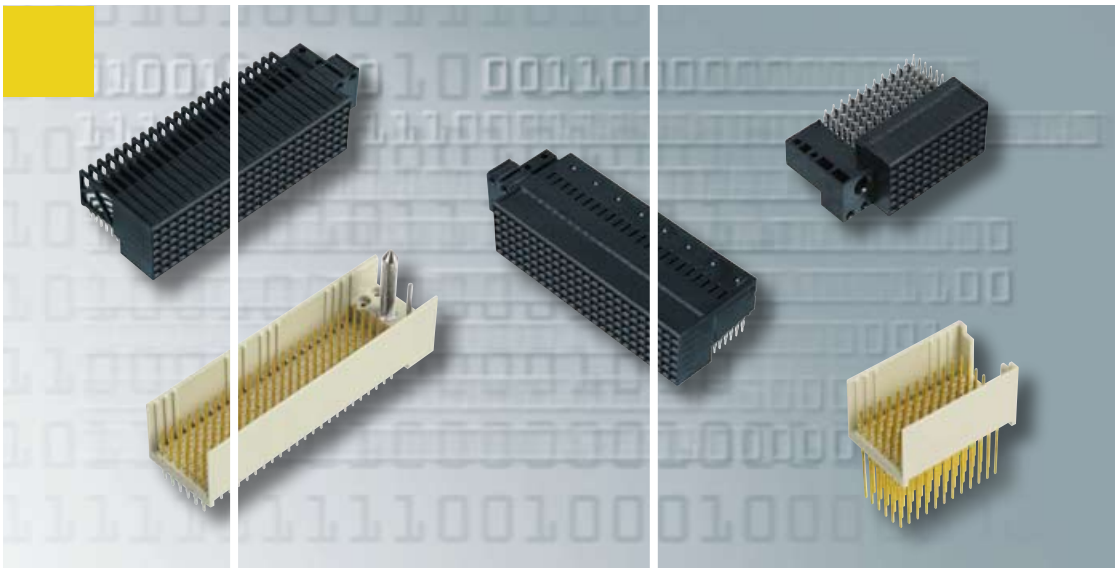
HARTING



Metric 6-row connectors

HARTING People | Power | Partnership

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Quality Connections Worldwide

HARTING was founded in 1945 by the family that still owns the company.

Today, HARTING employs around 2,000 people worldwide, including 150 qualified engineers. The sales team, including more than 100 sales engineers is in daily contact with our customers.

The company is one of the world's leading manufacturers of connectors, and currently have 34 subsidiary companies in Europe, the United States and Asia. In several product areas, HARTING is a market leader.

Great emphasis is placed on close links with customers, including the provision of a 'Just-in-Time'-Service to ensure rapid delivery to key customers.

HARTING products are designed and manufactured using the latest automated techniques, from CAD systems in the research and development department to automatic production techniques on the assembly lines.

Production and quality control is based on a 'zero-error' philosophy which can only be reached by the continuous successful implementation of fully automated production techniques. The organisation and procedures for quality assurance are based on the EN ISO 9001 standard. A total of 60 engineers and other employees, most of whom are trained and qualified to standards laid down by the DGQ (German Association of Quality) or the SAQ (Swiss Association of Quality), are employed solely on quality-assurance activities.

Metric 6-row connectors

General information

It is the user's responsibility to check whether the components illustrated in this catalogue comply with different regulations from those stated in special fields of application which we are unable to foresee.

We reserve the right to modify designs in order to improve quality, keep pace with technological advancement or meet particular requirements in production.

General information

In comparison to the standard 5-row *har-bus® HM* series, this new 6-row version offers a significantly higher contact density, thus permitting applications where very high contact density is important. Typically, for a signal transmission of 1.5 Gbps it is possible to obtain 7.5 differential pairs per cm of card edge (see figure 1). For a signal transmission of 2.5 Gbps at least 5 differential pairs per cm of card edge can be obtained (see figure 2).

Male and female connectors are both available with 72 or 144 contacts and can be supplied in reel or tube packaging.

A	+	-	G	G	+	-	G	G	+	-	G	G	+	-	G	G	+	-
B	G	G	+	-	G	G	+	-	G	G	+	-	G	G	+	-	G	G
C	+	-	G	G	+	-	G	G	+	-	G	G	+	-	G	G	+	-
D	G	G	+	-	G	G	+	-	G	G	+	-	G	G	+	-	G	G
E	+	-	G	G	+	-	G	G	+	-	G	G	+	-	G	G	+	-
F	G	G	+	-	G	G	+	-	G	G	+	-	G	G	+	-	G	G

Figure 1

A	+	-	G	+	-	G	+	-	G	+	-	G	+	-	G	+	-	G
B	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
C	+	-	G	+	-	G	+	-	G	+	-	G	+	-	G	+	-	G
D	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
E	+	-	G	+	-	G	+	-	G	+	-	G	+	-	G	+	-	G
F	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

Figure 2

Male connectors

Each contact position can be loaded with any of the 12 different contacts lengths shown (see figure 3).

