

DIN EN ISO 21432:2021-05 (E)

Non-destructive testing - Standard test method for determining residual stresses by neutron diffraction (ISO 21432:2019)

Contents		Page
European foreword		4
Foreword		5
Introduction		7
1 Scope		8
2 Normative references		8
3 Terms and definitions		8
4 Symbols and abbreviated terms		12
4.1 Symbols and units		12
4.2 Subscripts		14
4.3 Abbreviated terms		14
5 Summary of method		14
5.1 General		14
5.2 Outline of the principle — Bragg's law		14
5.3 Neutron sources		14
5.4 Strain determination		15
5.4.1 General		15
5.4.2 Monochromatic instrument		15
5.4.3 TOF instrument		15
5.5 Neutron diffractometers		16
5.6 Stress determination		16
6 Purpose, geometry and material		21
6.1 General		21
6.2 Purpose of the measurement		21
6.3 Geometry		21
6.4 Composition		21
6.5 Thermal/mechanical history		22
6.6 Phases and crystal structures		22
6.7 Homogeneity		22
6.8 Microstructure		22
6.9 Texture		22
7 Preparations for measurements		22
7.1 General		22
7.2 Alignment and calibration of the instrument		22
7.3 Choice of diffraction conditions		23
7.3.1 Monochromatic instruments		23
7.3.2 TOF instruments		25
7.4 Positioning procedures		26
7.5 Gauge volumes		26
7.6 Methods for establishing the macroscopically stress-free or reference lattice spacing		27
8 Measurement and recording requirements		29
8.1 General		29
8.2 Recording requirements		29

8.2.1	General.....	29
8.2.2	General information — instrument.....	29
8.2.3	General information — specimen.....	30
8.2.4	Specific information required for each diffraction measurement	30
8.3	Specimen co-ordinates.....	31
8.4	Positioning of the specimen.....	31
8.5	Measurement directions.....	31
8.6	Number and location of measuring positions.....	31
8.7	Gauge volume.....	32
8.8	Gauge volume centroid considerations	32
8.9	Temperature.....	32
9	Calculation of stress.....	32
9.1	General.....	32
9.2	Normal stress determinations.....	32
9.3	Stress state determinations	33
9.3.1	General.....	33
9.3.2	The $\sin^2\psi$ method.....	33
9.4	Choice of elastic constants.....	34
9.5	Diffraction data analysis	34
9.5.1	General.....	34
9.5.2	Peak fitting function.....	34
9.5.3	Background function.....	35
9.5.4	Peak to background ratio.....	35
9.5.5	Distorted peak profiles.....	35
10	Reliability.....	36
11	Reporting.....	37
11.1	General.....	37
11.2	Strain or stress values.....	37
11.2.1	General.....	37
11.2.2	Stress-free or reference lattice spacing.....	37
11.2.3	Conversion of strain to stress	37
11.2.4	Elastic constants.....	37
11.2.5	Positioning.....	37
11.3	Neutron source and instrument.....	37
11.4	General measurement procedures	38
11.5	Specimens/materials properties.....	38
11.6	Original data.....	38
11.7	Uncertainties and errors	38
	Annex A (informative) Measurement and analysis methodologies.....	39
	Annex B (informative) Determination of uncertainties in a measurand.....	48
	Bibliography.....	51