har:bus® 64

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har:bus® 64

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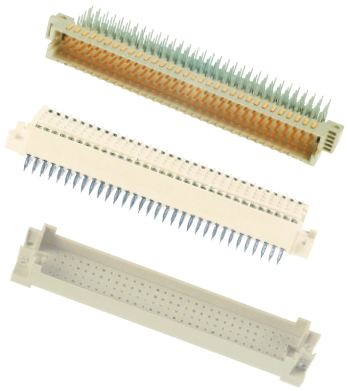


The past 20 years the VMEbus has reached a dominant position for industrial busses with a number of suppliers.

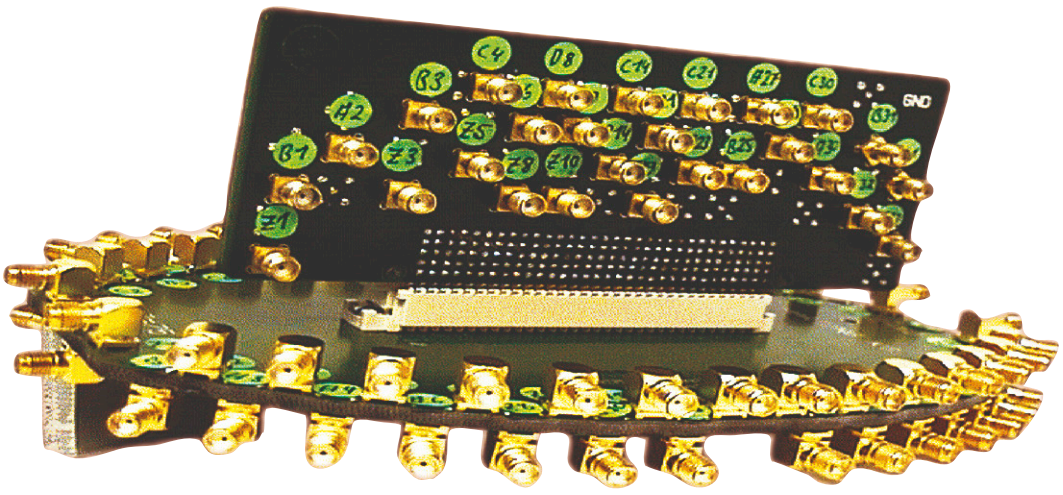
Despite numerous new bus systems based on the rapid changes in chip technology, VMEbus systems offer significant advantages such as their robustness, reliability and increased availability of processor, memory and I/O cards.

Additional advantages appear under real-time conditions, where unforeseen events have to be managed. This is realised with the program interrupt concept and variable control that closely monitors the bus system.

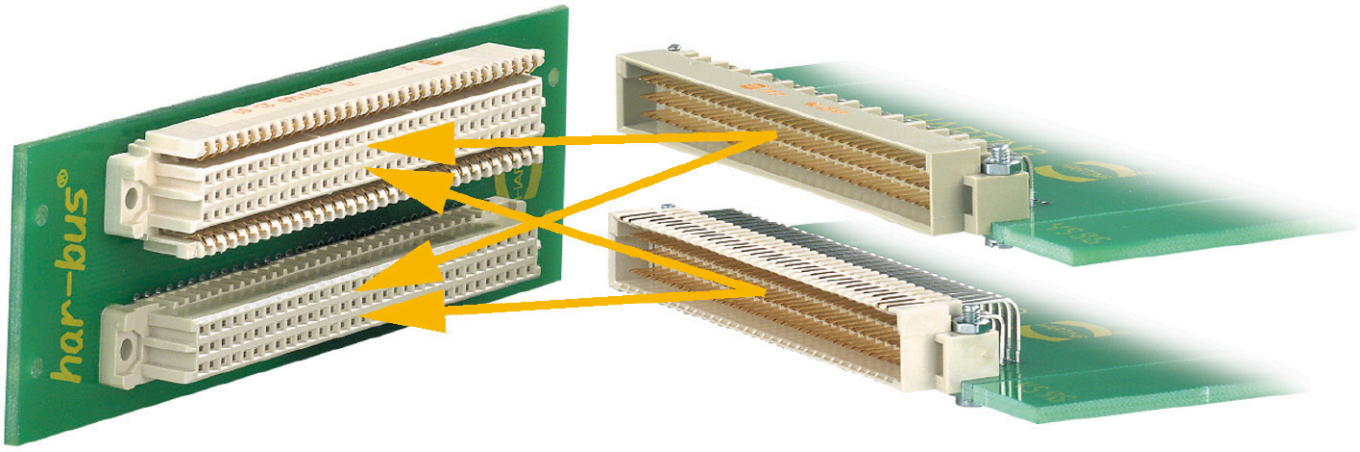
With the increase in processing speeds and data transmission rates, 3 row DIN 41612 connectors have reached their limit, so the VME standard needs to be enhanced further.

When VME architecture was increased from 8-bit to 64-bit and data transmission rates up to 160 Mbyte/s (VME 64x), HARTING introduced **har-bus® 64** with 160 pins. This Eurocard connector is 100 % backwards compatible to existing 3 row connectors with 96 contacts, therefore old can plug into new.

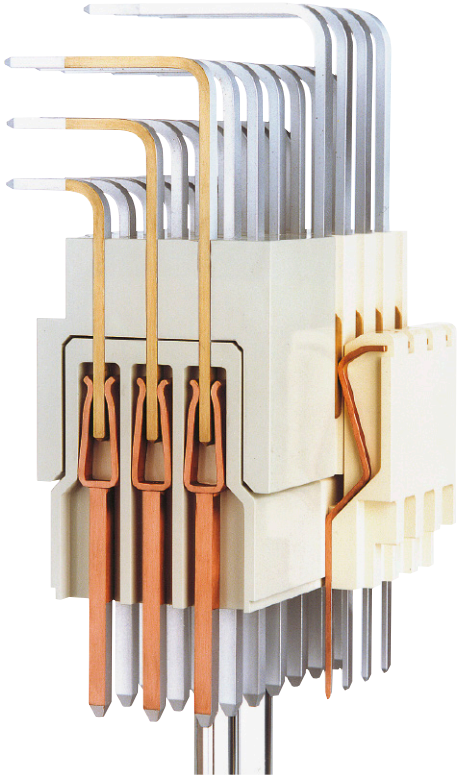
To offer the best design possible from the start, HARTING developed spice models that were later certified via signal integrity measurements of the connector.



High precision slot structure with VME pinning for connector characterisation.



Backward compatibility



The design of har:bus® 64 female connectors allows mating of any combinations of the 5 or 3 row versions without mechanical interference, thus making it possible for users to upgrade and maintain existing systems at lower costs. It is also possible to mate 5 row male connectors with 3 row female connectors.

The feature of backward compatibility allows a gradual upgrade of existing Eurocard based systems without the additional cost of a complete system redesign. It is not necessary to replace conventional 96 pin based boards as they remain pluggable into the 160 pin based systems.