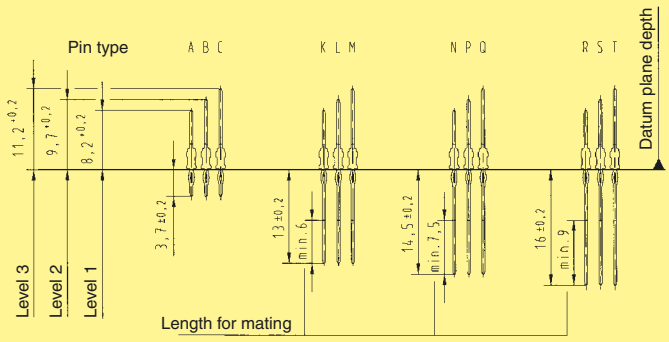
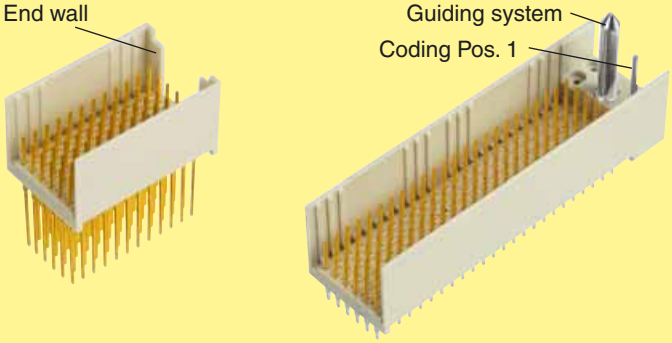


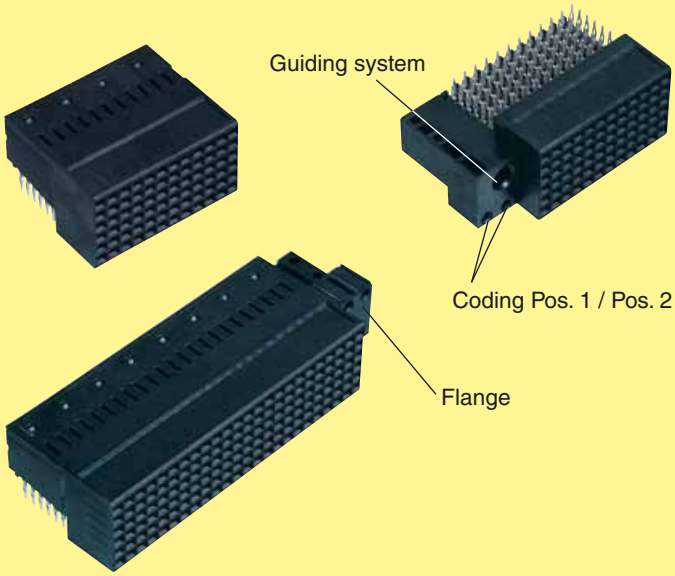
Figure 3

All male connectors can be supplied with end wall, coding pins and guiding system.



Female connectors with press-in termination

The 6-row female connector needs comparable space on the daughter card as the 5-row versions, as it has similar outer dimensions. Compared to the male connectors, coding pins and a guiding system are available upon request too.



Female connectors in SMC (Surface Mount Compatible) technology

Using the reflow soldering process, these 6-row female connectors in SMC technology can be soldered to the PCB at the same time as other SMC components. So the handling cost can be reduced significantly and there is no need for a separate press-in process. These connectors are made from a high temperature plastic material that can withstand up to 260°C (lead free soldering). To hold the connector securely on the PCB before the solder process, kinked contacts are offered as standard on both connector sides.

For further information please contact your local HARTING representative.

The continuing trend towards miniaturisation has revolutionised the assembly of electronic components. For the past 15 years, most components have been secured directly to the pcb surface by means of Surface Mount Technology (SMT). By dispensing with drilled holes on the pcb, a space saving of up to 70 percent is achieved.

Today, typical components such as ICs, resistors, capacitors, inductors, and connectors with straight terminal pins are almost exclusively fitted using SMD (Surface Mount Device) technology in mass production. In contrast, angled SMD connectors at the edge of the board have not been successful because of tolerance problems (co-planarity) and stresses during mating.

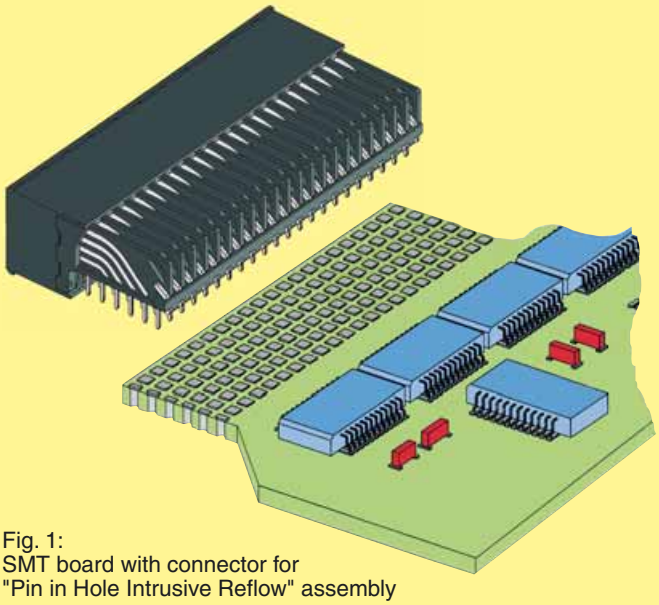


Fig. 1:
SMT board with connector for
"Pin in Hole Intrusive Reflow" assembly

“Pin in Hole Intrusive Reflow*”

In this process, the connector is inserted into plated through holes in a comparable way to conventional component mounting. All other components can be assembled on the pcb surface.

