

# ISO 5817 guide for the assessment of discontinuities and imperfections in fusion-welded joints in steel, nickel and titanium

Acceptance limits	Limits for discontinuities and imperfections			Note:	
	D	C	B		
<b>Crack (100)/Crater crack (104)/Lack of fusion(401)/Burn through (510)</b>					
$t \geq 0,5$ mm	Not permitted				
<b>Surface pore (2017)</b>					
$t = 0,5$ to 3 mm	$d \leq 0,3 \times s$ or $a$	Not permitted	Maximum dimension for a single pore for $s$ =nominal butt weld thickness $a$ =nominal throat thickness of the fillet weld		
s eller $a = 2$ mm	0,6 mm*				
$t > 3$ mm	$d \leq 0,3 \times s$ eller $a$ max 3 mm				$d \leq 0,2 \times s$ eller $a$ max 2 mm
s eller $a = 3$ mm	0,9 mm				0,6 mm
s eller $a = 5$ mm	1,5 mm				1,0 mm
s eller $a = 8$ mm	2,4 mm				1,6 mm
s eller $a \geq 10$ mm	3,0 mm	2,0 mm			
<b>End crater pipe (2025)</b>					
$t = 0,5$ to 3 mm	$h^* \leq 0,2 \times t$	Not permitted			
$t = 2$ mm	0,4 mm*				
$t > 3$ mm	$h \leq 0,2 \times t$ max 2 mm				$h \leq 0,1 \times t$ max 1 mm
$t = 3,1$ mm	0,6 mm				0,3 mm
$t = 5$ mm	1,0 mm				0,5 mm
$t = 8$ mm	1,6 mm				0,8 mm
$t \geq 10$ mm	2,0 mm	1,0 mm			
<b>Incomplete root penetration (4021)</b>					
$t \geq 0,5$ mm	$h^* \leq 0,2 \times t$ max 2 mm	Not permitted	Not permitted		
$t = 2$ mm	0,4 mm*				
$t = 4$ mm	0,8 mm*				
$t = 6$ mm	1,2 mm*				
$t = 8$ mm	1,6 mm*				
$t \geq 10$ mm	2,0 mm*				
<b>Undercut (5011/5012)</b>					
$t = 0,5$ to 3 mm	$h^* \leq 0,2 \times t$ max 1 mm	$h^* \leq 0,1 \times t$ max 0,5 mm	Not permitted		
$t = 2$ mm	0,4 mm*	0,2 mm*			
$t > 3$ mm	$h \leq 0,2 \times t$ max 1 mm	$h \leq 0,1 \times t$ max 0,5 mm			$h \leq 0,05 \times t$ max 0,5 mm
$t = 3,1$ mm	0,6 mm	0,3 mm			0,16 mm
$t = 5$ mm	1,0 mm	0,5 mm			0,25 mm
$t = 8$ mm	1,0 mm	0,5 mm			0,4 mm
$t \geq 10$ mm	1,0 mm	0,5 mm	0,5 mm		
<b>Shrinkage groove (5013)</b>					
$t = 0,5$ to 3 mm	$h^* \leq 0,2 \times t$ max 1 mm	$h^* \leq 0,1 \times t$ max 0,5 mm	Not permitted		
$t = 2$ mm	0,4 mm*	0,2 mm*			
$t > 3$ mm	$h^* \leq 0,2 \times t$ max 2 mm	$h^* \leq 0,1 \times t$ max 1 mm			$h^* \leq 0,05 \times t$ max 0,5 mm
$t = 3,1$ mm	0,6 mm*	0,3 mm*			0,16 mm*
$t = 5$ mm	1,0 mm*	0,5 mm*			0,25 mm*
$t = 8$ mm	1,6 mm*	0,8 mm*			0,4 mm*
$t \geq 10$ mm	2,0 mm*	1,0 mm*	0,5 mm*		
<b>Excess weld metal (butt weld) (502)</b>					
$t \geq 0,5$ mm	$h \leq 1,0+0,25 \times b$ max 10 mm	$h \leq 1,0+0,15 \times b$ max 7 mm	$h \leq 1,0+0,1 \times b$ max 5 mm		
$b = 5$ mm	2,25 mm	1,75 mm	1,5 mm		
$b = 10$ mm	3,5 mm	2,5 mm	2,0 mm		
$b = 15$ mm	4,75 mm	3,25 mm	2,5 mm		
<b>Excess convexity (fillet weld) (503)</b>					
$t \geq 0,5$ mm	$h \leq 1,0+0,25 \times b$ max 5 mm	$h \leq 1,0+0,15 \times b$ max 4 mm	$h \leq 1,0+0,1 \times b$ max 3 mm		
$b = 5$ mm	2,25 mm	1,75 mm	1,5 mm		
$b = 10$ mm	3,5 mm	2,5 mm	2,0 mm		
$b = 15$ mm	4,75 mm	3,25 mm	2,5 mm		
<b>Excess penetration (504)</b>					
$t = 0,5$ to 3 mm	$h \leq 1,0+0,6 \times b$	$h \leq 1,0+0,3 \times b$	$h \leq 1,0+0,1 \times b$		
$b = 2$ mm	2,2 mm	1,6 mm	1,2 mm		
$t > 3$ mm	$h \leq 1,0+1,0 \times b$ max 5 mm	$h \leq 1,0+0,6 \times b$ max 4 mm	$h \leq 1,0+0,2 \times b$ max 3 mm		
$b = 3$ mm	4,0 mm	2,8 mm	1,6 mm		
$b = 5$ mm	5,0 mm	4,0 mm	2,0 mm		
$b = 10$ mm	5,0 mm	4,0 mm	3,0 mm		
<b>Incorrect weld toe (butt weld) (505)</b>					
$t \geq 0,5$ mm	$\alpha \geq 90^\circ$	$\alpha \geq 110^\circ$	$\alpha \geq 150^\circ$		
<b>Incorrect weld toe (fillet weld) (505)</b>					
$t \geq 0,5$ mm	$\alpha \geq 90^\circ$	$\alpha \geq 100^\circ$	$\alpha \geq 110^\circ$		