Not only VMEbus, but also existing proprietary bus systems for which 3 row 96 pin connectors are no longer performance sufficient, har:bus® 64 provides the opportunity to adapt the system economically without a complete redesign to a new bus architecture.

har:bus® 64 – five rows – 160 poles

Two additional rows of contacts in the har:bus® 64 connector offer new system features:

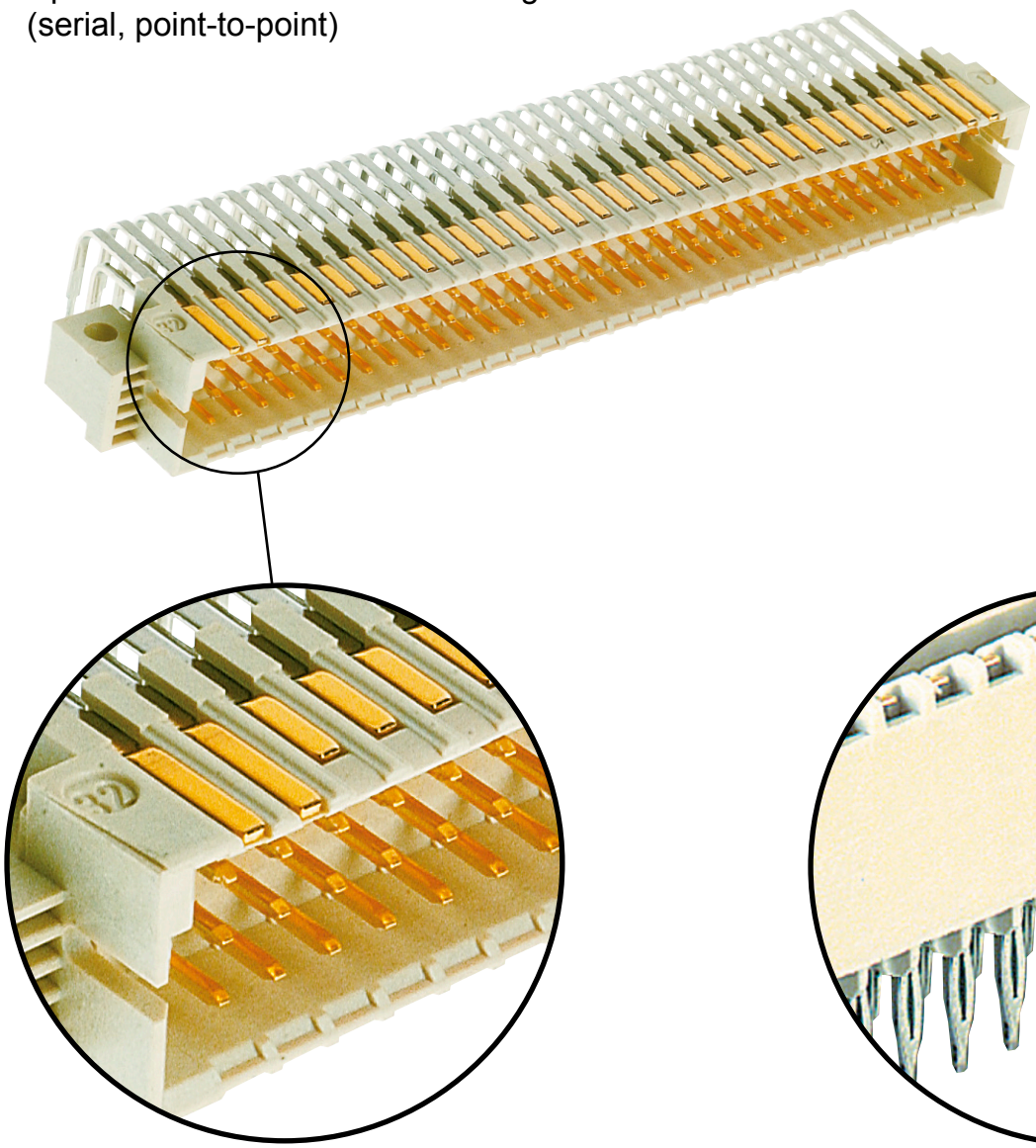
- Additional contacts for I/O and system upgrade
- New voltage supplies for 3.3 V and 48 V system components
- Identifying locations of system components and the bus length. “Plug & Play“
- Improved signal/ground ratio for reliable signal data transfer at rates up to 320 MByte/s (VMEbus) resp. 1.25 Gb/s (Gigabit Ethernet) or 3.125 Gb/s (serial point-to-point)
- Live Insertion for replacing processor or memory cards without closing down the system
- User defined pins for test and maintenance bus lines

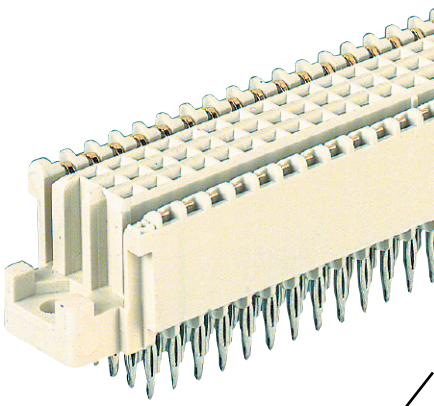
The advantages of har:bus® 64 in detail

User-defined pins in the outer rows can be used for application specific functions such as **additional I/O**. Configured as a shield to provide larger ground return paths, they assure for higher **data transfer rates**:

- Up to 320 MByte/s for asynchronous signals (VMEbus)
- Up to 1.25 GB/s for Gigabit Ethernet
- Up to 3.125 GB/s for differential signals (serial, point-to-point)

Proprietary bus systems can utilise the new contact rows to optimise signal-to-ground ratios and improve system speed.

