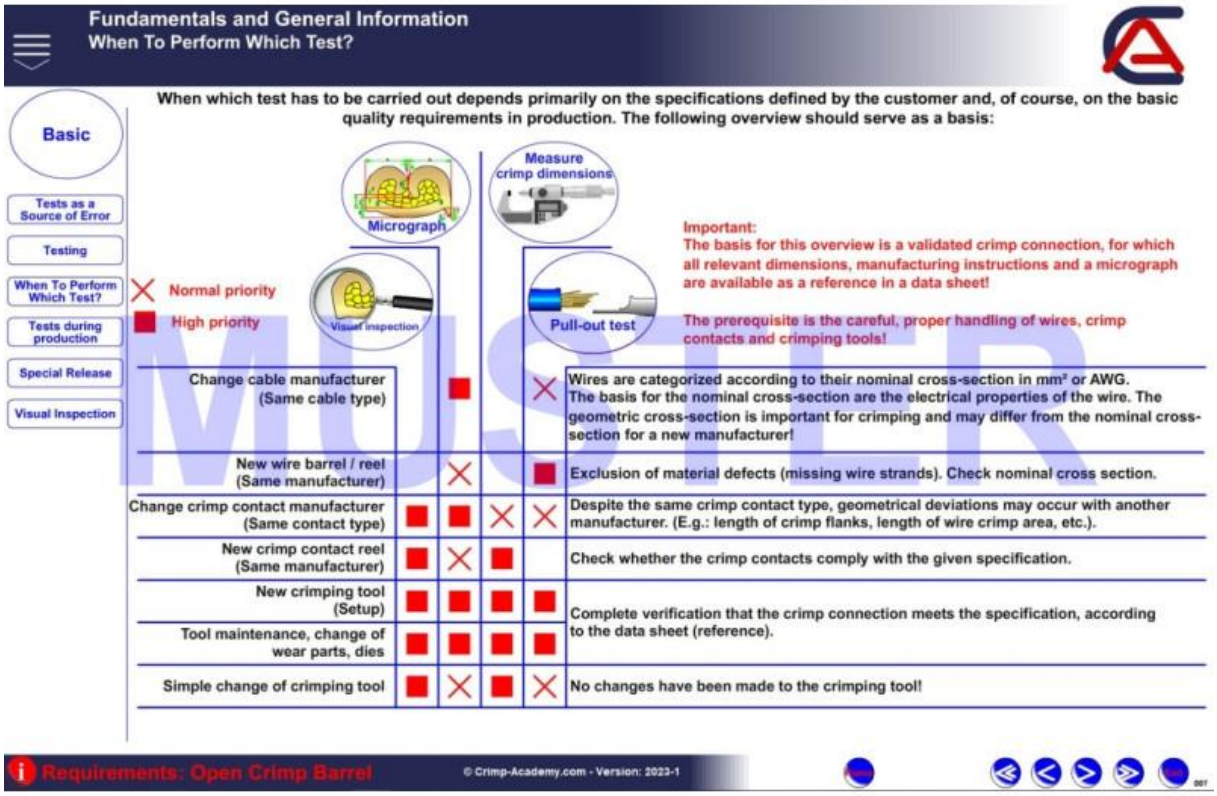
Training tool: Crimp quality monitoring - methods & application

