

harbus® 64 / harbus® 64 inverse

Page

VMEbus systems **06.02**

harbus® 64

System description **06.03**

Technical characteristics **06.10**

Male connectors **06.11**

Female connectors **06.12**

Pin shrouds **06.15**

Application examples **06.16**

harbus® 64 inverse

System description **06.17**

Technical characteristics **06.20**

Male connectors **06.21**

Female connectors **06.22**

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.

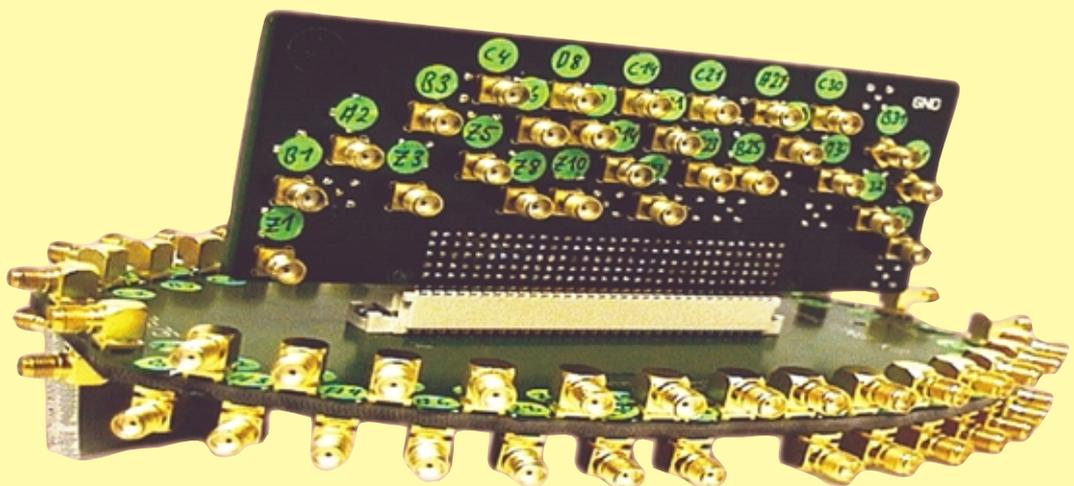
Additional advantages appear under real-time conditions, where unforeseen events have to be managed. This is realised with the program interrupt concept and variable control that closely monitors the bus system.



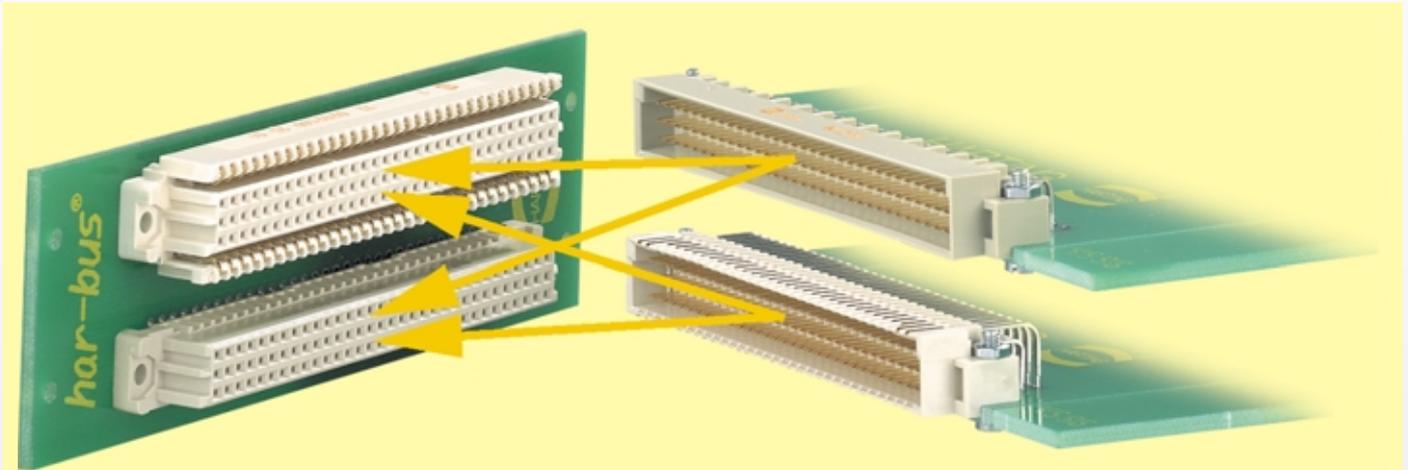
With the increase in processing speeds and data transmission rates, 3 row DIN 41612 connectors have reached their limit, so the VME standard needs to be enhanced further.

When VME architecture was increased from 8-bit to 64-bit and data transmission rates up to 160 Mbyte/s (VME 64x), HARTING introduced **harbus[®] 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.

