for Different Tube Materials and Thicknesses on page 10)	Cable Length (TEA only)**
	mm	in.		
TEA: Attached **TEB**: Detachable (Use with a TEZ-BBS or TEZ-BBK cable.**)	**Standard** TEA: 9.6 mm to 50 mm TEB: 11 mm to 50 mm by 0.2 mm **Custom** (TEA only) 6.6 mm to 9.4 mm 50.2 mm to 100 mm	**Standard** TEA: 0.378 in. to 1.969 in. TEB: 0.433 in. to 1.969 in. by 0.008 in. **Custom** (TEA only): 0.260 in. to 0.370 in. 1.976 in. to 3.937 in.	001 (Very Low) 015 (Low) 050 (Mid) 250 (High) 600 (Very High)	15 m (50 ft) 20 m (65 ft) 30 m (100 ft)

*Refer to Table 1 — ECT Probe-Diameter Selection Guide for Common Tube Sizes on page 7 for assistance with probe diameter selection.
**TEZ cable information for TEB probes is available on page 11.

Eddy Current Probes

TEC/TED — Air Conditioner | Attached/Detachable

Ideal for air conditioners and circonferential cracks.

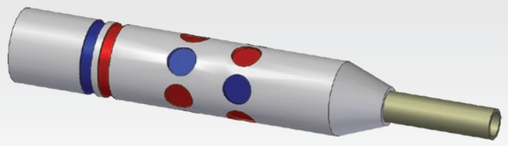
Recommendations

Heavy tube wall: TEC and TED probes are not recommended for wall thicknesses over 2.0 mm (0.08 in.) because the inspection may be limited to the inside. Note that these probes require the TE-ADP-004 adaptor (page 43).

Features

- Solid construction for durability.
- Includes a differential bobbin set and a circumferentially-sensitive pancake array.
- Detection of circumferentially-oriented cracks.
- Better detection capability in the transition zone.
- Ideal for air-conditioner tubing.

Probe design



The air conditioning probe combines pancake arrays with standard differential bobbins for detection of circumferentially oriented cracks.

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TEC-224-050-N20

Probe Type	Probe Diameter	Center Frequency	Cable Length
TEC = Air conditioner	224 = 22.4 mm	050 = 50 kHz	N20 = 20 m

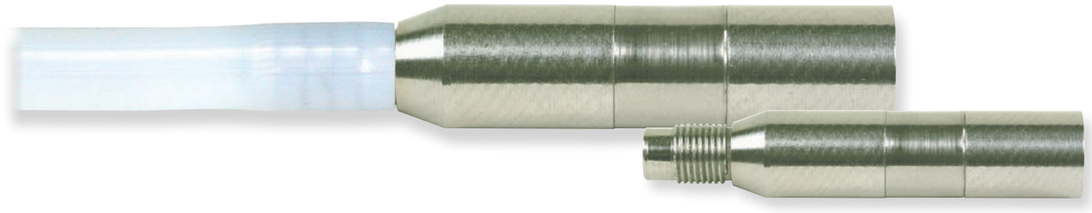
Probe Type	Probe Diameter * (use mm in part ID)		Center Frequency (refer to Table 2 — ECT Probe Frequency Selection for Different Tube Materials and Thicknesses on page 10)	Cable Length (TEC only)**
	mm	in.		
TEC: Attached **TED**: Detachable (Use with TEZ-ACS or TEZ-ACK cables.**)	**Standard** TEC: 9.6 mm to 50 mm TED: 11 mm to 50 mm by 0.2 mm **Custom** (TEC only) 50.2 mm to 100 mm	**Standard** TEC: 0.378 in. to 1.969 in. TED: 0.433 in. to 1.969 in. by 0.008 in. **Custom** (TEC only): 1.976 in. to 3.937 in.	015 (Low) 050 (Mid) 250 (High) 600 (Very High)	15 m (50 ft) 20 m (65 ft) 30 m (100 ft)

*Refer to Table 1 — ECT Probe-Diameter Selection Guide for Common Tube Sizes on page 7 for assistance with probe diameter selection.
**TEZ cable information for TED probes is available on page 11.

Eddy Current Probes

TEE/TEF — Titanium Probe | Attached/Detachable

The heavy-duty bobbin probe solution.



Features

- Ultimate durability.
- Titanium protective cover for coils.
- Stainless steel wear guides at the front and rear ends.
- Ideal for heaters, coolers, and heat exchangers.

Faster is better — Available for short delivery times

The probes listed below are regularly stocked for quick delivery. If the probe you require is not indicated, consider the alternate options with slight diameter and frequency variations, which won't affect the quality of your results. (See the Faster is Better sections on pp. 7 and 9 for more details.)

Part ID	Item Number	Diameter		Center Frequency (kHz)
		mm	in.	
TEE-140-050-N20	U8280463	14	0.551	50 (Mid)
TEE-140-250-N20	U8280464	14	0.551	250 (High)
TEE-148-005-N20	U8280411	14.8	0.583	5 (Very Low)
TEE-148-050-N20	U8280465	14.8	0.583	50 (Mid)
TEE-148-250-N20	U8280466	14.8	0.583	250 (High)
TEE-156-015-N20	U8280403	15.6	0.614	15 (Low)

Part ID	Item Number	Diameter		Center Frequency (kHz)
		mm	in.	
TEE-156-250-N20	U8280467	15.6	0.614	250 (High)
TEE-182-015-N20	U8280620	18.2	0.717	15 (Low)
TEE-182-050-N20	U8280621	18.2	0.717	50 (Mid)
TEE-200-015-N20	U8280631	20	0.787	15 (Low)
TEE-204-015-N20	U8280468	20.4	0.803	15 (Low)
TEE-204-250-N20	U8280632	20.4	0.803	250 (High)

Standard/Custom Probes (Made to Order)

Use the following nomenclature and the chart below to configure your part number.

TEE-224-050-N20

Probe Type	Probe Diameter	Center Frequency	Cable Length
TEE = Titanium	224 = 22.4 mm	050 = 50 kHz	N20 = 20 m

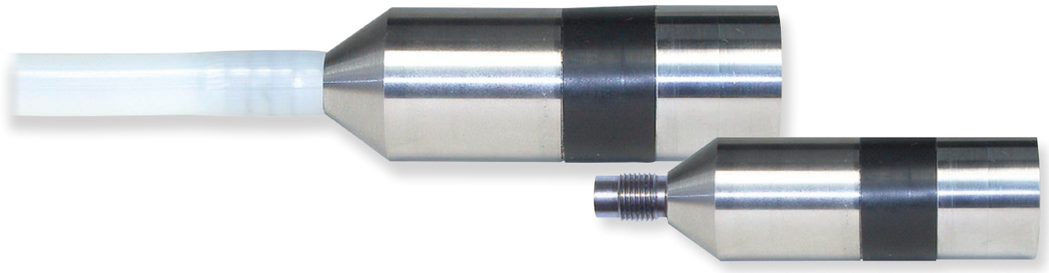
Probe Type	Probe Diameter *† (use mm in part ID)		Center Frequency (refer to Table 2 — ECT Probe Frequency Selection for Different Tube Materials and Thicknesses on page 10)	Cable Length (TEE only)**
	mm	in.		
TEE: Attached **TEF**: Detachable Use with TEZ-BBS or TEZ-BBK cables.**	**Standard** TEE: 9.6 mm to 50 mm TEF: 11 mm to 50 mm by 0.2 mm	**Standard** TEE: 0.378 in. to 1.969 in. TEF: 0.433 in. to 1.969 in. by 0.008 in.	001 (Very Low) 015 (Low) 050 (Mid) 250 (High) 600 (Very High)	15 m (50 ft) 20 m (65 ft) 30 m (100 ft)

*Refer to Table 1 — ECT Probe-Diameter Selection Guide for Common Tube Sizes on page 7 for assistance with probe diameter selection.
**TEZ cable information for TEF probes is available on page 11.
† Note that probes with a diameter over 25.4 mm (1.00 in.) come with a stainless steel 316-grade protective cover for the coils instead of a titanium protective cover.

Eddy Current Probes

TEK/TEL — High Resolution | Attached/Detachable

The best resolution for thin-wall inspection.



Features

- Narrow coil, ideal for thin tubing inspection such as titanium tubing.
- Lightweight, solidly built.
- Coils protected by a plastic sleeve.
- Stainless steel wear guides at the front and rear ends.

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TEK-224-050-N20

Probe Type	Probe Diameter	Center Frequency	Cable Length
TEK = High-resolution	224 = 22.4 mm	050 = 50 kHz	N20 = 20 m

Probe Type	Probe Diameter * (use mm in part ID)		Center Frequency (refer to Table 2 — ECT Probe Frequency Selection for Different Tube Materials and Thicknesses on page 10)	Cable Length (TEK only)**
	mm	in.		
TEK: Attached **TEL**: Detachable Use with TEZ-BBS or TEZ-BBK cables.**	**Standard** TEK: 9.6 mm to 50 mm TEL: 11 mm to 50 mm by 0.2 mm **Custom** (TEK only) 50.2 mm to 100 mm	**Standard** TEK: 0.378 in. to 1.969 in. TEL: 0.433 in. to 1.969 in. by 0.008 in. **Custom** (TEK only): 1.976 in. to 3.937 in.	015 (Low) 050 (Mid) 250 (High) 600 (Very High)	15 m (50 ft) 20 m (65 ft) 30 m (100 ft)

*Refer to Table 1 — ECT Probe-Diameter Selection Guide for Common Tube Sizes on page 7 for assistance with probe diameter selection.
**TEZ cable information for TEL probes is available on page 11.

Eddy Current Probes

TEG — Flexible Bullet | Attached

The flexible solution for your U-bend inspections.

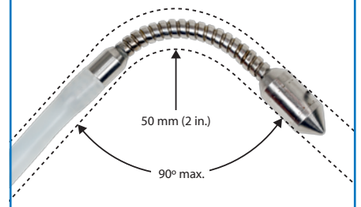
Recommendations

TEG probes are designed to inspect tight U-bends with radius of curvatures as low as 50 mm (2 in.). These probes are designed to inspect one half of the U-bend (90°) from each side of the tube.

Features

- Solid stainless steel construction for durability.
- Titanium protective cover for coils.
- Tight U-bend capability (with curvature radius as low as 50 mm [2 in.]).

Tube Curvature and Radius



TEG inspects tubes with a maximum of 90° bend one side a time. Minimum radius is 50 mm.

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TEG-224-050-N25

Probe Type	Probe Diameter	Center Frequency	Cable Length
TEG = Flexible bullet probe	224 = 22.4 mm	050 = 50 kHz	N25 = 25 m

Probe Type	Probe Diameter * (use mm in part ID)		Center Frequency (refer to Table 2 — ECT Probe Frequency Selection for Different Tube Materials and Thicknesses on page 10)	Cable Length**
	mm	in.		
TEG: Flexible bullet	**Standard** 11 mm to 25.4 mm by 0.2 mm	**Standard** 0.433 in. to 1.000 in. by 0.008 in.	015 (Low) 050 (Mid) 250 (High) 600 (Very High)	25 m (80 ft) N = Nylon H = More flexible

*Refer to Table 1 — ECT Probe-Diameter Selection Guide for Common Tube Sizes on page 7 for assistance with probe diameter selection.
**Information on cables for TEG probes with superior flexibility is available on page 11.

Eddy Current Probes

TEO — Carter Super Magnetic Bias Probe | Attached

The ECT solution for mildly ferritic tube inspection.

Recommendations

TEO are limited to mildly ferritic tube inspection of thicknesses below 1.5 mm. In other contexts, the probe is not likely to provide adequate magnetic saturation of the tube wall.