The components are positioned using pick-and-place machines. These automatic assembly machines differ according to whether the components are small, light-weight or bulky. Connectors, compared to ICs, are considered bulky (odd form). They are more difficult to grip, due to their comparatively heavy weight and larger size. But machines for odd form components, provide the higher insertion power, necessary to fit the components into pcb holes, which are filled with solder paste. Generally modern SMC production lines are equipped with both types of machine. Therefore the "Pin in Hole Intrusive Reflow" process entails no extra investment costs for the user.

Conventional assembly process:

1. Application of solder paste
2. Positioning the components
3. Positioning odd form components
4. Reflow soldering
5. Pressing in or partially dip soldering the connector at the board edge
6. Quality inspection

“Pin in Hole Intrusive Reflow” assembly:

1. Application of solder paste
2. Positioning the components
3. Positioning odd form components
4. Reflow soldering
5. ~~Pressing in or partially dip soldering the connector at the board edge~~
6. Quality inspection

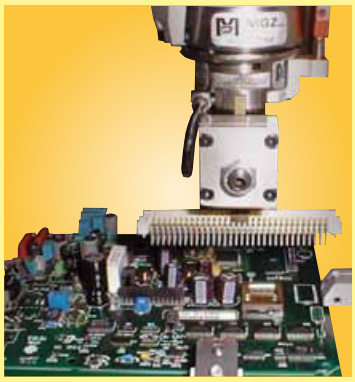


Fig. 2:
Pick-and-place machine for odd form components
(Courtesy of JOT Automation GmbH)

* Also known as Pin-in-Paste or Through Hole Reflow (THR)

har:bus® HM 6-row connector was designed for Pin in Hole Intrusive Reflow with features like an inspection friendly black colour, tape and reel packaging for automated handling and it is self retaining on pcb via kinked pin. The open design – moulded from high temperature resistant material – ensures good heat distribution, so that current solder temperature profiles can be used. The special material of the insulation body withstands also the higher temperatures of lead free soldering.

Advantages for using har:bus® HM 6-row connectors are:

- Partial dip soldering or press fitting is no longer required
- High mechanical stability
- Complete compatibility with Surface Mount Technology
- Savings through integration into the automated assembly process
- Reduced floor space in the production plant

Application of solder paste

Before the components are assembled, solder paste is applied to all the solder pads and the plated through holes. Usually a screen printing process is used for this purpose. A squeegee moves across the pcb, which is masked with screens and presses the solder paste into all unmasked areas. A good solder joint is basically determined by the amount of the applied solder paste. Only a few parameters (illustrated on the right) will lead to the right quantity.

As an alternative to screen printing, the solder paste can be applied by means of a dispenser. A high-precision robot moves the dispenser to all required positions on the pcb. The dispensing method is particularly suitable for small pcb's or applications which demand high precision and flexibility in dispensing volumes.

Fig. 3: Dispenser in operation

Solder paste volume

There are numerous scientific studies dealing with calculation of the required quantity of solder paste. These studies use various parameters, e.g. the shrinking factor of the paste during soldering or the thickness of the screens used for masking the pcb. Since such calculation methods are complicated to apply, the following rule of thumb has proved valuable in practice:

$$V_{Paste} = 2(V_H - V_P)$$

in which:

V_{Paste} = Required volume of solder paste

V_H = Volume of the plated through hole

V_P = Volume of the connector termination in the hole

Comment: the multiplier "2" compensates for solder paste shrinkage during soldering. For this purpose, it was assumed that 50 % of the paste consists of the actual solder, the other 50 % being soldering aids.

Requirements for the solder connection

At the beginning of a new production batch, the process parameters, such as quantity of solder paste and soldering temperature, can be set by interpreting simple cross-sections of the soldered connection. A reliable measure for achieving optimum parameters is the quantity of solder required to fill the hole. In soldered connections of high quality, the holes are filled to between 75 % and 100 %.

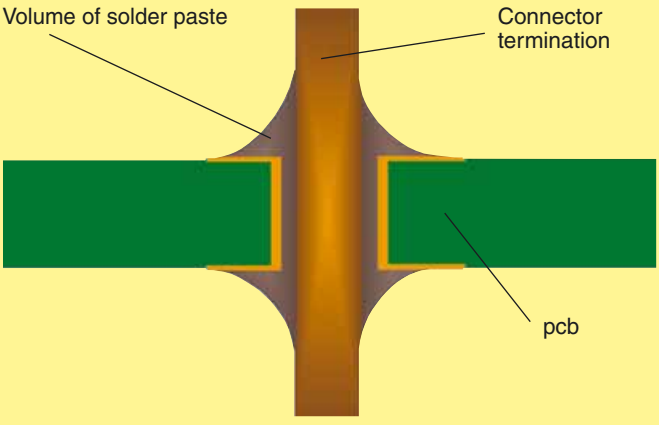


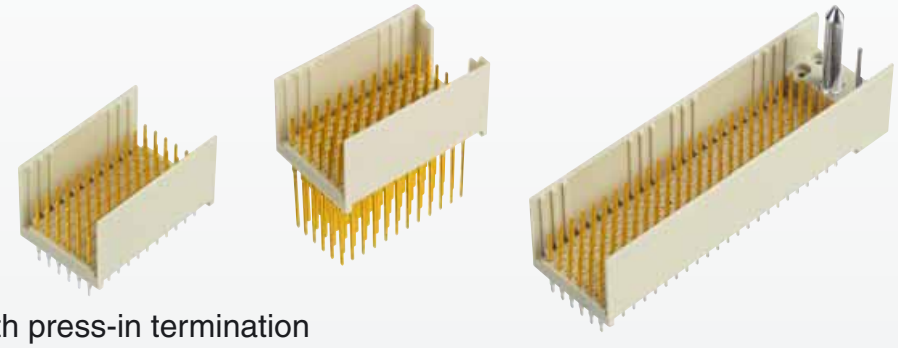
Fig. 4: Plated through hole with connector termination

