



Information Note

Codes, Standards, Practices, and Guidelines related to Acoustic Emission (AE)

Document released in September 2013

The purpose of this document is to demonstrate the wide-spread use of acoustic emission applications by listing Codes, Standards, Practices and Guidelines related to Acoustic Emission, in the alphabetical sequence of the issuing organizations, as far as Vallen Systeme GmbH is aware of at release time.

Vallen Systeme does not undertake any responsibility for the correctness and completeness of this list. Any reader discovering any incorrectness or incompleteness of our list is invited to report the desired addition or change, along with any proof if possible, and we and other readers will be happy to find the additions and changes in the next revision of this list.

Organizations issuing Codes, Standards, Practices or Guidelines for Acoustic Emission, with Abbreviation and Web Site:

1	Association Française des Ingénieurs en Appareils à Pression (A.F.I.A.P.), (www.afiap.org)	2
2	American Gear Manufacturer Association (AGMA), (www.agma.org)	2
3	American Petroleum Institute (API), (www.api.org)	2
4	American Society of Mechanical Engineers (ASME), (www.asme.org)	2
5	American Society of NDT (ASNT), (www.asnt.org)	3
6	American Society for Testing and Materials (ASTM), (www.astm.org)	3
7	Australian Standard, Australia (www.standards.org.au)	5
8	Committee on Acoustic Emission from Reinforced Plastics, Society of Plastics Industry (CARP/SPI), USA, (www.socplas.org)	6
9	Comité Européen de Normalisation (CEN), Belgium, (www.cenorm.be)	6
10	Electric Power Research Institute (EPRI), USA, (www.epri.com)	7
11	European Committee for Electrotechnical Standardization, (CENELEC), (www.cenelec.eu)	8
12	Institute of Electric and Electronic Engineers (IEEE), USA, (www.ieee.org)	8
13	International Institute of Welding, (IIW), (www.iiwelding.org)	8
14	International Organisation for Standardisation (ISO), Switzerland, (www.iso.ch)	8
15	Japanese Industrial Standard (JIS), Japan, (www.jsa.or.jp)	9
16	Japanese Society for Non-Destructive Inspection (JSNDI), Japan (www.jsndi.jp)	9
17	National Aeronautics and Space Administration (NASA), (www.nasa.gov)	9
18	National Association of Corrosion Engineers (NACE), USA, (www.nace.org)	10
19	Technischer Überwachungsverein (TÜV), DE, (www.tuev-verlag.de/ProduktVerz/tabvd005.htm)	10
20	United Kingdom Health & Safety Executive (HSE), UK (www.hse.gov.uk)	10

1 Association Française des Ingénieurs en Appareils à Pression (A.F.I.A.P.), (www.afiap.org)

Term	Title	Edition	Comment
	Guideline for acoustic emission testing of pressure equipment.	2009	pressure vessel

2 American Gear Manufacturer Association (AGMA), (www.agma.org)

Term	Title	Edition	Comment
AGMA 93FTM9	Gear Tooth Bending Fatigue Crack Detection by Acoustic Emissions and Tooth Compliance Measurements	1993	metal

3 American Petroleum Institute (API), (www.api.org)

Term	Title	Edition	Comment
ANSI/API 510	Pressure vessel inspection code: Maintenance inspection, rating, repair and alteration (Section 6.4 "External Inspection")	2006	pressure vessel
API SPEC 16A	Specification for Drill Through Equipment	2004	quality assurance drilling machine

4 American Society of Mechanical Engineers (ASME), (www.asme.org)

Term	Title	Edition	Comment
ASME	Boiler and Pressure Vessel Code Section V, Article 11, Acoustic Emission Examination of Fiber Reinforced Plastic Vessels	2001	pressure vessel, fiber reinforced plastic vessels
ASME	Boiler and Pressure Vessel Code Section V, Article 12, Acoustic Emission Examination of Metallic Vessels During Pressure Testing	2001	pressure vessel, metal
ASME	Boiler and Pressure Vessel Code Section V, Article 13, Continuous Acoustic Emission Monitoring	2001	Monitoring, metal, non-metal
ASME	Boiler and Pressure Vessel Code Section V, Article 29, Acoustic Emission Standards	2001	See ASTM E 650-97, E 976- 98, E 1211-97, E 1419-96
ASME	Boiler and Pressure Vessel Code Terminology for Nondestructive Examinations Standards, 5. Acoustic Emission	2001	See ASTM E 1316-99
ASME	Boiler and Pressure Vessel Code Section VIII, Division 1, Case No. 1968 Use of Acoustic Emission Examination in Lieu of Radiography	1985	pressure vessel valid until 1991, might be not valid