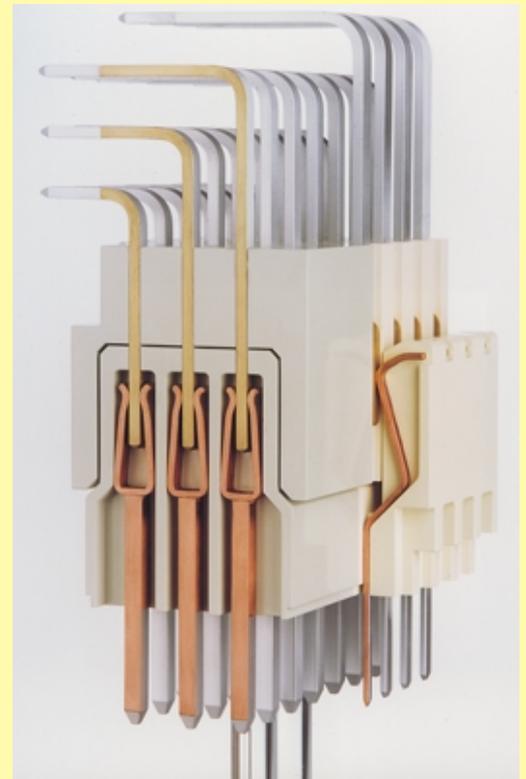


Backward compatibility

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

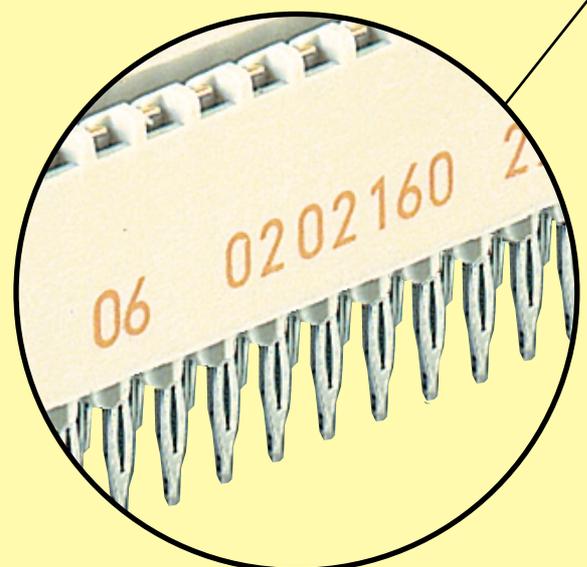
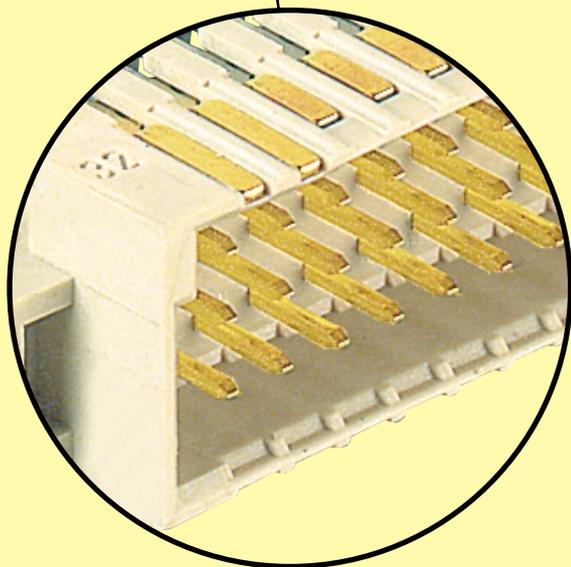
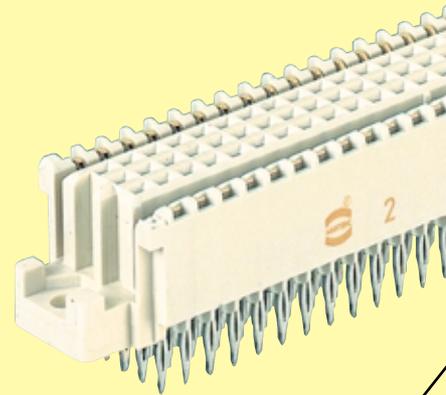
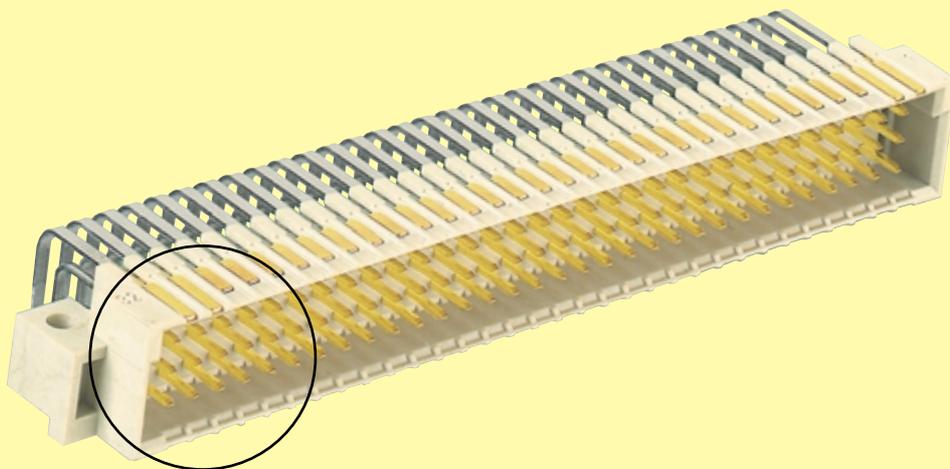
Two additional rows of contacts in the **har-bus® 64** connector offer new system features:

- 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
- 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 **harbus® 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 **data transfer rates up to 320 MByte/s**.

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

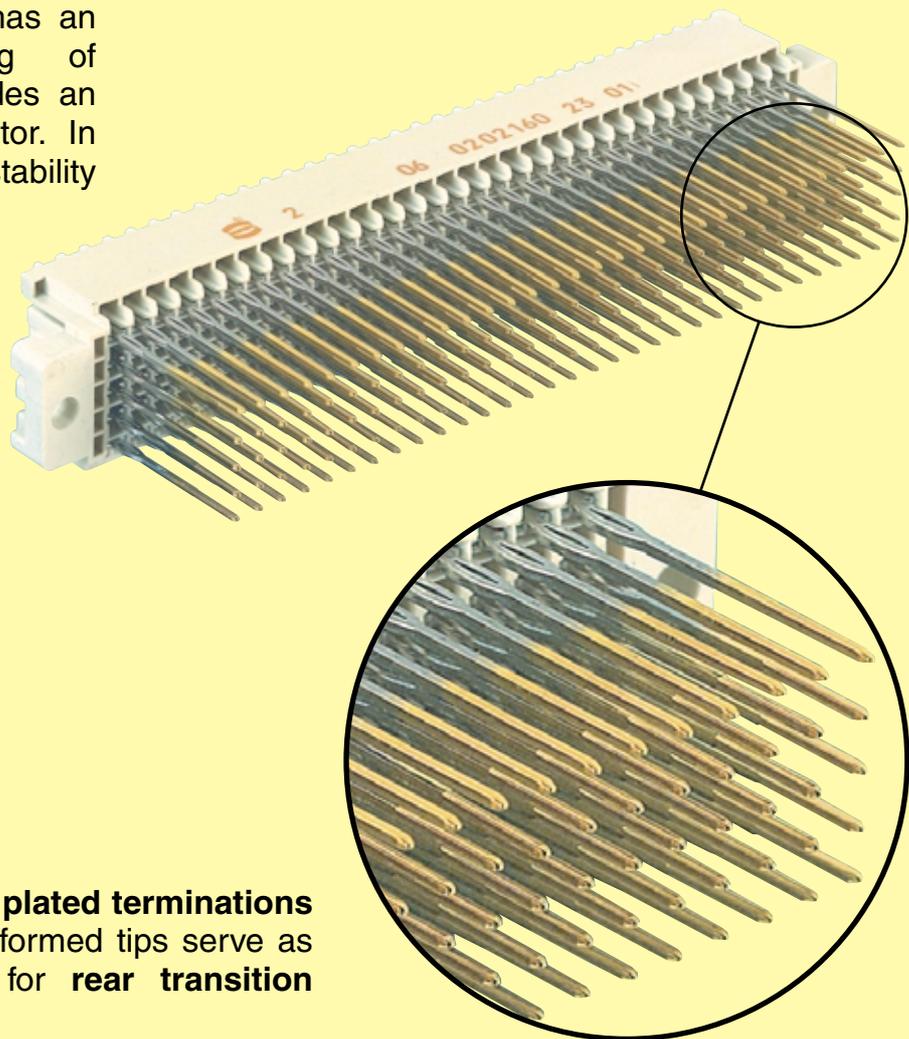
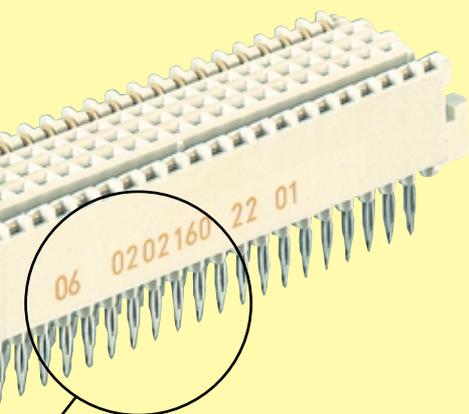


