Tooling

Page

Modular tooling system for starting connector press-in

The diversity of connector types with press-in terminations and varying termination styles make it necessary to have a simple, flexible tooling system that can be continuously updated.

The HARTING modular tooling system has significant advantages in terms of economic assembly of the many connector types with press-in terminations.
The basic modules of the tooling system which will always be required are:

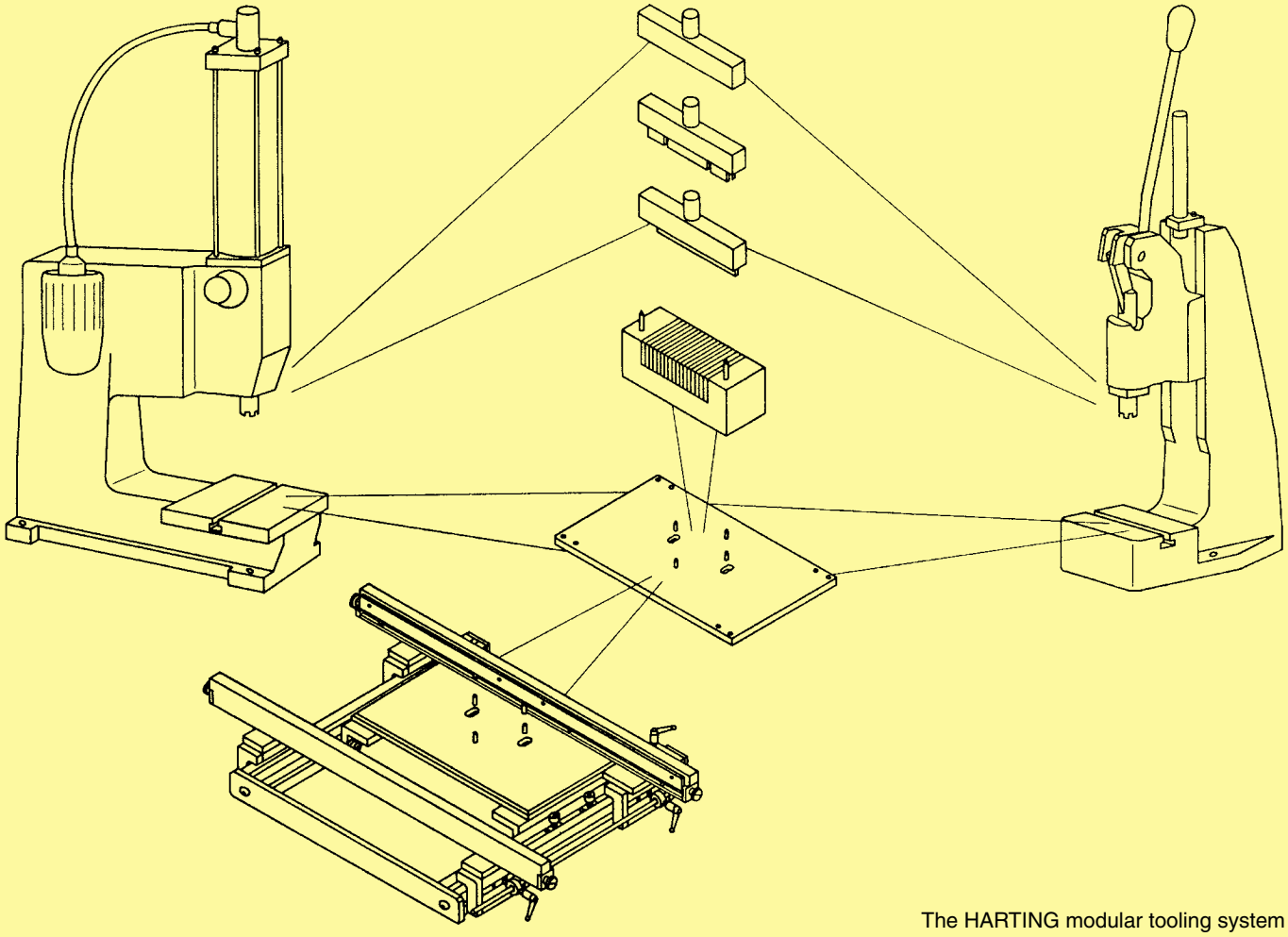
- Press
- Top tool
- Bottom tool
- Base plate

To increase automation and productivity the following modules may be added to the basic assembly:

- Guide frame with base plate
  for accurate positioning of the pcb
  up to a length of 600 mm

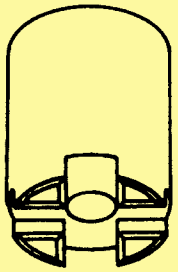
- Guide frame ”Standard“
  for hand bench press and pneumatic press
  and pcb height of 123.5 up to 309.5 mm

- Guide frame ”Long“
  for pneumatic press and
  pcb height of 123.5 up to 668.5 mm



The HARTING modular tooling system

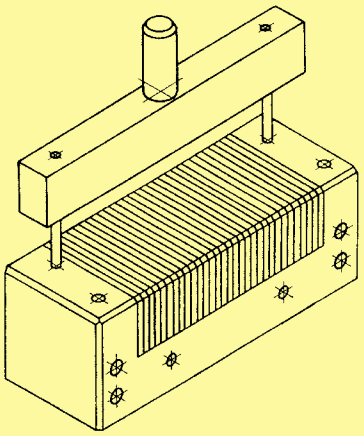
When setting up an assembly machine it is not necessary to set the working height of the press and adjust the base plate more than once. There is no need for further adjustments. All the other adaptations for various applications are performed efficiently and are reliant by various combinations of individual modules.



Ram with cross-shaped groove

Positioning the bottom tool in relation to the top tool

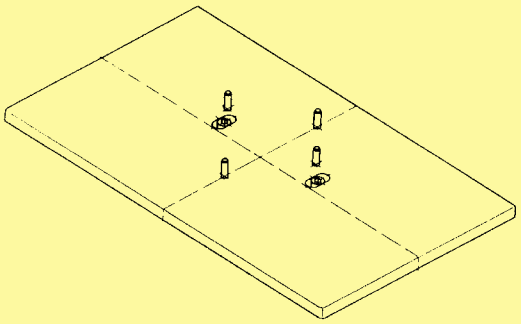
The ram of the HARTING press is generally provided with a cross-shaped groove which accurately positions the top tool in steps of 90°.