Term	Title	Edition	Comment
ASME	Boiler and Pressure Vessel Code Section XI, Division 1, Article IWA-2000, Examination and Inspection, (IWA-2234) Acoustic Emission Examination	2001	Pressure vessel, nuclear technology
ASME	Boiler and Pressure Vessel Code Section XI, Division 1, Code Case N-471, Acoustic Emission for Successive Inspections (approval date April 19, 02)	2002	Pressure vessel, nuclear technology, valid until April 19, 05
ASME	Boiler and Pressure Vessel Code Section XI, Division 1, Code Case No. N-471, Acoustic Emission for successive inspections Supplement 1 Guidance information for acoustic emission monitoring of pressure boundaries during operation (approval date 04/19/02)	2002	pressure vessel, metal, fiber reinforced plastic, valid until April 19, 05
ASME	Boiler and Pressure Vessel Code Section XI, Appendix, Acoustic Emission Monitoring of Nuclear Reactor Pressure Boundaries during Operation	2010	pressure vessel, nuclear
ASME	RTP-1-1995 Standard Guide to Test Methods and Standards for Nondestructive Testing of Advanced Ceramics	1999	Ceramics

5 American Society of NDT (ASNT), (www.asnt.org)

Term	Title	Edition	Comment
ASNT SNT-TC-1A	Personnel Qualification and Certification in Nondestructive Testing	2011	Fundamentals, certification

6 American Society for Testing and Materials (ASTM), (www.astm.org)

Term	Title	Edition	Comment
ASTM C 1175	Standard Guide to Test Methods and Standards for Nondestructive Testing of Advanced Ceramics	2010	ceramics
ASTM E 543	Standard Specification for Agencies Performing Nondestructive Testing	2013	fundamentals
ASTM E 569	Standard Practice for Acoustic Emission Monitoring of Structures During Controlled Stimulation	2013	structures
ASTM E 650	Standard Guide for Mounting Piezoelectric Acoustic Emission Sensors	2012	fundamentals
ASTM E 749	Standard Practice for Acoustic Emission Monitoring During Continuous Welding	2012	welding, monitoring
ASTM E 750	Standard Practice for Characterizing Acoustic Emission Instrumentation	2010	fundamentals
ASTM E 751	Standard Practice for Acoustic Emission Monitoring During Resistance Spot-Welding	2012	welding, monitoring

Term	Title	Edition	Comment
ASTM E 976	Standard Guide for Determining the Reproducibility of Acoustic Emission Sensor Response	2010	calibration
ASTM E 1065	Standard Guide for Evaluating Characteristics of Ultrasonic Search Units	2008	fundamentals
ASTM E 1067	Standard Practice for Acoustic Emission Examination of Fiberglass Reinforced Plastic Resin (FRP) Tanks/Vessels	2011	fiberglass reinforced plastic
ASTM E 1106	Standard Test Method for Primary Calibration of Acoustic Emission Sensors	2012	calibration
ASTM E 1118	Standard Practice for Acoustic Emission Examination of Reinforced Thermosetting Resin Pipe (RTRP)	2011	pipe, fiberglass reinforced plastic
ASTM E 1139	Standard Practice for Continuous Monitoring of Acoustic Emission from Metal Pressure Boundaries	2012	monitoring
ASTM E 1211	Standard Practice for Leak Detection and Location Using Surface-Mounted Acoustic Emission Sensors	2012	leakage
ASTM E 1212	Standard Practice for Quality Management Systems for Nondestructive Testing Agencies	2012	Quality management
ASTM E 1316	Standard Terminology for Nondestructive Examination	2013	terminology
ASTM E 1359	Standard Guide for Evaluating Capabilities of Nondestructive Testing Agencies	2012	Quality management
ASTM E 1419	Standard Practice for Examination of Seamless, Gas-Filled, Pressure Vessels Using Acoustic Emission	2009	pressure vessels
ASTM E 1495	Standard Guide for Acousto-Ultrasonic Assessment of Composites, Laminates, and Bonded Joints	2012	fiber reinforced plastic
ASTM E 1544	Standard Practice for Construction of a Stepped Block and Its Use to Estimate Errors Produced by Speed-of-Sound Measurement Systems for Use on Solids	1999 (2004) e1	fundamentals
ASTM E 1736	Standard Practice for Acousto-Ultrasonic Assessment of Filament-Wound Pressure Vessels	2010	pressure vessel, fiber reinforced plastic
ASTM E 1781	Standard Practice for Secondary Calibration of Acoustic Emission Sensors	2013	calibration
ASTM E 1888/ E 1888 M	Standard Practice for Acoustic Emission Examination of Pressurized Containers Made of Fiberglass Reinforced Plastic with Balsa Wood Cores	2012	pressure vessel, fiberglass reinforced plastic
ASTM E 1930	Standard Practice for Examination of Liquid-Filled Atmospheric and Low-Pressure Metal Storage Tanks Using Acoustic Emission	2012	pressure vessel, metal
ASTM E 1932	Standard Guide for Acoustic Emission Examination of Small Parts	2012	small parts

