

harbus® 64

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VMEbus systems **02.02**

harbus® 64

System description **02.03**

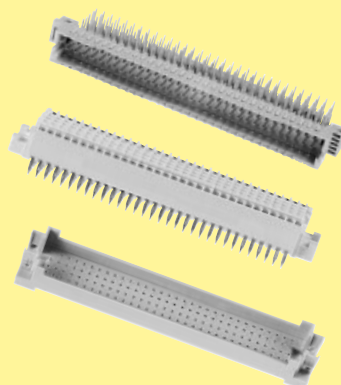
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The past 20 years the VMEbus has reached a dominant position for industrial busses with a number of suppliers.

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.

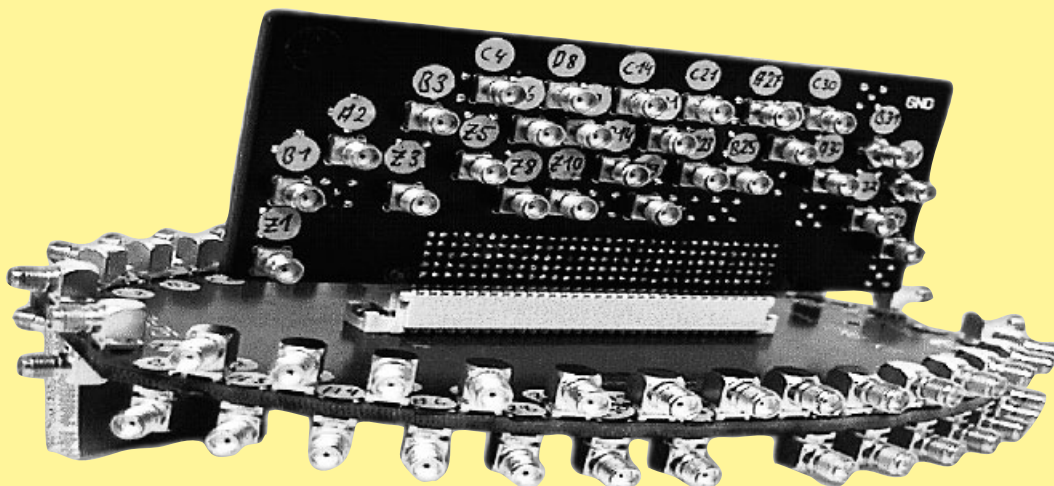
Additional advantages appear under real-time conditions, where unforeseen events have to be managed. This is realised with the program interrupt concept and variable control that closely monitors the bus system.



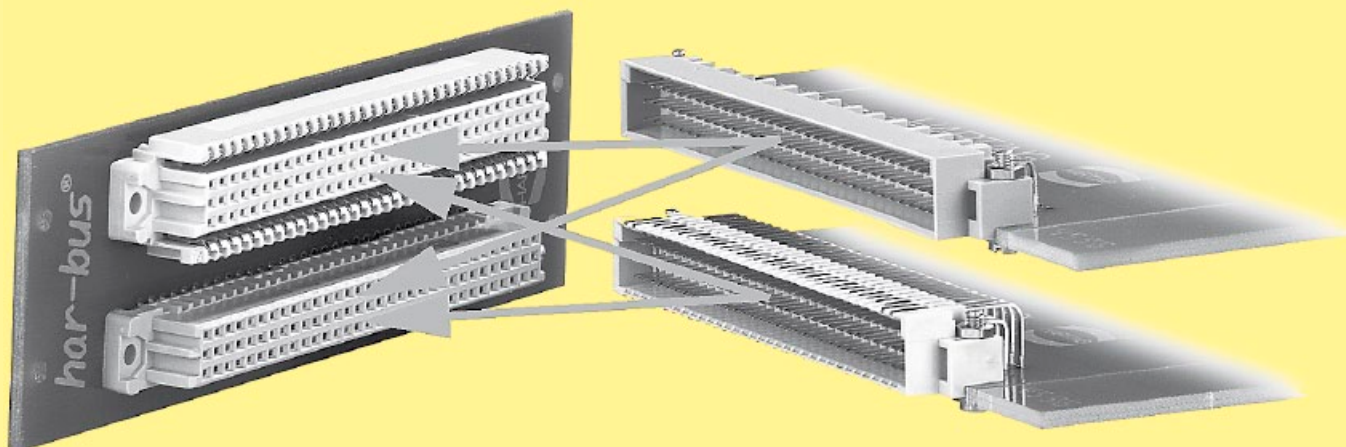
With the increase in processing speeds and data transmission rates, 3 row DIN 41612 connectors have reached their limit, so the VME standard needs to be enhanced further.

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

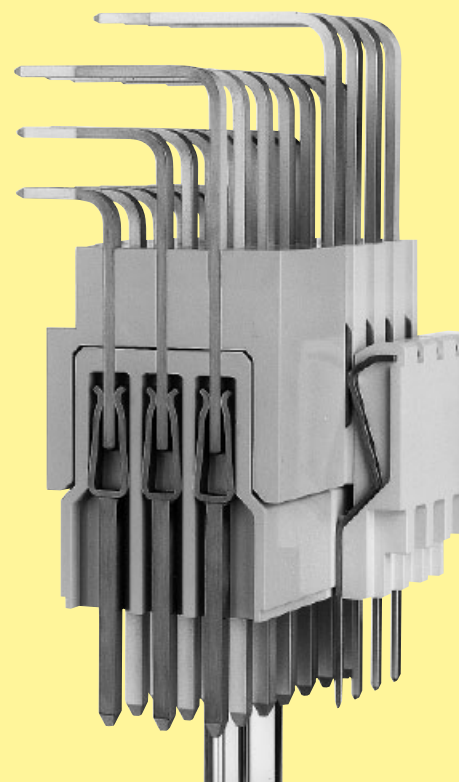


Backward compatibility

The design of **harbus® 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, **harbus® 64** provides the opportunity to adapt the system economically without a complete redesign to a new bus architecture.