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<b>Overlap (506)</b>					
$t \geq 0,5$ mm	$h \leq 0,2 \times b$	Not permitted	Not permitted		
$b = 10$ mm	2,0 mm				
$b = 15$ mm	3,0 mm				
$b = 20$ mm	4,0 mm				
<b>Incomplete filled groove (511)</b>					
$t = 0,5$ to 3 mm	$h^* \leq 0,25 \times t$	$h^* \leq 0,1 \times t$	Not permitted		
$t = 2$ mm	0,5 mm*	0,2 mm*			
$t > 3$ mm	$h^* \leq 0,25 \times t$ max 2 mm	$h^* \leq 0,1 \times t$ max 1 mm			$h^* \leq 0,05 \times t$ max 0,5 mm
$t = 3,1$ mm	0,8 mm*	0,3 mm*			0,16 mm*
$t = 5$ mm	1,25 mm*	0,5 mm*			0,25 mm*
$t \geq 10$ mm	2,0 mm*	1,0 mm*			0,5 mm*
<b>Excessive asymmetry of fillet weld (512)</b>					
$t \geq 0,5$ mm	$h \leq 2,0+0,2 \times a$	$h \leq 2,0+0,15 \times a$	$h \leq 1,5+0,15 \times a$		
$a = 3$ mm	2,6 mm	2,5 mm	3,0 mm		
$a = 4$ mm	2,8 mm	2,6 mm	2,1 mm		
$a = 5$ mm	3,0 mm	2,75 mm	2,25 mm		
$a = 7$ mm	3,4 mm	3,1 mm	2,6 mm		
$a = 10$ mm	4,0 mm	3,5 mm	3,0 mm		
<b>Root concavity (515)</b>					
$t = 0,5$ to 3 mm	$h \leq 0,2+0,1 \times t$	$h \leq 0,1 \times t^*$	Not permitted		
$t = 2$ mm	0,4 mm	0,2 mm*			
$t > 3$ mm	$h \leq 0,2 \times t^*$ max 2 mm	$h \leq 0,1 \times t^*$ max 1 mm			$h \leq 0,05 \times t^*$ max 0,5 mm
$t = 3,1$ mm	0,6 mm*	0,3 mm*			0,16 mm*
$t = 5$ mm	1,0 mm*	0,5 mm*			0,25 mm*
$t \geq 10$ mm	2,0 mm*	1,0 mm*			0,5 mm*
<b>Insufficient throat thickness (5213)</b>					
$t = 0,5$ to 3 mm	$h^* \leq 0,2+0,1 \times a$	$h^* \leq 0,2$	Not permitted		
$a = 2$ mm	0,4 mm*	0,2 mm*			
$t > 3$ mm	$h^* \leq 0,3+0,1 \times a$ max 2 mm	$h^* \leq 0,3+0,1 \times a$ max 1 mm			
$a = 3$ mm	0,6 mm*	0,6 mm*			
$a = 5$ mm	0,8 mm*	0,8 mm*			
$a = 10$ mm	1,3 mm*	1,0 mm*			
<b>Excessive throat thickness (5214)</b>					
$t \geq 0,5$ mm	Unlimited	$h \leq 1,0+0,2 \times a$ max 4 mm	$h \leq 1,0+0,15 \times a$ max 3 mm		
$a = 3$ mm		1,6 mm	1,45 mm		
$a = 5$ mm		2,0 mm	1,75 mm		
$a = 10$ mm		3,0 mm	2,5 mm		