Features

- Super magnetic bias.
- Ultra-durable construction.
- Hardened steel wear surface for long life even in harsh environments.
- Ideal for suppressing permeability noise in mildly ferritic materials, including Monel, 3RE60, nickel, SEA-CURE, Duplex, and 400-series stainless steel.

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TEO-208-050-N20

Probe Type	Probe Diameter	Center Frequency	Cable Length
TEO = Carter probe	208 = 20.8 mm	050 = 50 kHz	N20 = 20 m

Probe Type	Probe Diameter * (use mm in part ID)		Center Frequency (refer to Table 2 — ECT Probe Frequency Selection for Different Tube Materials and Thicknesses on page 10)	Cable Length
	mm	in.		
TEO: Carter probe	**Standard** 11 mm to 22.2 mm by 0.2 mm	**Standard** 0.433 in. to 0.874 in. by 0.008 in.	015 (Low) 050 (Mid) 250 (High) 600 (Very High)	15 m (50 ft) 20 m (65 ft) 30 m (100 ft)

*Refer to Table 1 — ECT Probe-Diameter Selection Guide for Common Tube Sizes on page 7 for assistance with probe diameter selection.

Eddy Current Probes

TER — Airgun Probe | Detachable

For those who need speed and performance for big jobs.

Recommendations

TER probes are designed be used with the Airgun scanner to speed up ECT inspection (4 m/s to 6 m/s push speed, and 2 m/s encoded pull speed).

Features

- Extra lightweight.
- Designed to work with the MPP04-01 Airgun probe pusher-puller (refer to page 46).
- Grooved design to reduce pushing force in the tube end and improve durability.
- Ideal for steam condensers, coolers, and heat exchangers.

The MPP04-01 Airgun

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TER-208-050-N20

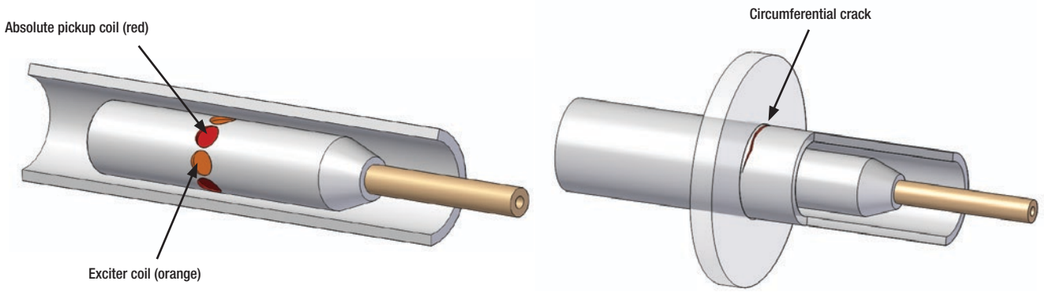
Probe Type	Probe Diameter	Center Frequency	Cable Length
TER = Airgun probe	208 = 20.8 mm	050 = 50 kHz	N20 = 20 m

Probe Type	Probe Diameter * (use mm in part ID)		Center Frequency (refer to Table 2 — ECT Probe Frequency Selection for Different Tube Materials and Thicknesses on page 10)	Cable Length**
	mm	in.		
TER: Airgun probe Use with a TEZ-BBG cable.**	**Standard** 14 mm to 31.6 mm by 0.2 mm **Custom***** 11.4 mm to 13.8 mm	**Standard** 0.551 in. to 1.244 in. by 0.008 in. **Custom***** 0.449 in. to 543 in.	15 (Low) 050 (Mid) 250 (High) 600 (Very High	20 m (65 ft) 30 m (100 ft)

*Refer to Table 1 — ECT Probe-Diameter Selection Guide for Common Tube Sizes on page 7 for assistance with probe diameter selection.
**TEZ Kevlar cable information for TER probes is available on page 11.
***Custom TER probes with diameters below 14 mm require the AEIX0818 custom nozzle.

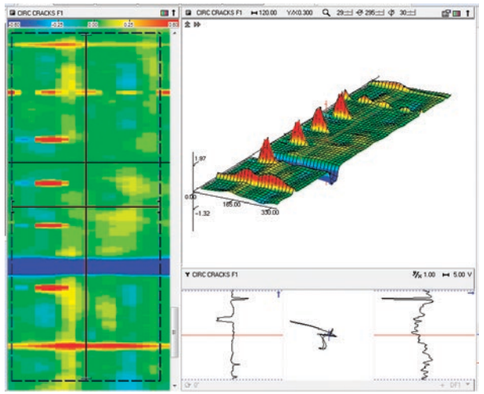
Eddy Current Array Tube Inspection Applications

Using eddy current probes to find circumferential cracks is often a challenge. Thanks to the TXE probe series, it's now an easy task. These reflection (driver/pickup) array probes, which are made of eight independent circumferential sensors, are the best at detecting circumferential cracks, particularly those located at the edge of supports or tube sheets. The output display is an intuitive C-scan image, and the probe can also be used to scan the entire length of the tube at very high speeds (around 1 m/s).

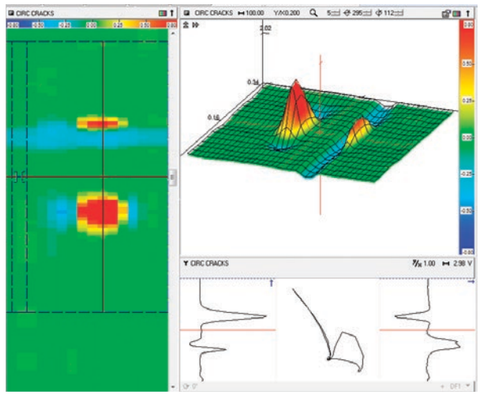


Probe Response

The TXE series eddy current array probes have independent channels that enable generation of C-scan views for easier analysis.



CT02 ECT Olympus calibration tube C-scan



Circumferential cracks (75% and 50% at the support)

Connector and Compatibility

All TXE-series eddy current array probes are manufactured with the 41-pin ITT cannon connector for straight compatibility with the MultiScan MS 5800™ system without the need for an adaptor.

Standard ECT connector

Eddy Current Probes

TXE — Eddy Current Array Tube Probe | Attached

Excellent circumferential crack detection and C-scan capabilities.

Recommendations

TXE probes are designed to be used for the detection of circumferential cracks in stainless steel tubing.

Features

- Detection of circumferential cracks anywhere in the tube, including tube-sheet and support locations.
- Full-length tube inspection with speeds almost equal to the ECT standard speed (1 m/s), replacing rotation pancake probes.
- 2-D and 3-D C-scan representation for maximum understanding of signals using the MultiView™ C-scan option.
- Solid and durable titanium construction.
- No multiplexer required. Direct connection to the standard MS 5800 EC extended connector.
- Option to use up to four frequencies with mixing, and all with C-scan displays.

The best results are achieved with a fill factor between 90% and 95%.

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TXE-R8-148-MF-N20

Probe Type	Coils Disposition	Probe Diameter		Frequency Level	Cable Length
		mm	in.		
TXE = ECT Array	R8 = 8 reflection coils	148 = 14.8 mm		MF = Medium frequency	N20 = 20 m

Probe Type	Coils Disposition	Probe Diameter (use mm in part ID)		Frequency Level	Cable Length
		mm	in.		
TXE: Eddy current array tube probe	**R8**: 8 reflection coils	**Standard** 13.8 mm to 24 mm by 0.2 mm	**Standard** 0.543 in. to 0.945 in. by 0.008 in.	**MF**: Medium frequency optimized for stainless steel.	20 m (65 ft)

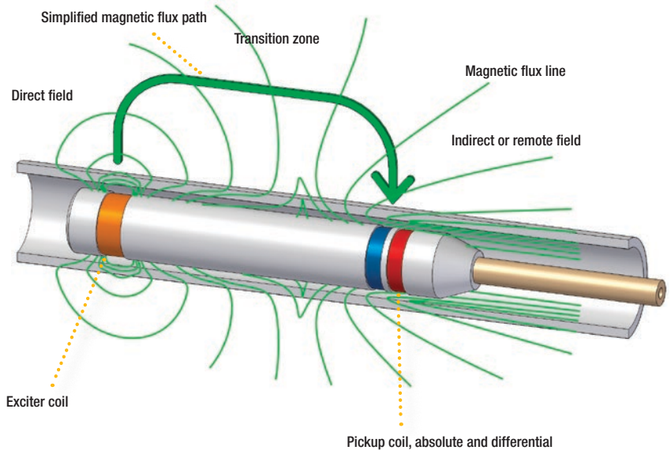
Remote Field Applications

Remote field testing (RFT) probes are being used to successfully inspect ferromagnetic tubing such as carbon steel or ferritic stainless steel. They are very sensitive in detecting and measuring volumetric defects resulting from erosion, corrosion, wear, and baffle cuts. Sensitivity to pitting has been further enhanced with the remote field probe's new design.

The remote field probe is a low-frequency variant of the exciter (driver)-pickup eddy current probe, which is characterized by an exciter-pickup distance of at least 2.5 to 3 times the tube OD. This distance is essential and critical for the pickup coils to be able to sense the "remote" magnetic field rather than the "direct" field.

Olympus remote field probes and equipment are used successfully around the world to inspect heat exchangers, feedwater heaters, and boiler tubes. RFT is a through-wall transmission technique. The basic probe is made of one exciter coil and two pickup coils. There are two magnetic fields present: the **direct field** in the vicinity of the exciter coil is rapidly attenuated with distance, while the **indirect field** is diffused outward through the tube wall. The near field then propagates along the tube axis, before being rediffused back through the tube wall. The zone in which the indirect field is dominant is called the remote field. This zone is present at a distance greater than two tube diameters.

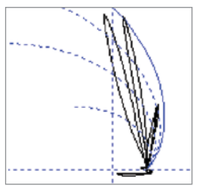
All remote field probes have their pickup coils set to 2.5 to 3 times the tube OD to ensure that only the indirect field is picked up. All Olympus RFT probes have a set of circumferential pickup coils that can be operated simultaneously in absolute and differential mode.



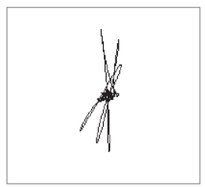
- The distance between the pickup and exciter coils is 2.5 to 3 times the tube OD. (Single exciter model shown.)

Probe Response

All TRX-series probes have a set of circumferential receiver coils that can be operated simultaneously in absolute and differential mode.



Absolute response



Differential response

Connector and Compatibility

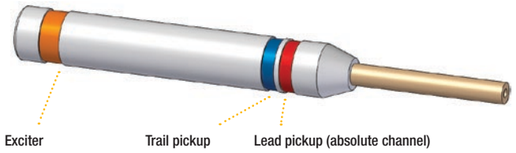
All TRX probes use a 19-pin ITT Cannon connector compatible with the TC4700, TC5700, and the MultiScan MS 5800™ system.

Olympus RFT connector

Understanding the Differences Between Remote Field Probe Models

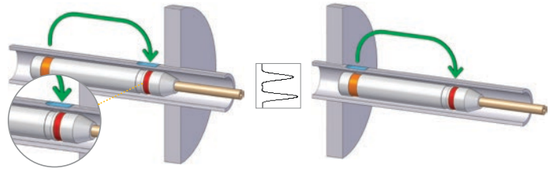
Single Exciter (TRS series)

- Preferred as a general-purpose probe for wall-loss detection.
- Clear response on wall-loss and erosion-type defects.
- The probe is optimized for simple ABS interpretation.
- Two channels: Absolute (ABS) and differential (DIFF).
- The probe is blind to small defects (pits) on the near side of the support plate.



