# DIN EN ISO 15653:2018-06 (E)

## Metallic materials - Method of test for the determination of quasistatic fracture toughness of welds (ISO 15653:2018)

## Contents

Page


**European foreword** ... **4**

**Foreword** ... **5**

**1 Scope** ... **6**

**2 Normative references** ... **6**

**3 Terms and definitions** ... **6**

**4 Symbols and units** ... **8**

**5 Principle** ... **8**

**6 Choice of specimen design, specimen orientation and notch location** ... **9**
6.1 Classification of target area for notching ... 9
6.2 Specimen design ... 9
6.3 Specimen and crack plane orientation ... 9

**7 Pre-machining metallography** ... **13**
7.1 Microstructural assessment of macrosections ... 13
7.2 Additional requirements for heat-affected zone tests ... 14

**8 Machining** ... **14**
8.1 Tolerances on specimen dimensions ... 14
8.2 Notch placement for through-thickness notched specimens ... 15
8.3 Notch placement for surface-notched specimens ... 15
8.4 Notch machining ... 16

**9 Specimen preparation** ... **21**
9.1 Fatigue precracking ... 21
9.2 Side grooving ... 21

**10 Test apparatus, requirements and test procedure** ... **21**

**11 Post-test metallography** ... **21**
11.1 General ... 21
11.2 Through-thickness notched specimens ... 22
11.2.1 Sectioning ... 22
11.2.2 Assessment ... 22
11.3 Surface-notched specimens ... 22
11.3.1 Sectioning ... 22
11.3.2 Assessment ... 22
11.4 Assessment of pop-in ... 22

**12 Post-test analysis** ... **25**
12.1 Choice of tensile properties ... 25
12.2 Determination of fracture toughness ... 26
12.2.1 $K_{Ic}$ ... 26
12.2.2 $\delta$ ... 26
12.2.3 $J$ ... 27
12.2.4 Shallow-notched bend specimen ... 27
12.3 Qualification requirements ... 28
12.3.1 General ... 28
12.3.2 Weld-width-to-crack-ligament ratio ... 28

12.3.3 Crack front straightness ..... 28
12.3.4 Symbols used to identify fracture toughness values ..... 30
12.3.5 Through-thickness notched specimens ..... 30
12.3.6 Surface-notched specimens ..... 30

**13 Test report** ..... **31**

**Annex A** (informative) **Examples of notch locations** ..... **32**

**Annex B** (informative) **Examples of pre-test and post-test metallography** ..... **34**

**Annex C** (informative) **Residual-stress modification and precracking technique** ..... **36**

**Annex D** (normative) **Assessment of pop-in** ..... **40**

**Annex E** (informative) **Shallow-notched bend specimen testing** ..... **47**

**Bibliography** ..... **50**