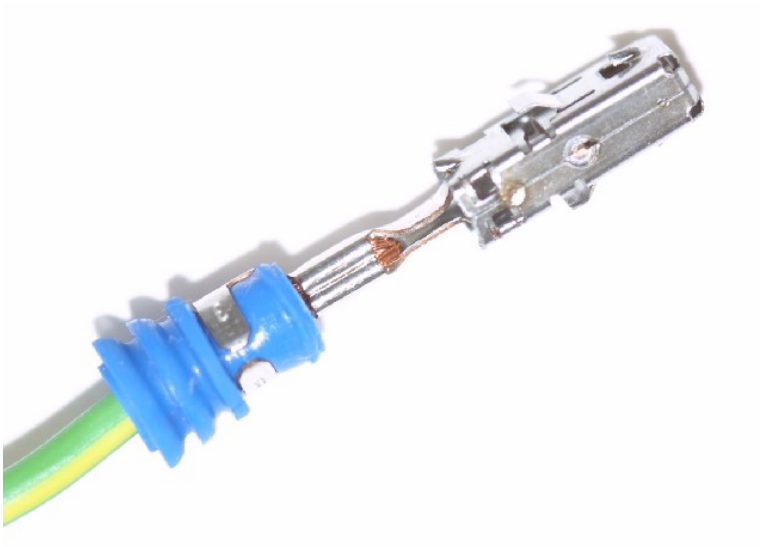
Robert Bosch GmbH

1 928 F00 025-EN

Processing Specification

BDK 2,8

VALID	CHANGE	DWN.	CHK.
12.11.2002	New edition	Philipp	Rehbein
29.08.2005	Editorial revision	Seel	Rehbein
13.11.2008	ÄAS 92 J 14 704 (correction of the processing tolerance of the insulation crimp width on page 10)	Philipp	Rehbein
16.07.2014	Addition new crimp 0,35mm²	Hu	Steinbrecher
20.10.2021	3E10052328	Baljak	gez. Smolka
14.04.2023	3E10087049	Baljak	pki, BOSCH, DE, G, R, Gregor.Smolka Digitally signed by pki, BOSCH, DE, G, R, Gregor.Smolka Date: 2023.04.19 06:58:20 +02'00'



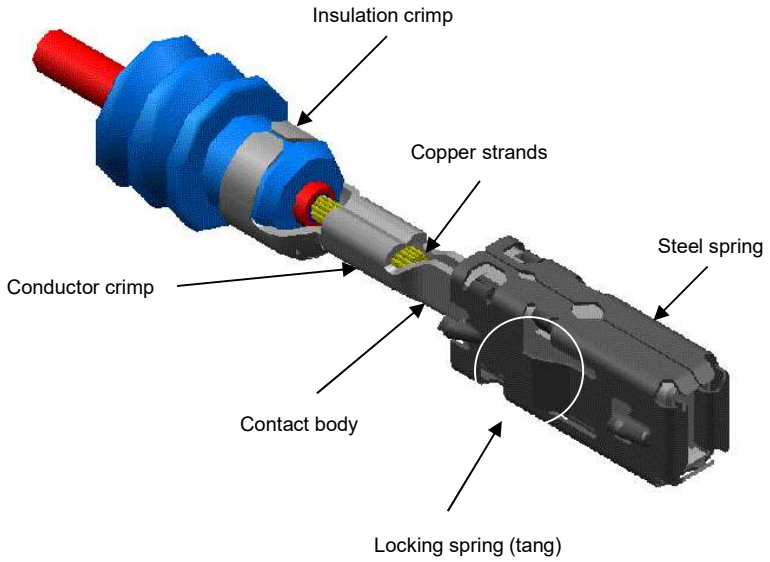
Contents

1. Contact BDK 2,8

1.1 Area of Applications

The contact BDK 2,8 (BDK = Bosch Damping Contact) was developed for connectors applied to a high vibration level.

The contact is used, for example, in 2–7 way Bosch compact connectors for engine applications. An innovative technology guarantees reliable connection even for severe vibration applications.
The contact features are a single-wire seal and a secondary locking.



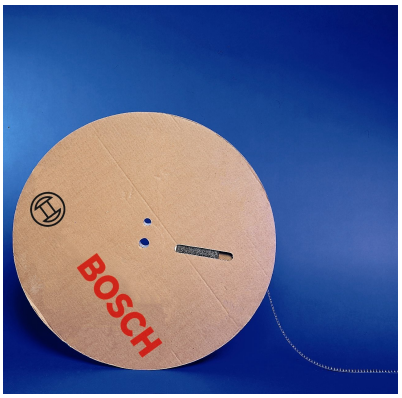
1.2 Design

The base material of the contact body is CuNiSi, with tin-plated crimping area (for further details refer to TKU 1 928 A00 23T). The BDK 2,8 is available with a tin-, silver- or gold plating in the contacting area. Gold platings are required for more higher requirements.

The BDK 2,8 can be ordered for 0,35mm², 0,5-1,0mm² and 1,5 - 2,5 mm² crimping areas. The crimp connections are designed for FLR-B wires and for FLR-A wire 1.5 mm² as per **DIN 72551 Parts 5 and 6.**

The packaging must be disposed of by the user.

The contacts are suitable for transverse feed from the left.