Four preleading contacts (1.5 mm) serve to pre-load the transmit and receive logic so that the bus will not experience glitches during **live insertion** of new cards into the backplane.

Backplane connector terminations are designed in solderless **press-in technology**.

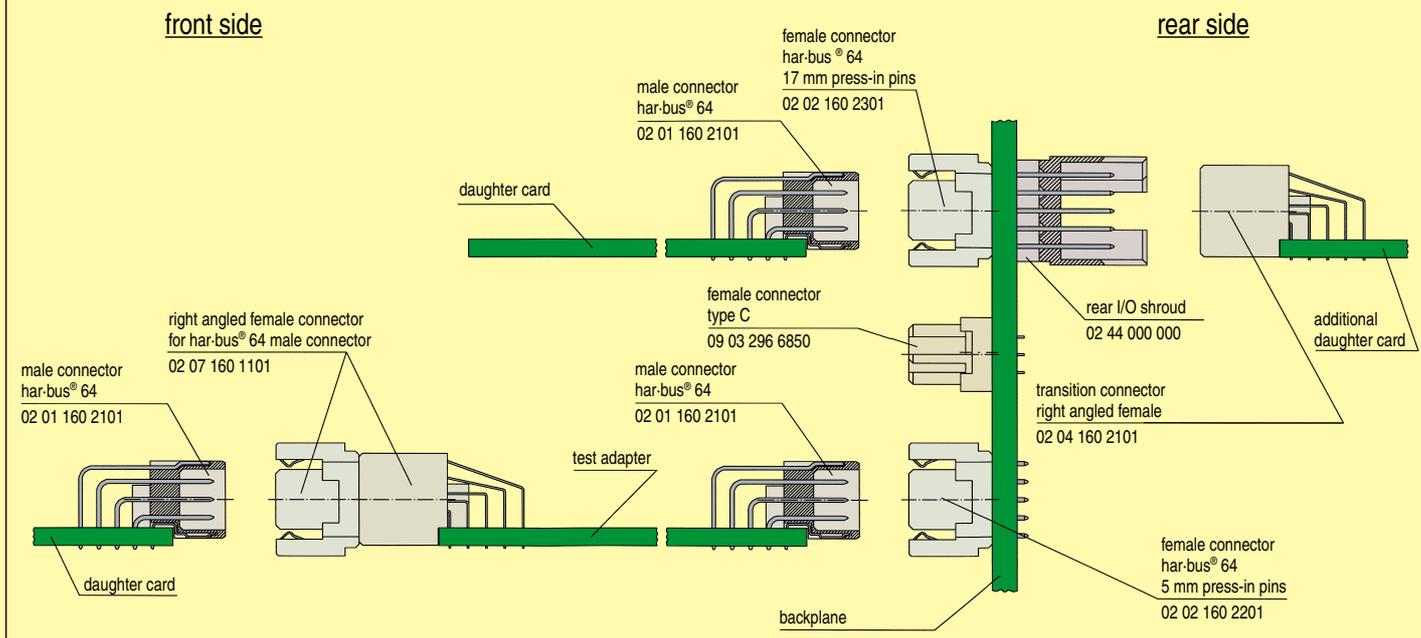
The connector can be installed without any special tooling using economical **flat dies** for high speed insertion.

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 05).



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

har-bus® 64 system description



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 ¹⁾		distance in mm	
		rows a, b, c	rows z, d
between two rows	clearance	1.2	1.2
	creepage	1.2	1.2
between two contacts (in a row)	clearance	1.2	1.0
	creepage	1.2	1.0

¹⁾ valid for mated and unmated connectors

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
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Contact resistance

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

Insulation resistance	≥ 10 ¹⁰ Ω acc. to IEC 60512-2
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Temperature range	-55 °C ..+ 125 °C
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Electrical termination

Male connector	Solder pins for pcb termination Ø 1.0 ± 0.1 mm according to IEC 60326-3
Female connector	Solder pins for pcb termination Ø 1.0 ± 0.1 mm according to IEC 60326-3 Compliant press-in terminations
Diameter of pcb plated through holes	0.94 - 1.09 mm
pcb thickness	≥ 1.6 mm
Recommended pcb holes for press-in technology	Drilled hole: 1.15 ^{-0.03} mm Cu : 25 - 50 μm Sn : 5 - 15 μm

Insertion and withdrawal force	≤ 160 N
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Materials

Mouldings	<ul style="list-style-type: none"> Liquid Cristal Polymer (LCP), for male connectors, straight female connectors, UL 94-V0 Thermoplastic resin glass-fibre filled, UL 94-V0
Contacts	Copper alloy

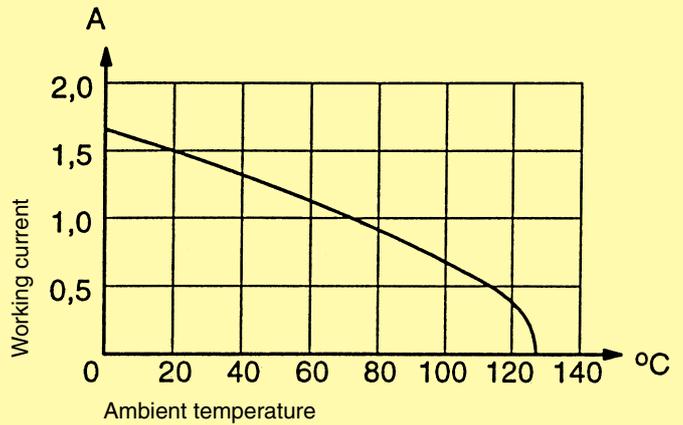
Contact surface	Contact zone: selectively plated ²⁾ Termination zone: tinned selectively plated ²⁾ similar to the performance level of the contact zone
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²⁾ Explanation performance levels see chapter 00

