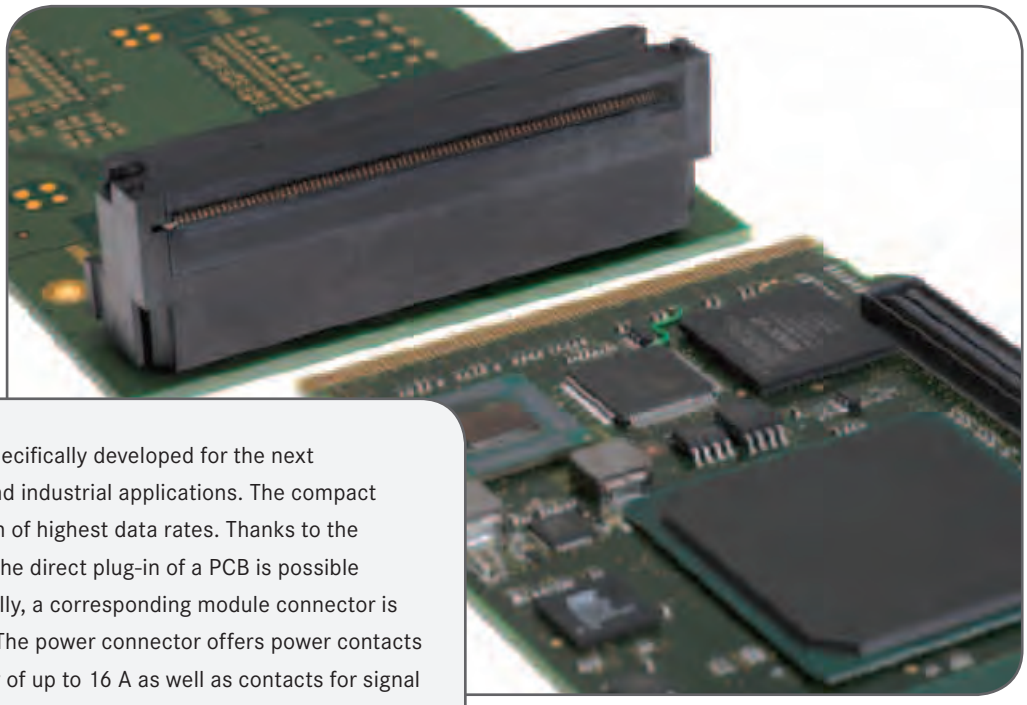


The TCA connectors have been specifically developed for the next generation of telecom, medical and industrial applications. The compact connector allows the transmission of highest data rates. Thanks to the innovative GuideSpring concept, the direct plug-in of a PCB is possible without any safety loss. Additionally, a corresponding module connector is available for robust applications. The power connector offers power contacts with the current carrying capacity of up to 16 A as well as contacts for signal transmission. HARTING offers application-specific design-in support for the connectors, as well as the system analysis support.

Application profile:

CONNECTION TYPE		ENVIRONMENT		APPLICATION						
Board to Board	Cable/ Wire to Board	IP 20	IP 65 / IP 67	Data	Signal	Power	high performance			
							Data transfer rate	Shielding	Nimber of contacts, contact density	Voltage, working current
●		●		●	●	●	●		●	●

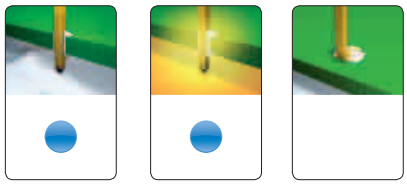
Cable termination

Han-Quick Lock® | *IDC* | *Crimp*

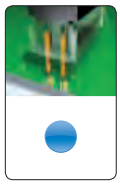
Screw | *Cage clamp* | *Axial screw*

PCB termination

THT | *SMC* | *SMT*



Press-in

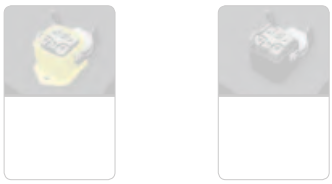


Application standard

PICMG® AdvancedTCA® AdvancedMC™ µTCA™

Housing integration

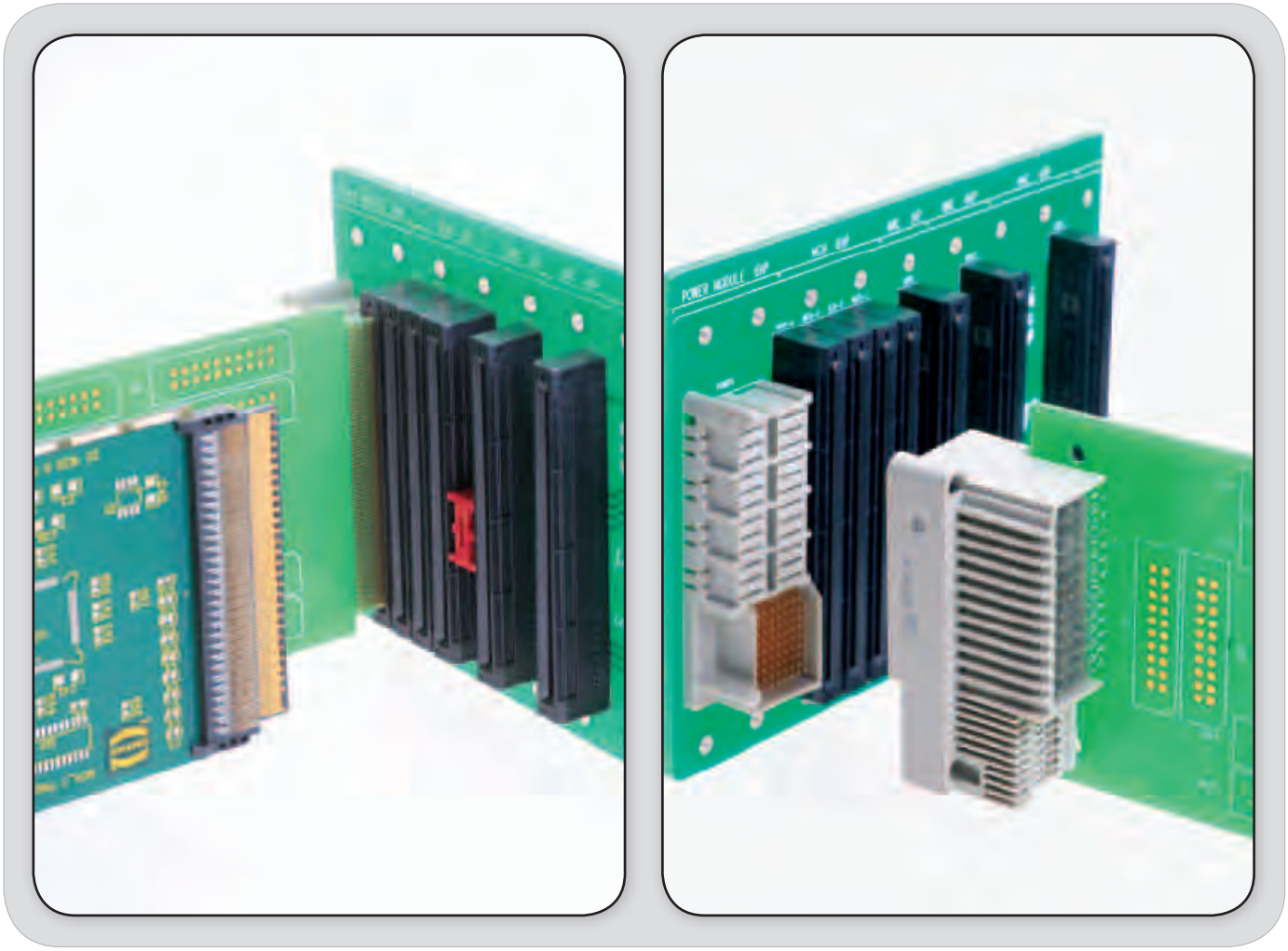
Separate housing | *Integrated housing*



CONTENTS PAGE

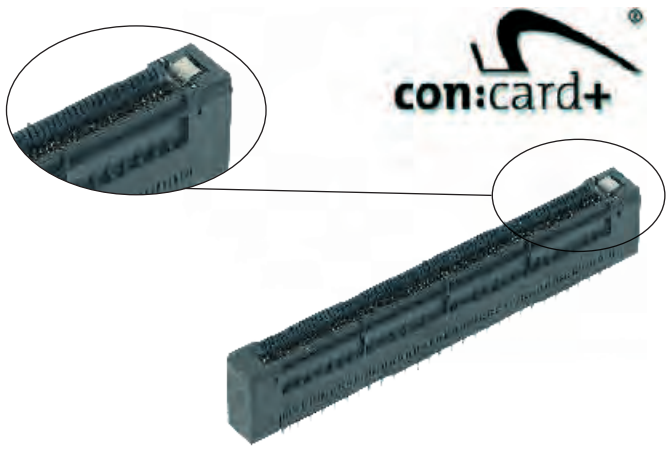
CONNECTORS FOR TCA

The TCA connectors have been developed for the open hardware standards AdvancedTCA®, AdvancedMC™ and MicroTCA™.
They are specified by the PCI Industrial Computer Manufacturers Group (PICMG), a consortium of more than 450 product suppliers. These innovative systems are finding increasing use for industrial control systems and computer systems.
HARTING is an active member of the PICMG and participated in the standardization process of the connectors for these systems. HARTING offers several connectors for signal and power transmission.
With the new "**con:**card**+**" connectors with press-in termination, HARTING has substantially improved the contact reliability of the AdvancedMC™ connector for MicroTCA™ and AdvancedTCA®. The key element of the new "**con:**card**+**" connector is the integrated GuideSpring, which is able to compensate any tolerance deviations of the AdvancedMC™ printed circuit boards by centrally positioning the circuit board within the connector slot. The GuideSpring allows HARTING to ensure the reliable connection of the circuit boards, which can be manufactured in large-scale production today.
Other advantages of the "**con:**card**+**" technology are the extremely smooth contact surface and a robust contact coating which allows the specified 200 mating cycles between the daughter card and the card edge connector. Especially for rough environments, HARTING offers supplementary to the specification a connector for the AdvancedMC™ module. The plug connector replaces the gold pads of the card edge and offers increased reliability.



HIGH CONTACT RELIABILITY

The "**con:**card**+**" technology offers highest contact reliability as required for industry applications.



AMC/MCH PLUG CONNECTOR

The HARTING Plug connector supplements the exisiting MicroTCA™ and AdvancedMC™ specification and can replace the padfield of the AdvancedMC™ module card edge. Thereby the contact reliability is increased especially in the fields of rough environments like in industry apllications.

INTERNATIONAL STANDARD

The TCA connectors meet the requirements of the PICMG (PCI Industrial Computers Manufacturers Group) specifications AdvancedMC™, Advanced TCA® and MicroTCA™ and can be used for these applications.

PICMG®

AdvancedTCA®

AdvancedMC™

µTCA™

PICMG, formally known as the PCI Industrial Computing Manufacturing Group – is an industry consortium of over 450 companies. PICMG's purpose is to define standard architectures in an effort to reduce system costs and development cycles and since its 1994 foundation, PICMG has been responsible for the establishment of several of successfully implemented, open, industrial standards. Open standards have proven themselves to be very advantageous for system manufacturers and end-user, because they create multiple vendors of similar parts, low prices at high volumes, and a shortened time-to-market.

Historically, PICMG has created several successful standards.

- PICMG 1.x Series – a passive backplane PCI specification
- PICMG 2.x Series – the CompactPCI® standard

AdvancedTCA®

Today, the AdvancedTCA® series of specifications (PICMG 3.x) targets the requirements of the next generation of carrier grade telecommunications equipment. AdvancedTCA®, short for Advanced Telecom Computing Architecture and sometimes simply abbreviated ATCA®, incorporates an impressive suite of recent technological advancements including the latest trends in high speed interconnect technologies.

Features of AdvancedTCA® include optimization for high-capacity, high-performance telecom and industrial applications, improved reliability, manageability, redundability, and serviceability. Encompassing a technological growth path valid for up to ten years, AdvancedTCA® has earned a solid position within the telecom systems market.

The rack or chassis, is responsible for housing the backplane and the daughtercards, as well as cooling and powering the system. HARTING offers the ATCA® power connector that energises the blades, both the straight backplane and the right angled daughtercard connector.