Design	:	complementary to IEC 61 076-4-101 (2 mm hard metric specification)
Number of contacts	:	72 or 144
Contact spacing	:	2.00 mm (1.50 mm between contact rows on the termination side of female connectors)
Working current	:	1.0 A (24 °C temp. raise) 1.5 A (52 °C temp. raise) 2.0 A (88 °C temp. raise)
Test voltage$_{r.m.s.}$	:	min. 750 V
Contact resistance	:	< 20 mΩ
Impedance (differential)	:	100 Ω
Typical differential data rate	:	1.5 - 2.5 Gbps
Temperature range	:	- 55 °C ... + 125 °C
during reflow soldering		max. 260 °C (peak temperature)
Performance level	:	performance level 2 = 250 mating cycles performance level 1 = 500 mating cycles
Termination technique	:	press-in for male and female connectors SMC for female connectors, compatible with lead-free solder process
Pcb characteristics	:	min. 1.4 mm for male and female connectors with press-in terminations 1.6 mm - 2.4 mm for female connectors with SMC terminations
Recommended configuration of plated through holes	:	

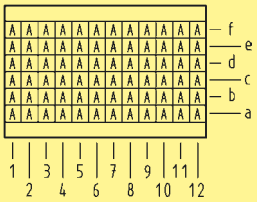
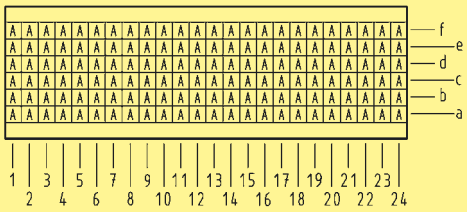
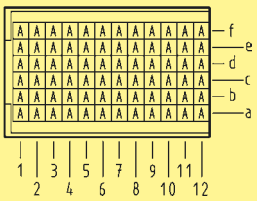
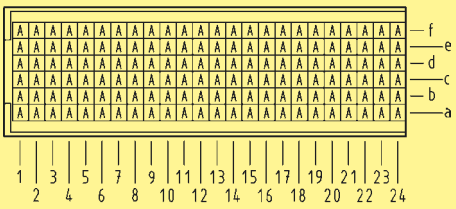
	press-in	SMC
Diameter of holes	0.6 $^{\pm 0.05}$ mm	0.7 $^{+0.07}_{-0.05}$ mm
Drilling	0.7 $^{\pm 0.02}$ mm	0.8 $^{\pm 0.02}$ mm
Cu	30 - 50 µm	30 - 50 µm
SnPb	5 - 15 µm	5 - 15 µm

Mating force	:	< 0.75 N/pin
Materials		
Mouldings	:	Thermoplastic resin, glass-fibre filled, UL 94-V0
Contacts	:	Copper alloy
Contact surface	:	Au/Ni
Packaging		
Tube	:	Male connectors and female connectors with press-in terminations
Tape & Reel	:	Female connectors with SMC terminations

* Other platings on request

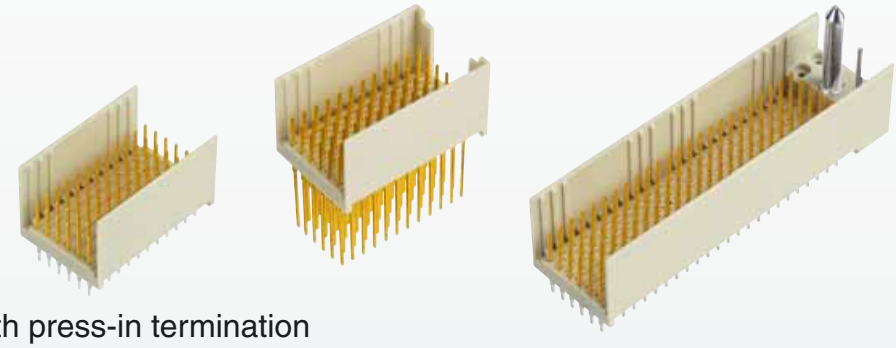


Male connectors straight, with press-in termination

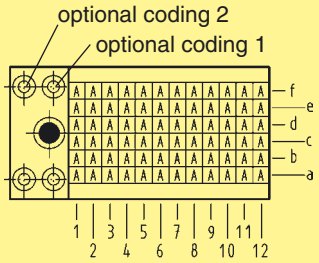
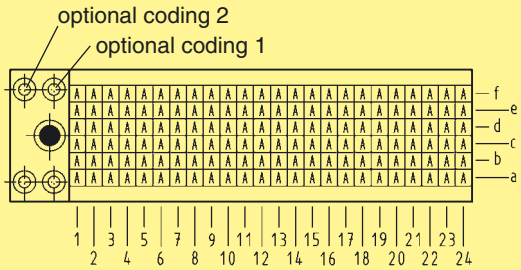
Identification	Number of contacts	Contact length [mm] mating side	Contact length [mm] termination side	Part number	Contact configuration
Connectors without flange without coding without endwall	72	8.2	3.7	17 41 072 1204 **17 41 072 2204**	
	144	8.2	3.7	17 44 144 1205 **17 44 144 2205**	
Connectors without flange without coding with endwall	72	8.2	3.7	17 42 072 1203 **17 42 072 2203**	
	144	8.2	3.7	17 45 144 1204 **17 45 144 2204**	

Connector dimensions see pages 12 and 13.
The pin types A, B, C … R, S, T can be mixed in any configuration.
Please request the part number.

