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	Level 2 (% of	Level 3 (% of
	total duration)	total duration)	total duration)
11.1 Introduction to terminology and history of	1	1	2
acoustic emission testing (AT)			
11.2 Physical principles of the method and	8	12	14
associated knowledge			
11.3 Product knowledge and capabilities of the	11	12	12
method and its derived techniques			
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, $\frac{2}{2}$ and 3

Content			Level 1	Level 2	Level 3
11.1	History		X	X	X
Introduction	Purpose of NDT	What is testing?	X	X	X
to	_	Vilor in the more of NIDT?	X	X	X
terminology		A	X	X	X
and history of		p			
acoustic		H	X	X	X
emission		V	X	X	X
testing (AT)		N	X	X	X
	Purpose of	D	X	X	X
	acoustic	A	X	X	X
	emission testing				
	(AT)				
	Relevant	IS	X	X	X
	standards				
11.2 Physical	Physical	R	X		
principles and	principles of		X		
associated	acoustic	C	X		
knowledge	emission testing	V	X		
	sources	Frequency range		X	
	(mechanism in?	Source characteristics		X	

analogy to	Effect of dislocation			X
earthquakes)	Effect of stress on the waves			X
carinquanes)	Modes of fracture			X
Characteristics	Transient emission	X		21
of Acoustic	Continuous emission	X		
Emission testing	Amplitude	X		
Limssion testing	Frequency range	X		
	riequency range	Λ	V	
	Effect of source difficultion		X	
	1		X	
	2		X	
	1		X	
			X	
	-			X
	F	X	X	
		X		
			X	
	\mathcal{L}			X
	C			Λ
	1			X
	1			X
Sources of	1	X	X	X X
acoustic		X	X	X
emission testing		X	X	X
		X	X	X
	1	X	X	X
	7	X	X	X X
	7	X	X	Y
	_	X	X	X X
	- C	Λ	Λ	Λ
		X	X	X
		X	X	X
		X	X	X
		X	X	X
		X	X	X
	1	X	X	X
	N -	X	X	
	1	X	X	X X
	7	X	X	Y
	1	Λ	Λ	X
Wave	1	X		Λ
propagation	7	X X		
	<u>-</u>	X		
	1		X	
	Neare parameters	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	
I	1	1		

		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		
		Alacothor datath			X
				X	
		d		X	
				X	
				21	X
				X	7.1
				21	X
					X
					X
11.3 Product	Fields of	S	X		
knowledge	application of			X	
and related	acoustic			X	
capability of	emission testing			X	
the method				Λ	
and derived					X
techniques					X
		S	X		
				X	
					X
					X
	Fundamentals of			X	
	material sciences			X	
	and basic				X
	knowledge of				**
	mechanical				X
	properties	-			
	Pressure equipment		X		
	equipment	es			
		0.3		X	
		_			
					X
	D 1				
	Product	Cumine of relevant standards	37		
	standards and codes	associated with acoustic	X		
	codes	Product standards, their			
		influence on acoustic emission		X	
		testing		71	
		Directives for non-pressurized			_
		equipment			X
	1		I .	I	

		Relevant standards associated			X
		with acoustic emission testing			
11.4	Sensors	Piezoelectricity	X		
Equipment		Construction	X		
		Frequency response	X		
		Wide-band and resonant	X		
		sensors			
		Coupling and sensitivity	X		
		1	X		
		5	X		
			X		
			X		
				X	
		-		X	
		· ·		X	
		4		X	
		-		X	
		- /			
		-		X	
		e			X
					X
		_			X
		-			
					X
					X
					X
		3			X
	Preamplifiers		X		
			X		
			X		X
			X		
					X
				X	
		(X	
		-)		X	
				X	
		-		Λ	X
	Signal				Λ
	processing			X	
		1		X	
			X		
		1	X		
		1	X		
		1	X		
		RMS	X		
		Amplitude	X		
		Threshold	X		
		Single – vs multi-channel			
		system	X	X	
		Acquisition rate Waveform digitization		X X	
		Waveform digitization		X	
		Waveform recording			X

		Digital vs analogous signal			X
		System parameter definition			X
		and selection			
		Distribution techniques			X
		Spectral analysis			X
		Cascaded hits			X
		Continuous mode			X
		measurement			X
	Source location	-	v	X	X
	processing	-	X	Λ	Λ
	processing	_	Λ	X	
				21	X
				X	
			X		
		1	X		
			X		
			X		
				X	
				X	
				X	
		_			X
		_			X
		_			X
					X
	Advanced signal	-	X		
	processing		X		
	processing		X		
			11	X	
				X	
				X	
					X
					X
					X
		(
	Equipment		X		
	adjustments	3		X	
			X		
		-			
				X	
				X	
				_	37
					X
	Fundamental of	Knowledge and use of	X		
	informatics	computers	Λ		
		Knowledge of software		X	
11.5	Information	Identification or designation	X	X	X
Information	about the test	material	37	37	37
prior to test	object	— Object to be tested	X	X	X
		— Kind of manufacture— Catalogue of defects	X	X	X
		— Catalogue of defects		Λ	Λ

		— Extent of test coverage	X	X	X
	Test conditions	Accessibility		X	X
	and application	Infrastructure			X
	of standard	Particular test conditions		X	X
		Application standard		X	X
		Stage of manufacture or service life when testing is to			X
		S t		X	X
				X	X
		1			X
	Technique and	\$		X	
	sequence of	\$		X	
	performing test	1		X	
	Instructions				X
				X	
			X		
		1			X
		1			X
11.6 Testing	Equipment set-	5	X		
	up	1	X		
		1	X		
		-	X		
			X		
			X		
			X		
		n		X	
					X
	Test		X	X	
	performance	1	X	X	
	Data acquisition	-	X X		
	and data display during test	d-	Λ		
		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	Stop criteria	X		
	actions during the test	Verification of on-line detected Acoustic emission testing sources by other NDT methods		X	
		Interpretation of the relation has some of			X
11.7 Evaluation	Data display		X		
and reporting			X X		
			X		
			X X		
			Λ	X	
		1			X
	Data interpretation		X		
			X		
				X	
		.5		X	X
	Data evaluation	3		X	Λ
		\$		X	
		1 1			X
	Documentation and reporting	1	X		
11.0				X	
11.8 Assessment	Product standards and acceptance criteria			X	
	cinteria				X
		t s			X
	Acoustic emission testing	Validation	X		
	source evaluation and test results	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	Personnel	ISO 9712		X	X	X
aspects	qualification					X
	Documentation	1	7			X
						X
		i				X
		I	n		X	
		ì		X		
		1			X	X
		I			X	X
	Knowledge of				X	
	applicable NDT	I I	S		X	
	application and	T .			X	X
	product	J.		X	X	X
	standards	Equipment verification		X	X	X
11.10	New	New developments in the fiel	ld			
Developments	developments in	of NDT (differences)				
	acoustic					X
	emission testing					
	and associated NDT techniques					