Term	Title	Edition	Comment
ASTM E 2075/ E 2075M	Standard Practice for Verifying the Consistency of AE-Sensor Response Using an Acrylic Rod	2010	sensor check
ASTM E 2076/ E 2076 M	Standard Practice for Examination of Fiberglass Reinforced Plastic Fan Blades Using Acoustic Emission	2010	fiberglass reinforced plastic
ASTM E 2191/ E 2191 M	Standard Practice Method for Examination of Gas-Filled Filament-Wound Composite Pressure Vessels Using Acoustic Emission	2010	pressure vessel, fiber reinforced plastic
ASTM E 2374	Standard Guide for Acoustic Emission System Performance Verification	2010	Fundamentals, verification
ASTM E 2478	Standard Practice for Determining Damage-Based Design Stress for Fiberglass Reinforced Plastic (FRP) Materials Using Acoustic Emission	2011	Composites
ASTM E 2533	Standard Guide for Nondestructive Testing of Polymer Matrix Composites Used in Aerospace Applications	2009	Composites, Aerospace
ASTM E 2598	Standard Practice for Acoustic Emission Examination of Cast Iron Yankee and Steam Heated Paper Dryers	2013	Paper Dryer
ASTM E2661/ E2661M	Standard Practice for Acoustic Emission Examination of Plate-like and Flat Panel Composite Structures Used in Aerospace Applications	2010	Composites, Aerospace
ASTM E 2863 E2863M	Standard Practice for Acoustic Emission Examination of Welded Steel Sphere Pressure Vessels Using Thermal Pressurization	2012	pressure vessels (small spheres)
ASTM E 2907	Standard Practice for Examination of Paper Machine Rolls Using Acoustic Emission from Crack Face Rubbing	2013	Paper machine roll
ASTM F 914/ F 914 M	Standard Test Method for Acoustic Emission for Aerial Personnel Devices Without Supplemental Load Handling Attachments	2010	aerial device
ASTM F 1430/ F 1430 M	Standard Test Method for Acoustic Emission Testing of Insulated and Non-Insulated Aerial Personnel Devices with Supplemental Load Handling Attachments	2010	aerial device
ASTM F 1797	Standard Test Method for Acoustic Emission Testing of Insulated and Non-Insulated Digger Derricks	2009 e1	structures
ASTM F 2174	Standard Practice for Verifying Acoustic Emission Sensor Response	2002 (2008)	sensor check
ASTM E 2374	Standard Guide for Acoustic Emission System Performance Verification	2010	Fundamentals, verification

7 Australian Standard, Australia (www.standards.org.au)

Term	Title	Edition	Comment
AS 4748-2001	Acoustic emission testing of fibreglass-insulated booms on elevating work platforms	2001	aerial device

8 Committee on Acoustic Emission from Reinforced Plastics, Society of Plastics Industry (CARP/SPI), USA, (www.socplas.org)

Term	Title	Edition	Comment
CARP/SPI	Recommended Practice for Acoustic Emission Evaluation of Fiber Reinforced Plastic (FRP) Tanks and Pressure Vessels	Draft Oct 1999	compare to ASTM E 1067
CARP/SPI	Recommended Practice for Acoustic Emission Testing of Fiberglass Reinforced Plastic Piping Systems	1988	fiberglass reinforced plastic
CARP/SPI	Recommended Practice for Acoustic Emission Testing of Reinforced Thermosetting Resin Pipe (RTRP)	1983	compare to ASTM E 1118
CARP/SPI	Recommended Practice for Acoustic Emission Testing of Pressurized Highway Tankers made of Fiberglass Reinforced Plastic with Balsa Cores	1993	compare to ASTM E 1888
CARP/SPI	Guidance for Development of AE Applications on Composites	1993	fiber reinforced plastic

9 Comité Européen de Normalisation (CEN), Belgium, (www.cenorm.be)

In English: European Committee for Standardization.

Information provided with CEN standards: "CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration."