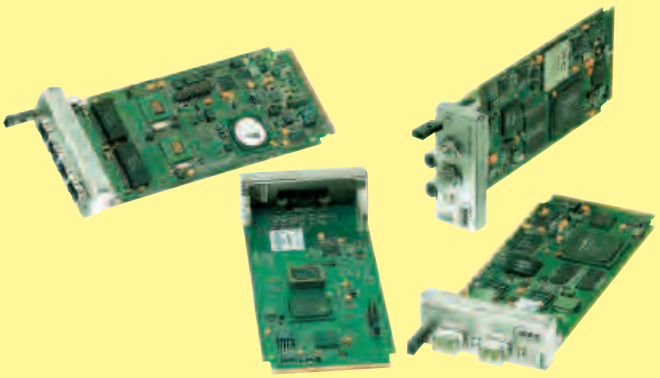
AdvancedTCA® chassis with backplane

The backplane, said to be passive, is merely a medium for the daughtercards to communicate with each other. And, the daughtercards, sometimes called blades or boards, provide the system with its functionality and allow for an easy, hot-swappable module exchange from the front of the system.

Initially, many blades were designed with a fixed functionality, and they had to be replaced once their functionality became obsolete or the demands of the system changed. With the continuation of exponential technological growth, concept proved to be a costly endeavour for the end-user.

AdvancedMC™

To extend the functionality and modularity of AdvancedTCA®, blade manufacturers conceived the idea of upgradeable daughtercards, and began to insert mezzanine cards onto the blades when needed. To achieve a common mezzanine concept, PICMG developed the Advanced Mezzanine Card (AdvancedMC™) standard AMC.0.



AdvancedMC™ modules for different applications

For the use of Advanced Mezzanine Cards, as well called AdvancedMC™ modules, a carrier is necessary. A carrier is an ATCA® blade with only little functionality beyond AdvancedMC™ management. It contains the mechanical environment for the AdvancedMC™ modules. Depending on their size, up to eight AdvancedMC™ modules can be hot-swapped in and out of a carrier, this enabled the creation of extremely scalable and upgradeable systems.

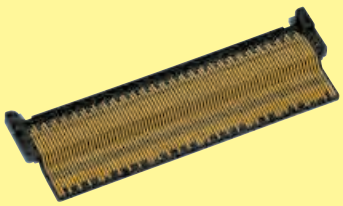
AdvancedTCA® carrier board with AdvancedMC™ modules

To connect AdvancedMC™ modules to carrier boards PICMG defined a new high-speed mezzanine connector: the AdvancedMC™ connector – a card edge connector mounted on the carrier board. It contacts directly with the module's PCB gold pads. Although PICMG defined four AdvancedMC™ connector types (B, B+, AB and A+B+), current market developments focus on type B+.

The HARTING AdvancedMC™ B+ connector features a new design element that supplements the standard – the GuideSpring. The GuideSpring significantly increases the mating reliability and prevents contact interruptions and surface wear when subjected to shocks or vibrations.

The press-fit termination technology provides significant cost and durability advantages over other termination technologies. The connector design allows for the use of a standard flat rock die. For more press-in process control, HARTING offers a special top and bottom tool.

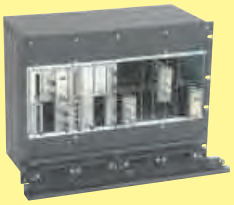
The HARTING AdvancedMC™ Plug Connector can replace the module´s PCB gold pads and increase the contact reliability from the module side. Please find more information about the HARTING AdvancedMC™ Plug Connector on page 12.17 ff.



µTCA™

This revolutionary AdvancedMC™-based design concept has led to the recent development of a completely mezzanine-based system – MicroTCA™. MicroTCA™, short for Micro Telecom Computing Architecture, is a more cost-efficient platform than AdvancedTCA® when dealing with smaller applications, yet powerful enough to address the needs of telecom, enterprise and medical applications.

This newly-implemented PICMG standard, outlined in the MTCA.0 specification, presents a design-concept whereby AdvancedMC™s – the same kind used in ATCA® systems – plug directly into a passive backplane; this eliminates the need for carrier boards.

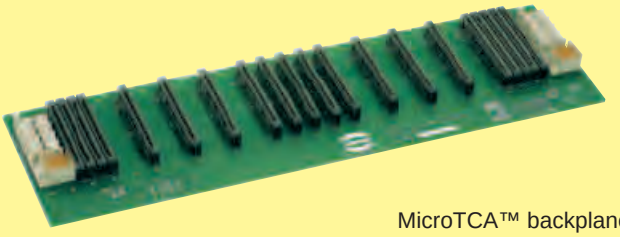


MicroTCA™ double cube system

Naturally the mating face of the AdvancedMC™ connector for MicroTCA™ is the same as for ATCA®, but with a right angled mating direction. It contains the new GuideSpring and is available in press-in termination. PICMG members voted HARTING's MicroTCA™ connector footprint as the new MicroTCA™ standard connector for press-fit termination technology.

AdvancedMC™ and power connectors for MicroTCA™

The MicroTCA™ backplane is typically powered by special, field replaceable, hot-swapable, redundant Power Supply Units (PSU). The PSU connects to the backplane through a MicroTCA™ power connector (press-fit termination) also available from HARTING.



MicroTCA™ backplane

The module management is performed by a MicroTCA™ Carrier Hub, or MCH. An MCH is connected to the backplane by up to four adjacent card-edge connectors. One MCH can control up to 12 AdvancedMC™ modules, thus depending on redundancy requirements, workload, or both, one or two MCHs may be used within a single system.

For a precise mechnical alignment of the mating tongues HARTING offers the special Plug Connectors according to MTCA.0.

MCH board

*What is **con:**card+?*

con:card**+** is a quality seal for AdvancedMC™ connectors that helps to deliver a significant increase in the reliability of MicroTCA™ and AdvancedTCA® systems. In order to reach the target availability of 99.999 %, all system components must be carefully coordinated, and they must function reliably. The selection of suitable connectors is an essential, decisive factor here, as today it is virtually impossible for series production to meet the strict tolerances for the AdvancedMC™ modules as defined in the respective specifications. The so-called GuideSpring is ideally suited for compensating here, and represents just one of a total of five key advantages of the **con:**card**+** philosophy. All the advantages are introduced in the following. Please find further information also on the internet at www.concardplus.com.

Special contact design

*Unlike conventional mating systems with male and female connectors, the AdvancedMC™ has only one, not two, contact tongues per contact. In order to ensure a permanently reliable contact, this single contact tongue must press against the gold pad with sufficient force throughout the entire lifetime. In addition, the thickness of the AdvancedMC™ modules may fluctuate by ±10 %. To meet this challenge, HARTING utilizes a special contact design with very low relaxation for the **con:**card**+** connector.*

PdNi contact coating

In order better to meet the high requirements placed on the connectors, a palladium-nickel surface (PdNi) with additional gold flash is used. As a result, wear resistance is increased by roughly 30 %. Even when applied very thinly, PdNi surfaces offer a quality and corrosion-resistant coating that meets the high requirements placed on the connection far better than pure gold.

Smooth contact surface

The specification for the AdvancedMC™ entails 200 mating cycles for a module. On the PCB, the nickel/hard gold layer on the relatively soft copper can only stand up to this high load if the contact surface is absolutely smooth.
This is the case with the ***con:****card****+*** *connector. With years of experience in stamping techniques and the utilization of high-performance stamping tools with special process components, HARTING is actively involved in minimizing gold pad wear.*

GuideSpring

PCB manufacturers are not capable of meeting the AdvancedMC™ modules' tight tolerances with certainty in the series process today. Just a single card with tolerances slightly larger than allowed by the specifications can lead to a system breakdown.
The ***con:****card****+*** *GuideSpring offsets these tolerance deviations by constantly pressing the module against the opposite wall. As this is displaced somewhat towards the middle, the slot is optimally designed for the AdvancedMC™ module, and the mating reliability increases tremendously.*
In addition, the GuideSpring secures the module position in the case of shocks and vibrations. This prevents loss of contact and surface wear.

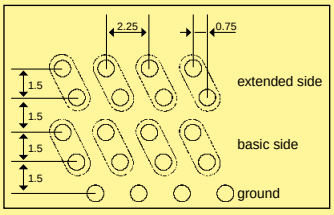
Press-fit technology

Press-fit technology results in a gas-tight, corrosion-resistant, low-ohm quality mechanical connection between the pin and the through contacting of the PCB. This remains reliably in contact and stable, even under conditions of high mechanical and thermal loads, such as vibration, bending and frequent temperature changes. This technology represents a tremendous advantage over other processing techniques. Measurements substantiate that the required transmission rates are easily attained.

Technical characteristics

Design according	PICMG AMC.0 (RoHS compliance)
Number of contacts	170
Contact spacing	0.75 mm
Clearance and creepage distance between contacts	0.1 mm min.
Working current of power contacts as defined in AMC.0 spec.	~ 2.2 A @ 70 °C max. 30 °C temp. rise (PICMG requirement min. 1.52 A)
Test voltage	80 $V_{r.m.s.}$
Working voltage typically	3.3 V; 5.0 V; 12.0 V
Initial contact resistance	
ground contacts	60 mΩ max.
signal, power, general purpose contacts	90 mΩ max.
Initial insulation resistance	100 MΩ min.
Nominal differential impedance	100 Ω±10 %

Max. crosstalk @ 25 ps risetime	Bottom route
Adjacent	0.55 %
Basic-to-extended (diagonal)	0.68 %
Basic-to-extended (opposite)	0.39 %
Multiline (five multi-aggressor differential pairs)	2.74 % max.



PCB library on request (PADS/Dx-Designer)

SPICE models and S-Parameter on request

Differential propagation delay	Basic side:	125 ps
	Extended side:	145 ps
Differential skew	Between basic and extended side:	20 ps
	Within basic and extended side:	±2 ps

Temperature range	-55 °C … +105 °C
Durability as per AMC.0 specification	200 mating cycles
Termination technique	Press-in termination
Mating force	100 N max., typically 65 - 90 N (depending on AdvancedMC™)
Withdrawal force	65 N max., typically 30 - 45 N (depending on AdvancedMC™)

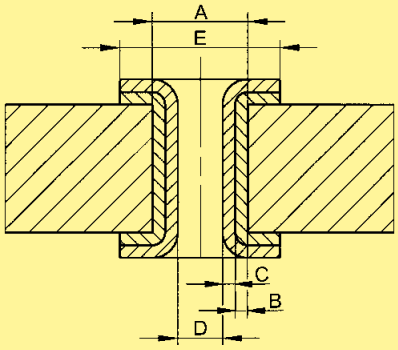
Materials

Moulded parts	Liquid Crystal Polymer (LCP), UL 94-V0
Contacts	Copper Alloy
Contact surface	Pd/Ni with Au flash
Packaging	Cardboard box (other packaging on request)

Recommended plated through hole specification

	A	Drill hole-Ø	$0.64^{\pm 0.01}$ mm
	B	Cu	25 - 35 µm
Tin plated PCB (HAL)	C	Sn	5 - 15 µm
	D	Hole-Ø	0.53 - 0.60 mm
Au / Ni plated PCB	C	Ni	3 - 7 µm
		Au	0.05 - 0.12 µm
	D	Hole-Ø	0.55 - 0.60 mm
Chemical tin plated PCB	C	Sn	0.8 - 1.5 µm
	D	Hole-Ø	0.56 - 0.60 mm
Silver plated PCB	C	Ag	0.1 - 0.3 µm
	D	Hole-Ø	0.56 - 0.60 mm
OSP copper plated PCB	C	---	---
	D	Hole-Ø	0.56 - 0.60 mm
	E	Pad size	min. 0.95 mm

The press-in zone of the AdvancedMC™ connector is tested according to Telcordia/Bellcore GR 1217CORE Part7. It is approved to be used with a plated through hole according IEC 60352-5 with a diameter of $0.55^{\pm 0.05}$ mm (drilled hole $0.64^{\pm 0.01}$ mm).
Based on our experiences regarding the production process of the PCB manufacturer we recommend a plated through hole configuration like shown in the above spreadsheet. To achieve the recommended plated through hole diameter, it is important to specify especially the drilled hole diameter of $0.64^{\pm 0.01}$ mm to your PCB supplier.
For drillings use e.g. drill bit # 72 (0.025" ≈ 0.64 mm).

