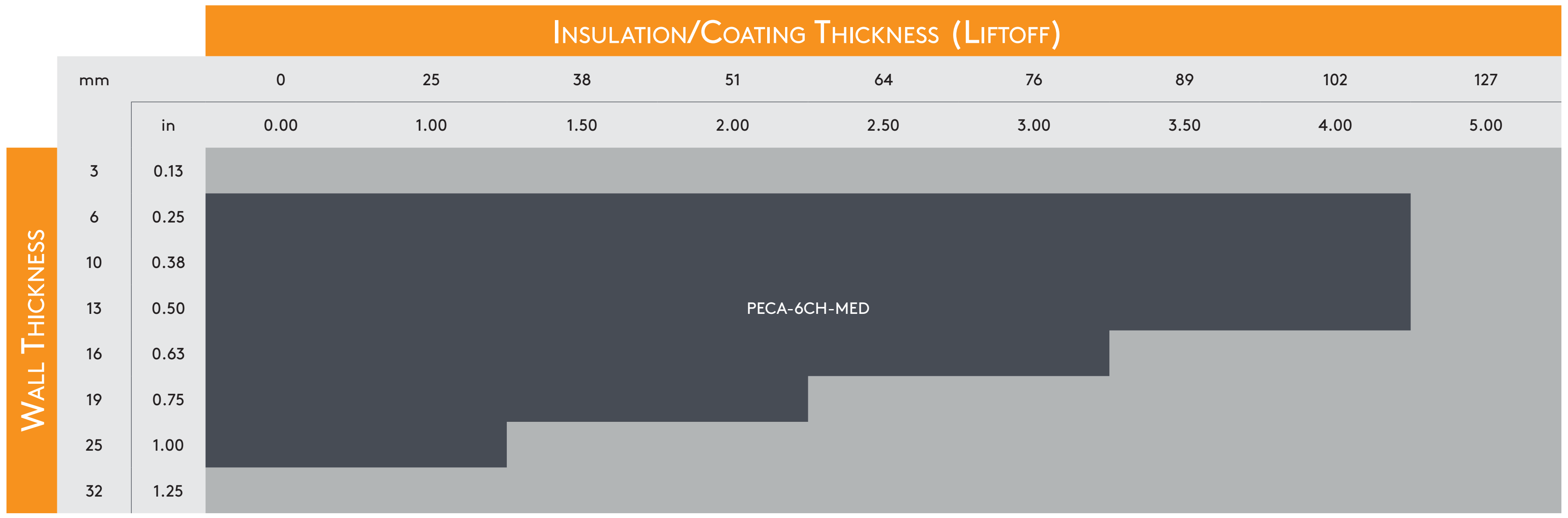
Lyft®

Pulsed Eddy Current Array (PECA) Probe

Selection and Footprint – Carbon Steel (Lyft 2.1)

This reference document is designed to assist you determine whether the PECA probe is suited to your application with Lyft software version 2.1. Knowing the nominal thickness of the component to be inspected and the nominal insulation/coating thickness in place will help you do this. The remaining information is intended to help you understand and determine the footprint of your probe, scan resolution, and circumferential grid spacing. This is especially useful in quantifying the performance of the Lyft solution under different conditions.

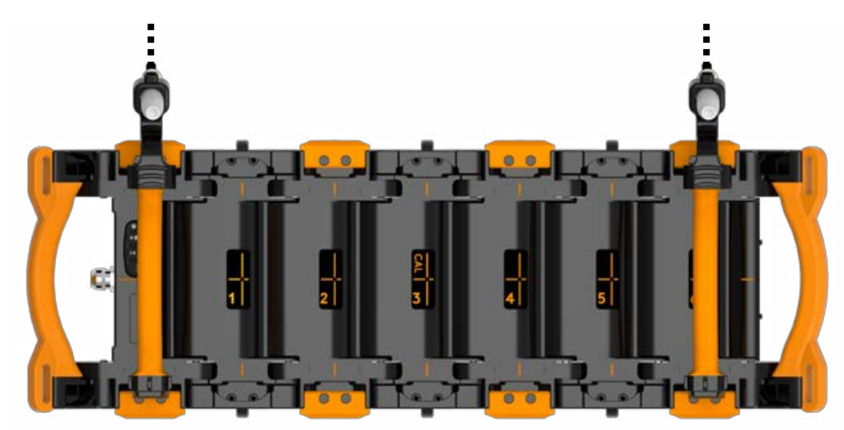
PECA Probe Application Range



Smallest configuration: 102 mm (4 in) OD pipe, schedule 40, with 25 mm (1 in) insulation; total OD 152 mm (6 in).

Coverage Across the Probe

Full coverage across the probe (with a minimum 50 % signal overlap) is guaranteed on pipes and plates for all the liftoff values in the probe selection table above (double index axis resolution required below 25 mm (1 in) liftoff). The probe's array is composed of six elements numbered 1–6. The center of each element is aligned with a wheel of the probe. You can calibrate the probe by placing element 3 on a nominal thickness.