Term	Title	Edition	Comment
CEN EN 1071-3 :2005	Advanced technical ceramics - Methods of test for ceramic coatings - Part 3: Determination of adhesion and other mechanical failure modes by a scratch test	2005	ceramics
CEN EN 1330-1 :1998	Non-destructive testing – Terminology – Part 1: List of general terms	1998	terminology
CEN EN 1330-2 :1998	Non-destructive testing – Terminology – Part 2: Terms common to the non-destructive testing methods	1998	terminology
CEN EN 1330-9 :2009	Non-destructive testing – Terminology – Part 9: Terms used in acoustic emission testing	2009	terminology
CEN EN 12817 :2010	LPG Equipment and accessories - Inspection and requalification of LPG tanks up to and including 13 m ³	2010	LPG tanks
CEN EN 12819 :2009	LPG equipment and accessories - Inspection and requalification of LPG tanks greater than 13 m ³	2009	LPG tanks
CEN ISO/TR 13115:2011	Non-destructive testing - Methods for absolute calibration of acoustic emission transducers by the reciprocity technique (ISO/TR 13115:2011)	2011	fundamentals calibration
CEN EN 13445-5 :2009	Unfired pressure vessels - Part 5: Inspection and testing (Annex E)	2009	pressure vessel
CEN EN 13477-1 :2001	Non-destructive testing – Acoustic emission – Equipment characterization - Part 1: Equipment description	2001	fundamentals

Term	Title	Edition	Comment
CEN EN 13477-2 :2010	Non-destructive testing – Acoustic emission – Equipment characterization - Part 2: Verification of operating characteristic	2010	fundamentals calibration
CEN EN 13554 :2011	Non-destructive testing – Acoustic emission – General principles	2011	fundamentals
CEN EN 13480-5 :2012	Metallic industrial piping - Part 5: Inspection and testing	2012	piping
CEN EN 14584 :2013	Non-destructive testing - Acoustic emission - Examination of metallic pressure equipment during proof testing - Planar location of AE sources	2013	location
CEN EN 15495 :2007	Non Destructive testing - Acoustic emission - Examination of metallic pressure equipment during proof testing - Zone location of AE sources	2007	location
CEN EN 15856 :2010	Non-destructive testing - Acoustic emission - General principles of AE testing for the detection of corrosion within metallic surrounding filled with liquid	2010	Storage tanks
CEN EN 15857 :2010	Non-destructive testing - Acoustic emission - Testing of fibre-reinforced polymers - Specific methodology and general evaluation criteria	2010	FRP
CEN EN ISO 16148:2006	Gas cylinders - Refillable seamless steel gas cylinders - Acoustic emission testing (AT) for periodic inspection (ISO 16148:2006)	2006	pressure vessels
CEN ISO/TR 25107:2006	Non-destructive testing - Guidelines for NDT training syllabuses (ISO/TR 25107:2006)	2006	Training
CEN CR 13935:2000	Non-destructive testing - Generic NDE data format model	2000	Data format
97/23/EC	Pressure Equipment Directive	November 1999	Pressure vessels

10 Electric Power Research Institute (EPRI), USA, (www.epri.com)

Term	Title	Edition	Comment
EPRI NP-6844	Acoustic Emission for Detecting Crack Initiation in Stainless Steel	Mai 1990	metal
EPRI TR-105265-V1	Acoustic Emission Monitoring of High-Energy Steam Piping: Volume 1: Acoustic Emission Monitoring Guidelines for Hot Reheat Piping	January 1996	steam pipes
EPRI TR-107147	Acoustic Emission Monitoring of Reactor Vessel Head and Internal Lift Rigs	August 1997	nuclear technique
EPRI 1011708	Development of a New Acoustic Emission Technique for the Detection and Location of Gassing Sources in Power Transformers and LTCs	May 2005	location, electrical engineering

Term	Title	Edition	Comment
EPRI 1004329	Guidelines for the Evaluation of Seam-Welded High-Energy Piping	December 2003	pipes
EPRI 1012344	Technical Update: Development and Testing of an On-Line AE (Acoustic Emission)/Vibration Instrument	December 2006	transformer
EPRI 1021893	Technical Update: Converting Data into Action: New Clustering Algorithms for Acoustic Emission Signals	December 2011	transformer

11 European Committee for Electrotechnical Standardization, (CENELEC), (www.cenelec.eu)

CENELEC is like CEN one of the three European Standardization Organisations.

Term	Title	Edition	Comment
EN 61057:1993	Aerial devices with insulating boom used for live working exceeding 1 kV a.c. (bases on similar standard published by IEC 61057:1991)	1993	aerial device

12 Institute of Electric and Electronic Engineers (IEEE), USA, (www.ieee.org)

Term	Title	Edition	Comment
IEEE C57.127-2007	Trial-Use Guide for the Detection of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers	2007	partial discharges

13 International Institute of Welding, (IIW), (www.iiwelding.org)

The internet page of this institute offers a search function in a technical database finding many papers dealing with acoustic emission. Only one recent conference paper from 2011 listed here as example.