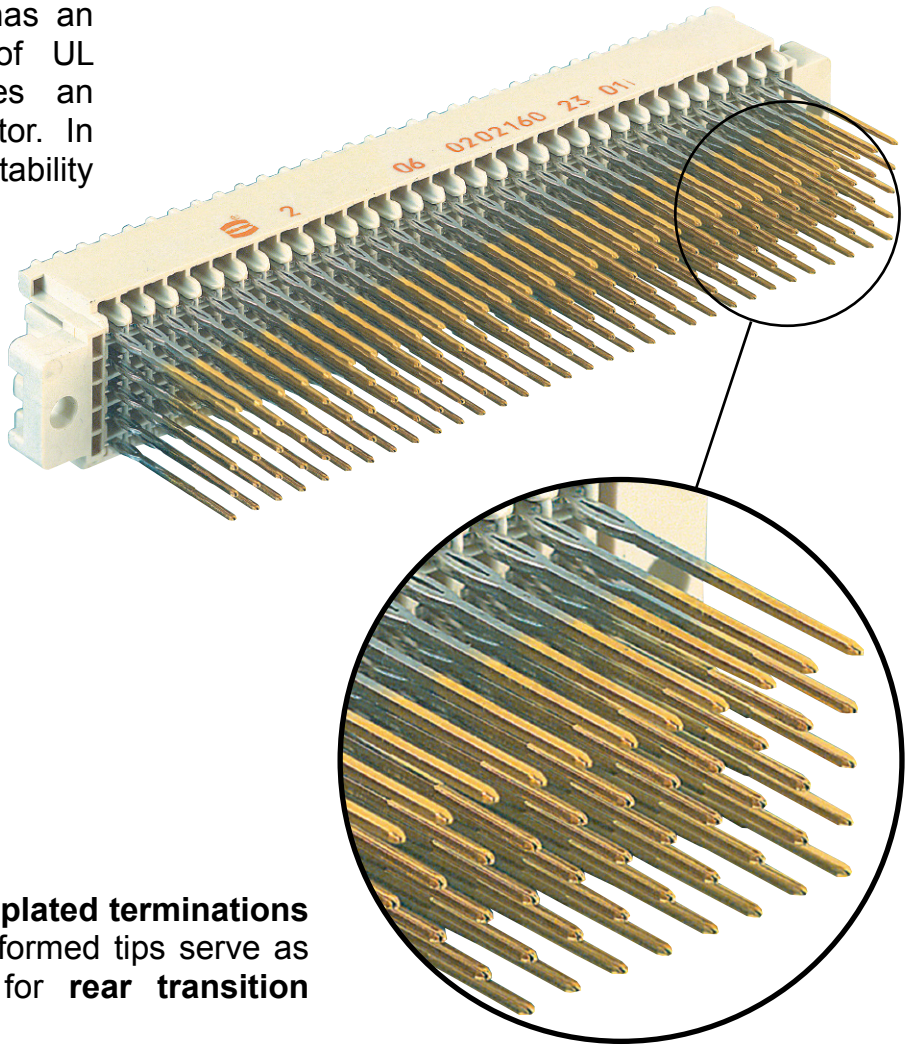


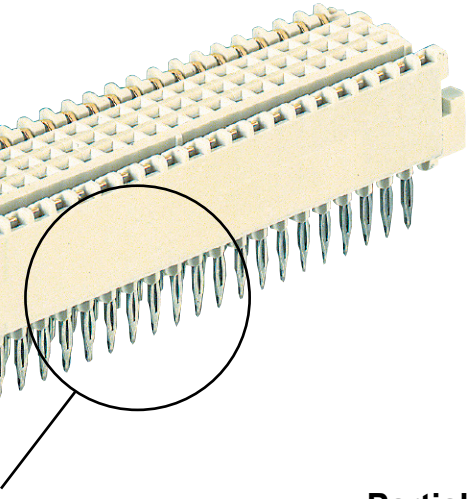


Four preleading contacts (1.5 mm) serve to pre-load the transmit and receive logic so that the bus will not experience glitches during **live insertion** of new cards into the backplane.

Backplane connector terminations are designed in solderless **press-in technology**.
The connector can be installed without any special tooling using economical **flat dies** for high speed insertion.

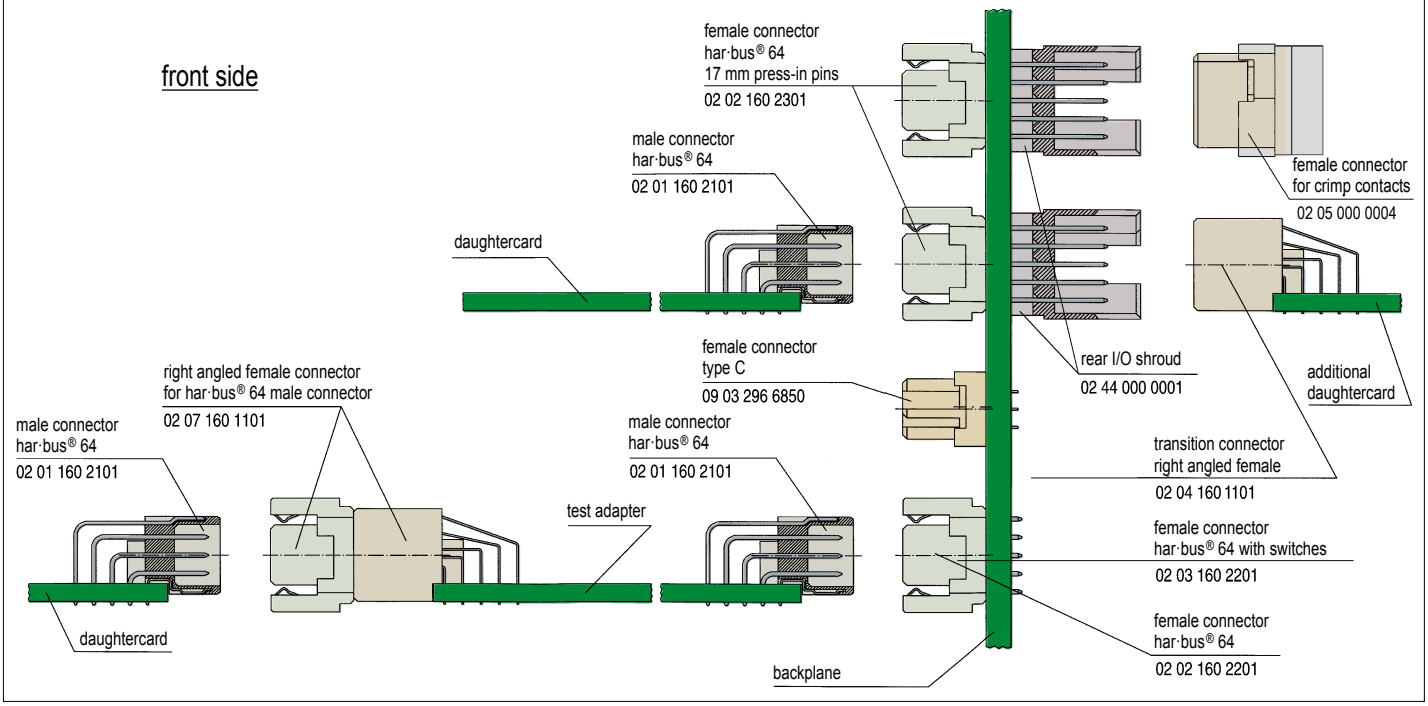
The insulator, made of LCP, has an inherent flammability rating of UL 94-V0 and therefore provides an **environment friendly** connector. In addition, the heat deformation stability of LCP makes the connector **surface-mount compatible** (see chapter 00).

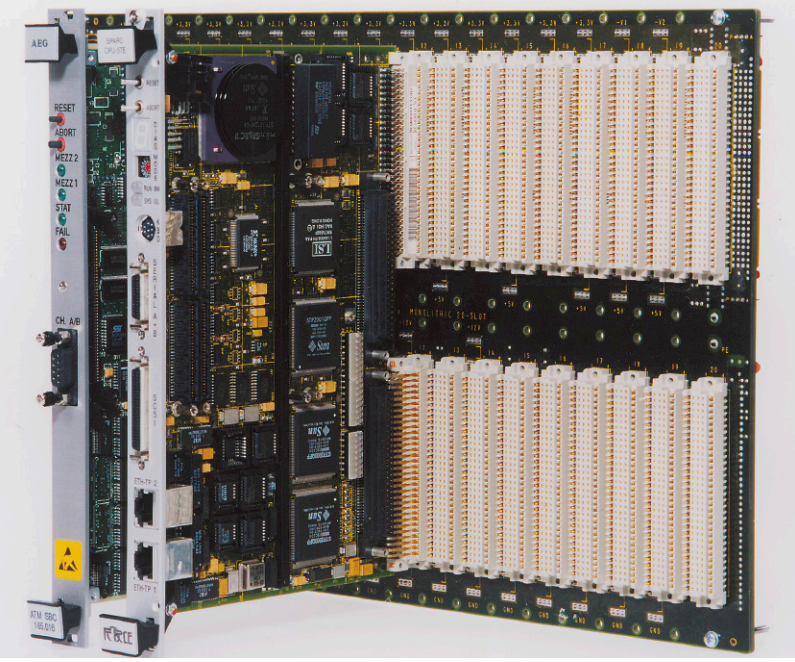




Partially gold plated terminations with precisely formed tips serve as contact area for **rear transition boards.**

system description





As a typical multiprocessor bus, VME has to distribute processor information continuously according to the right priorities.

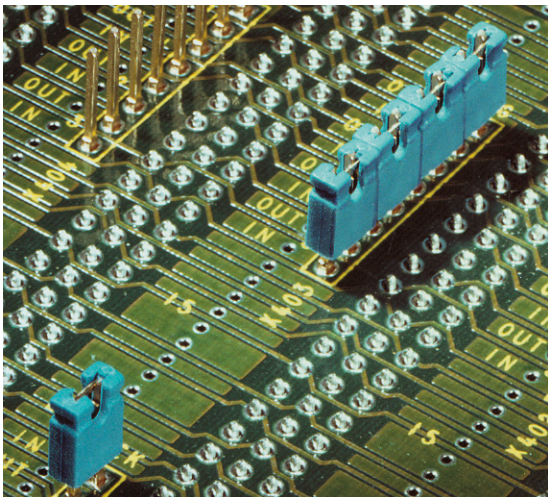
This is done through the well known daisy-chain lines.

