

Contents

1	Introduction	1
1.1	Distance Amplitude Correction Curve	2
1.2	Distance-Gain-Size Method (DGS).	3
1.3	Key Differences: DAC Versus DGS.	4
1.4	Foresight to This Book.	5
	References	5
2	State of the Art: DAC and DGS	7
2.1	Distance Amplitude Curve	7
2.2	Distance-Gain-Size Method	8
2.2.1	EN ISO 16811:2012	9
2.2.2	DGS Evaluation	9
	References	19
3	DGS Deviations Using Angle Beam Probes	21
3.1	Sound Fields.	23
3.2	A Manufacturer-Independent Issue.	25
3.3	The Beginning of a New Probe Technology	26
	References	27
4	The New Probe Technology, Single Element Probes.	29
4.1	Design Principle	29
4.2	Calculation Method	31
4.2.1	The Fastest Path	32
4.2.2	Included Angle	34
4.2.3	Time of Flight	34
4.2.4	Angle in the Test Material	35
4.2.5	Angles in the Wedge of the Probe.	35
4.2.6	Transducer Coordinates	36
4.2.7	Calculation Summary.	37

4.3	Necessary Adaptations	38
4.3.1	Phase Shift	38
4.3.2	Corrected Angle of Incidence	41
4.3.3	Area Correction.	42
4.4	Single Element Probes	42
4.5	Rotational Symmetry	44
4.5.1	Measurement of the Sound Fields	44
4.6	Advantage of the New Probe Technology	45
	References	45
5	New Probe Technology, Phased Array Probes	47
5.1	Delay Laws.	49
5.2	DGS Accuracy	49
5.3	Sound Exit Points	50
	References	52
6	New Probe Technology, Curved Coupling Surfaces	53
6.1	Fastest Path.	54
6.2	Angles	56
6.3	Transducer Coordinates	57
6.4	Example: Solid Axle	58
6.5	Delay Laws.	60
	References	63
7	Bandwidth-Dependent DGS Diagrams	65
7.1	Single Frequency Ultrasound.	65
7.1.1	Near Field Length	69
7.2	Multi-frequency Ultrasound.	71
7.2.1	Near Field Length	71
7.2.2	Back Wall Echo Curve	74
7.2.3	ERS Curves	74
	References	79
8	Applying Bandwidth-Dependent DGS Diagrams	81
8.1	Results Using Phased Array Angle Beam Probes	82
	References	84
9	Bandwidth-Dependent DAC Curves	85
9.1	Calculating Bandwidth-Dependent DAC Curves	85
9.2	Applying the Bandwidth-Dependent DAC Curves	88
9.2.1	Using a Reference Echo from a Calibration Standard.	88
9.2.2	Using One Single Side-Drilled Hole as Reference	91
9.2.3	Recording a DAC Curve for One Single Angle.	92
9.2.4	Pros and Cons	96
	References	98

10	Convert SDH into FBH and Vice Versa	99
	10.1 SDH or FBH?	102
	References	103
11	Frequency-Dependent Sound Attenuation	105
	Reference	108
	Appendix	109
	Further Readings	115
	Index	117

Defect Sizing Using Non-destructive Ultrasonic Testing
Applying Bandwidth-Dependent DAC and DGS Curves

Kleinert, W.

2016, XVIII, 118 p. 90 illus., 83 illus. in color., Hardcover

ISBN: 978-3-319-32834-8