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 60512



* for angled female connector see page 06.20

Number of contacts

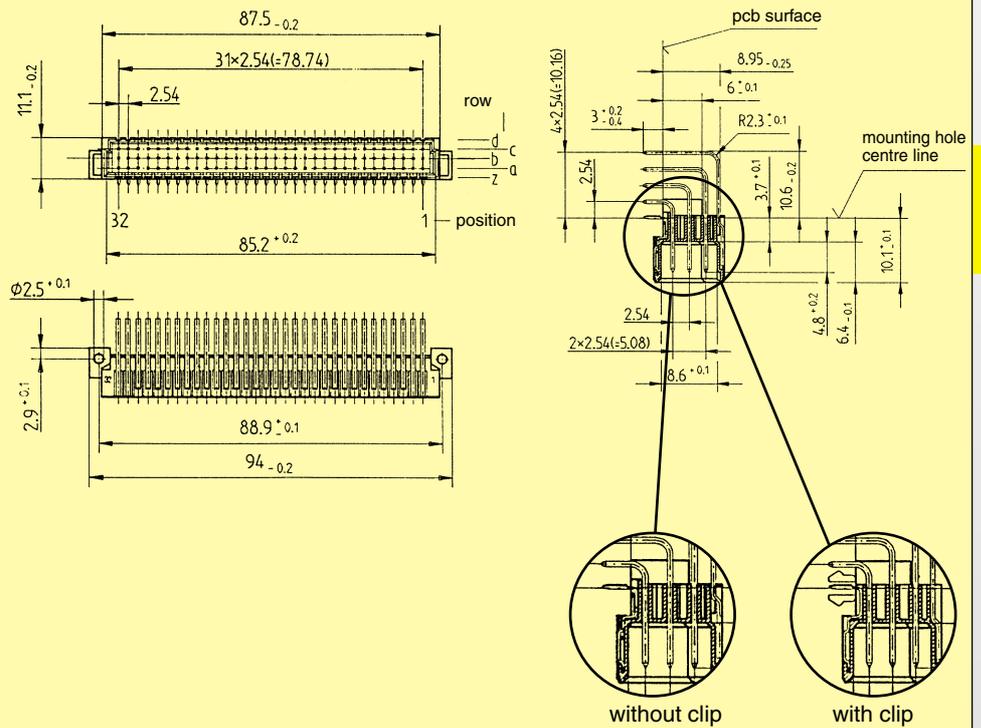
160



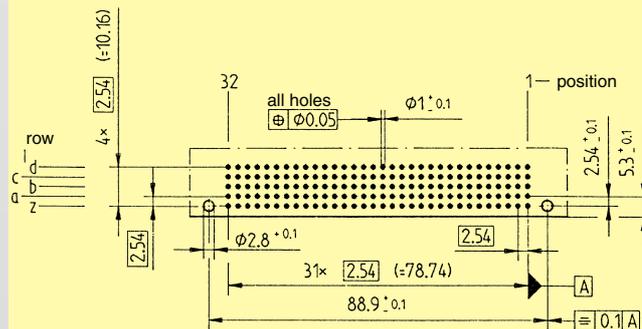
Male connectors

Identification	Number of contacts	Contact arrangement	Part No. Performance levels according to DIN 41 612	
			2	1
Male connectors, angled with solder pins	160	z, a, b, c, d	02 01 160 2101	02 01 160 1101
			Explanation chapter 00	
without retention clip	160	z, a, b, c, d	02 01 160 2101	02 01 160 1101
SMC version* with retention clip	160	z, a, b, c, d	02 01 160 2102	02 01 160 1102

