GE
Measurement & Control

WeldScan Probes

Designed for Inspections of Ferrous and Non-Ferrous Welds plus Steel Structures

imagination at work

WeldScan Probes

WeldScan is an eddy current technique for detecting and sizing fatigue cracks in ferrous and non-ferrous welds with or without coatings. In addition, they can be utilized on other structures and are commonly used in the shipping, rail, and civil engineering industries. WeldScan probes have been designed to minimize the effects of material variations such as uneven/undressed weld surfaces and the heat affected zone. WeldScan is the trade name of GE's Inspection Technologies range of probes dedicated to this task.

Benefits of WeldScan:

- Approved method for replacing MPI of welds – has approval from many certifying authorities and operating training certification schemes.
- Method can be used by Rope Access Inspectors – no scaffolding required.
- Time Saving – Minimal surface preparation is required, as coatings do not have to be removed prior to the inspection. (Coatings thickness < 2 mm)
- No consumable chemical materials are required, unlike both liquid penetrate and MPI methods.
- No couplant is required for eddy current inspection, unlike ultrasonics.
- A cost-effective alternative to other inspection methods.
- Eddy Currents is a GREEN technology – environmentally friendly!

Approval Bodies

Many certifying authorities in the oil and gas industry accept the use of eddy currents as an inspection method and recommend their use with Phase Plane instruments, such as the Phasec 3 series. These bodies include Lloyds Register, Det Norsk Veritas, BureauVeritas, and the PCN body.

Training of the individual in the WeldScan technique is carried out by a number of commercial organizations worldwide, and individuals can become NDT qualified in either the PCN or ASNT schemes.

The use of eddy currents is standardized by EN 1711:2000 *"Eddy Current Examination of Welds by Complex Plane Analysis."*

As part of the requirements of EN 1711:2000, the coating thickness that covers the weld has to be assessed prior to the actual inspection scan/s. This is required to ensure the weld inspections are carried out using the correct sensitivity levels. Therefore, typically two separate inspections have to be performed when using a single frequency instrument:

1. To determine the coating thickness, using a suitable absolute probe.
2. To verify the inspection scans of the weld and heat affected zone, utilizing a suitable WeldScan probe.

Single Frequency Weld Inspection (Phasec/Locator)

Typical Welding Inspection Procedure (Single Frequency Instruments)

Preinspection

Coating Thickness: If the weld is coated (i.e., painted) it is important to ascertain the thickness of this layer before the inspection to compensate for it. If this is not performed, incorrect sensitivity levels may be selected and possible defects missed. This is achieved with a Broadband Probe (Paint Probe) 130P3 and Reference Standard 31A008, using the four yellow plastic shims. Each shim is approximately 0.5 mm thick.

Note: The frequency used for this inspection is 10 kHz, which is outside the normal frequency range quoted on the probe.

Broadband Probe 130P3 (Paint Probe)

Weld Reference Standard 31A008

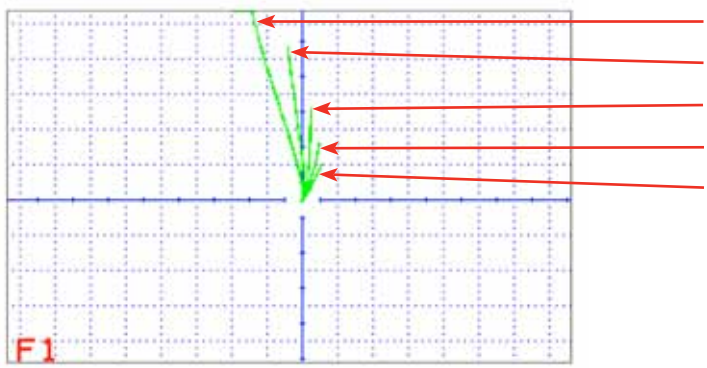
Set up Guide Notes for Coating Evaluation

Use similar settings as below.

Parameter	Value
Mode	Normal Single
Frequency	10 kHz
Probe	Absolute
Gain X/Y	20 dB/20 dB
Filter HP/LP	DC/300 Hz
Input Gain	High
Drive	0

Basic Paint Probe Settings

Step	Task
1.	Connect Paint Probe to instrument and switch on.
2.	Set the parameters as above (guide only).
3.	Balance probe in air.
4.	Place probe on Reference Stand (Part No: 31A008) away from EDM slots and edges. Using the phase control, rotate the signal to obtain a vertical signal amplitude.
5.	Increase the % Full Screen Height (FSH) of the signal to >100% FSH by using the gain control.
6.	Position one plastic shim on reference standard and place probe on it, noting the % FSH of the signal. Using the gain control, adjust signal amplitude to approximately 80% Full Screen Height (FSH).
7.	Remove probe from shim and place another shim on top of the other. Note % FSH of the signal.
8.	Repeat step 4 for the remaining two shims.
9.	Now that the instrument has been set up, place the probe on the area to be inspected, noting the % FSH of the signal amplitude.
10.	Match the % FSH of the signal from the inspection area to that given from the reference standard/shim combination.