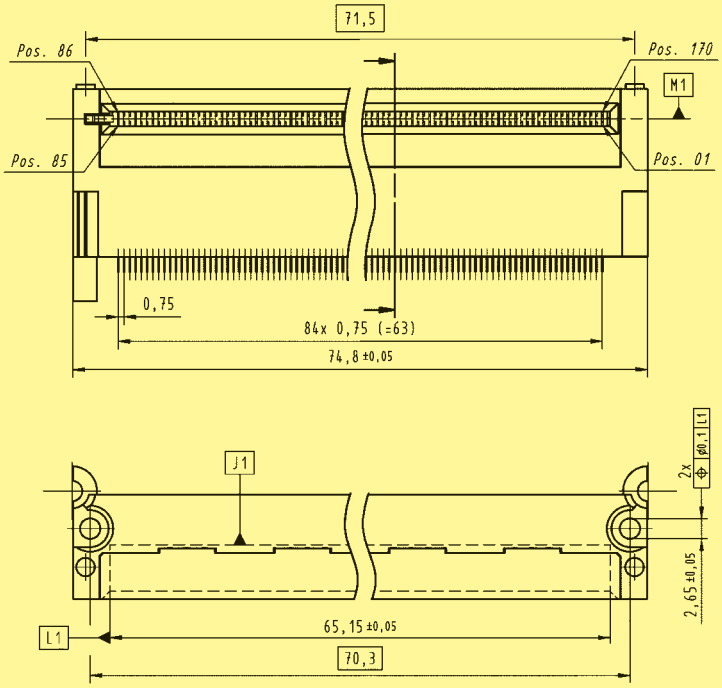


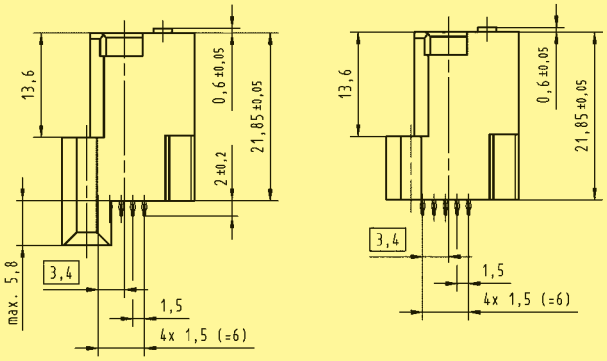
con:card+®

Card edge connectors, angled

Identification	No. of contacts	Contact length [mm] termination side	Part number
AdvancedMC™ connector for ATCA®, type B+ with peg and with GuideSpring	170	2.0	16 04 170 5104 000
AdvancedMC™ connector for ATCA®, type B+ without peg and with GuideSpring	170	2.0	16 04 170 5106 000

With peg Without peg With peg Without peg



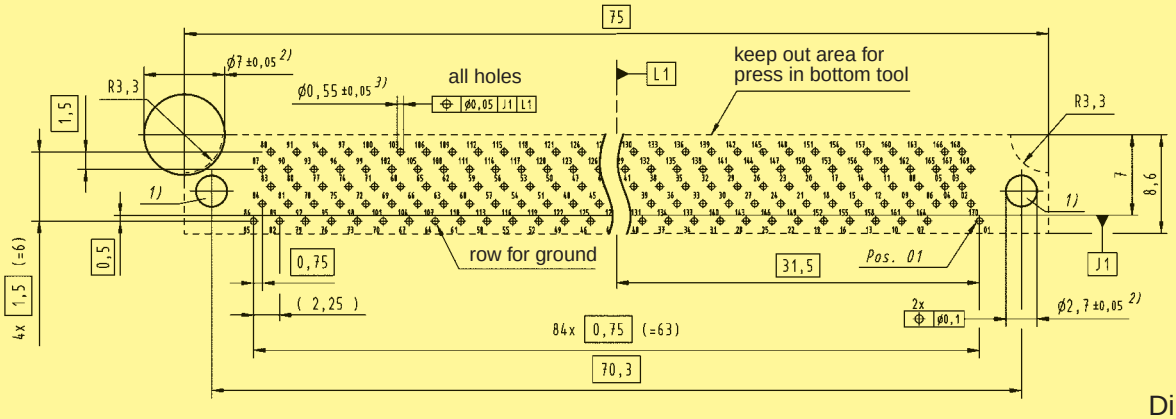


1) fixing-hole optional

2) non-metallized drillings

3) recommended plated through hole specification see page 12.08

Board drillings (view magnified)

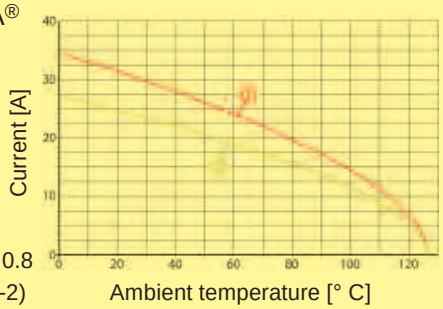


Dimensions [mm]

Technical characteristics

Design according	PICMG 3.0 R2.0
Total number of contacts	30, max. 34
Power contacts	8
Signal contacts	22, max. 26
Clearance and creepage distance between contacts	
Within group 5–16	0.7 mm min.
Within group 17–24	2.5 mm min.
25 to 26	5.5 mm min.
Within group 27–34	1.4 mm min.
13–16 to 17–20	3.0 mm min.
21–24 to 25–26	4.0 mm min.
25–26 to 27–29	2.0 mm min.
Sequential contact engagement	
1st	25, 26, 28, 29, 30, 31
2nd	33
3rd	5–24, 34
4th	27, 32
Working current	
Power contacts	16 A
Signal contacts	1 A
Test voltage	
Contacts 1–16	1000 $V_{r.m.s.}$
Contacts 17–34	2000 $V_{r.m.s.}$
Initial contact resistance	
Power contacts	≤ 2.2 mΩ
Signal contacts	≤ 8.5 mΩ
Insulation resistance	≥ 10^{10} Ω
Temperature range	-55 °C … +125 °C
Durability	250 mating cycles
Termination technique	Press-in termination
Mating force	67 N max.
Withdrawal force	67 N max.

Derating for ATCA® power contacts
Contact loading acc. PICMG 3.0



① Derating
② Derating @ $I_{max.}$ x 0.8 (acc. IEC 60512-5-2)

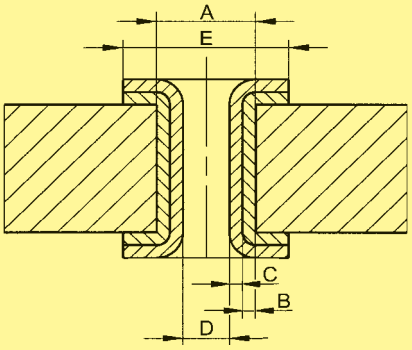
Materials

Moulded parts	PBT, glass-fibre filled, UL 94-V0
Contacts	Copper Alloy
Contact surface	Selectively gold plated
Packaging	Tray packaging (other packaging on request)

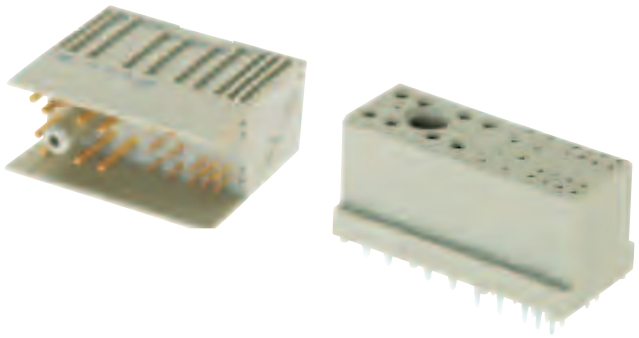
Recommended plated through hole specification

			Signal contacts	Power contacts
	A	Drill hole-Ø	$1.15^{\pm 0.025}$ mm	$1.75^{\pm 0.025}$ mm
	B	Cu	25 - 35 µm	25 - 35 µm
Tin plated PCB (HAL)	C	Sn	5 - 15 µm	5 - 15 µm
	D	Hole-Ø	1.00 – 1.10 mm	1.60 – 1.70 mm
Au / Ni plated PCB	C	Ni	3 - 7 µm	3 – 7 µm
		Au	0.05 - 0.12 µm	0.05 - 0.12 µm
	D	Hole-Ø	1.00 – 1.10 mm	1.60 – 1.70 mm
Chemical tin plated PCB	C	Sn	0.8 - 1.5 µm	0.8 - 1.5 µm
	D	Hole-Ø	1.00 – 1.10 mm	1.60 – 1.70 mm
Silver plated PCB	C	Ag	0.1 - 0.3 µm	0.1 - 0.3 µm
	D	Hole-Ø	1.00 – 1.10 mm	1.60 – 1.70 mm
OSP copper plated PCB	C	---	---	---
	D	Hole-Ø	1.00 – 1.10 mm	1.60 – 1.70 mm
	E	Pad size	min. 1.4 mm	min. 2.0 mm

The press-in zone of the AdvancedTCA® power connector is tested according to Telcordia/Bellcore GR 1217CORE Part7. It is approved to be used with a plated through hole according IEC 60352-5 with a diameter of $1.00^{+0.09}_{-0.06}$ mm for signal contacts and $1.60^{+0.09}_{-0.06}$ mm for power contacts (drilled hole $1.15^{\pm 0.025}$ mm resp. $1.75^{\pm 0.025}$ mm).
Based on our experiences regarding the production process of the PCB manufacturer we recommend a plated through hole configuration like shown in the above spreadsheet. To achieve the recommended plated through hole diameter, it is important to specify especially the drilled hole diameter of $1.15^{\pm 0.025}$ mm resp. $1.75^{\pm 0.025}$ mm to your PCB supplier.

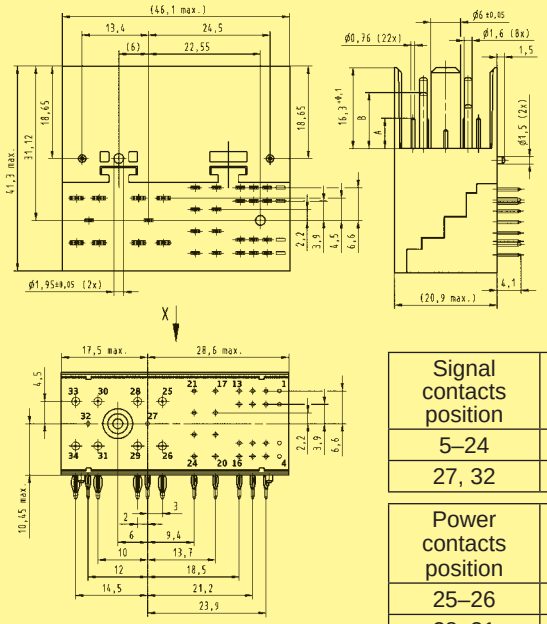


Power connectors for AdvancedTCA®



Identification	No. of contacts	Contact length [mm] termination side	Part number
Power connector for AdvancedTCA®, male	30	4.1	16 32 030 1101 000
	34	4.1	16 32 034 1101 000
Power connector for AdvancedTCA®, female	30	5.3	16 31 030 1201 000
	34	5.3	16 31 034 1201 000

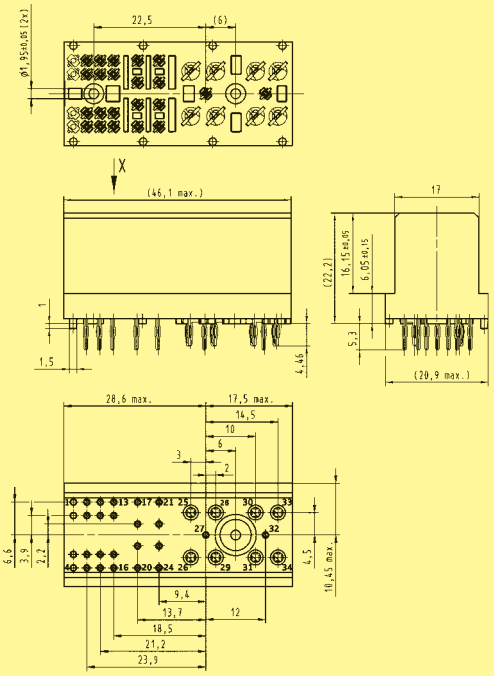
Male connector with 30 contacts



Signal contacts position	Dimension A
5–24	6.1
27, 32	3.8

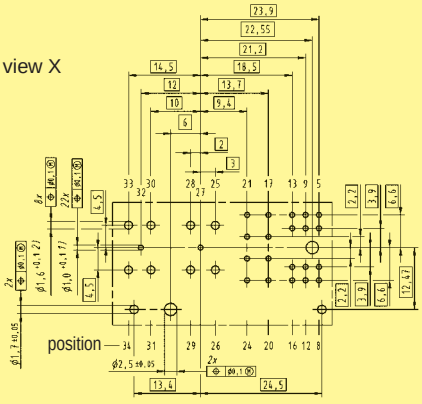
Power contacts position	Dimension B
25–26	14.3
28–31	14.3
33	11.3
34	8.8

Female connector with 30 contacts

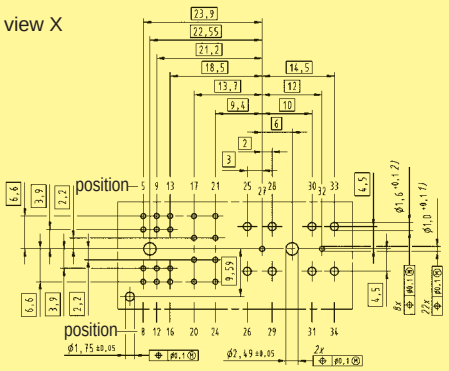


Board drillings

view X



view X



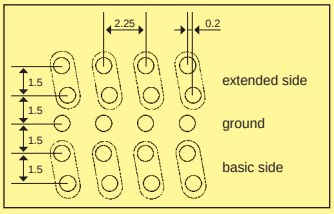
1) + 2) recommended plated through hole specification
see page 12.10

Dimensions [mm]

Technical characteristics

Design according	PICMG MTCA.0 R1.0 (RoHS compliance)
Number of contacts	170
Contact spacing	0.75 mm
Clearance and creepage distance between contacts	0.1 mm min.
Working current of power contacts as defined in MTCA.0 spec.	~ 2.3 A @ 70 °C max. 30 °C temp. rise (PICMG requirement min. 1.52 A)
Test voltage	80 $V_{r.m.s.}$
Working voltage typically	3.3 V; 5.0 V; 12.0 V
Initial contact resistance	25 mΩ max.
Initial insulation resistance	100 MΩ min.
Nominal differential impedance	100 Ω±10 %

Max. NEXT @ 25 ps risetime	Bottom route
Adjacent	0.65 %
Basic-to-extended (diagonal)	0.60 %
Basic-to-extended (opposite)	0.73 %
Multiline (five multi-aggressor differential pairs)	2.88 % max.