Term	Title	Edition	Comment
ICRA-2011-AUS-S801	Conf. Paper: ACOUSTIC EMISSION MONITORING IN POWER STATIONS	2011	Piping

14 International Organisation for Standardisation (ISO), Switzerland, (www.iso.ch)

Term	Title	Edition	Comment
ISO 9712:2012	Non-destructive testing -- Qualification and certification of personnel Hint: CEN EN 473 was superseded in 2012 by this standard.	2012	qualification
ISO 12713:1998	Non-destructive testing – AE-Testing – Primary Calibration of Acoustic Emission Sensors	July 1998	calibration
ISO 12714:1999	Non-destructive testing – AE-Testing – Secondary Calibration of Acoustic Emission Sensors	July 1999	calibration
ISO 12716:2001	Non-destructive testing – AE-Testing – Terminology	2001	terminology

Term	Title	Edition	Comment
ISO/TR 13115 :2011	Non-destructive testing -- Methods for absolute calibration of acoustic emission transducers by the reciprocity technique	2011	calibration
ISO 16148 :2006	Gas cylinders -- Refillable seamless steel gas cylinders -- Acoustic emission testing (AT) for periodic inspection	2006	pressure vessels
ISO 18436-6 :2008	Condition monitoring and diagnostics of machines -- Requirements for qualification and assessment of personnel -- Part 6: Acoustic emission	2008	condition monitoring, qualification
ISO 22096 :2007	Condition monitoring and diagnostics of machines -- Acoustic emission	2007	condition monitoring
ISO 25107 :2006	Non-destructive testing -- Guidelines for NDT training syllabuses	2006	training

15 Japanese Industrial Standard (JIS), Japan, (www.jisa.or.jp)

Term	Title	Edition	Comment
JIS Z 2342:2003	Methods for acoustic emission testing of pressure vessels during pressure test and classification of test results	2003	pressure vessels, compare with NDIS 2342

16 Japanese Society for Non-Destructive Inspection (JSNDI), Japan (www.jsndi.jp)

Term	Title	Edition	Comment
NDIS 2106	Evaluation of performance characteristics of acoustic emission equipment	1997	fundamentals
NDIS 2109	Method for absolute calibration of acoustic emission transducers by reciprocity technique	2004	calibration
NDIS 2110	Method for measurement of sensitivity degradation of acoustic emission transducer	December 1997	calibration
NDIS 2412	Acoustic emission testing of spherical pressure vessels made of high tensile strength steel and classification of test results	1980	pressure vessels, metal
NDIS 2421	Recommended practice for in situ monitoring of concrete structures by acoustic emission	2000	Structures, concrete

17 National Aeronautics and Space Administration (NASA), (www.nasa.gov)

Term	Title	Edition	Comment
NASA NPR 8831.2E	Facilities Maintenance and Operations Management (Appendix F Predictive Testing & Inspection)	Nov 2008	Leakage, flaw detection
	Innovation project: Use of Modal Acoustic Emission to Monitor Damage Progression in Carbon Fiber/Epoxy Tows and Implications for Composite Structures	2011	composites

18 National Association of Corrosion Engineers (NACE), USA, (www.nace.org)

Term	Title	Edition	Comment
NACE SP0296-2010 (formerly RP0296)	Detection, Repair, and Mitigation of Cracking in Refinery Equipment in Wet H ₂ S Environments	2010	pressure vessels

19 Technischer Überwachungsverein (TÜV), DE, (www.tuev-verlag.de/ProduktVerz/tabvd005.htm)

Term	Title	Edition	Comment
TÜV MB 369	Durchführung der Schallemissionsprüfung (SEP) bei Gasdruckprüfungen an Druckbehältern in Gasspeicheranlagen	May 2001	pressure vessels
TÜV MB DRBE 375	Durchführung der Schallemissionsprüfung (SEP) bei Gasdruckprüfungen an CNG-Speicherbehältern von Füllanlagen	July 2008	pressure vessels

20 United Kingdom Health & Safety Executive (HSE), UK (www.hse.gov.uk)

Many studies and research reports can be found on the internet page of HSE, only two examples listed below:

Term	Title	Edition	Comment
RR328	Research Report: Acoustic monitoring of the hulls of Floating Production Storage and Offloading facilities (FPSOs) for corrosion and damage	2005	monitoring, overview
RR685	Research Report: Structural integrity monitoring, Review and appraisal of current technologies for offshore applications	2009	monitoring, overview