harbus® 64 – five rows – 160 poles

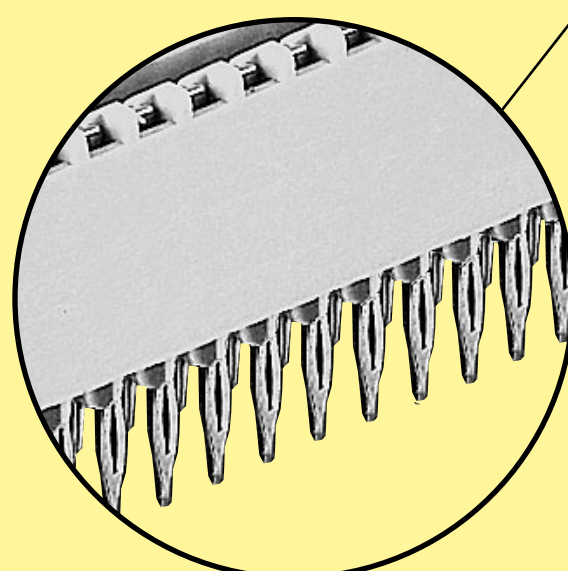
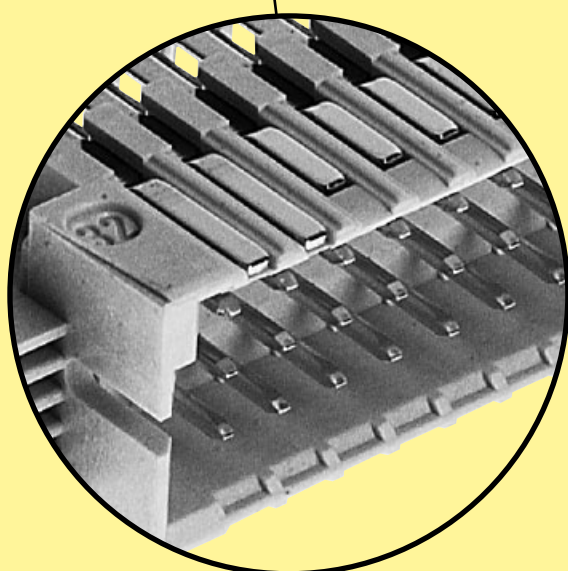
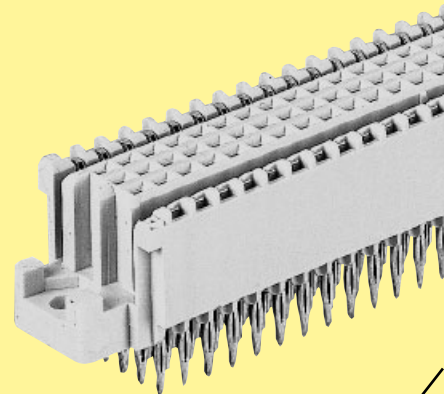
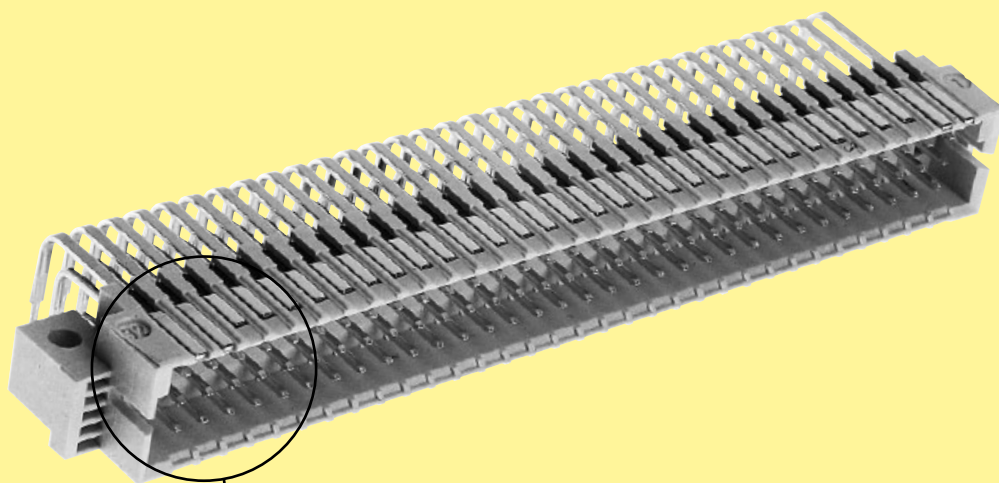
Two additional rows of contacts in the **harbus® 64** connector offer new system features:

- 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.

