

**Tooling**

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Press-in technology

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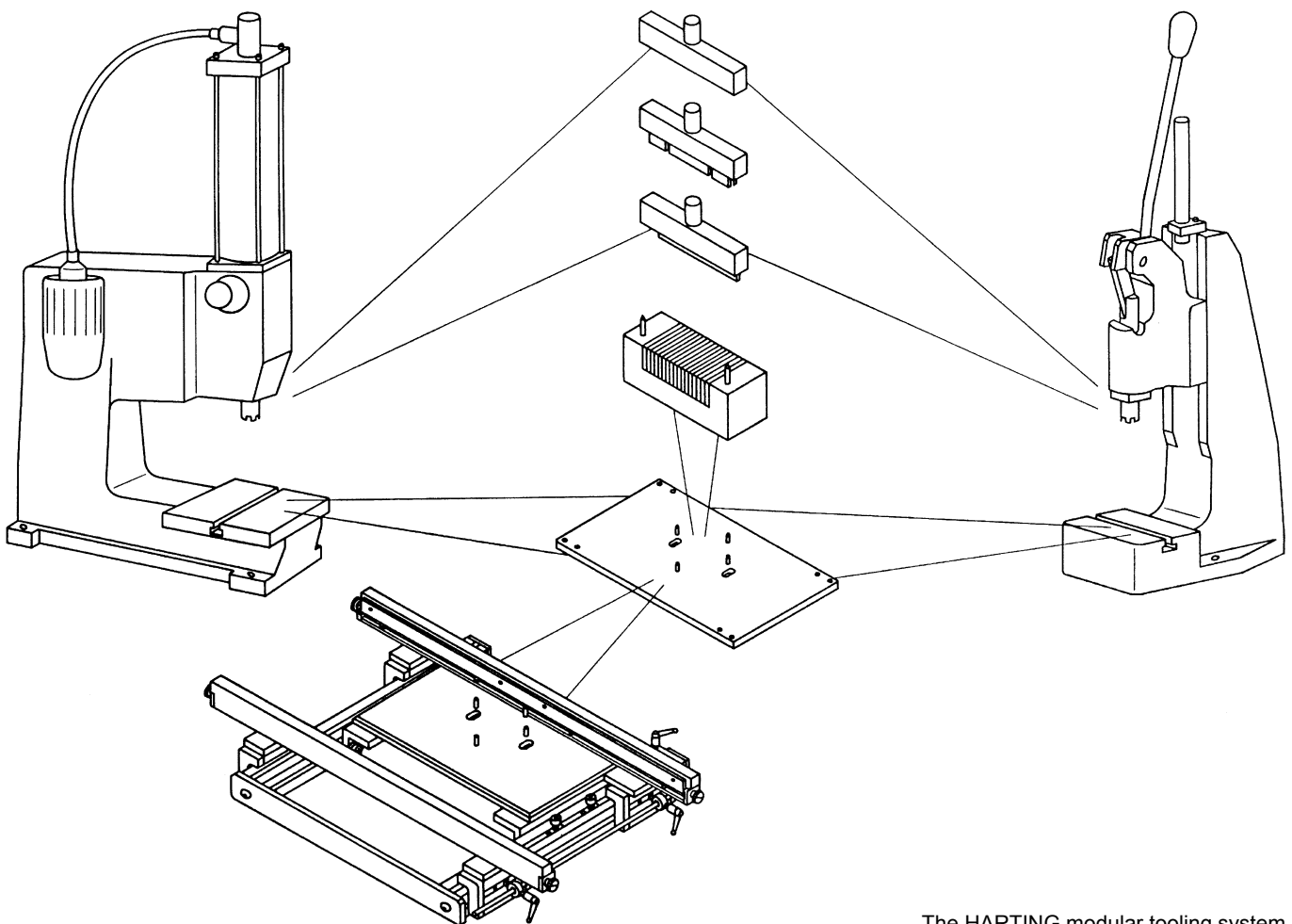
The diversity of connector types with press-in terminations and varying termination styles make it necessary to have a simple, flexible tooling system that can be continuously updated.

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



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.

## 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°.

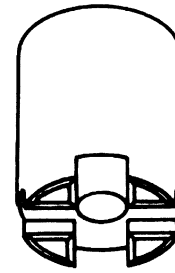
Two guide pins position the bottom tool in relation to the top tool simply and accurately.

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

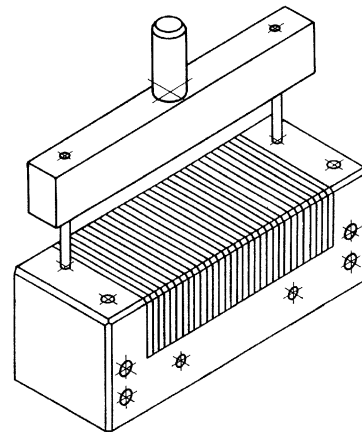
Two pairs of pins on the base plate locate the bottom tool in relation to the top tool in steps of 90°.