Thin print part numbers: performance level 1
Bold print part numbers: performance level 2

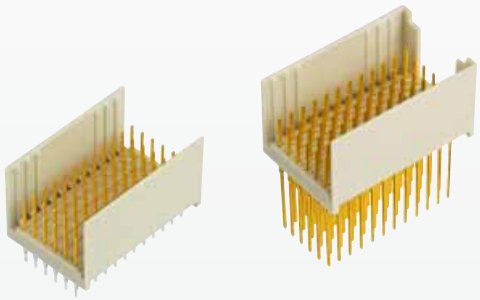


Male connectors straight, with press-in termination

Identification	Number of contacts	Contact length [mm] mating side	Contact length [mm] termination side	Part number	Contact configuration
Connectors with flange without coding without endwall	72	8.2	3.7	17 43 072 1209 **17 43 072 2209**	
	144	8.2	3.7	17 46 144 1207 **17 46 144 2207**	
Connectors with flange with coding 1 without endwall	72	8.2	3.7	17 43 072 1211 **17 43 072 2211**	
	144	8.2	3.7	17 46 144 1209 **17 46 144 2209**	
Connectors with flange with coding 2 without endwall	72	8.2	3.7	17 43 072 1210 **17 43 072 2210**	
	144	8.2	3.7	17 46 144 1208 **17 46 144 2208**	
Connectors with flange with coding 3 (= coding 1 + 2) without endwall	72	8.2	3.7	17 43 072 1212 **17 43 072 2212**	
	144	8.2	3.7	17 46 144 1210 **17 46 144 2210**	

Connector dimensions see pages 12 and 13.
The pin types A, B, C … R, S, T can be mixed in any configuration.
Please request the part number.

Thin print part numbers: performance level 1
Bold print part numbers: performance level 2

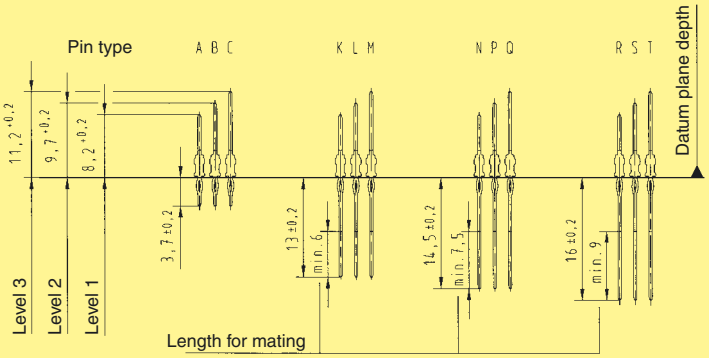


Male connectors straight, with press-in termination

Drawing

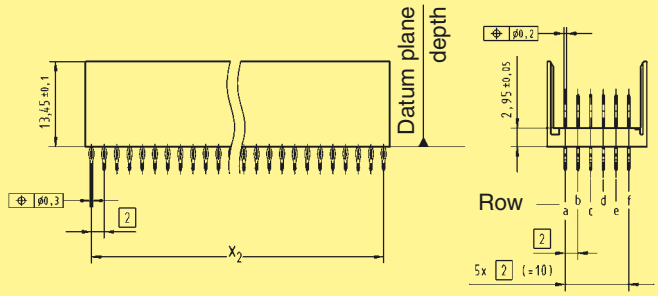
Dimensions in mm

Connector dimensions [mm]

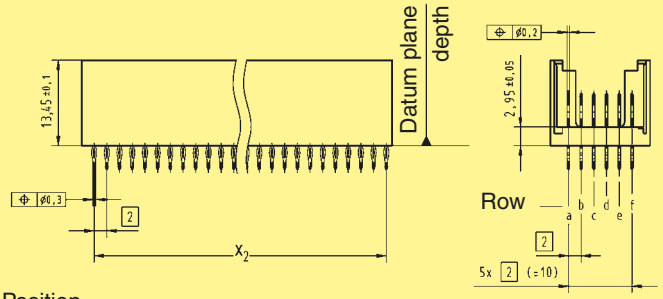


Contact positions	x_1	x_2	x_3
72	23.9	11 x 2 (= 22)	24.9
144	47.9	23 x 2 (= 46)	48.9

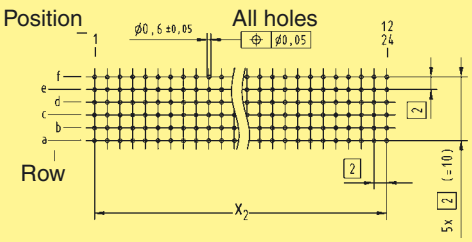
without flange
without coding
without endwall