Positioning the bottom tool in relation to top tool

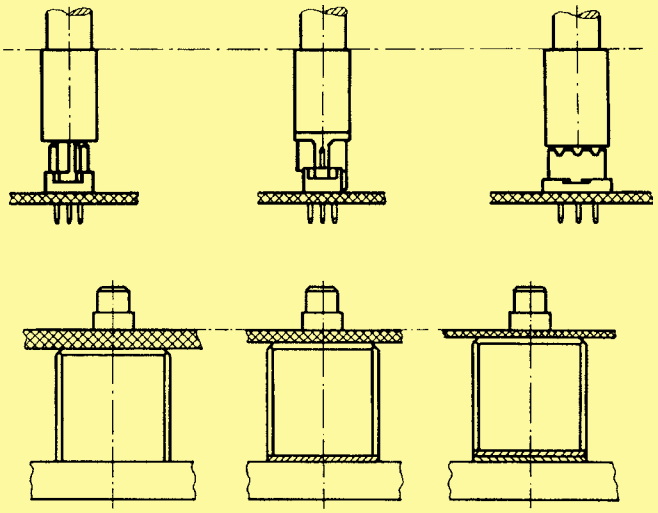
Two guide pins position the bottom tool in relation to the top tool simply and accurately.

These guide pins cannot be used for positioning the pcb or the connector!



Base plate with pairs of location pins at 90°

Two pairs of pins on the base plate locate the bottom tool in relation to the top tool in steps of 90°.



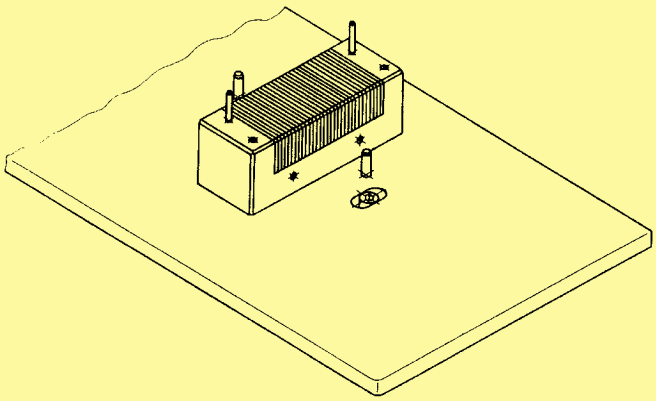
Height compensation

- Various overall heights of connectors are accommodated by type-specific top tools.
- Various pcb thicknesses are accommodated by the use of spacers between the bottom tool and base plate.

Range of applications for the bottom tool

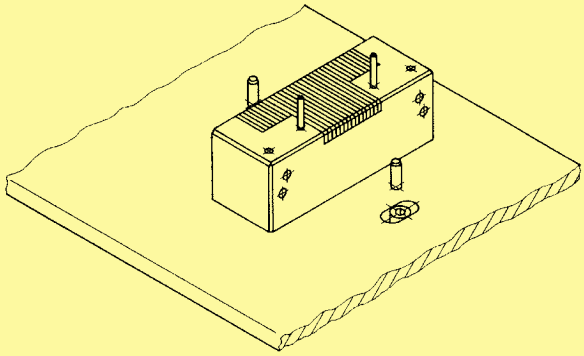
One bottom tool can be used to assemble connectors with straight or angled press-in terminations.

When pressing in the connectors with angled press-in terminations the positioning pins remain in the bottom tool and serve as guide pins for the connector.



Bottom tool set for assembling connectors with angled pins

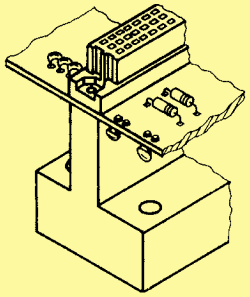
By rotating the bottom tool in steps of 90° and relocating the positioning pins it is possible to assemble half-length connectors with angled press-in terminations.



Bottom tool set for assembling half-length connectors with angled pins

Bottom tool (narrow version)

In addition to the square bottom tool with multi-functional properties, HARTING offers the alternative of a narrow bottom tool for assembling connectors with straight press-in terminations. This tool supports the pcb within the press-in connector zone and therefore makes it possible to assemble connectors where electronic components are to be placed in close proximity.



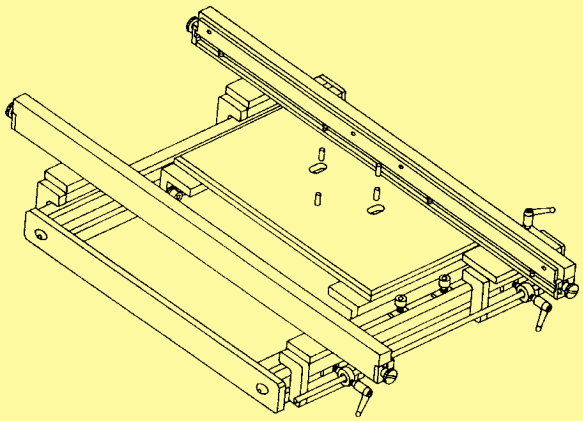
Narrow version of the bottom tool for special applications