1.3 Storage

The disposable contact reels should be stored well protected against external influences (crushing, impacts, kicks, thrusts, etc.).
Contacts stored for too long loose their production specific lubrication due to environmental effects, and proper processing or terminal properties can thus no longer be guaranteed. The fitter himself is responsible for the usability of the contacts stored at his plant. So that any processing problems can be easily traced, the fitter must be able to check the storage period of the contacts. The production date is marked on the packaging.

Storage capability and conditions are as follows:

Storage conditions	**max. storage time**	
	Sn, Ag-plated	Au-plated
Temperature +15 to +30°C (relative humidity 45 to 75%)	6 months	12 months
Temperature +25°C (constant relative humidity 60%)	12 months	12 months

1.4 Set up of processing environment

The processing environment must be designed to satisfy maximum quality requirements. The prime objective must be to ensure a low failure rate.
Special notes on the production of wiring harnesses see Y 280 F70 004.

2. Crimp connection

The quality features of crimp connections are described in **DIN EN 60352 Parts 1 and 2**, as well as **DIN 46249**. The staff working on crimping machines must receive intensive training to familiarize them with the content of these Processing Specification.

2.1 Crimping pliers

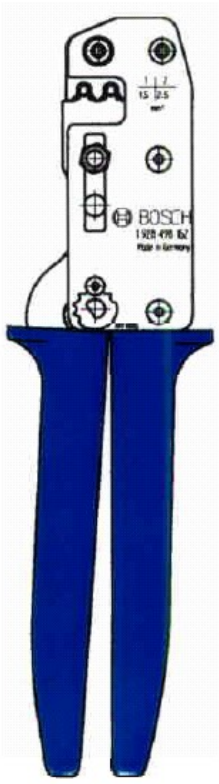
Bosch offers a crimping pliers for manual crimping of the BDK 2,8 contact. ***All permissible wire cross sections and all types of contact can be processed with a single tool.***
The pliers features three profiles and one swivelling positioning element. An unlocking mechanism allows the pliers to be opened in any position in the event of incorrect use. An adjuster wheel is provided on the tool for setting the applied actuation. Since any adjustment of this wheel will affect the quality of the crimp produced, subsequent inspection of the crimp is essential.

Further information on adjusting the crimping pliers can be found in the operating instructions. The adjusting wheel is pre-set before the tool leaves the factory.

For reasons of quality the user is obliged to ensure that the crimping pliers is correctly adjusted.
An examination of the achieved crimp dimensions is therefore absolutely essential (see 2.3.3 and 2.4.2).

2.1.1 Purpose of the crimping pliers

As it is impossible to produce high quality crimps with the crimping pliers, **the use in industrial manufacturing is not allowed.**
For use in specimen-making, small series, pre-series, prototypes, etc. the crimp quality must be assured by means of measures outlined in Chapter 2.4.

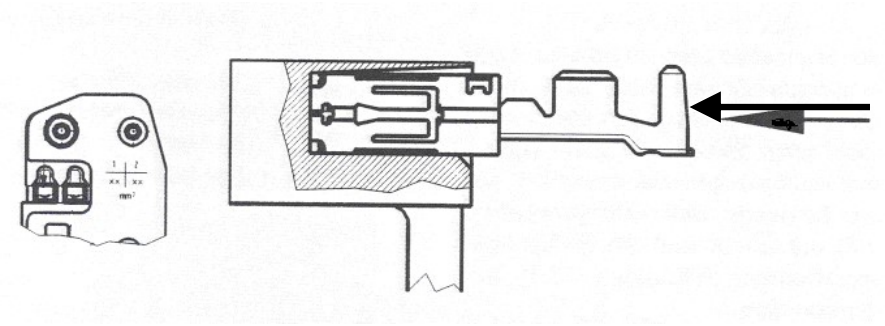


2.1.2 Notes on handling

To ensure a high crimp quality always press the crimping pliers together up to the stop.

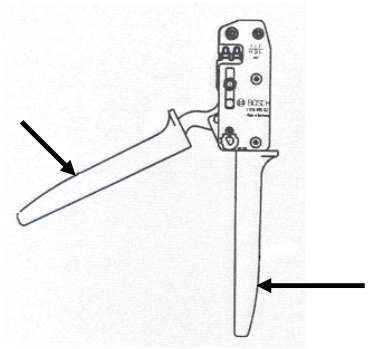
Crimping procedure:

- Insert contact in the pliers

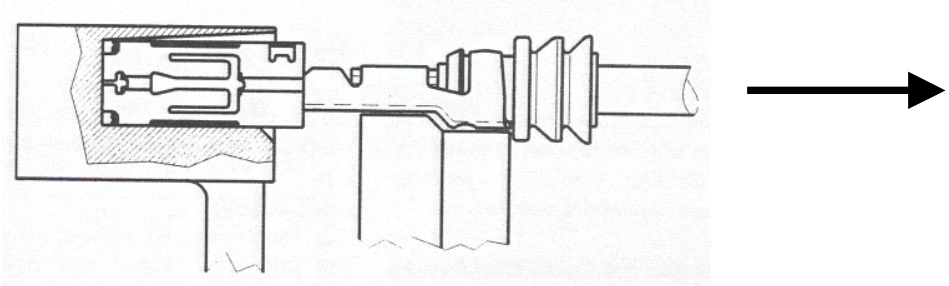


- Then place the stripped wire in correct position in crimping area with a fitted single-wire-seal. (refer to 2.3 „Crimping specifications“ for dimensions).

