

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

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

---

<b>Contents</b>		<b>Page</b>
European foreword.....		4
Foreword.....		5
<b>1</b>	<b>Scope</b> .....	<b>6</b>
<b>2</b>	<b>Normative references</b> .....	<b>6</b>
<b>3</b>	<b>Terms and definitions</b> .....	<b>6</b>
<b>4</b>	<b>Symbols and units</b> .....	<b>8</b>
<b>5</b>	<b>Principle</b> .....	<b>8</b>
<b>6</b>	<b>Choice of specimen design, specimen orientation and notch location</b> .....	<b>9</b>
6.1	Classification of target area for notching.....	9
6.2	Specimen design.....	9
6.3	Specimen and crack plane orientation.....	9
<b>7</b>	<b>Pre-machining metallography</b> .....	<b>13</b>
7.1	Microstructural assessment of macrosections.....	13
7.2	Additional requirements for heat-affected zone tests.....	14
<b>8</b>	<b>Machining</b> .....	<b>14</b>
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
<b>9</b>	<b>Specimen preparation</b> .....	<b>21</b>
9.1	Fatigue precracking.....	21
9.2	Side grooving.....	21
<b>10</b>	<b>Test apparatus, requirements and test procedure</b> .....	<b>21</b>
<b>11</b>	<b>Post-test metallography</b> .....	<b>21</b>
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
<b>12</b>	<b>Post-test analysis</b> .....	<b>25</b>
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
<b>13</b>	<b>Test report.....</b>	<b>31</b>
<b>Annex A</b>	<b>(informative) Examples of notch locations .....</b>	<b>32</b>
<b>Annex B</b>	<b>(informative) Examples of pre-test and post-test metallography .....</b>	<b>34</b>
<b>Annex C</b>	<b>(informative) Residual-stress modification and precracking technique .....</b>	<b>36</b>
<b>Annex D</b>	<b>(normative) Assessment of pop-in .....</b>	<b>40</b>
<b>Annex E</b>	<b>(informative) Shallow-notched bend specimen testing.....</b>	<b>47</b>
	<b>Bibliography.....</b>	<b>50</b>