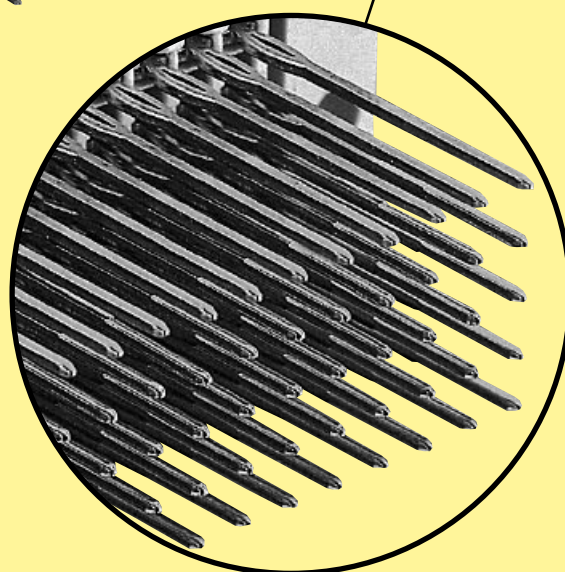
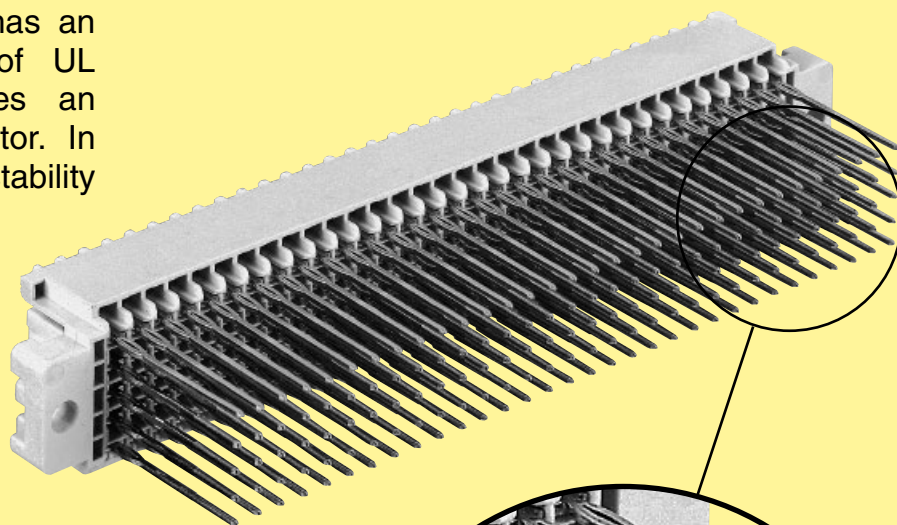
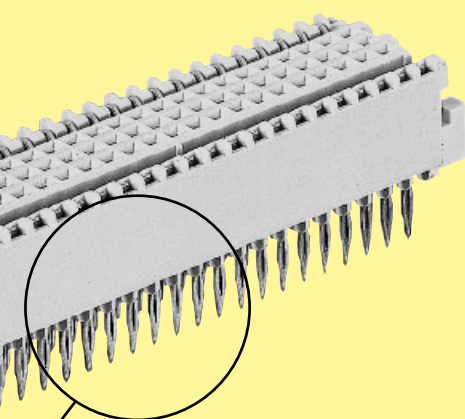


Four preleading contacts (1.5 mm) serve to pre-load the transmit and receive logic so that the bus will not experience glitches during **live insertion** of new cards into the backplane.

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 00).

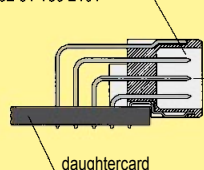


Partially gold plated terminations with precisely formed tips serve as contact area for **rear transition boards**.

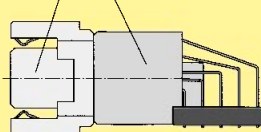
system description

front side

male connector
har-bus® 64
02 01 160 2101



right angled female connector
for har-bus® 64 male connector
02 07 160 1101



test adapter

male connector
har-bus® 64
02 01 160 2101

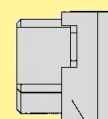
female connector
har-bus® 64
17 mm press-in pins
02 02 160 2301

male connector
har-bus® 64
02 01 160 2101

female connector
type C
09 03 296 6850

male connector
har-bus® 64
02 01 160 2101

rear side



female connector
for crimp contacts
02 05 000 000x



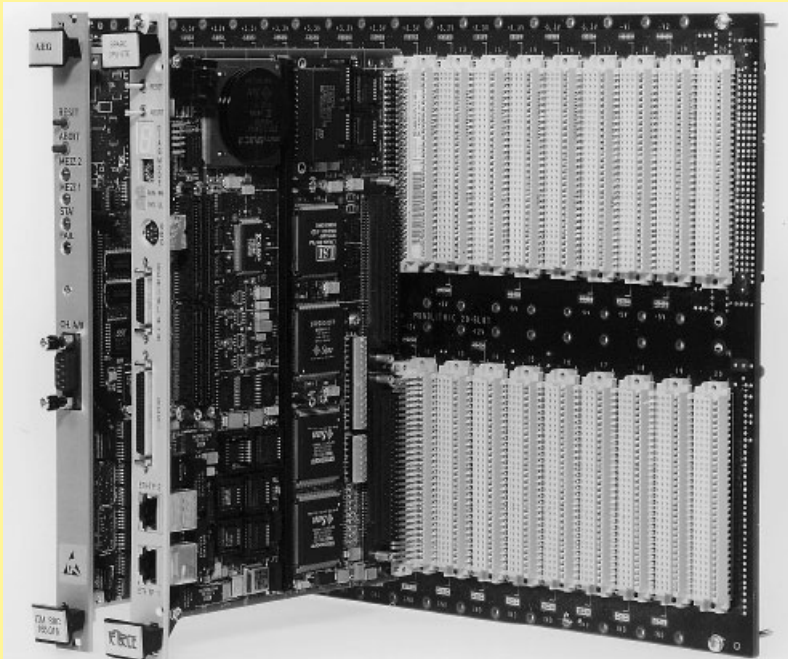
rear I/O shroud
02 44 000 0001

transition connector
right angled female
02 04 160 1101

female connector
har-bus® 64 with switches
02 03 160 2201

female connector
har-bus® 64
02 02 160 2201

backplane



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.