- Press pliers up to the stop.
  An automatic locking mechanism prevents early opening of the pliers.



- Pull out carefully contact at attached wire.



2.2 Crimping tool

2.2.1 Intended purpose

An applicator is available from Bosch for fitting the contact for industrial manufacturing of wiring harnesses. This tool features an AMP standard mount, i.e. it can be fitted to all machines based on this standard.

To match the contacts, the tool is designed for transverse feed from the left side.

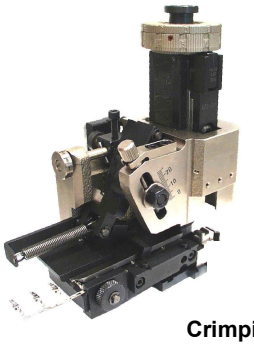
A specific tool can be ordered for each crimping range. The crimp height can be set on the tool by way of a latching mechanism (rest head). So the selected crimp heights can be produced. The fine tuning permits exact adjustment to compensate wear of the die.

Certain parts of the tool like the die, anvil and cutter are subject to natural wear on account of the mechanical stress to which they are exposed. They can be re-ordered if required in a wear part set. Only genuine wear parts are to be used. If the tool or the parameters of a tool were changed, the quality of the crimps has to be checked by performing trial crimps.

We cannot accept any liability for damage or poor quality crimping caused by the use of other tools.

Various presses from Komax, Schäfer, Hanke and other manufacturers can be used for semi-automatic processing of contacts.

In series production, for reasons of quality assurance, only automatic units with crimping force monitoring are to be used.
For the fully automatic processing of contacts, machines by Komax, Megomat, Ara, Artos among others can be put into operation.



Crimping tool

2.2.2 Tool setting

The correct setting of the tool must be checked prior to start-up. Careful tool setting is a prerequisite for high quality crimping. Particular attention is to be paid to the feed as this determines the final position of the contact in the die area. A precise check of the feed is possible through micrographs (2.4.1). The conductor and insulation crimp heights are set by way of adjuster wheels on the latching mechanism.

The parallel accuracy of the contact can be set using a height-adjustable contact support.
Whenever adjustments have been made, trial crimps are to be performed until the results achieved are in line with the crimping specifications (2.3) and the requirements of the in-process checks (2.4) are satisfied.
Further information on tool operation, installation and maintenance can be found in the operating instructions.

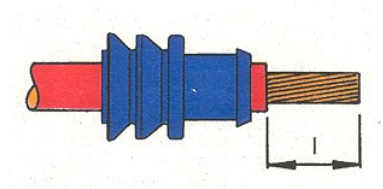
2.2.3 Lubrication

The contact BDK 2,8 can be processed without additional lubrication. The use of lubricants is not permitted. **We cannot accept any responsibility for faulty crimping or changed terminal properties caused by the use of lubricants!**

2.3 Crimping specifications

2.3.1 Stripping

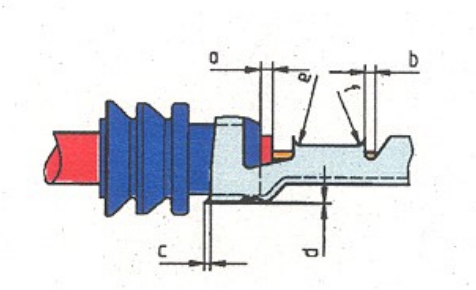
Care must be taken not to damage or sever individual cores when stripping. The stripping operation must not eliminate the process-related twisting, any re-twisting is not permitted. The wire insulation must not be damaged or permanently deformed by the stripping process. The insulation material must be free of any dirt or residue.



l = Stripped length after fitting single-wire seal

1928 498 054	4,0 ± 0,3
1928 498 055	4,3 ± 0,3
1928 498 056	4,0 ± 0,3
1928 498 057	4,3 ± 0,3
1928 498 058	4,0 ± 0,3
1928 498 059	4,3 ± 0,3
1928 499 395	4,0 ± 0,3
1928 499 396	4,0 ± 0,3
1928 499 397	4,0 ± 0,3

2.3.2 Wire and single-wire seal



a = Insulation projection:	min.	0 mm
	max.	1,0 mm
b = Conductor projection:	min.	0,1 mm
	max.	1,3 mm
c = Seperator length:	max.	0,3 mm
d = Seperator ridge:	max.	0,03 mm
e = Entry radius:	0,25 ± 0,15 mm	

Notes to the wire:

The contact is designed for wires of reduced cross section (FLR-B wires) and corresponding FLR-A wire as per **DIN 72551 Part 5 and 6**. Other wires require the approval of the Bosch development department.

Notes on single-wire seal:

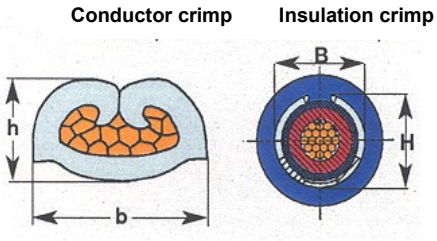
The insulation crimp must be fitted in a way that the single-wire seal is neither damaged, scratched nor cracked (refer to failure illustrations in Section 2.4.5.2). Pressure marks are only permitted if there is no danger for leaking.
Single-wire seals according to chapter 6 order information have to be used exclusively. Other seals require the approval of the Bosch development department.