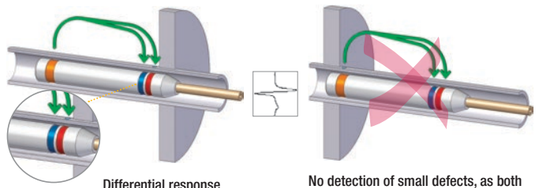
NOTE: The DIFF channel is made by subtracting the lead and trail pickups.

Wear scars, erosion, and wall loss are detected on both sides of the support plates by the ABS channel.



Large defect detected from the ABS channel on both sides of the support.

However, small defects such as individual pits are not detected by the DIFF channel on the near side of support, because the same variations are subtracted from the exciter effect.

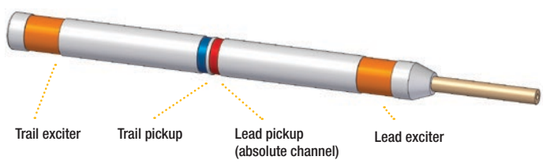


Differential response

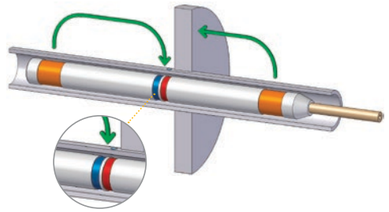
No detection of small defects, as both coils detect and subtract the same signal.

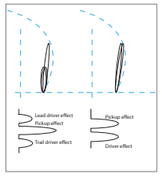
Dual Exciter (TRX series)

- Used when pitting is expected in the tubes.
- Two exciters; switchable lead/both/trail.
- Two channels: Absolute (ABS) and differential (DIFF).
- The probe is optimized for simple DIFF interpretation.
- Clearer response to small defects (pits), even on both sides of the support plate.
- ABS data is more complex to analyze than when using a single exciter probe.



Dual-exciter probes can detect wear pits on both sides of the support plate, because there is always one exciter to supply energy to the pickup coils.



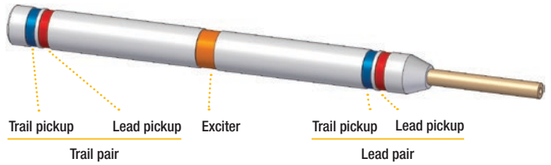


The short defect comparison: voltage plane (top) and strip chart (bottom).

The ABS channel is more difficult to interpret, because a defect generates three signals (instead of two for a single exciter).

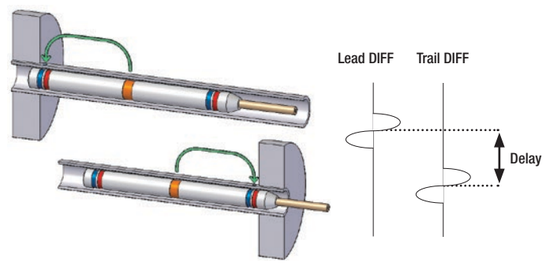
Dual Pickup (TRT series)

- Used when defects are expected on the tube sheets.
- Four channels: Lead set (ABS/DIFF) and trail set (ABS/DIFF).
- Combines the advantages of both the single- and dual-exciter models.
- Data analysis is longer and requires experienced users.



The dual pickup acts as two single-exciter probes in one probe casing, combining the excellent wall-loss response of the ABS channel with the dual-exciter model's capability to detect pits on each side of the support plate. This makes the dual-pickup model ideal for inspecting both tube sheets.

These probes take more time to perform data analysis, and because there are four channels to analyze, in addition to a delay between the lead and trail channel sets, they also require more experienced operators.



Ferromagnetic Tubing Model Selection (RFT/NFT/MFL)

[ ] -120-300-N20

The table below provides an overview of each family to help assist you in selecting the right probe model for your application.

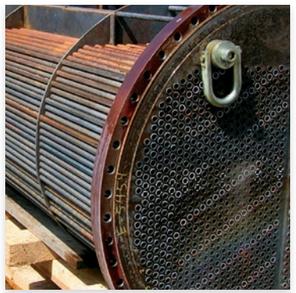
Ferromagnetic Applications

Standard RFT Inspection

TRS: Single exciter
- Detects and enables sizing of pitting, corrosion, and erosion in ferromagnetic tubing.
- Simple data analysis.
- Economic solution.

TRX: Dual exciter
- Superior detection and sizing of pitting, corrosion, and erosion in ferromagnetic tubing.
- Same great sensitivity on both sides of the support.

TRT: Dual pickup
- Employed for better analysis of tube-sheet regions.
- For advanced users.



Boilers RFT Inspection

TRC: Flexible boiler probe
- Flexible RFT solution for boiler inspection.

Fin-Fan Tubes (NFT/MFL Inspections)

TRD: Near-field probe
- Best solution for carbon steel fin-fan ID inspection.
- ID inspection only.
- Simplest use for easy analysis.

TFB: Magnetic flux leakage probe
- Fin-fan solution if OD detection is required.

RFT Dimension Selection Based on Tube Size

TRX- [ ] -300-N20

Table 3 — RFT Diameter Selection for Common Carbon Steel Tube Sizes

The following table lists the probe diameters required for each RFT model in conjunction with the selected tube OD and thickness. Please note that the probe diameters in this table are in part-number format (for example, 120 is a 12 mm outside-diameter probe).

						Rigid RFT (TRS, TRX, TRT)		Flexible RFT (TRC - Boiler)	
OD mm	(in.)	BWG	WT mm	(in.)		Recommended Probe Diameter	Alternate Probe Diameter*	Recommended Probe Diameter	Alternate Probe Diameter*
12.7	(0.5)	19	1.07	(0.042)		090			
		18	1.24	(0.049)		090			
15.88	(0.625)	18	1.24	(0.049)		110	120		
		16	1.65	(0.065)		110	100		
		14	2.11	(0.083)		100			
19	(0.75)	16	1.65	(0.065)		140	130		
		14	2.11	(0.083)		130	120		
		13	2.41	(0.095)		120	130		
		12	2.77	(0.109)		120	110		
25.4	(1.0)	14	2.11	(0.083)		190	180		
		13	2.41	(0.095)		180	190		
		12	2.77	(0.109)		180	170		
		11	3.05	(0.12)		170			
		10	3.40	(0.134)		160	170		
31.75	(1.25)	14	2.11	(0.083)		260	240		
		13	2.41	(0.095)		240			
		12	2.77	(0.109)		240			
		11	3.05	(0.12)		220	240		
		10	3.40	(0.134)		220			
38.1	(1.5)	14	2.11	(0.083)		300	320		
		13	2.41	(0.095)		300	280		
		12	2.77	(0.109)		280	300	280	
		11	3.05	(0.12)		280	300		
		10	3.40	(0.134)		280		280	
50.8	(2.0)	12	2.77	(0.109)				370	
		10	3.40	(0.134)				370	
		8	4.19	(0.165)				340	370
63.5	(2.5)	10	3.40	(0.134)				450	
		8	4.19	(0.165)				450	
		6	5.16	(0.206)				450	
76.2	(3.0)	8	4.19	(0.165)				550	
		6	5.16	(0.206)				550	
		4	6.05	(0.238)				550	
88.9	(3.50)	6	5.16	(0.206)				650	
		4	6.05	(0.238)				650	
		2	7.21	(0.284)				650	

*** Alternate probe diameters can be used if you do not have the recommended diameter.**

If your tube dimension does not appear in the chart above, you can use the formulas below.

Note: Make sure that you select the right formula corresponding to the tube ID.

Tube ID < 0.5 in. (12.7 mm)	Standard formula (Tube ID ≈ 1 in. (25.4 mm))	Tube ID > 2.5 in. (63.5 mm)	Where: **DIAM:** Probe diameter × 10 **ID:** Tube internal diameter
DIAM = 8.5 × ID (mm)	**DIAM = 9 × ID (mm)**	**DIAM = 9.5 × ID (mm)**	

Example: The tube OD is 24 mm, and the wall thickness is 1.8 mm. Therefore, the tube ID is 20.4 mm (24 – 1.8 – 1.8).

As such, the correct probe DIAM would be 183.6 (20.4 × 9 = 183.6). Because DIAM values are rounded to the lowest full mm, the DIAM value would be 180 (18.0 mm).

RFT Frequency Availability

TRX-120- [ ] -N20

Range Name	Frequency	Range	Comments	RFT Model Available
085 (Low)	85 Hz	20 Hz - 200 Hz	Used for wall thicknesses greater than 6 mm (1/4 in.).	TRC only
300 (Standard)	300 Hz	100 Hz - 1 kHz	The most current probe central frequency.	All RFT models
02K (High)	2 kHz	600 Hz - 6 kHz	Not common. Can be used for thin and lower permeability carbon steel, such as A-556 or Nickel 200.	All RFT models*
15K (Ultra High)	15 kHz	5 kHz - 50 kHz	Used for ferromagnetic stainless steel, such as SS349 (A-268), Duplex stainless steel, or SEA-CURE.	All RFT models*

*Probes with this frequency range have a lower gain preamplifier.

RFT Cable Availability

TRX-120-300- [ ]

Cable	Description*
N20	20 m nylon cable (attached only)
N30	30 m nylon cable (attached only)

*The oversize RFT probe cable is made from a more resistant nylon cable.

Remote Field Probes

TRS — Single Exciter

An economic and simple general-purpose RFT solution.

Recommendation

A general-purpose solution for ferromagnetic tubing inspection. For superior results on the support, a dual-exciter probe (TRX) is recommended. For superior results at the tube sheet, a dual-pickup probe (TRT) is recommended.

Features

- Detects and enables sizing of pitting, corrosion, and erosion in ferromagnetic tubing.
- Data analysis is simpler using the single exciter.
- Includes a built-in preamplifier for maximum reduction of false indications.
- Rugged design featuring high-quality signal response.

Faster is better — Available for short delivery times

The probes listed below are regularly stocked for quick delivery. If the probe you require is not indicated, consult the "Alternate probe diameter" column in the diameter selection section (Table 3 — RFT Diameter Selection for Common Carbon Steel Tube Sizes on page 25) to find an alternate probe diameter.

Part ID	Item Number	Diameter		Center Frequency (Hz)
		mm	in.	
TRS-100-300-N20	U8280140	10	0.394	300
TRS-110-300-N20	U8280141	11	0.433	300
TRS-120-300-N20	U8280142	12	0.472	300
TRS-130-300-N20	U8280143	13	0.512	300
TRS-140-300-N20	U8280203	14	0.551	300
TRS-160-300-N20	U8280275	16	0.630	300

Part ID	Item Number	Diameter		Center Frequency (Hz)
		mm	in.	
TRS-170-300-N20	U8280115	17	0.669	300
TRS-180-300-N20	U8280116	18	0.709	300
TRS-190-300-N20	U8280260	19	0.748	300
TRS-220-300-N20	U8280277	22	0.866	300
TRS-240-300-N20	U8280278	24	0.945	300

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TRS-120-300-N20

Probe Type	Probe Diameter	Center Frequency	Cable Length
(TRS = Single Exciter)	120 = 12 mm	300 = 300 Hz	N20 = 20 m

Probe Type	Probe Diameter * (use mm in part ID)		Center Frequency (refer to page 26)	Cable Length
	mm	in.		
TRS: Single Exciter RFT probe	**Standard** 9 mm to 22 mm by 1 mm 22 mm to 50 mm ** by 2 mm	**Standard** 0.354 in. to 0.866 in. by 0.039 in. 0.866 in. to 1.969 in. ** by 0.079 in.	300 (Standard) 02K (High) 15K (Ultra High)	20 m (65 ft) 30 m (100 ft)

*Refer to Table 3 — RFT Diameter Selection for Common Carbon Steel Tube Sizes on page 25 for assistance with probe diameter selection.
** Probes with a diameter greater than 26.0 mm (1.023 in.) have a lightweight design and probe body made of plastic and two stainless sleeves (see picture above).