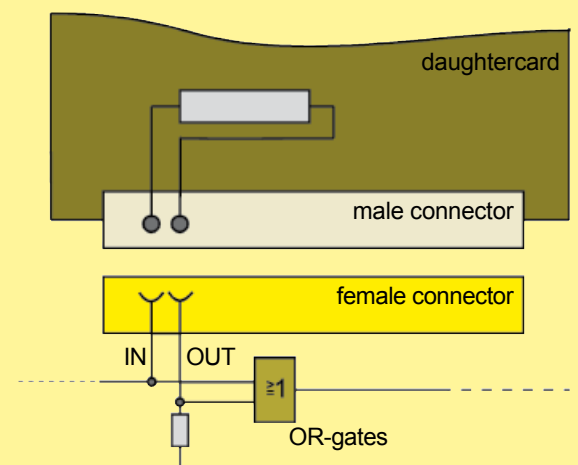
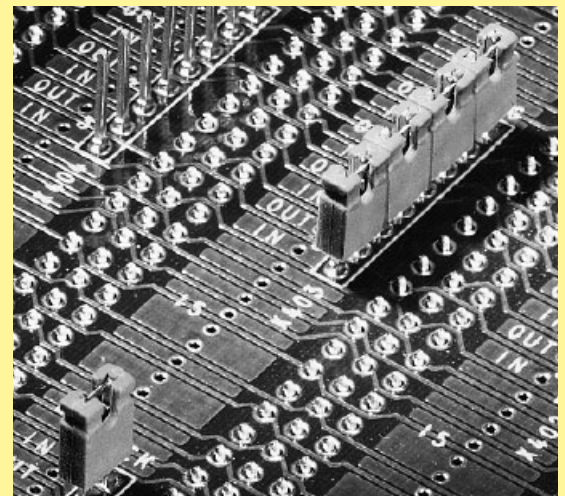
The VME protocol requests 5 daisy-chains on position 1 of every backplane.

These lines are defined to go through every daughter card.

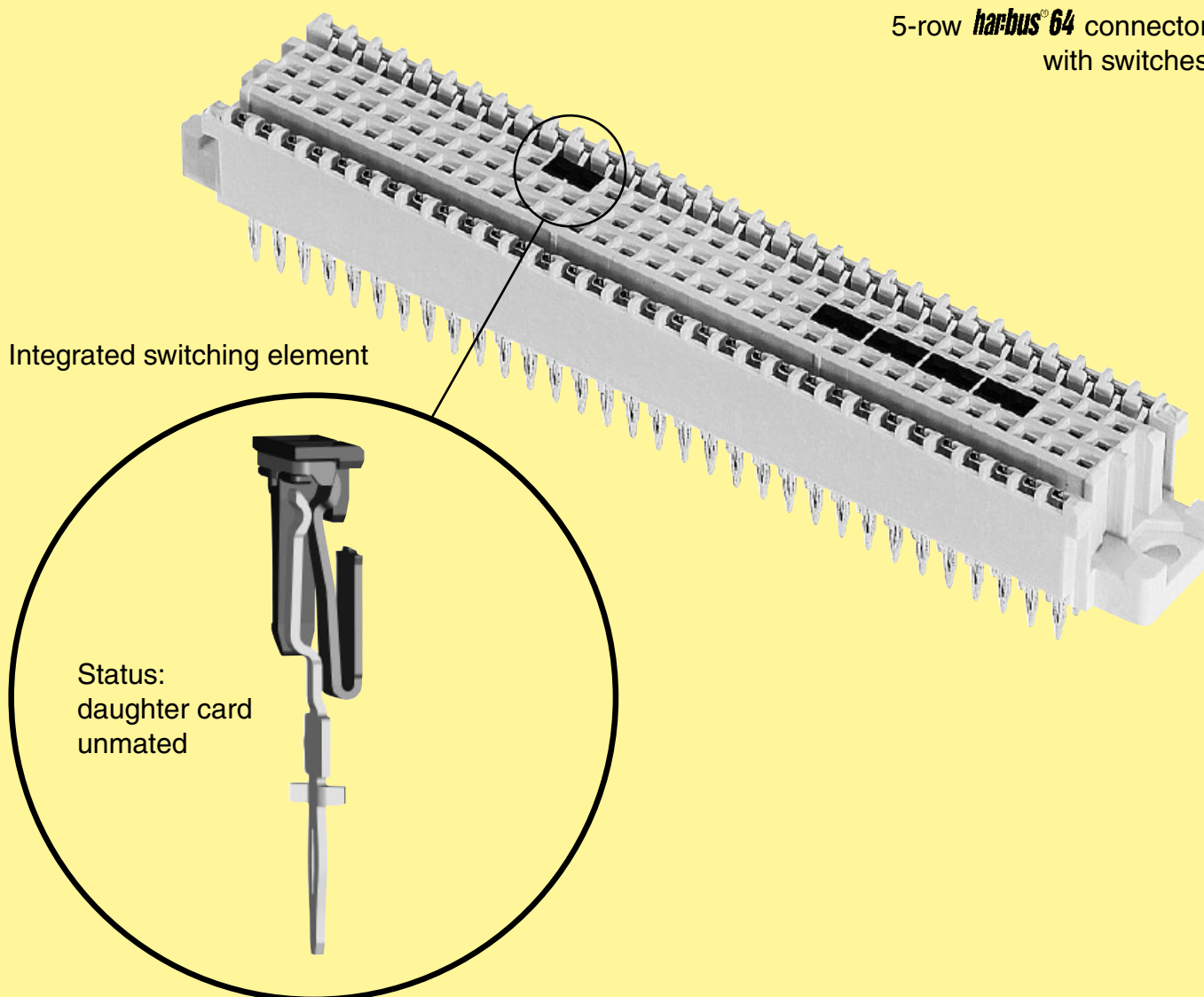
Therefore, in case of unloaded card slots the signal have to be bridged across the connector.