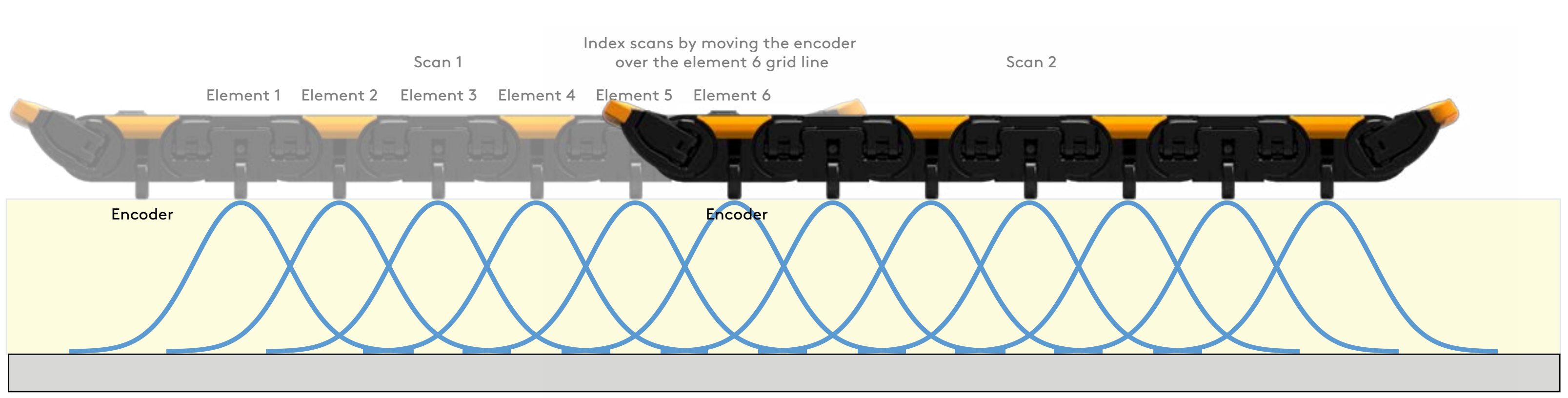


Grid-As-U-Go™

Use the Grid-As-U-Go accessory to trace grid lines while scanning a component and correctly index your scans.

Lateral / Circumferential Index

The probe's encoder is located under the control keypad, next to the cable exit. As a rule of thumb, the best way to index your scan is to place the encoder on the grid line previously scanned by element 6, as illustrated here.



Calculating the PECA Probe Footprint

Use the following formula to determine your probe's footprint (FP) and determine the **axial grid resolution**.

$$FP \approx 0.65 \times LO + FP_0$$

Where LO is the **liftoff** (insulation, jacket, coating thickness) and FP_0 is the footprint at a **liftoff of zero**.

For the probe, FP_0 is:

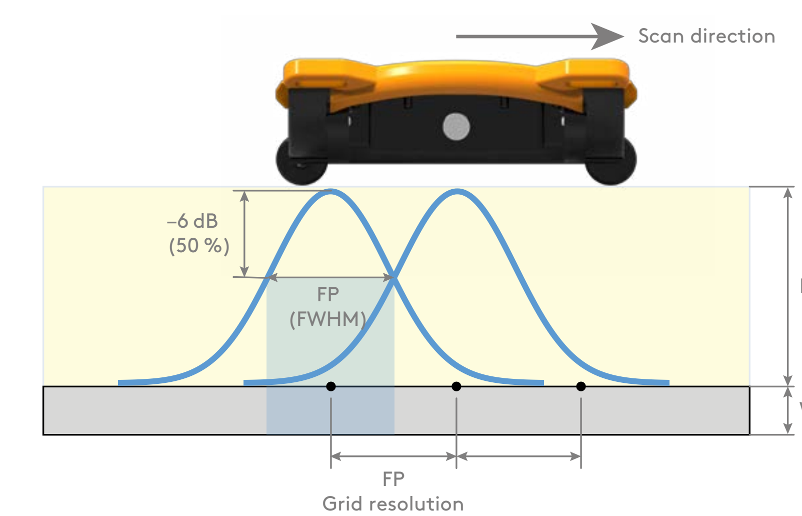
PECA-6CH-MED

FP_0 = 46 mm (1.80 in)

		Insulation/Coating Thickness (Liftoff)								
	mm	0	25	38	51	64	76	89	102	127
	in	0.00	1.00	1.50	2.00	2.50	3.00	3.50	4.00	5.00
Footprint PECA-6CH-MED	mm	46	62	70	79	87	95	104	112	-
	in	1.8	2.45	2.78	3.10	3.43	3.75	4.08	4.40	-

Footprint

Use the footprint of the probe to determine the **optimal grid resolution** for proper detection. The FP is defined as the **full width at half maximum (FWHM)** of the response detected by the probe. This ensures a 50 % signal overlap between each point on the grid map.



Minimum Detectable Defect Diameters at Specific Depths

Liftoff		Defect Depth 10 %		20 %		30 %		40 %		50 %		60 %	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
0	0.0	76	3.0	54	2.1	44	1.7	38	1.5	34	1.3	31	1.2
12	0.5	92	3.6	65	2.6	53	2.1	46	1.8	41	1.6	38	1.5
25	1.0	107	4.2	76	3.0	62	2.4	53	2.1	48	1.9	44	1.7
38	1.5	120	4.7	85	3.3	69	2.7	60	2.4	54	2.1	49	1.9
50	2.0	131	5.1	92	3.6	75	3.0	65	2.6	58	2.3	53	2.1
64	2.5	142	5.6	101	4.0	82	3.2	71	2.8	64	2.5	58	2.3
75	3.0	151	5.9	107	4.2	87	3.4	75	3.0	67	2.7	62	2.4
90	3.5	162	6.4	114	4.5	93	3.7	81	3.2	72	2.8	66	2.6
102	4.0	170	6.7	120	4.7	98	3.9	85	3.3	76	3.0	69	2.7

Note 1: Tests were performed over 200 different configurations, using mixed liftoff values, types of weather jackets, flat and round-bottom holes.
Note 2: Requires the use of double-index resolution for liftoff values between 0 and 25 mm (1 in).
Note 3: Requires a minimum resolution of half the footprint on the scan axis.
Note 4: Impossible to detect through-hole defects (100 % wall loss).

