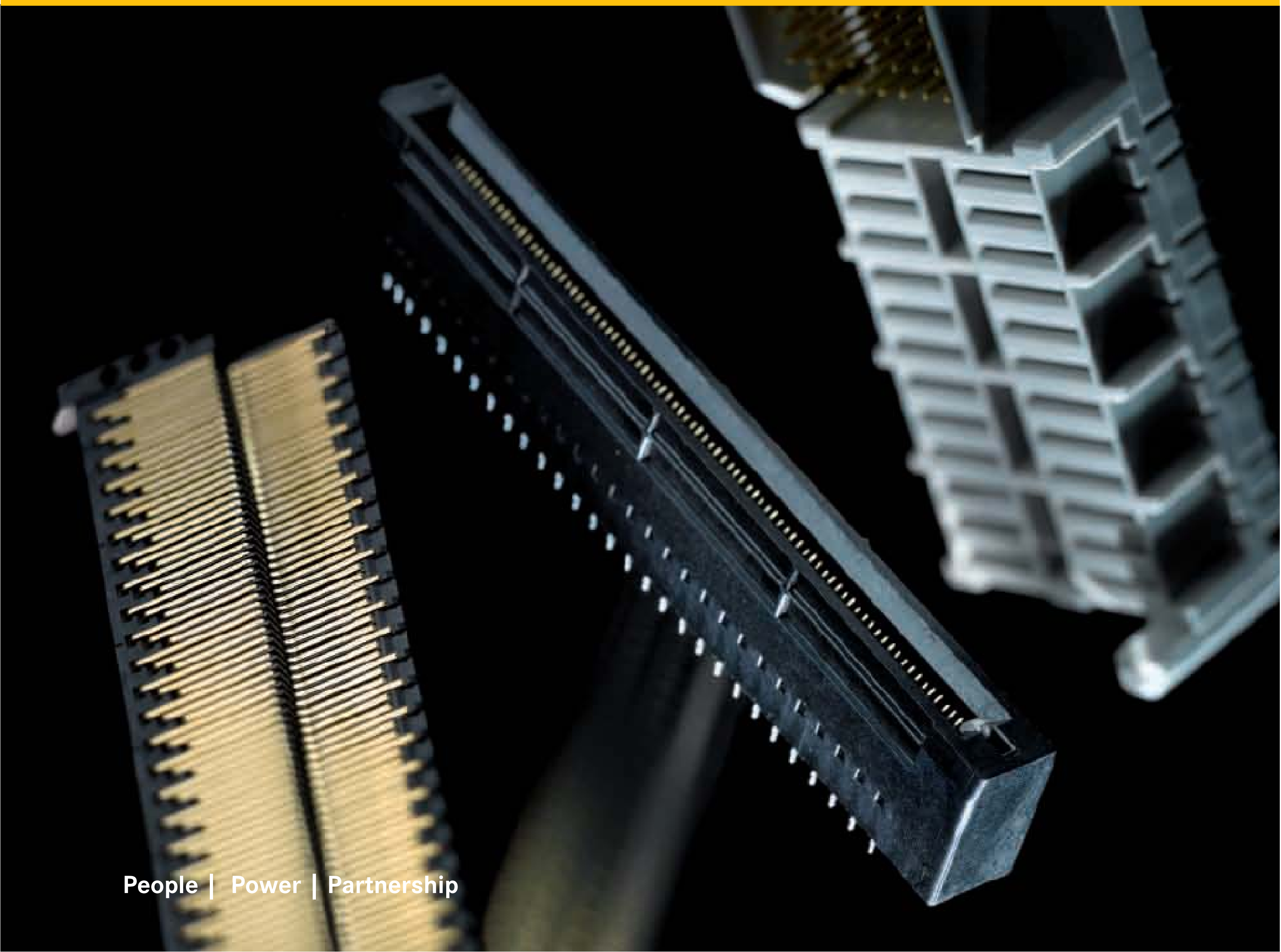
35 3

Pushing Performance

Automatic Systems

HARTING TCA Connectors



People | Power | Partnership

Transforming customer wishes into concrete solutions

Headquartered in Espelkamp in East Westphalia, Germany, the HARTING Technology Group develops tailored solutions and products revolving around electrical and electronic connector technologies. These offerings focus on power and data transmission applications, as well as on network solutions. Founded in 1945 in Minden, HARTING is currently employing a workforce of more than 3000 members of staff worldwide.
In today's increasingly knowledge and information shaped societies, the capability to network and integrate with customers and suppliers, as well as technology and business partners is playing the decisive role.
And this applies to national as well as international levels. With 40 Subsidiary companies and Representatives in 27 countries, HARTING is committed to maintaining close proximity to markets and customers. Always at hand on location, HARTING is able to rapidly record market impulses and respond flexibly.