2.3.3 Conductor crimp / insulation crimp

Conformity with the specified dimensions and tolerances is urgently recommended in order to guarantee uniformly high standards of quality. Suitable measuring instruments, such as specially shaped micrometers and caliper gauges, must be used for checking. All geometric measurements can be taken non-destructively.

All specified values refer to FLR-B wires (DIN 72551).

Wire [mm²]	b [mm]	h [mm]	B [mm]	H [mm]
Tolerances	+ 0,1		± 0,25	
0,35	1,6	1,06± 0,02	3,75	3,80± 0,05
0,5	2,03	1,18± 0,05	4,2	4,19 - 0,2
0,75	2,03	1,27± 0,05	4,2	4,19 - 0,2
1,0	2,03	1,36± 0,05	4,2	4,19 - 0,2
1,5	2,54	1,58± 0,05	4,3	4,19 - 0,2
2,5	2,54	1,81± 0,05	4,3	4,4 - 0,2



All specified values refer to FLR-A wires (DIN 72551).

Wire [mm²]	b [mm]	h [mm]	B [mm]	H [mm]
Tolerances	**+ 0,1**	**± 0,05**	**± 0,1**	**± 0,1**
1,5	2,54	1,58	4,30	4,09

For applying other types of wires a release of that wires is necessary.
Specified values for other wires can be provided by the Bosch development department.

2.3.4 Deviation from longitudinal axis

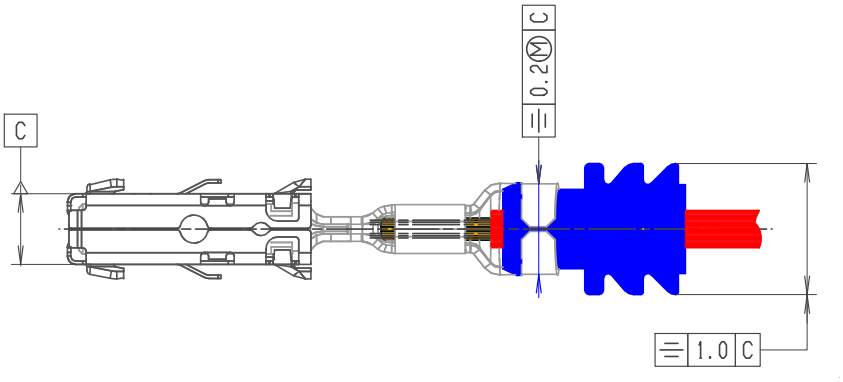
As a general rule, fitted contacts must not exhibit any visible deviation from their longitudinal axis, e.g.:

- Non-parallelism
- Non-symmetry

Such deviations generally become apparent in the form of a bend (angle between connection and crimp areas).

Symmetry

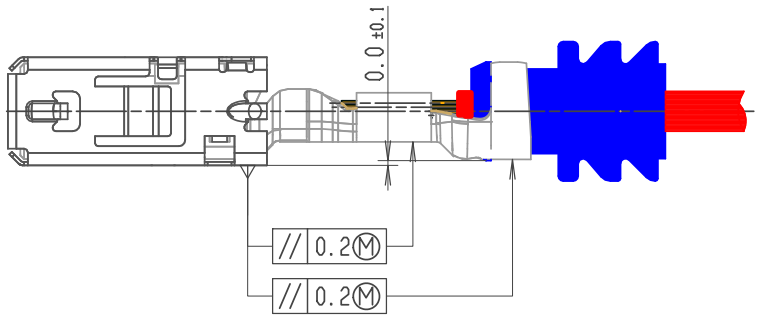
The width of the insulation crimp must be within a symmetry tolerance of 0,2 mm with respect to the body of the contact.



Parallelism

The base of the wire and insulation crimp must be within a tolerance of parallelism 0,2 mm with respect to the contact.
Maximum-material-principle:
The required parallelism may be exceeded by the extent to which other dimensions (e.g. insulation crimp height) remain the requirements. The total deviation which results from the sum of all tolerances however may not be exceeded.

In cases of doubt an assembly test can be performed.
If the contacts scratch or if they have to be bent or strained to allow insertion, the deviation from the longitudinal axis of the contact is excessive. The tool settings have to be corrected accordingly.



2.4 In-process checks for series manufacture

In-process checks enable possible faults to be detected. The cause of the problem however must be determined and eliminated immediately by the staff involved.
The use of monitoring systems does not relieve personnel of their responsibility to exercise due care, nor does it justify employing unqualified personnel.
Faulty components are always to be discarded. Re-working is not permitted.
If not otherwise specified, the frequency of checking and the scope of random samples are to be determined by assembly personnel on their own responsibility using statistical methods.

2.4.1 Micrographs

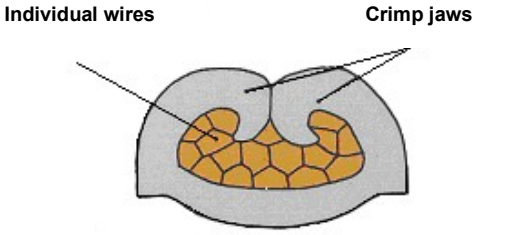
Micrographs are designed to substantiate the degree of compression of a crimp connection. The process involves cutting open the crimp perpendicularly to its axis grinding and polishing it. The crimp connection is examined in the most severely deformed areas of the conductor crimp. BDK 2,8 contacts have several small beads in the area of the conductor crimp.
Grinding and polishing is not to be performed in the area of the beads.
Micrographs have a high priority and have precedence over other checks. The dimensions of a crimp have to be optimized within the set tolerances on the basis of micrographs.