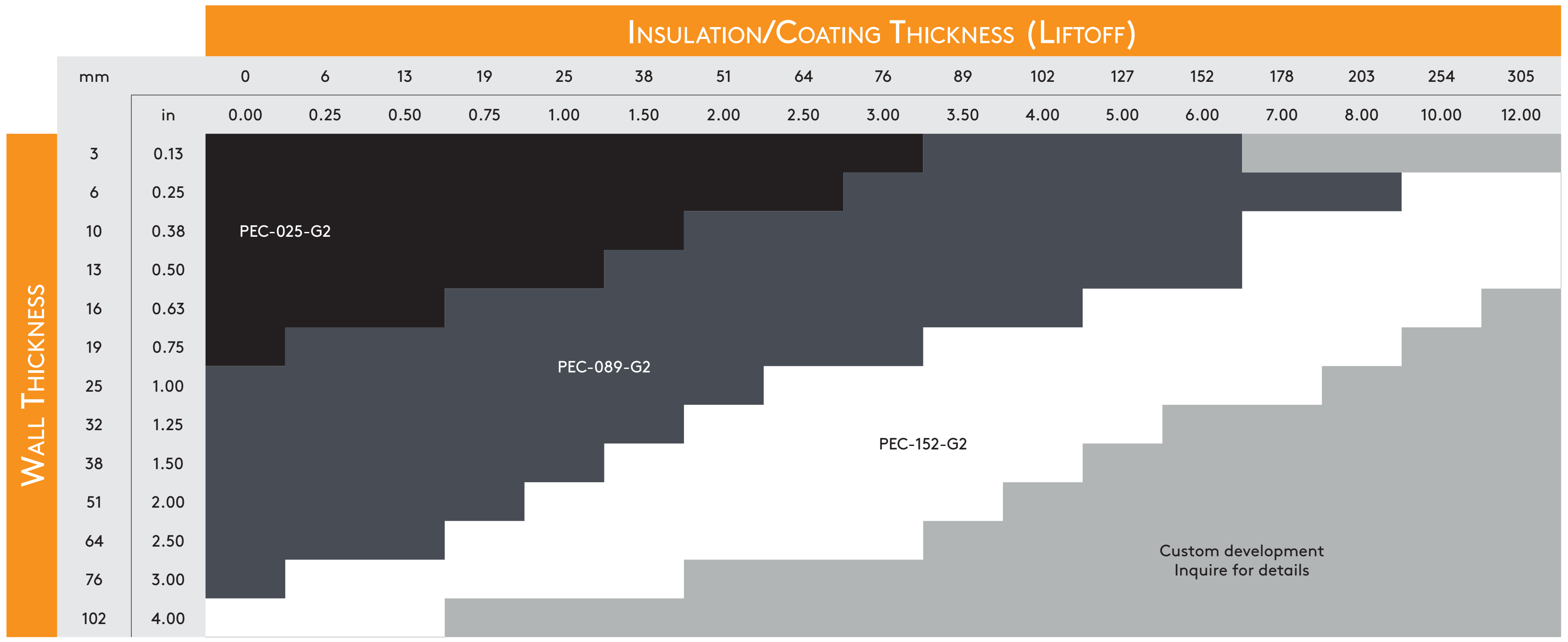
Lyft®

Second-Generation PEC Probes (G2)

Single-Element PEC Probe Selection and Footprint – Carbon Steel (Lyft 2.1)

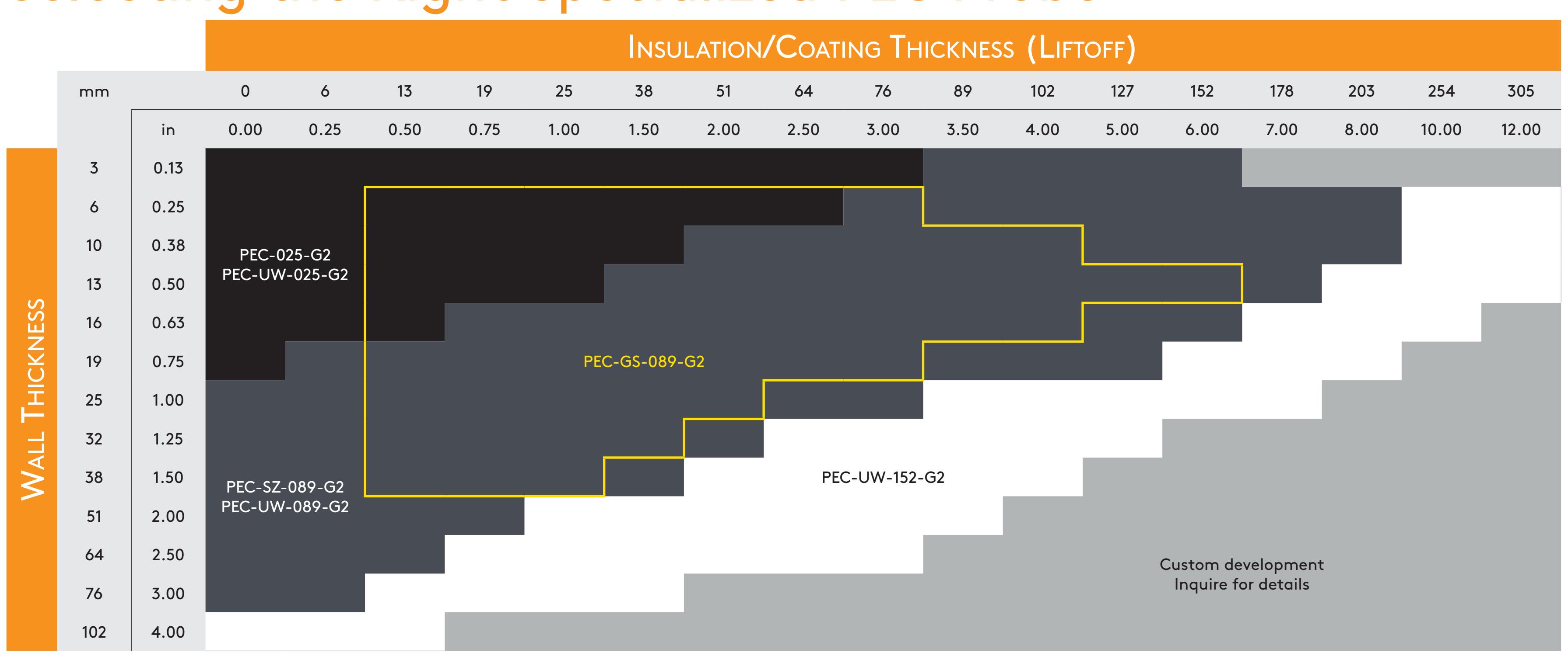
This reference document is designed to assist you in selecting the right PEC probes for your application with Lyft software version 2.1. Knowing the nominal thickness of the component to be inspected and the nominal insulation / coating thickness in place, the selection tables below suggest the adequate probes. The remaining information is intended to help you understand and determine the footprint of selected probes. This is especially useful in quantifying the performance of the Lyft solution in a variety of conditions.