ALWAYS AT HAND, WHEREVER OUR CUSTOMERS MAY BE.

Increasing industrialization is creating growing markets characterized by widely diverging demands and requirements. The search for perfection, increasingly efficient processes and reliable technologies is a common factor in all sectors across the globe. HARTING is providing these technologies – in Europe, America and Asia. The HARTING professionals at our international subsidiaries engage in close, partnership based interaction with our customers, right from the very early product development phases, in order to realize customer demands and requirements in the best possible manner.

Our people on location form the interface to the centrally coordinated development and production departments. In this way, our customers can rely on consistently high, superior product quality – worldwide.

OUR CLAIM: PUSHING PERFORMANCE.

HARTING provides more than optimally attuned components. In order to serve our customers with the best possible solutions, HARTING is able to contribute a great deal more and play a closely integrative role in the value creation process.

From ready assembled cables through to control racks or ready-to-go control desks: Our aim is to generate the maximum benefits for our customers – without compromise!

QUALITY CREATES RELIABILITY – AND WARRANTS TRUST.

The HARTING brand stands for superior quality and reliability – worldwide. The standards we set are the result of consistent, stringent quality management that is subject to regular certifications and audits.

EN ISO 9001, the EU Eco-Audit and ISO 14001:2004 are key elements here. We take a proactive stance to new requirements, which is why HARTING ranks among the first companies worldwide to have obtained the new IRIS quality certificate for rail vehicles.

WE ASPIRE TO TOP PERFORMANCE.

Connectors ensure functionality. As core elements of electrical and optical wiring, connection and infrastructure technologies, they are essential in enabling the modular construction of devices, machines and systems across a very wide range of industrial applications. Their reliability is a crucial factor guaranteeing smooth functioning in the manufacturing area, in telecommunications, applications in medical technology – in fact, connectors are at work in virtually every conceivable application area. Thanks to the consistent further development of our technologies, customers enjoy investment security and benefit from durable, long term functionality.

HARTING TECHNOLOGY CREATES ADDED VALUE FOR CUSTOMERS.

Technologies by HARTING are at work worldwide. HARTING's presence stands for smoothly functioning systems, powered by intelligent connectors, smart infrastructure solutions and mature network systems. In the course of many years of close, trust-based cooperation with its customers, the HARTING Technology Group has advanced to one of the worldwide leading specialists for connector technology. Extending beyond the basic functionalities demanded, we offer individual customers specific and innovative solutions. These tailored solutions deliver sustained effects, provide investment security and enable customers to achieve strong added value.