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 new 5-row *harbus*[®] 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



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 $\leq 20 \text{ m}\Omega$
rows z, d $\leq 30 \text{ m}\Omega$

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

Temperature range $-55 \text{ }^\circ\text{C} \dots +125 \text{ }^\circ\text{C}$

for press-in termination $-40 \text{ }^\circ\text{C} \dots +105 \text{ }^\circ\text{C}$
acc. to IEC 60512-11

During reflow soldering max. $+240 \text{ }^\circ\text{C}$ for 20 s
for SMC connectors

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

Electrical termination

Solder pins for pcb
termination $\varnothing 1.0 \pm 0.1 \text{ mm}$
according to IEC 60326-3

Crimp terminal
 $0.09 - 0.50 \text{ mm}^2$

Compliant press-in
terminations

pcb thickness $\geq 1.6 \text{ mm}$
Recommended pcb holes
for press-in technology See recommendation page 00.25
in acc. to EN 60352-5

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

Materials

Mouldings

- Liquid Cristal Polymer (LCP),
for male connectors, straight
female connectors, UL 94-V0

- Thermoplastic resin
glass-fibre filled, UL 94-V0

Copper alloy

Contacts

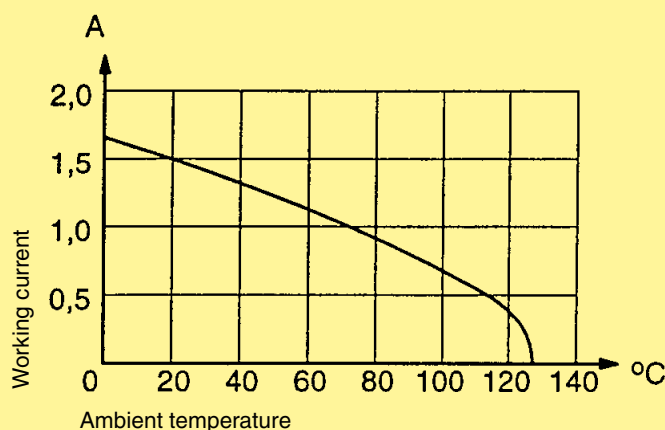
Contact surface

Contact zone Plated acc. to performance
level¹⁾

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



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

harbus® 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 $\leq 60 \text{ m}\Omega$

Insertion and withdrawal force

Complete connector $\leq 180 \text{ N}$

Number of contacts

160



Male connectors, angled, SMC compatible

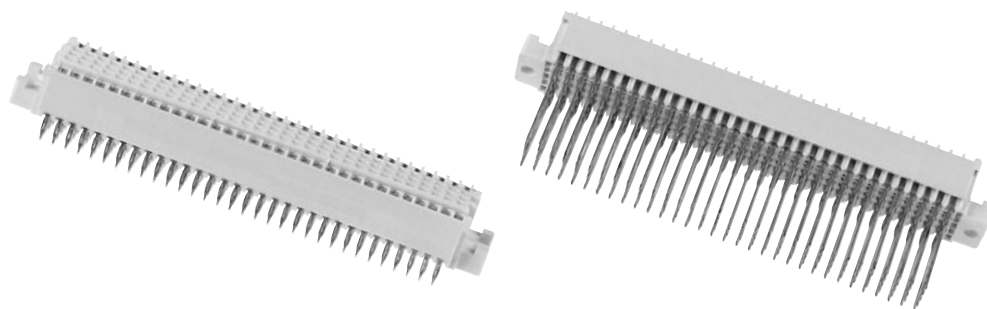
Identification	Number of contacts	Contact arrangement	Part No. 2	Performance levels according to IEC 61 076-4-113 Explanation chapter 00 1
Male connector*				
without retention clip	160	z, a, b, c, d	02 01 160 2101	02 01 160 1101 02 01 160 1105 ²⁾
with retention clip	160	z, a, b, c, d	02 01 160 2102	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 = 0.29 - 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 $\varnothing$ to reduce standard mounting force (see chapter 00)

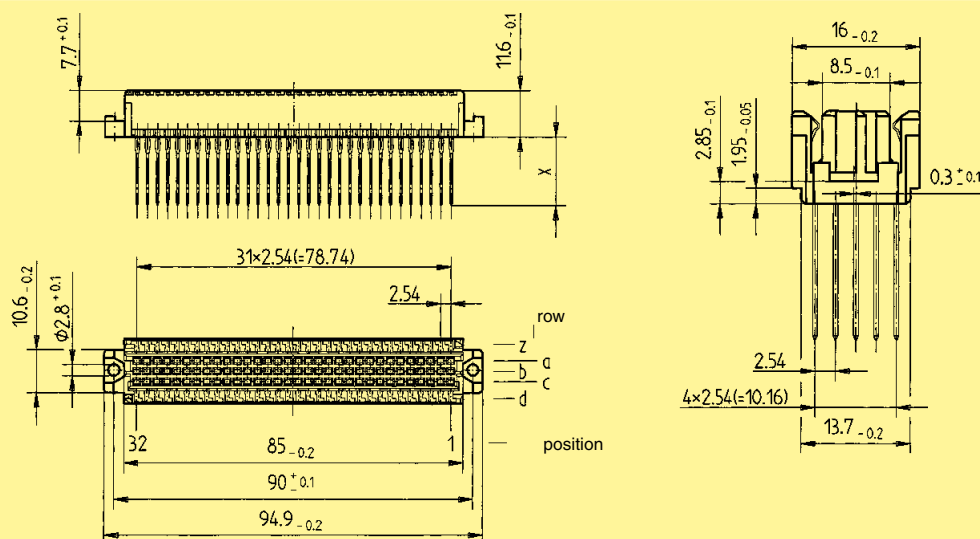
²⁾ Special variant with min. 1.27 μ m (50 pinch) Au and SnPb on termination