Remote Field Probes

TRX — Dual Exciter

The best RFT solution for pitting.

Recommendations

Use a dual exciter for superior results in detecting pitting near support plates. The dual-exciter probes provide the same great sensitivity on both sides of the support, which can be further enhanced by employing a dual-frequency mix.

Features

- Superior detection and sizing of pitting, corrosion, and erosion in ferromagnetic tubing.
- Same great sensitivity on both sides of the support.
- Can be switched from a single- to dual-exciter probe using the MultiView™ software.
- Includes a built-in preamplifier for maximum reduction of false indications.
- Rugged design featuring high-quality signal response.

Faster is better — Available for short delivery times

The probes listed below are regularly stocked for quick delivery. If the probe you require is not indicated, consult the "Alternate probe diameter" column in the diameter selection section (Table 3 — RFT Diameter Selection for Common Carbon Steel Tube Sizes on page 25) to find an alternate diameter.

Part ID	Item Number	Diameter		Center Frequency (Hz)
		mm	in.	
TRX-100-300-N20	U8280286	10	0.394	300
TRX-110-300-N20	U8280190	11	0.433	300
TRX-120-300-N20	U8280122	12	0.472	300
TRX-130-300-N20	U8280123	13	0.512	300
TRX-140-300-N20	U8280195	14	0.551	300

Part ID	Item Number	Diameter		Center Frequency (Hz)
		mm	in.	
TRX-160-300-N20	U8280196	16	0.630	300
TRX-170-300-N20	U8280113	17	0.669	300
TRX-180-300-N20	U8280114	18	0.709	300
TRX-190-300-N20	U8280249	19	0.748	300
TRX-240-300-N20	U8280247	24	0.945	300

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TRX-120-300-N20

Probe Type	Probe Diameter	Center Frequency	Cable Length
(TRS = Single Exciter)	120 = 12 mm	300 = 300 Hz	N20 = 20 m

Probe Type	Probe Diameter * (use mm in part ID)		Center Frequency (refer to page 26)	Cable Length
	mm	in.		
TRX: Dual Exciter RFT probe	**Standard** 9 mm to 22 mm by 1 mm 22 mm to 50 mm ** by 2 mm	**Standard** 0.354 in. to 0.866 in. by 0.039 in. 0.866 in. to 1.969 in. ** by 0.079 in.	300 (Standard) 02K (High) 15K (Ultra High)	20 m (65 ft) 30 m (100 ft)

*Refer to Table 3 — RFT Diameter Selection for Common Carbon Steel Tube Sizes on page 25 for assistance with probe diameter selection.
** Probes with a diameter greater than 26.0 mm (1.023 in.) have a lightweight design and probe body made of plastic and two stainless sleeves (see picture above).

Remote Field Probes

TRT — Dual Pickup

An advanced solution for inspection on tube sheets.

Recommendations

The use of dual-pickup probes is intended for advanced users. These probes are basically two single-exciter probes in one and are typically employed for better analysis of tube-sheet regions.

Features

- Specialized four-channel design featuring two opposed single-exciter probes within the same casing.
- Optimized for tube-sheet signal analysis.
- Includes a built-in preamplifier for maximum reduction of false indications.
- Rugged design featuring high-quality signal response.

Faster is better — Available for short delivery times

The probes listed below are regularly stocked for quick delivery.

Part ID	Item Number	Diameter		Center Frequency (Hz)
		mm	in.	
TRT-450-300-N20	U8280145	45	1.772	300

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TRT-120-300-N20

Probe Type	Probe Diameter	Center Frequency	Cable Length
TRT = Dual pickup	120 = 12 mm	300 = 300 Hz	N20 = 20 m

Probe Type	Probe Diameter * (use mm in part ID)		Center Frequency (refer to page 26)	Cable Length
	mm	in.		
TRT: Dual pickup RFT probe	**Standard** 9 mm to 22 mm by 1 mm 22 mm to 50 mm ** by 2 mm	**Standard** 0.354 in. to 0.866 in. by 0.039 in. 0.866 in. to 1.969 in. ** by 0.079 in.	300 (Standard) 02K (High) 15K (Ultra High)	20 m (65 ft) 30 m (100 ft)

*Refer to Table 3 — RFT Diameter Selection for Common Carbon Steel Tube Sizes on page 25 for assistance with probe diameter selection.
** Probes with a diameter greater than 26.0 mm (1.023 in.) have a lightweight design and a probe body made of plastic and two stainless sleeves (see picture above).

Remote Field Probes

TRC — Boiler Probe

A flexible probe solution for boiler inspection.

Features

- Single exciter-type with differential and absolute pickups.
- Flexible and waterproof design.
- Includes a built-in preamplifier for maximum reduction of false indications.
- Replaceable centering brushes (part number: TR-ACC-01 [U8770249]).

Faster is better — Available for short delivery times

The probes listed below are regularly stocked for quick delivery. If the probe you require is not indicated, consult the "Alternate probe diameter" column in the diameter selection section (Table 3 — RFT Diameter Selection for Common Carbon Steel Tube Sizes on page 25) to find an alternate probe diameter.

Part ID	Item Number	Diameter		Center Frequency (Hz)
		mm	in.	
TRC-340-300-N20	U8280035	34	1.339	300
TRC-370-300-N20	U8280037	37	1.457	300
TRC-450-300-N20	U8280039	45	1.772	300

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TRC-370-300-N20

Probe Type	Probe Diameter	Center Frequency	Cable Length
TRC = Boiler probe	120 = 12 mm	300 = 300 Hz	N20 = 20 m

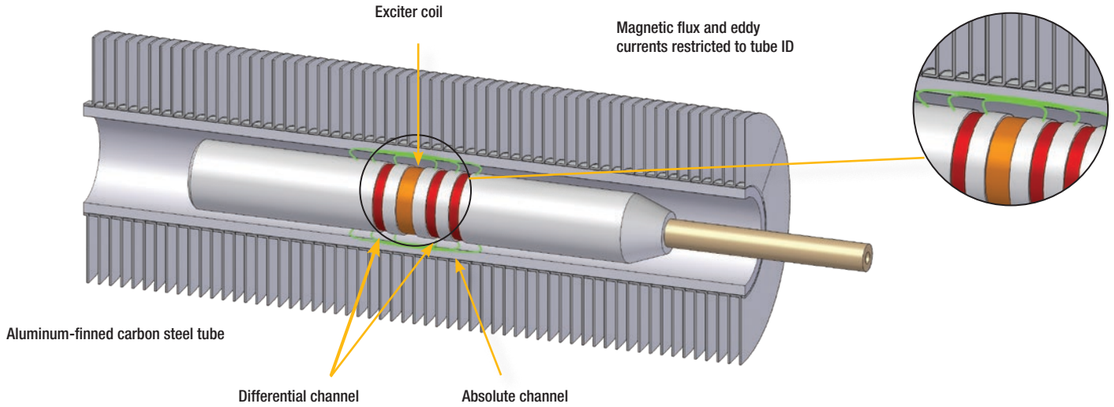
Probe Type	Probe Diameter * (use mm in part ID)		Center Frequency (refer to page 26)	Cable Length
	mm	in.		
TRC: Flexible boiler probe	280 (28 mm) 340 (34 mm) 370 (37 mm) 450 (45 mm) 550 (55 mm) 650 (65 mm)	280 (1.102 in.) 340 (1.339 in.) 370 (1.457 in.) 450 (1.772 in.) 550 (2.165 in.) 650 (2.559 in.)	085 (Low) 300 (Standard)	20 m (65 ft) 30 m (100 ft)

*Refer to Table 3 — RFT Diameter Selection for Common Carbon Steel Tube Sizes on page 25 for assistance with probe diameter selection.

Near Field Applications

The near-field testing (NFT) eddy current technology is a rapid and cost-effective inspection solution designed specifically for ID defect detection in carbon steel fin-fan tubes. NFT probes cut costs and improve ease-of-use because they do not require expensive and cumbersome externally referenced coils.

Near-field probes are an excellent alternative to magnetic flux leakage (MFL) probes. This NFT technology, which is based on a simple eddy current exciter (driver)-pickup design, produces signals that are very easy to analyze. Because NFT probes operate within the same frequency range as remote field testing (RFT) probes, NFT probes are manufactured for use with the standard MultiScan MS 5800™ RFT connector (shown under **Connector and Compatibility** on page 22). In addition, there is no magnet, making probe pushing and pulling a lot easier.



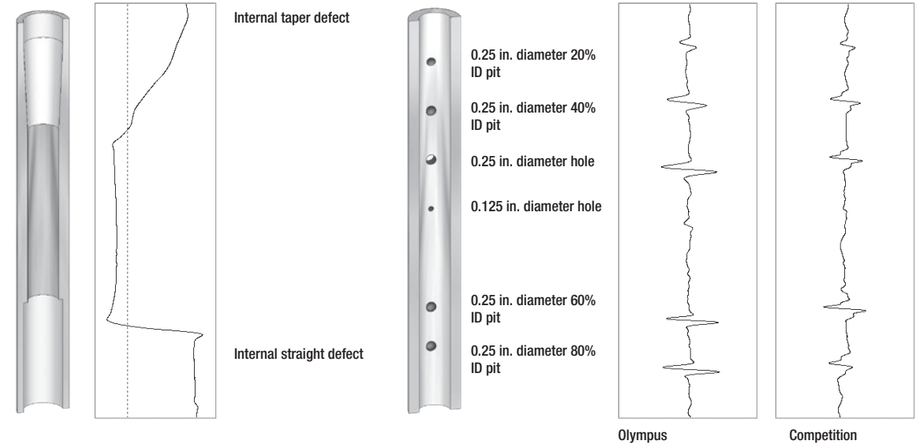
Absolute exciter-pickup configuration

Differential exciter-pickup configuration

The absolute channel easily detects internal volumetric defects, such as corrosion, erosion, and wall thinning. The damage severity can be evaluated by exclusively analyzing the signal amplitude.

While pit clusters can be detected with the absolute channel, the differential channel is better at detecting more localized defects (such as individual pits), and with much greater signal clarity than competitors' probes.

NFT Signal



Near-Field Probes

TRD — Near-Field Probe

The easiest solution for carbon steel fin-fan tubing.

Features

- Ideal for carbon steel fin-fan tubes.
- Excellent detection of internal corrosion, erosion, and axial cracking. (Not recommended for detecting OD defects.)
- No need for a reference probe or extension.
- High-quality, amplitude-based signals.
- Fast and simple data analysis.

Faster is better — Available for short delivery times

The probes listed below are regularly stocked for quick delivery. If the probe you need is not indicated, consult the "Alternate probe diameter" column in the diameter selection section (Table 4 on page 33) to find an alternate probe diameter.

Part ID	Item Number	Diameter		Center Frequency (Hz)
		mm	in.	
TRD-160-300-N30	U8280227	16	0.630	300
TRD-170-300-N30	U8280086	17	0.669	300
TRD-180-300-N30	U8280112	18	0.709	300
TRD-240-300-N30	U8280377	22	0.866	300
TRD-280-300-N30	U8280241	28	1.102	300

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TRD-170-300-N30

Probe Type	Probe Diameter	Center Frequency	Cable Length
TRD = Near field	170 = 17 mm	300 = 300 Hz	N30 = 30 m

Probe Type	Probe Diameter * (use mm in part ID)		Center Frequency	Cable Length
	mm	in.		
TRD: Near field probe	**Standard** 11 mm to 31 mm by 1 mm **Custom** 32 mm to 100 mm ** by 1 mm	**Standard** 0.433 in. to 1.220 in. by 0.039 in. **Custom** 1.260 in. to 3.937 in. ** by 0.039 in.	300 (Standard)	20 m (65 ft) 30 m (100 ft)

*Refer to Table 4 on page 33 for assistance with probe diameter selection.
** Probes with a diameter greater than 31.0 mm (1.220 in.) have a lightweight design and probe body made of plastic and two stainless sleeves (see picture above).

