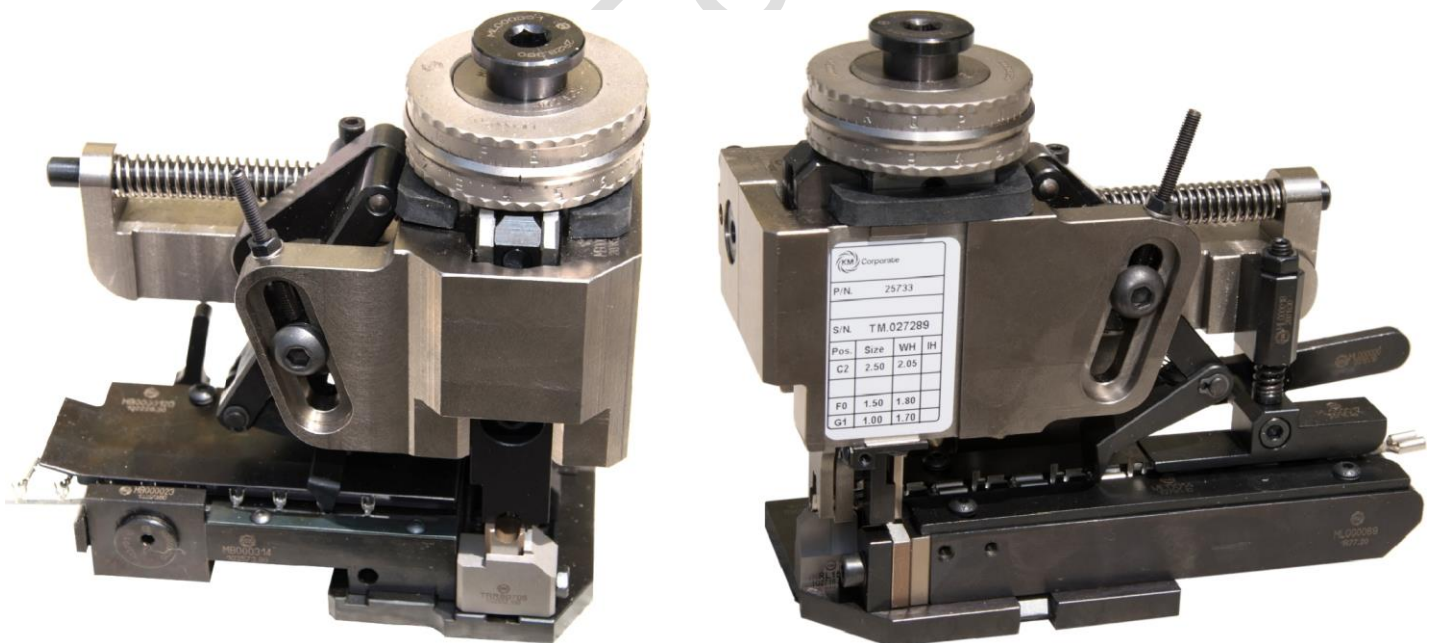


Crimping Tool Technology in Cable Processing

Industrial production of crimp connections
with the open crimp barrel

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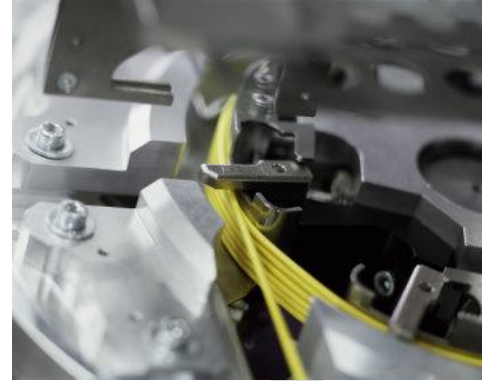
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3. MACHINE TECHNOLOGY

3.1 FUNDAMENTALS

Depending on the application, required quality and quantities, there are a wide variety of machine concepts. A list and brief description would go beyond the scope of this documentation. This chapter shows a brief overview of the basic possibilities that cable assembly has regarding machine technology.



Important: As in all manufacturing areas, so it is also in wire processing: Good tools and good machines are the basic prerequisite for a good quality of the finished wire harness. "Low cost" means, in addition to an often significantly lower price, that sacrifices must also be made in terms of the reliability of the equipment and thus the quality produced with it!