Note: *To enable demonstration of screen shot, the phase has been rotated by 10° for each coating thickness measurement.*

Typical Signals Obtained from Shims

Setup Guide Noted for Weld Inspection

After the thickness of the coating (if applicable) has been established, it is now required to calibrate the Instrument to perform the Weld Inspection.

Parameter	Value
Mode	Normal Single
Frequency	100 kHz
Probe	Bridge
Gain X/Y	50 dB/50 dB
Filter HP/LP	DC/300 Hz
Input Gain	High
Drive	+8

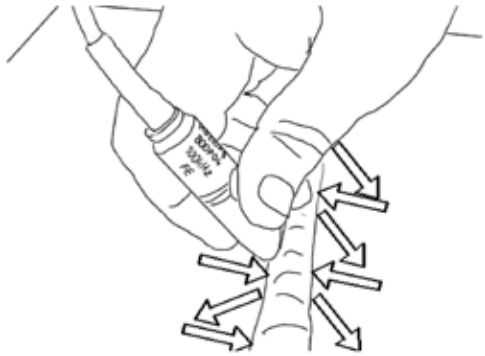
Basic Weld Inspection Settings

Step	Task
1.	Disconnect the Paint Probe and connect a suitable WeldScan Probe.
2.	Set the parameters as above (guide only). Alternatively, go to "Recall Setups" in the menu and select "WeldScan Fe."
3.	Utilizing the Reference Standard (with the correct number of shims), place probe on it away from any EMD slots and edges, and then balance.
4.	Scan probe over 1.0 mm slot and note the signal amplitude and phase.
5.	Using the phase control, rotate the signal to vertical and adjust the gain to give 100% FSH when scanning over the 1.0 mm slot.
6.	Carry out inspection of weld as per company procedure.

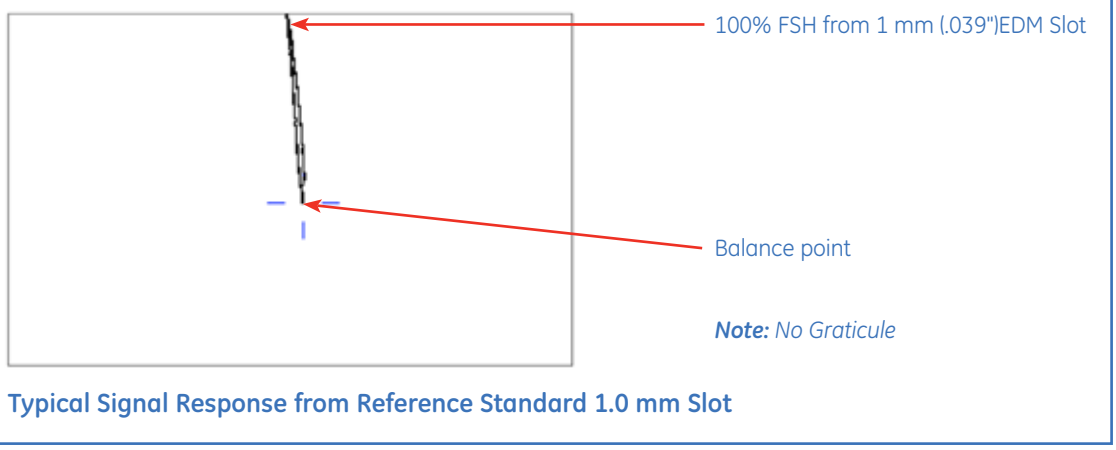
Typical Scanning Techniques

The illustrations below show typical scan patterns for the cap of the weld, the toe of the weld, and the Heat Affected Zone (HAZ).

Scanning the Cap of the Weld



Scanning Toe and HAZ of the Weld



Typical Signal Response from Reference Standard 1.0 mm Slot

Dual Frequency Weld Inspection (Phasec 2d/3d)

Advantages of Dual Frequency Inspections over Single Frequency Inspections

The main advantage of using a Dual Frequency Instrument over a Single Frequency Instrument is that the coating thickness can be monitored continuously during the inspection, allowing adjustment of instrument sensitivity for variations in coating thicknesses. Moreover, this procedure only requires the use of a single WeldScan probe, thus eliminating the need to interchange probes for coating thickness evaluations and weld inspections.

- Will reduce inspection time.
- Coating thickness variations can be observed while inspecting the weld, permitting inspection sensitivity levels to be adjusted as required, ensuring inspection quality is maintained.
- Only one probe is required.