Table 4 – NFT Diameter Selection for Common Tube Sizes

OD mm (in.)	BWG	WT mm (in.)	Recommended Probe Diameter	Alternate Probe Diameter*
19.05 (0.75)	16	1.65 (0.065)	140	
	14	2.11 (0.083)	130	
	13	2.41 (0.095)	120	
	12	2.77 (0.109)	120	
25.4 (1.0)	16	1.65 (0.065)	190	200
	14	2.11 (0.083)	180	190
	12	2.77 (0.109)	170	180
	11	3.05 (0.12)	170	
	10	3.40 (0.134)	160	170
31.75 (1.25)	14	2.11 (0.083)	240	260
	13	2.41 (0.095)	230	240
	12	2.77 (0.109)	230	240
	11	3.05 (0.12)	220	240
	10	3.40 (0.134)	220	230
38.1 (1.5)	14	2.11 (0.083)	300	
	13	2.41 (0.095)	290	300
	12	2.77 (0.109)	280	300
	11	3.05 (0.12)	280	300
	10	3.40 (0.134)	270	300

* The alternate probe diameter can be used if you do not have the recommended diameter.

If your tube dimension does not appear in the preceding chart, you can use the formulas below.

Note: Make sure that you select the right formula corresponding to the tube ID.

Tube ID < 0.5 in. (12.7 mm)	Standard formula Tube ID ≈ 1in. (25.4 mm)	Tube ID > 2.5 in. (63.5 mm)	Where:
DIAM = 8.5 × ID (mm)	**DIAM = 9 × ID (mm)**	**DIAM = 9.5 × ID (mm)**	**DIAM**: Probe diameter × 10 **ID**: Tube internal diameter

Example: The tube OD is 24 mm, and the wall thickness is 1.8 mm. Therefore, the tube ID is 20.4 mm (24 – 1.8 – 1.8).

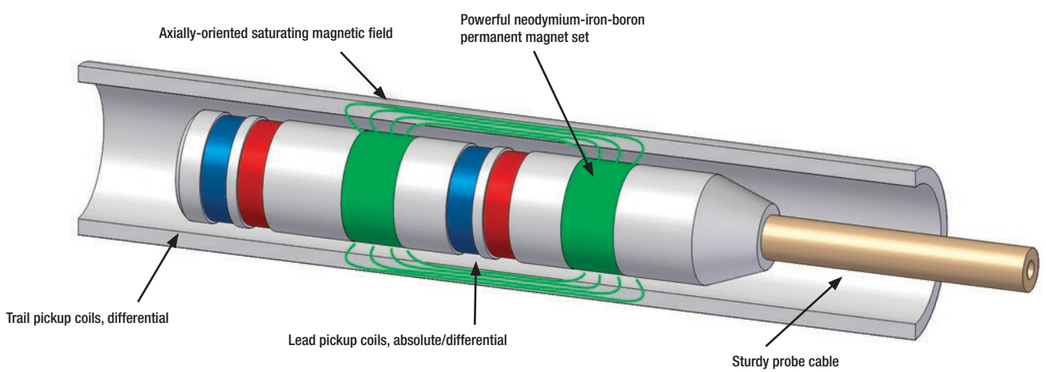
As such, the correct probe DIAM would be 183.6 (20.4 × 9 = 183.6). Because DIAM values are rounded to the lowest full mm, the DIAM value would be 180 (18.0 mm).

Magnetic Flux Leakage Applications

The magnetic flux leakage (MFL) technique is based on magnetization of the material being inspected. Magnetization is provided by a strong magnet located inside the probe. As the probe encounters a wall reduction or sharp discontinuity, the flux distribution varies around that area and is detected either with a Hall-effect transducer or an inductive pickup coil.

MFL measures the magnetization of the tube to detect irregularities such as corrosion and steam erosion. MFL is recommended for the inspection of aluminum-finned carbon steel tubes, because the magnetic flux is not affected by the presence of fins.

The MFL technique is also suitable for the detection of circumferential cracks. A circumferential crack is a type of flaw that is not detected by RFT or IRIS inspections. For better results, the TFB-series probes should be used with the TF-ADP-001 adaptor.



Probe Response

The TFB-series magnetic flux leakage probes have a set of circumferential receiver coils that can be operated simultaneously in absolute and differential mode. They also have a trailing coil that picks up the remaining magnetism present on the inside wall of the tube.

Connector and Compatibility

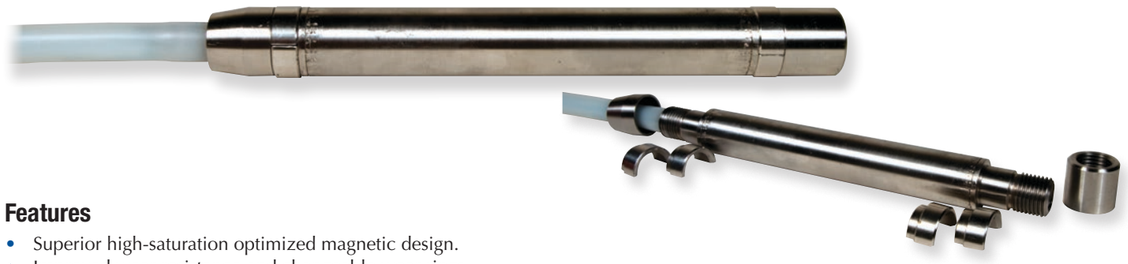
The TFB-series MFL probes use an 8-pin ITT Cannon connector that is compatible with the TC4700, TC5700, and MultiScan MS 5800™ system.

Olympus MFL connector

Magnetic Flux Leakage Probes

TFB — High Saturation | Attached

A fin-fan solution with OD defect detection.



Features

- Superior high-saturation optimized magnetic design.
- Improved wear resistance and changeable wear rings.
- Can detect outside volumetric defects.
- Suitable for air-finned coolers.

Faster is better — Available for short delivery times

The probes listed below are regularly stocked for quick delivery. If the probe you require is not indicated, consult the "Alternate probe diameter" column in Table 5 — High-Saturation MFL Probe (TFB Model) Selection Guide for Common Carbon Steel Tube Sizes on page 36 to find an alternate probe diameter.

Part ID	Item Number	Diameter	
		mm	in.
TFB-120-N20	U8280231	12	0.472
TFB-132-N20	U8280135	13.2	0.520
TFB-170-N20	U8280137	17	0.669
TFB-179-N20	U8280111	17.9	0.705

Part ID	Item Number	Diameter	
		mm	in.
TFB-187-N20	U8280246	18.7	0.736
TFB-198-N20	U8280361	19.8	0.780
TFB-242-N20	U8280099	24.2	0.953

Standard/Custom Probes (Made to Order)

Use the nomenclature and the chart below to configure your part number.

TFB-179-N20

Probe Type	Probe Diameter	Cable Length
TFB = MFL probe	179 = 17.9 mm	N20 = 20m

Probe Type	Probe Diameter (use mm in part ID)			Cable Length
	Part Number Diameter	mm**	in.**	
TFB: Magnetic flux leakage probe	120*	12.0	0.472	20 m (65 ft) 30 m (100 ft)
	132*	13.2	0.520	
	161*	16.1	0.634	
	170*	17.0	0.669	
	179	17.9	0.705	
	187	18.7	0.736	
	198	19.8	0.780	
	229	22.9	0.902	
	242	24.2	0.953	
	283	28.3	1.114	
	296	29.6	1.165	

* Smaller-diameter probes have less sentitivity to external defects, because the probe core section is much smaller than the tube section. However, the sensitivity to internal defects is still very high.
** These probes have an overall diameter that is slightly larger than the part number reference. Refer to Table 5 — High-Saturation MFL Probe (TFB Model) Selection Guide for Common Carbon Steel Tube Sizes on page 36 for the overall diameter figures.

MFL Probe Selection Based on Tube Size

Table 5 — High-Saturation MFL Probe (TFB Model) Selection Guide for Common Carbon Steel Tube Sizes

Warning: If your tubes are dirty, a smaller probe might be required for the inspection. Olympus is not responsible if you select a probe that is not compatible with your application. If you require assistance, please contact an Olympus representative.

Example: For a one-inch tube with a wall thickness of 2.41 mm, the required probe would be TFB-187-N20. This probe has an overall diameter of 19.4 mm and changeable hardened steel half-rings.

Tube Dimensions			Probe ID Diameter – mm (in.)										
			12.0 (0.472)	13.2 (0.520)	16.1 (0.634)	17.0 (0.669)	17.9 (0.705)	18.7 (0.736)	19.8 (0.780)	22.9 (0.902)	24.2 (0.953)	28.3 (1.114)	29.6 (1.165)
			Overall Diameter (including wear system) — mm (in.)										
OD mm (in.)	BWG	WT mm (in.)	12.5 to 12.8 (0.49 to 0.50)	13.7 to 14.0 (0.54 to 0.55)	16.6 to 16.9 (0.65 to 0.66)	18 (0.71)	18.7 (0.73)	19.4 (0.77)	20.5 (0.81)	23.8 (0.94)	25.1 (0.99)	29.2 (1.15)	30.5 (1.20)
19 (0.75)	16	1.65 (0.065)		●									
	14	2.11 (0.083)		●									
	13	2.41 (0.095)	●	○									
	12	2.77 (0.109)	●										
25.4 (1.0)	16	1.65 (0.065)							●				
	15	1.83 (0.072)							●				
	14	2.11 (0.083)						●					
	13	2.41 (0.095)					○	●					
	12	2.77 (0.109)					●						
	11	3.05 (0.12)				●							
	10	3.40 (0.134)			○	●							
	9	3.76 (0.148)			●								
31.75 (1.25)	13	2.41 (0.095)									●		
	12	2.77 (0.109)									●		
	11	3.05 (0.12)								●			
	10	3.40 (0.134)								●			
38.1 (1.5)	12	2.77 (0.109)											●
	11	3.05 (0.12)											●
	10	3.40 (0.134)										●	
	9	3.76 (0.148)										●	
Wear System			Carbide beads (fixed)			Hardened steel half-rings (changeable)							

● This is the recommended probe size.

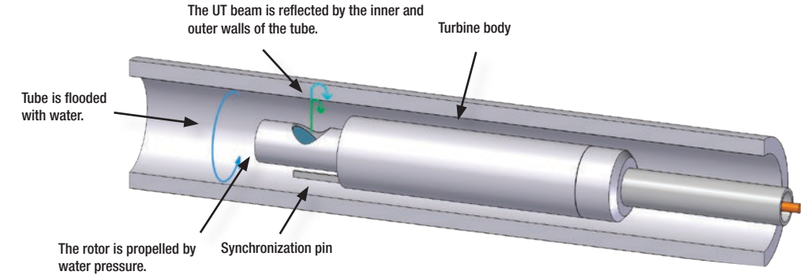
○ This size can be used if you do not have the recommended size.

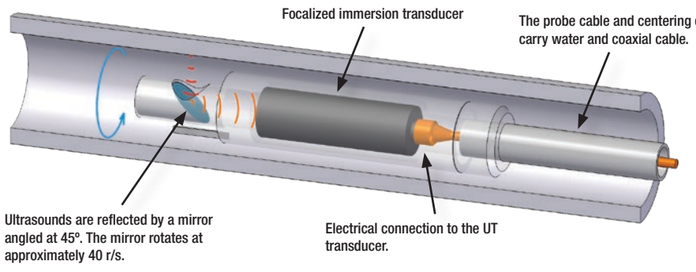
IRIS Applications

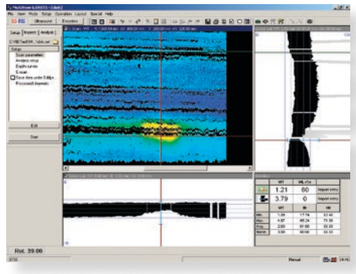
The internal rotary inspection system (IRIS) is an ultrasonic technique well suited to petrochemical and balance-of-plant (BOP) tube inspections. This technique uses an ultrasonic beam to scan the internal surface of the tube in helicoidal patterns, thus ensuring that the full length of the tube is tested. Olympus tube inspection systems monitor the front-wall and back-wall echoes to measure the tube wall thickness.

