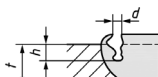
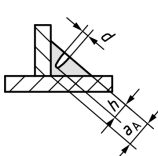
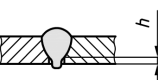
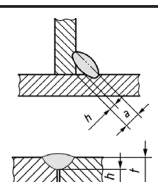
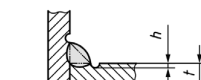
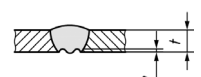
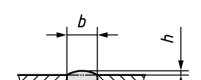
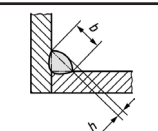
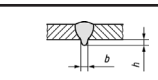
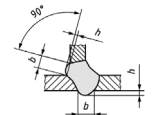
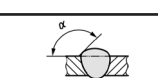
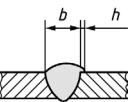
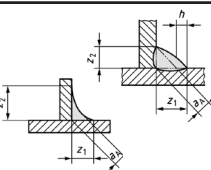
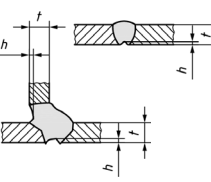
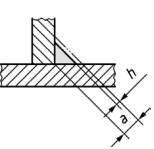
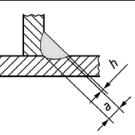
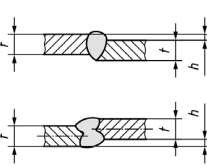
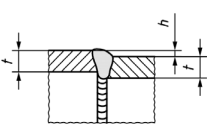
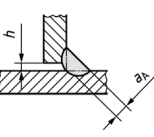
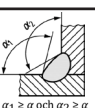


ISO 5817 guide for the assessment of discontinuities and imperfections in fusion-welded joints in steel, nickel and titanium

Acceptance limits	Limits for discontinuities and imperfections			Note:
	D	C	B	
Crack (100)/Crater crack (104)/Lack of fusion (401)/Burn through (510)				
t ≥ 0,5 mm	Not permitted			
Surface pore (2017)				
t = 0,5 to 3 mm	d ≤ 0,3 x s or a _A	Not permitted	Not permitted	Maximum dimension for a single pore for s= nominal butt weld thickness a _A = nominal throat thick- ness of the fillet weld
s or a _A =2 mm	0,6 mm*			
t > 3 mm	d ≤ 0,3 x s or a _A max 3 mm	d ≤ 0,2 x s or a _A max 2 mm		
s or a _A = 3 mm	0,9 mm	0,6 mm		
s or a _A = 5 mm	1,5 mm	1,0 mm		
s or a _A = 8 mm	2,4 mm	1,6 mm		
s or a _A ≥ 10 mm	3,0 mm	2,0 mm		
End crater pipe (2025)				
t = 0,5 to 3 mm	h ≤ 0,2 x s or a _A d ≤ 0,3 x s or a _A	Not permitted	Not permitted	 
t =2 mm	h ≤ 0,4 mm d ≤ 0,6 mm			
t > 3 mm	h ≤ 0,2 x s or a _A max 2 mm d ≤ 0,3 x s or a _A max 3 mm	h ≤ 0,1 x s or a _A max 1 mm d ≤ 0,2 x s or a _A max 2 mm		
s or a _A = 3,1 mm	h ≤ 0,6 mm d ≤ 0,9 mm	h ≤ 0,3 mm d ≤ 0,6 mm		
s or a _A = 5 mm	h ≤ 1,0 mm d ≤ 1,5 mm	h ≤ 0,5 mm d ≤ 1 mm		
s or a _A = 8 mm	h ≤ 1,6 mm d ≤ 2,4 mm	h ≤ 0,8 mm d ≤ 2,4 mm		
s or a _A ≥ 10 mm	h ≤ 2,0 mm d ≤ 3,0 mm	h ≤ 1,0 mm d ≤ 2,0 mm		
Lack of fusion (401)				
t = 0,5 mm	Not permitted	Not permitted	Not permitted	
Micro lack of fusion (4014) (Can only be detected by microscopic examination ≥ 50 X)				
t = 0,5 mm	Not permitted	Not permitted	Not permitted	
Incomplete root penetration (4021)				
t ≥ 0,5 mm	h* ≤ 0,2 x 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 ≥ 10 mm	2,0 mm*			
Undercut (5011/5012) **				
t = 0,5 to 3 mm	h* ≤ 0,2 x t max 1 mm	h* ≤ 0,1 x t max 0,5 mm	Not permitted	 
t =2 mm	0,4 mm*	0,2 mm*		
t > 3 mm	h ≤ 0,2 x t max 1 mm	h ≤ 0,1 x t max 0,5 mm	h ≤ 0,05 x 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 ≥ 10 mm	1,0 mm	0,5 mm	0,5 mm	
Shrinkage groove (5013) **				
t = 0,5 to 3 mm	h* ≤ 0,2 x t max 1 mm	h* ≤ 0,1 x t max 0,5 mm	Not permitted	
t =2 mm	0,4 mm*	0,2 mm*		
t > 3 mm	h* ≤ 0,2 x t max 2 mm	h* ≤ 0,1 x t max 1 mm	h* ≤ 0,05 x 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 ≥ 10 mm	2,0 mm*	1,0 mm*	0,5 mm*	
Excess weld metal (buttweld) (502) **				
t ≥ 0,5 mm	h ≤ 1,0+0,25 x b max 10 mm	h ≤ 1,0+0,15 x b max 7 mm	h ≤ 1,0+0,1 x 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	
Excess convexity (fillet weld) (503) **				
t ≥ 0,5 mm	h ≤ 1,0+0,25 x b max 5 mm	h ≤ 1,0+0,15 x b max 4 mm	h ≤ 1,0+0,1 x 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	
Excess penetration (504)				
t = 0,5 to 3 mm	h ≤ 1,0+0,6 x b	h ≤ 1,0+0,3 x b	h ≤ 1,0+0,1 x b	 
b = 2 mm	2,2 mm	1,6 mm	1,2 mm	
t > 3 mm	h ≤ 1,0+1,0 x b max 5 mm	h ≤ 1,0+0,45 x b max 4 mm	h ≤ 1,0+0,2 x 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	
Incorrect weld toe (buttweld) (505)				
t ≥ 0,5 mm	α ≥ 90°	α ≥ 110°	α ≥ 150°	