Reference: Tool-06-EN-QS
File format: App (exe)
Language: English


Fundamentals and General Information
When To Perform Which Test?
Basic
Tests as a Source of Error
Testing
When To Perform Which Test?
Tests during production
Special Release
Visual Inspection
When which test has to be carried out depends primarily on the specifications defined by the customer and, of course, on the basic quality requirements in production. The following overview should serve as a basis:
Micrograph
Measure crimp dimensions
Visual inspection
Pull-out test
Normal priority
High priority
Important:
The basis for this overview is a validated crimp connection, for which all relevant dimensions, manufacturing instructions and a micrograph are available as a reference in a data sheet!
The prerequisite is the careful, proper handling of wires, crimp contacts and crimping tools!
Change cable manufacturer (Same cable type)
Wires are categorized according to their nominal cross-section in mm² or AWG. The basis for the nominal cross-section are the electrical properties of the wire. The geometric cross-section is important for crimping and may differ from the nominal cross-section for a new manufacturer!
New wire barrel / reel (Same manufacturer)
Exclusion of material defects (missing wire strands). Check nominal cross section.
Change crimp contact manufacturer (Same contact type)
Despite the same crimp contact type, geometrical deviations may occur with another manufacturer. (E.g.: length of crimp flanks, length of wire crimp area, etc.).
New crimp contact reel (Same manufacturer)
Check whether the crimp contacts comply with the given specification.
New crimping tool (Setup)
Tool maintenance, change of wear parts, dies
Complete verification that the crimp connection meets the specification, according to the data sheet (reference).
Simple change of crimping tool
No changes have been made to the crimping tool!
Requirements: Open Crimp Barrel
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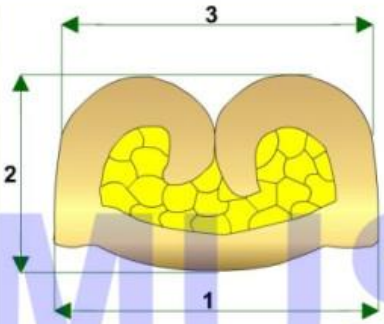
MUSTER

Measuring Crimp Dimensions
Measuring Crimp Dimensions
Measuring Tools
Measurement Procedure
Wire Crimp Width



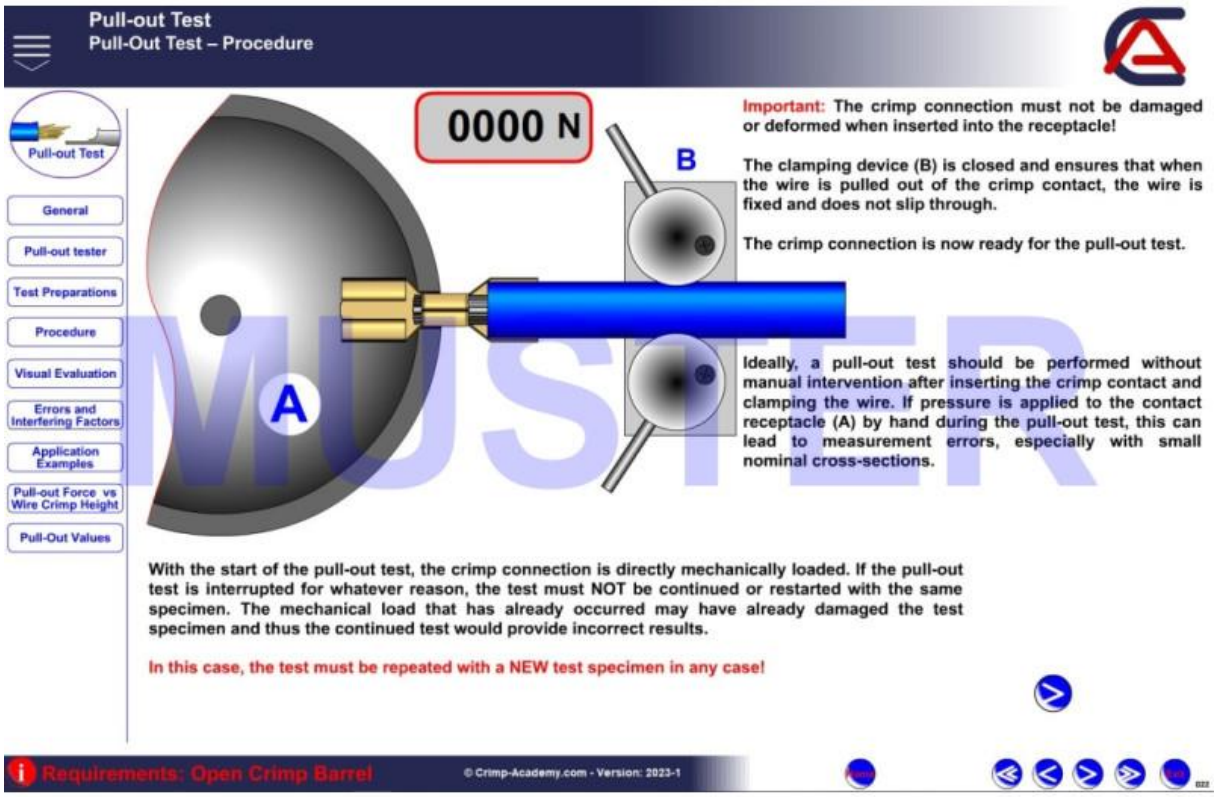
The crimp height (2) is an adjustable dimension in the processing tool. The crimp height is specified by the contact manufacturer depending on the conductor/cross section. As a non-destructive test, crimp height measurement offers reliable quality control during ongoing production.

