Phased Array Ultrasonic Testing

(PAUT)

Course Curriculum

Table of Contents

Who we are?

African NDT Centre (Pty) Ltd is an NDT training and service provider organization located in Roodepoort, South Africa, providing complete solutions for NDT training and inspection.

We conduct training for PCN certification for level 1,2 and 3 in the following methods:

- PCN - Eddy Current Testing (ET)
- PCN - Ultrasonic Testing (UT)
- PCN - Magnetic Particle Testing (MT)
- PCN - Liquid Penetrant Testing (PT)
- PCN - Radiographic Testing (RT)
- PCN – Radiographic Interpretation (RI)
- PCN – Basic Radiation Safety (BRS)
- PCN – Visual Testing (VT)
- PCN – UT Phased Array (PAUT)
- PCN – UT Time of Flight Diffraction (TOFD)

How to Book Your Training Course

To book a training course, simply contact us via phone or email and we will be happy to discuss your requirements. If necessary, we can provide advice on which type of training and certification is appropriate for you or your company.

Courses can be booked and paid online on the following links:
ANDTC Constantia Kloof Campus: https://andtc.com/courses-constantia-kloof/
ANDTC Vaal Training Centre: https://andtc.com/courses-vaal/

Training courses are conducted on a regular basis at both our branches, and PCN examinations are run ongoing at our Roodepoort Examination Centre.

Contact Us

ANDTC Constantia Kloof

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PCN ATO Authorization Number: 0838

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PCN ATO Authorization Number: 0837

What is Phased Array Ultrasonic Testing?

Phased Array Ultrasonic Testing (PAUT) is an advanced ultrasonic NDT method that uses a multi-element probe (typically 16–256 elements) to electronically steer, focus, and shape ultrasonic beams without moving the probe mechanically. It produces real-time, high-resolution images (A-scan, B-scan, C-scan, S-scan) of internal defects in welds, forgings, and composites — dramatically improving speed, coverage, and detectability over conventional UT.

How It Works:

1. Multi-Element Probe
2. Electronic Pulsing (Phasing)
3. Beam Formation
4. Data Acquisition & Imaging

Applications:

- Weld inspection
- Corrosion mapping: Tanks, pipes, vessels (grid or encoded).
- Aerospace: Composites, bond lines, honeycomb.
- Forgings & castings: Crack detection in turbine blades.
- In-service: CUI, HTHA, crack sizing.

Equipment:

- Probes: 1D linear, 2D matrix, dual linear, curved arrays.
- Instruments: Olympus Omniscan, GE Mentor, Zetec TOPAZ, Sonatest VEO.
- Software: Beam simulation, data analysis, reporting (Tomoview, UltraVision).

Advantages:

- Single-pass full volumetric coverage.
- Permanent digital records (audit-ready).
- High POD for planar defects (cracks, LOF).
- No radiation (unlike RT).
- Encoded scans → repeatable, traceable.

Limitations:

- High cost (equipment, training).
- Requires skilled Level 2/3 operators.
- Couplant needed (gel, water).
- Complex setup (focal laws, calibration).
- Data overload (large files).

About the Course

PCN Level 2

This course equips participants with a solid understanding of PAUT theory and its practical application on welds, castings & forgings (multi-sector) preparing and qualifying them as PCN Level II in PAUT.

PCN Level 3

This guidance course targets the PCN Level 3 requirements for PAUT practitioners. Its primary goal is to familiarise candidates with the examination scope and required knowledge level. It helps identify weaker subject areas and provides advice on any additional training needed.

Qualification Requirements

Prerequisites

- Matric (Grade 12) with Mathematics and/or Science
- Basic understanding of physics principles (recommended)
- For Level 3: Previous PCN certification as required by PCN standards

Training Hours

Level 2	Level 3
15 Days	5 Days

Note: Direct access to Level 2 or 3 requires the total days shown in the table for Levels 1 and 2, or Levels 1, 2 and 3 respectively.

Product Sector

Multi Sector - This course prepares candidates for certification across multiple product sectors as defined by PCN standards.

Experience Requirements

Level 2	Level 3
4 Months	24 Months

Note: Experience may be acquired either prior to (for Level 1 and 2 entry only) or following success in the qualification examination. However, the chances of success in a PCN examination may be significantly reduced if candidates have little or no current experience in the application of the NDT method in the sector concerned.

Documents to be Submitted for Examination

- Valid PCN UT Level 2 Cert
- ID
- PSL 57-A Initial Examination Application
- PSL 30 - Log of Experience
- PSL 44 - Vision Requirements
- CP-27 Code of Ethics
- PCN ID (wallet or e-certificate) -only for existing PCN certificate holders
- Proof of either holding PCN certification or successful completion of BINDT PCN Online Product Technology- cert with QR code
- One government-approved identity document (Passport/ID Card/Driver's License)
- Note: Blank PSL and CP forms can be collected from ANDTC offices during course or downloaded from BINDT website.

Learning Outcomes

PCN Level 2

Upon completion, the candidate shall be able to:

1. Master PAUT Theory & Beam Physics
2. Set Up & Calibrate PAUT Equipment Independently
3. Write & Execute PAUT Written Instructions
4. Perform Full Volumetric Inspection with Encoded Data
5. Accurately Size & Characterize Defects
6. Interpret Codes & Apply Acceptance Criteria
7. Produce Audit-Ready Digital Reports
8. Perform Practical Examination (PCN Level 2 PAUT)

PCN Level 3

Upon completion, the candidate shall be able to:

1. Master Advanced PAUT Physics & Modelling
2. Design & Qualify PAUT Procedures for Critical Applications
3. Supervise, Audit & Train Level 1&2 PAUT Personnel
4. Interpret Complex PAUT Data & Resolve Ambiguities
5. Lead PAUT Program & Code Compliance
6. Integrate PAUT with Other NDT & Digital Systems
7. Prepare for PCN Level 3 Examination (PAUT).