Guide frame

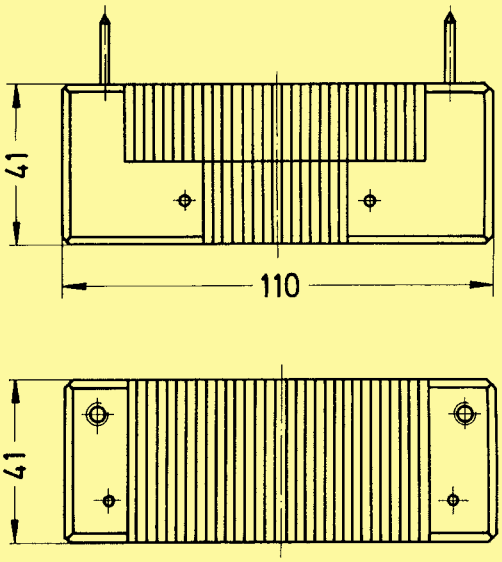
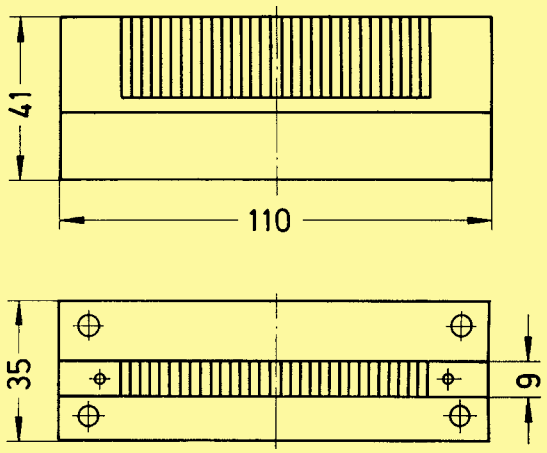
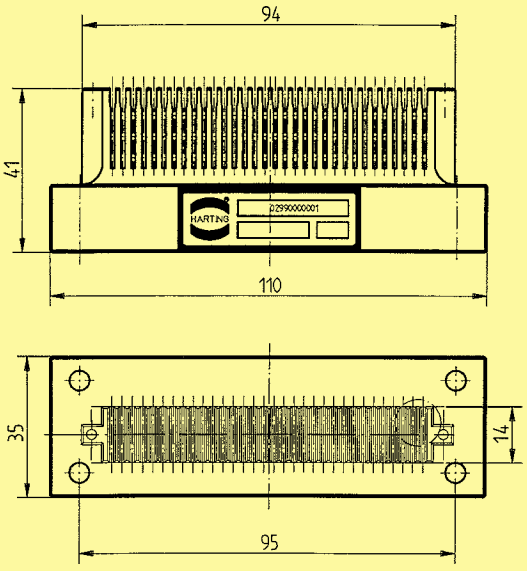
The guide frame screwed to the base plate ensures the correct positioning of the pcb in relation to the top and bottom tools and permits a much higher rate of assembly.

Both guide rails are adjustable to accommodate various pcb sizes.

A spring-loaded supporting rail lifts the pcb away from the bottom tool after the press-in operation ensuring that no damage occurs to the conductors as it passes through the machine.

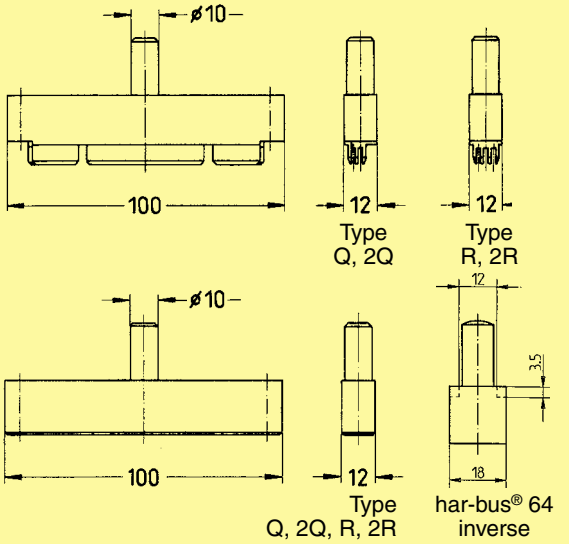


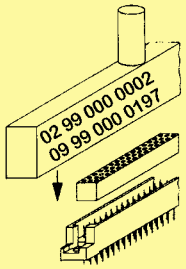
Guide frame for positioning the pcb in relation to the top and bottom tools

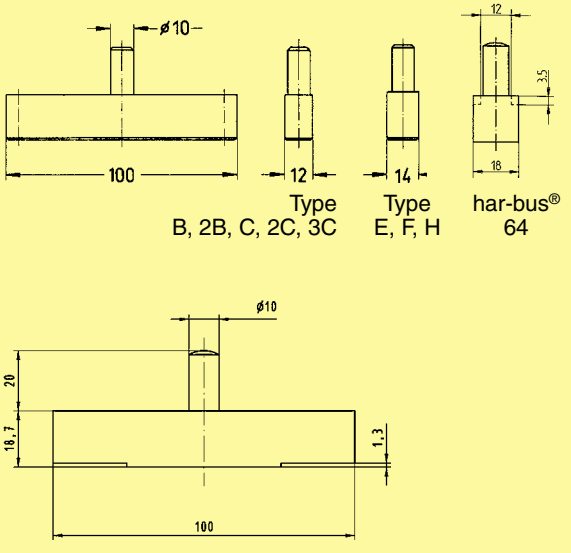
Identification		Part No.	Drawing	Dimensions in mm
Bottom tool Universal for use with **male and female connectors**	Type B, 2B C, 2C, 3C M Q, 2Q R, 2R E F H har-bus® 64 har-bus® 64 inverse SEK 18*	09 99 000 0185		
Bottom tool Narrow for use with **male connectors** for use with **female connectors**	Type Q, 2Q R, 2R SEK 18* Type B, 2B C, 2C, 3C M F H	09 99 000 0256 09 99 000 0256		
Bottom tool Narrow har-bus® 64 for use with **female connectors** for use with **male connectors**	har-bus® 64 har-bus® 64 inverse	02 99 000 0001		