PCB library on request (PADS/Dx-Designer)

SPICE models and S-Parameter on request

Differential propagation delay	Basic side: 70 ps ± 5 ps Extended side: 70 ps ± 5 ps
Differential skew	Between basic and extended side: ±2 ps Within basic and extended side: ±2 ps
Temperature range	-55 °C … +105 °C
Durability as per MTCA.0 spec.	200 mating cycles
Termination technique	Press-in termination
Mating force	100 N max., typically 60 - 80 N (depending on AdvancedMC™)
Withdrawal force	65 N max., typically 40 - 60 N (depending on AdvancedMC™)

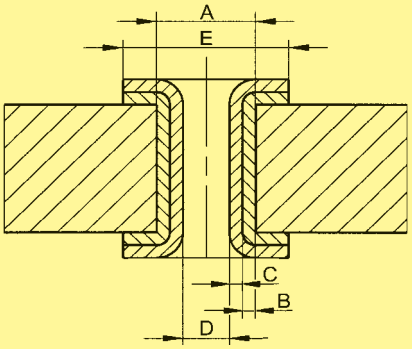
Materials

Moulded parts	Liquid Crystal Polymer (LCP), UL 94-V0
Contacts	Copper Alloy
Contact surface	Pd/Ni with Au flash Au over Ni on request
Packaging	Cardboard box (other packaging on request)

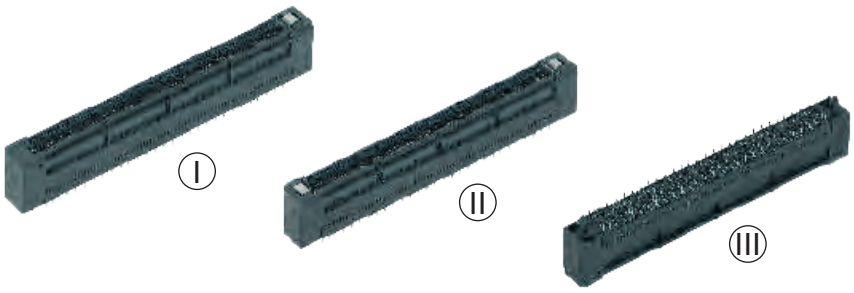
Recommended plated through hole specification

	A	Drill hole-Ø	$0.64^{\pm 0.01}$ mm
	B	Cu	25 - 35 µm
Tin plated PCB (HAL)	C	Sn	5 - 15 µm
	D	Hole-Ø	0.53 - 0.60 mm
Au / Ni plated PCB	C	Ni	3 - 7 µm
		Au	0.05 - 0.12 µm
	D	Hole-Ø	0.55 - 0.60 mm
Chemical tin plated PCB	C	Sn	0.8 - 1.5 µm
	D	Hole-Ø	0.56 - 0.60 mm
Silver plated PCB	C	Ag	0.1 - 0.3 µm
	D	Hole-Ø	0.56 - 0.60 mm
OSP copper plated PCB	C	---	---
	D	Hole-Ø	0.56 - 0.60 mm
	E	Pad size	min. 0.95 mm

The press-in zone of the AdvancedMC™ connector is tested according to Telcordia/Bellcore GR 1217CORE Part7. It is approved to be used with a plated through hole according IEC 60352-5 with a diameter of $0.55^{\pm 0.05}$ mm (drilled hole $0.64^{\pm 0.01}$ mm).
Based on our experiences regarding the production process of the PCB manufacturer we recommend a plated through hole configuration like shown in the above spreadsheet. To achieve the recommended plated through hole diameter, it is important to specify especially the drilled hole diameter of $0.64^{\pm 0.01}$ mm to your PCB supplier.
For drillings use e.g. drill bit # 72 (0.025" ≈ 0.64 mm).

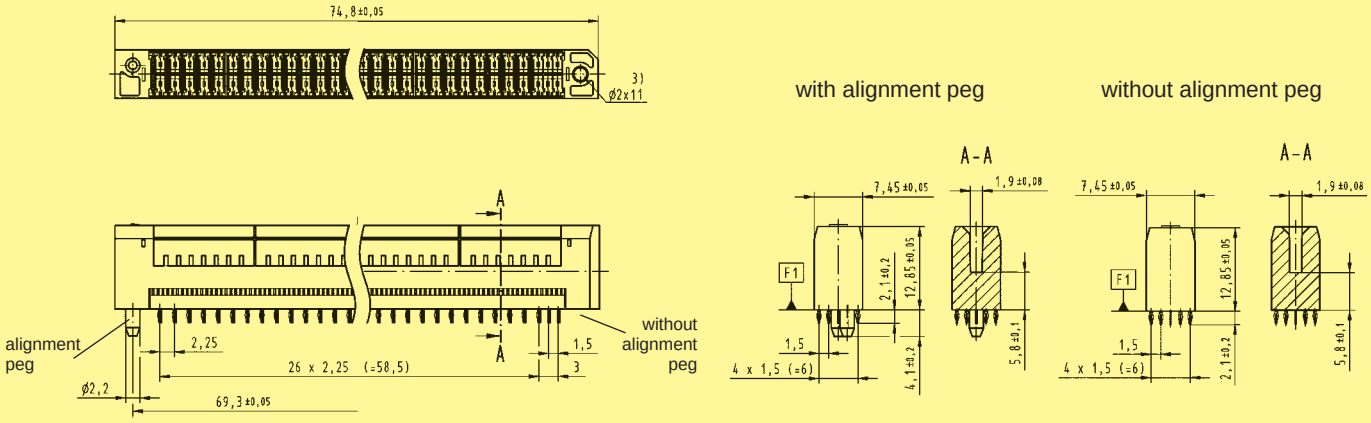


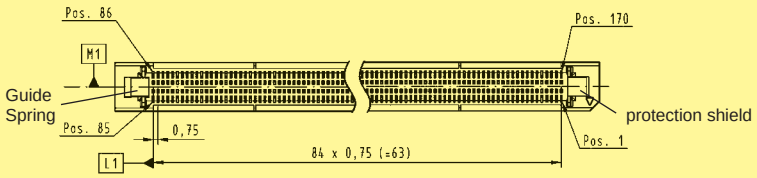
con:card+



Card edge connectors, straight

Identification	No. of contacts	Contact length [mm] termination side	Part number
AdvancedMC™ connectors for MicroTCA™			
with GuideSpring (I)	170	2.1	16 11 170 5202 000
with GuideSpring and protection shield (II)	170	2.1	16 11 170 5205 000
with GuideSpring and alignment peg (III)	170	2.1	16 11 170 5206 000
with GuideSpring, protection shield and alignment peg	170	2.1	16 11 170 5207 000



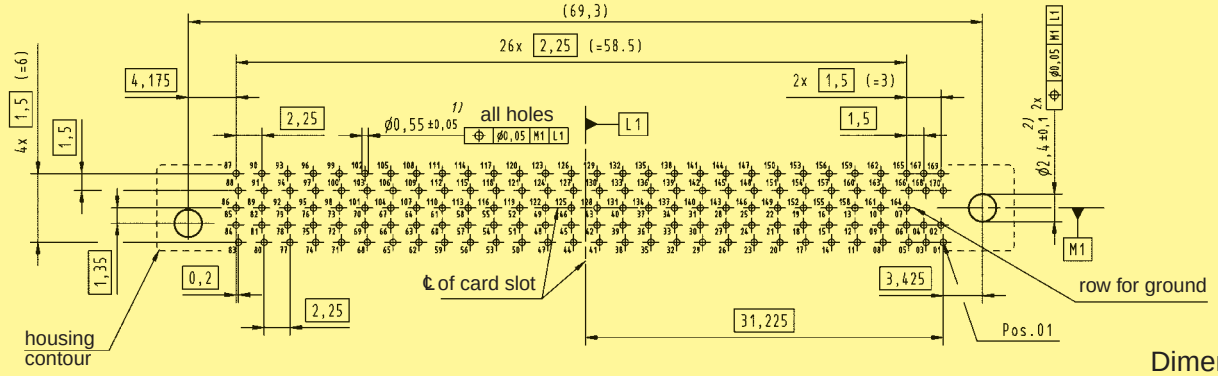


1) recommended plated through hole specification see page 12.12

2) non-metallized drillings
optional: for part numbers
16 11 170 5202 000 and 16 11 170 5205 000
mandatory: for part numbers
16 11 170 5206 000 and 16 11 170 5207 000

3) for optional fixing: use self-tapping screws for plastic, 2.2 x length
(length = PCB thickness + min. 6.5 mm to max. 10 mm)
e.g. HARTING part number 09 06 001 9974
Screwing torque references:
PCB + 6.5 mm: 20 cNm
PCB + 10 mm: 40 cNm

Board drillings (view magnified)



Dimensions [mm]

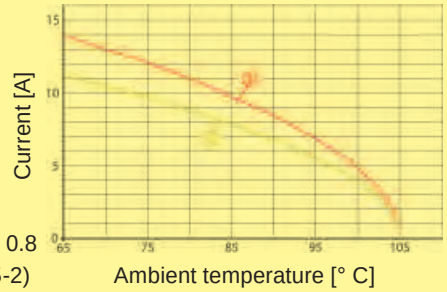
TCA

Technical characteristics

Design according	PICMG MTCA.0 R1.0 (RoHS compliance)
Total number of contacts	96
Power contacts	24
Signal contacts	72
Sequential contact engagement	
1st	Power 4–11
2nd	Power 1–3, power 12–24
3rd	Signal A2–H9
4th	Signal A1
Working current	
Power contacts	9.3 A @ 80 % derating acc. IEC 60512 and 70 °C ambient temperature and 30 °C temperature rise
Signal contacts	1 A @ 80 % derating acc. IEC 60512 and 70 °C ambient temperature
Initial contact resistance	
Power contacts	≤ 5 mΩ
Signal contacts	≤ 25 mΩ
Initial insulation resistance	≥ 100 MΩ min.
Temperature range	-55 °C … +105 °C
Durability	200 mating cycles
Termination technique	Press-in termination
Mating force	145 N max.
Withdrawal force	110 N max.