Dimensions



Board drillings

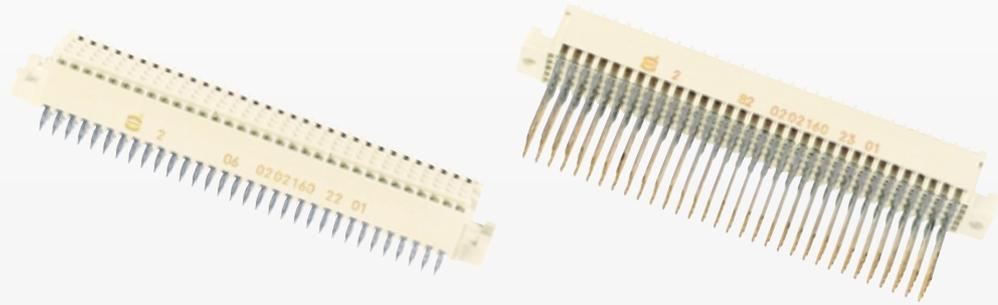


Dimensions in mm

* SMC see chapter 05

Number of contacts

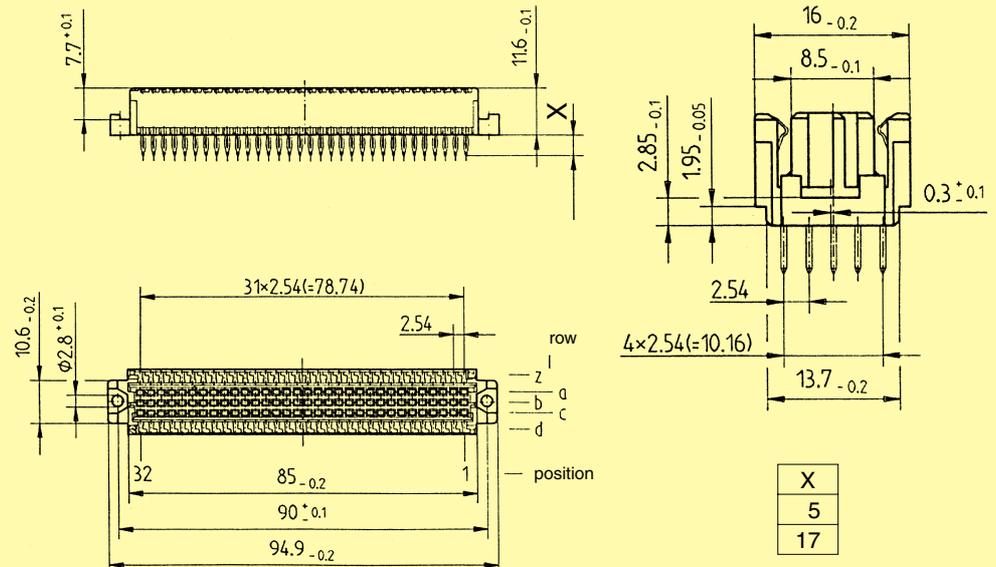
160



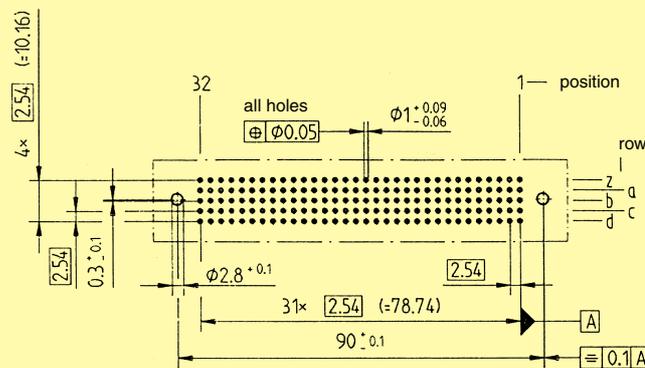
Female connectors

Identification	Number of contacts	Contact arrangement	Part No. Performance levels according to DIN 41 612	
			2	1
Female connectors, straight				
with press-in terminations				
with fixing flange 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 fixing flange 5 mm	160	z, a, b, c, d	02 02 160 2202	02 02 160 1202
17 mm*	160	z, a, b, c, d	02 02 160 2302	02 02 160 1302

Dimensions



Board drillings



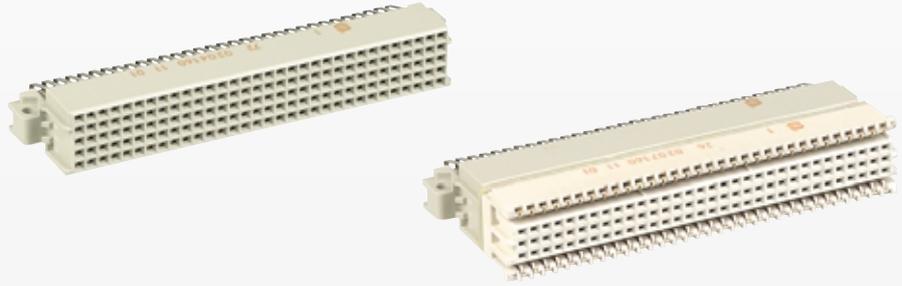
Dimensions in mm

har-bus 64

* selectively gold-plated
Press-in technology see chapter 04
Tooling see chapter 30

Number of contacts

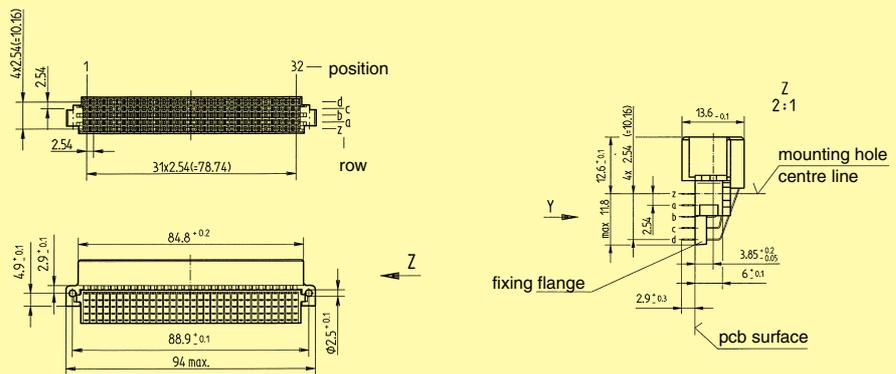
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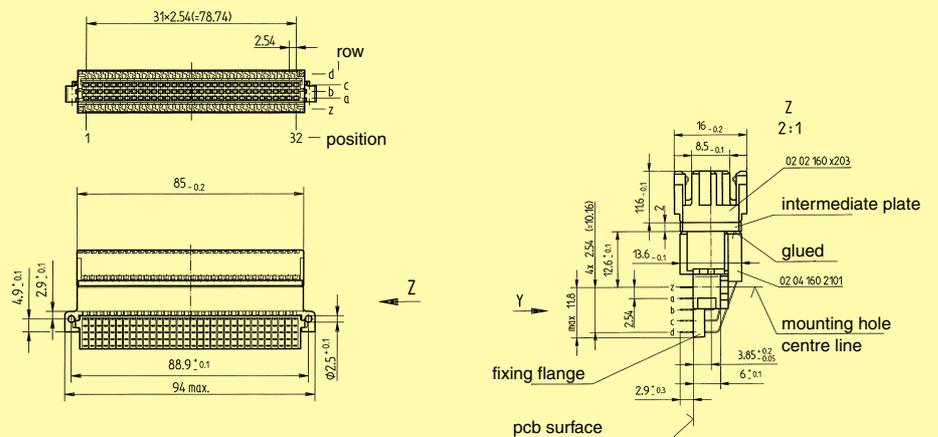
Female connectors

Identification	Number of contacts	Contact arrangement	Part No. Performance levels according to DIN 41 612 Explanation chapter 00	
			2	1
Female connectors, angled with solder pins for rear access and har-bus® 64 inverse male connector for har-bus® 64 male connector	160	z, a, b, c, d	02 04 160 2101	02 04 160 1101
	160	z, a, b, c, d		02 07 160 1101