The VME protocol requests 5 daisy-chains on position 1 of every backplane.

These lines are defined to go through every daughter card.

Therefore, in case of unloaded card slots the signal have to be bridged across the connector.

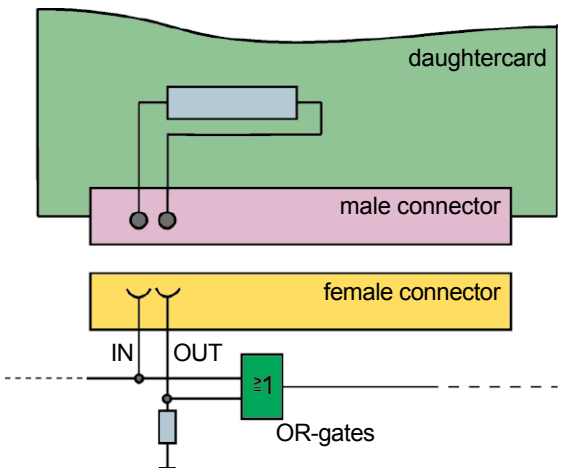
Bridging variants:



1. The empty card slots may be assembled with dummy cards, that bridge the daisy-chain lines.

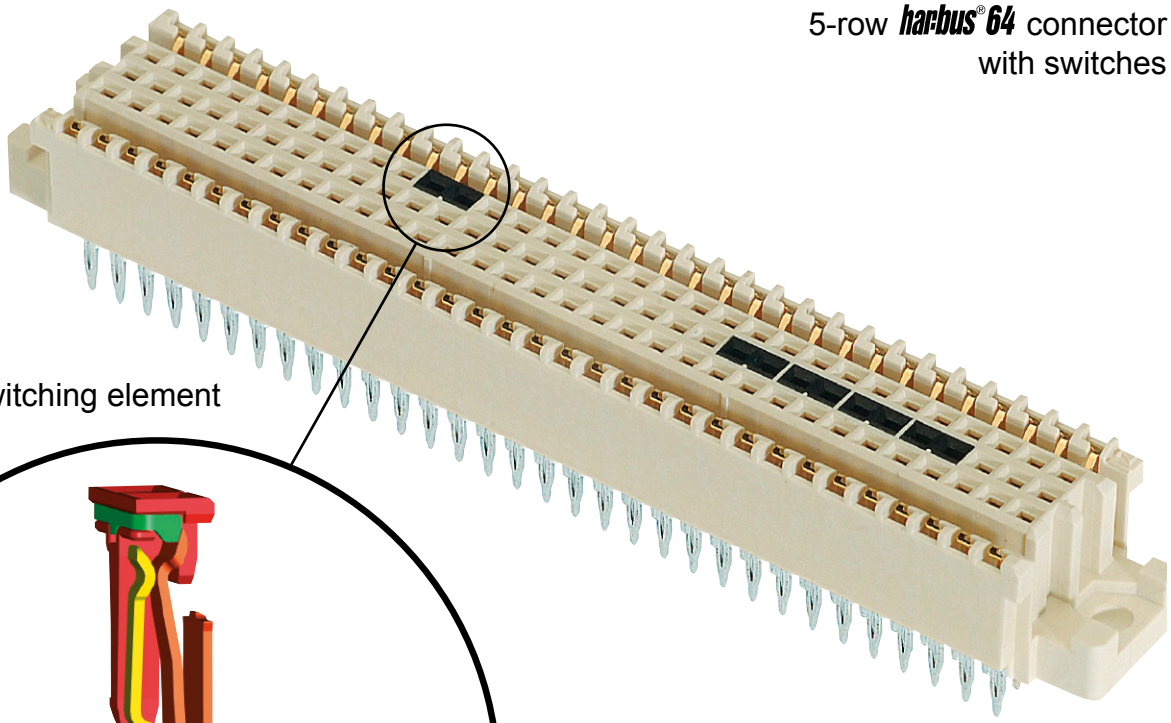
2. Bridging can be achieved by inserting 5 jumpers on the backplane manually.

3. Bridging by using IC's with internal integration OR the function may accept automatic daisy-chaining.

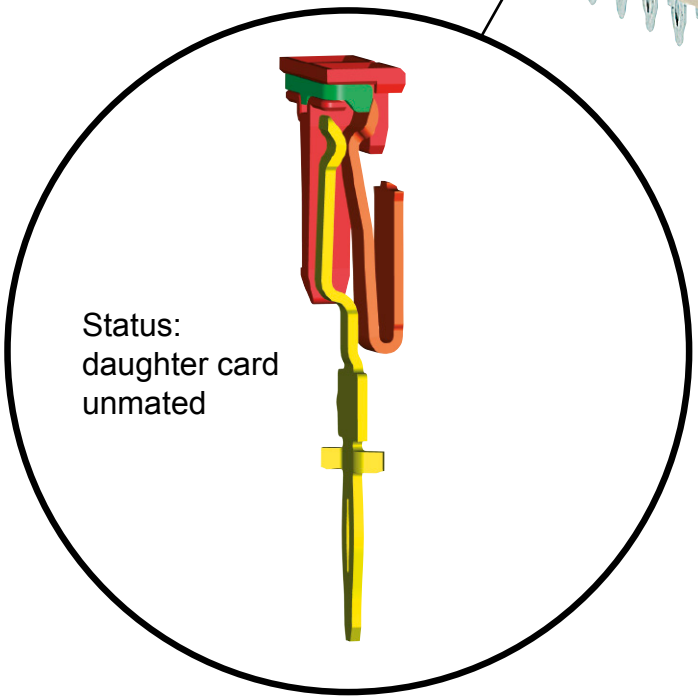


4. The 5-row har-bus® 64 connector with switches allows an automatic switching. In the case of an unmated daughter card the connector bridges the signals at positions a21-22, b4-5, b6-7, b8-9 and b10-11. The switch elements open automatically when the daughter card is mated, so that the daughter card accepts the ongoing signal daisy-chain.

5-row **har-bus® 64** connector
with switches



Integrated switching element



Advantages:

- Passive backplane; no active components assembled
- No additional space required, due to integrated switching function inside the connector
- No jumpers on the backplane
- User friendly regarding maintenance and repairing
- Automatically daisy-chaining through mating/unmating the daughter card
- High MTBF value
- No additional, manual bridging necessary
- Less assembly cost, no special tooling required

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VMEbus Technology ™

Number of contacts	160
Contact spacing (mm)	2.54
Working current	1 A at 70 °C and all contacts are loaded

see current carrying capacity chart

Clearance and creepage distances

minimal clearance and creepage distance		distance in mm		
		rows a, b, c	rows z, d	female angled
between two rows	clearance	1.2	1.2	0.6
	creepage	1.2	1.2	0.6
between two contacts (in a row)	clearance	1.2	1.0	0.8
	creepage	1.2	1.0	0.8

Working voltage

The working voltage also depends on the clearance and creepage dimensions of the pcb itself and the associated wiring — according to the safety regulations of the equipment. Explanations see chapter 00

Test voltage $U_{r.m.s.}$ 1 kV

Contact resistance

rows a, b, c ≤ 20 mΩ
rows z, d ≤ 30 mΩ

Insulation resistance ≥ 10^{10} Ω acc. to IEC 60 512-2

Temperature range	– 55 °C … + 125 °C
for press-in termination	– 40 °C … + 105 °C acc. to IEC 60 512-11
During reflow soldering	max. + 240 °C for 20 s for THR connectors