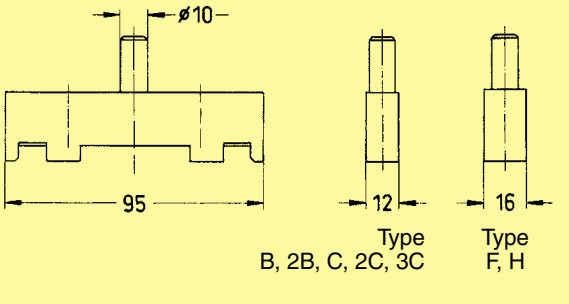
* Connectors see separate catalogue

Identification		Part No.	Drawing	Dimensions in mm
Top tool				
without insert block				
for use with **male connectors**	Type Q, 2Q	09 99 000 0181		
	R, 2R	09 99 000 0183		
	har-bus® 64 inverse	02 99 000 0012		
with insert block				
for use with **male connectors**	Type Q, 2Q	09 99 000 0197		
	R, 2R			
	har-bus® 64 inverse	02 99 000 0002		
Insert blocks				
for use with **male connectors**	Type Q	09 99 000 0275		
	2Q	09 99 000 0274		
	R	09 99 000 0277		
	2R	09 99 000 0276		
	har-bus® 64 inverse	02 99 000 0011		
for use with **shrouds**	har-bus® 64			
	Type E	02 09 000 0012		
	Type R	09 99 000 0277		
	Type 2R	09 99 000 0276		
Top tool				
for use with **female connectors**	Type B, 2B	09 99 000 0197		
	C, 2C, 3C			
	D-Sub*			
	SEK 18*			
	har·mik*			
	Type E	09 99 000 0221		
	F			
	H			
	har-bus® 64	02 99 000 0002		
	Type M (24+8)	09 99 000 0269		
	M (42+6)	09 99 000 0270		
	M (60+4)	09 99 000 0271		
	M (78+2)	09 99 000 0272		
Top tool				
only for short posts and pcb thickness > 1.6 mm and without guide frame	Type B, 2B	09 99 000 0228		
	C, 2C, 3C			
for use with **female connectors**	Type F	09 99 000 0229		
	H			



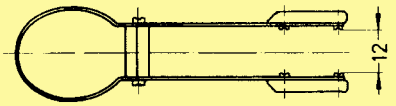
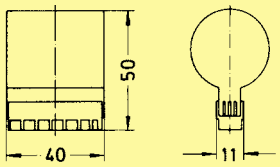
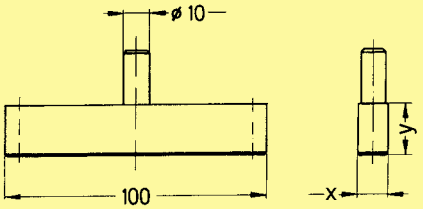
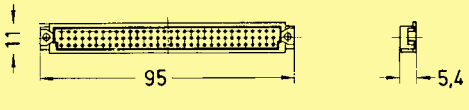
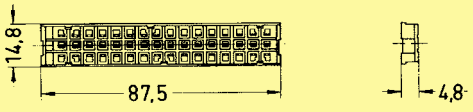
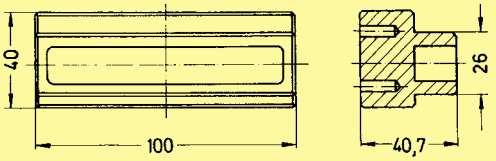






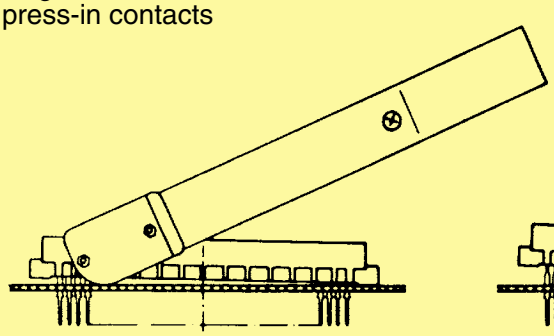
Tooling

* Connectors see separate catalogues

Identification	for use with	Part No.	Drawing	Dimensions in mm
Removal tool for moulding	**Male connectors** Type Q 2Q R 2R	09 99 000 0198		
Removal tool for single male contacts		09 99 000 0239		
Insertion tool for single male press-in contacts		09 99 000 0200		
Press-out tool	**Termination length** 17 mm 13 - 13.2 mm 11.5 mm 4.5 - 5.3 mm	09 99 000 0197 09 99 000 0219 09 99 000 0221 09 99 000 0220	 Termination length [mm] / x [mm] / y [mm] 17 / 12 / 18.7 13 - 13.2 / 12 / 22.7 11.5 / 14 / 20.1 4.5 - 5.3 / 12 / 30.2 With the different dimension y no adjustment of hand bench press necessary.	
Termination support for protection against bending of 13 mm - 17 mm terminations	**Male connectors** Type Q, 2Q R, 2R **Female connectors** Type B, 2B C, 2C, 3C **Female connectors** Type F	09 99 000 0240 09 99 000 0241	 	
Support block for repair and removal	**Male connectors** Type Q, 2Q R, 2R SEK 18* **Female connectors** Type B, 2B C, 2C, 3C F	09 99 000 0218		