Selecting the Right PEC Probe



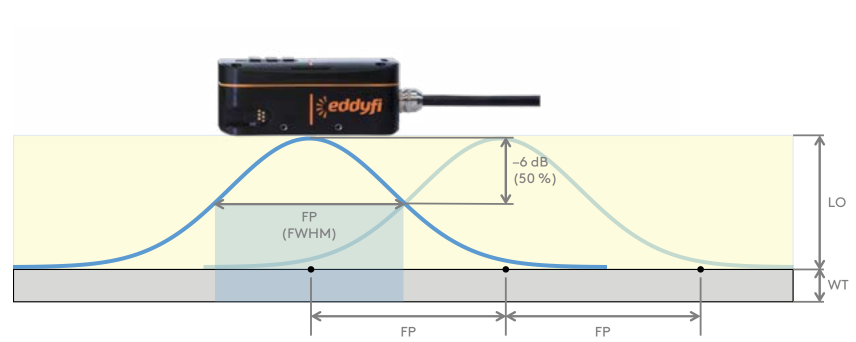
We recommend using the PEC-GS-089-G2 in applications on galvanized steel (GS) weather jackets. If you use other standard probes over GS weather jackets, add 40 mm (1.5 in) liftoff for every 0.5 mm (0.020 in) of GS.

Selecting the Right Specialized PEC Probe



Footprint

The footprint (FP) of a probe is used to determine the **optimal grid resolution** for proper detection. FP is defined as the **full width at half maximum (FWHM)** of the response detected by the probe. So doing, ensuring a 50 % signal overlap between each point on the grid map.



Calculating the PEC Probe Footprint

Use the following formula to determine your probe's footprint (FP) and determine the **axial grid resolution**.

$$FP \approx 0.65 \times LO + FP_0$$

Where *LO* is the **liftoff** (insulation, jacket, coating thickness) and FP_0 is the footprint at a **liftoff of zero**.

For the probe, FP_0 is:

PEC-025-G2 / UW	PEC-089-G2 / SZ / UW	PEC-152-G2 / UW
FP_0 = 35 mm (1.38 in)	FP_0 = 62 mm (2.44 in)	FP_0 = 100 mm (3.94 in)

		Insulation/Coating Thickness (Liftoff)																
	mm	0	6	13	19	25	38	51	64	76	89	102	127	152	178	203	254	305
	in	0.00	0.25	0.50	0.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	5.00	6.00	7.00	8.00	10.00	12.00
Footprint PEC-025-G2 PEC-UW-025-G2	mm	35	39	43	47	52	60	68	76	85	–	–	–	–	–	–	–	–
	in	1.38	1.54	1.70	1.87	2.03	2.36	2.68	3.00	3.35	–	–	–	–	–	–	–	–
PEC-089-G2 PEC-SZ-89-G2 PEC-UW-089-G2	mm	62	66	70	74	79	87	95	103	112	120	128	145	161	178	194	–	–
	in	2.44	2.60	2.77	2.93	3.09	3.42	3.74	4.07	4.39	4.72	5.04	5.69	6.34	7.00	7.64	–	–
PEC-GS-089-G2	mm	–	–	70	74	79	87	95	103	112	120	128	145	161	178	194	–	–
	in	–	–	2.77	2.93	3.09	3.42	3.74	4.07	4.39	4.72	5.04	5.69	6.34	7.00	7.64	–	–
PEC-152-G2 PEC-UW-152-G2	mm	100	104	108	112	117	125	133	141	150	158	166	183	199	216	232	265	298
	in	3.94	4.10	4.26	4.41	4.59	4.91	5.24	5.56	5.89	6.21	6.54	7.19	7.84	8.49	9.14	10.43	11.73

We recommend using the PEC-GS-089-G2 in applications on galvanized steel (GS) weather jackets. If you use other standard probes over GS weather jackets, add 40 mm (1.5 in) liftoff for every 0.5 mm (0.020 in) of GS.

Minimum Detectable Defect Diameters at Specific Depths

Footprint		Defect Depth 10 %		20 %		30 %		40 %		50 %		60 %	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
40	1.6	49	1.9	35	1.4	28	1.1	24	1.0	22	0.9	20	0.8
50	2.0	61	2.4	43	1.7	35	1.4	31	1.2	27	1.1	25	1.0
60	2.4	73	2.9	52	2.0	42	1.7	37	1.4	33	1.3	30	1.2
70	2.8	86	3.4	61	2.4	49	1.9	43	1.7	38	1.5	35	1.4
80	3.1	98	3.9	69	2.7	57	2.2	49	1.9	44	1.7	40	1.6
90	3.5	110	4.3	78	3.1	64	2.5	55	2.2	49	1.9	45	1.8
100	3.9	122	4.8	87	3.4	71	2.8	61	2.4	55	2.2	50	2.0
110	4.3	135	5.3	95	3.8	78	3.1	67	2.7	60	2.4	55	2.2
120	4.7	147	5.8	104	4.1	85	3.3	73	2.9	66	2.6	60	2.4
130	5.1	159	6.3	113	4.4	92	3.6	80	3.1	71	2.8	65	2.6
140	5.5	171	6.8	121	4.8	99	3.9	86	3.4	77	3.0	70	2.8
150	5.9	184	7.2	130	5.1	106	4.2	92	3.6	82	3.2	75	3.0
160	6.3	196	7.7	139	5.5	113	4.5	98	3.9	88	3.5	80	3.2
170	6.7	208	8.2	147	5.8	120	4.7	104	4.1	93	3.7	85	3.4
180	7.1	220	8.7	156	6.1	127	5.0	110	4.3	99	3.9	90	3.5
190	7.5	233	9.2	165	6.5	134	5.3	116	4.6	104	4.1	95	3.7
200	7.9	245	9.6	173	6.8	141	5.6	122	4.8	110	4.3	100	3.9