Derating for MicroTCA™ power contacts

Contact loading acc. MTCA.0



① Derating

② Derating @ $I_{max.}$ x 0.8 (acc. IEC 60512-5-2)

Materials

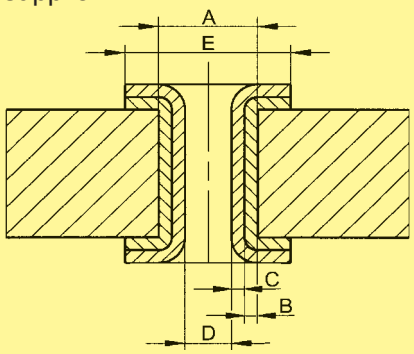
Moulded parts	PBT, glass-fibre filled, UL 94-V0
Contacts	Copper Alloy
Contact surface	
Power contacts:	selectively gold plated
Signal contacts:	selectively PD/Ni plated
Packaging	Tray packaging (other packaging on request)

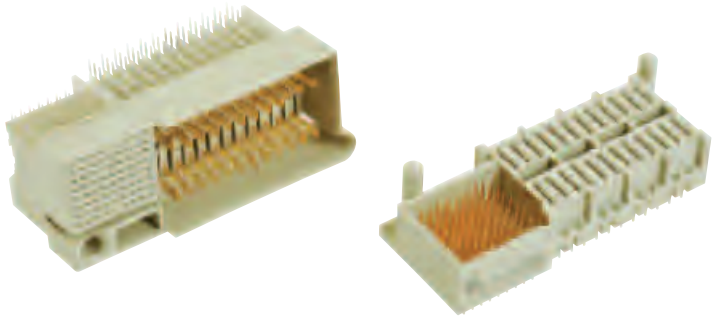
Recommended plated through hole specification

	A	Drill hole-Ø	$0.7^{\pm 0.02}$ mm
	B	Cu	25 - 35 µm
Tin plated PCB (HAL)	C	Sn	5 - 15 µm
	D	Hole-Ø	0.60 - 0.65 mm
Au / Ni plated PCB	C	Ni	3 - 7 µm
		Au	0.05 - 0.12 µm
	D	Hole-Ø	0.60 - 0.65 mm
Chemical tin plated PCB	C	Sn	0.8 - 1.5 µm
	D	Hole-Ø	0.60 - 0.65 mm
Silver plated PCB	C	Ag	0.1 - 0.3 µm
	D	Hole-Ø	0.60 - 0.65 mm
OSP copper plated PCB	C	---	---
	D	Hole-Ø	0.60 - 0.65 mm
	E	Pad size	min. 1.0 mm

The press-in zone of the MicroTCA™ power connector is tested according to Telcordia/Bellcore GR 1217CORE Part7. It is approved to be used with a plated through hole according IEC 60352-5 with a diameter of $0.60^{+0.05}$ mm (drilled hole $0.70^{\pm 0.02}$ mm).

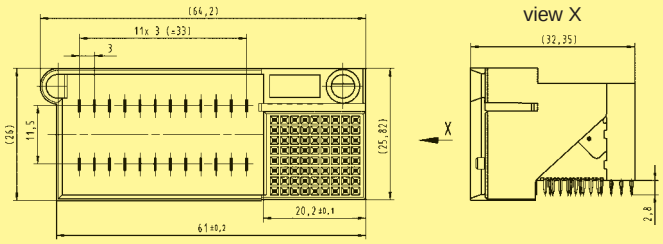
Based on our experiences regarding the production process of the PCB manufacturer we recommend a plated through hole configuration like shown in the above spreadsheet. To achieve the recommended plated through hole diameter, it is important to specify especially the drilled hole diameter of $0.70^{\pm 0.02}$ mm to your PCB supplier.



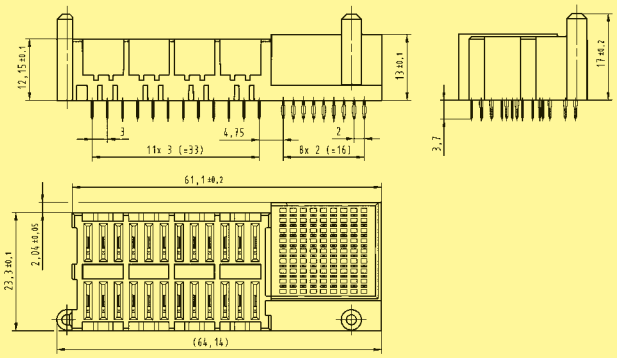


Identification	No. of contacts	Contact length [mm] termination side	Part number
Power output connectors for MicroTCA™			
module version	96	2.8	16 34 096 1101 000
backplane version	96	3.7	16 33 096 1201 000

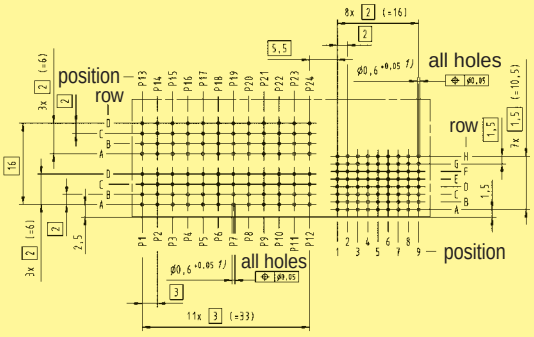
Module version

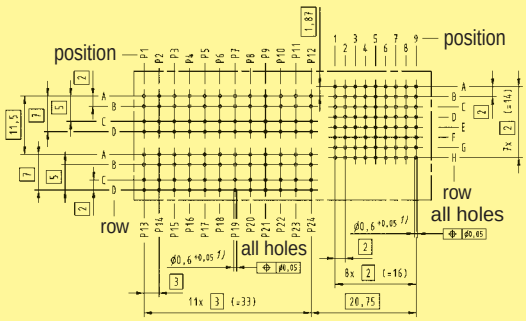


Backplane version



Board drillings



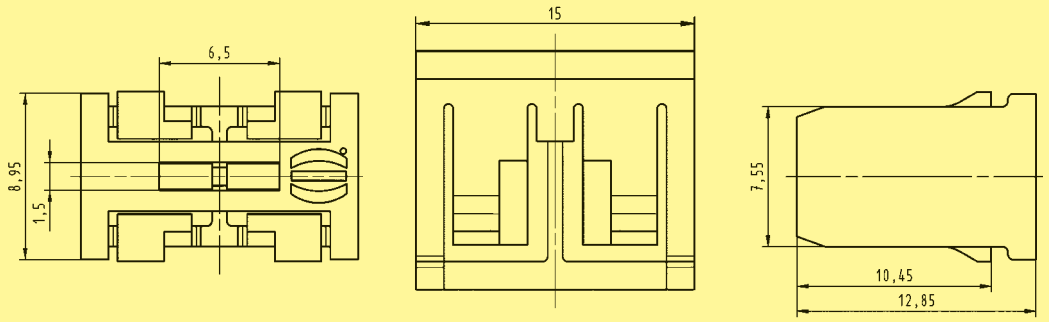


1) recommended plated through hole specification see page 12.14

Dimensions [mm]

Protection Block for MicroTCA™ backplanes

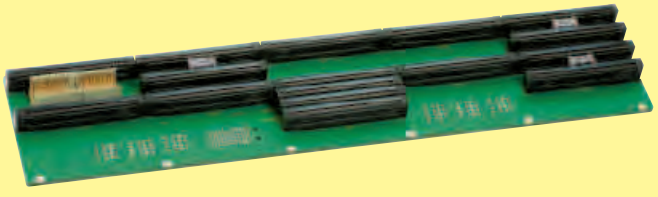
Identification	Part number
MicroTCA™ Protection Block	16 79 000 0010 000



The MicroTCA™ specification defines modules with the option of multiple mating interfaces like the MCH module for system management and switching. There are four different pitches defined for the module interfaces and the backplane connectors respectively, the basic unit is called horizontal pitch (HP) and is 5.08 mm (0.2 inch).

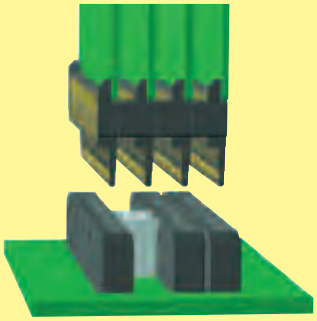
Compact-Size	3 HP	15.24 mm
Mid-Size	4 HP	20.32 mm
Full-Size	6 HP	30.48 mm
MCH	1.5 HP	7.62 mm

Any MCH (or other multiple mating interface modules) with more than two mating interfaces (2x MCH-pitch 1.5 HP = Compact-Size pitch 3 HP) could unintentional mate with connectors of the adjacent slot or could be plugged into the wrong slot. Even though the pin-assignment and e-keying for the MCH is defined, it can cause system failures or even destroy hardware if a MCH is inserted into two adjacent AMC Compact-Size slots. For other multiple mating interface modules, this situation is even worse, because neither e-keying nor pin assignment is specified in MTCA.0.



MicroTCA™ backplane with protection blocks

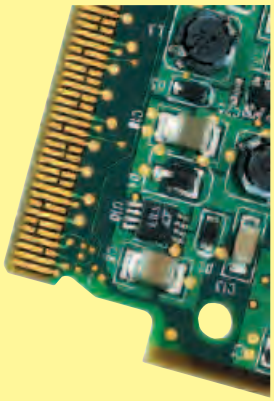
To prevent errors in case of misinsertion, MTCA.0 R1.0 chapter 2.13 outlines protection blocks that occupy the space between two adjacent connectors in a Compact-Size slot. Furthermore this protection block can be used for keying functions of multiple mating interface modules.



The free space between the backplane connectors is occupied by the protection block

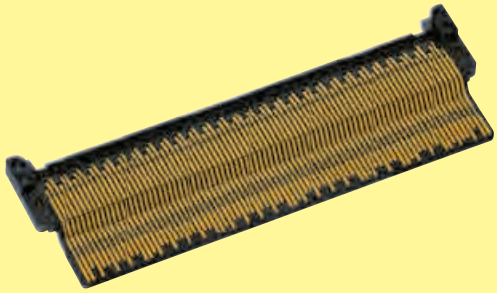
HARTING designed a protection block fully independent of the backplane and sub rack design. The HARTING protection block is clipped between two connectors, hence no fixing features (holes, clips...) need to be designed into the backplane or the sub rack mechanics. The assembly is done quick and easy by hand. It can even be installed easily after the backplane is mounted with a simple flat-head screwdriver, an easy removal is possible in a similar way. The keying block can be placed into four different positions, hence a keying of multitongue modules by using tongues with a cutout is possible.

The PICMG specification AMC.0 defined a card edge with gold pads as the mating interface for the AdvancedMC™ module. As already explained in the chapter "**con:**card**+**", it is very difficult for a PCB manufacturer to produce the tight tolerances required for the AdvancedMC™ module card edge in a consistent process. Furthermore, the quality of the gold pads is only specified in general terms.



Replacing the PCB gold pads with a connector eliminates certain drawbacks of the card edge connection. The HARTING Plug Connector offers the following advantages:

- **Controlled quality of both mating sides**
- **Small dimensional tolerances**
- **Defined hard gold surface**
- **Reduced mating forces**
- **Allows use of thicker PCBs**
- **Standard reflow solder process**
- **Cost savings are possible**



Controlled quality of both mating sides
The major advantage is that a solid contact with a band plated surface mates with the backplane connector. The connection is no longer made directly from the card edge to the backplane connector but instead indirectly via a module connector approved from one source. The AdvancedMC™ module with a Plug Connector is still within the dimensional range of the PICMG AMC.0 specification and is fully mating compatible with AdvancedMC™ card edge connectors. Consequently the Plug Connector can be used in both MicroTCA™ and ATCA® environments.

Small dimensional tolerances
The injection moulding process is much more precise than the PCB production process. While the AMC.0 specification defines a PCB width tolerance of 0.1 mm, the moulding process has a dimensional tolerance less than 0.03 mm. The lead-in chamfer is milled for the PCB but is realized in the connector as a smooth moulded plastic chamfer. Compared with the rough surface of a PCB chamfer with exposed glass fibre, the smooth Plug chamfer avoids abrasion of the backplane connector contact surface.

Defined hard gold surface
The AMC.0 specification defines hard gold to be on the PCB pads. However a common and unique definition of hard gold does not exist today. Additionally, the interruptions of the gold pads (which are necessary for the hot-swap ability) require a selective hard gold process. This is a complex process which is relatively expensive, so commonly just chemical gold with insufficient surface thickness is used. As a result, there are significant differences in the durability of the gold and the surface structure on the modules which are currently available.
The contacts of the HARTING AdvancedMC™ Plug Connector are plated all-around and are manufactured in a defined band plating process with controlled quality. There are different performance levels possible as the noble finish thickness can be adapted easily to meet customer demands.

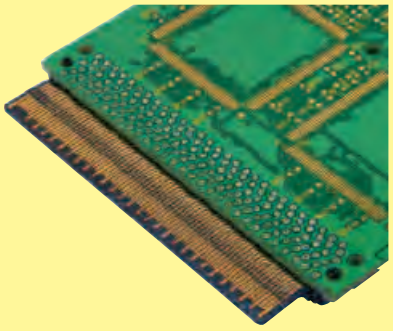
Reduced mating forces
For the module card edge, the prepads of lagging contacts are required by the Telcordia/Bellcore specification to avoid stress of the connector contact when sliding on the FR4 base material. The Plug Connector does not need prepads. The four mating steps are realized with true lagging contacts. The sophisticated design of the insulator reduces the mating forces of the module significantly.