Acceptance limits	Limits for discontinuities and imperfections			Note:
	D	C	B	
Overlap (506)				
t ≥ 0,5 mm	h ≤ 0,2 × b	Not permitted	Not permitted	
b = 10 mm	2,0 mm			
b = 15 mm	3,0 mm			
b = 20 mm	4,0 mm			
Sagging (509)-Incompletely filled groove (511) **				
t = 0,5 to 3 mm	h* ≤ 0,25 × t	h* ≤ 0,1 × t	Not permitted	
t = 2 mm	0,5 mm*	0,2 mm*		
t > 3 mm	h* ≤ 0,25 × t max 2 mm	h* ≤ 0,1 × t max 1 mm	h* ≤ 0,05 × 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 ≥ 10 mm	2,0 mm*	1,0 mm*	0,5 mm*	
Excessive asymmetry of fillet weld (512)				
t ≥ 0,5 mm	h ≤ 2,0+0,2 × a _A	h ≤ 2,0+0,15 × a _A	h ≤ 1,5+0,15 × a _A	
a = 3 mm	2,6 mm	2,5 mm	1,95 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	
Root concavity (515) **				
t = 0,5 to 3 mm	h ≤ 0,2+0,1 × t	h ≤ 0,1 × t*	Not permitted	
t = 2 mm	0,4 mm	0,2 mm*		
t > 3 mm	h ≤ 0,2 × t* max 2 mm	h ≤ 0,1 × t* max 1 mm	h ≤ 0,05 × 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 ≥ 10 mm	2,0 mm*	1,0 mm*	0,5 mm*	
Insufficient throat thickness (5213)				
t = 0,5 to 3 mm	h* ≤ 0,2+0,1 × a	h* ≤ 0,2	Not permitted	
a = 2 mm	0,4 mm*	0,2 mm*		
t > 3 mm	h* ≤ 0,3+0,1 × a max 2 mm	h* ≤ 0,3+0,1 × 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*		
Excessive throat thickness (5214)				
t ≥ 0,5 mm	Unlimited	h ≤ 1,0+0,2 × a max 4 mm	h ≤ 1,0+0,15 × 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	
Stray arc (601)				
t ≥ 0,5 mm	Permitted, if the properties of the parent metal are not affected.	Not permitted	Not permitted	
Spatter (602)/Temper colour (610)				
t ≥ 0,5 mm	Acceptance depends on application, e.g.material, corrosion, protection.			
Linear misalignment between plates (5071)				
t = 0,5 to 3 mm	h ≤ 0,2+0,25 × t	h ≤ 0,2+0,15 × t	h ≤ 0,2+0,1 × t	
t = 2 mm	0,7 mm	0,5 mm	0,4 mm	
t > 3 mm	h ≤ 0,25 × t max 5 mm	h ≤ 0,15 × t max 4 mm	h ≤ 0,1 × 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	
Circumferential misalignment (5072)				
t ≥ 0,5 mm	h ≤ 0,5 × t max 4 mm	h ≤ 0,5 × t max 3 mm	h ≤ 0,5 × 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 ≥ 10 mm	4,0 mm	3,0 mm	2,0 mm	
Incorrect root gap for fillet welds (617)				
t = 0,5 to 3 mm	h ≤ 0,5+0,1 × a _A	h ≤ 0,3+0,1 × a _A	h ≤ 0,2+0,1 × a _A	
a _A = 2 mm	0,7 mm	0,5 mm	0,4 mm	
t ≥ 3 mm	h ≤ 1+0,3 × a max 4 mm	h ≤ 0,5+0,2 × a max 3 mm	h ≤ 0,5+0,1 × a max 2 mm	
a _A = 4 mm	2,2 mm	1,3 mm	0,9 mm	
a _A = 6 mm	2,8 mm	1,7 mm	1,1 mm	
a _A = 10 mm	4,0 mm	2,5 mm	1,5 mm	
Incorrect weld toe (fillet weld) (505)				
t ≥ 0,5	α ≥ 90°	α ≥ 100°	α ≥ 110°	

*** 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.

**** Smooth transition is required.** For excess weld metal(502) and excessive convexity(503) a smooth transition is required between the capping run(s) and the plate surface and/or the adjacent welding bead(s).