Note 1: Impossible to detect through-hole defects (100 % wall loss).
Note 2: Requires a minimum resolution of half the footprint of the selected probe.
Note 3: Above defect sizes were determined using flat-bottom holes.

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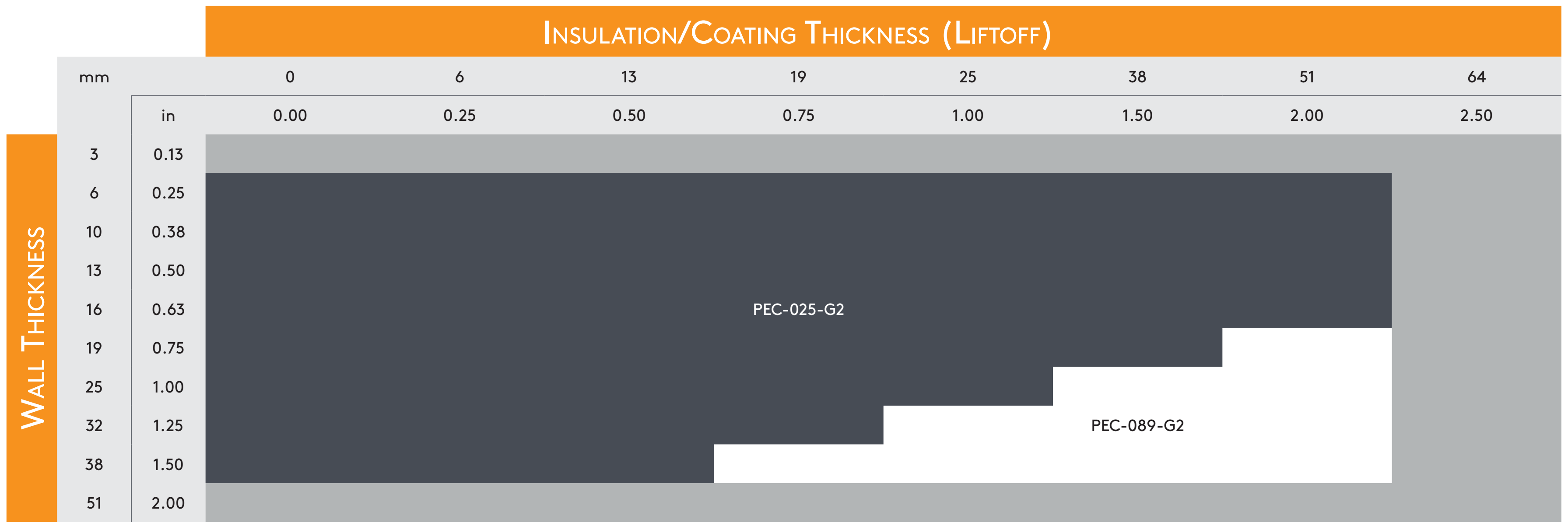
Cast Iron
PEC Probe Selection and Footprint (Lyft 2.1)

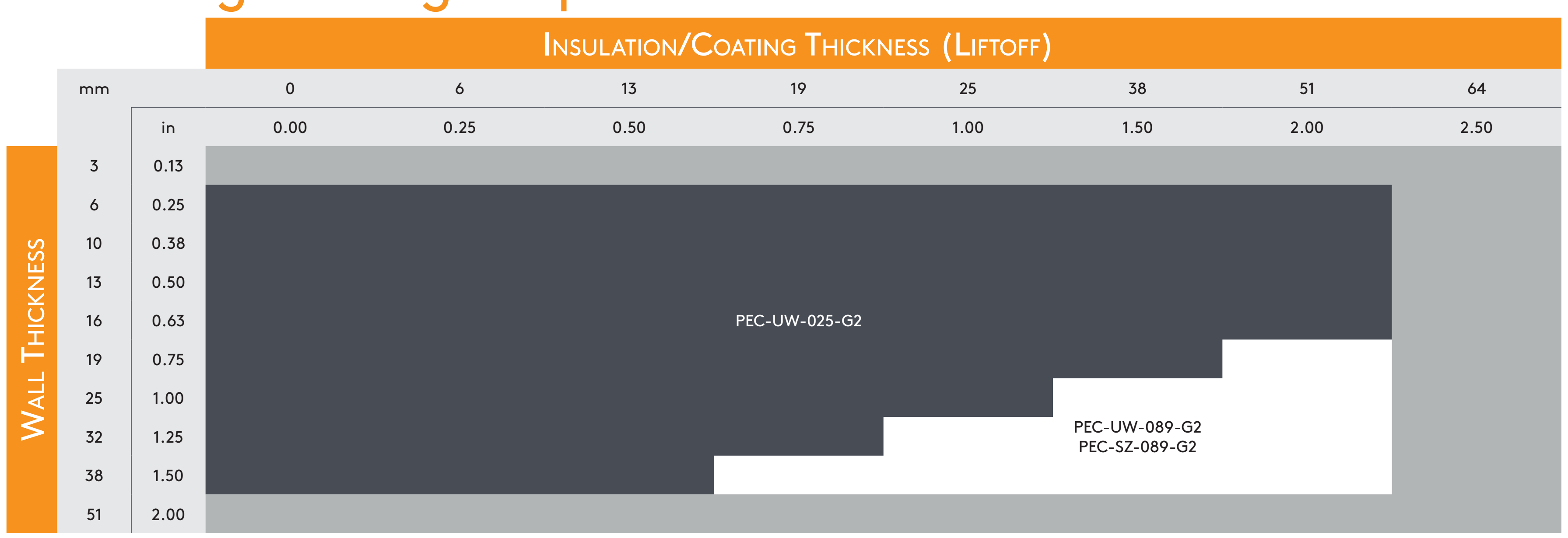
This reference document is specific to Cast Iron inspections with PEC technology. It is designed to assist you in selecting the right PEC probes for your application with Lyft software version 2.1. Knowing the nominal thickness of the component to be inspected and the nominal insulation/coating thickness in place, the selection tables below suggests the adequate probes.