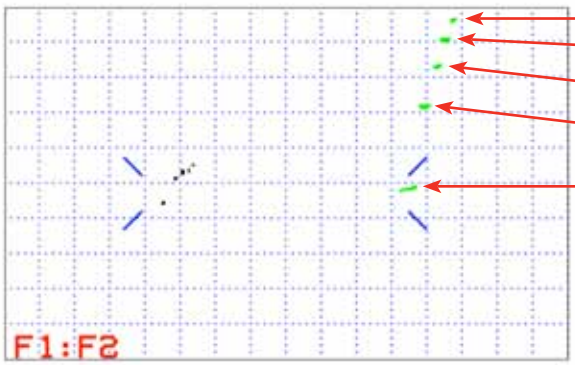
Setup Guide Notes for Welding Inspection Using Dual Frequency Mode

F1 Channel		F2 Channel	
Parameter	**Value**	**Parameter**	**Value**
Frequency 1	100 kHz	Frequency 2	10 kHz
Probe 1	Bridge	Probe 2	Absolute
Gain 1 X/Y	50 dB/50 dB	Gain 2 X/Y	53 dB/53 dB
Filter 1 HP/LP	DC/300 Hz	Filter 2 HP/LP	DC/300 Hz
Input Gain 1	High	Input Gain 2	High

Basic Dual Frequency Weld Inspection Settings

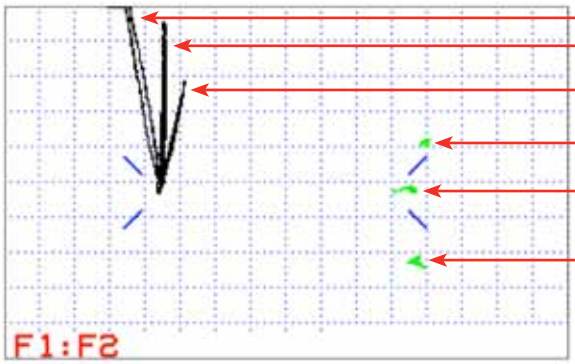
Note: Frequency 1 = Weld Inspection Channel
Frequency 2 = Coating Channel

Step	Task
1.	Connect WeldScan Probe to a Dual Frequency instrument and switch on the instrument.
2.	Go to main menu and select Mode = Normal Dual, View = F1:F2 and Balance = Split. Note: In "Split" the Left hand Balance Key Balances F1 and Right Hand Balance Key Balances F2.
3.	Set the parameters as above (guide only). Alternatively go to "Recall Set Ups" in the menu and select "WeldScan Dual Fe". Note: Phase, Gain and balance positions may require adjustment.
4.	To Ascertain Coating Thickness place the probe away from EDM slots and edges on the reference bock (no shims) Part No: 31A008 and balance.
5.	Position all 4 plastic shim on reference standard and re-place probe on the total stack, noting the % FSH of the signal. Using the gain control adjust signal amplitude to approximately 95% Full Screen Height (FSH).
6.	Remove probe from reference block and remove 1 shim. Replace probe and note % FSH of the signal.
7.	Repeat steps 6 for the remaining shims
8.	After ascertaining coating thickness use correct number of shims and place probe on reference block away from EDM slots and edges and balance F1 and F2 Channels.
9.	Scan probe over 1.0 mm slot and note the signal ampli-tude and phase.
10.	Using the phase control rotate the signal to vertical and adjust the gain to give 100% FSH when scanning over the 1.0 mm slot. (or as per company procedures.)



4 Shims = 2.0 mm (.079")
3 Shims = 1.5 mm (.059")
2 Shims = 1.0 mm (.039")
1 Shim = 0.5 mm (.020")
Bare Metal - 0 Shims

Coating Thickness Assessment



>100 FSH = Bare Metal
95% FSH = 1 Shim
60% FSH = 2 Shims
2 Shims = 1.0 mm (.039")
1 Shims = 0.5 mm (.020")
Bare Metal

Varying Coating Thickness vs. Signal Amplitude

Note:
1. To enable to show screen shot, the F1 Phase has been rotated by +/-10°.
2. Probe scanned over 1.0 mm EDM slot

Probe	Tip Diameter	Overall Length	Tip to Handle Distance	Drop
632-267-008	.219" (5.563 mm)	2.5" (63.5 mm)	.50" (12.7 mm)	N/A
632-266-008	.375" (9.525 mm)	2.5" (63.5 mm)	.50" (12.7 mm)	N/A
632-265-009	.625" (15.875 mm)	2.5" (63.5 mm)	N/A	N/A
632-266-108	.375" (9.525 mm)	1.5" (38.1 mm)	N/A	.250" (6.35 mm)