Process reliability is key.

Probably the most striking example of this is the preparation of a crimp connection with a "low cost" hand crimping tool without positioning aid. Saving a "few euros" investment means, as described in several examples in Chapter 8 "Hand crimping pliers: Processing of open crimp sleeves", considerable reductions in quality up to: "No quality can be produced".

The difference between "low cost" and brand quality is usually noticeable after a few hundred work cycles. In the mechanical components, the play becomes larger and thus it becomes increasingly difficult to meet the required high quality standards. Even the best machine operator (setter) cannot compensate for e.g. bearing play in such a way that a crimp force monitoring can detect bad crimps.

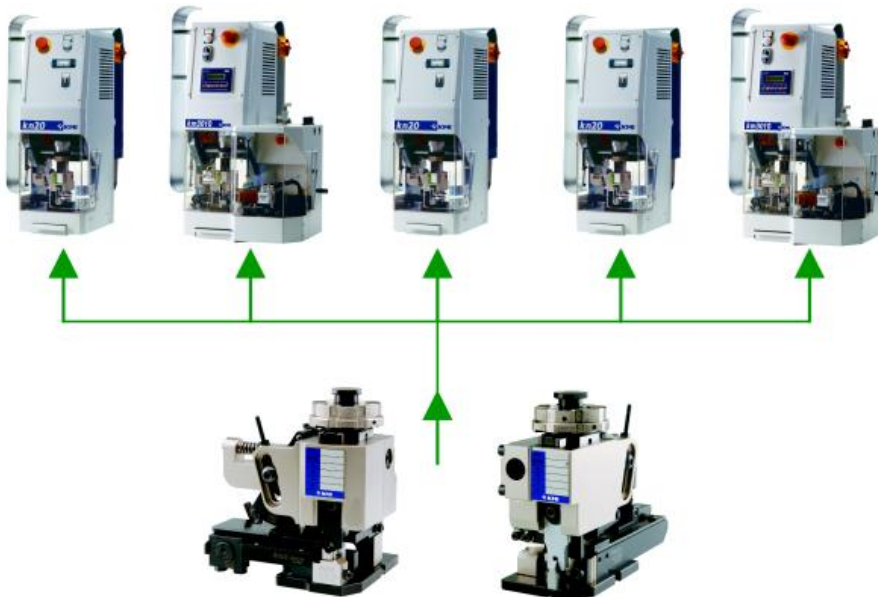


For this reason, some industries (e.g. automotive) now stipulate which equipment must be used for wire processing. But here, too, it is imperative that the quality of the equipment is constantly checked. Production equipment is likewise manufactured by people, who can make mistakes. And the argument: "We are not to blame for the poor quality because we use the prescribed equipment!" does not protect against complaints and recourse claims in the event of corresponding failures or damage caused by a faulty cable harness.

In principle, there are several alternative processing setups for each work step in the field of wire processing. These range from hand tools to semi-automation and full automation.

The decision which equipment to use depends on:

- **Number of pieces that must be manufactured**
- **Quality demand on the finished product**



By adjusting all crimping machines in a production line to the "bottom dead center", the crimping applicators can be used in a wide variety of crimping machines without major retooling and adjustment work.

Important: A visual inspection of the crimp connection and the corresponding measurements (crimp height, micrograph, pull-out test) must always be performed for the first crimp connections made!

3.3.4 ADJUSTING THE BOTTOM DEAD CENTER

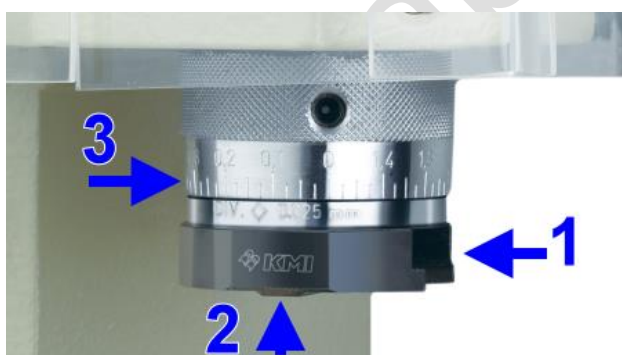
There are special measuring and setting cylinders for setting the crimping machine.