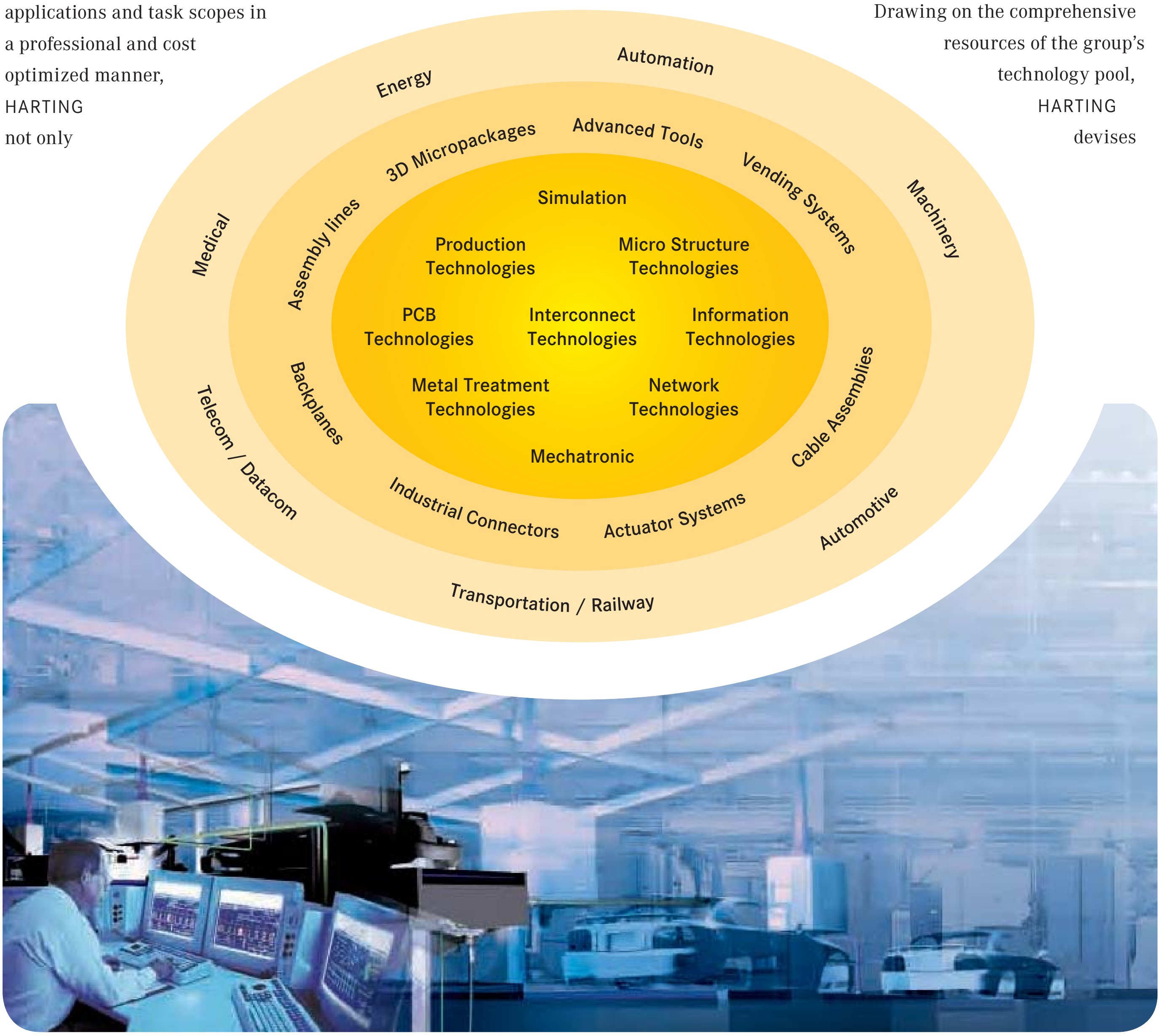
OPTING FOR HARTING OPENS UP AN INNOVATIVE, COMPLEX WORLD OF CONCEPTS AND IDEAS.

In order to develop connectivity and network solutions serving an exceptionally wide range of connector applications and task scopes in a professional and cost optimized manner, HARTING not only commands the full array of conventional tools and basic technologies. Over and beyond these capabilities, HARTING is constantly harnessing and refining its broad base of knowledge and experience to create new solutions that ensure continuity at the same time. In securing this know-how lead, HARTING draws on a wealth of sources from both in-house research and the world of applications alike.

Salient examples of these sources of innovative knowledge include microstructure technologies, 3D design and construction technology, as well as high temperature or ultrahigh frequency applications that are finding use in telecommunications or automation networks, in the automotive industry, or in industrial sensor and actuator applications, RFID and wireless technologies, in addition to packaging and housing made of plastics, aluminum or stainless steel.

HARTING SOLUTIONS EXTEND ACROSS TECHNOLOGY BOUNDARIES.

Drawing on the comprehensive resources of the group's technology pool, HARTING devises



practical solutions for its customers. Whether this involves industrial networks for manufacturing automation, or hybrid interface solutions for wireless telecommunication infrastructures, 3D circuit carriers with microstructures, or cable assemblies for high-temperature applications in the automotive industry - HARTING technologies offer far more than components, and represent mature, comprehensive solutions attuned to individual customer requirements and wishes. The range covers ready-to-use cable configurations, completely assembled backplanes and board system carriers, as well as fully wired and tested control panels.

In order to ensure the future proof design of RF- and EMC-compatible interface solutions, the central HARTING laboratory (certified to EN 45001) provides simulation tools, as well as experimental, testing and diagnostics facilities all the way through to scanning electron microscopes. In the selection of materials and processes, lifecycle and environmental aspects play a key role, in addition to product and process capability considerations.