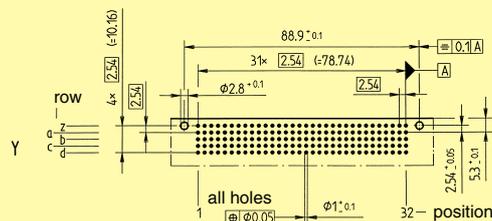
Dimensions 02 04 160 x101



Dimensions 02 07 160 1101



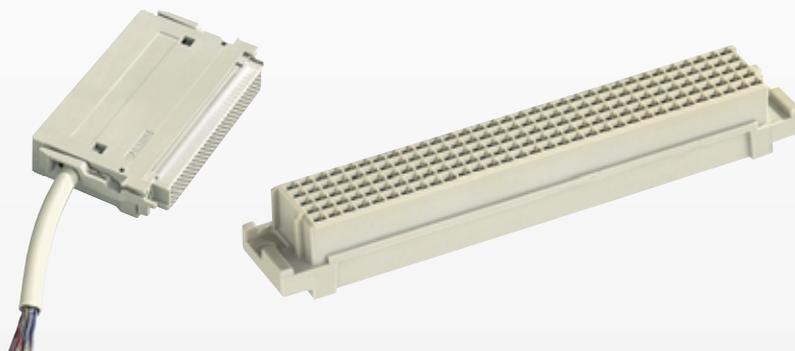
Board drillings



Dimensions in mm

Number of contacts

max. 160



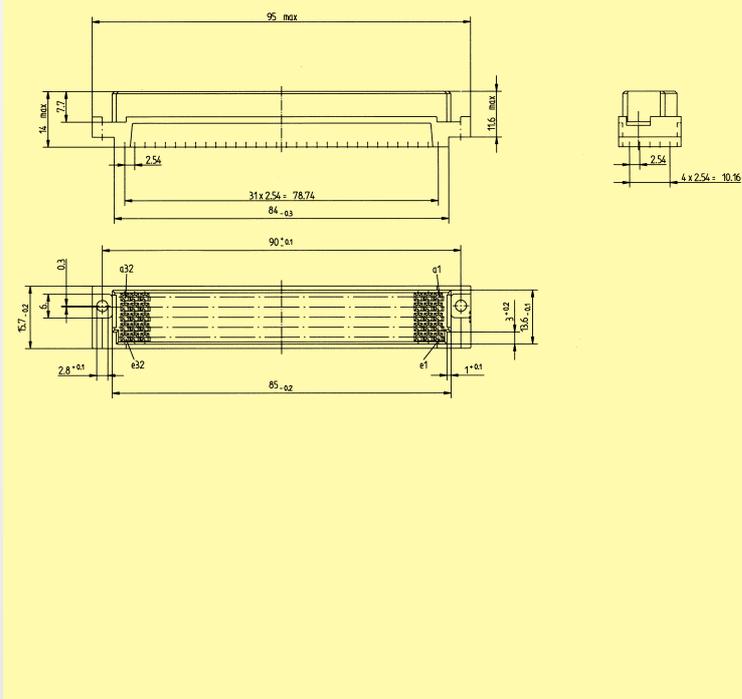
Female connectors

Identification	Number of contacts	Part No.	Drawing	Dimensions in mm
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Female connector for crimp contacts
order contacts separately fits into shell housing C see chapter 20

160

02 05 000 0001



Identification Wire gauge

Female crimp contacts
Bandoliered contacts (approx. 500 pieces)

1
2

Performance level 2
02 05 000 2501
02 05 000 2502

Wire gauge mm ²	AWG	Insulation-ø mm
0.08 - 0.22	28 - 24	0.7 - 1.5
0.14 - 0.56	26 - 20	0.8 - 2.0

HARTING crimping tool for bandoliered contacts (500 pieces)

02 99 000 0010

Wire gauge
0.08 - 0.5 mm²



Number of contacts

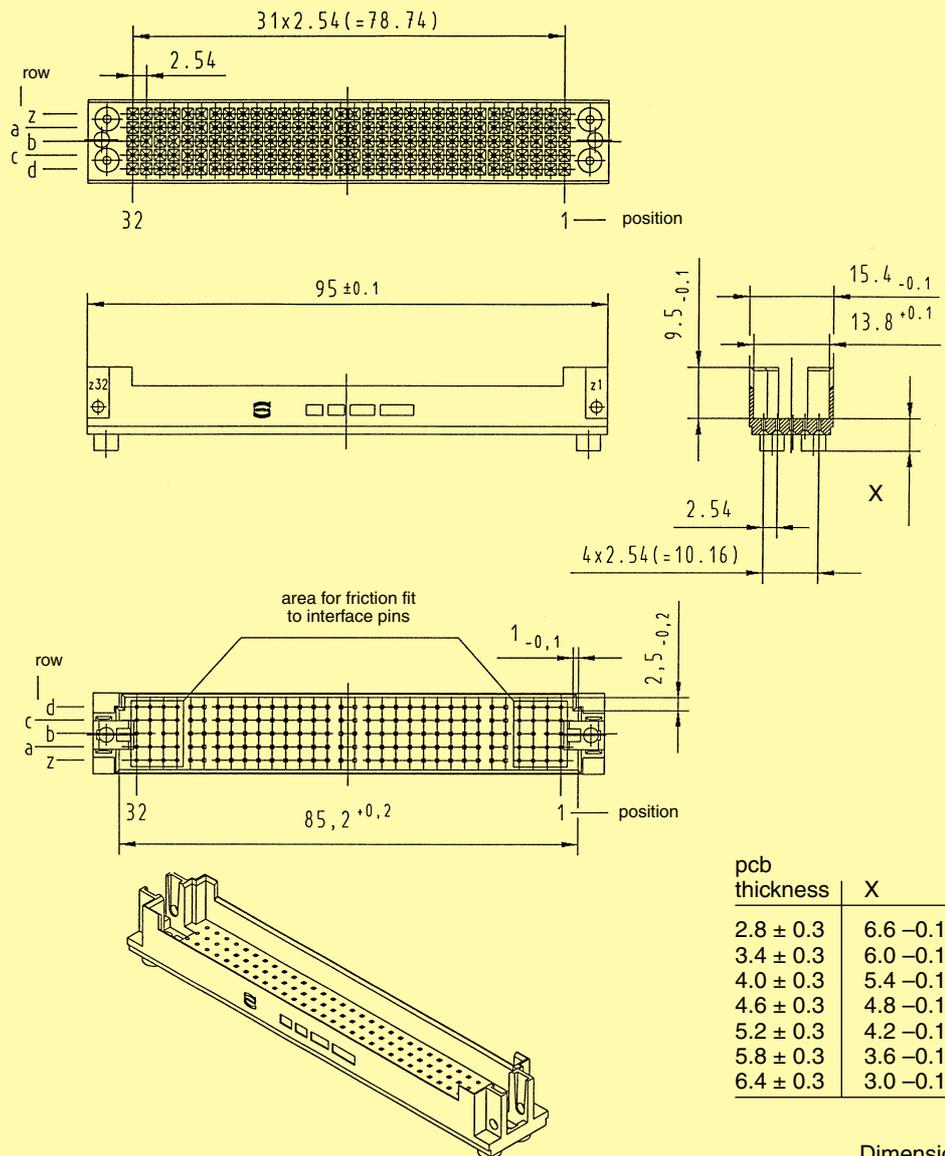
160



Pin shrouds

Identification	Number of contacts	Contact arrangement	Part No.	
Pins shrouds	160	z, a, b, c, d	pcb thickness (± 0.3 mm)	
			02 44 000 0007	2.8
			02 44 000 0001	3.4
			02 44 000 0002	4.0
			02 44 000 0003	4.6
			02 44 000 0004	5.2
			02 44 000 0005	5.8
			02 44 000 0006	6.4