What to Bring?

- Own PPE (coveralls or lab coat, safety boots)
- PCN wallet card or other form of photographic identification

Special Notes

- African NDT Centre reserves the right to disqualify participants from the certification program when personnel are found not to meet PCN requirements
- Participants are not allowed to use their own equipment during training and examination. African NDT Centre provides all necessary ET equipment and accessories
- Professional dress code must be followed during the entire training and examination period
- Once enrolled, joining instructions will be sent via email with all necessary information communicated telephonically

Training and Examination Information

The training program comprises daily assessments after completion of each chapter, and participants are required to achieve above 70% marks. Based on daily assessment performance, candidates are awarded successful completion of training.

Participants are then required to undergo PCN examination which consists of:

- Theory examination
- Practical examination
- NDT instruction writing (Level 2 only)

Candidates must obtain a minimum of 70% in each examination element to achieve PCN certification as Level 1, 2, or 3.

PCN certification is valid for 5 years from the date of certification. The certificate must be renewed according to PCN requirements.

Syllabus Reference

This curriculum is aligned with the PCN examination syllabus as published in **PCN24/GEN/Appendix Z1 - NDT Examination Syllabi, Issue 1, February 2024**.

The detailed syllabus breakdown covering all topics for Level 1, 2, and 3 is available in our comprehensive course documentation (Document No: CC-PA, Issue 2, dated 01/07/2024 noted as Annexure A)

African NDT Centre regularly reviews and updates the curriculum in line with scientific, industrial, and technological developments in eddy current testing, as well as any changes to PCN certification requirements.

ANNEXURE A

Contents	Level 1	Level 2	Level 3 (Note 1)
1.0 Principles of phased array probes	1.0. Array of piezo-electric elements 1.1 Delays 1.2 Control of beam shape and angle 1.3 Laws 1.4 Fundamental principles of probe performance and design	1.1. Array of piezo-electric elements 1.1 Delays 1.2 Control of beam shape and angle 1.3 Laws 1.4 Fundamental principles of probe performance and design	Not Presented
2.0 Principles of inspection sensitivity	2.0 Reference reflectors 2.1 Sensitivity to misaligned defects	2.0 Reference reflectors 2.1 Sensitivity to misaligned defects	Not Presented
3.0 Phased array instrument	3.0 Control panel including input and output sockets 3.1 Block diagram of internal circuit modules	3.0 Control panel including input and output sockets 3.1 Block diagram of internal circuit modules	Not Presented

4.0 Scanning with phased array probes	4.0. Swept beams 4.1. Linear scans 4.2. Fixed beam scans 4.3. Line scans – raster scans	4.4. Swept beams 4.5. Linear scans 4.6. Fixed beam scans 4.7. Line scans – raster scans	Not Presented
5.0 Calibration and checks	5.0 Checking probe elements 5.1 Beam angles and offsets/index point 5.2 Beam shape	5.0 Checking probe elements 5.1 Beam angles and offsets/index point 5.2 Beam shape	Not Presented
6.0 Software for data collection	6.0 Fie structure 6.1 Basic interface and windows options or panes 6.2 Status bar 6.3 Setup parameters 6.4 Inspection sequence –tabs: sequence and encoder settings 6.5 UT settings –tabs: acquisition, probe, configuration, etc. 6.6 Data acquisition controls and protocol 6.7 Acquisition toolbar 6.8 Online views of data presentation	6.0 Fie structure 6.1 Basic interface and windows options or panes 6.2 Status bar 6.3 Setup parameters 6.4 Inspection sequence –tabs: sequence and encoder settings 6.5 UT settings –tabs: acquisition, probe, configuration, etc. 6.6 Data acquisition controls and protocol 6.7 Acquisition toolbar 6.8 Online views of data presentation 6.9 Analysis mode 6.10 Data analysis view types 6.11 Analysis tools 6.12 Volumetric image merging principles	Not Presented

7.0 Principles of data analysis	Not Applicable	7.0 Review of data analysis for conventional ultrasonic inspection image formats and specific application to ultrasonic phased arrays	Not Presented
8.0 Software familiarity	8.0 Displays and display types – options available to customise these including echo-dynamic patterns B, C, D scan formats and merged volumetric views 8.1 Cursors and gates 8.2 Reporting and data file conversions available 8.3 Saving files	8.0 Volumetric merge options 8.1 Displays and display types – options available to customise these including echo-dynamic patterns B, C, D scan formats and merged volumetric views 8.2 Soft gain and thresholds including gating and DAC curves 8.3 Overlays – creating and importing/manipulating 8.4 Cursors and gates 8.5 Reporting and data file conversions available 8.6 Saving files	Not Presented
9.0 Use of software tools for defect detection and sizing	Not Applicable	9.0 Use of software tools for defect detection and sizing	Not Presented

10.0 Data analysis	Not Applicable	10.0 Data analysis	Not Presented
11.0 Procedures for verification of flaw existance and position	11.0 Procedures for verification of flaw existance and position	11.0 Procedures for verification of flaw existance and position	Not Presented
12.0 Reporting	12.0 Reporting	12.0 Reporting	Not Presented

Note 1: Phased Array level 3 course not available through ANDTc