

Opleidingsprogramma PA (Phased Array)

Het opleidingsprogramma dient de kandidaat voor te bereiden voor het examen PA niveau 2. De totale minimale cursus duur is vermeld in de Hobeon SKO Regelingen SKNDO (par. 6).

| | Description | Omschrijving | aantal uren theorie | aantal uren praktijk |
|-----|---|--|------------------------|-------------------------|
| 1. | Physics of Phased Array | Grondbeginselen Phased Array | 2 | |
| 1.1 | Vibration and waves Wave types, mode conversion Arrival time of signals Depth and position calculation | Trillingen en golven Golf types, golftransformatie Aankomsttijden van signalen Diepte en positie berekening | | |
| 1.2 | Reflection, refraction and diffraction (incl. Snell's law, Huygens principle) | Reflectie, breking en diffractie (incl. Wet van Snellius en Huygens) | | |
| 1.3 | Orientation dependance | Oriëntatie afhankelijkheid | | |
| 1.4 | Interference | Interferentie | | |
| 2. | Probes | Tasters | 4 | |
| 2.1 | Frequency, crystal size and sound beams | Frequentie, kristal afmeting en geluidsbundels | | |
| 2.2 | Pulse height and width | Pulshoogte en breedte | | |
| 2.3 | Near field and far field | Nabije veld en verre veld | | |
| 2.4 | Probe delay and index | Probe delay en inzendpunt | | |
| 3. | Examination parameters | Onderzoekparameters | 4 | |
| 3.1 | Incident angle / probe selection | Inzendhoek en tasterkeuze | | |
| 3.2 | Time delays, steering focusing | Delays, sturing en focussering | | |
| 3.3 | Focal laws | Focus wetten | | |
| 3.4 | Equipment settings | Apparatuur instellingen | | |
| 3.5 | Signal amplitude | Signaal amplitude | | |
| 3.6 | Timing and coverage | Tijdsvenster en dekking | | |
| 3.7 | Bandwidth and filtering Pulse Repetition Frequency S/N ratio, averaging | Bandbreedte en filtering Pulsherhalingsfrequentie Signaal Ruis verhouding, signaal middeling | | |
| 3.8 | Reference calibration | Referentie / gevoeligheidscalibratie | | |
| 3.9 | Coupling conditions | Aankoppeling | | |
| 4 | Reliability, Sensitivity and Resolution | Betrouwbaarheid, Gevoeligheid en Resolutie | 4 | |
| 4.1 | Probability of detection (POD) | Detectiekans | | |
| 4.2 | False Call Rates | False Call Rates | | |
| 4.3 | Reliability, reproducibility | Betrouwbaarheid en reproduceerbaarheid | | |
| 4.4 | Accuracy | Nauwkeurigheid | | |
| 4.5 | Blind zones | Dode zones | | |
| 4.6 | Resolution | Resolutie | | |
| 4.7 | Reference blocks and reflectors | Referentieblokken en reflectors | | |
| 5. | Applications of Phased Array | Phased Array toepassingen | 8 | |

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|------|--|--|----------|-----------|
| 5.1 | (Weld) Materials | (Las) materialen | | |
| 5.2 | Welds in pipelines and pressure vessels Single sided access | Lassen in pijpleidingen en drukvaten Éénzijdige toegang | | |
| 5.3 | Geometries T-joints K-welds Nozzles | Geometrieën T-stukken K-naden Nozzles | | |
| 5.4 | High Temperatures | Hoge temperaturen | | |
| 5.5 | Limitations of Phased Array | Beperkingen van Phased Array | | |
| 6. | Codes, standards and procedures | Codes, standaards en procedures | 4 | |
| 6.1 | ASME Code Case 2235 API 620 | ASME Code Case 2235 API 620 | | |
| 6.2 | Acceptance Criteria | Acceptatie Criteria | | |
| 7. | Scanner operation | Bediening van scanner | 2 | 2 |
| 7.5 | Construction and adjustments of scanner | Opbouw en instellingen van scanner | | |
| 7.6 | Encoder calibration | Encoder calibratie | | |
| 8. | Software and equipment | Software en apparatuur | 4 | 4 |
| 8.1 | Menu structure and input parameters | Menu structuur en parameters | | |
| 9. | Data acquisition, processing, presentation | Data acquisitie, verwerking en weergave | 4 | 16 |
| 9.1 | Sampling rate, digitiser frequency | Sampling rate | | |
| 9.2 | Nyquist Theorem | Theorema van Nyquist | | |
| 9.3 | Signal and data presentation | Signaal en data weergave | | |
| 9.4 | Corrected views | Gecorrigeerde weergaven | | |
| 9.5 | Flaw positions the weld, overlays | Defect posities in de las, overlays | | |
| 10. | Data interpretation / evaluation | Data interpretatie en evaluatie | 4 | 8 |
| 10.1 | Recognition of geometrical signals | Herkenning van geometrische indicaties | | |
| 10.2 | Separation of multiple embedded flaws | Onderscheiden van meervoudige ingesloten defecten | | |
| 10.3 | Type of flaws Point reflectors Outside surface breaking Inside surface breaking Indications from adjacent material such as parent material and cladding | Fout types Punt reflectoren Oppervlaktebrekend buitenoppervlak Oppervlaktebrekend binnenoppervlak Indicaties uit aangrenzend materiaal zoals basismateriaal of cladding | | |
| 10.4 | Images of real flaws Length and height sizing techniques Flaw characterization Mode conversion signals | Beelden van echte defecten Lengte en hoogte sizing technieken Fout karakterisatie Golftransformatie signalen | | |
| 11 | Reporting | Rapportage | 4 | 6 |
| 11.1 | Examination parameters | Onderzoeksparameters | | |
| 11.2 | Data presentation | Data weergave | | |
| 11.3 | Presentation of results / findings | Weergave van resultaten en bevindingen | | |