Adjustment:

- Place the measuring cylinder on the base plate under the top tool fixture.
- Turn the crimping machine downward by hand. The contact surface presses the spring-loaded measuring cylinder down.
- The spring equalizes the play of the crimping machine. When the ram passes the "bottom dead center", the current value can be read on the display instrument.
- Loosen the adjusting screw for the ram and adjust the "bottom dead center" if necessary.

Stepless adjustment:

In modern crimping machines, the holder for the crimping tools is equipped with a stepless adjustment mechanism.



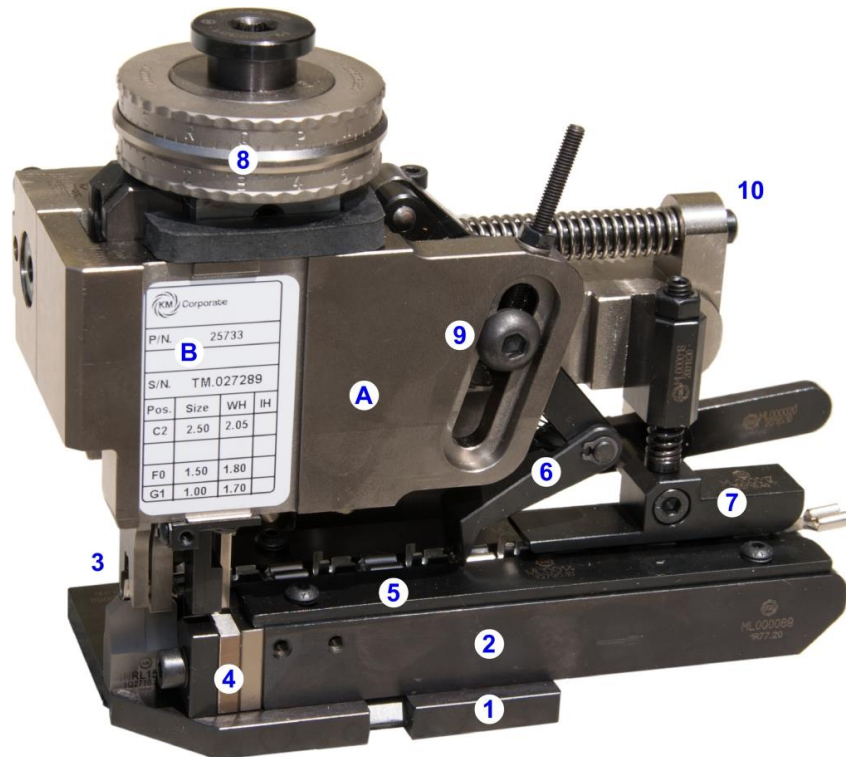
- (1) Holder for the ram of the crimping tool.
- (2) Front pressure surface on the ram.
- (3) Stepless adjustment of the bottom dead center.

In modern crimping machines, the ram is infinitely adjustable. This means that the bottom dead center can be set quickly and very accurately.

Important: To prevent accidental readjustment by the machine operator, this setting can be locked on the crimping machine, e.g. with locking varnish!