HARTING KNOWLEDGE IS PRACTICAL KNOW-HOW GENERATING SYNERGY EFFECTS.

HARTING commands decades of experience with regard to the applications conditions of connectors in telecommunications, computer and network technologies and medical technologies, as well as industrial automation technologies, such as the mechanical engineering and plant engineering areas, in addition to the power generation industry or the transportation sector. HARTING is highly conversant with the specific application areas in all of these technology fields.

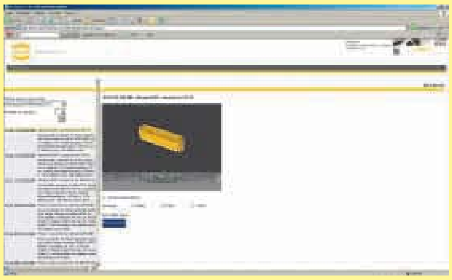
The key focus is on applications in every solution approach. In this context, uncompromising, superior quality is our hallmark. Every new solution found will invariably flow back into the HARTING technology pool, thereby enriching our resources. And every new solution we go on to create will draw on this wealth of resources in order to optimize each and every individual solution. In this way, HARTING is synergy in action.

HARKIS® is the abbreviation for **HAR**TING-**K**atalog-**I**nformations-**S**ystem (HARTING catalogue information system).

HARKIS® is an electronic catalogue with part configuration and 3D components library. Here you can choose a connector according to your demands. Afterwards you are able to send your inquiry created with the listed parts. The drawings to every single part are available in PDF-format. The parts are downloadable in 2D-format (DXF) and 3D-format (IGES, STEP). The 3D-models can be viewed with a VRML-viewer.

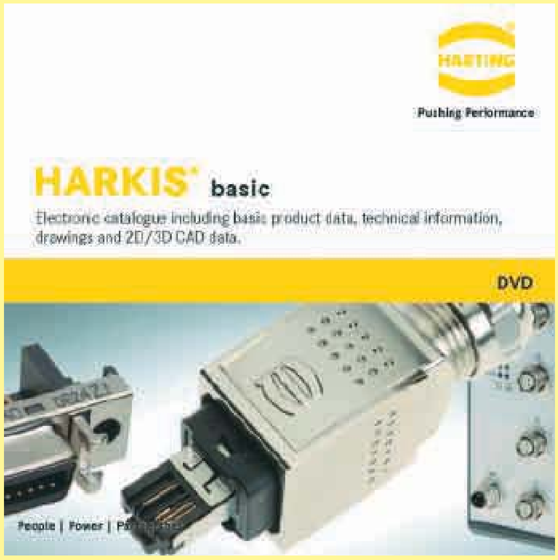
You can find ***HARKIS***® at **www.HARKIS.HARTING.com**. It is also available on CD-Rom and DVD.

Piece part consulting



CAD library

Identification	Part number
HARKIS® CD-ROM Basic product catalogue	98 40 000 0401
HARKIS® DVD Basic product catalogue 2D and 3D CAD files inclusive	98 40 000 0405



General information

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

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

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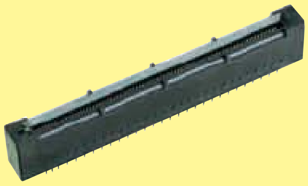
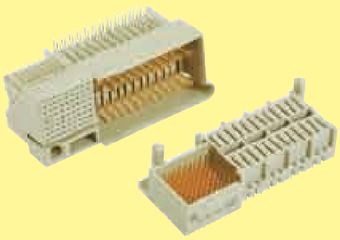
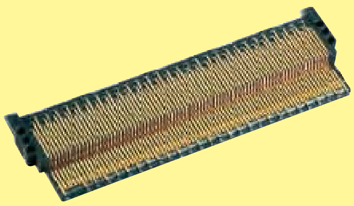
TCA connectors







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.

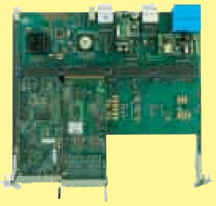
Initially, many blades were designed with a fixed functionality, and they had to be replaced once their functionality became obsolete or the demands of the system changed. With the continuation of exponential technological growth, concept proved to be a costly endeavour for the end-user.