WeldScan Probes

			Phasec 1.1 Mini Phasec QuickCheck	Locator 2 & 2s	Phasec 2200 D-62 Phasec 2 & 3	Zetec	Staveley Nortec Rohmann	Disconnect Probe *Cable Required	Disconnect Probe *Cable Required
		Connector	6P Jaeger	7P Lemo	12P Lemo	4P Amphenol	8P Burndy	4P Lemo	3P Fischer
Probe Description									
Straight Probes	**Frequency**	**Cable Length**							
7/32" Straight (5.556 mm)	450kHz-2.5MHz	6' (1.83 m)	632-267-000	632-267-015	632-267-002	632-267-004	632-267-006	632-267-008	
		12' (3.66 m)	632-267-010	632-267-025	632-267-012	632-267-014	632-267-016		
3/8" Straight (9.525 mm)	60kHz-1.2MHz	6' (1.83 m)	632-266-000	632-266-015	632-266-002	632-266-004	632-266-006	632-266-008	
		12' (3.66 m)	632-266-010	632-266-025	632-266-012	632-266-014	632-266-016		
5/8" Straight (15.875 mm)	60kHz-700kHz	6' (1.83 m)	632-265-000	632-265-015	632-265-002	632-265-004	632-265-006	632-265-009	
		12' (3.66 m)	632-265-010	632-265-025	632-265-012	632-265-014	632-265-016		
90° Tipped Probes									
7/32", inline (5.556 mm) 1/4" drop (6.35 mm)	450kHz-2.5MHz	6' (1.83 m)	632-267-100	632-267-115	632-267-102	632-267-104	632-267-106	632-267-108	632-267-208
		12' (3.66 m)	632-267-110	632-267-125	632-267-112	632-267-114	632-267-116		
3/8", inline (9.525 mm) 1/4" drop (6.35 mm)	60kHz-1.2MHz	6' (1.83 m)	632-266-100	632-266-115	632-266-102	632-266-104	632-266-106	632-266-108	
		12' (3.66 m)	632-266-110	632-266-125	632-266-112	632-266-114	632-266-116		
5/8" Inline (15.875 mm) 1/4" Drop (6.35 mm)	60kHz-700kHz	6' (1.83 m)			632-265-102	632-265-104			
		12' (3.66 m)			632-265-112				
5/8" 90° (15.875 mm) 1/4" Drop (6.35 mm)	60kHz-700kHz	6' (1.83 m)			632-265-202				
		12' (3.66 m)			632-265-212				
Highwear Straight Probes									
3/8" High Wear (Ceramic Tip) (9.525 mm)	60kHz-1.2MHz							632-266-011	
5/8" Highwear (Ceramic Tip) (15.875 mm)	60kHz-700kHz	6' (1.83 m)	632-265-001	632-265-013	632-265-003	632-265-005	632-265-007	632-265-011	
5/8" Highwear (SST) (15.875 mm)	60kHz-700kHz							632-265-018	
High Temperature	**425° F (220° C) Continuous Use**								
5/8" Straight Handle Length 6" (15.875 mm / 152.4 mm)	60kHz-700kHz							632-265-008	

Additional Information

Equivalent Hocking to Lewistown Intergrated Cable

Hocking Part No		Lewistown Part No
800P04MB1P	to	632-265-002
800P01MD1P		632-266-002

Cables available for for Detachable Probes

Part Number			Length		
Hocking	**Steeb**	**Lewistown**	**Feet**	**Meters**	**Description**
40A700	A074022	074-140-022	4.9	1.5	Cable, 4.9' Long, Differential, Lemo 12 Pin to Lemo 4 Pin
40A701	A140023	074-140-023	12	3.7	Cable, 12' Long, Differential, Lemo 12 Pin to Lemo 4 Pin
40A702	A010121	640-010-121	10	3	Cable, 10' Long, Differential, Lemo 12 Pin to Lemo 4 Pin, Armor Jacketed
40A703	A010196	640-010-196	8	2.4	Cable, 8' Long, Differential, Lemo 12 Pin to Lemo 4 Pin
40A704	A010235	640-010-235	33	10	Cable, 10 Meters Long, Differential, Lemo 12 Pin to Lemo 4 Pin, Water Resistant
40A705	A010241	640-010-241	50	15.2	Cable, 50' Long, Differential, Lemo 12 Pin to Lemo 4 Pin
40A706	A010242	640-010-242	100	30.5	Cable, 100' Long, Differential, Lemo 12 Pin to Lemo 4 Pin
40A707	A010266	640-010-266	12	3.7	Cable, 12' Long, Differential, Lemo 12 Pin to a 90° Lemo 4 Pin
40A708	A010277	640-010-277	20	6.1	Cable, 20' Long, Differential, Lemo 12 Pin to Lemo 4 Pin, Armor Jacketed

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