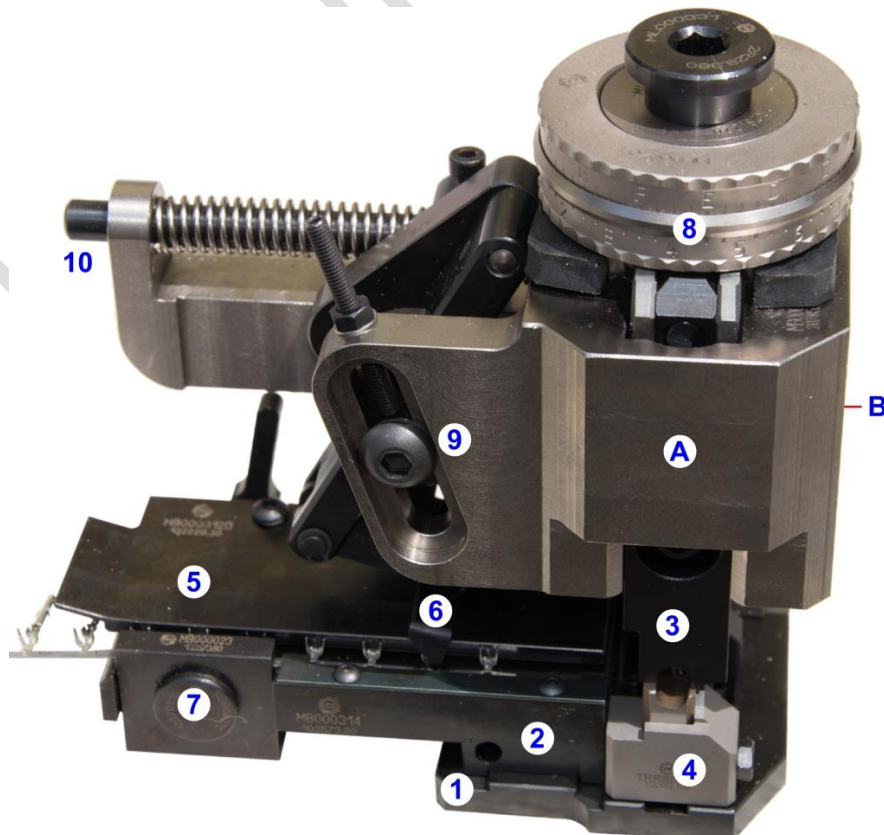
4.2 CRIMP APPLICATOR: DEFINITIONS

Endfeed Crimp Applicator



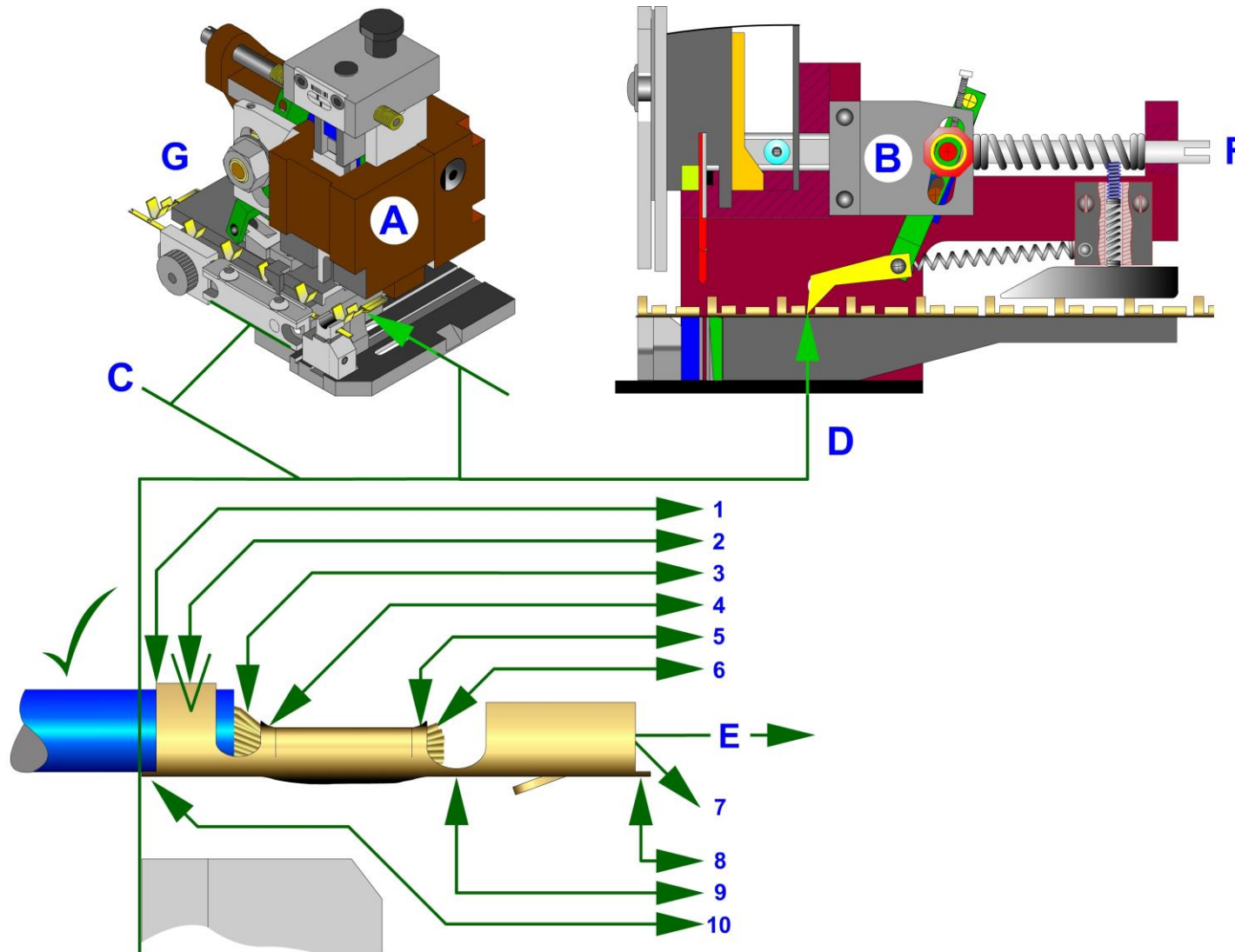
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|--------------------------|-----------------------|--------------------------------|
| (A) Tool body | (3) Wearing parts kit | (7) Contact brake |
| (B) Identification label | (4) Shear unit | (8) Ram (top tool fixture) |
| (1) Tool base plate | (5) Contact guide | (9) Adjustment: Feed stroke |
| (2) Tool table | (6) Feed finger | (10) Adjustment: Feed position |