Allows use of thicker PCBs
By using a HARTING AdvancedMC™ Plug Connector, the mating interface of the module is defined by the connector instead of the PCB. This fact leads to clear advantages and provides a wider scope for the module development. The restriction of the PCB thickness of 1.6 mm +/-10% is no longer a limiting factor. A PCB

thickness of e.g. 2 mm can be used as this fits in the mechanical environment.

Standard reflow solder process

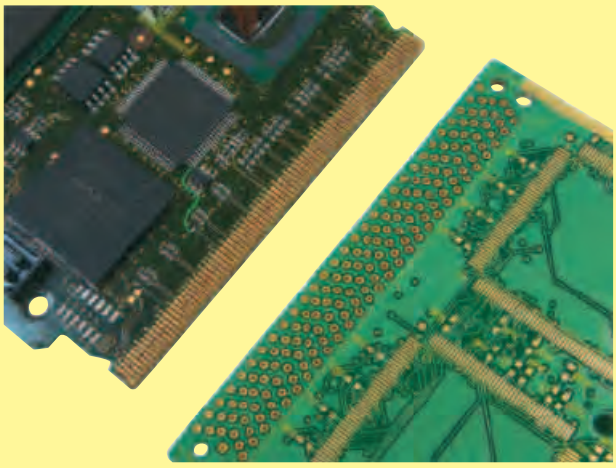
For backplanes press-fit termination is the first choice, however solder termination offers advantages for module cards. The Plug Connector is mounted to the PCB through “pin-in-hole-reflow” solder technology (PIHR). It can be soldered in the same production process as the other semi finished components on the AdvancedMC™ module. Optionally, the Plug Connector can be delivered with a pick-and-place-pad for automatic assembly.



Another advantage of this mechanically stable technology is, that the connector can be replaced. This can avoid the cost of scrapping a module if the mating interface is damaged during handling.

Cost savings are possible

By offering so many different advantages during the manufacturing process, the use of HARTING Plug Connectors also contributes to keeping costs down. Selective plating increases the cost of producing gold pads. Tight tolerance specifications also cause a large number of rejects. The beveled PCB edge is another critical area, because damage can occur to the contact pads.



A simple board layout with through-holes is sufficient for the HARTING Plug, and these boards can be produced inexpensively and with excellent quality control, thus reducing the number of rejects. Furthermore the cost of a reject can be high if a defective PCB edge is not detected until the board is populated with expensive components. A HARTING Plug on a module can be replaced easily, reducing scrapping costs.

Mounting direction

The HARTING Plug Connector is available in two versions. The difference is the mounting direction, i. e. the side of the AdvancedMC™ module PCB on which the Plug Connector is assembled.

Basic side

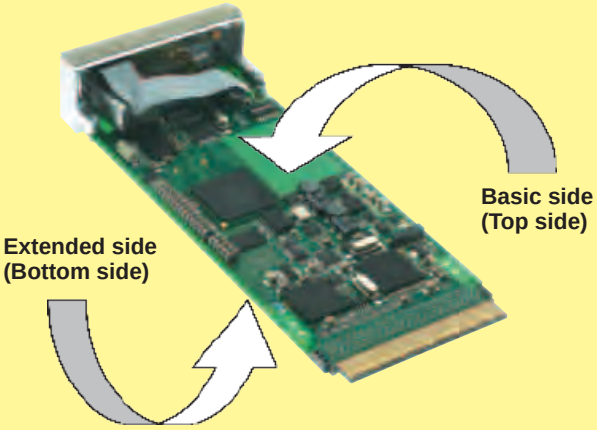
The so called basic side refers to the component side 1 as defined in the AMC.0 specification (pins 1 to 85). The main components are mounted on the basic side (sometimes also called top side).

During the manufacturing process, a Plug Connector that is mounted from the basic side can be soldered in the same assembly step as the other large components.

Extended side

The so called extended side refers to the component side 2 as defined in the AMC.0 specification (pins 86 to 170).

A Plug Connector mounted on the extended side is “hanging” at the bottom side of the AdvancedMC™ module.



This picture shows an AdvancedMC™ module with a Plug Connector mounted on the extended side.

The footprint of a Plug Connector for the basic side is different than that for the extended side. The connectors are not interchangeable. Due to advantages in the assembly of the connector, the basic side version is preferable.

For an MCH stack, only connectors having the same mounting direction can be stacked.

Design according	PICMG MicroTCA.0 R1.0 PICMG AMC.0 R2.0 (RoHS compliance)
Number of contacts	170
Contact spacing	0.75 mm
Clearance and creepage distance between contacts	0.1 mm min.
Working current of power contacts as defined in AMC.0 spec., tested with HARTING MicroTCA™ backplane connector	~ 2.4 A @ 70 °C max. 30 °C temp. rise (PICMG requirement min. 1.52 A)
Test voltage	80 $V_{r.m.s.}$
Working voltage typically	3.3 V; 5.0 V; 12.0 V
Initial contact resistance	25 mΩ max.
Initial insulation resistance	100 MΩ min.
Nominal differential impedance	100 Ω ± 10 %

Max. crosstalk @ 25 ps risetime	Bottom route
Adjacent	0.5 %
Basic-to-extended (diagonal)	0.2 %
Basic-to-extended (opposite)	0.7 %
Multiline (five multi-aggressor differential pairs)	2.1 % max.

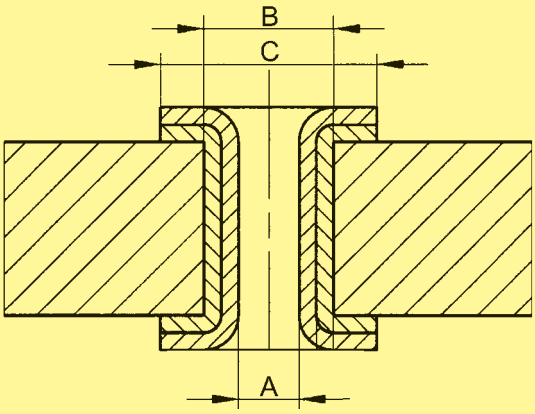
Propagation delay	
Long contact side:	152 ps / 147 ps
Short contact side:	121 ps / 129 ps
Skew within differential pairs	
Long contact side:	5 ps
Short contact side:	8 ps

Temperature range during reflow soldering	-55 °C … +105 °C 220 °C for 2 minutes 270 °C max. short-term
Durability as per AMC.0 specification	200 mating cycles in total
Termination technique	Solder termination (Pin in Hole Intrusive Reflow)
Pick-and-place-weight	< 7 g
Mating force	100 N max., typically 40 - 70 N (depending on backplane connector)
Withdrawal force	65 N max., typically 30 - 50 N (depending on backplane connector)

The mating and withdrawal force is highly depending on the mating half connector, but typically only 50 % to 70 % of the mating force of a PCB card edge.

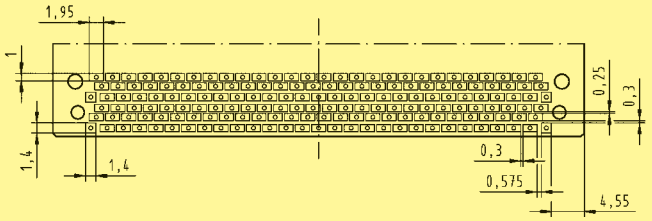
Materials

Moulded parts	Liquid Crystal Polymer (LCP), UL 94-V0
Contacts	Copper alloy
Contact surface	Au over Ni
Packaging	Tray packaging (other packaging on request)



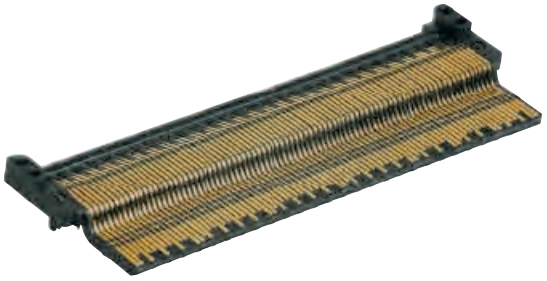
Plated through hole recommendations		
A	Plated hole-Ø	$0.55^{\pm 0.05}$ mm
B	Drill hole-Ø	$0.65^{\pm 0.01}$ mm
C	Pad size	0.95 mm

Stencil recommendation (for basic side mounting)



Each termination requires a solder paste volume of 0.5 mm³. Since the stencil can only provide fractions of this volume (0.29 mm³ at 0.15 mm stencil thickness), the remaining solder paste must be pressed into the plated through hole. For a nominal AMC card (1.6 mm PCB thickness, 0.55 mm plated hole diameter) the paste must penetrate the hole by 0.9 mm.

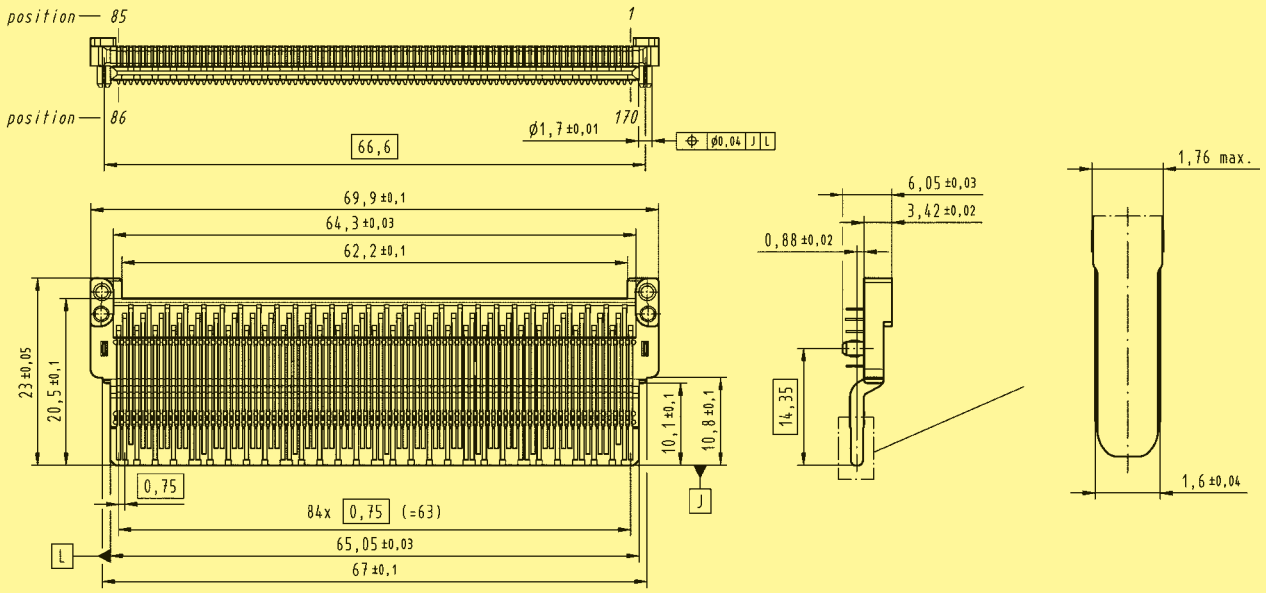
Plug Connector for AdvancedMC™ modules



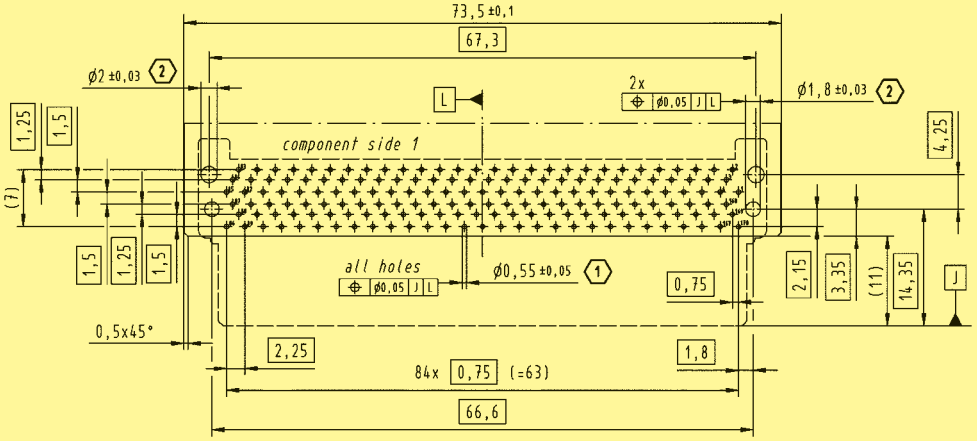
For mounting on basic side

Identification	No. of contacts	Part number
AdvancedMC™ Plug Connector for basic side mounting	170	16 23 170 1301 000
AdvancedMC™ Plug Connector for basic side mounting with nozzle pad for pick and place assembly	170	16 23 170 1302 000