## Height compensation

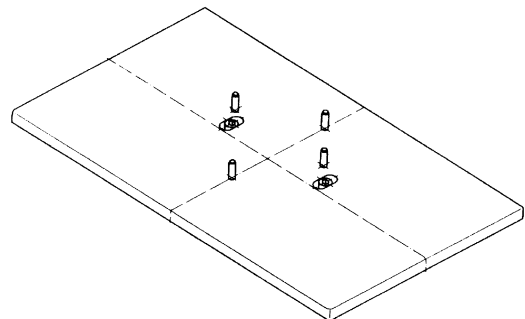
- Various overall heights of connectors are accommodated by type-specific top tools.
- Various pcb thicknesses are accommodated by the use of spacers between the bottom tool and base plate.



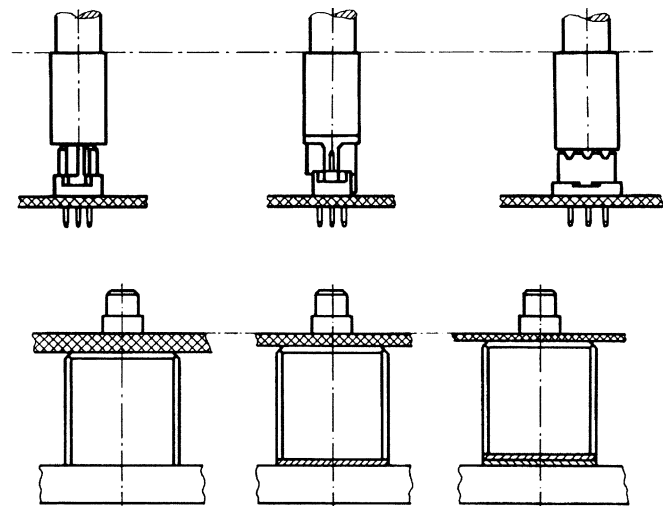
Ram with cross-shaped groove



Positioning the bottom tool in relation to top tool



Base plate with pairs of location pins at 90°



## 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.

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 (narrow version)

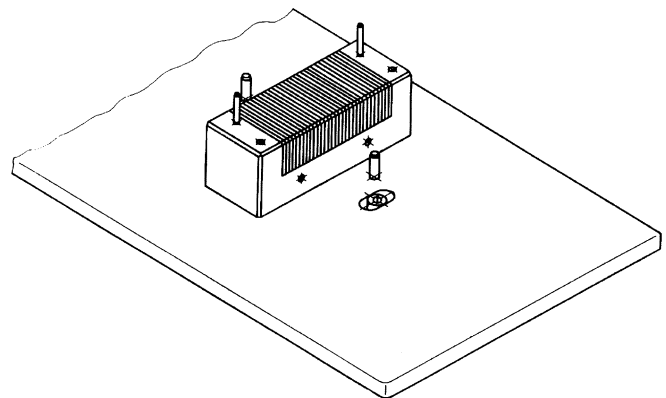
In addition to the square bottom tool with multi-functional properties, HARTING offers the alternative of a narrow bottom tool for assembling connectors with straight press-in terminations. This tool supports the pcb within the press-in connector zone and therefore makes it possible to assemble connectors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

## Guide frame

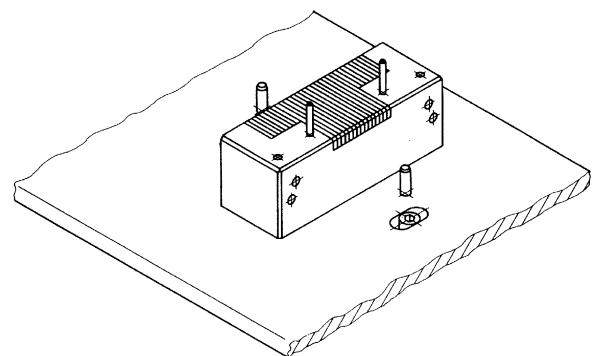
The guide frame screwed to the base plate ensures the correct positioning of the pcb in relation to the top and bottom tools and permits a much higher rate of assembly.

Both guide rails are adjustable to accommodate various pcb sizes.

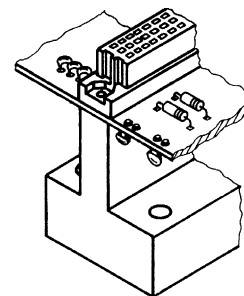
A spring-loaded supporting rail lifts the pcb away from the bottom tool after the press-in operation ensuring that no damage occurs to the conductors as it passes through the machine.



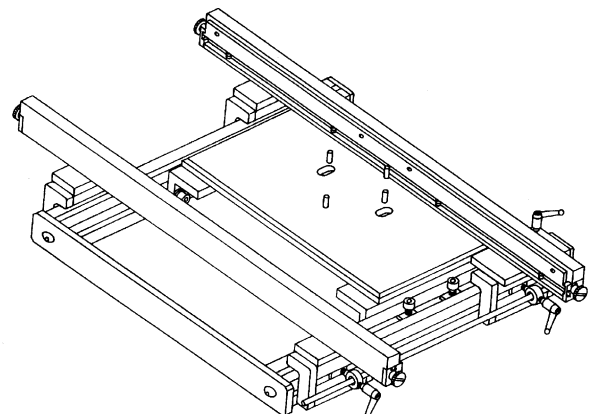
Bottom tool set for assembling connectors with angled pins