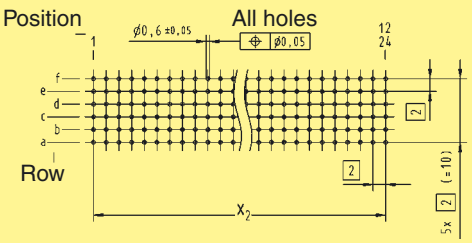
without flange
without coding
<u>with</u> endwall

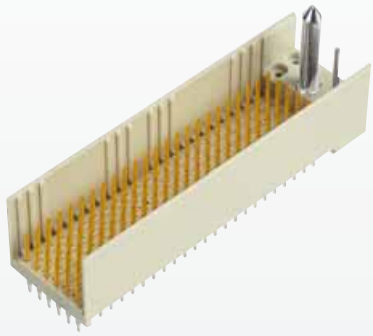


Board drillings



Board drillings



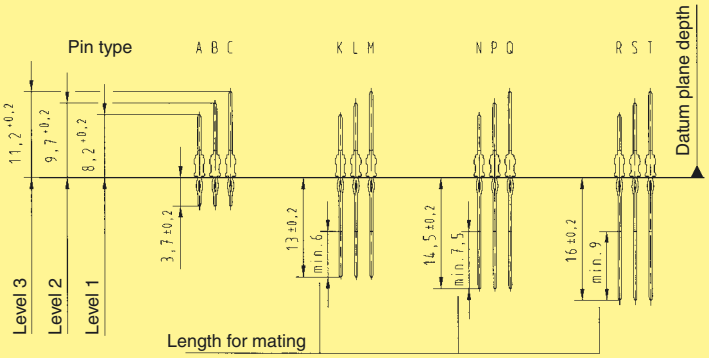


Male connectors straight, with press-in termination

Drawing

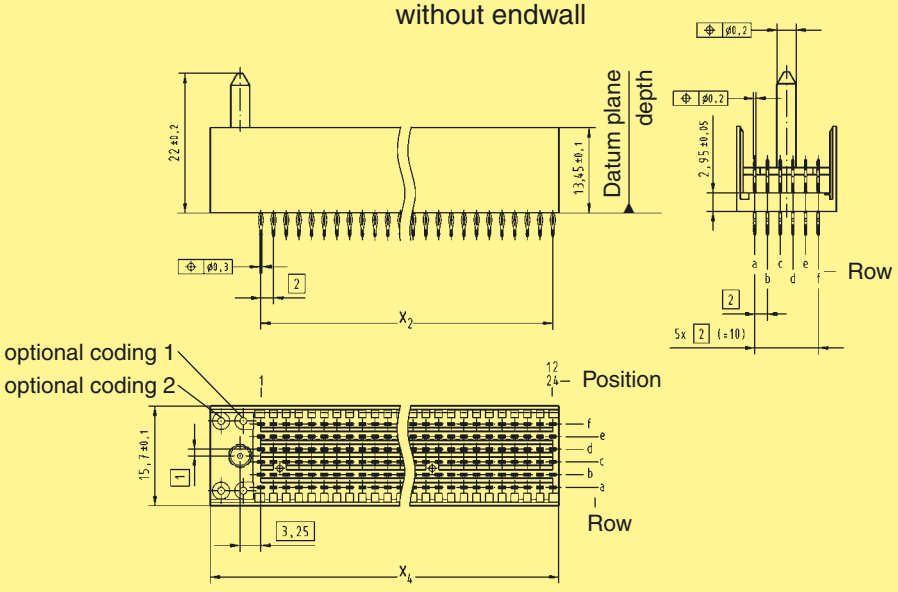
Dimensions in mm

Connector dimensions [mm]