AdvancedMC™ Plug Connector for basic side mounting



Board drillings (view of the basic side / component side 1)

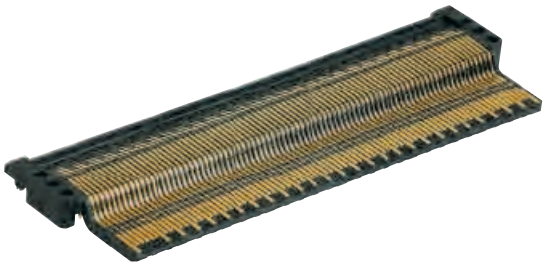


(1) plated holes

(2) non-metallized drillings

Dimensions [mm]

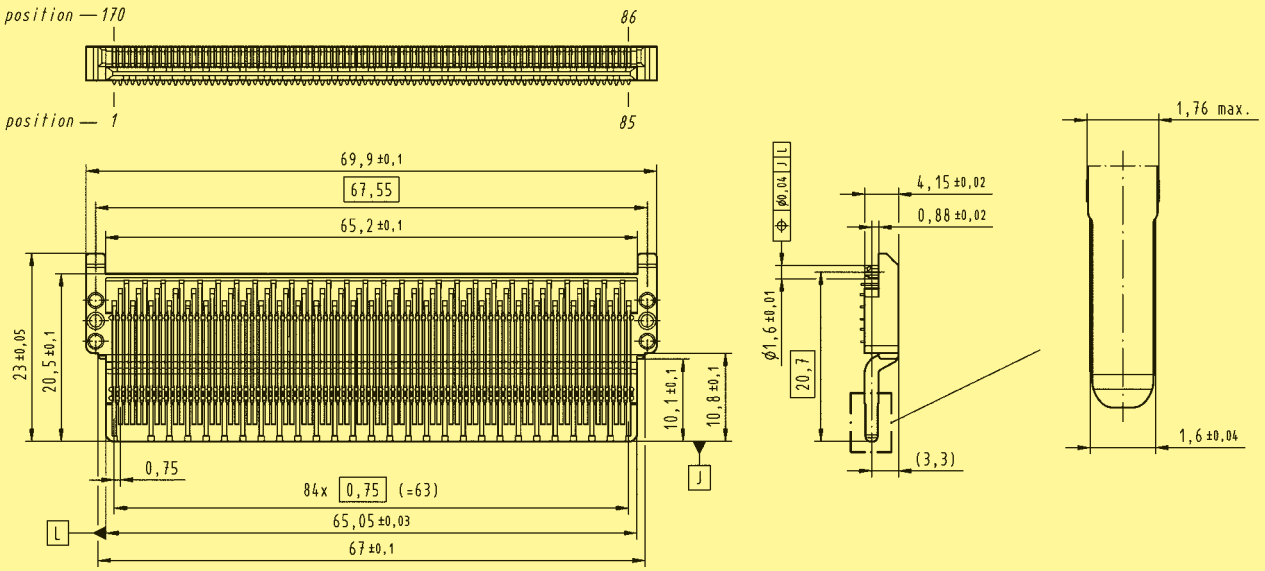
Plug Connector for AdvancedMC™ modules



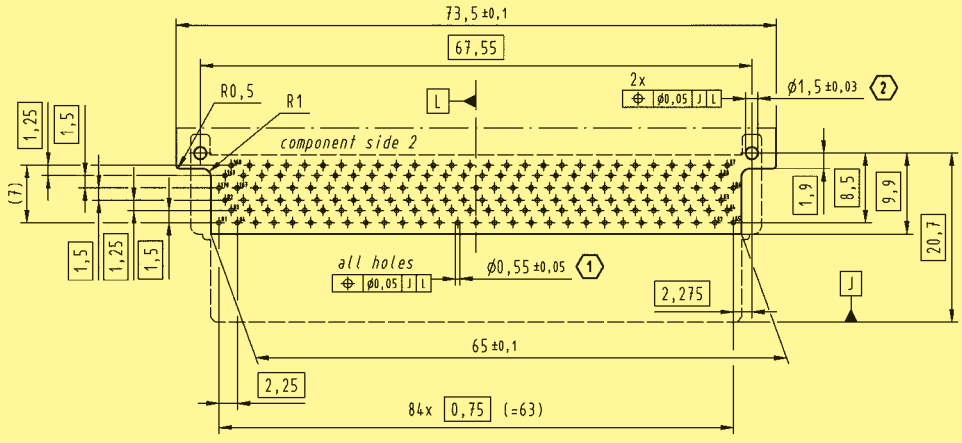
For mounting on extended side

Identification	No. of contacts	Part number
AdvancedMC™ Plug Connector for extended side mounting replacement of former part number 16 21 170 1301 000	170	16 21 170 1303 000
AdvancedMC™ Plug Connector for extended side mounting with nozzle pad for pick and place assembly replacement of former part number 16 21 170 1302 000	170	16 21 170 1304 000

AdvancedMC™ Plug Connector for extended side mounting



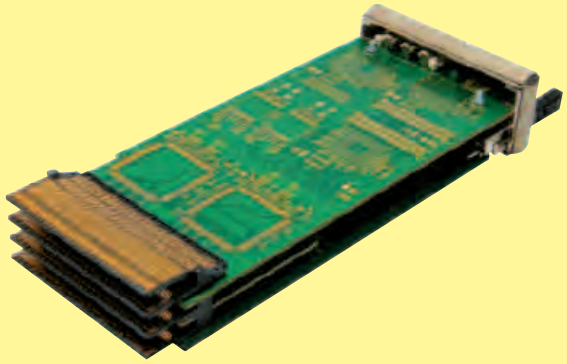
Board drillings (view of the extended side / component side 2)



Dimensions [mm]

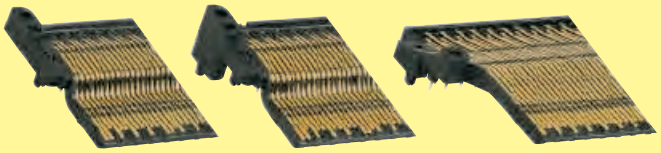
TCA

An important component of a MicroTCA™ system is the “MicroTCA™ Carrier Hub”, abbreviated MCH. The main functions of an MCH module are hardware platform management and the management of the fabric connectivity. Since the MCH module requires many more connections than a standard AdvancedMC™ module, an MCH may have up to 4 mating tongues each with 170 contacts.



The MTCA.0 specification recommends the use of a special Plug Connector to reduce the insertion force of the module and to solve the tolerance stack-up problem between the multiple tongues and the backplane connectors.

The HARTING Plug Connector system consists of three different Plug Connectors. The **AdvancedMC™ Plug** is required for an MCH module and is always used in the MCH1-slot. Furthermore it can be used for any conventional AdvancedMC™ module to replace the pcb gold pads.

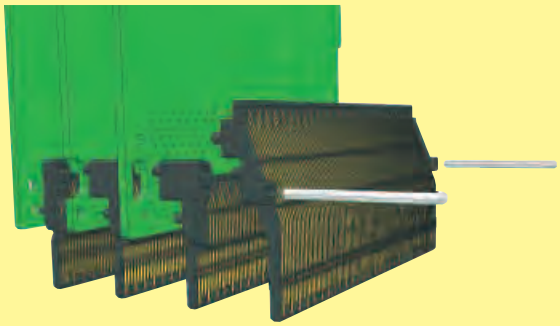


AdvancedMC™ Plug, MCH Plug, Piggyback Plug

If more than one mating tongue is needed, the **MCH Plug Connector** is mated with the backplane MCH connectors 2 and 3 depending on the MicroTCA™ configuration. Compared to the AdvancedMC™ Plug, the MCH Plug insulator has standoffs ensuring the correct distance for the slot width between two tongues or backplane connectors respectively. The MCH and AdvancedMC™ Plugs have different contact staggering on the basic side, the extended side is equal.

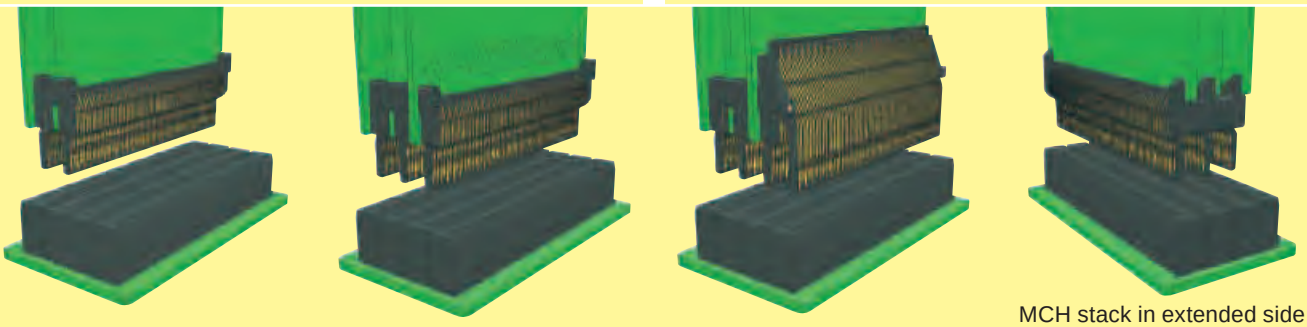
The **Piggyback Plug Connector** is designed for the MCH4 slot, but the connector itself is soldered on the PCB3. For a MicroTCA™ system with more than 6 AdvancedMC™ modules using the switched fabric fat pipe, an MCH module with 4 mating tongues must be used. In general the switched fabric is located only on the PCB3, so a high-speed connection is needed between the MCH4 slot and the PCB3.

To build a connector stack for two, three or four mating tongues, the HARTING Plug Connectors are mounted like building blocks via pegs and the holes on the adjacent Plugs. For additional mechanical stability, the connector stack is fixed using metal stacking pins. The complete connector stack can be installed easily without any special tooling.



Exploded view of an MCH stack with four tongues including Piggyback Plug

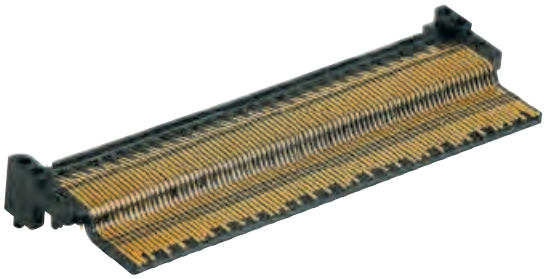
As with the AdvancedMC™ Plug, HARTING offers the Plug Connectors for MCH modules in versions for basic side or extended side mounting. Only connectors with the same mounting direction can be stacked together. The Piggyback Plug is only available as basic side version, therefore for a MCH module with four tongues, the basic side version is preferred.