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.



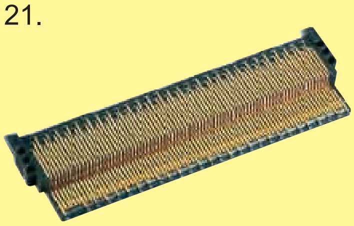
AdvancedTCA® carrier board with AdvancedMC™ modules

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 (see page 26).

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 21.



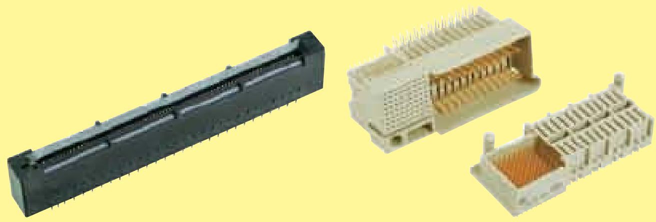
µTCA™

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.

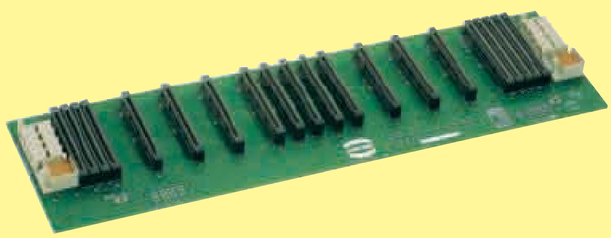
MicroTCA™ double cube system

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. (see page 24).

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 material

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 alloy with very low relaxation as the contact material 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.

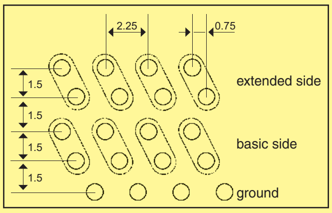
Press-fit technology

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.	1.52 A @ 70 °C max. 30 °C temp. rise
Test voltage	80 $V_{r.m.s.}$
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.
Withdrawal force	65 N max.

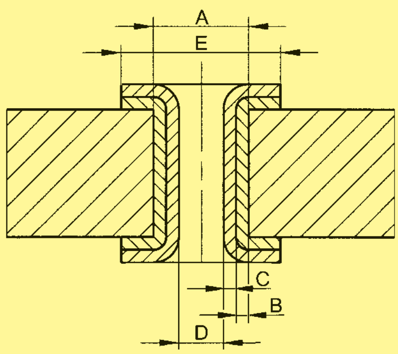
Materials

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).