Regular micrograph checking is an indispensable feature of series production and involves proof of proper state of compression of the crimp connection with the specified tool setting.

2.4.1.1 Conductor crimp - Ideal case

- All individual wires must be compressed into a honeycomb arrangement.
- There must not be any individual wires missing (stripping error).
- The crimp jaws must rest against one another.
- There must not be any visible cavities.
- The base must assume the illustrated shape.

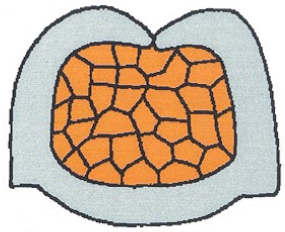
If all the listed criteria can be seen in the micrograph, a „gas-tight“ crimp connection can be assumed.



Ideal appearance

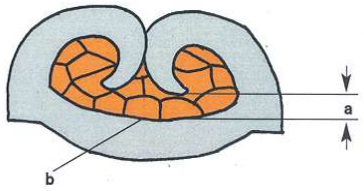
2.4.1.2 Conductor crimp - Borderline samples

The individual wires still show a honeycomb arrangement.
In case of missing individual wires, it must be assumed, that the remaining wires still stay compressed in the honeycomb arrangement.
Tiny gaps between individual wires or between wires and crimp claw are permitted if the gaps are definitely closed in another micrograph plane.



Just permissible

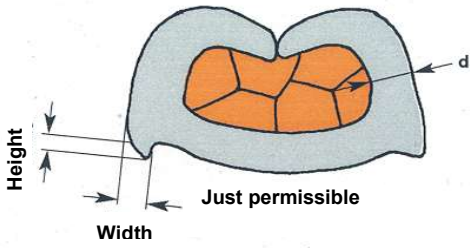
Distance (a) between both crimp claws and the base of the crimp (b) corresponds at smallest point to wire diameter of uncrimped individual core.



Just permissible

Limiting values for ridge formation at base of crimp:

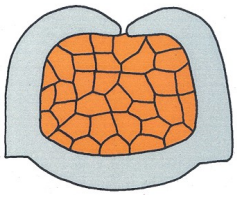
max. perm. ridge height at base of crimp = metal thickness d.
max. perm. ridge width = ½ metal thickness d.



2.4.1.3 Conductor crimp faults

The crimp claws do not rest against one another.
The crimp is overfilled.

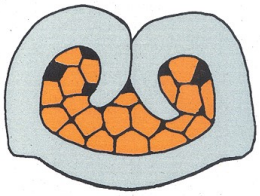
- Check assignment of crimp connection area to conductor cross-section used.



Not permissible

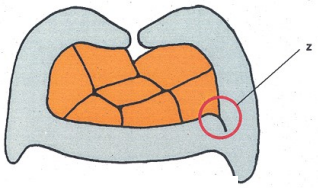
Unsatisfactory compression.
Crimp is underfilled.

Check the following:
- Assignment of crimp connection area to conductor cross-section used.
- Stripping errors
- Crimp height
- Cavities / Holes



Not permissible

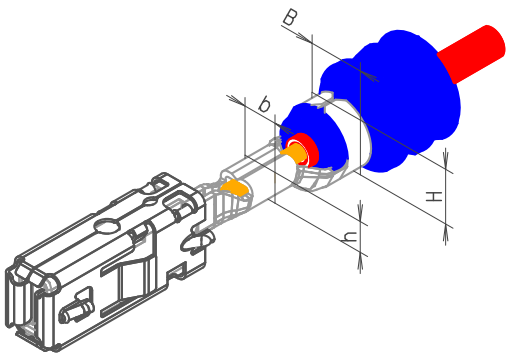
Material cracked at z and crimp claws open.
Cause: Upper and lower dies worn.
Ridges form



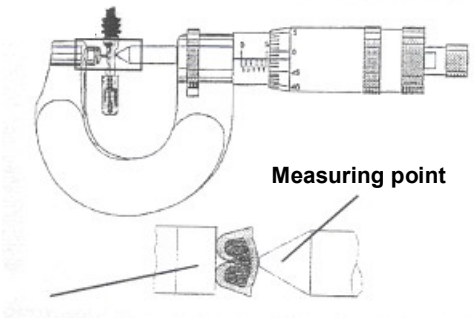
Not permissible

2.4.2 Crimp dimensions

Compliance with dimensions and tolerances is an absolute necessity if constant quality is to be guaranteed. The conductor crimp dimensions are checked using a pointed-end micrometer as shown. Conductor crimp width and insulation crimp height / width are determined with a vernier caliper.
Parallelism, symmetry and position readings are taken with a profile projector.



Crimp dimension measurements at marked locations



Concuctor crimp height measurements

2.4.3 Crimping force monitoring

The use of suitable measuring instruments allows to draw conclusions on the applied crimping force.
The applied crimping force gives then conclusions about the quality of the crimp connection. The measuring devices being put into operation are direct sensor-type or indirect force measurement systems.
Indirect force measurement can be achieved by way of position measurement and – in the case of hydraulic presses - by measuring oil pressure. A combination of several different measurement methods is often employed.