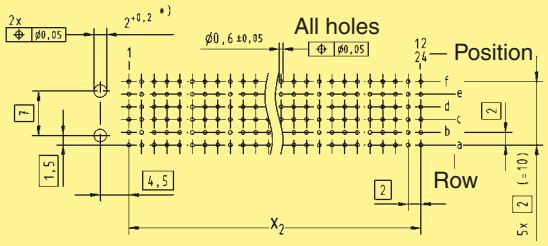


Contact positions	x_2	x_4
72	11 x 2 (= 22)	30.9
144	23 x 2 (= 46)	54.9

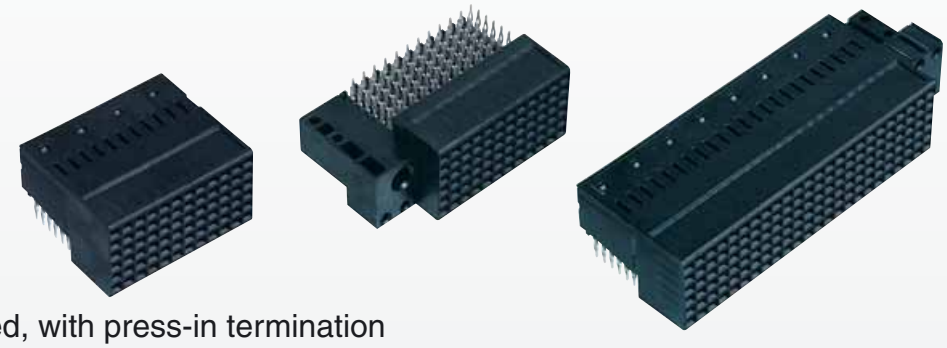
with flange
with coding
without endwall



Board drillings



* Non-metallized drillings

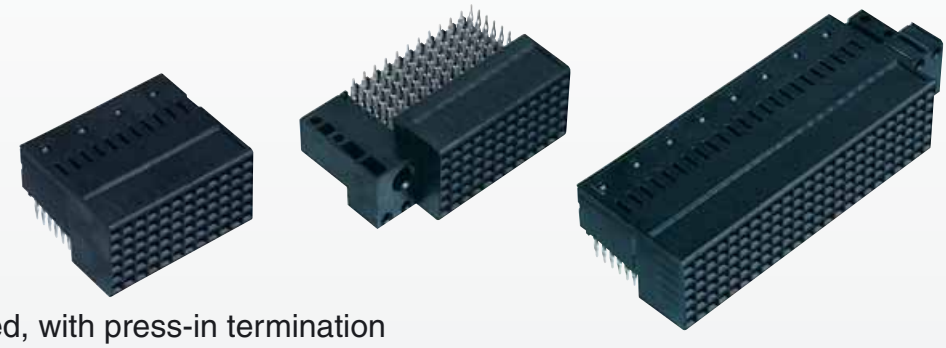


Female connectors angled, with press-in termination

Identification	No. of contacts	Contact length [mm] termination side	Part number
Connectors without flange without coding	72	3.35	17 51 072 1102 **17 51 072 2102**
	144	3.35	17 54 144 1102 **17 54 144 2102**
Connectors with flange without coding	72	3.35	17 52 072 1105 **17 52 072 2105**
	144	3.35	17 55 144 1105 **17 55 144 2105**
Connectors with flange with coding 1	72	3.35	17 52 072 1106 **17 52 072 2106**
	144	3.35	17 55 144 1106 **17 55 144 2106**
Connectors with flange with coding 2	72	3.35	17 52 072 1107 **17 52 072 2107**
	144	3.35	17 55 144 1107 **17 55 144 2107**
Connectors with flange with coding 3 (= coding 1 + 2)	72	3.35	17 52 072 1108 **17 52 072 2108**
	144	3.35	17 55 144 1108 **17 55 144 2108**

Connector dimensions see page 15.

Thin print part numbers: performance level 1
Bold print part numbers: performance level 2

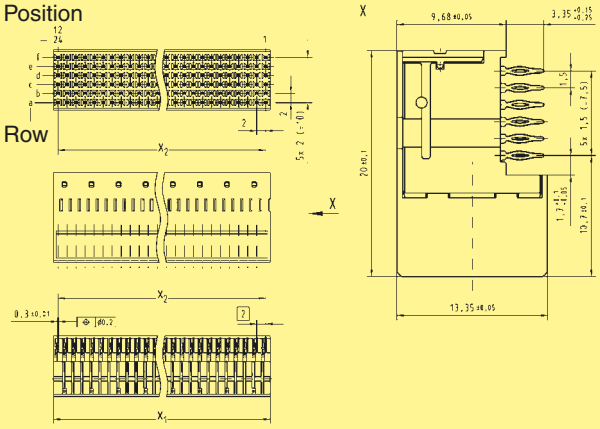


Female connectors angled, with press-in termination

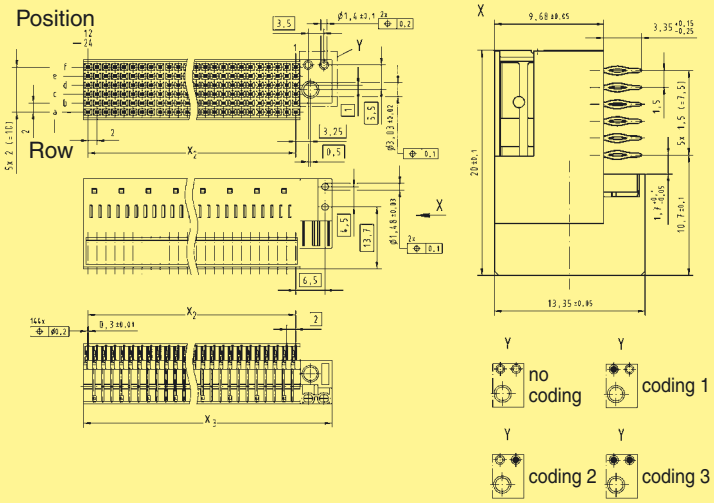
Drawing — Dimensions in mm

Connector dimensions [mm]

without flange
without coding

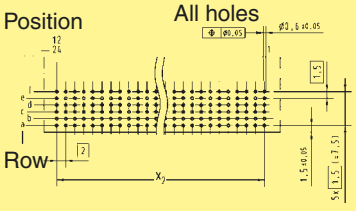


<u>with</u> flange
<u>with</u> coding

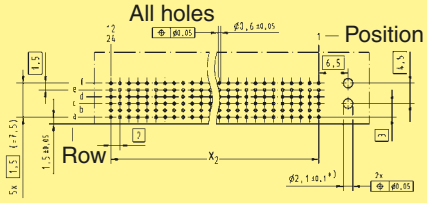


Contact positions	x_1	x_2	x_3
72	24.0	11 x 2 (= 22)	31.0
144	48.0	23 x 2 (= 46)	55.0