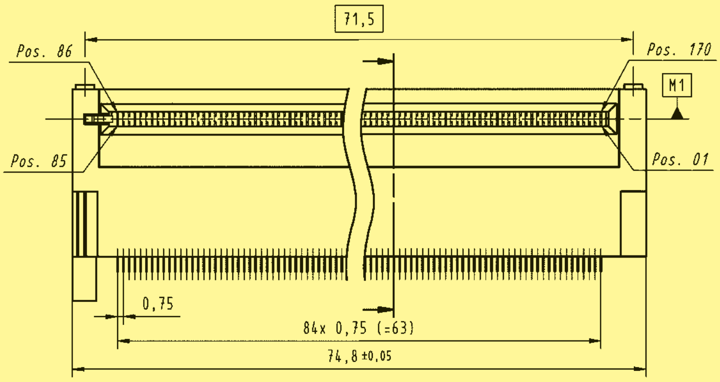


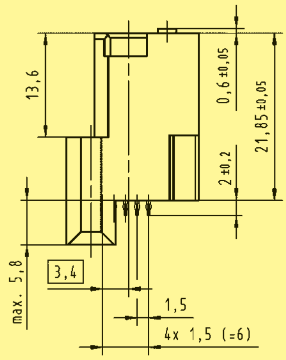
con:card+®

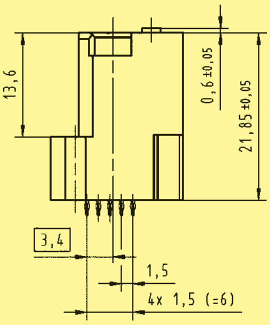
Card edge connectors, angled

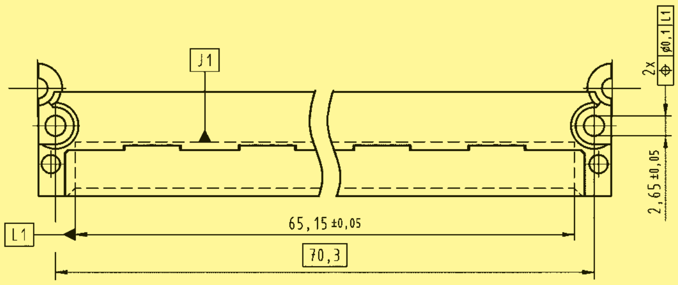
Identification	No. of contacts	Contact length [mm] termination side	Part number
AdvancedMC™ connector for ATCA®, type B+ with peg and with GuideSpring	170	2.0	16 04 170 5104 000
AdvancedMC™ connector for ATCA®, type B+ without peg and with GuideSpring	170	2.0	16 04 170 5106 000

With peg | Without peg | With peg | Without peg







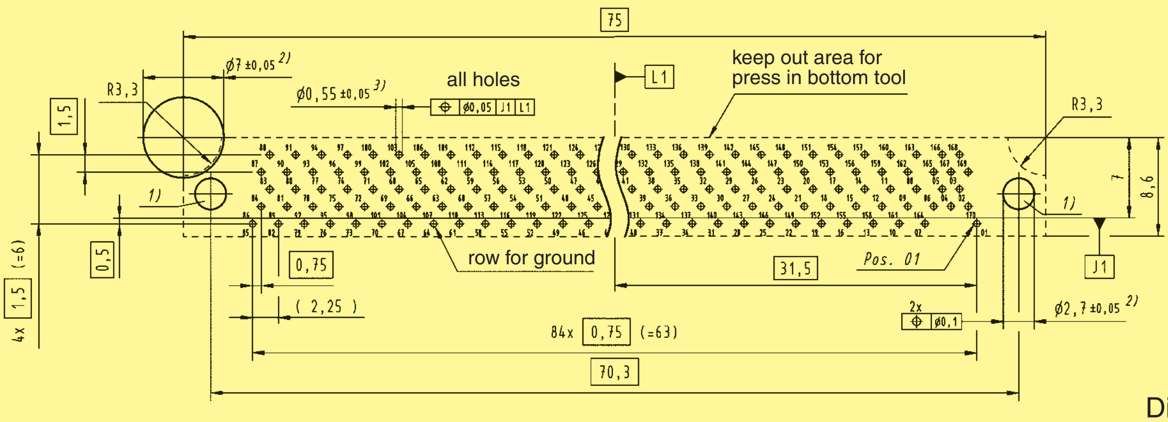


1) fixing-hole optional

2) non-metallized drillings

3) recommended plated through hole specification see page 12

Board drillings (view magnified)



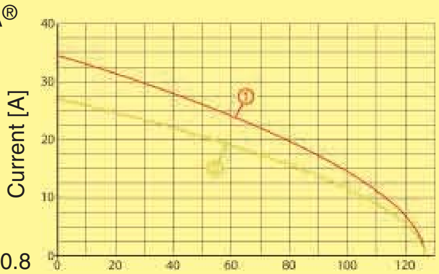
Dimensions [mm]

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)

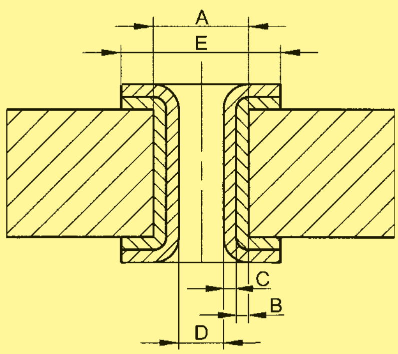
Materials

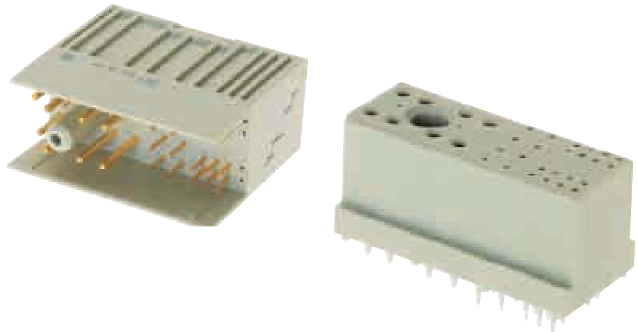
Moulded parts	PBT, glass-fibre filled, UL 94-V0
Contacts	Copper Alloy
Contact surface	Selectively gold plated
Packaging	Tray packaging (other packaging on request)