In the processing guideline (specification) which is defined for each crimp connection during design, the respective tolerances are usually defined in addition to the crimp dimensions.

The extent of the tolerance depends on the crimp height range in which the mechanical and electrical properties of a crimp connection are still OK with certainty. The tolerances specified by the customer are always decisive. These tolerances can also deviate from the actual specification of the manufacturer. This happens if the crimp connection is to be used for safety-relevant connections, for example.

If no tolerances are defined for the crimp height, the following table provides a means of orientation. The crimp height tolerance is defined according to the cross-section ranges.

Cross-section range:		Tolerance
0,03 - 0,20 mm²	AWG 32-34	+/- 0,02 mm
0,20 - 0,50 mm²	AWG 24-20	+/- 0,03 mm
0,30 - 0,81 mm²	AWG 22-18	+/- 0,04 mm
0,50 - 6,00 mm²		+/- 0,05 mm
6,00 - 25,00 mm²		+/- 0,10 mm
25,00 - 50,00 mm²		+/- 0,15 mm


Pull-out Test
Pull-Out Test – Procedure
Pull-out Test
General
Pull-out tester
Test Preparations
Procedure
Visual Evaluation
Errors and Interfering Factors
Application Examples
Pull-out Force vs Wire Crimp Height
Pull-Out Values
0000 N
B
A
Important: The crimp connection must not be damaged or deformed when inserted into the receptacle!
The clamping device (B) is closed and ensures that when the wire is pulled out of the crimp contact, the wire is fixed and does not slip through.
The crimp connection is now ready for the pull-out test.