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



Narrow version of the bottom tool for special applications



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

Identification	Part number	Drawing	Dimensions in mm
<p>Bottom tool Universal</p> <p>for use with <b>male and female connectors</b></p>	<p>Type B, 2B, 3B C, 2C, 3C M Q, 2Q, 3Q R, 2R, 3R E F H har-bus® 64 SEK 18*</p>	<p>09 99 000 0185</p>	
<p>Bottom tool Narrow</p> <p>for use with <b>male connectors</b></p> <p>for use with <b>female connectors</b></p>	<p>Type Q, 2Q, 3Q R, 2R, 3R SEK 18*</p> <p>Type B, 2B, 3B C, 2C, 3C M F H</p>	<p>09 99 000 0256</p> <p>09 99 000 0256</p>	
<p>Bottom tool Narrow har-bus® 64</p> <p>for use with <b>female connectors</b></p>	<p>har-bus® 64</p>	<p>02 99 000 0001</p>	

\* Connectors see separate catalogue

Identification		Part number	Drawing	Dimensions in mm
Top tool without insert block for use with <b>male connectors</b>	Type Q, 2Q R, 2R	09 99 000 0181 09 99 000 0183		Type Q, 2Q Type R, 2R
	with insert block for use with <b>male connectors</b>	Type Q, 2Q, 3Q R, 2R, 3R	09 99 000 0197	
Insert blocks for use with <b>male connectors</b>	Type Q 2Q 3Q R 2R 3R	09 99 000 0275 09 99 000 0274 09 99 000 0263 09 99 000 0277 09 99 000 0276 09 99 000 0264		
	for use with <b>shrouds</b>	har-bus® 64 Type E Type C, R Type 2C, 2R Type F		02 09 000 0012 09 99 000 0277 09 99 000 0276 09 06 248 3201
Top tool for use with <b>female connectors</b>	Type B, 2B, 3B C, 2C, 3C D-Sub* SEK 18* har-mik*	09 99 000 0197		Type B, 2B, 3B, C, 2C, 3C Type E, F, H har-bus® 64
	Type E F H	09 99 000 0221		
	har-bus® 64	02 99 000 0002		
	Type M (24+8) M (42+6) M (60+4) M (78+2)	09 99 000 0269 09 99 000 0270 09 99 000 0271 09 99 000 0272		
Top tool only for short posts and pcb thickness > 1.6 mm and without guide frame  for use with <b>female connectors</b>	Type C	09 99 000 0228		Type C Type F, H har-bus® 64
	Type F H	09 99 000 0229		
	har-bus® 64	02 99 000 0016		