The internal rotary inspection system probe operates in pulse-echo mode to measure wall thickness, material loss, and defect orientation within the range of 0.5 in. to 3 in. ID. The IRIS probe consists of an ultrasonic transducer firing in the axial direction of the tube. A mirror mounted on a water-propelled turbine deflects the ultrasonic beam in order to obtain a normal incidence wave on the internal wall of the tube. Because the mirror revolves around the axis, the entire circumference of the tube is examined. A complete IRIS probe includes the cable, a centering unit, a turbine, and a transducer.

This equipment was designed for optimum results in various applications, such as tube and shell heat exchangers, air coolers, and boilers tubes.



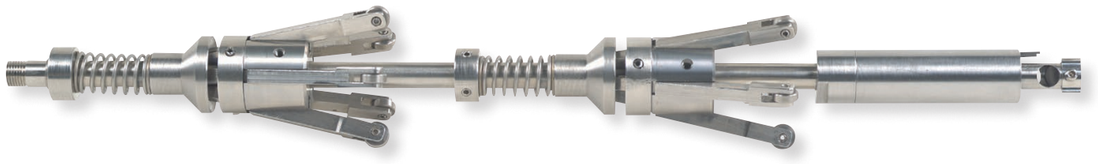




IRIS Probe Components

Various components are necessary to “build” an IRIS probe. The components are interchangeable, and must be chosen according to the tube dimensions.

To build an IRIS probe, the following components are necessary:



- Turbine head (TUA)
- Ultrasound transducer (TUB)
- Centering device (TUC)
- Probe cable (TUD)

For assistance with IRIS probe component selection, see Table 6 — IRIS Probe Component Selection for Common Tube Sizes on page 42.

TUA — Turbine Heads

IRIS turbines are propelled by water pressure, which make them rotate at approximately 40 r/s. These turbines include a 45° angled mirror that deflects the ultrasonic beam towards the tube wall.

	Part Number	Item Number	Description
	TUA-120	U8780157	12 mm (0.47 in.) IRIS turbine
	TUA-170	U8780158	17 mm (0.67 in.) IRIS turbine

TUB — Ultrasound Transducers

IRIS transducers are focused immersion transducers with an external diameter of 3/8 in. (9.53 mm) and an element diameter of 1/4 in. (6.35 mm). They are available in three different central frequencies and two focal lengths.

	Part Number	Item Number	Description
	TUB-254-10M	U8280001	1.0 in. (25.4 mm) focal length, 10 MHz
	TUB-254-15M	U8280002	1.0 in. (25.4 mm) focal length, 15 MHz
	TUB-254-20M	U8280003	1.0 in. (25.4 mm) focal length, 20 MHz
	TUB-381-10M	U8280004	1.5 in. (38.1 mm) focal length, 10 MHz
	TUB-381-15M	U8280005	1.5 in. (38.1 mm) focal length, 15 MHz
	TUB-381-20M	U8280024	1.5 in. (38.1 mm) focal length, 20 MHz

TUC — Centering Devices

	Part Number	Item Number	Description	Extent (Tube ID)
	TUC-XS	U8780162	Extra-small IRIS centering device.	0.45 in. to 0.71 in. (11.4 mm to 18.0 mm)
	TUC-SM	U8780161	Small IRIS centering device.	0.71 in. to 1.0 in. (18.0 mm to 25.4 mm)
	TUC-MD	U8780160	Medium IRIS centering device. The TUC-MD can be used with a flexible rod (not included) for boiler bend applications. See “IRIS-FLEXROD” accessory description on page 40.	0.96 in. to 1.65 in. (24.4 mm to 41.9 mm)
	TUC-LG	U8780159	A large IRIS centering device. The TUC-LG comes with an additional flexible rod that can be used in the centering device for boiler bend applications. See the “IRIS-FLEXROD” accessory description page 40.	1.5 in. to 3.0 in. (38.1 mm to 76.2 mm)
	TUC-MD-FLEX	U8280250	A medium IRIS centering device mounted on a flexible rod.	
	TUC-LG-FLEX	U8280251	A large IRIS centering device mounted on a flexible rod.	

TUD — Probe Cables

IRIS probe cables have two functions: they supply the water pressure required by the turbine, and they carry the ultrasonic signal using a small coaxial cable. The coaxial cable has a Microdot connector on the probe end and a BNC connector on the instrument/pump end. The water is supplied by the pump through a quick-connect 1/8 in. brass fitting.

	Part Number	Item Number	Description
	TUD-N20	U8800530	IRIS probe cable, 20 m (65 ft)
	TUD-N30	U8800532	IRIS probe cable, 30 m (100 ft)
	TUD-BNC	U8800529	BNC to BNC signal cable, 3.7 m (12 ft)
	TUD-LEM	U8800511	BNC to LEMO signal cable, 3.0 m (10 ft)

IRIS Probe Accessories

IRIS Accessories

	Part Number	Item Number	Description	Comments/ Specifications
	IRIS-FLEXROD	U8780156	A flexible rod for the TUC-MD and TUC-LG centering devices.	45° maximum bend angle between rods. 300 mm (12 in.) minimum recommended radius of curvature. One IRIS-FLEXROD comes with the TUC-LG centering device.
	IRIS-FLOOD	U8780145	IRIS flood tube adaptor.	For 3/4 in. (19.05 mm) and 1 in. (25.4 mm) OD tubes.
	IRIS-FILTER	U8780144	Water-filter unit and hose.	Comes with one 1/2 in. hose that is 25 ft in length with 3/4 in. brass fittings.
	IRIS-WP110	U8780146	Water pump, submersible, 110 V, 60 Hz.	**Dimensions (L × ∅)**: 63.5 cm × 10 cm (25 in. × 4 in.) **Weight**: 12.8 kg (28 lb) Comes with one 1/2 in. hose that is 25 ft in length with 3/4 in. brass fittings.
	IRIS-WP220	U8780147	Water pump, submersible, 220 V, 50 Hz.	**Dimensions (L × ∅)**: 84 cm x 8 cm (33 in. × 3 in.) **Weight**: 6 kg (13 lb) Comes with one 1/2 in. hose that is 25 ft in length with 3/4 in. brass fittings.

IRIS Probe and Part Kits

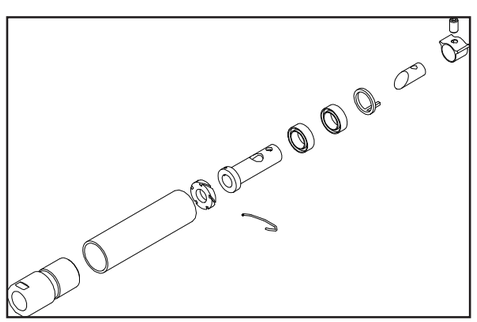
Part Number	Item Number	Description	Includes
IRIS-PKG-COMP	U8280027	Complete IRIS probe kit.	All IRIS probes, centering devices, 4 × 20 m IRIS cables, and accessories.
IRIS-PKG-CS	U8280028	Small-tube IRIS probe kit.	TUA-120, TUB-254-15M, TUC-XS, TUC-SM, and TUD-N20.
IRIS-PKG-CM	U8280026	Medium-tube IRIS probe kit.	TUA-170, TUB-381-10M, TUC-MD, and TUD-N20.
IRIS-PKG-CL	U8280025	Large-tube IRIS probe kit.	TUA-170, TUB-381-10M, TUC-MD, TUC-LG, and TUD-N20.

IRIS Repair Kits

Part Number	Item Number	Repairs
IRIS-REP-GEN	U8900358	All IRIS probe components.
IRIS-REP-CBL	U8800523	TUD-Nxx IRIS probe cables.
IRIS-REP-T12	U8900359	TUA-120 IRIS turbine.
IRIS-REP-T17	U8900360	TUA-170 IRIS turbine.
IRIS-REP-XS	U8900364	TUC-XS IRIS centering device.
IRIS-REP-S	U8900363	TUC-SM IRIS centering device.
IRIS-REP-M	U8900362	TUC-MD IRIS centering device.
IRIS-REP-L	U8900361	TUC-LG IRIS centering device.

Additional IRIS Repair Parts

In addition to the IRIS repair kits, individual parts are also available for order. More information on spare parts for turbines (TUA) and centering devices (TUC) can be found on our website: (www.olympus-ims.com/en/tube-inspection-probes/).



IRIS Accessories Selection

Table 6 — IRIS Probe Component Selection for Common Tube Sizes

OD mm (in.)	WT mm (in.)	Turbine (TUA)		Transducer (TUB)						Centering Device (TUC)			
				10 MHz		15 MHz		20 MHz					
		120	170	25.4 mm (1.0 in.)	38.1 mm (1.5 in.)	25.4 mm (1.0 in.)	38.1 mm (1.5 in.)	25.4 mm (1.0 in.)	38.1 mm (1.5 in.)	XS	SM	MD	LG
19.05 (0.75)	1.65 (0.065)	●				○		●		●			
	2.11 (0.083)	●				●		●		●			
	2.77 (0.109)	●				●				●			
25.4 (1.0)	1.65 (0.065)	●	●			○		●			●		
	2.77 (0.109)	●	●			●					●		
	3.41 (0.134)	●		●		●					●		
31.75 (1.25)	1.65 (0.065)	○	●			○		○	●			●	
	2.77 (0.109)	○	●			●						●	
	3.41 (0.134)	○	●	●		●						●	
38.1 (1.5)	1.65 (0.065)		●				○		●			●	
	3.41 (0.134)		●		●		●					●	
	4.19 (0.165)		●		●							●	
50.8 (2.0)	3.41 (0.134)		●		●		○						●
	4.19 (0.165)		●		●		○						●
	5.16 (0.206)		●		●								●
63.5 (2.5)	3.41 (0.134)		●		●		○						●
	4.19 (0.165)		●		●		○						●
	5.16 (0.206)		●		●								●
76.2 (3.0)	4.19 (0.165)		●		●		○						●
	5.16 (0.206)		●		●								●
	6.05 (0.238)		●		●								●

● This is the recommended component size.
○ This size can be used if you do not have the recommended size.

Probe Adaptors and Accessories

Probe Adaptors

	Part Number	Item Number	Description
ECT Probe Adaptors			
	TE-ADP-001	U8767023	Bobbin probe adaptor. Differential and absolute modes with internal reference. **Input**: 4-pin Amphenol. **Output**: 41-pin EC Extended for the MultiScan MS 5800™ system.
	TE-ADP-002	U8767024	Bobbin probe adaptor. Differential and absolute modes with external reference. **Input**: 2 × 4-pin Amphenol (test and reference probes). **Output**: 41-pin EC Extended for the MultiScan MS 5800 system.
	TE-ADP-003	U8767025	Bobbin probe adaptor. Differential and absolute modes with internal or external reference (switchable). **Input**: 6-pin Jaeger. **Output**: 41-pin EC Extended for the MultiScan MS 5800 system.
	TE-ADP-004	U8767026	Air conditioning (AC) probe adaptor. Pancake array, differential, and absolute modes with internal reference. **Input**: 2 x 4-pin Amphenol (bobbin and AC connectors). **Output**: 41-pin EC Extended for the MultiScan MS 5800 system.
	TE-ADP-005	U8767033	Probe adaptor. Absolute mode with internal reference. **Input**: BNC. **Output**: 41-pin EC Extended for the MultiScan MS 5800 system.
	TE-ADP-006	U8767034	Probe adaptor. Differential mode. **Input**: 4-pin Fischer. **Output**: 41-pin EC Extended for the MultiScan MS 5800 system.
	TE-ADP-007	U8767349	Probe adaptor. Reflection mode. **Input**: Triax Fischer. **Output**: 41-pin EC Extended for the MultiScan MS 5800 system.
	TE-ADP-008	U8767011	Universal bobbin probe adaptor. Differential and absolute modes with internal or reference (switchable), and switchable bridge or reflection mode (exciter-pickup). **Input**: 2 × 4-pin Amphenol. (Bridge mode: test and reference probe; Reflection mode: test probe only.) **Output**: 41-pin EC Extended for the MultiScan MS 5800 system.

