1 REASON FOR LATEST REVISION

Revision No.:	Keywords:	Chapter:	Valid from:	Respon.
00	Development document	All	06.05.2022	Ch.Dürager

2 SCOPE OF APPLCATION

This document contains the information about the required training for the NDT method "Ultrasonic Testing" provided by IMITec Training School.

The training course is offered for Level1 (L1), Level 2 (L2), and Level 3 (L3) personnel which are intended to qualify for Non-destructive Testing personnel based on the standard EN4179 (Aerospace applications).

The training program covers the required course content for the general part based on the EN4179 and in some points the requirements for the specific and practical part. However, it may be necessary to adapt the specific part to the specific requirements of IMITec clients (Employer Specific Training).

2.1 Information for the reader

In principle the training program is provided for the different Levels. Level 3 candidates, however, are expected to have already learned and tested a large part of the theory material in the Level 2 course. These parts are required for the Level 3 course and will be tested during the final exam.

2.2 Information about the Trainee

Name:	Start of Training:	Estimated End date of Training:
Signature Trainee:	**Signature RL3:**	

3 REFERENCE DOCUMENTS

Document	Addition	Remarks / Description
Ultrasonic Testing – Aerospace Applications	2020	Training book IMITec NDT Training School.
SN EN 4179	2022	Aerospace series – Qualification and approval of personnel for non-destructive testing.
Syllabus -Ultrasonic testing	2019	NANDTB-Germany

4 SYLLABUS EDDY ULTRASONIC TESTING

Chapter	Training Content		Done:	Comment / Date
Basic physical information / Ultrasonic principle	Generation of Ultrasonic waves	Basic principle		
		Theory of oscillations		
		Theory of waves		
	Wave forms	Longitudinal wave		
		Surface wave		
		Lamb waves		
		Pulse / pulse shape		
		Allocation of sound waves		
		Broad band pulse		

Chapter	Training Content		Done:	Comment / Date
		Narrow band pulses		
		Sound wave spectrum		
		Properties of ferrites		
	Mechanical behavior of sound waves	Sound waves in solid media		
		Sound in fluids		
		Sound in gases		
		refraction		
		Reflection		
	Physics	Sound pressure		
		Acoustical Impedance		
		Penetration factor		
		Reflection factor		
Sound field	Sound field geometry	Sound field of straight beam probes		
		Sound field of angle probes		
		Array probe		
		Sound fields of Rotation-symmetrical transducers		
		Rectangular pulse transducers		
		Influences on the sound field geometry		
	Vibrations and waves, refraction Acoustical impedance	Ultrasonic testing principle		
		Vibrations		
		Sound propagation		
		Sound field		
		Reflctor in sound field		
		Sound along boundary layers		
		Total reflection of same wave type		
		Law of refraction		
		Sound pressure amplitudes along boundary layers		
		Lateral wall effect		
		Wave conversion		
		Wave seperation		
Sound generation	Sound generation procedure	Electrodynamic procedure		
		Piezoelectric procedure		
		Ultrasonic generated by laser		
		Air Ultrasound		
		Magnetostriction effect		
		Physical correlations		
	Static and dynamic testing	Static test		
		Dynamic test		

Chapter	Training Content		Done:	Comment / Date
		Testing using sliding probe		
	Techniques	Measurement of specific electrical conductivity		
		Layer thickness measurement		
		Corrosion test		
		Crack test		
	Conductivity Measurement	General information on conductivity measurement		
		Purpose of conductivity measurement		
		Measuring principle		
		Variables		
		Measurement inaccuracies		
		Implementation		
		Standards and regulations pertaining to conductivity measurements		
		Conductivity measuring equipment		
		Calibration blocks for conductivity measurements		
	Layer thickness measurement	Equipment and parameter selection		
		Test sequence methodology		
		Representation and analysis of measurement values		
		Alternative methods		
	Corrosion testing	Equipment and parameter selection		
		Test sequence methodology		
		Representation and analysis of measurement values		
		Typical disturbance variables		
		Residual thickness measurement		
		Measuring the elimination of surface corrosion		
		Layer corrosion		
	Crack testing	Crack Type		
		Static crack test using metallic components		
		Signal processing, distinguishing of disturbance variables		
		Influences disturbing the process		

Chapter	Training Content		Done:	Comment / Date
		Determination of crack lengths		
		Crack testing with rotating probes		
		Sample defects found when inspecting holes		
	Static crack testing	General information		
		Types of causes for cracks		
		Determination of the crack length		
	Crack testing for detecting subsurface cracks	Signal processing, distinguishing of disturbance variables		
		Test method		
		Influences disturbing the process		
		Pulsed eddy current testing		
	Dynamic crack test with rotating probe	Examples of possible defects		
		Calibration blocks		
		Standards and regulations		
		Devices for testing with rotating probes		
	Use of automated Eddy current equipment	Determination of probe characteristics		
		Automated equipment settings		
		Measurement data acquisition		
		Scanners		
		Procedure monitoring in general		
		Calibration and reference blocks		
Rules and standards / test instruction	Standards	General information on standards		
		National standards		
		International standards		
		Process instruction		
	Test instruction	Requirements for a test instruction		
		Preparation of test instruction		
		Example of a test instruction		
Capabilities of the method		General information on Ultrasonic testing		
		Limits of the method		
		Other NDT methods		

Chapter	Training Content		Done:	Comment / Date
		Comparison with different surface crack testing methods		
		Comparison with test methods for subsurface cracks		
		Comparison with corrosion test methods		
Material science	Material defects generated during manufacture	Inclusions		
		Pores		
		Shrinkage cavities		
		Segregations		
		Cracks		
	Defects generated during processing	Rolling and forging defects		
		Turning, grinding defects		
		Defects caused by hardening		
	Defects caused by operational loads	Cracks		
		Corrosion		
Design concepts in Aviation		Safe-life		
		Fail-safe		
		Damage Tolerance		
Safety regulations		General safety regulations		
		Handling of test equipment and tools		
Practical exercises		Exercises practicing the handling of aeronautical parts		
		Preparation of a case study		
		Preparation of a test instruction		
		Development of a test problem		