The remaining information is intended to help you understand and determine the footprint of selected probes. This is especially useful in quantifying the performance of the Lyft solution in a variety of conditions.

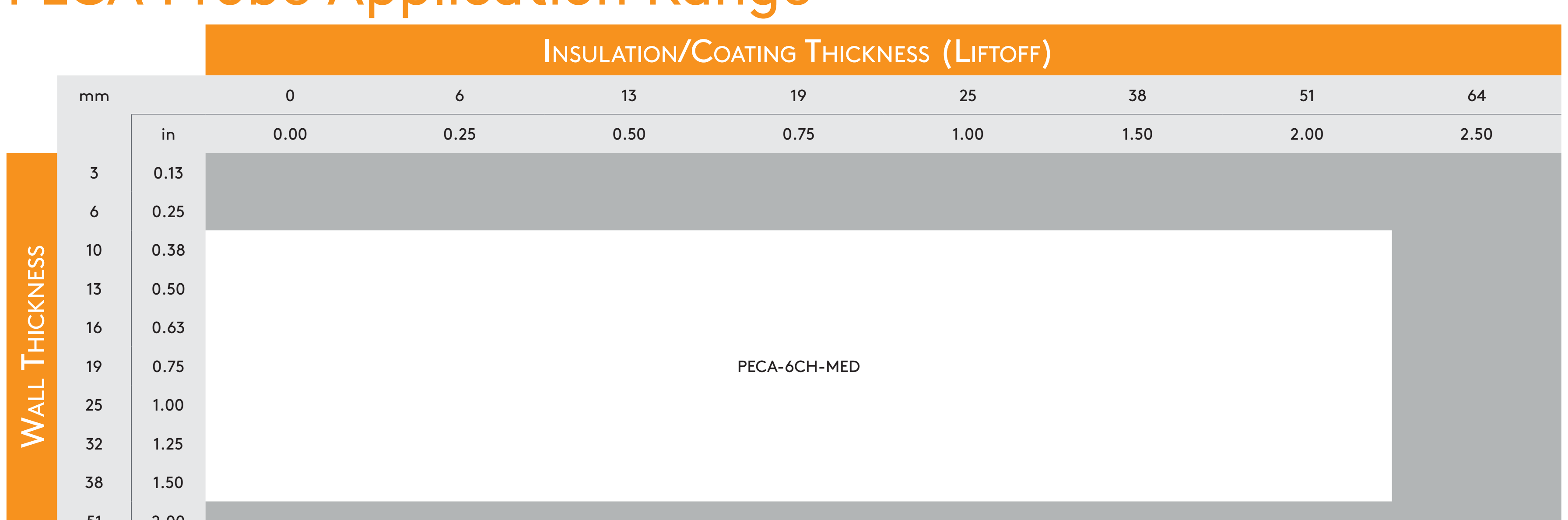
Selecting the Right PEC Single-Element Probe



Selecting the Right Specialized PEC Probe



PECA Probe Application Range



Calculating the PEC Probe Footprint

Footprint sizes for cast iron are the same as the ones for carbon steel. Use the following formula to determine your probe's footprint (FP).

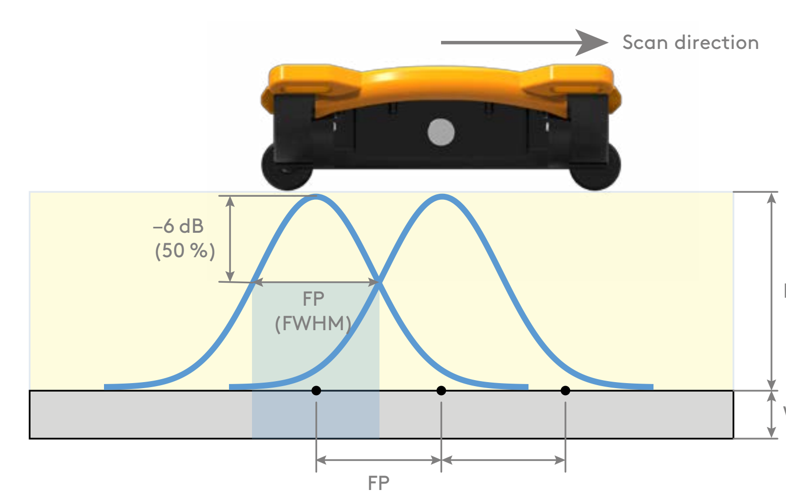
$$FP \approx 0.65 \times LO + FP_0$$

Where *LO* is the **liftoff** (insulation, jacket, coating thickness) and FP_0 is the footprint at a **liftoff of zero**.