<b>Stray arc (601)</b>					
$t \geq 0,5$ mm	Permitted, if the properties of the parent metal are not affected.	Not permitted	Not permitted		
<b>Spatter (602) Temper colour (610)</b>					
$t \geq 0,5$ mm	Acceptance depends on application, e.g. material, corrosion, protection				
<b>Linear misalignment between plates (5071)</b>					
$t = 0,5$ till 3 mm	$h \leq 0,2+0,25 \times t$	$h \leq 0,2+0,15 \times t$	$h \leq 0,2+0,1 \times t$		
$t = 2$ mm	0,7 mm	0,5 mm	0,4 mm		
$t > 3$ mm	$h \leq 0,25 \times t$ max 5 mm	$h \leq 0,15 \times t$ max 4 mm	$h \leq 0,1 \times t$ max 3 mm		
$t = 3,1$ mm	0,8 mm	0,5 mm	0,3 mm		
$t = 10$ mm	2,5 mm	1,5 mm	1,0 mm		
$t = 15$ mm	3,8 mm	2,3 mm	1,5 mm		
<b>Circumferential misalignment (5072)</b>					
$t \geq 0,5$ mm	$h \leq 0,5 \times t$ max 4 mm	$h \leq 0,5 \times t$ max 3 mm	$h \leq 0,5 \times t$ max 2 mm		
$t = 3$ mm	1,5 mm	1,5 mm	1,5 mm		
$t = 6$ mm	3,0 mm	3,0 mm	2,0 mm		
$t \geq 10$ mm	4,0 mm	3,0 mm	2,0 mm		
<b>Incorrect root gap for fillet welds (617)</b>					
$t = 0,5$ till 3 mm	$h \leq 0,5+0,1 \times a$	$h \leq 0,3+0,1 \times a$	$h \leq 0,2+0,1 \times a$		
$a = 2$ mm	0,7 mm	0,5 mm	0,4 mm		
$t \geq 3$ mm	$h \leq 1,0+0,3 \times a$ max 4 mm	$h \leq 0,5+0,2 \times a$ max 3 mm	$h \leq 0,5+0,1 \times a$ max 2 mm		
$a = 4$ mm	2,2 mm	1,3 mm	0,9 mm		
$a = 6$ mm	2,8 mm	1,7 mm	1,1 mm		
$a = 10$ mm	4,0 mm	2,5 mm	1,5 mm		

**\* Short discontinuities and imperfections**

Where the weld is 100 mm or more in length, discontinuities and imperfections shall be considered as short if their total length does not exceed 25 mm in the 100 mm containing the largest number of discontinuities and imperfections.

Where the weld is less than 100 mm in length, discontinuities and imperfections shall be considered as short if their total length does not exceed 25 % of the weld length.

Kiwa is not responsible for any errors.