The higher temperature limit includes the local ambient and heating effects of the contacts under load

Electrical termination

Solder pins for pcb termination Ø 1.0 ± 0.1 mm according to IEC 60 326-3
Crimp terminal 0.09 - 0.50 mm²
Compliant press-in terminations

pcb thickness ≥ 1.6 mm
Recommended pcb holes for press-in technology — See recommendation page 00.25 in acc. to EN 60 352-5

Insertion and withdrawal force ≤ 160 N

Materials

Mouldings
- Liquid Cristal Polymer (LCP), for male connectors, straight female connectors, UL 94-V0
- Thermoplastic resin glass-fibre filled, UL 94-V0

Contacts: Copper alloy

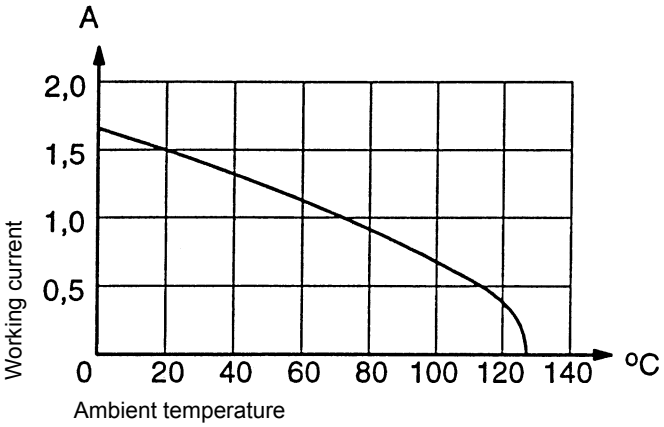
Contact surface

Contact zone: Plated acc. to performance level[1)]

Current carrying capacity chart

The current carrying capacity is limited by maximum temperature of materials for inserts and contacts including terminals. The current capacity curve is valid for continuous, non interrupted current loaded contacts of connectors when simultaneous power on all contacts is given, without exceeding the maximum temperature.

Control and test procedures according to DIN IEC 60 512



With selective loading higher currents can be transmitted. The requirements according to VITA 1.7 are fulfilled.

har-bus® 64 with switches

Deviating technical characteristics for the switching elements.

minimal clearance and creepage distance		distance in mm
		switching positions
between two rows	clearance	0.5
	creepage	0.7
between two contacts (in a row)	clearance	0.5
	creepage	0.7

Contact resistance

Switching elements ≤ 60 mΩ

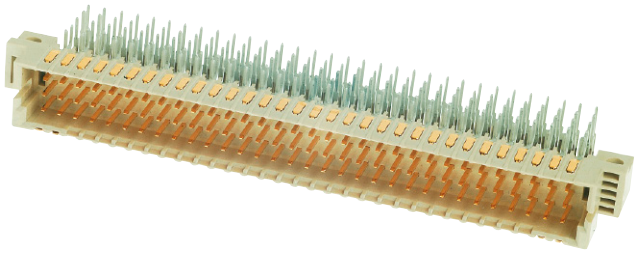
Insertion and withdrawal force

Complete connector ≤ 180 N

1) Explanation performance levels see chapter 00

Number of contacts

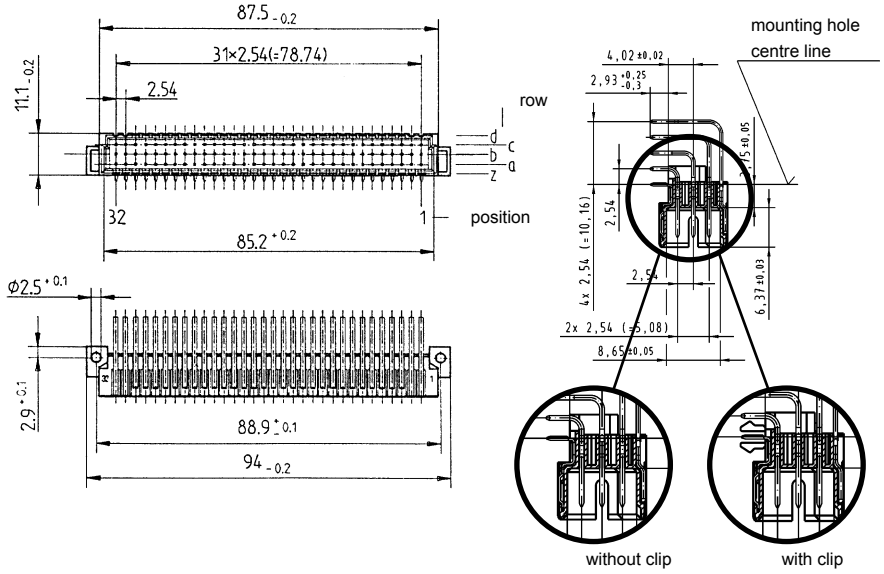
160



Male connectors, angled, THR compatible

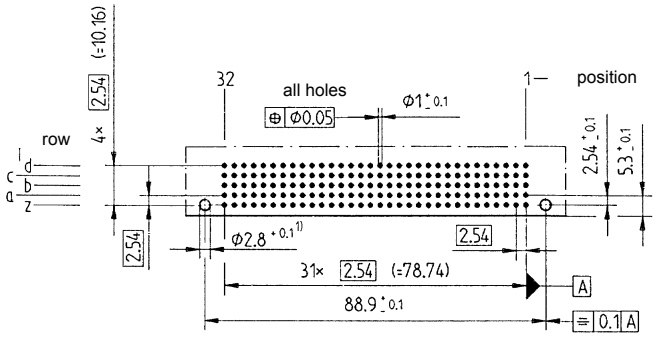
Identification	No. of contacts	Contact arrangement	Part number	Performance levels according to IEC 61 076-4-113 Explanation chapter 00
			2	1
Male connector* without retention clip	160	z, a, b, c, d	02 01 160 2101	02 01 160 1101 02 01 160 1105[2)]
Male connector* with retention clip	160	z, a, b, c, d	02 01 160 2102	02 01 160 1102 02 01 160 1106[2)]

Dimensions



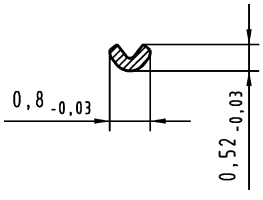
Board drillings

Mounting side

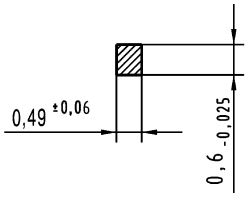


Cross section of solder terminations

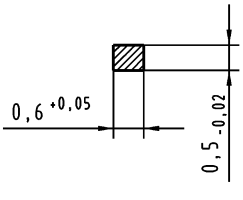
Row z:
A = 0.21 - 0.25 mm²



Rows a, b, c:
A = 0.25 - 0.33 mm²



Row d:
A = 0.29 - 0.32 mm²



A = cross area of contacts

Dimensions in mm

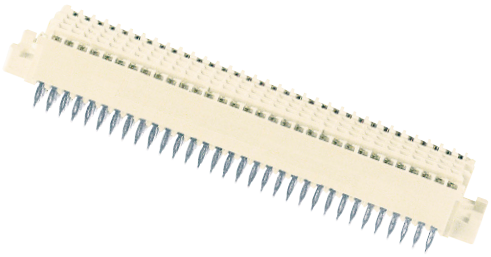
* Pre-leading contacts at positions d1, d2, d31 and d32

