

# ULTRASONIC TESTING

UT

Qualification training according to the ISO 9712

PROCESS	SYSTEM	METHOD	LEVEL / TECHNIQUE	SECTOR	CODE	VALID FROM	PREPARED BY
NDT	ISO 9712	UT	1, 2, 3	MS, w, c, t	-	1 / 2023	ŽBÁNEK

## INTRODUCTION

**Purpose of Ultrasonic Testing method (UT) is detection of mainly internal and back-wall (root side) defects in industrial parts and components using ultrasonic waves.**

UT qualified personnel has to have knowledge of its **physics principles**, be familiar with overall **requirements of most widely codes and standards**, be able to expand them to new applications and be **able to perform and document testing**.

Training focuses on **gaining knowledge and essential skills** to be further strengthened when collecting experience. Duration and content of the training **depends on the qualification level pursued** as well as the **product or industrial sector selected** (e.g. welding, casting, multisector applications etc.).

Training are designed to prepare participants for all examination parts – **general** (physics principles), **specific** (use of standards and codes), and **practical** (performance of the method) acc. to EN ISO 9712 in the ATG CERT Examination Center.

## RECOMMENDED PUBLICATIONS

### ATG publications

- UT – Ultrasonic Testing, Level 1, 2 (ATG handbook)
- UT – Collections of formulas (published by ATG)

### Other publications

- Personnel Training Publications: Ultrasonic Testing (UT) Programmed Instruction Series (ASNT handbook)
- Level III Study Guide: Ultrasonic Testing Method (UT) (ASNT handbook)
- Relevant Discontinuities – Ultrasonic Testing (UT) (ASNT handbook)
- Nondestructive Testing Handbook, Third Edition: Volume 7, Ultrasonic Testing (ASNT handbook)

## SYLLABUS COVERAGE

Training provides theoretical and practical training to understand Ultrasonic Testing (UT) principles, be familiar with various types of equipment, accessories, and other aids, and handling of tested parts and components to perform safely Ultrasonic Testing, report (and evaluate for Level 2 and Level 3) results of the testing.

## TRAINING DURATION

		SECTOR	LEVEL I	LEVEL II	LEVEL III
<b>MS</b>	Multisector		8 d (64 h)	10 d (80 h)	5 d (40 h)
<b>w</b>	Welds		8 d (64 h)	10 d (80 h)	5 d (40 h)
<b>c</b>	Castings		8 d (64 h)	10 d (80 h)	5 d (40 h)
<b>t</b>	Tubes		8 d (64 h)	10 d (80 h)	5 d (40 h)

## BODY OF KNOWLEDGE – DISCONTINUITIES OF MATERIALS

Content of this body of knowledge does not have dedicated part of examination, however it can be indirectly included in other examination parts.

SUBJECT		LEVEL I	LEVEL II	LEVEL III
<b>1</b>	<b>Types of discontinuities</b>			
1.1	Differentiation of discontinuities based on their initiation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.2	Discontinuities of castings	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3	Discontinuities of forgings	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.4	Discontinuities of welds	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.5	Heat treatment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.6	Discontinuities initiated during processing and service	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.6.1	Abrasion cracks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.6.2	Material fatigue	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.6.3	Stress corrosion	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.6.4	Creep	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

## BODY OF KNOWLEDGE – GENERAL PART

SUBJECT		LEVEL I	LEVEL II	LEVEL III
<b>1</b>	<b>Physical Principles</b>			
1.1	Physical definitions and typical parameters	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.2	Oscillation – sinusoidal movement	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3	Waves and wave modes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3.1	Longitudinal waves	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3.2	Transversal waves	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3.3	Surface waves	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3.4	Plate waves	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3.5	Creeping waves	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.4	Acoustic pressure	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.5	Acoustic impedance, factors of reflection and transmission	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.6	Normal incidence, transmission, and reflection	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.7	Incidence oblique, refraction, Snell's law	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.7.1	1 <sup>st</sup> and 2 <sup>nd</sup> Critical angles, mode conversion	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.7.2	3 <sup>rd</sup> Critical angle, mode conversion	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.8	Transmission and reception of ultrasonic waves	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.9	Velocity of propagation of ultrasonic waves	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.9.1	Velocity measurement and dispersion	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1.9.2	Relation between velocity and elastic properties of material	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1.10	Isotropic and anisotropic materials	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