Recommended plated through hole specification

			Signal contacts	Power contacts
	A	Drill hole-Ø	$1.15^{\pm0.025}$ mm	$1.75^{\pm0.025}$ 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

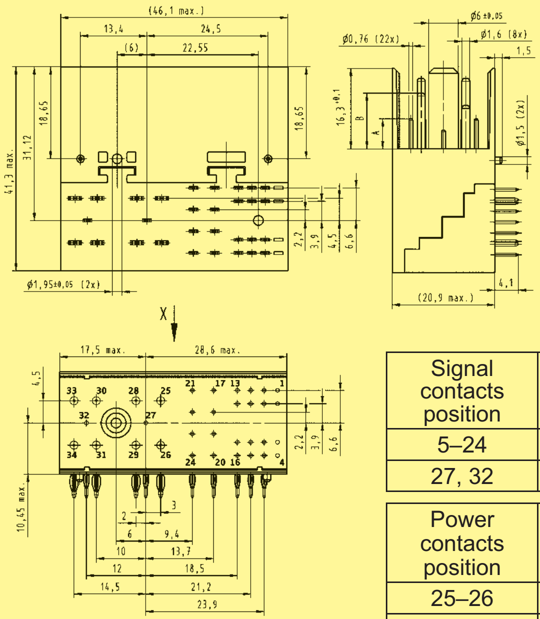
The press-in zone of the AdvancedTCA® power connector is tested according to Telcordia/Bellcore GR 1217CORE Part7. It is approved to be used with a plated through hole according IEC 60352-5 with a diameter of $1.00^{+0.09}_{-0.06}$ mm for signal contacts and $1.60^{+0.09}_{-0.06}$ mm for power contacts (drilled hole $1.15^{\pm0.025}$ mm resp. $1.75^{\pm0.025}$ 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 $1.15^{\pm0.025}$ mm resp. $1.75^{\pm0.025}$ mm to your PCB supplier.





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

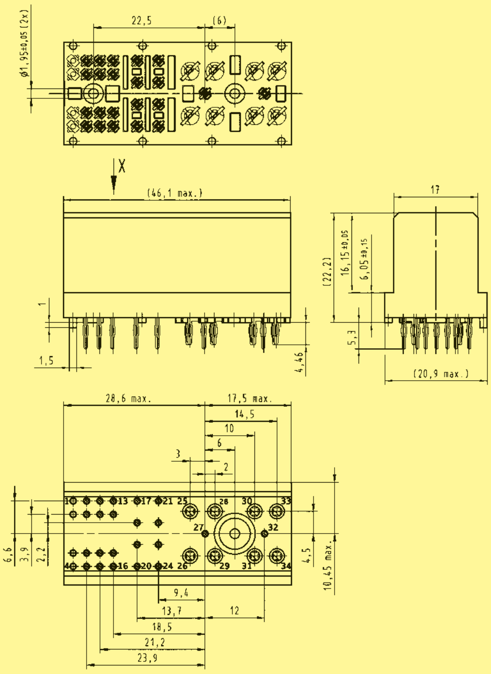
Male connector with 30 contacts



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

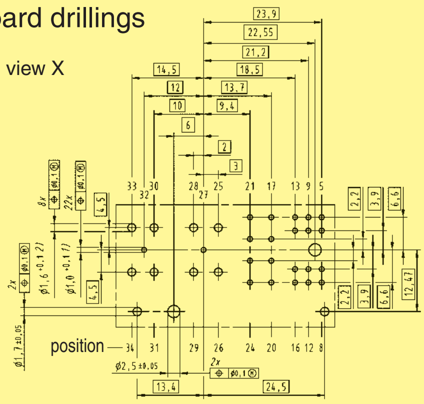
Power contacts position	Dimension B
25–26	14.3
28–31	14.3
33	11.3
34	8.8