MCH stacks in basic side version with 2, 3 and 4 tongues

MCH stack in extended side version

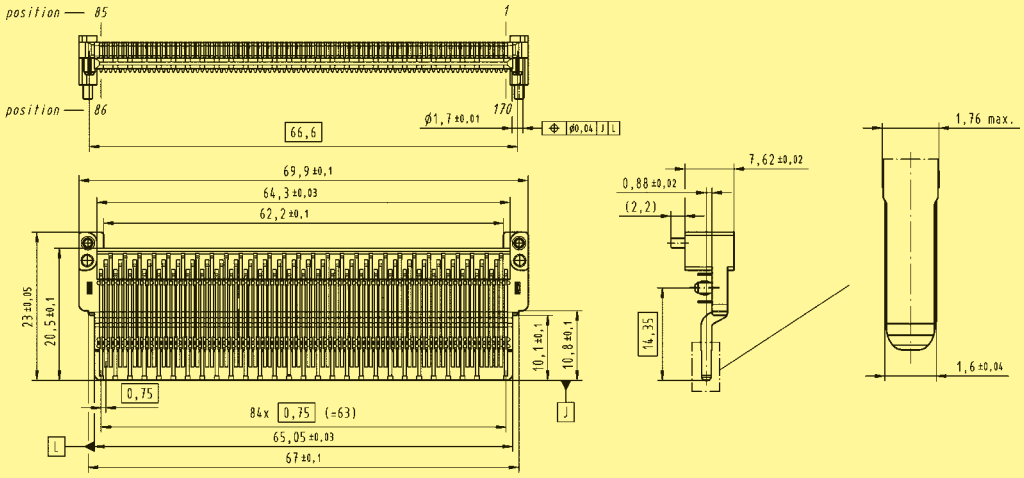
Plug Connectors for MCH modules



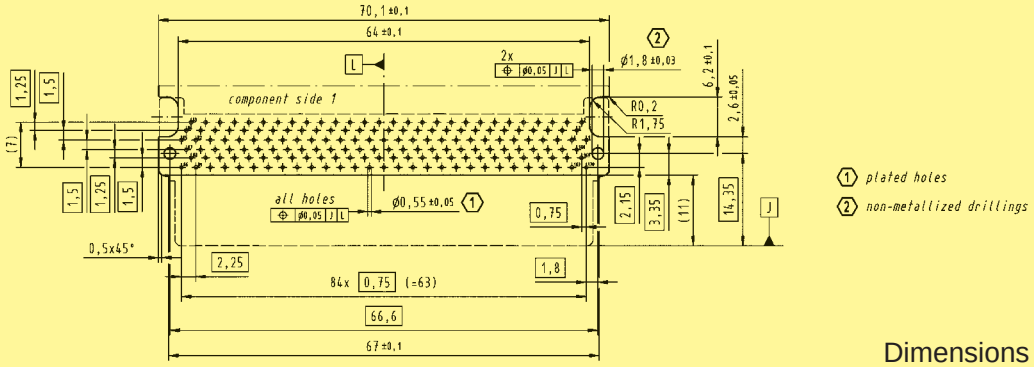
For mounting on basic side

Identification	No. of contacts	Part number
AdvancedMC™ Plug Connector for basic side mounting	170	16 23 170 1301 000
AdvancedMC™ Plug Connector for basic side mounting with nozzle pad for pick and place assembly	170	16 23 170 1302 000
MCH Plug Connector for basic side mounting	170	16 24 170 1301 000
MCH Plug Connector for basic side mounting with nozzle pad for pick and place assembly	170	16 24 170 1302 000
AdvancedMC™ – MCH Plug stacking-pin for basic side mounting		
double length (for two stacked plugs) 11 mm		16 79 000 0017 000
triple length (for three stacked plugs) 18.5 mm		16 79 000 0019 000
quad length (for four stacked plugs) 22.5 mm		16 79 000 0020 000

MCH Plug Connector
for basic side mounting

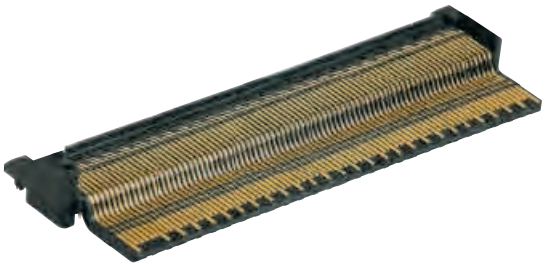


Board drillings
(view of the
basic side /
component side 1)



Dimensions [mm]

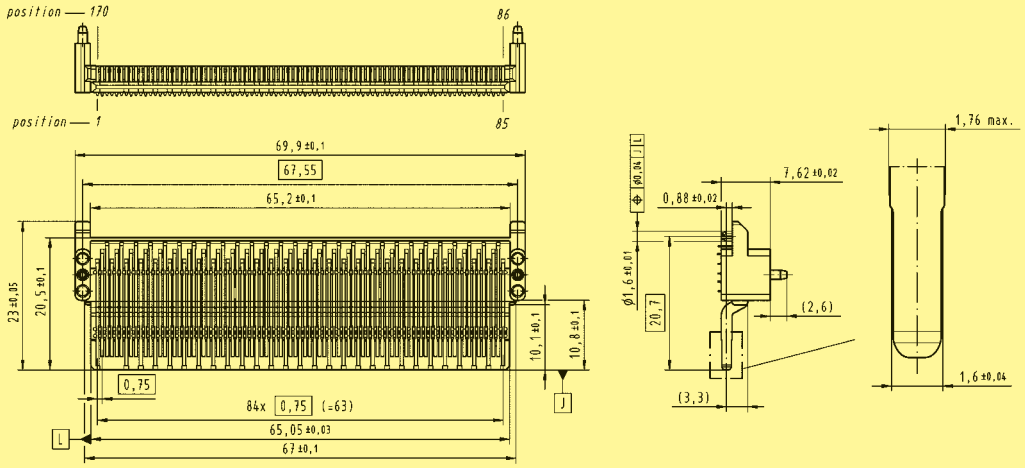
Dimensions for AdvancedMC™ Plug Connector for basic side mounting see page 12.20.



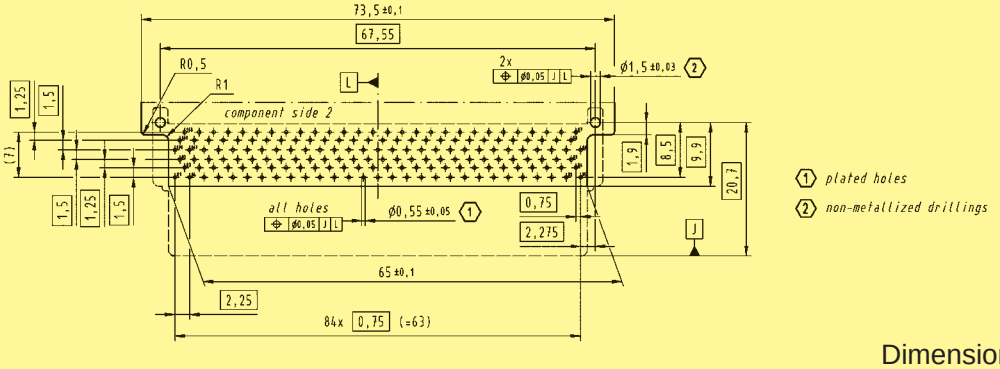
For mounting on extended side

Identification	No. of contacts	Part number
AdvancedMC™ Plug Connector for extended side mounting replacement of former part number 16 21 170 1301 000	170	16 21 170 1303 000
AdvancedMC™ Plug Connector for extended side mounting with nozzle pad for pick and place assembly replacement of former part number 16 21 170 1302 000	170	16 21 170 1304 000
MCH Plug Connector for extended side mounting replacement of former part number 16 22 170 1301 000	170	16 22 170 1303 000
MCH Plug Connector for extended side mounting with nozzle pad for pick and place assembly replacement of former part number 16 22 170 1302 000	170	16 22 170 1304 000
AdvancedMC™ – MCH Plug stacking-pin for extended side mounting		
double length (for two stacked plugs) 11.5 mm		16 79 000 0006 000
triple length (for three stacked plugs) 19 mm		16 79 000 0007 000
quad length (for four stacked plugs) 26.5 mm		16 79 000 0008 000

MCH Plug Connector
for extended side mounting

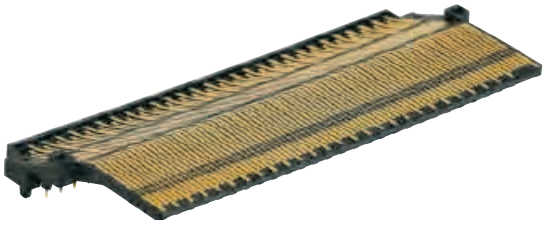


Board drillings
(view of the
extended side /
component side 2)



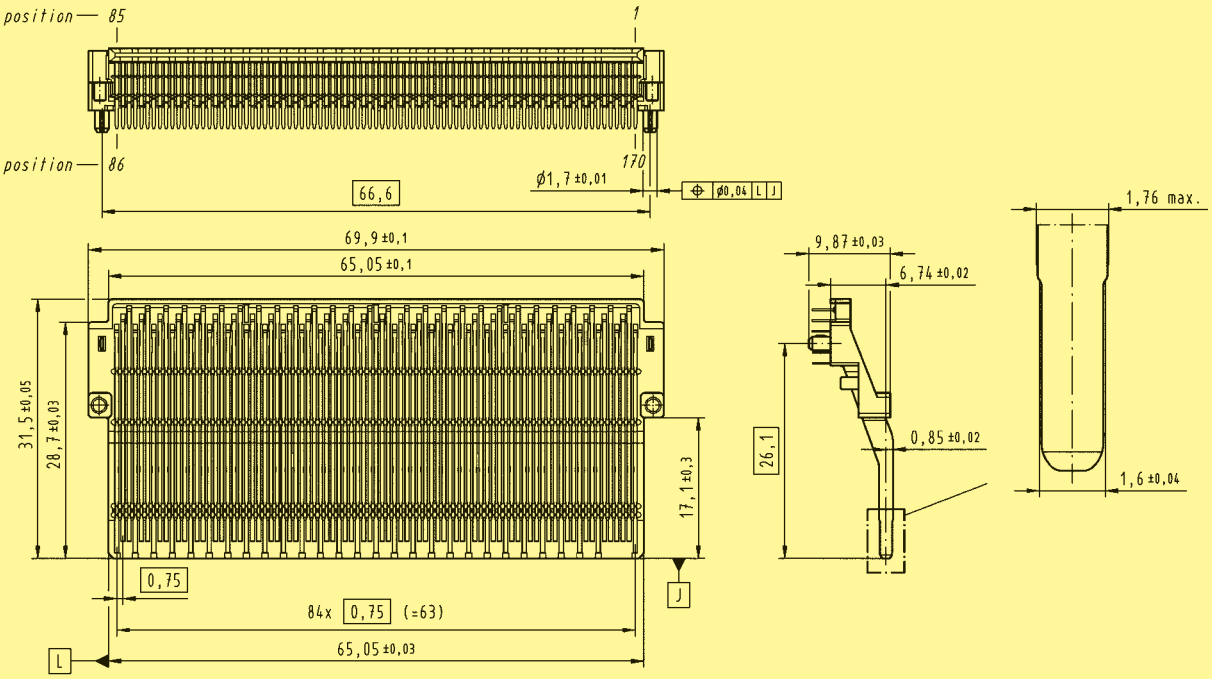
Dimensions [mm]

Dimensions for AdvancedMC™ Plug Connector for extended side mounting see page 12.21.

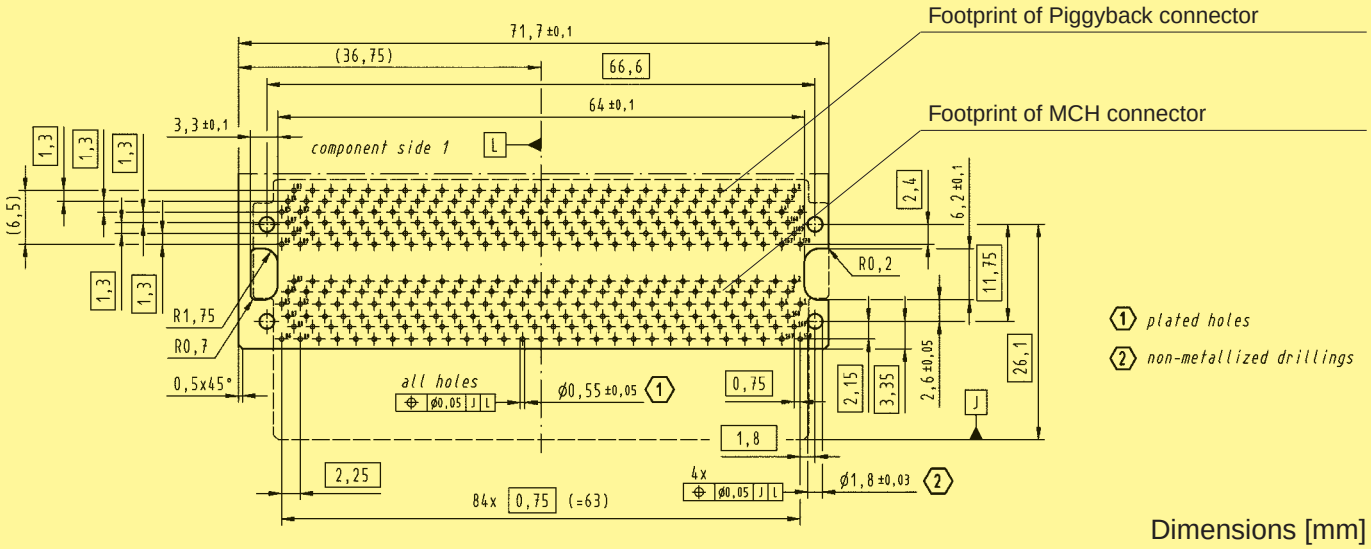


Identification	No. of contacts	Part number
MCH Piggyback Plug Connector applicable only in basic side mounting configuration	170	16 25 170 1301 000

MCH Piggyback Plug Connector



Board drillings (view of the basic side / component side 1)



Dimensions [mm]

TCA