	Part Number	Item Number	Description
	TE-ADP-009	U8767276	Probe adaptor for NORTEC® 500 and 1000 instruments. Signals only (no motor). **Input**: 16-pin LEMO®. **Output**: 41-pin EC Extended for the MultiScan MS5800 system.
	TE-ADP-010	U8767350	Universal probe adaptor for OmniScan® ECT/ECA instruments. 4 channels. **Input**: 19-pin Fischer. **Output**: 41-pin EC Extended for the MultiScan MS5800 system.
	TE-ADP-011	U8767242	Probe adaptor for Ecutec dual-mode instruments. Differential and absolute transverse modes. **Input**: 6-pin Amphenol. **Output**: 41-pin EC Extended for the MultiScan MS5800 system.
	TE-ADP-012	U8767351	Probe adaptor for GE Phasec instruments. Differential and absolute bridge, or exciter-pickup switchable modes. **Input**: 12-pin LEMO. **Output**: 41-pin EC Extended for the MultiScan MS5800 system.
	TE-ADP-013	U8775091	Probe adaptor for Cecco-1 probe. Exciter-pickup differential mode. **Input**: 2 × 4-pin Amphenol. **Output**: 41-pin EC Extended for the MultiScan MS5800 system.
	TE-ADP-014	U8775092	Probe adaptor for Perfection X-Axis instrument. Differential, absolute and "X-axis" modes. **Input**: 5-pin Amphenol. **Output**: 41-pin EC Extended for the MultiScan MS5800 system.
	TE-ADP-015	U8767262	Probe adaptor for NORTEC® Spitfire 2000 and MiniMite rotary scanners. **Input**: 16-pin LEMO **Output**: 41-pin EC Extended for the MultiScan MS5800 system and I/O connector (encoder).
RFT Probe Adaptors			
	TR-ADP-001	U8770250	Probe adaptor for Zetec MIZ-40, Corestar, and CSI instruments. **Input**: 3-pin and 6-pin Amphenol. **Output**: 19-pin RFT for the MultiScan MS5800 system.
	TR-ADP-002	U8770251	Probe adaptor for Zetec MIZ-27 and MIZ-28, Corestar, and CSI instruments. **Input**: 6-pin Amphenol and 5-pin ITT Cannon (for remote field amplifier box). **Output**: 19-pin RFT for the MultiScan MS5800 system.

	Part Number	Item Number	Description
	TR-ADP-003	U8770252	Probe adaptor for Russell NDE Systems Ferroscope 108. **Input**: 8-pin FCI-Burndy. **Output**: 19-pin RFT for the MultiScan MS5800 system.
	TR-ADP-004	U8770253	Probe adaptor for Testex instruments. **Input**: 9-pin Tyco Electronics (AMP). **Output**: 19-pin RFT for the MultiScan MS5800 system.
	TR-ADP-005	U8770254	Universal probe adaptor for Zetec, Corestar, and CSI instruments. **Input**: 3-pin and 6-pin Amphenol, and 5-pin ITT Cannon (for RFT amplifier box). **Output**: 19-pin RFT for the MultiScan MS5800 system.
	TR-ADP-006	U8767352	Probe adaptor for TMT Eddymax instruments. **Input**: 6-pin Amphenol. **Output**: 19-pin RFT for the MultiScan MS5800 system.
	TR-ADP-007	U8770454	ADA Probe adaptor for Russell NDE Systems Ferroscope 308. **Input**: 8-pin and 12-pin FCI-Burndy. **Output**: 19-pin RFT for the MultiScan MS5800 system.
	TR-ADP-008	U8779280	Dual pickup probe adaptor for Zetec, Corestar, and CSI instruments. **Input**: 2 × 6-pin Amphenol, and 5-pin ITT Cannon (for remote field amplifier box). **Output**: 19-pin RFT for the MultiScan MS5800 system.
MFL Probe Adaptors			
	TF-ADP-001	U8767027	Probe adaptor with wall-loss coil integrator. **Input**: 8-pin ITT Cannon. **Output**: 8-pin MFL for the MultiScan MS5800 system.
	TF-ADP-002	U8767028	Probe adaptor for Scientific Technology instruments. **Input**: 14-pin Amphenol. **Output**: 8-pin MFL for the MultiScan MS5800 system.

Reverse Probe Adaptors

Olympus has developed a series of “reverse probe adaptors” to enable use of Olympus remote and near-field probes with competitors' equipment. Each competitive equipment manufacturer has its own connector, input configuration, exciter voltage, etc. These differences have led to the development of one adaptor model per instrument and probe technology. Indeed, all remote and near-field probes, including the new TRS, TRX, TRT, and TRD series, can now be connected to competitor instruments, and without the need for a cumbersome “RFT amplifier” box.

The list below describes all current reverse adaptors. Please note that Olympus would be more than happy to develop a custom reverse adaptor for your equipment.

	Part Number	Item Number	Equipment Compatibility	Note
	**Reverse Adaptor for ECT Probes**			
	AN16-Z	U8767215	Olympus Nortec	Single differential channel
	**Reverse Adaptor for RFT Probes**			
	TR-REVADP-002	U8767326	CoreStar OMNI-100	DC power supply supplied.
	TR-REVADP-004	U8767327	CoreStar OMNI-200	DC power supply supplied.
	TR-REVADP-006	U8767238	Zetec MIZ-28	Direct connection to the equipment; no need for the "RFT preamplifier" box.
	Reverse Adaptor for NFT probes			
	TR-REVADP-001	U8767324	CoreStar OMNI-100	
	TR-REVADP-003	U8767325	CoreStar OMNI-200	
	TR-REVADP-005	U8770450	Zetec MIZ-28	Direct connection to the equipment; no need for the "RFT preamplifier" box.

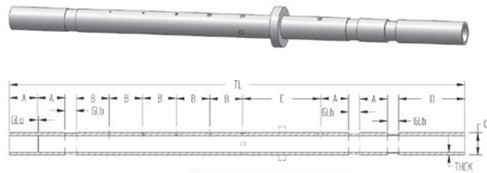
Accessories

	Part Number	Item Number	Description
	TA-FSW-001	U8770248	**Footswitch** Rugged footswitch to control the MultiScan MS 5800™ system. Includes two dual-switch foot pedals to start/stop the acquisition, erase the screen, and balance the probe, in addition to more “live” analysis functions. *MultiView™ software v. 6.0R7 or higher is required.
	MPP04-01	U8780155	**Airgun** The Airgun is a convenient probe pusher-puller for condenser inspections. With air pressure near 120 psi, it can push the probe at 4 m/s to 6 m/s (12 ft/s to 20 ft/s), and pull the probe back at a typical speed of 2 m/s (6 ft/s). The Airgun has a built-in encoder that allows for precise defect location, and its controls allow for fast single-operator inspections with the MultiScan MS 5800™ acquisition unit.
	20ED0074	U8764077	**Backpack** The MultiScan MS 5800 backpack improves safety while inspection equipment is being carried over steps or in awkward places. The backpack enables a constant 3-point contact. The backpack was developed and tested in the field with the help of several service companies, whose input was used to precisely define the requirements of this unique product.

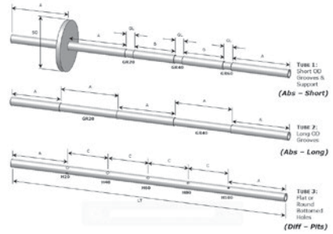
Tube Testing Calibration Tubes

Calibration Tube Selection

Olympus calibration standards are available for every tube inspection technique that we support. Designs have been made by experts for optimization with our probes and instruments, keeping calibration as simple and easy as possible. Spec sheets for the most recommended and common calibration tubes are available directly on the Olympus website (www.olympus-ims.com/en/tube-inspection-probes/).



CT02 — ECT Extended ASME calibration tube.



CT30 — Olympus-recommended RFT calibration tube trio.

Calibration Tube Part Numbering

Use the nomenclature and the chart below to configure your part number.

CT02-031-F20

Tube Types | Material Type | Outside Diameter | Wall Thickness

CT02	ECT extended ASME calibration tube with support ring.
CT26	RFT minimal requirements tube with support ring.
CT30	RFT matched calibration tube trio with support ring (recommended).
CT45	NFT standard calibration tube
CT50	MFL standard calibration tube
CT60	IRIS standard calibration tube

001	Admiralty brass - SB111, SB543
003	Aluminum (6061-T-6)
004	Aluminum bronze - SB111
008	Carbon steel - A178
009	Carbon steel - A179
010	Carbon steel - A192
011	Carbon steel - A210
012	Carbon steel - A214
018	Copper
020	Copper nickel 70-30 - SB111, SB543
021	Copper nickel 90-10 - SB111, SB543
023	Hastelloy C
024	Inconel 600 - SB163 alloy 600
025	Incoloy 800 - SB163 alloy 800
026	Incoloy 825 - SB163 alloy 825
027	Monel 400 - SB163 alloy 400
028	Nickel 200 - SB163 alloy 200
029	Stainless steel 304 - A213 TP304, A249 TP304, A688 TP304
030	Stainless steel 316 - A213 TP316, A249 TP316, A688 TP316
031	Stainless steel 321 - A213 TP321, A249 TP321
032	Stainless steel 439 - A268 TP439, SS349 (A-268)
033	Stainless steel Duplex (2205), 3RE60 - A789
034	Titanium 99% - SB338

	in.	(mm)
A	0.375	(9.53)
B	0.5	(12.7)
C	0.625	(15.88)
D	0.75	(19.05)
E	0.875	(22.23)
F	1	(25.4)
G	1.125	(28.58)
H	1.25	(31.75)
I	1.375	(34.93)
J	1.5	(38.1)
K	1.625	(41.28)
L	1.75	(44.45)
N	2	(50.8)
O	2.25	(57.15)
P	2.5	(63.5)
R	3	(76.2)
S	3.5	(88.9)

	BWG	in.	(mm)
24	24	0.022	(0.56)
23	23	0.025	(0.64)
22	22	0.028	(0.71)
21	21	0.032	(0.81)
20	20	0.035	(0.89)
19	19	0.042	(1.07)
18	18	0.049	(1.24)
17	17	0.058	(1.47)
16	16	0.065	(1.65)
15	15	0.072	(1.83)
14	14	0.083	(2.11)
13	13	0.095	(2.41)
12	12	0.109	(2.77)
11	11	0.12	(3.05)
10	10	0.134	(3.4)
09	9	0.148	(3.76)
08	8	0.165	(4.19)
07	7	0.18	(4.57)
06	6	0.203	(5.16)
05	5	0.22	(5.59)

Table 7 — Calibration Tube Availability

The following table lists all of the calibration tubes that can be readily provided by Olympus. If a tube is not available, Olympus can provide free calibration-tube blueprints. We can also produce these unavailable calibration tubes at our high-tech machine shop if the customer provides the appropriate raw materials. Available tubes are indicated with black cells.