„o.k.“/ „not o.k.“ evaluation is performed by comparing the measured values with reference values.
The deviation must not exceed the defined limit values. Because by monitoring the process any failure can be observed immediately and an intervention in the production process is possible.
Automatic crimping force monitoring is an indispensable feature of series production (2.2.1).
The emerging crimping force is governed, for example, by the press used (semiautomatic / fully automatic).
The reference values must therefore be measured and determined by the assembly personnel.
The setting of the monitoring unit / the predefinition of the reference values must be sensitive enough to detect the following errors:

- Insertion errors such as incorrect positioning, incorrect wire (cross-section, structure etc.), insulation in conductor crimp area.
- Individual cores sticking out/ missing
- Stripped length too short/no conductor projection
- Deviations from specified crimp height
- Tool wear

Proper functioning of the crimping force monitoring is to be checked at regular intervals respectively after lengthy shutdowns, by simulating known, reproducible errors.
Recording of reference values is mandatory on machine set-up and crimping tool replacement (whenever tool is removed from and returned to mount). Reference values cannot be applied to similar contacts or other crimping tools.

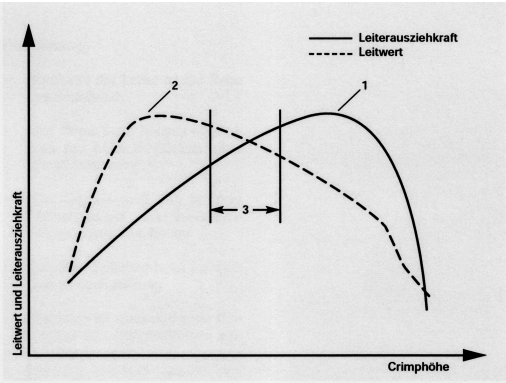
Any software updates offered by the manufacturer which could improve crimping quality, must always be employed.

2.4.4 Conductor pull-off force

This measurement involves pulling on the wire (in line with DIN IEC 512-8) until the conductor becomes detached from the crimp connection or the wires tear off. The measurement is to be performed with open insulation crimp. The force expended is monitored during the measurement and the maximum value recorded.

As can be seen from the graph, there is an optimum level (1) of conductor pull-off force. Excessive crimp height will mean that the individual wires only lie loosely in the crimp claw. They can thus easily be pulled out, the conductor force is lower. An excessive crimp height results in narrowing of the cross-section due to the severe compression.
The individual wires are thus subjected to greater tensile stress an tear off more readily.

It is however not sufficient to simply design the crimp height on the basis of the optimum conductor pull-off force.



Attention must also be paid to the electrical properties of the crimp connection. The optimum point in terms of conductance is to be found in the overly compressed area of the crimp connection (2). Accordingly, the correct crimp height (3) lies between the optimum conductance and the optimum conductor pull-off force. The compression of a good crimp connection is thus slightly greater than the optimum level (1)
The optimum range can also be determined by measuring the crimp dimensions instead of the conductance.

If the conductor pull-off force is in excess of the required value, a good crimp connection can only be assumed if the correct crimp dimensions were also established in a preceding check.

The minimum values for conductor pull-off force are as follows:

Wire cross-section [mm²]	Conductor pull-off force F [N]
0,35	> 50
0,50	> 60
0,75	> 80
1,00	> 100
1,50	> 170
2,50	> 200

2.4.5 Visual inspections

Visual inspections have to be performed regularly.

2.4.5.1 Evaluation criteria

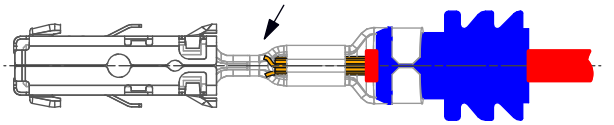
- All individual wires must be enclosed by the conductor crimp.
- Individual wires must not be damaged.
- The base of the crimp claw must exhibit a distinct change in shape.
- The crimp claws must be closed an rest against one another.
- Any ridges must not be too large. The ridge height must be less than the material thickness of the crimp barrel. The ridge width must not exceed half the material thickness of the crimp barrel (for definition of „ridge height“ and „ridge width“, refer to Section 2.4.1.2).
- The contact geometry must not be altered by the crimping operation. Particular attention is to be paid to bending or deformation of locking spring, cantilever spring and contact body.

  Crimping force recording systems cannot provide a clear-cut assessment when monitoring insulation crimping. Visual inspection is particularly important in this case.
- The conductor insulation must reveal any pressure marks or cracks in the area of individual–core seal, as could result for example from stripping.
- After crimping, the single-wire seal must not reveal any scratches of cracks. Particular attention is to be paid to the area between and next to the insulation crimp tabs. The collar of the single-wire seal is centred in the window of the crimp base.

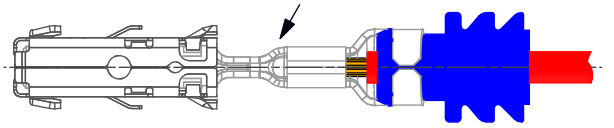
Refer to Section 2.4.5.2 for examples of properly produced and faulty insulation/ conductor crimp.