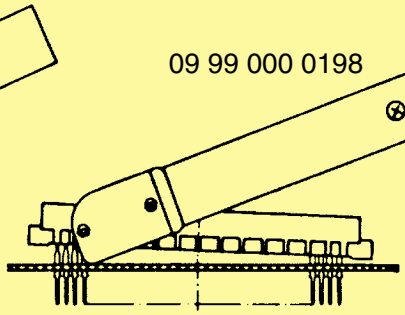
* Connectors see separate catalogue

Replacement of single male press-in contacts

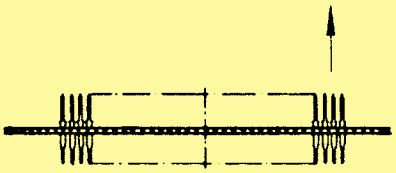


Lever up the moulding

09 99 000 0198



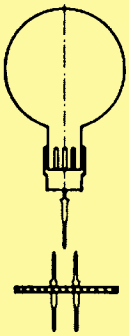
Remove the moulding



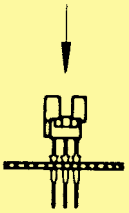
Pull out a single male contact

Insert the new contact
into the cavity of the contact
using insertion tool

09 99 000 0200



Correctly position
the new contact
and press-in by hand



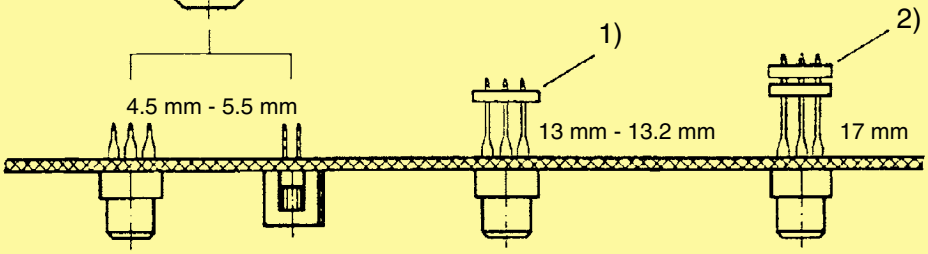
Set up the moulding
with the press

Replacement of complete press-in connectors

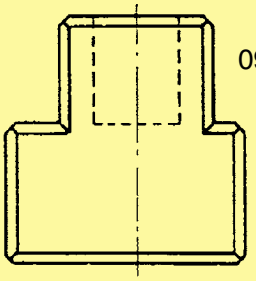
09 99 000 0220

09 99 000 0219

09 99 000 0197

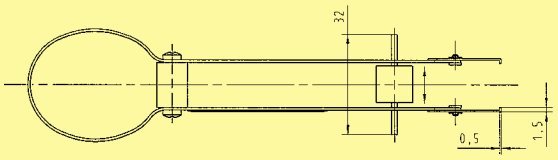
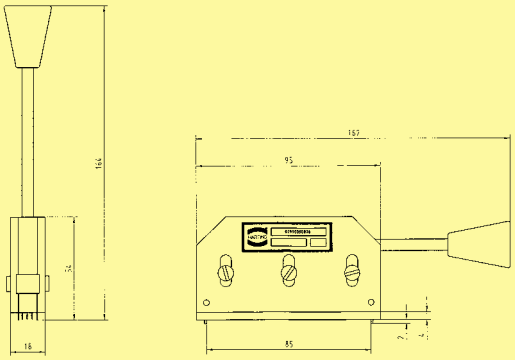
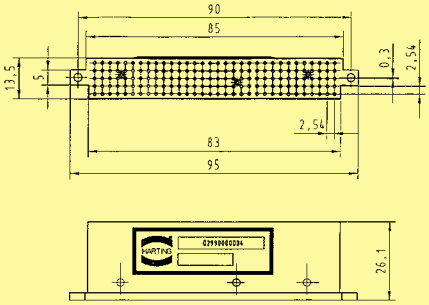
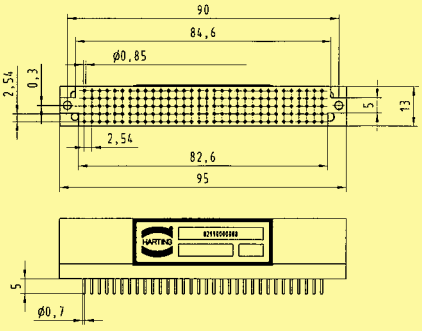
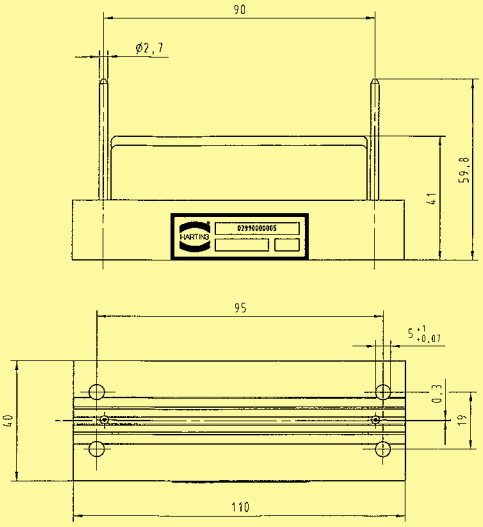


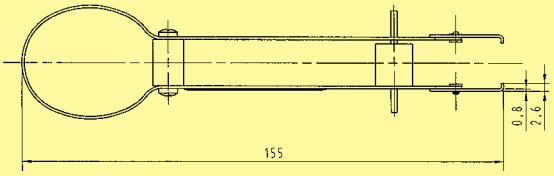
09 99 000 0218



[1] Termination support (see page 30.07)

[2] for 17 mm wrap posts
two termination supports are recommended

Identification	for use with	Part No.	Drawing	Dimensions in mm
Removal tool for moulding	**Female connectors** har-bus® 64	02 99 000 0003		
Removal tool (heavy duty) for moulding	**Female connectors** har-bus® 64	02 99 000 0006		
Press-out tool for 17 mm terminations	**Female connectors** har-bus® 64	02 99 000 0004		
Press-out tool for 5 mm / 4.5 mm terminations	**Female connectors** har-bus® 64	02 99 000 0008		
Support block	**Female connectors** har-bus® 64	02 99 000 0005		

Identification	for use with	Part No.	Drawing	Dimensions in mm
Removal tool for shroud	**rear** **I/O shroud** har-bus® 64	02 99 000 0007		
	rear **I/O shroud** Type C, 2C R, 2R	09 99 000 0278		

Replacement of complete **har-bus® 64** press-in connectors

Steps in detail

1. Lever up the moulding by using a removal tool

   a) The removal tool with Part No. 02 99 000 0003 is suitable for repairing small quantites. It can only be used if the adjacent components on the pcb are at least 2 mm apart from the moulding of the connector.

   b) The removal tool with Part No. 02 99 000 0006 is suitable for repairing large quantities. Due to its design it can also be used if components on the pcb are in close proximity to the moulding of the connector.

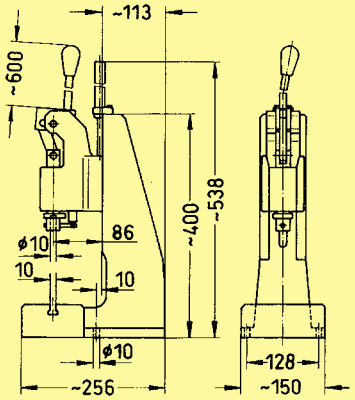
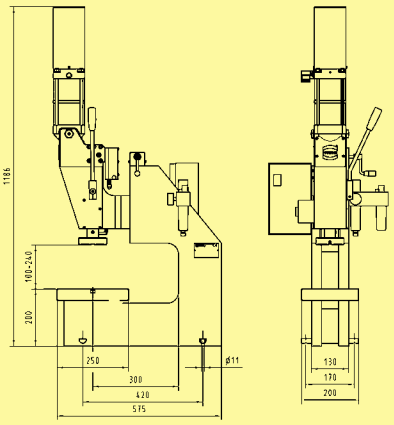
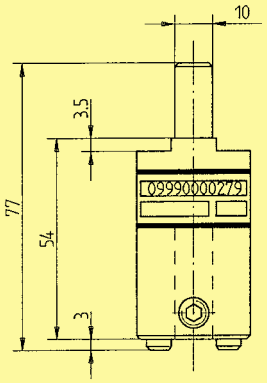
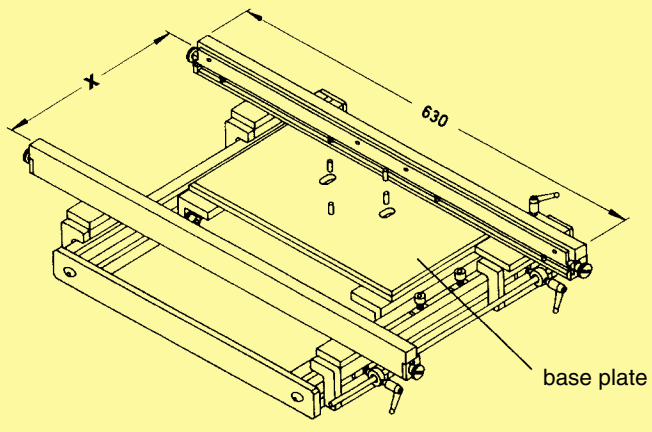
2. Lever up the rear I/O shroud with the removal tool 02 99 000 0007. This step is only required with 17 mm termination length.