Board drillings



Board drillings



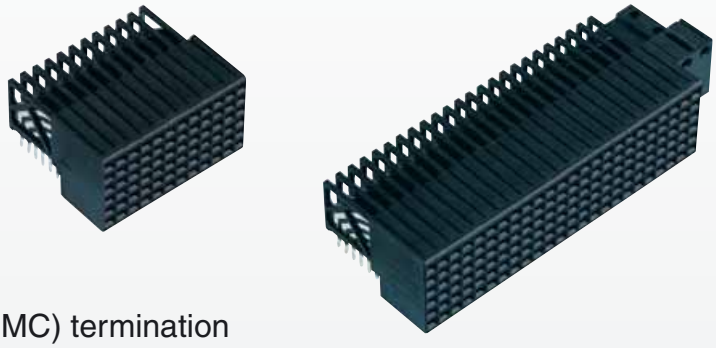
* Non-metallized drillings

Female connectors angled, with solder (SMC) termination

Identification	No. of contacts	Contact length [mm] termination side	Part number
Connectors without flange without coding	72	2.5	17 51 072 1802 **17 51 072 2802**
	144	2.5	17 54 144 1802 **17 54 144 2802**
Connectors with flange without coding	72	2.5	17 52 072 1805 **17 52 072 2805**
	144	2.5	17 55 144 1805 **17 55 144 2805**
Connectors with flange with coding 1	72	2.5	17 52 072 1806 **17 52 072 2806**
	144	2.5	17 55 144 1806 **17 55 144 2806**
Connectors with flange with coding 2	72	2.5	17 52 072 1807 **17 52 072 2807**
	144	2.5	17 55 144 1807 **17 55 144 2807**
Connectors with flange with coding 3 (= coding 1 + 2)	72	2.5	17 52 072 1808 **17 52 072 2808**
	144	2.5	17 55 144 1808 **17 55 144 2808**

Connector dimensions see page 17.

Thin print part numbers: performance level 1
Bold print part numbers: performance level 2

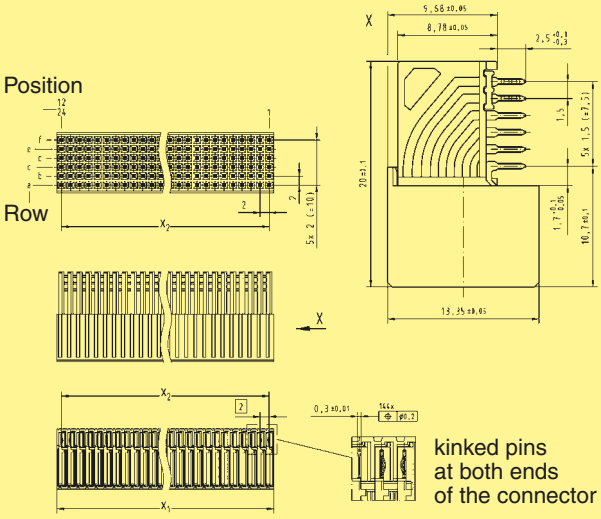


Female connectors angled, with solder (SMC) termination

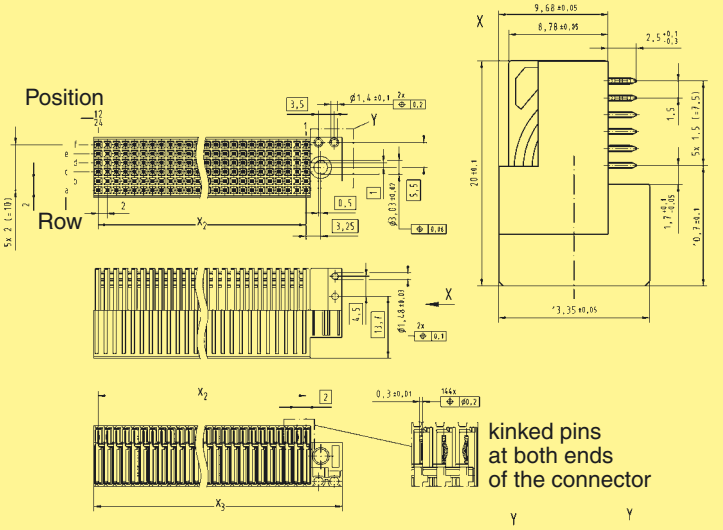
Drawing — Dimensions in mm

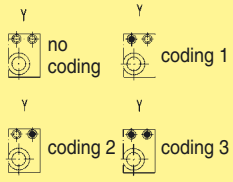
Connector dimensions [mm]

without flange
without coding



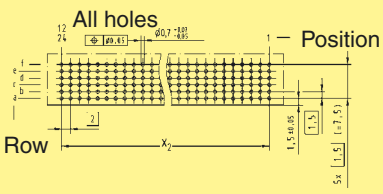
with flange
with coding



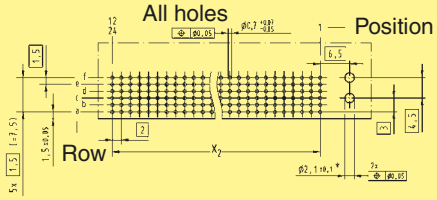


Contact positions	x_1	x_2	x_3
72	24.0	11 x 2 (= 22)	31.0
144	48.0	23 x 2 (= 46)	55.0

Board drillings



Board drillings



* Non-metallized drillings

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Espelkamp / Germany – Plant 5

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