

# Acoustic emission testing (AT) — Levels 1, 2 and 3

The acoustic testing training shall be in accordance with Tables 13 and 14.

Table 13 — General content

Content	Level 1 (% of total duration)	Level 2 (% of total duration)	Level 3 (% of total duration)
11.1 Introduction to terminology and history of acoustic emission testing (AT)	1	1	2
11.2 Physical principles of the method and associated knowledge	8	12	14
11.3 Product knowledge and capabilities of the method and its derived techniques	11	12	12
11.4 Equipment	14	16	13
11.5 Information prior to testing	11	13	24
11.6 Testing	42	18	14
11.7 Evaluation and reporting	11	15	8
11.8 Assessment	1	8	10
11.9 Quality aspects	1	2	5
11.10 Developments	0	3	8

Table 14 — Acoustic emission testing (AT) — Levels 1, 2 and 3

Content		Level 1	Level 2	Level 3	
11.1 Introduction to terminology and history of acoustic emission testing (AT)	History	X	X	X	
	Purpose of NDT	What is testing?	X	X	X
		V	X	X	X
		A	X	X	X
		P	X	X	X
		I	X	X	X
		V	X	X	X
		M	X	X	X
	Purpose of acoustic emission testing (AT)	I	X	X	X
		A	X	X	X
Relevant standards	I	X	X	X	
11.2 Physical principles and associated knowledge	Physical principles of acoustic emission testing sources (mechanism in?)	P	X		
		C	X		
		C	X		
		V	X		
		Frequency range		X	
	Source characteristics		X		

analogy to earthquakes)	Effect of dislocation			X	
	Effect of stress on the waves			X	
	Modes of fracture			X	
Characteristics of Acoustic Emission testing	Transient emission	X			
	Continuous emission	X			
	Amplitude	X			
	Frequency range	X			
	Effect of source dimension		X		
			X		
			X		
			X		
			X		
				X	
		X	X		
		X			
			X		
				X	
	Sources of acoustic emission testing		X	X	X
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
		X	X	X	
Wave propagation			X		
			X		
		X			
		X			
			X		
		X			
	Wave motion and velocity		X		
	Mode conversion		X		
	Reflection and refraction		X		
	Wave Attenuation		X		
	— Attenuation vs frequency			X	
	Wave dispersion		X		
	Diffraction			X	
Geometric effects		X			

		Shadowing effects		X	
		Anisotropic propagation			X
		Wave propagation in fluids			X
		Influence of fluids			X
	Source location	One sensor location	X		
		Linear location with delta-t	X		
		Planar location with delta-t	X		
		Continuous emission	X		
					X
				X	
				X	
				X	
					X
					X
			X		
11.3 Product knowledge and related capability of the method and derived techniques	Fields of application of acoustic emission testing		X		
				X	
				X	
				X	
					X
					X
			X		
				X	
	Fundamentals of material sciences and basic knowledge of mechanical properties			X	
				X	
					X
					X
	Pressure equipment		X		
				X	
				X	
Product standards and codes	Guidelines for product standards associated with acoustic emission testing	X			
	Product standards, their influence on acoustic emission testing		X		
	Directives for non-pressurized equipment			X	



		Digital vs analogous signal			X	
		System parameter definition and selection			X	
		Distribution techniques			X	
		Spectral analysis			X	
		Cascaded hits			X	
		Continuous mode measurement			X	
	Source location processing			X	X	X
				X		
					X	
						X
					X	
				X		
				X		
				X		
				X		
					X	
					X	
					X	
						X
						X
	Advanced signal processing			X		
				X		
				X		
					X	
					X	
					X	
	Equipment adjustments			X		
					X	
				X		
					X	
				X		
					X	
Fundamental of informatics		Knowledge and use of computers	X			
		Knowledge of software		X		
11.5 Information prior to test	Information about the test object	Identification or designation material	X	X	X	
		— Object to be tested	X	X	X	
		— Kind of manufacture	X	X	X	
		— Catalogue of defects		X	X	

		— Extent of test coverage	X	X	X	
	Test conditions and application of standard	Accessibility		X	X	
		Infrastructure			X	
		Particular test conditions		X	X	
		Application standard		X	X	
		Stage of manufacture or service life when testing is to be carried out			X	
		Test method		X	X	
		Test equipment		X	X	
	Technique and sequence of performing test				X	
				X		
				X		
	Instructions				X	
				X		
			X			
					X	
				X		
11.6 Testing	Equipment set-up		X			
			X			
			X			
			X			
			X			
			X			
			X			
			X			
				X		
					X	
	Test performance		X	X		
			X	X		
		Data acquisition and data display during test		X		
				X		
			Comparison with the verification	X		
Comparison with location of simulated source	X					
Establishment of the acceptance criteria		X				
Selection of plots, correlation and distributions		X				

		On-line evaluation			X
	Necessary actions during the test	Stop criteria	X		
		Verification of on-line detected Acoustic emission testing sources by other NDT methods		X	
		Interpretation of the relation between acoustic emission and physical sources			
11.7 Evaluation and reporting	Data display		X		
			X		
			X		
			X		
			X		
			X		
			X		
				X	
				X	
	Data interpretation		X		
			X		
				X	
				X	
					X
	Data evaluation			X	
			X		
				X	
Documentation and reporting		X			
			X		
11.8 Assessment	Product standards and acceptance criteria			X	
					X
					X
	Acoustic emission testing source evaluation and test results		X		
		Relations between acoustic emission testing and physical sources		X	
		Interpretation of connection between acoustic emission testing and physical sources			X

		Sophisticated data treatment techniques			X		
11.9 Quality aspects	Personnel qualification	ISO 9712	X	X	X		
					X		
	Documentation					X	
						X	
						X	
					X		
			X				
					X	X	
					X	X	
		Knowledge of applicable NDT application and product standards				X	
						X	
	X		X	X	X		
		Equipment verification	X	X	X		
11.10 Developments	New developments in acoustic emission testing and associated NDT techniques	New developments in the field of NDT (differences)			X		