160



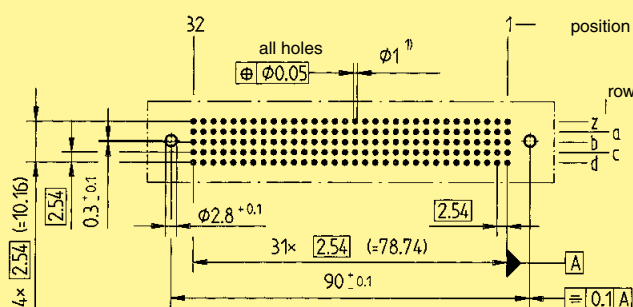
har-bus 64

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

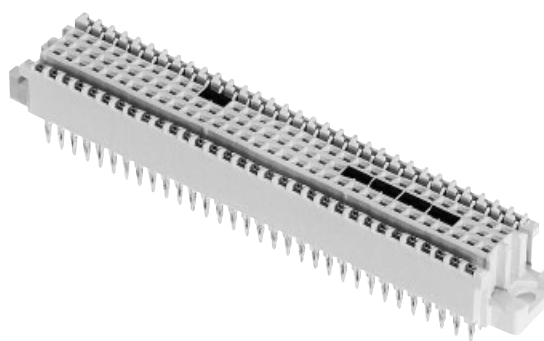
Mounting side



Dimensions in mm

Number of contacts

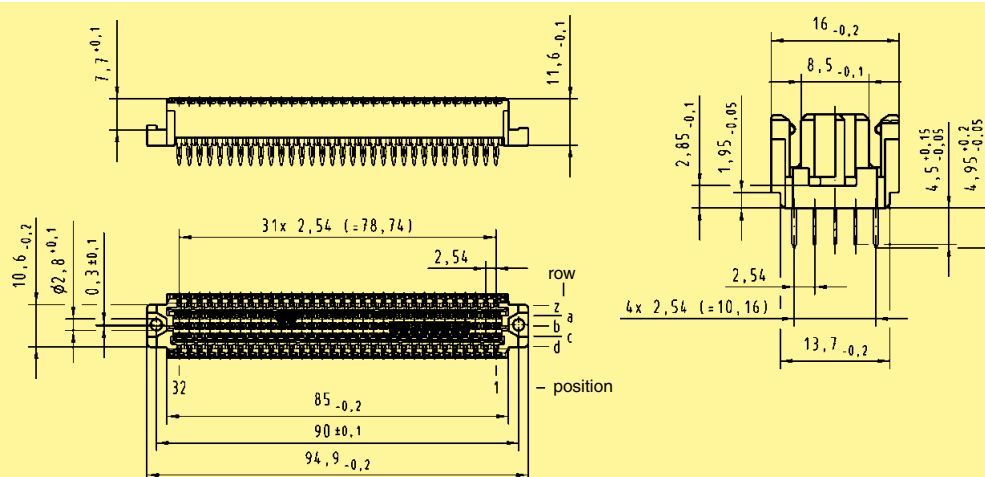
160



Female connectors

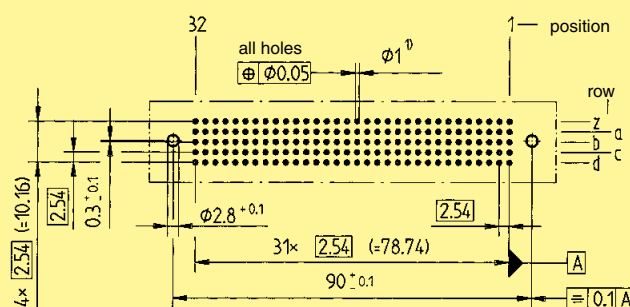
Identification	Number of contacts	Contact arrangement	Part No. Performance level 2 according to IEC 61076-4-113 Explanation chapter 00
Female connectors, straight with switches ²⁾			
with press-in terminations			
with flange 4.5/5 mm	160	z, a, b, c, d	02 03 160 2201