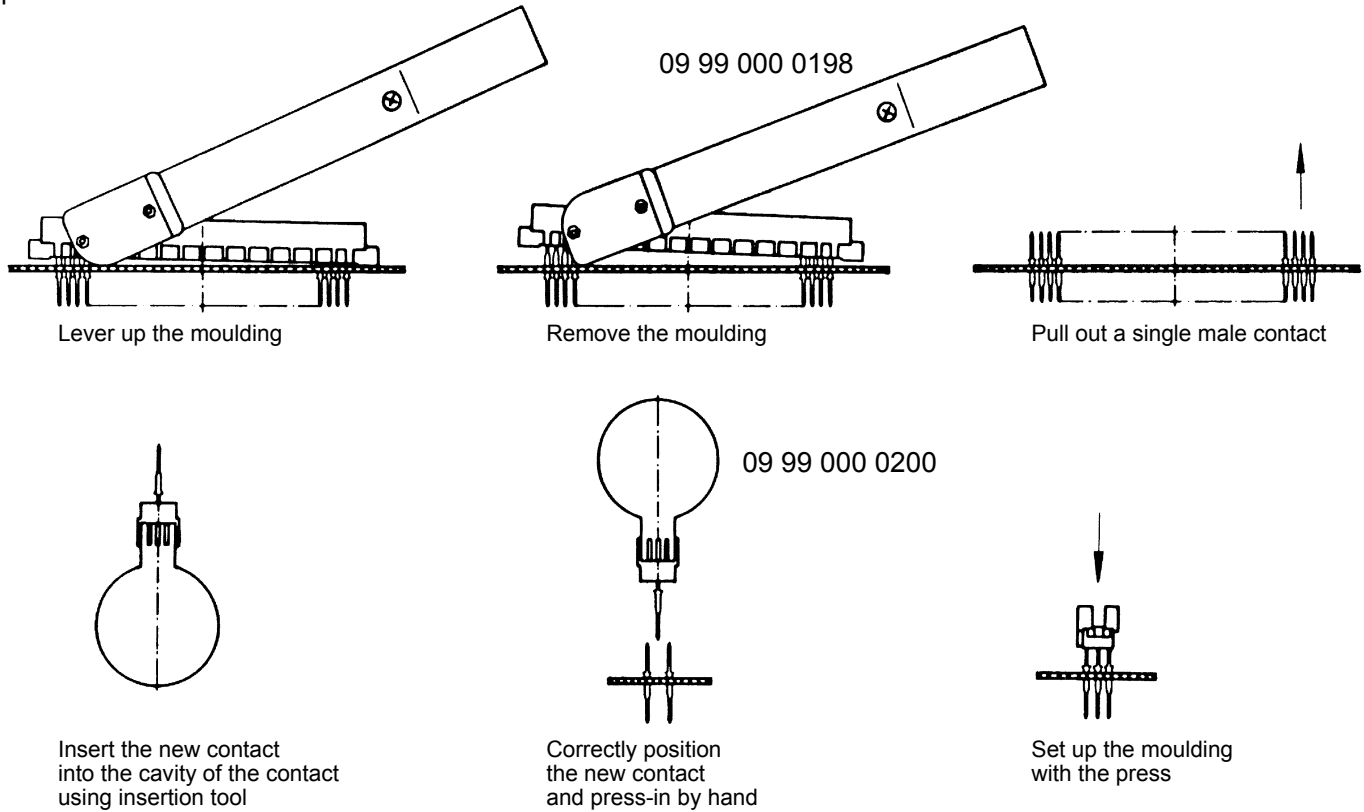
Tooling

\* Connectors see separate catalogues

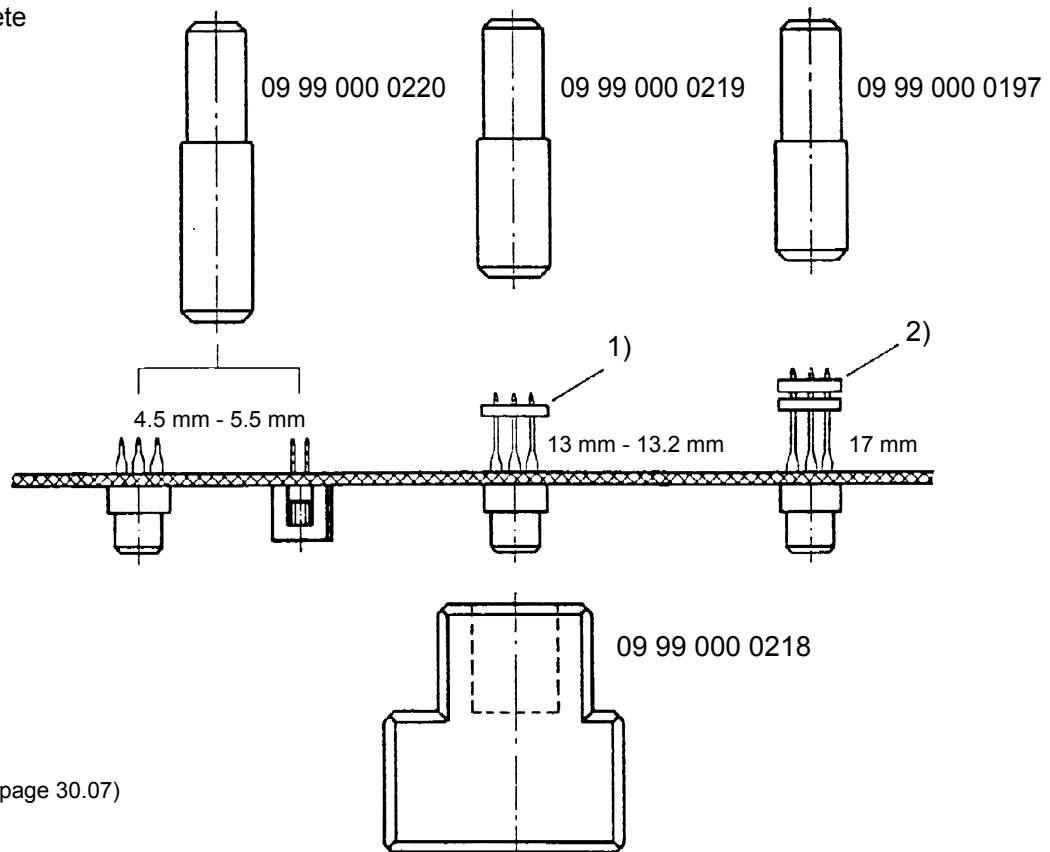
Identification	for use with	Part number	Drawing	Dimensions in mm															
Removal tool for moulding	<b>Male connectors</b> Type Q, 2Q, 3Q R, 2R, 3R	09 99 000 0198		12															
Removal tool for single male contacts		09 99 000 0239																	
Insertion tool for single male press-in contacts		09 99 000 0200		50 40 11															
Press-out tool	<b>Termination length</b>  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		<table border="1"> <thead> <tr> <th>Termination length [mm]</th> <th>x [mm]</th> <th>y [mm]</th> </tr> </thead> <tbody> <tr> <td>17</td> <td>12</td> <td>18.7</td> </tr> <tr> <td>13 - 13.2</td> <td>12</td> <td>22.7</td> </tr> <tr> <td>11.5</td> <td>14</td> <td>20.1</td> </tr> <tr> <td>4.5 - 5.3</td> <td>12</td> <td>30.2</td> </tr> </tbody> </table> <p>With the different dimension y no adjustment of hand bench press necessary.</p>	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
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																	
Termination support for protection against bending of 13 mm - 17 mm terminations	<b>Male connectors</b> Type Q, 2Q, 3Q R, 2R, 3R  <b>Female connectors</b> Type B, 2B, 3B C, 2C, 3C	09 99 000 0240		11 95 5,4															
	<b>Female connectors</b> Type F	09 99 000 0241		14,8 87,5 4,8															
Support block for repair and removal	<b>Male connectors</b> Type Q, 2Q, 3Q R, 2R, 3R SEK 18*  <b>Female connectors</b> Type B, 2B, 3B C, 2C, 3C F	09 99 000 0218		40 100 26 40,7															