Ideally, a pull-out test should be performed without manual intervention after inserting the crimp contact and clamping the wire. If pressure is applied to the contact receptacle (A) by hand during the pull-out test, this can lead to measurement errors, especially with small nominal cross-sections.
With the start of the pull-out test, the crimp connection is directly mechanically loaded. If the pull-out test is interrupted for whatever reason, the test must NOT be continued or restarted with the same specimen. The mechanical load that has already occurred may have already damaged the test specimen and thus the continued test would provide incorrect results.
In this case, the test must be repeated with a NEW test specimen in any case!
Requirements: Open Crimp Barrel
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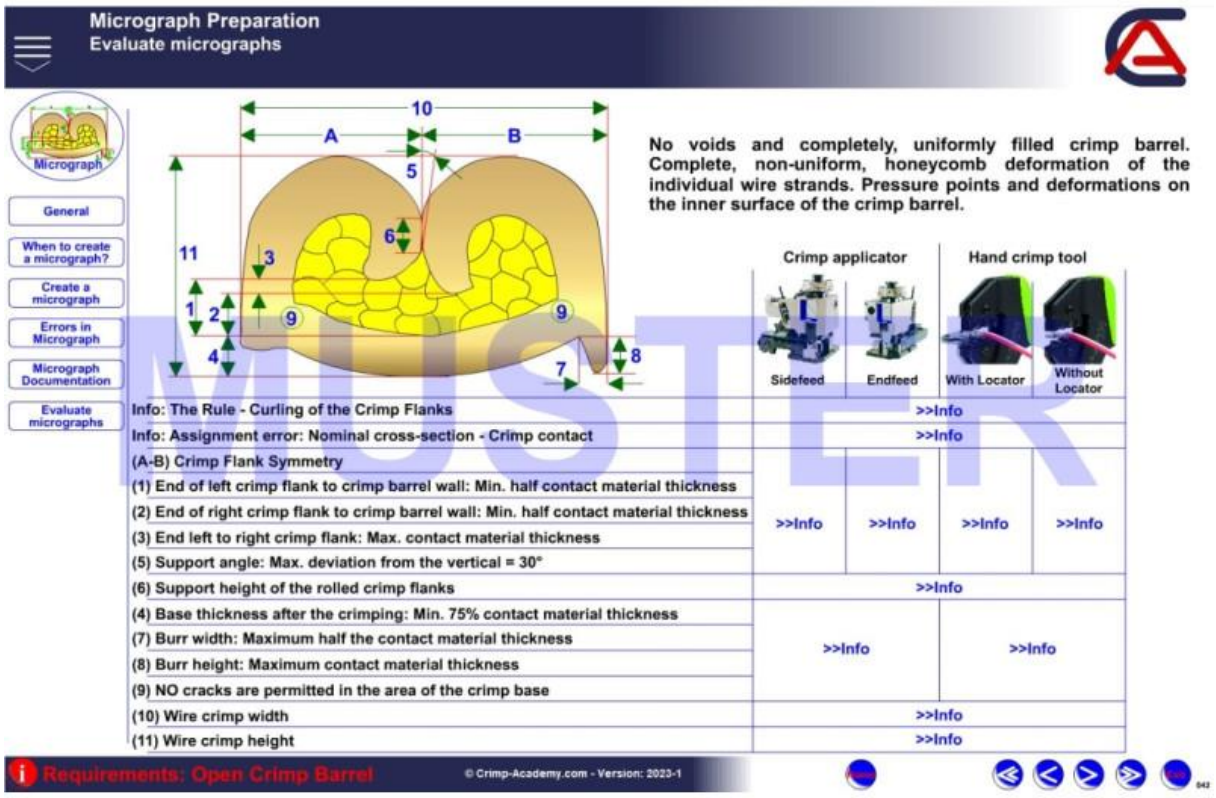
Micrograph Preparation
Evaluate micrographs
Micrograph
General
When to create a micrograph?
Create a micrograph
Errors in Micrograph
Micrograph Documentation
Evaluate micrographs
10
A
B
5
6
11
3
1
2
9
9
4
7
8
No voids and completely, uniformly filled crimp barrel. Complete, non-uniform, honeycomb deformation of the individual wire strands. Pressure points and deformations on the inner surface of the crimp barrel.
Crimp applicator
Hand crimp tool
Sidefeed
Endfeed
With Locator
Without Locator
Info: The Rule - Curling of the Crimp Flanks
>>Info
Info: Assignment error: Nominal cross-section - Crimp contact
>>Info
(A-B) Crimp Flank Symmetry
(1) End of left crimp flank to crimp barrel wall: Min. half contact material thickness
(2) End of right crimp flank to crimp barrel wall: Min. half contact material thickness
(3) End left to right crimp flank: Max. contact material thickness
(5) Support angle: Max. deviation from the vertical = 30°
>>Info
>>Info
>>Info
>>Info