Example: If you require an RFT calibration tube trio made of A214 carbon steel with 1 in. OD x 16 BWG (CT30-012-F16), you should:

1. Search for the 012 material in the different material columns. Next, check the 012 section to see if the F16 is available.
2. Check the cells to the right of the F16 line. The CT30 is unavailable (white), but the CT26 is available as an alternative (black).

Material	Tube OD/BWG	CTXX				
		CT02	CT26	CT30	CT45 / CT50	CT60
001	A21		■			■
	B18		■			■
	C16		■			■
	C18		■			■
	C19		■			■
	C20		■			■
	D14		■			■
	D16		■			■
	D18		■			■
	D20		■			■
	E16		■			■
	E18		■			■
	E20		■			■
	F12		■			■
	F14		■			■
	F16		■			■
	F18		■			■
	F20		■			■
	H18				■	
003	B16		■	■		
	F11		■		■	
	H11			■	■	
	H16			■	■	
	J16			■	■	
	N11			■	■	
004	D16		■			■
	D18		■			■
005	C14		■			■
	C16		■			■
	D12		■			■
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	E14		■			■
	E16		■			■
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	F12		■			■
	F13		■			■
	F14		■			■
	F16		■			■
008	H11			■	■	
	H13			■	■	
	H14			■	■	
	J11			■	■	
	J12			■	■	
	J13			■	■	
	J16			■	■	
	L11			■	■	
	N08			■	■	
	N09			■	■	
	N10			■	■	
	N11			■	■	
	N13			■	■	
	P07			■	■	
	P10			■	■	
	P16			■	■	
	R12			■	■	
009	C14			■	■	
	C16			■	■	
	D11			■	■	
	D13			■	■	
	D14			■	■	
	D16			■	■	
	E13			■	■	
	F12			■	■	
	F13			■	■	
	F14			■	■	
	F16			■	■	
	H11			■	■	
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	H14			■	■	
	J11			■	■	
	J13			■	■	
010	C14		■			■
	C16		■			■
	C18		■			■
010	D10	■	■			■
	D12	■	■			■
	D14	■	■			■
	D16	■	■			■
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	E16	■	■			■
	E18	■	■			■
	E20	■	■			■
	F12	■	■			■
	F13	■	■			■
	F14	■	■			■
	H08				■	■
	H12				■	■
	N06				■	■
	N08				■	■
	P05				■	■
	P06				■	■
	P07				■	■
	P10				■	■
	S08				■	■
011	D10		■			
	D12		■			
	D14		■			
	J10				■	■
	J13				■	■
	L07				■	■
	N09				■	■
	N10				■	■
	O07				■	■
012	A20		■			
	C14		■			
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	D11		■			
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	D14		■			
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	B20		■			
	B24		■			
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	C18		■			
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018	D19	■	■			■
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	P14	■	■			■
	P16	■	■			■
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	D15	■	■			■
	D16	■	■			■
	D18	■	■			■
	D22	■	■			■
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	J20		■			■
	L18		■			■
	N18		■			■
	N20		■			■

■: Available, □: Not available.

Probes Summary Table

The following table will assist you in selecting the right probe for your application. The series category for each probe type is indicated on the top and corresponds to a section of the catalog.

		Technology/Probe model													
		Eddy Current (ECT) TE_ Series							Remote Field (RFT) TR_ Series				Near Field TRD Series	Magnetic Flux Leakage (MFL) TF_ Series	IRIS TU_ Series
		TEA/TEB (standard bobbin)	TEC/TED (air conditioners)	TEE/TEF (titanium bobbin)	TEG (flexible bullet)	TEK/TEL (high-resolution bobbin)	TEO (CARTER super-magnetic bias)	TER (airgun bobbin)	TXE (Eddy current array probe)	TRS (single exciter; rigid)	TRX (dual exciter, rigid)	TRT (dual pickup)	TRC (boiler probe)	TRD (near-field probe)	TFB (high-saturation)	IRIS
Application	Nonferritic Tubing															
	Nonferritic tube (condenser, heat exchanger, feedwater heater)	✔		✔	✔			✔								✔
	Air conditioners		✔													
	Circumferential crack		✔						✔							
	Small pit detection in thin-wall tube (example: titanium)				✔											
	Nonferritic tubes with light permeability changes (certain 300-series stainless)					✔										✔
	U-bends			✔												
	C-scan capability								✔							✔
	Ferritic Tubing															
	Mildly ferritic steel (Monel, 3RE60, SEA-CURE, and 400-series stainless)					✔				✔	✔	✔			✔	✔
	Heat exchanger, feedwater heater									✔	✔	✔			✔	✔
	Boiler												✔			✔
	Aluminum-finned air cooler													✔	✔	✔

Parts and Parameters Quick Guide

TEA-224-050-N15

Probe Type	Probe Diameter	Center frequency	Cable Length
TEA = Bobbin probe	(224 = 22.4 mm)	(050 = 50 kHz)	N15 = 15 m

Probe Type	Diameter	Standard Center Frequency	Cable Length	Note
TEA/TEB (ECT: Bobbin probe)	TEA: 9.6 mm to 50 mm by 0.2 mm. TEB: 11 to 50 mm by 0.2 mm. Custom (TEA): 6.6 mm to 100 mm.	1, 15, 50, 250, 600 (Range = 250 Hz to 1,200 kHz)	TEA: 15, 20, 30 m. TEB: TEZ-BBS-Nxx.	
TEC/TED (ECT: Air conditioner)	TEC: 9.6 mm to 50 mm by 0.2 mm. TED: 11 mm to 50 mm by 0.2 mm. Custom (TEC): 50.2 mm to 100 mm.	15, 50, 250, 600 (Range = 2 kHz to 1,200 kHz)	TEC: 15, 20, 30 m. TED: TEZ-ACS-Nxx.	Not recommended for wall thicknesses over 2.0 mm. TE-ADP-004 is required.
TEE/TEF (ECT: Titanium)	TEE: 9.6 mm to 50 mm by 0.2 mm. TEF: 11 mm to 50 mm by 0.2 mm.	1, 15, 50, 250, 600 (Range = 250 Hz to 1,200 kHz)	TEE: 15, 20, 30 m. TEF: TEZ-BBS-Nxx.	The titanium cover is replaced by a stainless steel protective cover for diameters over 25.4 mm.
TEK/TEL (ECT: High resolution)	TEK: 9.6 mm to 50 mm by 0.2 mm. TEL: 11 mm to 50 mm by 0.2 mm. Custom (TEK): 50.2 mm to 100 mm.	15, 50, 250, 600 (Range = 2 kHz to 1,200 kHz)	TEK: 15, 20, 30 m. TEL: TEZ-BBS-Nxx.	
TEG (ECT: Flexible Bullet)	11 mm to 25.4 mm by 0.2 mm.	15, 50, 250, 600 (Range = 2 kHz to 1,200 kHz)	25 m N25 = Nylon H25 = More flexible	Inspection of bends in two times: 90° from each ends of the tube. Min radius of curvature: 2 in.
TEO (ECT: Super magnetic)	11 mm to 22.2 mm by 0.2 mm.	15, 50, 250, 600 (Range = 2 kHz to 1,200 kHz)	15, 20, 30 m	Limited to wall thicknesses below 1.5 mm.
TER (ECT: Airgun)	14 mm to 31.6 mm by 0.2 mm. Custom: 11.4 mm to 13.8 mm.	15, 50, 250, 600 (Range = 2 kHz to 1,200 kHz)	TEZ-BBG-Nxx (20 m or 30 m Airgun cable)	Dedicated probe and cable for use with the Airgun.
TXE (ECT: Coils Array)	13.8 mm to 24 mm by 0.2 mm.	MF (optimized for SS inspections)	20 m	Best results achieved with a fill factor between 90% and 95%.
TRS (RFT: Single exciter)	9 mm to 22 mm by 1 mm. 22 mm to 50 mm by 2 mm.	300 Hz, 2 kHz, 15 kHz (Range = 100 Hz to 50 kHz)	20, 30 m	Diameters over 26 mm have a lightweight plastic design.
TRX (RFT: Dual exciter)	9 mm to 22 mm by 1 mm. 22 mm to 50 mm by 2 mm.	300 Hz, 2 kHz, 15 kHz (Range = 100 Hz to 50 kHz)	20, 30 m	Diameters over 26 mm have a lightweight plastic design.
TRX (RFT: Dual pickup)	9 mm to 22 mm by 1 mm. 22 mm to 50 mm by 1 mm.	300 Hz, 2 kHz, 15 kHz (Range = 100 Hz to 50 kHz)	20, 30 m	Diameters over 26 mm have a lightweight plastic design.
TRC (RFT: Boiler probe)	28, 34, 37, 45, 55, 65 mm.	85 Hz, 300 Hz (Range = 20 Hz to 1 kHz)	20, 30 m	Use 85 Hz for wall thicknesses over 6 mm.
TRD (NFT: Near-field probe)	11 mm to 31 mm by 1 mm. Custom: 32 mm to 100 mm by 1 mm.	300 Hz (Range = 100Hz to 1 kHz)	20, 30 m	
TFB (MFL: High saturation)	12, 13.2, 16.1, 17, 17.9, 18.7, 19.8, 22.9, 24.2, 28.3, 29.6 mm	N/A	20, 30 m	Probe diameters are slightly smaller than the actual real overall diameter because of the wear rings.

Please validate your request on the specific probe page.

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MultiScan MS5800™ System, MultiView™ Software, and TubePro Software

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- Advanced user-editable reporting featuring 2-D tube maps and impressive 3-D drawings.
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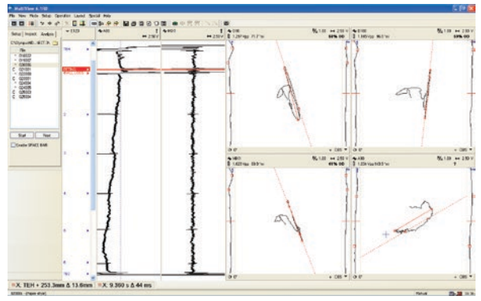
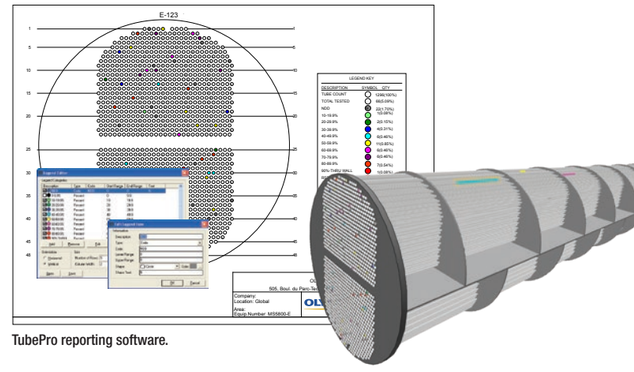
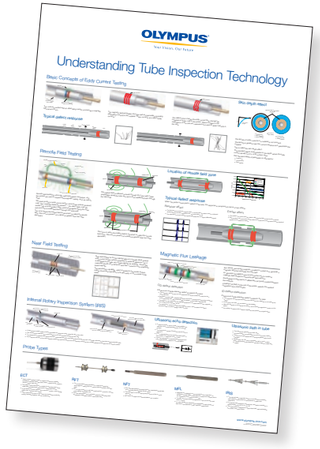


MultiView acquisition and analysis software.



TubePro reporting software.



Understanding Tube Inspection Technology Poster

In order to support the NDT community, Olympus has published the *Understanding Tube Inspection Technology* poster. This poster has been designed by field experts to present tube inspection technologies in a concise and clearly illustrated manner. This poster is a valuable resource for those who are responding to the large demand for tube inspection solutions.

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