3. Pull out the female contacts with the press-out tool

   a) for 17 mm termination length use Part No. 02 99 000 0004 and

   b) for 5 mm termination length use Part No. 02 99 000 0008.

   During this process the press-out tool replaces the top tool and the pcb is supported by the support block (Part No. 02 99 000 0005) from the bottom.

Identification	Part No.	Drawing	Dimensions in mm
Hand bench press	09 99 000 0201		Technical characteristics Working stroke 25 mm Press force 15 kN max. Hole ø in the ram ø 10 mm Net weight approx. 23 kg
Pneumatic press **40 kN**	09 99 000 0282		Technical characteristics Total stroke 48 mm Working stroke 0-6 mm Press force 40 kN max. Air pressure 6 bar Hole ø in the ram ø 10.01 mm Net weight 136 kg Power supply 110 V / 220 V AC
Adaptor for height compensation[1)]	09 99 000 0279		
Guide frame with base plate Standard type for pcb size x = 123,5 - 309,5 mm Long type[2)] for pcb size x = 123,5 - 668,5 mm Base plate	09 99 000 0244 09 99 000 0261 09 99 000 0255		

[1)] suitable for 09 99 000 0282 and all CPM machines (see page 30.12 pp.)
[2)] not suitable for hand bench press

The **CPM prestige** press-in machine with a graphical user interface

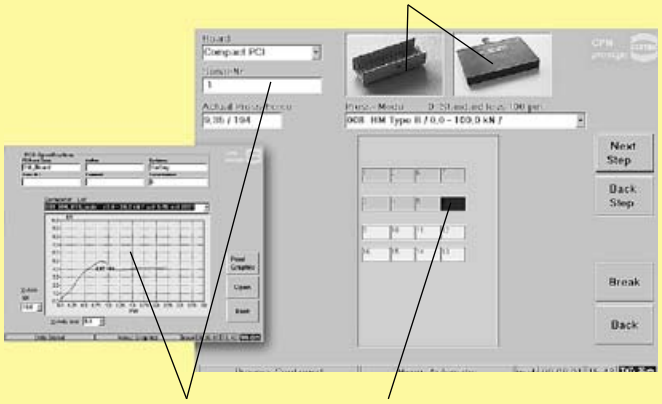
The **CPM prestige** is a consequential development of the successful CPM 2001 press-in machines. The excellent design, supported by a wide range of tools presents a convenient, easy and comfortable way of processing backplanes and daughtercards. The machine is fully programmable and is supplied with a graphical user interface for control and visualisation of the complete process. The use of a microprocessor control allows the recognition and storage of different component heights, so that the pressing-in of different components is initiated simultaneously with only one button. The user-friendly touch-screen guides the user through the menu-orientated process controls.

The visualisation of the entire press-in process (the position of the connector, press-in forces etc.) allows the rapid recognition and eradication of the possible error sources. With the addition of a barcode reader (1D and 2D)[1)] the parameters of every pcb layout can be stored, recalled and loaded into the automated press-in programme. The extensive operation monitor functions simplify the service and support of the machine.

The machine employs the automatic switch-off system “autosense”, known worldwide for its reliability. The different connector types and the tolerances of the pcb are automatically recognised and taken into consideration at the press-in operation, thus maximising the process security.

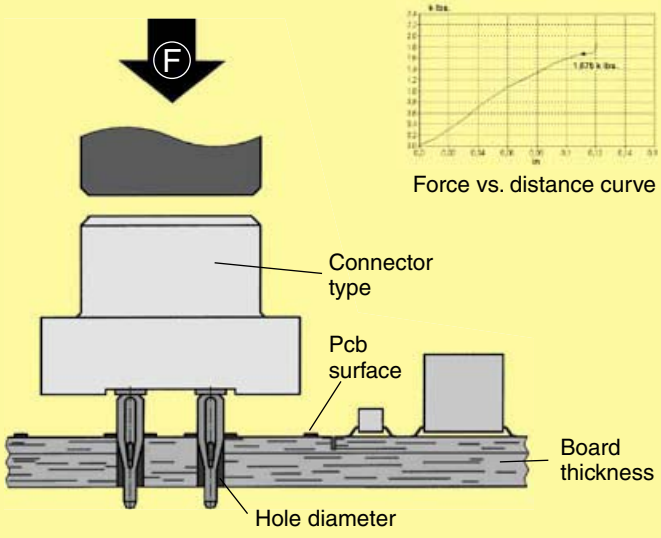
Visual guiding system via touch monitor

Real photos of connectors and tools



Process data

Layout with current position highlighted

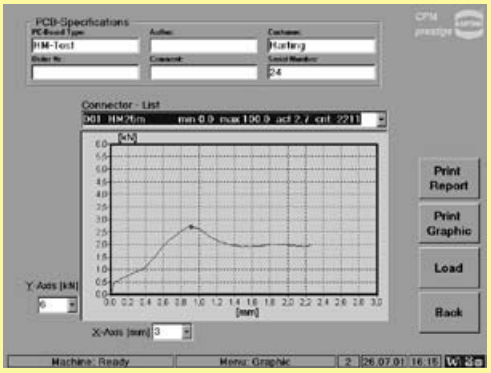


Force vs. distance curve

Shown are the four most considerable influences of the press-in process.