Sidefeed Crimp Applicator



4.4 EFFECTS OF TOOL SETTINGS - EXAMPLE: CONTACT POSITION

If the contact position on the anvil is changed by the setting of the crimping tool, this influences several parameters in the crimp connection at the same time. With sidefeed crimp applicators, the contact position on the anvil is set via the table position (G). With endfeed crimp applicators, this setting is made via the set screw (F) for the feed of the crimp contacts.

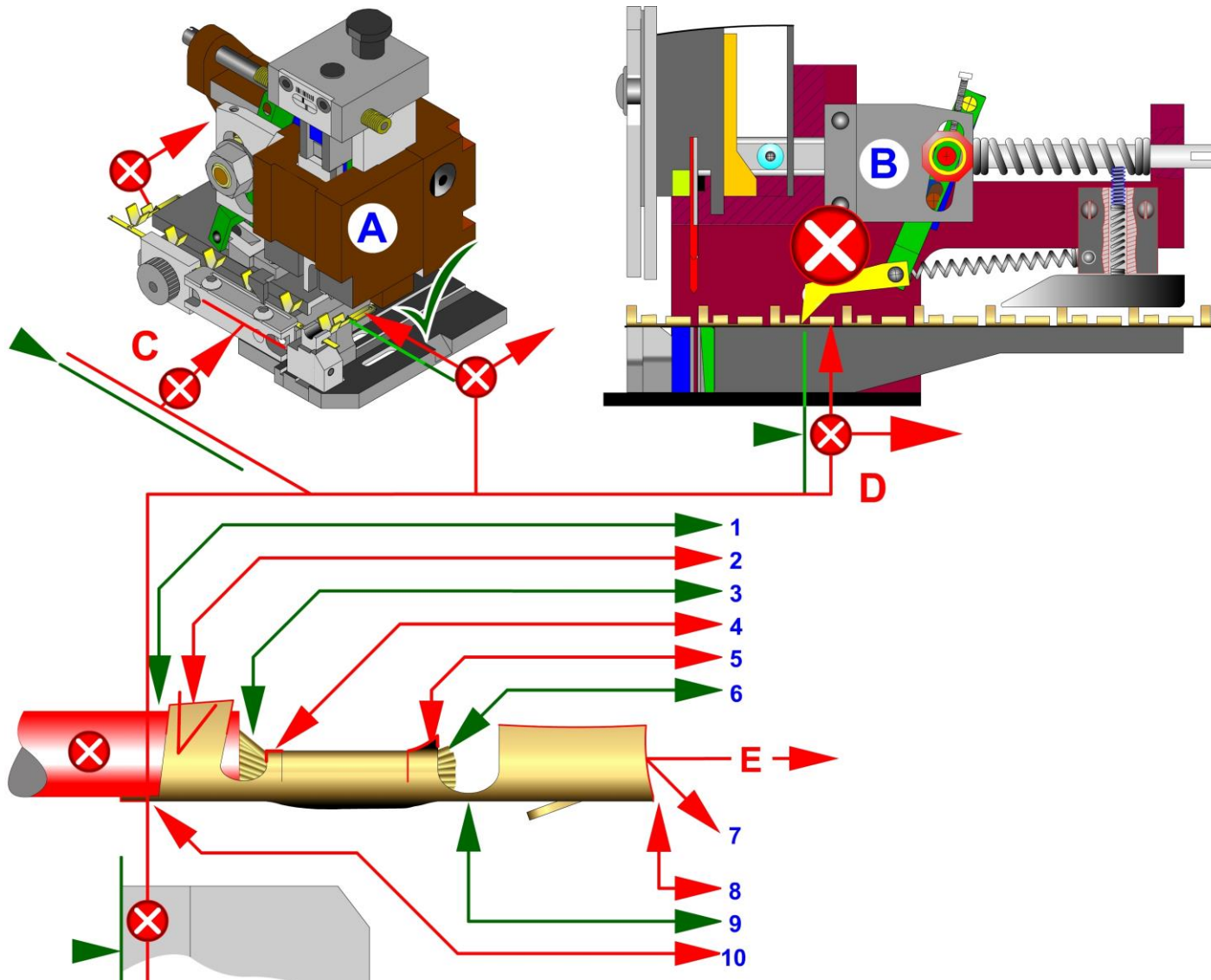


(A) Sidefeed crimp applicator:
(G/C) Table position OK!

(B) Endfeed crimp applicator:
(D) Feed setting OK!

(E) Contact position OK!

- (1) Insulation crimp flanks: OK**
- (2) Position of insulation crimp flanks: OK**
- (3) Conductor position (Seal Position): OK**
- (4) Rear bellmouth: OK**
- (5) Front bellmouth: OK**
- (6) Conductor protrusion: OK**
- (7) Contact/function area: OK**
- (7) Crimp contact geometry: OK**
- (8) Front tab: OK**
- (9) Wire crimp - contact area transition: OK**
- (10) Rear tab: OK**



(A) Sidefeed crimp applicator:

(C) Table position NOK: Table too far back!

(B) Endfeed crimp applicator:

(D) Feed position NOK: Contact not transported far enough

(E) Contact position NOK:

Contact position too far forward!

(1) Insulation crimping flanks: OK

(2) Position insulation crimp flanks: Tilting forward

(3) Wir position (Seal position): OK (*1)

(4) Rear bellmouth: missing

(5) Front bellmouth: too big

(6) Conductor protrusion: OK (*2)

(7) Contact/Functional Area:

Sidefeed OK | Endfeed: possibly damaged

(7) Crimp contact geometry:

Crimp contact may be bent

(8) Front tab

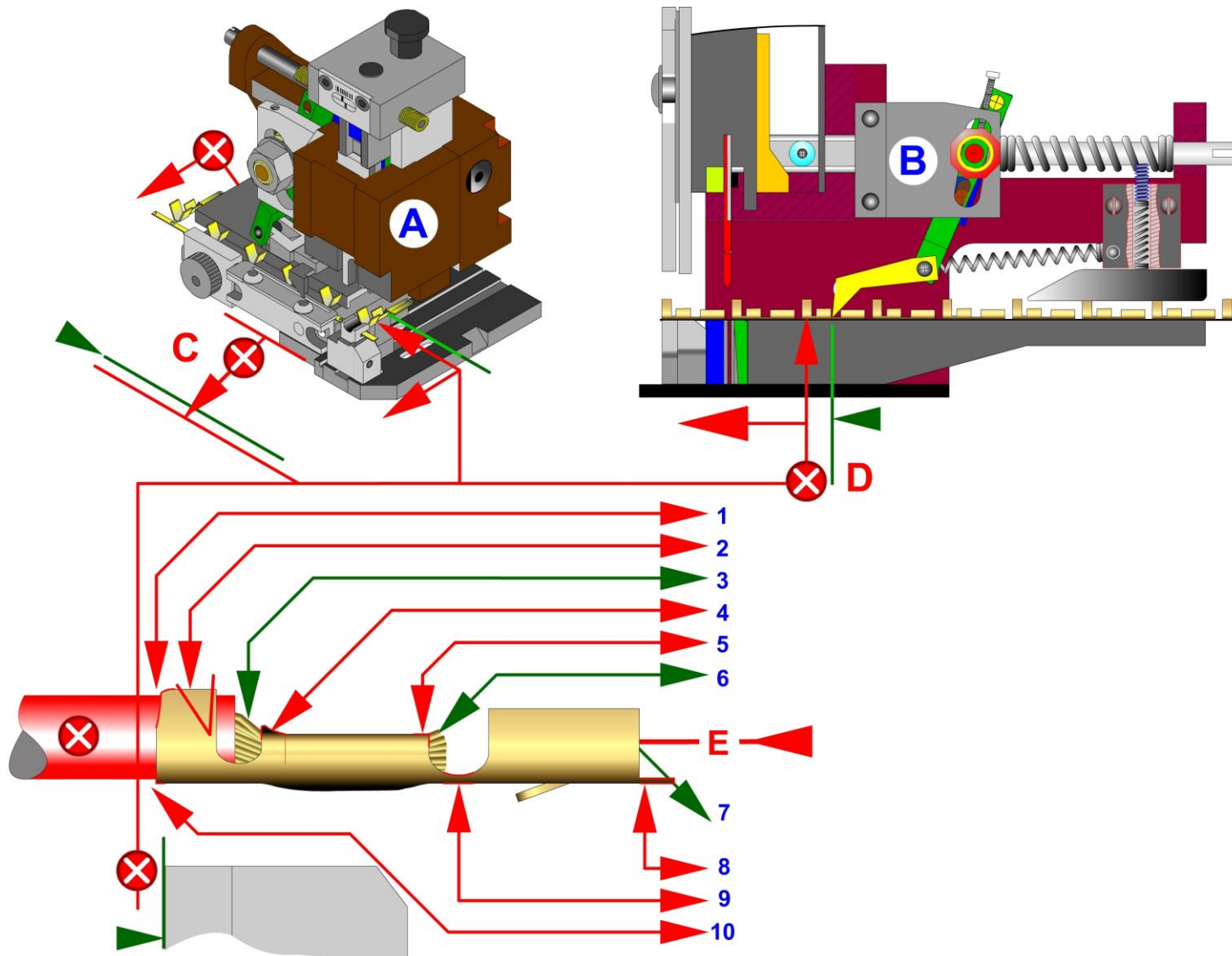
Sidefeed: OK | Endfeed: too short or missing

(9) Transition wire crimp to contact area: OK

(10) Rear tab: too long

When the tool is used in the stripper-crimper or on the fully automatic crimping machine, the wire is fixed in place by a gripper and inserted into the crimp contact.

Error: (*1) Wire not inserted deep enough (*2) Wire protrusion too short.



- (A) Sidefeed crimp applicator:
- (C) Table position NOK: Table too far forward!
- (B) Endfeed crimp applicator:
- (D) Feed position NOK: Contact transported too far!
- (E) Contact position NOK: Contact position too far forward!
- (1) Insulation crimp flanks: possibly damaged
- (2) Position of insulation crimp flanks: Tilt to the rear!
- (3) Wire position (Seal Position): OK (*1)
- (4) Rear bellmouth too big, may be incised
- (5) Front bellmouth too small or missing
- (6) Conductor protrusion: OK (*2)
- (7) Contact/Functional Area: OK
- (7) Crimp contact geometry: Crimp contact may be bent
- (8) Front tab
- Sidefeed: OK | Endfeed: too long
- (9) Transition zone may be damaged
- (10) Rear tab: too short or missing