\* Connectors see separate catalogue

## Replacement of single male press-in contacts



## Replacement of complete press-in connectors



<sup>1)</sup> Termination support (see page 30.07)

<sup>2)</sup> for 17 mm wrap posts  
two termination supports are recommended



Identification	for use with	Part number	Drawing	Dimensions in mm
Removal tool for moulding	<b>Female connectors</b> har-bus® 64	02 99 000 0003		
Removal tool (heavy duty) for moulding	<b>Female connectors</b> har-bus® 64	02 99 000 0006		
Press-out tool for 17 mm terminations	<b>Female connectors</b> har-bus® 64	02 99 000 0004		
Press-out tool for 5 mm / 4.5 mm terminations	<b>Female connectors</b> har-bus® 64	02 99 000 0008		
Support block	<b>Female connectors</b> har-bus® 64	02 99 000 0005		

Identification	for use with	Part number	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 number 02 99 000 0003 is suitable for repairing small quantities. 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 number 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 number 02 99 000 0004 and
  - b) for 5 mm termination length use Part number 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 number 02 99 000 0005) from the bottom.

Identification	Part number	Drawing	Dimensions in mm
Hand bench press	09 99 000 0201		<p>Technical characteristics</p> <p>Working stroke 25 mm</p> <p>Press force 15 kN max.</p> <p>Hole <math>\varnothing</math> in the ram <math>\varnothing</math> 10 mm</p> <p>Net weight approx. 23 kg</p>
Pneumatic press 40 kN	09 99 000 0282		<p>Technical characteristics</p> <p>Total stroke 48 mm</p> <p>Working stroke 0-6 mm</p> <p>Press force 40 kN max.</p> <p>Air pressure 6 bar</p> <p>Hole <math>\varnothing</math> in the ram <math>\varnothing</math> 10.01 mm</p> <p>Net weight 136 kg</p> <p>Power supply 110 V / 220 V AC</p>
Adaptor for height compensation <sup>1)</sup>	09 99 000 0279		
<p>Guide frame with base plate</p> <p>Standard type for pcb size x = 123.5 - 309.5 mm</p> <p>Long type<sup>2)</sup> for pcb size x = 123.5 - 668.5 mm</p> <p>Base plate</p>	<p>09 99 000 0244</p> <p>09 99 000 0261</p> <p>09 99 000 0255</p>		<p>base plate</p>

<sup>1)</sup> suitable for 09 99 000 0282 and all CPM machines (see page 30.12 ff.)

<sup>2)</sup> not suitable for hand bench press

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

The **CPM prestige SI** 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.

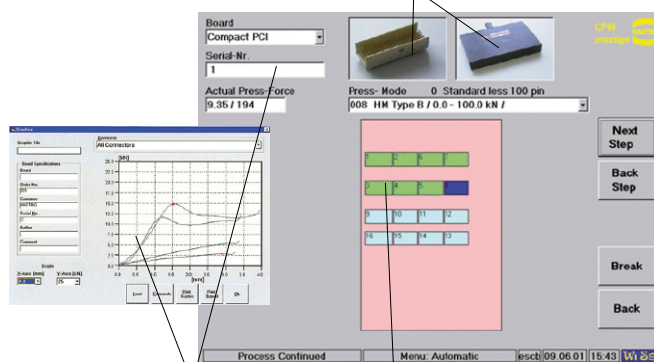
The visualisation of the entire press-in process (the position of the connector, press-in forces etc.) allows the rapid recognition and eradication of the possible error sources. With the addition of a barcode reader (1D and 2D)<sup>1)</sup> the parameters of every pcb layout can be stored, recalled 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.



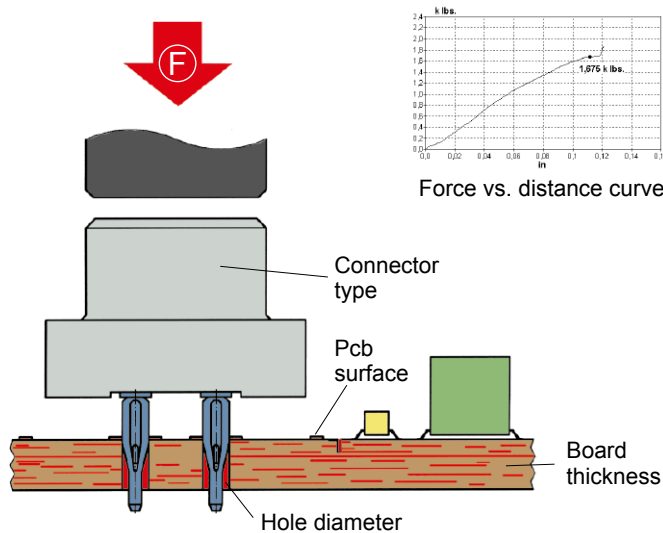
Visual guiding system via touch monitor

Real photos of connectors and tools



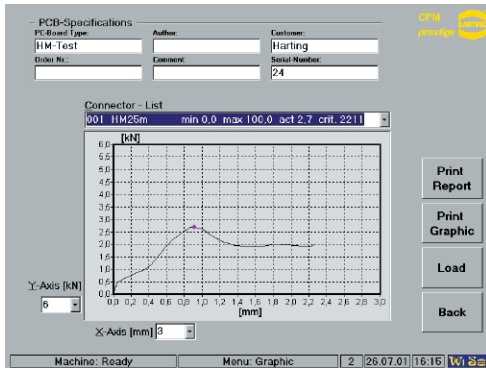
Process data

Layout with current position highlighted



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

<sup>1)</sup> 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 number** 09 89 050 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 SI**  
(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 IPC (WES7)
- 2D-Barcode reader for management ease of press-in programs
- All dimensions allow an easy integration into production lines