Dimensions



Board drillings

Mounting side



Dimensions in mm

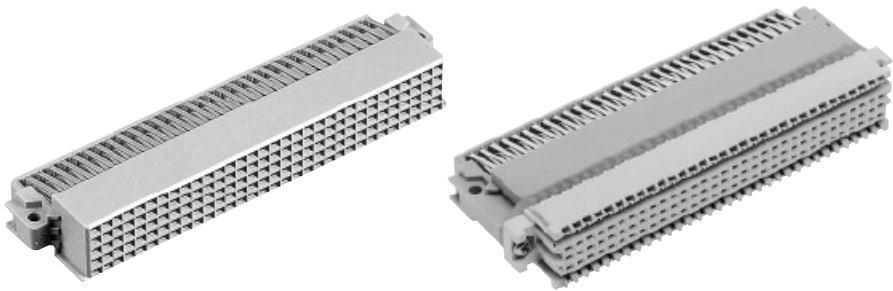
Tooling see chapter 30

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

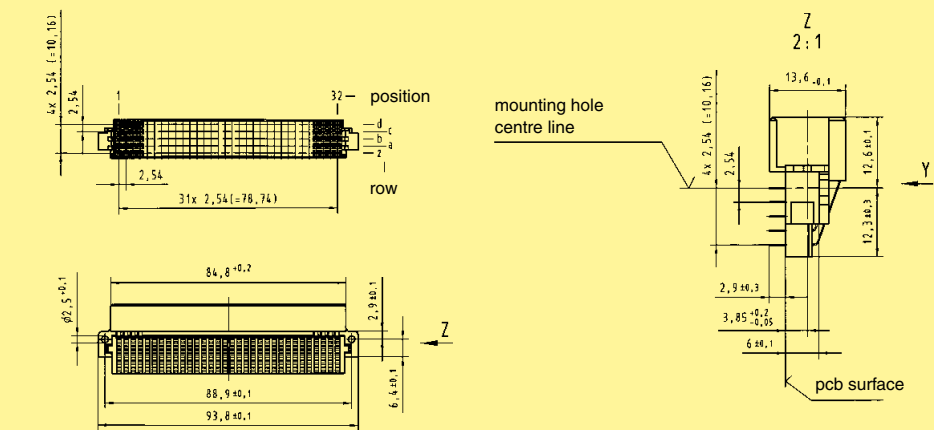
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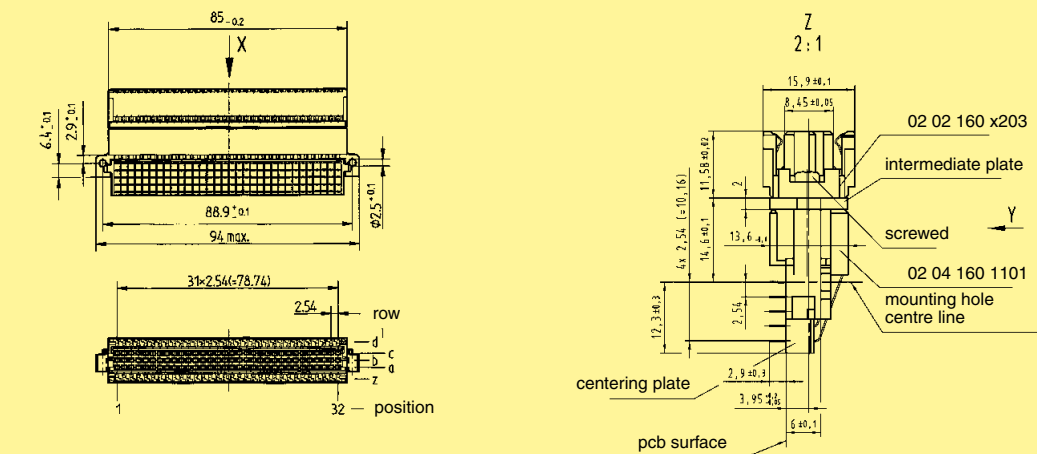
Female connectors

Identification	Number of contacts	Contact arrangement	Part No. Performance level 1 according to IEC 61076-4-113 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

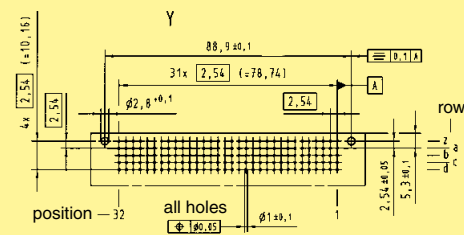
Dimensions
02 04 160 1101



Dimensions
02 07 160 1101



Board drillings
Mounting side

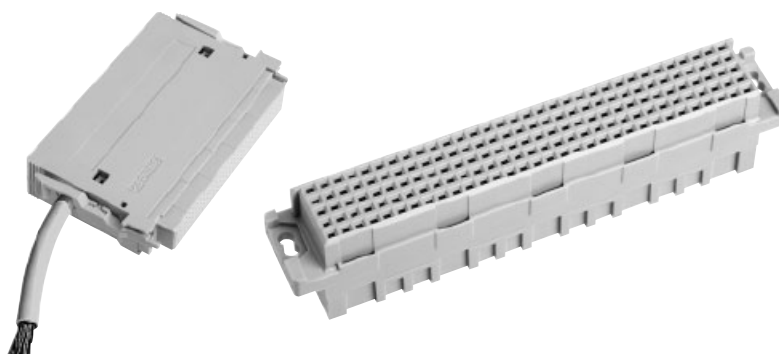


Dimensions in mm

Number of contacts

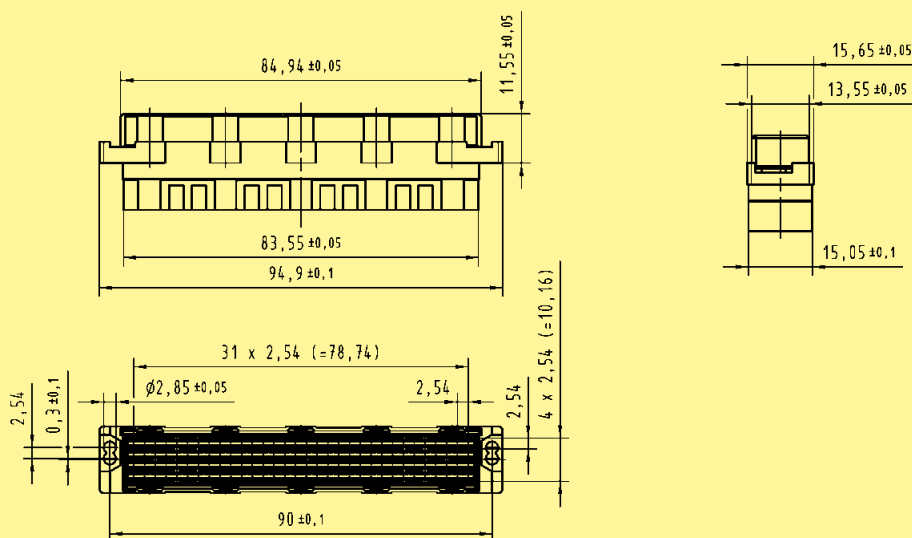
max. 160

Female connectors



Identification	Number of contacts	Contact-arrangement	Suitable for	Part No.
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