For each probe, FP_0 is:

PECA-6CH-MED	PEC-025-G2/UW	PEC-089-G2/SZ/UW
FP_0 = 46 mm (1.80 in)	FP_0 = 35 mm (1.38 in)	FP_0 = 62 mm (2.44 in)

			Insulation/Coating Thickness (Liftoff)						
		mm	0	6	13	19	25	38	51
		in	0.00	0.25	0.50	0.75	1.00	1.50	2.00
Footprint	PEC-025-G2 PEC-UW-025-G2	mm	35	39	43	47	52	60	68
		in	1.38	1.54	1.70	1.87	2.03	2.36	2.68
	PEC-089-G2 PEC-UW-089-G2	mm	62	66	70	74	79	87	95
		in	2.44	2.60	2.77	2.93	3.09	3.42	3.74
	PECA-6CH-MED	mm	46	50	54	58	62	70	79
		in	1.8	1.96	2.13	2.28	2.45	2.78	3.10

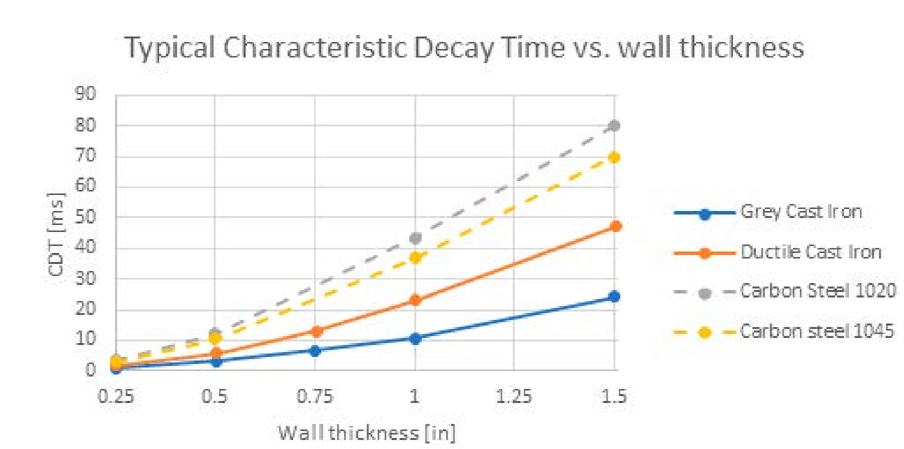


Footprint

Use the footprint of the probe to determine the **optimal grid resolution** for proper detection. The FP is defined as the **full width at half maximum (FWHM)** of the response detected by the probe. This ensures a 50 % signal overlap between each point on the grid map.

Characteristic Decay Time (CDT)

Both grey and ductile irons are supported while selecting cast iron type during setup with the Lyft software. These materials are typically more resistive than carbon steel, leading to a much faster PEC response and lower Characteristic Decay Time (CDT). Typical CDT of grey and ductile cast irons are compared to carbon steel in the graph beside:



You may need to adjust the CDT manually before starting the SmartPULSE or PEC Autoset procedures if the cast iron deviates significantly from the typical behavior.

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First-Generation PEC Probes (G1)

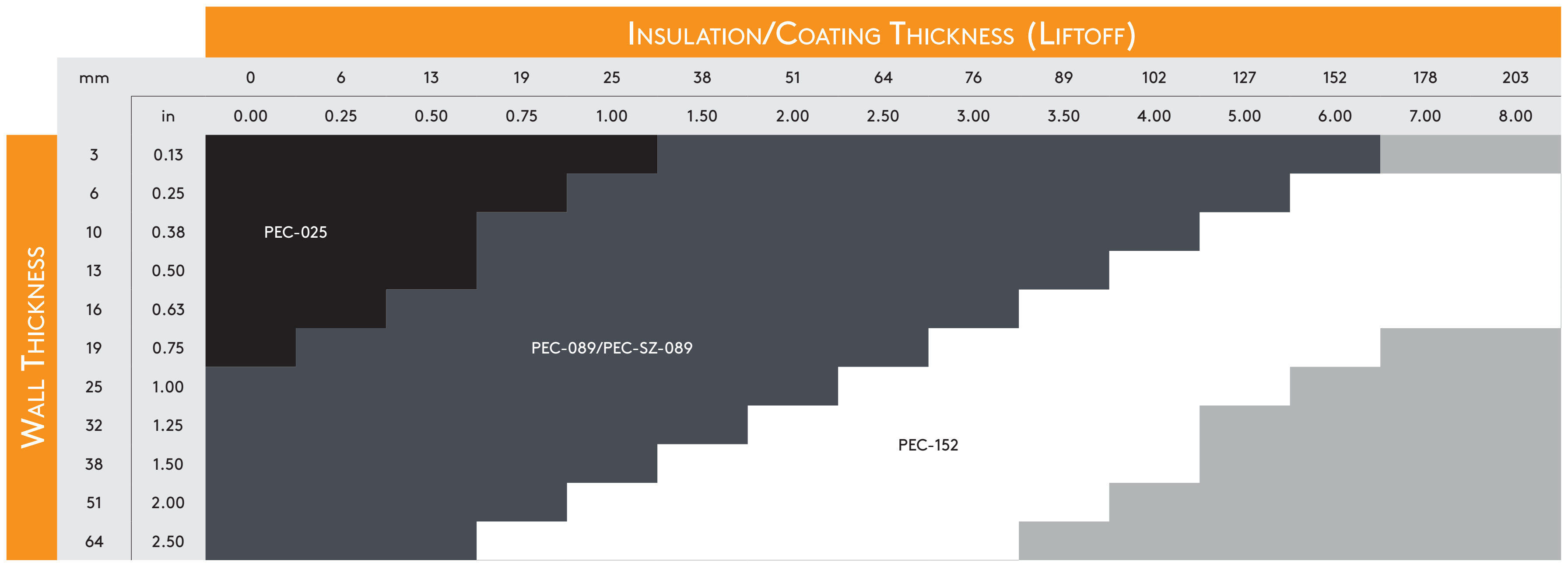
Single-Element PEC Probe Selection and Footprint – Carbon Steel (Lyft 2.1)

This reference document is designed to assist you in selecting the PEC probe that is best suited to your application with Lyft software version 2.1. Knowing the nominal thickness of the component to be inspected and the nominal insulation / coating thickness in place, the selection table below suggests the adequate probe.