Tooling

1) optional



Quality control of press-in termination

The press-in force correlates with the diameter of the plated through hole and with the friction coefficient of the surface; therefore it can be used for a continuous monitoring of the process.

The retention force, as an indirect measure of the normal force, serves to qualify the process or random tests.

Part No. **09 89 040 0000**

Technical characteristics

Drive	electro-mechanical, servo
Press-in force	100 kN
max. pcb dimensions	600 x 1000 mm
Floor space	1200 x 1150 mm
Weight	980 kg
Power supply	208 / 380 / 400 / 415 V
Consumption	< 1 kW
Colour	on request

CPM prestige
(incl. PC, control software, barcode reader, keyboard, touch screen)

Built-in features:

- Guiding rails (carbon/spring-loaded) for the secure positioning of the pcb
- Touch-screen and Industrial PC with UPS (uninterruptable power supply)
- Barcode reader for management ease of press-in programs
- All dimensions allow an easy integration into production lines

Process monitoring and quality assurance:

- Touch screen interface with graphical and verbal menus for all machine functions
- Autosense: automated press-in interruption at incorrect press-in forces
- Storage and validation of all press-in parameters via quality assurance software (press-in force tolerances)
- Continuous high-precision measurement and recording of press-in forces and distances
- Remote determination of errors and maintenance
- High flexibility through a modular tool range

Options:

- Rotatable tool changer
- Insertion removal station

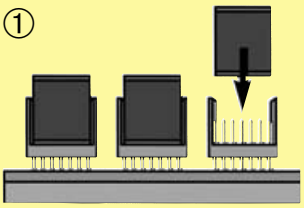
Insertion removal station

Power supply	220 V / 50 Hz
Air pressure	6 bar (15-16 l/min.)
Part No.	**09 89 020 0070** for pcb dimensions of max. 710 mm x 540 mm
Part No.	**09 89 020 0060** for pcb dimensions of max. 1000 mm x 600 mm

Bestseller **CPM prestige with insertion removal station**, adaptable to all HARTING press-in machines.

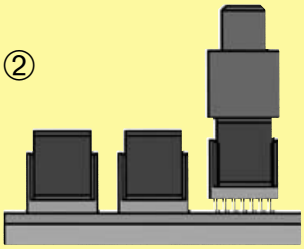
Principle:

①



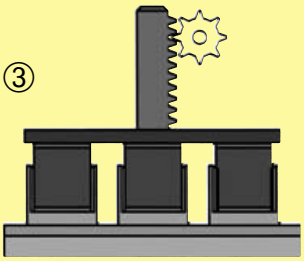
Load all headers with inserts **for <u>one</u> press-in cycle**

②



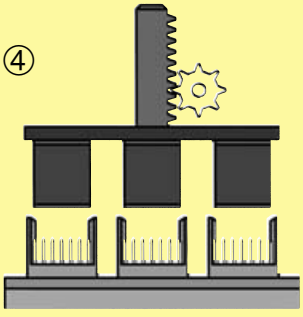
Press-in all connectors with a flat die

③



Position the magnetic plate

④



Remove all press-in inserts in one operation

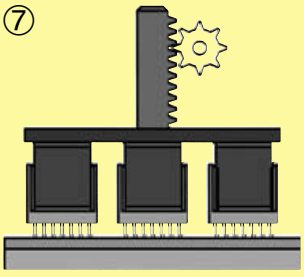
Remove the processed pcb from the machine

⑤

⑥

Move the next pre-assembled pcb to the press-in machine

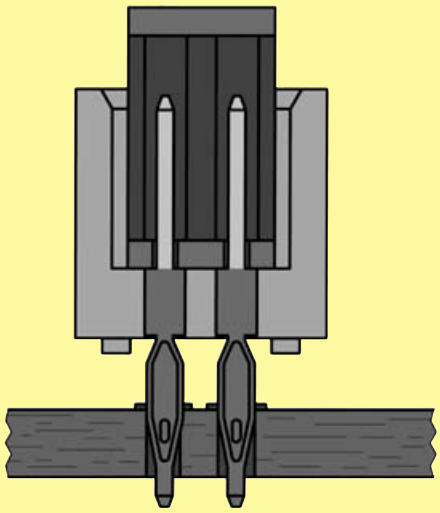
⑦



Load all headers in one operation

The insertion removal station has been developed both for the **CPM prestige** and the CPM 2001/s. It can additionally be used as stand alone equipment.

Today nearly all female connectors are designed for flat rock tooling. For every type of male connector specific tooling and a high degree of X-Y-process accuracy is required. Therefore HARTING offers press-in insert blocks that transfer all well known assembling advantages from female connectors to male headers.

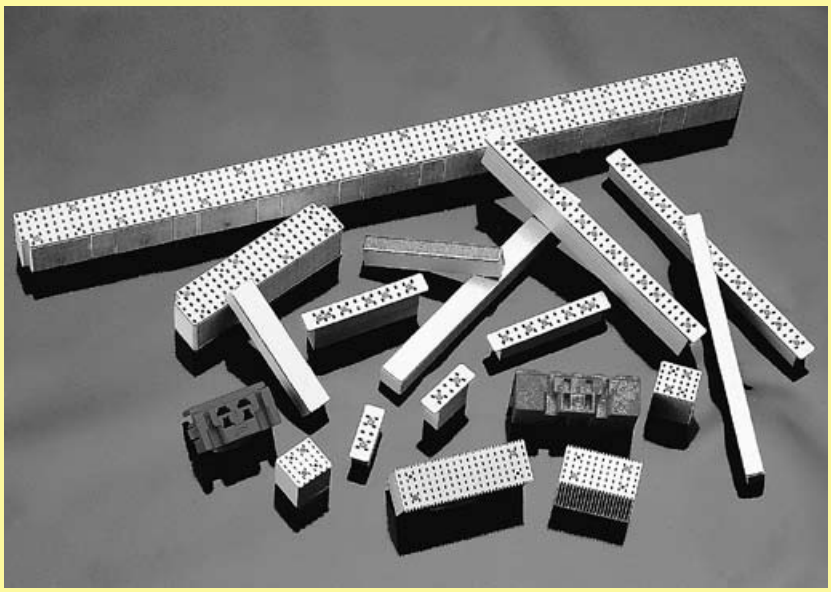


Advantages of press inserts

Robust tooling

No lateral force to pcb hole

No abrasion of the contact mating surface by the press tool



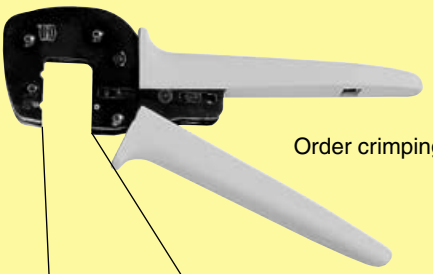
HARTING has already developed press-in inserts for all major male connector families on 2.54 mm, 2.5 mm and 2 mm pitches.