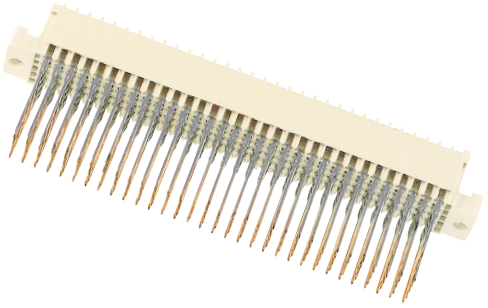
[1)] Recommendation for variants with clip: Drillings can be enlarged up to 3.1 mm ø to reduce standard mounting force (see chapter 00)

[2)] Special variant with min. 1.27 µm (50 µinch) Au and SnPb on termination

Number of contacts

160

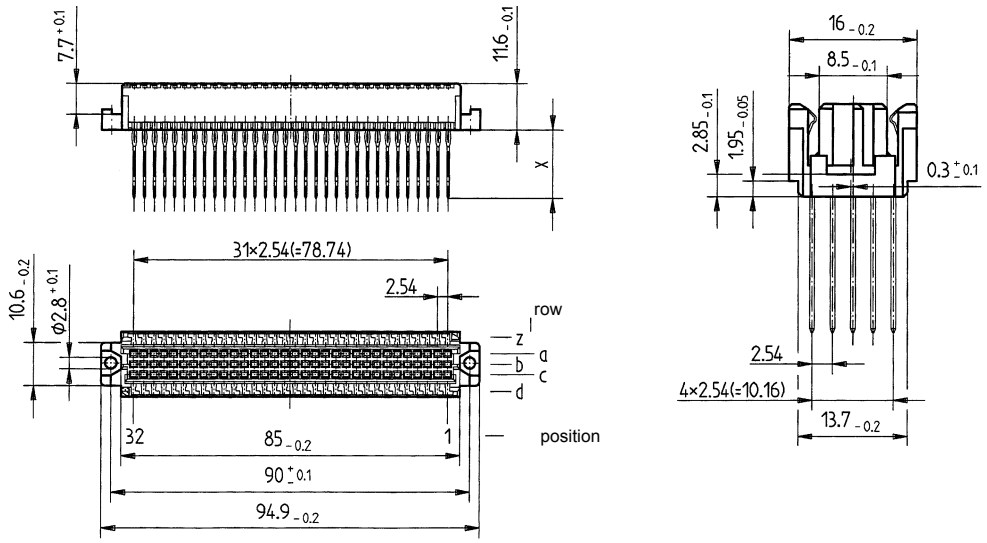




Female connectors

Identification	No. of contacts	Contact arrangement	Part number Performance levels according to IEC 61 076-4-113 Explanation chapter 00 2	1
Female connectors, straight[2]				
with press-in terminations				
with 3.7 mm	160	z, a, b, c, d		02 02 160 1601
fixing flange 4.5 / 5 mm	160	z, a, b, c, d	02 02 160 2201	02 02 160 1201
17 mm*	160	z, a, b, c, d	02 02 160 2301	02 02 160 1301
without 5 mm	160	z, a, b, c, d	02 02 160 2202	02 02 160 1202
fixing flange 17 mm*	160	z, a, b, c, d	02 02 160 2302	02 02 160 1302
with solder pins				
2.9 mm	160	z, a, b, c, d	02 02 160 2804	

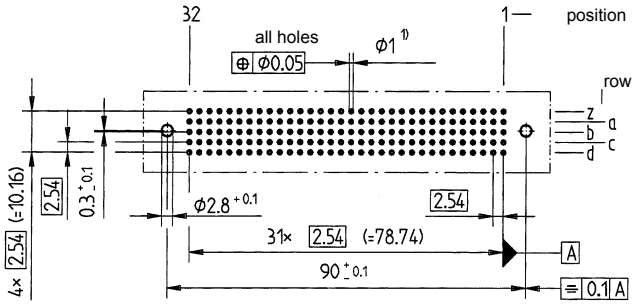
Dimensions



Part number	Dimension "X" for row z	a	b	c	d
02 02 160 1601	3.7	3.7	3.7	3.7	3.7
02 02 160 2201 / 02 02 160 1201	5.0	4.5	4.5	4.5	5.0
02 02 160 2301 / 02 02 160 1301	17.0	17.0	17.0	17.0	17.0
02 02 160 2202 / 02 02 160 1202	5.0	5.0	5.0	5.0	5.0
02 02 160 2302 / 02 02 160 1302	17.0	17.0	17.0	17.0	17.0
02 02 160 2804	2.9	2.9	2.9	2.9	2.9

Board drillings

Mounting side



Dimensions in mm

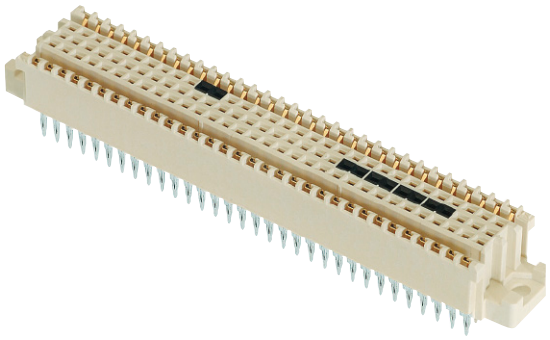
Tooling see chapter 30

[1] Press-in technology and refer to recommended configuration of pcb holes, see page 00.25

* selectively gold-plated

Number of contacts

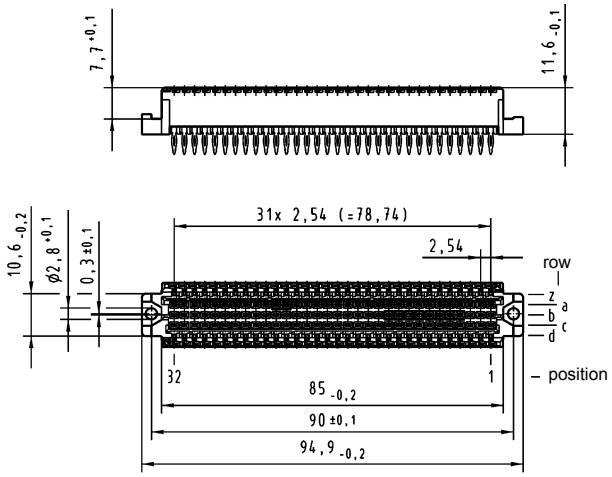
160

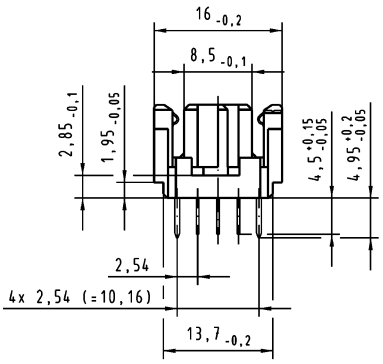


Female connectors

Identification	No. of contacts	Contact arrangement	Part number Performance level 2 according to IEC 61 076-4-113 Explanation chapter 00
Female connectors, straight with switches[2] with press-in terminations with flange 4.5 / 5 mm	160	z, a, b, c, d	02 03 160 2201