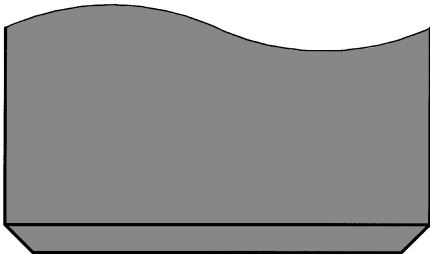
### Process monitoring and quality assurance:

- 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
- Position plates with "Roll & Drop"

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.

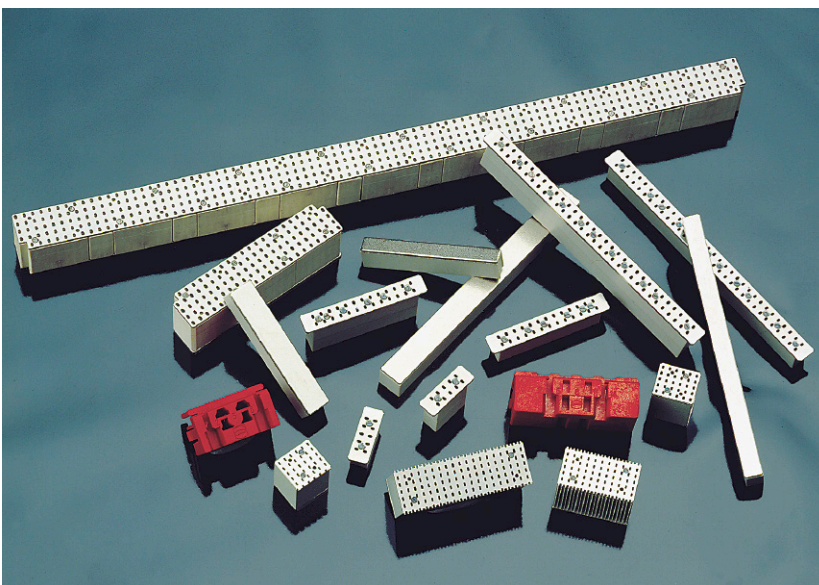
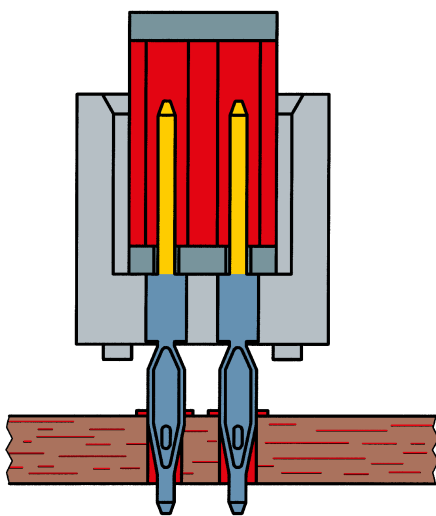


## Advantages of press inserts

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 and 2 mm pitches.