Inserts for any other special components can be developed on request.

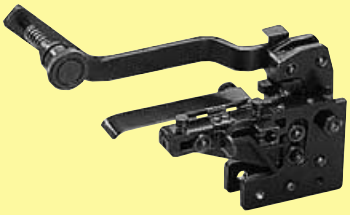
The additional process for inserting and removing the press-in inserts can be efficiently done with the insertion removal station. This station removes all press-in inserts with a magnetic plate in one operation and inserts them into the next pre-assembled pcb with the necessary precision. (Principle see page 30.14).

The cycle time for loading all headers is between 4 and 6 seconds, independent from the amount of press-in inserts.

To load the inserts automatically means also that connectors assembled in a wrong way will be recognised and errors consequently prevented.

Identification	Part No.	Drawing / Dimensions in mm
HARTING crimping tool for individual contacts BC and FC	09 99 000 0620	 Order crimping inserts separately
Crimping insert set for individual contacts each set contains locator and crimp insert top and bottom part		Wire gauge
BC / FC 1	09 99 000 0621	BC: 0.09 - 0.50 mm² FC 1: 0.09 - 0.25 mm²
FC 2	09 99 000 0622	FC 2: 0.14 - 0.56 mm²
FC 3	09 99 000 0623	FC 3: 0.50 - 1.50 mm²
BC solid wire	09 99 000 0629	BC: 0.13 mm² (solid wire)
Locator		
BC	09 99 000 0630	
FC	09 99 000 0631	
Service case for crimping tool and 5 sets inserts, incl. screwdriver for insert change, without contents	09 99 000 0632	
HARTING crimping tool for bandoliered contacts (500 pieces) BC	09 99 000 0248	Wire gauge 0.09 - 0.5 mm²
for bandoliered contacts (250 pieces)		Wire gauge
FC 1	09 99 000 0247	0.09 - 0.25 mm²
FC 2	09 99 000 0119	0.14 - 0.56 mm²
FC 3	09 99 000 0120	0.50 - 1.50 mm²
BC solid wire	09 99 000 0627	0.13 mm² (solid wire) 
Crimping tool for individual contacts FC 1, FC 2 and FC 3 (Service tool)	09 99 000 0191	Wire gauge FC 1: 0.14 - 0.25 mm² FC 2: 0.25 - 0.56 mm² FC 3: 0.75 - 1.50 mm² Locator is supplied with the tool. 
Insertion tool for contacts BC	09 99 000 0100	
for contacts FC 1, FC 2 and FC 3	09 99 000 0088	
Removal tool for contacts BC	09 99 000 0101	
for contacts FC 1, FC 2 and FC 3	09 99 000 0087	

Insertion and removal see chapter 02

Identification	Part No.	Drawing	Dimensions in mm
HARTING semi-automatic crimping device Main drive, foot-operated 115/230 V – 50 Hz	09 99 000 0246	 Locator not necessary	
Crimping head for bandoliered contacts BC	09 99 000 0252	Wire gauge 0.09 - 0.5 mm² 	
FC 1	09 99 000 0249	0.09 - 0.25 mm²	
FC 2	09 99 000 0250	0.14 - 0.56 mm²	
FC 3	09 99 000 0251	0.5 - 1.5 mm²	
BC solid wire	09 99 000 0628	0.13 mm² (solid wire)	
Real holder for 2,500 contacts FC 1, FC 2 or FC 3 and for 5,000 contacts BC	09 99 000 0158		

Automated crimping machine type BK

Main characteristics

- Smooth run through electronic brakes
- Hand wheel for manual adjustments
- Maintenance friendly through needle bearing rail
- Simple handling by quick change tool and stripper

Part No.	**09 98 000 5000**
Technical Characteristics	
Dimensions	
Height	690 mm (1400 mm with a contact reel)
Width/Breite	350 mm
Depth/Tiefe	370 mm
Total weight	72 kg
Power supply	230 V, 50/60 Hz, 2.5 A
Consumption	0.75 kW
Motor speed	440 - 2000 rpm
Cable length	2 m incl. plug
Control	SPS
Work cycle trigger	Sensor
Work cycle	0.35 s for stripping and crimping
Illumination	Integrated tool light
Stroke counter	Daywise and fixed
Crimp force monitor	BB07i
Crimping tool	Quick change tool
Adjustable process parameters	Crimping heigth on wire Crimping heigth on insulation Depth of insulation stripping Length of insulation stripping Wire retainer position Wire position in the crimp contact Band thrust

Further details you will find in our product flyer.

Automatic crimping tools · Types B, C, D, E, F, FM, 2F and MH

Identification	for use with	Part No.	Wire gauge [mm²]	AWG	Insulation [Ø mm]
Crimping tool					
for DIN 41 612 connectors[1]					
	contacts BC	09 98 000 3004	0.09 - 0.56	28 - 20	0.7 - 1.6
	contacts FC 1	09 98 000 3005	0.09 - 0.25	28 - 24	0.7 - 1.6
	FC 2	09 98 000 3006	0.14 - 0.56	26 - 20	0.8 - 2.3
	FC 3	09 98 000 3007	0.50 - 1.50	20 - 16	1.6 - 2.8
for D-Sub connectors[2]					
	standard contacts	09 98 000 3008	0.09 - 0.25	28 - 24	0.7 - 1.4
		09 98 000 3009	0.25 - 0.56	24 - 20	0.9 - 1.7
	high density contacts	09 98 000 3012		26 - 24	0.8 - 1.4

[1] 3.5 + 0.5 mm of insulation is stripped from the wire to be crimped
[2] 2.5 + 0.5 mm of insulation is stripped from the wire to be crimped