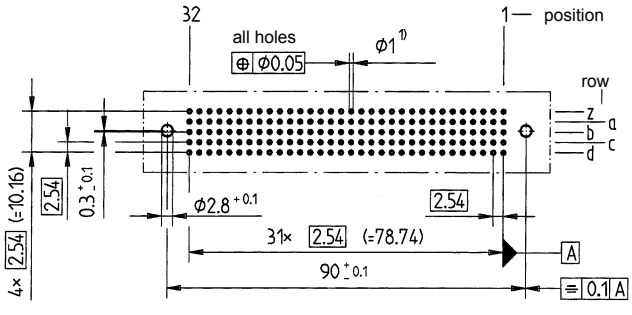
Dimensions





Board drillings

Mounting side



Dimensions in mm

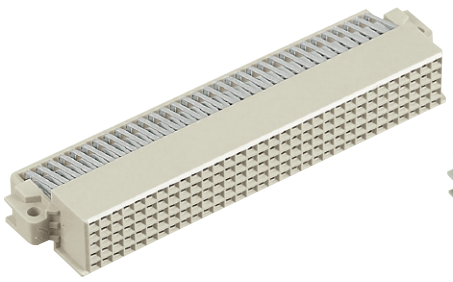
Tooling see chapter 30

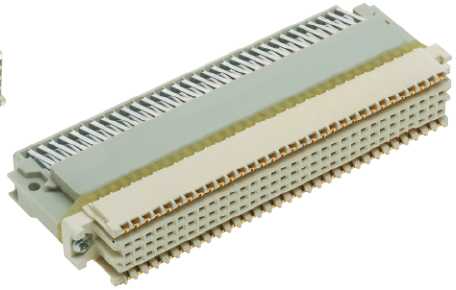
1) Press-in technology see page 00.25

2) Switching elements at positions a21-22, b4-5, b6-7, b8-9 and b10-11

Number of contacts

160

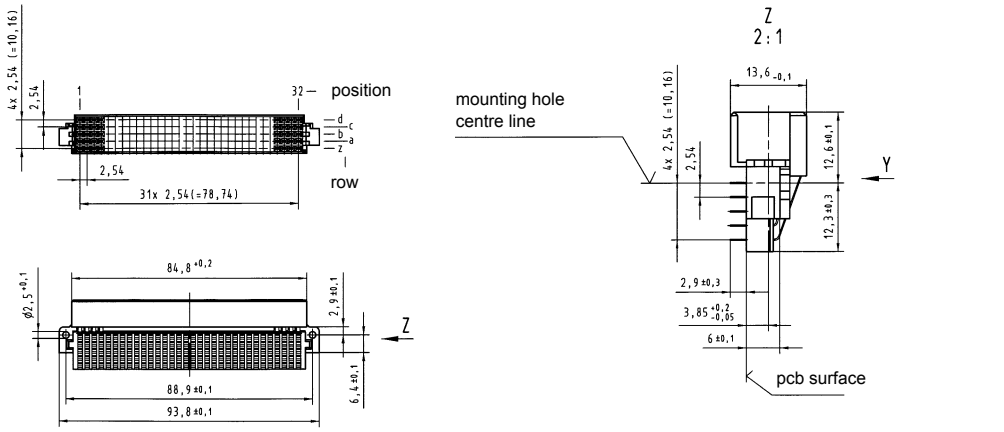




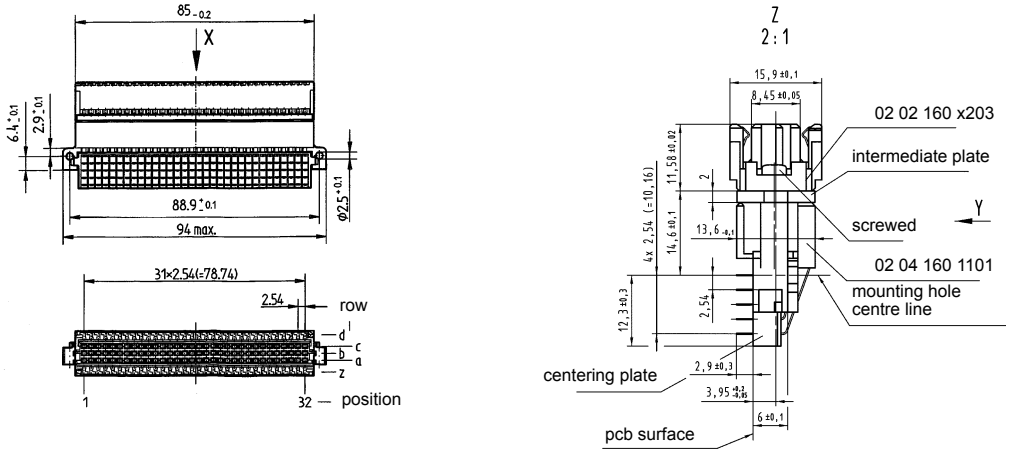
Female connectors

Identification	No. of contacts	Contact arrangement	Part number Performance level 1 according to IEC 61 076-4-113 Explanation chapter 00
Female connectors, angled with solder pins			
for rear access	160	z, a, b, c, d	02 04 160 1101
for har-bus® 64 male connector	160	z, a, b, c, d	02 07 160 1101

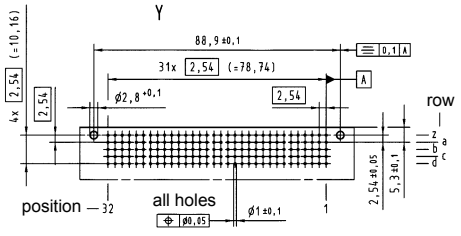
Dimensions
02 04 160 1101



Dimensions
02 07 160 1101



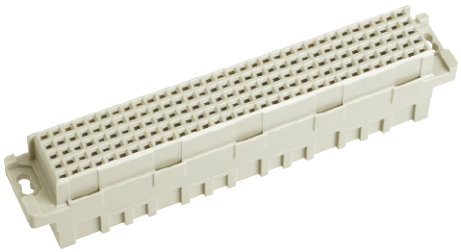
Board drillings
Mounting side



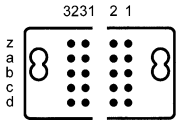
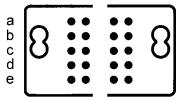
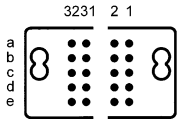
Dimensions in mm

Number of contacts

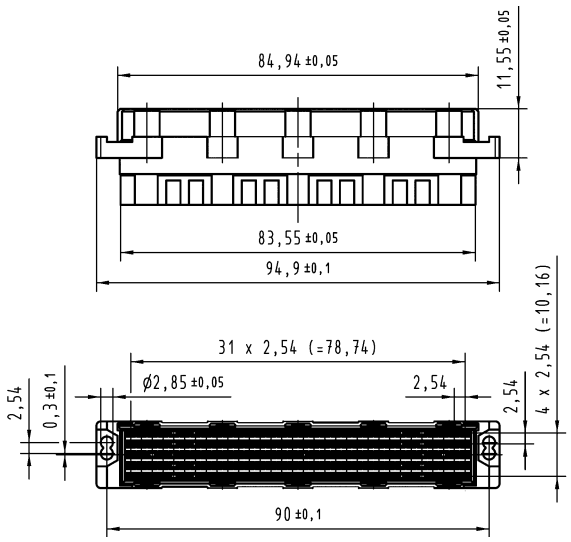
max. 160

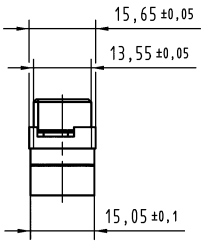


Female connectors

Identification	No. of contacts	Contact-arrangement	Suitable for	Part number
Female connector for crimp contacts order contacts separately fits into shell housing C see chapter 20	160		har-bus® 64 shroud	02 05 000 0004
	160		Male connector type R with 5 rows	02 05 000 0005
	160		Male connector type C with 5 rows	02 05 000 0003