(6) Support height of the rolled crimp flanks
>>Info
(4) Base thickness after the crimping: Min. 75% contact material thickness
(7) Burr width: Maximum half the contact material thickness
(8) Burr height: Maximum contact material thickness
(9) NO cracks are permitted in the area of the crimp base
>>Info
>>Info
(10) Wire crimp width
>>Info
(11) Wire crimp height
>>Info
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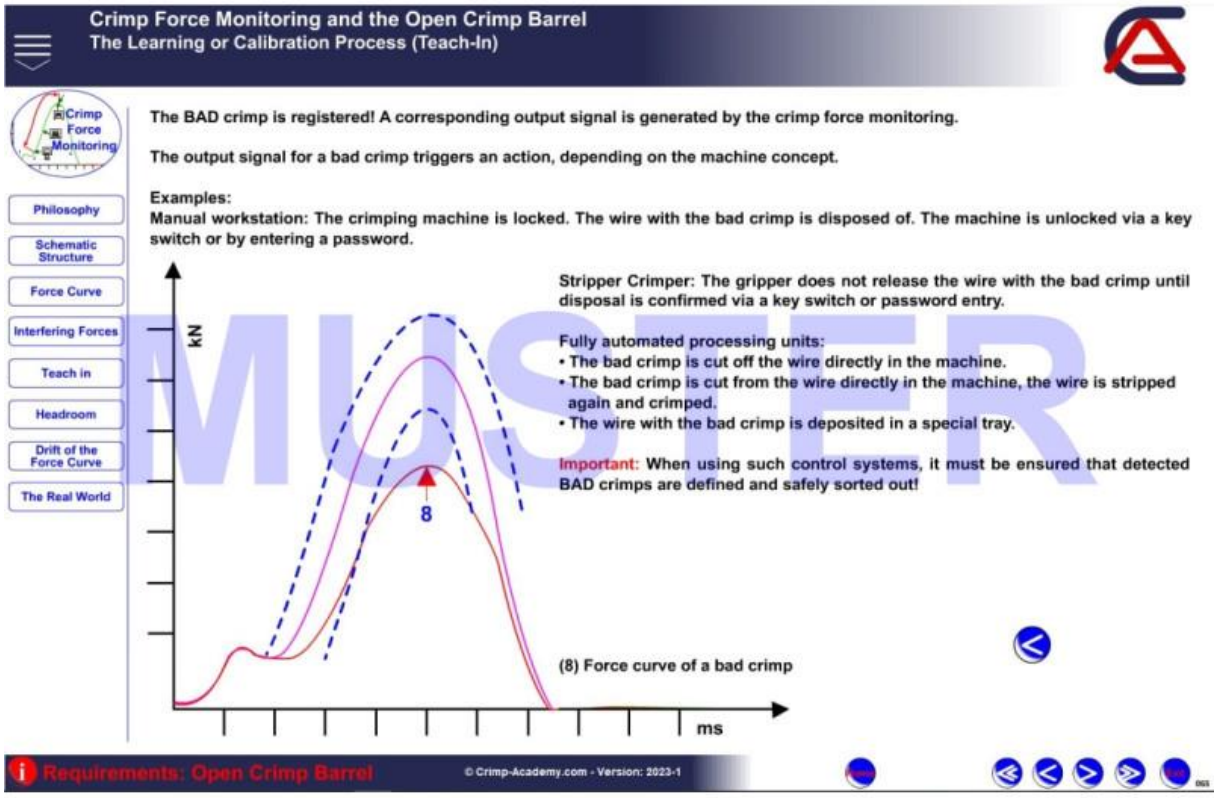
Crimp Force Monitoring and the Open Crimp Barrel
The Learning or Calibration Process (Teach-In)
Crimp Force Monitoring
Philosophy
Schematic Structure
Force Curve
Interfering Forces
Teach in
Headroom
Drift of the Force Curve
The Real World
The BAD crimp is registered! A corresponding output signal is generated by the crimp force monitoring.
The output signal for a bad crimp triggers an action, depending on the machine concept.
Examples:
Manual workstation: The crimping machine is locked. The wire with the bad crimp is disposed of. The machine is unlocked via a key switch or by entering a password.
Stripper Crimper: The gripper does not release the wire with the bad crimp until disposal is confirmed via a key switch or password entry.
Fully automated processing units:
• The bad crimp is cut off the wire directly in the machine.
• The bad crimp is cut from the wire directly in the machine, the wire is stripped again and crimped.
• The wire with the bad crimp is deposited in a special tray.
Important: When using such control systems, it must be ensured that detected BAD crimps are defined and safely sorted out!
kN
8
ms
(8) Force curve of a bad crimp
Requirements: Open Crimp Barrel
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