Dimensions



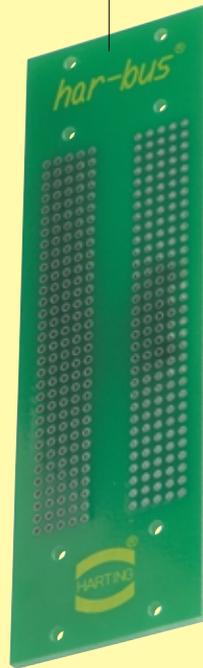
Dimensions in mm

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 0001

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

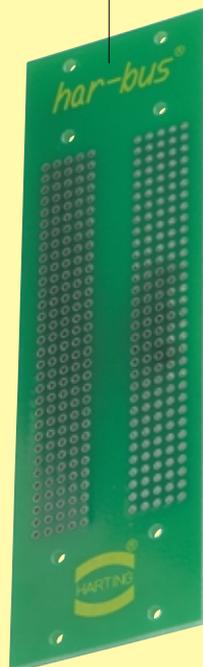
har-bus 64

Application 2

Female connector
02 02 160 2301



Backplane



Pin shroud
02 44 000 0007



Locking lever
09 03 000 9913



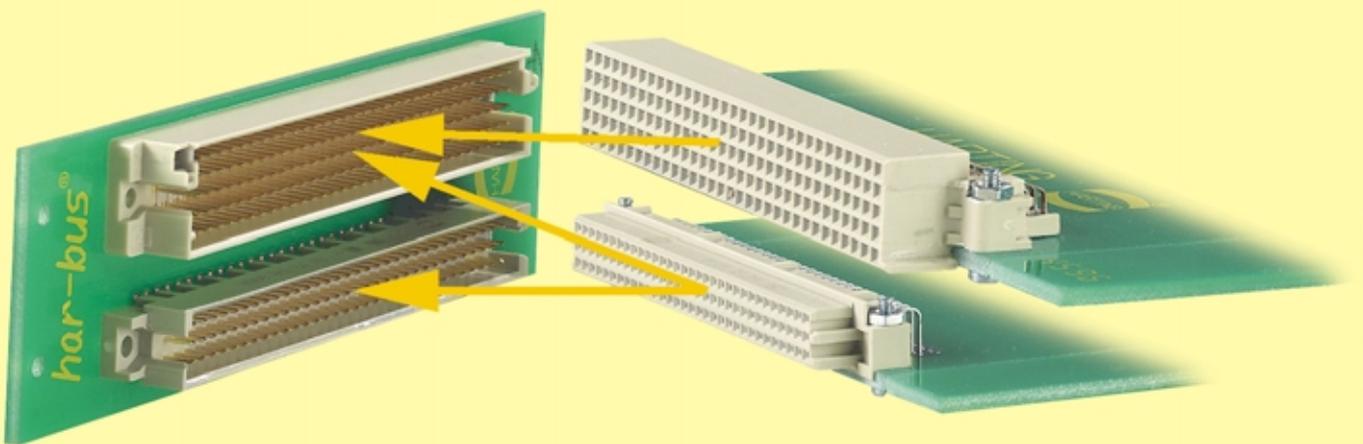
Female connector
for crimp contacts
02 05 000 0001



Backward compatible system upgrade with inverse connectors

The inverse types of DIN 41 612 connectors, e.g. 3 row type R connectors, have a strong position in telecoms. However, the trend is for increasing data transfer rates and the demand for additional signal pins.

The 5 row inverse connector system allows a gradual enhancement of existing systems. The 5 row male connector is mateable with both daughter cards with 3 row female connectors and with innovative high-speed boards with 5 row female connectors.



harbus® 64 inverse is a 5 row 160 pin connector that supplies additional rows d and z to type R connectors according to DIN 41 612.

Due to the special design of the moulding the male connectors are backwards compatible to 3 row type R female connectors. An internal coding system prevents the mismatching of female connectors.

The male connector is fully compatible with all 3 row type R female connectors and the 5 row angled **harbus® 64** female connector.

The additional contact rows d and z of **harbus® 64** inverse offer following advantages to the user:

- **Additional contacts** for I/O or new functions yet to be defined
- **Improved signal/ground ratio** for reliable data transfer at rates up to 320 MByte/s
- **Backward compatibility** i.e. daughter cards with 3 row connectors can be upgraded without function loss
- **Secure mating** due to internal coding
- **Gradual system enhancement on demand**

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

minimal clearance and creepage distance ¹⁾		distance in mm	
		male connector	female connector
between two rows	clearance	1.4	0.6
	creepage	1.4	0.6
between two contacts (in a row)	clearance	1.2	0.8
	creepage	1.2	0.8

¹⁾ valid for mated and unmated connectors

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	$\leq 20 \text{ m}\Omega$
Insulation resistance	$\geq 10^{10} \Omega$ acc. to IEC 60512-2

Temperature range	-55 °C ..+ 125 °C
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Electrical termination

Male connector	Compliant press-in termination
Diameter of pcb plated through holes	0.94 - 1.09 mm
pcb thickness	$\geq 1.6 \text{ mm}$
Recommended pcb holes for press-in technology	Drilled hole : $1.15^{-0.03} \text{ mm}$ Cu : 25 - 50 μm Sn : 5 - 15 μm
Female connector	Solder pins for pcb connection $\varnothing 1.0 \pm 0.1 \text{ mm}$ according to IEC 60 326-3

Insertion and withdrawal force	$\leq 160 \text{ N}$
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Materials

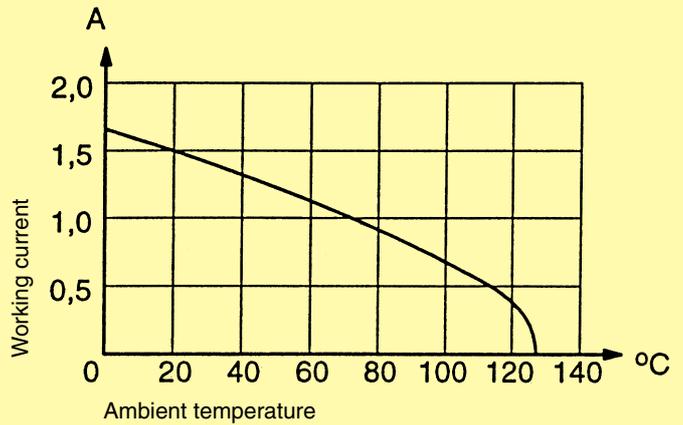
Mouldings	Thermoplastic resin, glass-fibre filled, UL 94-V0
Contacts	Copper alloy