SUBJECT		LEVEL I	LEVEL II	LEVEL III
1.11	Phenomena of guided propagation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1.12	Source of ultrasonic waves	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.12.1	Piezo-electric effect	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.12.2	Ferro-electricity or electrostriction Magnetostriction	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>2</b>	<b>Propagation of Ultrasonic Waves</b>			
2.1	Characteristic of the beam of circular transducer	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.1.1	Near field	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.1.2	Far field	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.1.3	Beam divergence	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.2	Characteristic of the beam of rectangular transducer	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.3	Transducer characteristics – material, dimensions, piezo-electric constants	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.4	Beam profiling, beam divergence factor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.5	Reflection of wave from reflectors - overview	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.5.1	Back wall	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.5.2	Flat bottom hole	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.5.3	Side drilled hole	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.5.3	Notches	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.6	Attenuation of ultrasound	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.6.1	Attenuation measuring	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.6.2	Attenuation factor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.7	Transfer losses	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.7.1	Determination of transfer losses	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.7.2	Transition correction	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>3</b>	<b>Equipment</b>			
3.1	Principle of ultrasonic device analogue and digital	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.2	Functions of ultrasonic device	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.2.1	Pulse generation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.2.2	Reception and amplification	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.2.3	Time base setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.2.4	Gates, monitors	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.2.5	Screen types	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.2.6	Advanced functions	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.3	Types of signal presentation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.3.1	A-scan	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.3.2	B-scan, C scan	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.3.2	Other types of signal presentations D-scan, P-scan etc.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.4	Various types of probes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.4.1	Contact probes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.4.2	Immersion probes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

SUBJECT		LEVEL I	LEVEL II	LEVEL III
3.4.3	Special type of probes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.4.4	Damping of probes – selection for required resolution and reduction of noise	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.4.5	Measurement of probes pulse length	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.5	Acoustic coupling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.5.1	Contact coupling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.5.2	Immersion coupling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.5.3	Dry coupling	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.6	Connecting cables	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.7	Digital flaw detector – sampling rate and digitization	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>4</b>	<b>Ultrasonic Testing Techniques</b>			
4.1	Techniques of ultrasonic testing - overview	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.2	Pulse-Echo technique	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.2.1	Straight beam	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.2.2	Angle beam	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.3	Through-Transmission technique	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.3.1	Straight beam	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.3.2	Angle beam	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.4	Resonance technique	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.5	Tandem technique	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.6	LLT technique	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.7	TOFD technique	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.8	Phased Array technique	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.9	Air coupled technique	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.10	Pulse "Pitch-Catch" technique	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.11	Impedance technique	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.12	Ultrasonic thickness measurement	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.13	Choice of techniques	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>5</b>	<b>Calibration Of Ultrasonic Equipment</b>			
5.1	Checking of ultrasonic system (equipment-probe-cable)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.2	Verifying of ultrasonic equipment characteristics	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.3	Calibration blocks	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.3.1	Standardized	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.3.2	The other	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.4	Reference and transfer blocks	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.5	Time base setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.5.1	For normal scanning	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.5.2	For oblique scanning	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.5.3	Methods of time base calibration	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

SUBJECT		LEVEL I	LEVEL II	LEVEL III
5.6	Verification of other parameters	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.7	Sensitivity setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.7.1	For normal scanning	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.7.2	For oblique scanning	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.7.3	DAC correction	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.7.4	DGS method	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.7.5	TCG correction	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.8	Registration levels	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>6</b>	<b>Evaluation Of Defects</b>			
6.1	Evaluation levels	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.2	Evaluation of amplitude using reference blocks - DAC	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.3	Evaluation of amplitude using DGS diagram	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.4	Defect length assessment methods	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.4.1	Drop about 6dB	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.4.2	Registration length	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.4.3	Other methods	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.5	Shape of echo	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.6	Evaluation of Decrease of the back wall echo	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.7	Population of indications	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.8	Effects of reflectors' surface	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.9	Defect type characterization techniques	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.10	Interpretation of indications	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.11	Acceptance levels - evaluation acc.to standards, specifications ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.12	Reporting of results	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.13	Storage and recording process	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>7</b>	<b>Effect Of Product Geometry</b>			
7.1	Product geometry categories	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7.2	Effect of surface curvature	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7.3	Probes' shoes adaption	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7.4	Side wall effect	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7.5	Geometry indications	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>8</b>	<b>Automation Of Testing</b>			
8.1	Mechanization and automation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8.2	Automatic and semi-automatic systems	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8.3	Multi-channel systems	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8.4	Additional instrumentation for automation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8.5	Immersion testing for automation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8.5.1	Normal scanning immersion testing	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8.5.2	Oblique scanning immersion testing	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

SUBJECT		LEVEL I	LEVEL II	LEVEL III
8.5.3	Reporting of immersion testing	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8.6	Types of scanning of components	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8.6.1	Scan index	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8.6.2	Scanning speed	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8.6.3	PRF selection	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## BODY OF KNOWLEDGE – SPECIFIC PART

The content of specific part is modified according to product sector which is covered by training. Multisector includes standards from all sectors. Level of detail paid to particular documents depends on the level of the training (Level I, Level II or III).