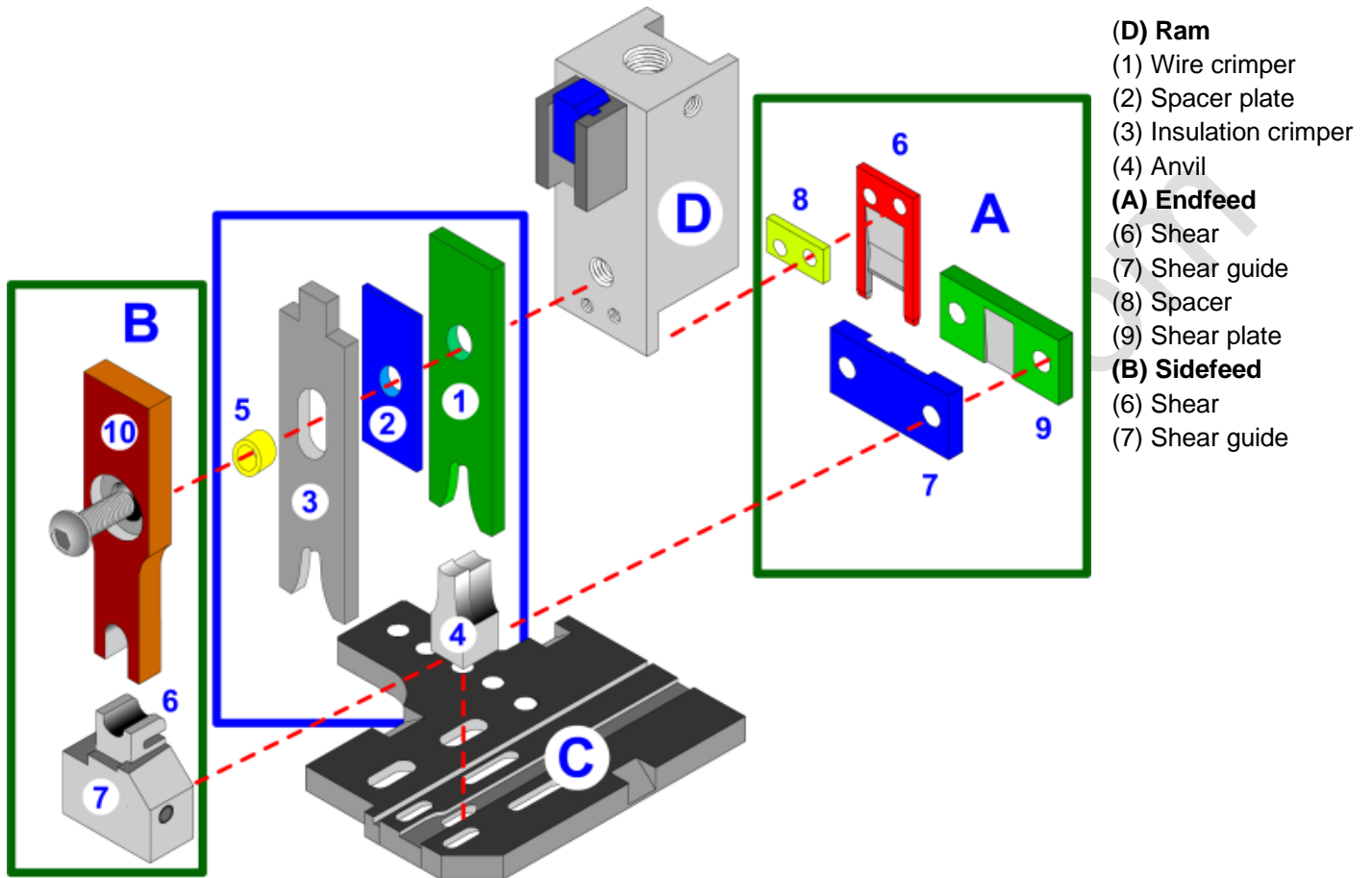
When the tool is used in the stripper-crimper or on the fully automatic crimping machine, the wire is fixed in place by a gripper and inserted into the crimp contact.
 Error: (*1) Wire inserted too deep - insulation may be in wire crimp area (*2) Wire protrusion too large!

6. CRIMPER, ANVIL, SHEAR UNIT

6.1 ASSIGNMENT OF THE WEAR PARTS



The correct assignment of the wearing parts to the respective crimp contact is important for creating a crimp connection. A set of wearing parts generally consists of the following components:



Each tool delivery is accompanied by a data sheet in which the wearing parts set is defined. In addition to the spare parts list, it is important to know how the wearing parts set must be arranged.