2.4.5.2 Examples for crimp faults

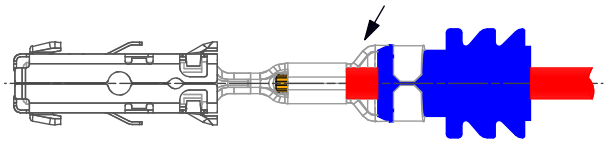
- Stripped length too long



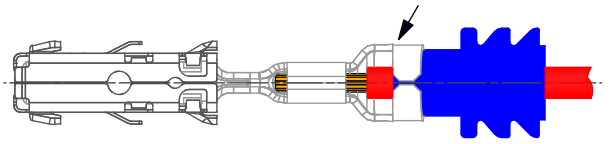
- Stripped length too short



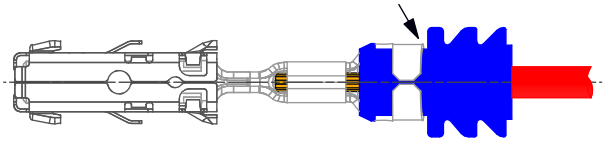
- Insulation extends into crimping area



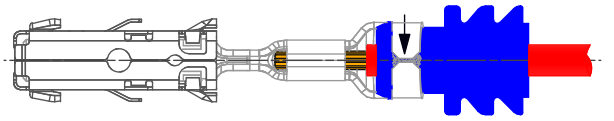
- Single-wire seal incorrectly positioned



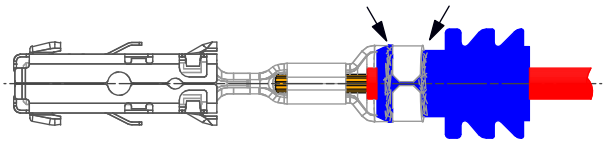
- Single-wire seal incorrectly positioned damage to front sealing lip by separator ridge (opposite)



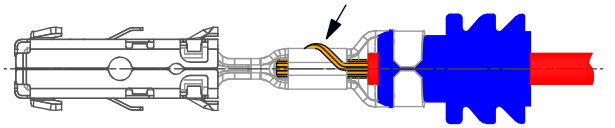
- Scratches on single-wire seal between insulation crimp tabs



- Scratches on single-wire seal on side of insulation crimp tab



- Individual wires not crimped



2.5 Failure table

Item	Problem	Possible effect[1])	Possible cause	Remedy
1	**Contact sets caught tool**	**Contact becomes bent and can no longer be used (problems with assembly of vibration resistance)**	**Upper die worn**	Check upper die for wear and replace if necessary
			Ejector worn	Clean
			Contact stored too long	Use new contacts
			Scraper missing/incorrectly adjusted	Fit/check adjustment of scraper
			Die worn	Re-polish
		Faulty crimp connection	Contact dimensions outside tolerance	Check contact
			Incorrect contact (other crimping range used)	Check contact
2	**Insulation bulges outwards**	**Tensile stress on wire may cause insulation to tear off**	Insufficient insulation crimp height	Check crimp height
			Actual wire dimension incorrect	Check type of wire, cross-section and insulation diameter
		Contact dimensions exceeded (assembly problems)	See above	See above
3	**entry of contact not smooth**	**Poor compression (result: impaired mechanical and electrical properties**	Crimper dirty	Re-polish
			Crimper worn	Replace
			Contact not centered on anvil	Check position
			Contact not in line with drawing data	Check contact
4	**Protruding individual wires**	**Poor compression**	Tool incorrectly set	Check height/lateral/depth positioning of contact
		Reduced conductor pull-off force		
5	**Ridge formation and cracking at base of crimp**	**Danger of injury**	Incorrect crimp height setting	Check setting
		Poor state of compression	Die wear	Replace die
			Die soiled	Re-polish die
6	**Entry radius not properly formed**	**Poor crimping**	Contact not correctly positioned on anvil	Check tool setting
		Reduced conductor pull-off force	Contact not in line with drawing data	Check contact

[1]) Here it is only about primary effects. Secondary effects depend on the contact application but can even result in failure of the electronic system (stranding of vehicles, failure of safety-relevant components).

3. Assembly

3.1 Manual

Proper locking must be ensured on fitting into housings. The locking bar of the contact provide an indication of this, as they can be clearly heard and felt latching into position.

Proper locking is however always to be checked by subsequently pulling on the wire (pull test).

Assembly tools are not required. It must be possible to perform assembly easily and without applying force, i.e. damage/ scratching must not occur. The plug housing must not be damaged. We cannot accept any liability for damage caused by the use of assembly tools.

3.2 Automatic

BDK 2,8 contacts are suitable for automatic assembly.

Automatic assembly is already implemented on various systems for several series applications.

Further information can be obtained from the Bosch development department.

4. Final inspection

4.1 Electrical function

In series production, final inspection of the wiring harness for continuity and for leaks in the case of sealed connectors (measurement of leakage rate through high pressure) should always take the form of 100% checking.

Installations for wiring harness final inspection must be provided with special adapters for attaching the wiring harnesses. The use of standard mating connectors (pin contacts/tabs) is not permitted, as these are not designed for the appropriate number of connection cycles and may lead in the event of frequent use to the entrainment of dirt and premature damage on account of their full insertion in the jack.

Test adapters are designed to permit connection of the wiring harness contacts without causing damage or the entrainment of dirt.
Users are responsible for obtaining test facilities and ensuring their proper function.