STANDARD		LEVEL I	LEVEL II	LEVEL III
<b>1</b>	<b>General Methodology</b>			
EN 1330 – 4	Non-destructive testing. Terminology. Terms used in ultrasonic testing	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN 583 – 1	Non-destructive testing. Ultrasonic examination. General principles	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN 14127	Non-destructive testing. Ultrasonic thickness measurement	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN ISO 7963	Non-destructive testing. Ultrasonic testing. Specification for calibration block No. 2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN ISO 2400	Non-destructive testing. Ultrasonic testing. Specification for calibration block No. 1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN 12668 - 1	Non-destructive testing. Characterization and verification of ultrasonic examination equipment. Instruments	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
EN 12668 - 2	Non-destructive testing. Characterization and verification of ultrasonic examination equipment. Probes	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
EN 12668 - 3	Non-destructive testing. Characterization and verification of ultrasonic examination equipment. Combined equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>2</b>	<b>Welds</b>			
EN ISO 11666	Non-destructive testing of welds - Ultrasonic testing - Acceptance levels	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN ISO 23279	Non-destructive testing of welds - Ultrasonic testing - Characterization of indications in welds	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN ISO 17640	Non-destructive testing of welds - Ultrasonic testing - Techniques, testing levels, and assessment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ASME Code V, VIII	Boiler and Pressure Vessel Code	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
EN ISO 22825	Non-destructive testing of welds - Ultrasonic testing - Testing of welds in austenitic steels and nickel-based alloys	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
EN ISO 10863	Non-destructive testing of welds - Ultrasonic testing - Use of time-of-flight diffraction technique (TOFD)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>3</b>	<b>Forgings</b>			
EN 10228 – 3	Non-destructive testing of steel forgings. Ultrasonic testing of ferritic or martensitic steel forgings	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN 10308	Non-destructive testing. Ultrasonic testing of steel bars	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN 10160	Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

STANDARD		LEVEL I	LEVEL II	LEVEL III
EN 10307	Non-destructive testing. Ultrasonic testing of austenitic and austenitic-ferritic stainless steels flat products of thickness equal to or greater than 6 mm (reflection method)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
EN 10228 - 4	Non-destructive testing of steel forgings. Ultrasonic testing of austenitic and austenitic-ferritic stainless steel forgings	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>4</b>	<b>Castings</b>			
EN 12680 - 1	Founding. Ultrasonic examination. Steel castings for general purposes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN 12680 - 2	Founding. Ultrasonic examination. Steel castings for highly stressed components	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
EN 12680 - 3	Founding. Ultrasonic examination. Spheroidal graphite cast iron castings	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>5</b>	<b>Tubes</b>			
EN ISO 10893 - 8	Non-destructive testing of steel tubes - Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN ISO 10893 - 9	Non-destructive testing of steel tubes - Part 9: Automated ultrasonic testing for the detection of laminar imperfections in strip/plate used for the manufacture of welded steel tubes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN ISO 10893 - 10	Non-destructive testing of steel tubes - Part 10: Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN ISO 10893 - 11	Non-destructive testing of steel tubes - Part 11: Automated ultrasonic testing of the weld seam of welded steel tubes for the detection of longitudinal and/or transverse imperfections	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
EN ISO 10893 - 12	Non-destructive testing of steel tubes - Part 12: Automated full peripheral ultrasonic thickness testing of seamless and welded (except submerged arc-welded) steel tubes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

## BODY OF KNOWLEDGE – PRACTICAL PART

In the practical part of the training the trainees practice working with instructions and procedures as well as knowledge gained from the standards discussed in the specific part. Training and examination specimens are representative for given product sectors.

SUBJECT		LEVEL I	LEVEL II	LEVEL III
<b>1</b>	<b>General</b>			
1.1	Using of ultrasonic devices	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.2	Calibration of ultrasonic devices	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3	Defect detection and interpretation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.4	Checking of ultrasonic system	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.5	Verification of probe parameters	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>2</b>	<b>Testing According To Instructions</b>			
2.1	Welds	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.1.1	Contact pulse-echo technique angle beam probe	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.1.2	Contact pulse-echo technique straight beam probe	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

SUBJECT		LEVEL I	LEVEL II	LEVEL III
2.2	Forgings and castings	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.2.1	Contact pulse-echo technique straight beam probe	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.2.2	Contact pulse-echo technique twin probe	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.2.3	Contact pulse-echo technique angle beam probe	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>3</b>	<b>Evaluation of products Quality</b>			
3.1	Welds	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.2	Forgings	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.3	Castings	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

## BODY OF KNOWLEDGE – DOCUMENTATION

In the practical part of the training the trainees practice dealing with process documentation from reporting results to reports, drafting instructions and procedures.

SUBJECT		LEVEL I	LEVEL II	LEVEL III
<b>1</b>	<b>Test Report</b>			
1.1	Purpose	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.2	Tested part	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3	Testing conditions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.4	Reporting findings	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.5	Evaluation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>2</b>	<b>Written Instruction</b>			
2.1	Validity range	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.2	Personnel requirements	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.3	Inspection range and area of interest	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.4	Equipment and accessories	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.5	Testing parameters and their verification	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.6	Evaluation, acceptance criteria	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.7	Reporting	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.8	Post-testing activity	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>3</b>	<b>Written Procedure</b>			
3.1	Validity range	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.2	Personnel requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.3	Inspection range and scheduled plan	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.4	Equipment, accessories and control activities	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.5	Setting of parameters	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.6	Testing parameters	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.7	Evaluation, acceptance criteria	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.8	Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.9	Post-testing activity	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>