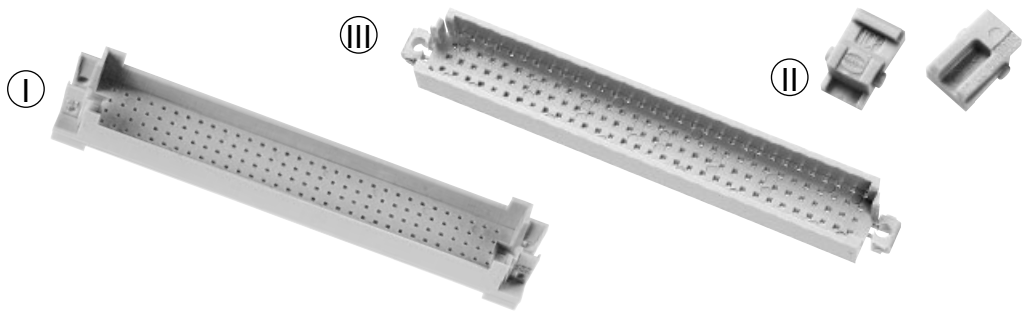


Identification	Part No.	Performance levels according to IEC 61076-4-113.	Explanation chapter 00
	2		1
Female crimp contacts har-bus® 64			
Bandoliered contacts (approx. 5,000 pieces)	02 05 000 2511		02 05 000 1511
Bandoliered contacts (approx. 500 pieces)	02 05 000 2512		02 05 000 1512
Individual contacts ¹⁾	02 05 000 2513		02 05 000 1513
	Wire gauge mm ² 0.09 - 0.5	AWG 28 - 20	Insulation ø mm 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

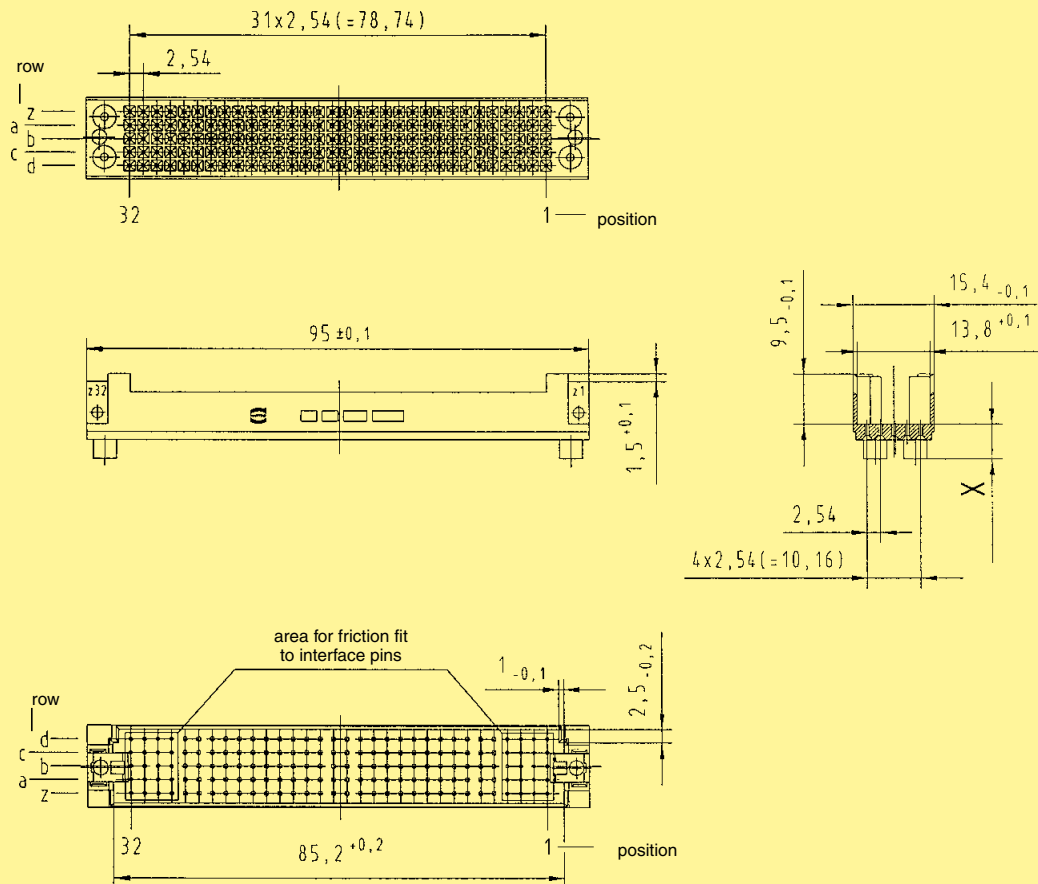
160



Pin shrouds

Identification	pcb-thickness ± 0.3	Dimension X - 0.1	Part No.
Pin shrouds ¹⁾			
I	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

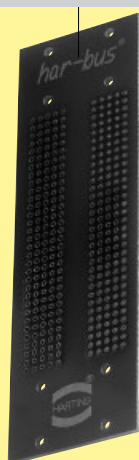
¹⁾ Insert block (02 09 000 0012) for assembly see chapter 30
²⁾ order 2 pieces per connector

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

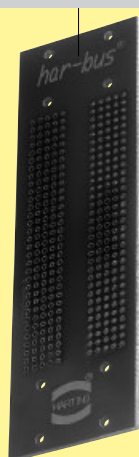
Locking lever
left 09 02 000 9902
right 09 02 000 9903

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

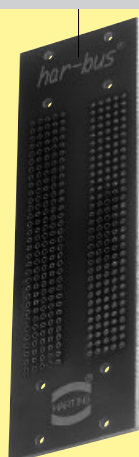


Application 3

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



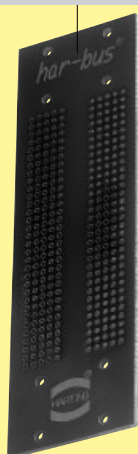
* Only for applications without rear P0-connector

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