The remaining information helps understand and determine the footprint of the selected probe, the averaging area, and the edge effect. This is especially useful in quantifying the performance of the Lyft solution in a variety of conditions.

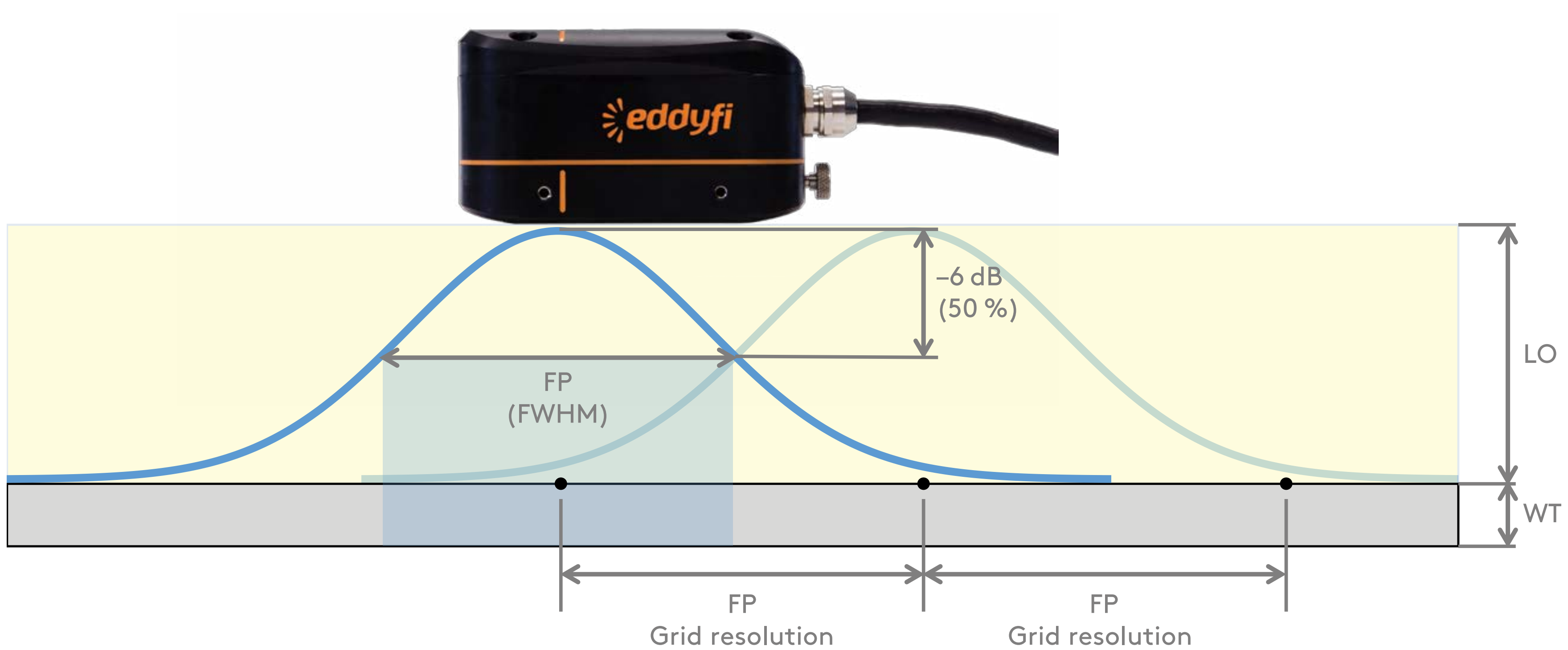
Selecting the Right PEC Probe

Reference the chart to choose a probe.



Footprint

The footprint (FP) of a probe is used to determine the **best grid resolution** for proper detection. FP is defined as the **full width at half maximum (FWHM)** of the response detected by the probe. So doing, ensuring a 50 % signal overlap between each point on the grid map.



Calculating the PEC Probe Footprint

Use the following formula to determine your probe's footprint (FP).

$$FP \approx 0.65 \times LO + FP_0$$

Where *LO* is the **liftoff** (insulation, jacket, coating thickness) and FP_0 is the footprint at a **liftoff of zero**.

For each probe, FP_0 is:

PEC-025	PEC-089 / PEC-SZ-089	PEC-152
FP_0 = 35 mm (1.38 in)	FP_0 = 62 mm (2.44 in)	FP_0 = 100 mm (3.94 in)

Footprint		Insulation/Coating Thickness (Liftoff)														
	mm	0	6	13	19	25	38	51	64	76	89	102	127	152	178	203
	in	0.00	0.25	0.50	0.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	5.00	6.00	7.00	8.00
PEC-025	mm	35	39	43	47	52	–	–	–	–	–	–	–	–	–	–
	in	1.38	1.54	1.70	1.87	2.03	–	–	–	–	–	–	–	–	–	–
PEC-089 PEC-SZ-89	mm	62	66	70	74	79	87	95	103	112	120	128	145	161	–	–
	in	2.44	2.60	2.77	2.93	3.09	3.42	3.74	4.07	4.39	4.72	5.04	5.69	6.34	–	–
PEC-152	mm	100	104	108	112	117	125	133	141	150	158	166	183	199	216	232
	in	3.94	4.10	4.26	4.41	4.59	4.91	5.24	5.56	5.89	6.21	6.54	7.19	7.84	8.49	9.14

Averaging Area

This is the **surface viewed by the probe** on the component. The wall thickness determined by Lyft is the **average wall thickness** within the **averaging area**. As a result, **corrosion flaws smaller than the averaging area are underestimated**. The averaging area diameter is **1.8 times** the probe footprint (**$AvgA_{\Phi} = 1.8 \times FP$**).

Edge Effect

The edge effect impacts PEC measurements when a probe **nears geometry variations** such as nozzles, flanges, or the end of a structure. Measurements begin to **vary from a distance of one FP** from the center of a probe's coils.