4.1.1 Test adapter and test pins

An electronic test is conducted by touching the contact with a test probe. The following points should be noted:

Spring-mounted test pins are used for contacting, which permits touching of the wiring harness contacts but do not penetrate into their contacting zone.
The test pins must be aligned in a way, that contacts are guided by the appropriate connector recesses.
The test pins must also be designed in such a manner that contacts which are incorrectly / not locked cannot be connected and are thus discarded as being faulty.

On account of dimensions and tolerances, test adapters and test pins used must be matched to the wiring harness connectors. Information on this topic can be obtained from Bosch if required

The test force must always be kept as small as possible.

4.1.2 Settings

The test voltage and current must not exceed the following limits:
U_{max} = 12 V
I_{max} = 100 mA.
Arcing must be avoided in any cases.

Recommended setting:
U_{max} = 20 mV
I_{max} = 1 mA

4.2 Locking

Proper engagement in the housing can be established by way of a push / pull test.
More detailed information can be obtained from the Bosch development department.

5. Disassembly

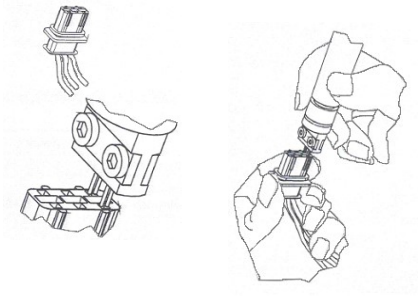
5.1 Disassembly tool

The BDK 2,8 contact can be removed from the housing again in the event of incorrect assembly or for connector repairs.
A prerequisite for this is the use of a disassembly tool as offered by Bosch (**Fig .1**; refer to 6.4).
To release the contact, the locking spring (tang) has to be pressed down by the pins of the disassembly tool.
The disassembly tool is designed to enable the pins to be rapidly replaced in the event of breakage.
Pins can also be re-ordered as a set (6.4).

5.2 Notes on Disassembly

5.2.1 Handling of disassembly tool

- Prepare the connector for removal of the contact. The exact procedure for this can be found in the assembly specifications of the connector concerned.
- Insert disassembly tool in connector release openings.
- Push contact on wire briefly towards disassembly tool and then pull out carefully.



Caution:

- If stiff, do not tug on wire as otherwise primary spring of contact will jam.
- Small pins of disassembly tool may break off if used inexpertly (danger of injury).

5.2.2 General notes

Check disassembled contacts for damage:

- Locking bars out of shape?
- Connection area damaged by testing etc.?
- Contact bent on disassembly?
- Other visible damage?

If damage is found on contact, pinch off contact and replace with a new one. This involves slackening pinched-off wire and pulling it through until original free length is available again. If this is not possible, all other wires of the same connector must be shortened to the same extent.
Post-treatment on new contacts has to be done with crimping force monitoring (2.4.3);
use may also be made of genuine Bosch crimping pliers (6.2).

Check appropriate connectors for damage:

- Plastic chips found on contact disassembly, e.g. under locking bar or at steel cantilever spring?
- Other damage on connector?

If connector damage is found, all other contacts must be disassembled in the same manner to enable the connector be replaced with a new one.

Further information can be found in the assembly specification for the connector concerned.

Following repair, connectors must be subjected to a functional test:

- Connectors with secondary locking:
  Electrical Final Inspection (4.1)
- Connectors without secondary locking:
  Electrical Final Inspection (4.1)
  Engagement Test (4.2)

6. Ordering information

6.1 Contacts and Single-wire seals

Crimping range [mm²]	Surface	Part no.	Single-wire seal
0,35	Au	1 928 499 397	1 928 300 599
0,50 - 1,00	Au	1 928 498 054	1 928 300 599
1,50 - 2,50	Au	1 928 498 055	1 928 300 600
0,35	Sn	1 928 499 396	1 928 300 599
0,50 - 1,00	Sn	1 928 498 056	1 928 300 599
1,50 - 2,50	Sn	1 928 498 057	1 928 300 600
0,35	Ag	1 928 499 395	1 928 300 599
0,50 - 1,00	Ag	1 928 498 058	1 928 300 599
1,50 - 2,50	Ag	1 928 498 059	1 928 300 600

6.2 Crimping pliers

Article	Part no.
Crimping pliers for 0,35 mm²	1 928 499 408
Crimping pliers for 0,50 / 0,75 / 1,00 mm²	1 928 498 161
Crimping pliers for 1,50 und 2,50 mm²	1 928 498 162

6.3 Crimping tool

Article		Part no.
Crimping tool Crimping range	0,35 mm²	1 928 499 409
Crimping tool Crimping range	0,50 – 1,00 mm²	1 928 498 163
Crimping tool Crimping range	1,50 – 2,50 mm²	1 928 498 164
Wear part set Crimping range	0,35 mm²	1 928 499 410
Wear part set Crimping range	0,50 – 1,00 mm²	1 928 498 165
Wear part set Crimping range	1,50 – 2,50 mm²	1 928 498 166

6.4 Disassembly tool

Article	Part no.
Disassembly tool	1 928 498 167
Spare part for disassembly tool	1 928 498 168

7. Information and addresses

Robert Bosch GmbH
Powertrain Solutions
http://www.bosch-connectors.com