

WELD IMPERFECTIONS

Weld imperfections

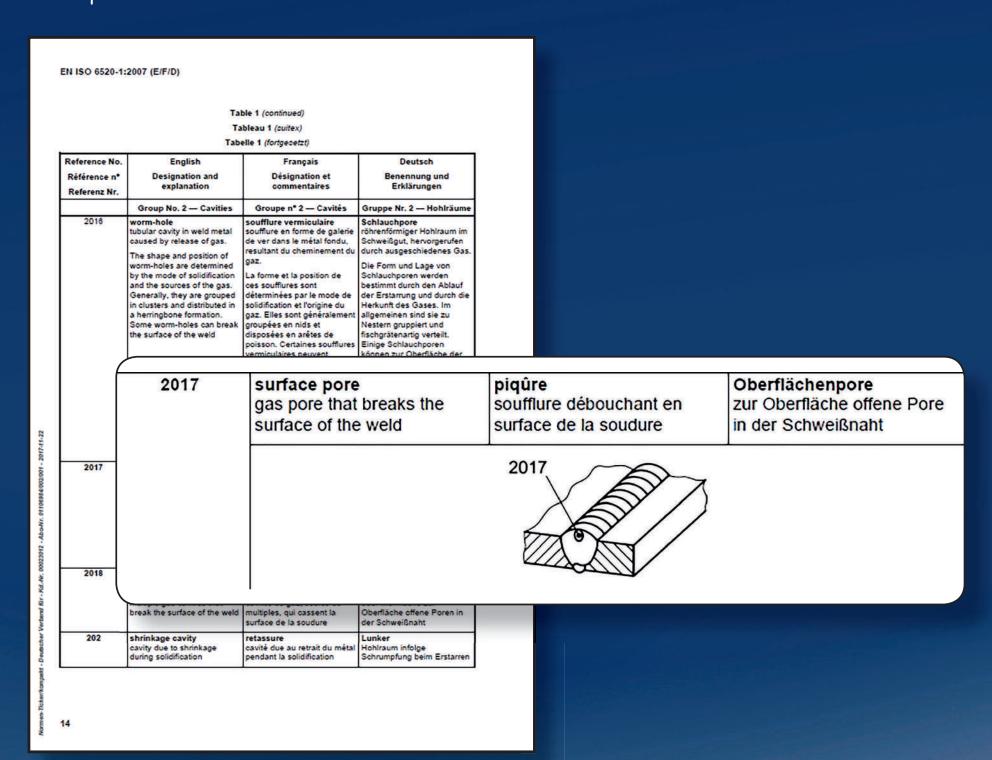
Imperfections are deviations in the quality of the manufacturing of a product, such as should normally not arise. Their development is influenced by the base material, the welding process, the welder and the weld preparation. In this respect, they may be more or less distinct.

If the imperfections exceed the permissible limits, they are defects which may lead to the failure of a whole structure. The welding coordinator must decide whether it is possible to repair such a defect or the part must be rejected.

Standards

In the trilingual standard ISO 6520-1 imperfections are defined and they are given reference numbers.

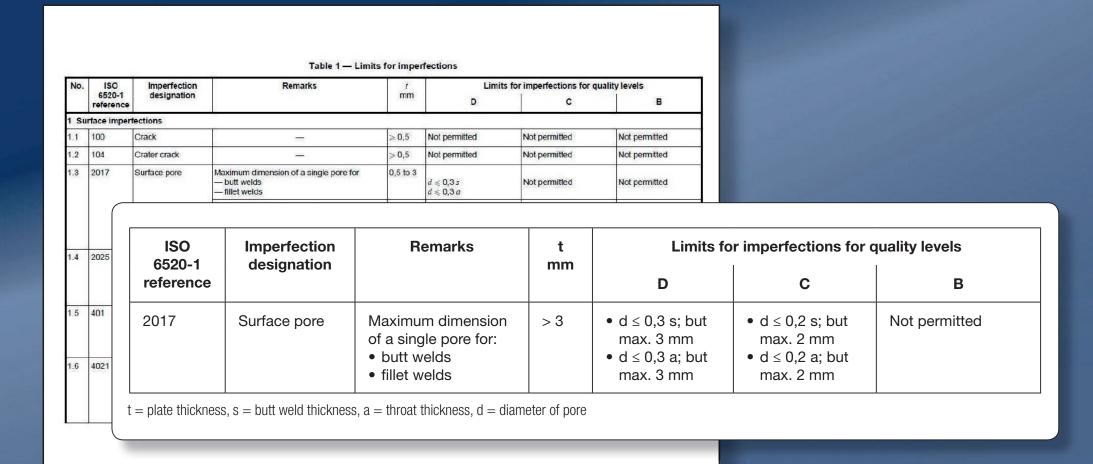
Example from ISO 6520-1:



In **ISO 5817** imperfections are grouped into quality levels.

QUALITY LEVEL	DEMANDS
D	low demands on the welded joint
С	medium demands on the welded joint
В	high demands on the welded joint

Example from ISO 5817:



The **DVS 0703** technical bulletin makes it easier for welding coordinators and testing bodies to assess the executed welds and provides notes about the development and avoidance of imperfections when these welds are manufactured.

Frequent imperfections and their causes

SURFACE IMPERFECTIONS AND THEIR CAUSES		
excess weld metal	 welding speed too low wrong weld build-up wrong bead sequence in the cover pass voltage too low in the case of GMA and SA welding 	
incompletely filled groove	 amperage too high welding speed too great arc length too great wrong weld build-up shielding gas quantity too great 	
undercut	 amperage too high arc length too great arc manipulation on one side 	
incomplete penetration	 torch angle wrong heat input too low 	
root concavity	 welding speed too high heat input of the first filler pass too great (in the PE position) root gap too small tacking point with root concavity not melted completely welding filler not "pressed through" 	
excessive penetration	 root gap too large welding speed in the root bead too low amperage too high welding attachment too large in the case of gas fusion welding unsuitable welding rod class 	
INTERNAL IMPERFECTIONS AND THEIR CAUSES		

INTERNAL IMPERFECTIONS AND THEIR CAUSES

pores	
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- unsuitable welding filler
- welding filler or welding consumables dirty
- shielding gas composition wrong shielding gas quantity too high / too low
- shielding gas envelope affected by draughts
- shielding gas nozzle of the torch dirty or defective arc too long
- distance between the workpiece and the torch nozzle too great
- overheated weld deposit
- cracks



- in the existing conditions, base material not weldable or to a limited extent only
- (e.g. high C, P and S contents) • welding filler unsuitable
- covered stick electrodes, flux or shielding gas moist
- attention not paid to the ambient temperature
- in the case of an interruption, welded cross section too small
- shrinkage restraint
- overheating
- cooling speed too high (t_{8/5} time too short)



- in the case of Process Group 12, ratio of the bead width to the bead height not complied with
- shrinkage forces too high
- contaminated base material (segregation zone)
- cooling speed too high (t_{8/5} time too short) poor or wrong weld preparation lack of fusion
 - weld pool flowing ahead (deposition efficiency and welding speed not adjusted) • amperage not sufficient
 - torch inclination or angle not correct
- magnetic arc blow incomplete root penetration
 - poor or wrong weld preparation amperage not adjusted
- solid inclusion

(oxide, slag, flux)

- in the case of pass / cap pass welding, misalignment of both weld pools • in the case of Process Groups 12 and 13, welding voltage too high
- interpass cleaning inadequate
 - amperage too low • covering type of stick electrodes or welding flux type has an inadequate rinsing effect
 - reinforcement of the previously welded bead too great
 - reaction of the tip of the welding rod or of the end of the wire electrode with atmospheric oxygen

In order to avoid any imperfections, it is necessary to pay attention to the following points:

surface condition, workpiece thickness and material finish Base material:

exact, clean and appropriate for the workpiece thickness and the welding process Weld preparation:

Welding process: correct sequence and right parameters

manual skills Welder:

appropriate for the material and the welding process Welding filler material: draughts, ambient temperature, humidity ... **Environment:**



















