# ISO 15653:2018-01 (E)

## Metallic materials - Method of test for the determination of quasistatic fracture toughness of welds

## Contents

Page


Foreword ..... v

1 Scope ..... 1

2 Normative references ..... 1

3 Termsanddefinitions ..... 1

4 Symbols and units ..... 3

5 Principle ..... 3

6 Choice of specimen design, specimen orientation and notch location ..... 4
6.1 Classification of target area for notching ..... 4
6.2 Specimen design ..... 4
6.3 Specimen and crack plane orientation ..... 4

7 Pre-machining metallography ..... 8
7.1 Microstructural assessment of macrosections ..... 8
7.2 Additional requirements for heat-affected zone tests ..... 9

8 Machining ..... 9
8.1 Tolerances on specimen dimensions ..... 9
8.2 Notch placement for through-thickness notched specimens ..... 10
8.3 Notch placement for surface-notched specimens ..... 10
8.4 Notch machining ..... 11

9 Specimen preparation ..... 16
9.1 Fatigue precracking ..... 16
9.2 Side grooving ..... 16

10 Test apparatus, requirements and test procedure ..... 16

11 Post-test metallography ..... 16
11.1 General ..... 16
11.2 Through-thickness notched specimens ..... 17
11.2.1 Sectioning ..... 17
11.2.2 Assessment ..... 17
11.3 Surface-notched specimens ..... 17
11.3.1 Sectioning ..... 17
11.3.2 Assessment ..... 17
11.4 Assessment of pop-in ..... 17

12 Post-test analysis ..... 20
12.1 Choice of tensile properties ..... 20
12.2 Determination of fracture toughness ..... 21
12.2.1 KIc ..... 21
12.2.2 ..... 21
12.2.3 J ..... 22
12.2.4 Shallow-notched bend specimen ..... 22
12.3 Qualification requirements ..... 23

12.3.1 General ..... 23
12.3.2 Weld-width-to-crack-ligament ratio ..... 23
12.3.3 Crack front straightness ..... 23
12.3.4 Symbols used to identify fracture toughness values ..... 25
12.3.5 Through-thickness notched specimens ..... 25
12.3.6 Surface-notched specimens ..... 25

13 Test report ..... 26

Annex A (informative) Examples of notch locations ..... 27

Annex B (informative) Examples of pre-test and post-test metallography ..... 29

Annex C (informative)Residual-stressmodificationandprecrackingtechnique ..... 31

Annex D (normative) Assessment of pop-in ..... 35

Annex E (informative) Shallow-notched bend specimen testing ..... 42

Bibliography ..... 45