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

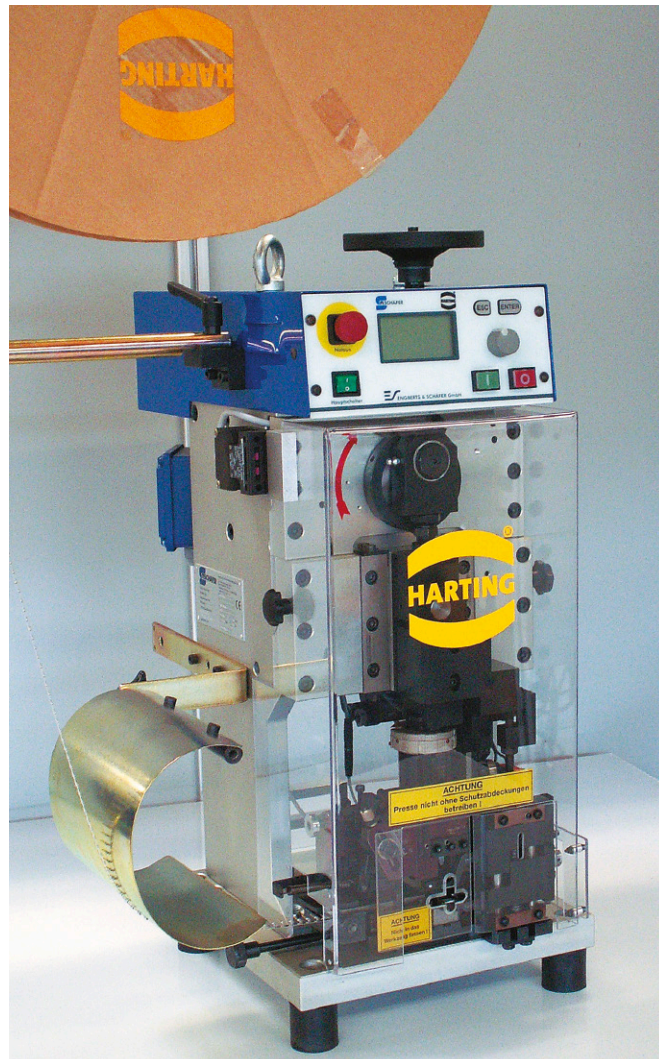


Identification	Part number	Drawing	Dimensions in mm
<p><b>HARTING crimping tool</b> for individual contacts</p> <p>BC / FC 1 / har-bus® 64</p> <p>FC 2</p> <p>FC 3</p> <p><b>Locator</b></p> <p>BC / FC 1 / har-bus® 64</p> <p>FC 2</p> <p>FC 3</p>	<p>09 99 000 0075</p> <p>09 99 000 0076</p> <p>09 99 000 0077</p> <p>09 99 000 0640</p> <p>09 99 000 0641</p> <p>09 99 000 0642</p>	<p>Wire gauge</p> <p>BC: 0.09 - 0.50 mm<sup>2</sup></p> <p>FC 1: 0.09 - 0.25 mm<sup>2</sup></p> <p>FC 2: 0.14 - 0.56 mm<sup>2</sup></p> <p>FC 3: 0.50 - 1.50 mm<sup>2</sup></p>	
<p><b>HARTING crimping tool</b> for individual contacts BC / FC and har-bus® 64</p> <p><b>Crimping insert set</b> for individual contacts each set contains locator and crimp insert top and bottom part</p> <p>BC / FC 1 / har-bus® 64</p> <p>FC 2</p> <p>FC 3</p> <p>BC / har-bus® 64 solid wire</p> <p><b>Locator</b></p> <p>BC / har-bus® 64</p> <p>FC</p> <p><b>Service case</b> for crimping tool and 5 sets inserts, incl. screwdriver for insert change, without contents</p>	<p>09 99 000 0620</p> <p>09 99 000 0621</p> <p>09 99 000 0622</p> <p>09 99 000 0623</p> <p>09 99 000 0629</p> <p>09 99 000 0630</p> <p>09 99 000 0631</p> <p>09 99 000 0632</p>	<p>Wire gauge</p> <p>BC: 0.09 - 0.50 mm<sup>2</sup></p> <p>FC 1: 0.09 - 0.25 mm<sup>2</sup></p> <p>FC 2: 0.14 - 0.56 mm<sup>2</sup></p> <p>FC 3: 0.50 - 1.50 mm<sup>2</sup></p> <p>BC: 0.13 mm<sup>2</sup> (solid wire)</p>	<p>Order crimping inserts separately</p>   
<p><b>Crimping tool</b> for individual contacts FC 1, FC 2 and FC 3 (Service tool)</p>	<p>09 99 000 0191</p>	<p>Wire gauge</p> <p>FC 1: 0.14 - 0.25 mm<sup>2</sup></p> <p>FC 2: 0.25 - 0.56 mm<sup>2</sup></p> <p>FC 3: 0.75 - 1.50 mm<sup>2</sup></p> <p>Locator (09 99 000 0205) is supplied with the tool.</p>	



Identification	Part number	Drawing	Dimensions in mm
<p><b>HARTING crimping tool</b> for bandoliered contacts (500 pieces) BC / har-bus® 64</p> <p>for bandoliered contacts (250 pieces)</p> <p>FC 1</p> <p>FC 2</p> <p>FC 3</p> <p>BC / har-bus® 64 solid wire</p>	<p>09 99 000 0248</p> <p>09 99 000 0247</p> <p>09 99 000 0119</p> <p>09 99 000 0120</p> <p>09 99 000 0627</p>	<p>Wire gauge 0.09 - 0.5 mm<sup>2</sup></p> <p>Wire gauge 0.09 - 0.25 mm<sup>2</sup></p> <p>0.14 - 0.56 mm<sup>2</sup></p> <p>0.50 - 1.50 mm<sup>2</sup></p> <p>0.13 mm<sup>2</sup> (solid wire)</p>	
<p><b>HARTING semi-automatic crimping device</b></p> <p>Main drive, foot-operated 115/230 V – 50 Hz</p> <p>Real holder for 2,500 contacts FC 1, FC 2 or FC 3 and for 5,000 contacts BC / har-bus® 64</p>	<p>09 99 000 0246</p> <p>09 99 000 0158</p>	<p>Locator not necessary</p>	
<p><b>Crimping head for bandoliered contacts</b> BC / har-bus® 64</p> <p>FC 1</p> <p>FC 2</p> <p>FC 3</p> <p>BC/har-bus® 64 solid wire</p>	<p>09 99 000 0252</p> <p>09 99 000 0249</p> <p>09 99 000 0250</p> <p>09 99 000 0251</p> <p>09 99 000 0628</p>	<p>Wire gauge 0.09 - 0.5 mm<sup>2</sup></p> <p>0.09 - 0.25 mm<sup>2</sup></p> <p>0.14 - 0.56 mm<sup>2</sup></p> <p>0.5 - 1.5 mm<sup>2</sup></p> <p>0.13 mm<sup>2</sup> (solid wire)</p>	
<p><b>Insertion tool</b> for contacts BC / har-bus® 64</p> <p>for contacts FC 1, FC 2 and FC 3</p>	<p>09 99 000 0100</p> <p>09 99 000 0088</p>		
<p><b>Removal tool</b> for contacts BC / har-bus® 64</p> <p>for contacts FC 1, FC 2 and FC 3</p>	<p>09 99 000 0101</p> <p>09 99 000 0087</p>		