Dimensions



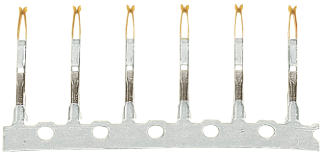


Identification	Part number	Performance levels according to IEC 61076-4-113. Explanation chapter 00 2	 1
Female crimp contacts har-bus® 64			
Bandoliered contacts (approx. 5 ,000 pieces)		02 05 000 2511	02 05 000 1511
Bandoliered contacts (approx. 500 pieces)		02 05 000 2512	02 05 000 1512
Individual contacts[1)]		02 05 000 2513	02 05 000 1513

Wire gauge mm²	AWG	Insulation ø mm
0.09 - 0.5	28 - 20	0.7 - 1.5

3.5 + 0.5 mm of insulation is stripped
For the fabrication in line with the specification please use exclusively crimp tools approved by HARTING (see DIN EN 60352-2)
Insertion, removal and crimping tools see chapter 30

Bandoliered contacts

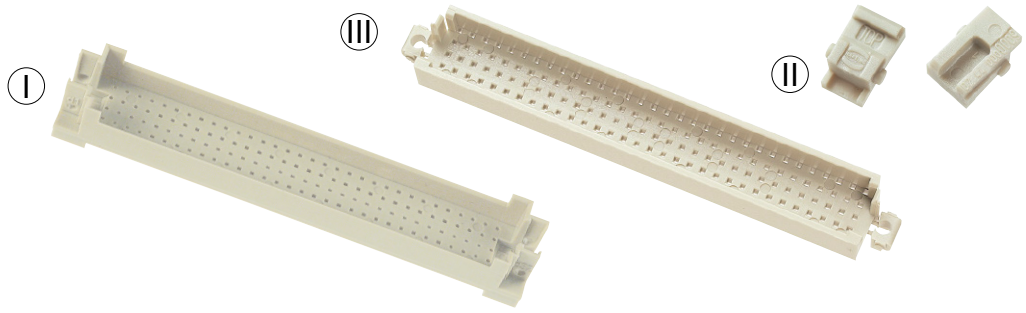


Individual contacts

[1)] Packaging unit 1,000 pieces

Number of contacts

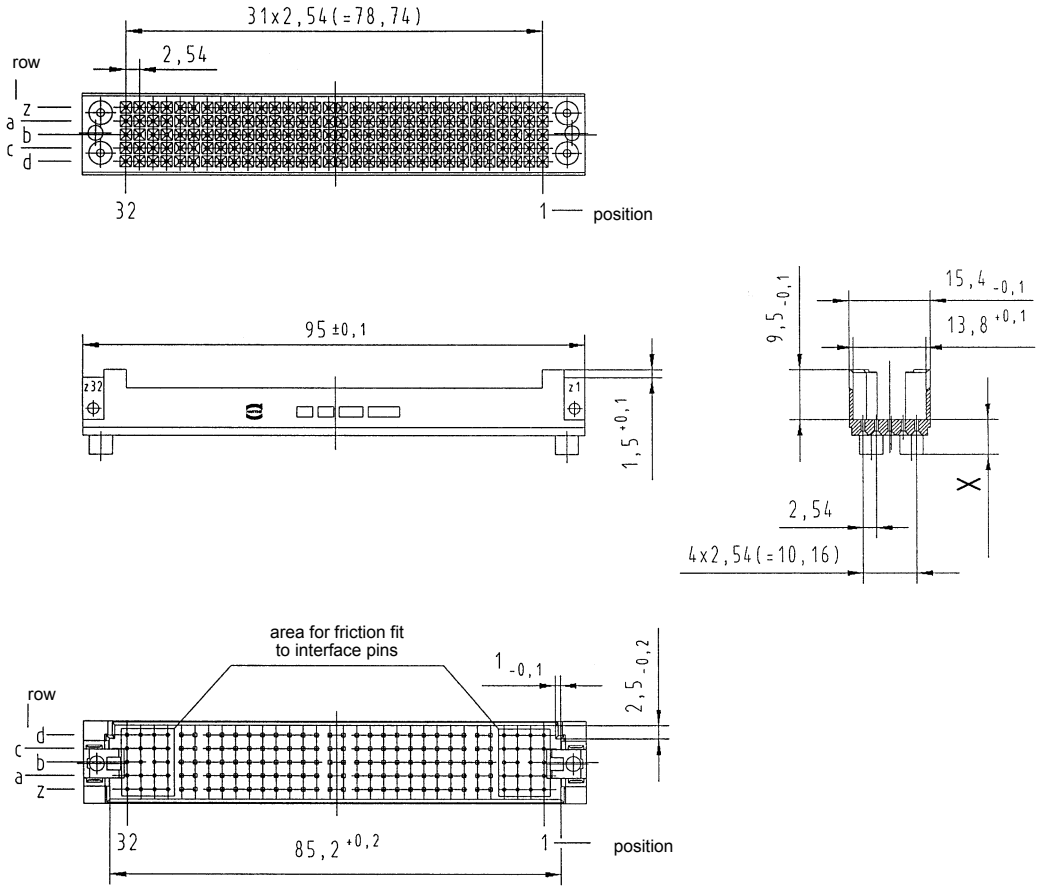
160



Pin shrouds

Identification	pcb-thickness ± 0.3	Dimension X - 0.1	Part number
Pin shrouds[1]			
(I)	1.6	7.8	02 44 000 0012
	2.2	7.2	02 44 000 0011
	2.8	6.6	02 44 000 0007
	3.4	6.0	02 44 000 0001
	4.0	5.4	02 44 000 0002
	4.6	4.8	02 44 000 0003
	5.2	4.2	02 44 000 0004
	5.8	3.6	02 44 000 0005
	6.4	3.0	02 44 000 0006
(II) Fixing brackets for shell housing C[2]			02 44 000 0009
(III) Shroud insert for 3 row female connectors			02 44 000 0008

Dimensions



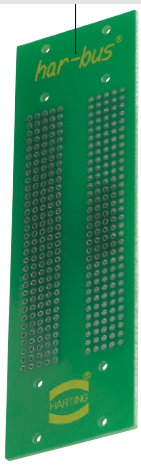
Dimensions in mm

[1] Insert block (02 09 000 0012) for assembly see chapter 30
[2] order 2 pieces per connector

Application 1*

Female connector
02 02 160 2301

Backplane



Pin shroud
02 44 000 0007

Fixing brackets
02 44 000 0009

Shell housing C
09 05 048 0501

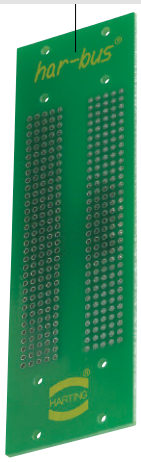
Female connector
with crimp contacts
02 05 000 0004

Locking lever
left 09 02 000 9902
right 09 02 000 9903

Application 2*

Female connector
02 02 160 2301

Backplane



Pin shroud
02 44 000 0007

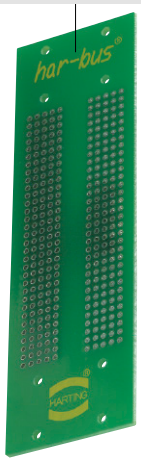
Locking lever
09 03 000 9913

Female connector
for crimp contacts
02 05 000 0004

Application 3

Female connector
02 02 160 2301

Backplane



Pin shroud
02 44 000 0007

Shroud insert
02 44 000 0008

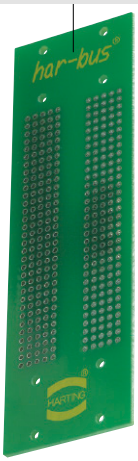
Female connector
09 73 296 6801

* Only for applications without rear P0-connector

Application 4

Female connector
02 02 160 2301

Backplane



Pin shroud
02 44 000 0007

Screw
M 2.5 x 30

Female connector
for crimp contacts
02 05 000 0004