Contact surface	Contact zone: selectively plated ²⁾ Termination zone: tinned
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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



harbus 64 inverse

²⁾ Explanation of performance levels see chapter 00

Number of contacts

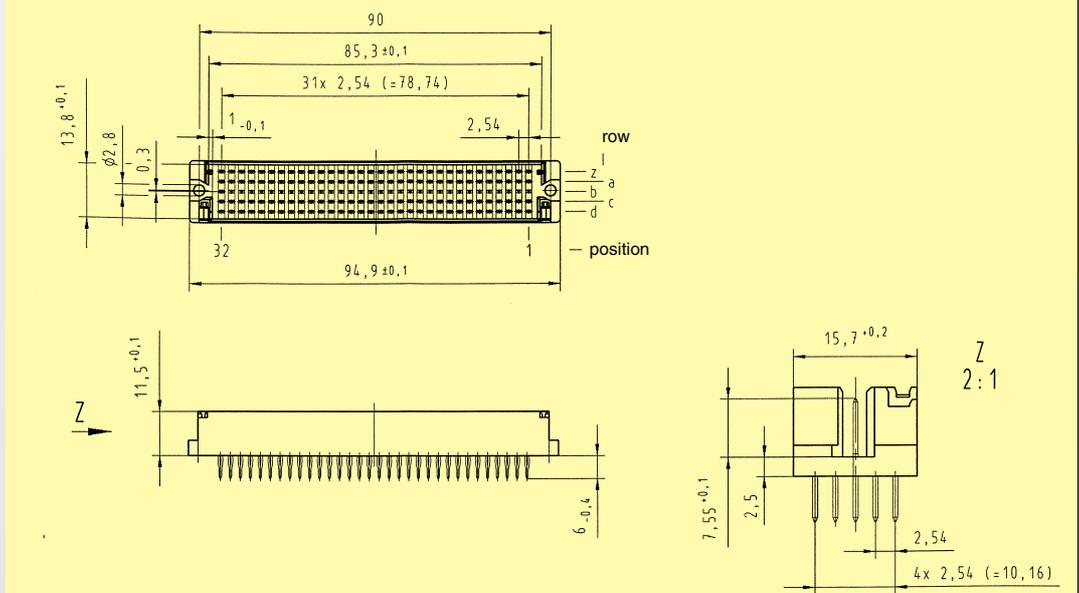
160



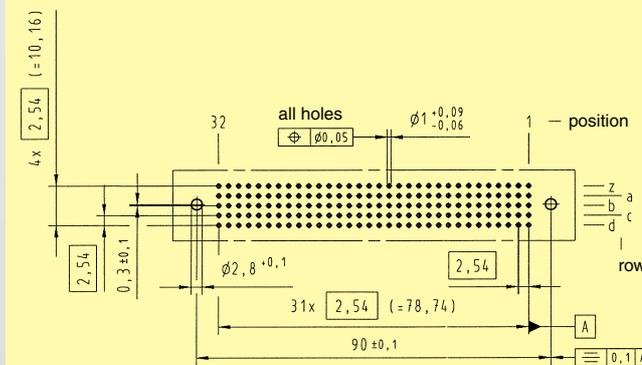
Male connectors

Identification	Number of contacts	Contact arrangement	Part No.	Performance levels according to DIN 41 612
			2	Explanation chapter 00 1
Male connectors, straight with press-in terminations	160	z, a, b, c, d	02 08 160 2201	02 08 160 1201

Dimensions



Board drillings



Dimensions in mm

har-bus 64
inverse

Number of contacts

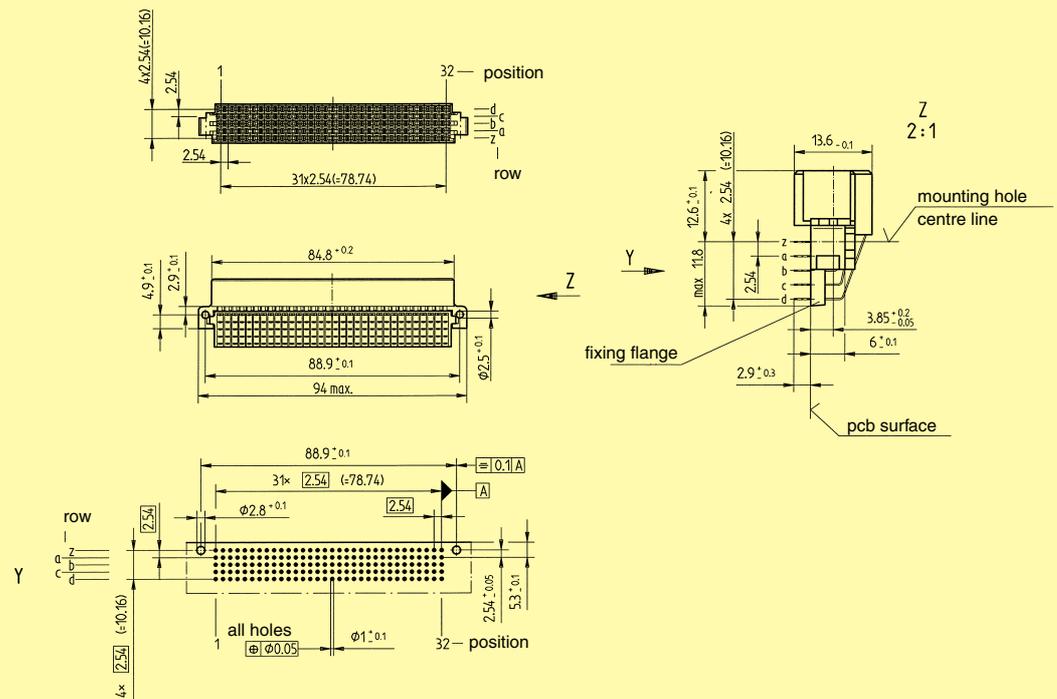
160



Female connectors

Identification	Number of contacts	Contact arrangement	Part No.	Performance levels according to DIN 41 612
			2	Explanation chapter 00 1
Female connectors, angled with solder pins for har-bus® 64 inverse male connectors and for rear access	160	z, a, b, c, d	02 04 160 2101	02 04 160 1101

Dimensions



Board drillings

har-bus 64
Inverse