**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 number 09 98 000 5000**

**Technical Characteristics**

**Dimensions**

Height 690 mm  
(1400 mm with a contact reel)

Width 350 mm

Depth 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

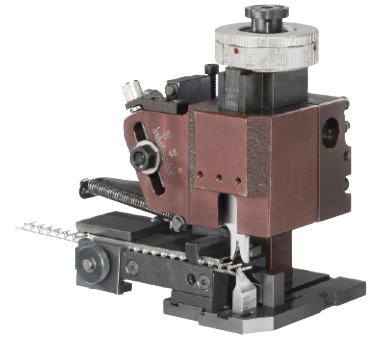
Illumination Integrated tool light

Stroke counter Daywise and fixed

Crimp force monitor BB07i

Crimping tool Quick change tool

Adjustable process parameters  
 Crimping height on wire  
 Crimping height on insulation  
 Depth of insulation stripping  
 Length of insulation stripping  
 Wire retainer position  
 Wire position in the crimp contact  
 Band thrust



Identification	for use with	Part number	Wire gauge [mm <sup>2</sup> ]	AWG	Insulation [Ø mm]	
Crimping tool  for DIN 41 612 connectors <sup>1)</sup>	contacts BC / har-bus® 64	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 <sup>2)</sup>	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

<sup>1)</sup> 3.5 + 0.5 mm of insulation is stripped from the wire to be crimped

<sup>2)</sup> 2.5 + 0.5 mm of insulation is stripped from the wire to be crimped

DIN 41 612 Signal crimp contact type			BC crimp contacts 09 02 000 ....						har-bus® 64 crimp contacts 02 05 000 ....					
Part number	Female contacts	PL 1	6474	8444	8474	6474	8444	8474	1511	1512	1513	1511	1512	1513
		PL 2	6484	8434	8484	6484	8434	8484	2511	2512	2513	2511	2512	2513
Bandoliered contacts: 5,000 pieces/reel			X			X			X			X		
Bandoliered contacts: 500 pieces/reel				X			X			X			X	
Individual contacts					X			X			X			X
Cable diameter		mm <sup>2</sup>	0.09-0.5			0.13 mm <sup>2</sup> solid wire			0.09-0.5			0.13 mm <sup>2</sup> solid wire		
		AWG	28-20						28-20					
Hand crimp tool		09 99 000 0075			X						X			
		09 99 000 0248		X						X				
		09 99 000 0627					X						X	
Hand crimp tool 09 99 000 0620 with insert		09 99 000 0621			X						X			
		09 99 000 0629						X						X
Semi automatic crimp tool 09 99 000 0246 with head		09 99 000 0252	X	X					X	X				
		09 99 000 0628				X	X					X	X	
and reel holder		09 99 000 0158	X			X			X			X		
Automatic crimp machine type BK 09 98 000 5000 with tools		09 98 000 3004	X			X			X			X		
Insertion tool		09 99 000 0100				X						X		
Removal tool		09 99 000 0101				X						X		

DIN 41 612 Power crimp contacts			FC crimp contacts 09 06 000 ....								
Part number	Female contacts	PL 1	6474	7474	8474	6471	7471	8471	6472	7472	8472
		PL 2	6484	7484	8484	6481	7481	8481	6482	7482	8482
	Male contacts	PL 1	9544	–	9554	9541	5541	9551	9542	5542	9552
		PL 2	9564	–	9574	9561	–	9571	9562	–	9572
	Female contacts for 1 x 1 wire wrap posts	–	6454	–	6464	6451	–	6461	6452	–	6462
Bandoliered contacts: 2,500 pieces/reel			X			X			X		
Bandoliered contacts: 250 pieces/reel				X			X			X	
Individual contacts					X			X			X
Cable diameter		mm <sup>2</sup>	0.09-0.25			0.14-0.56			0.5-1.5		
		AWG	28-24			26-20			20-16		
Hand crimp tool		09 99 000 0075			X						
		09 99 000 0076						X			
		09 99 000 0077									X
		09 99 000 0191			X			X			X
		09 99 000 0247		X							
		09 99 000 0119						X			
		09 99 000 0120								X	
Hand crimp tool 09 99 000 0620 with insert		09 99 000 0621			X						
		09 99 000 0622						X			
		09 99 000 0623									X
Semi automatic crimp tool 09 99 000 0246 with head		09 99 000 0249	X	X							
		09 99 000 0250				X	X				
		09 99 000 0251							X	X	
and reel holder		09 99 000 0158	X			X			X		
Automatic crimp machine type BK 09 98 000 5000 with tools		09 98 000 3005	X								
		09 98 000 3006				X					
		09 98 000 3007							X		
Insertion tool		09 99 000 0088		X			X			X	
Removal tool		09 99 000 0087		X			X			X	