Female connector with 30 contacts

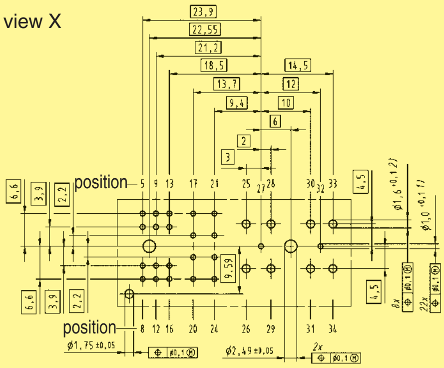


Board drillings

view X



view X



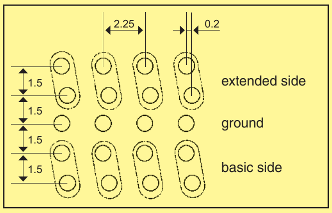
1) + 2) recommended plated through hole specification
see page 14

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.	1.52 A @ 70 °C max. 30 °C temp. rise
Test voltage	80 $V_{r.m.s.}$
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	0.58 %
Basic-to-extended (diagonal)	0.30 %
Basic-to-extended (opposite)	0.38 %
Multiline (five multi-aggressor differential pairs)	1.91 % max.



PCB library on request (PADS/Dx-Designer)

SPICE models and S-Parameter on request

Differential propagation delay	Basic side:	75 ps
	Extended side:	75 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.
Withdrawal force	65 N max.

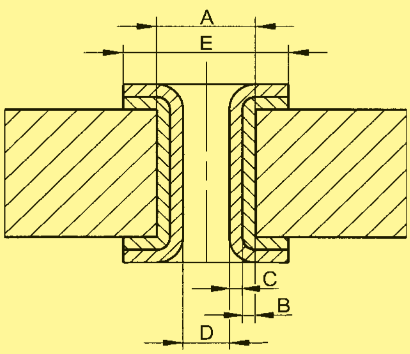
Materials

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).

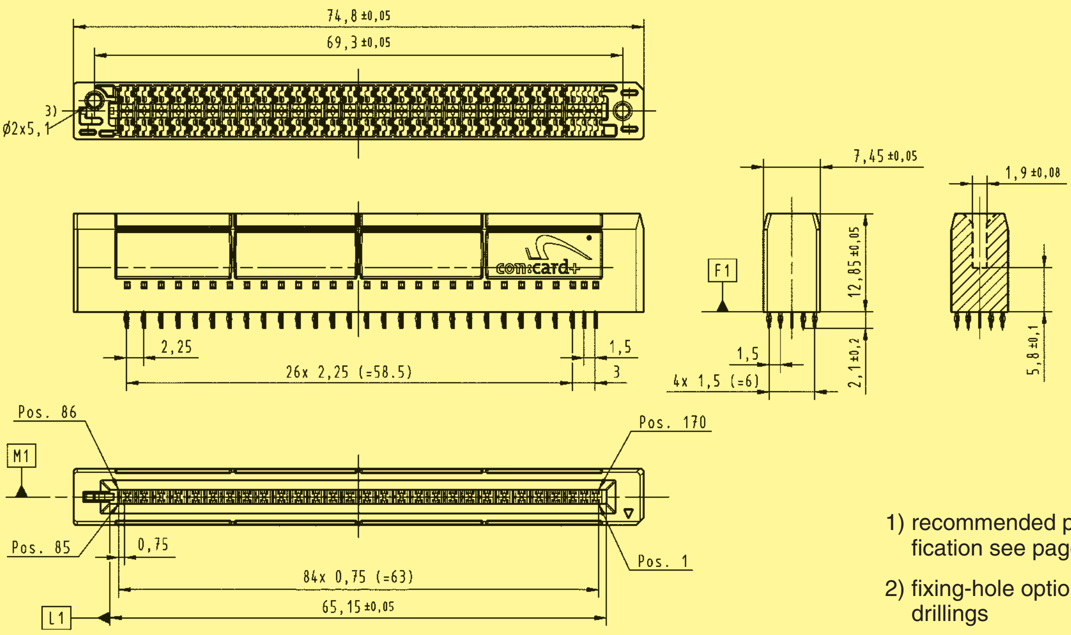


AdvancedMC™ connector for MicroTCA™

con:card+®

Card edge connector, straight

Identification	No. of contacts	Contact length [mm] termination side	Part number
AdvancedMC™ connector for MicroTCA™ with GuideSpring	170	2.1	16 11 170 5202 000

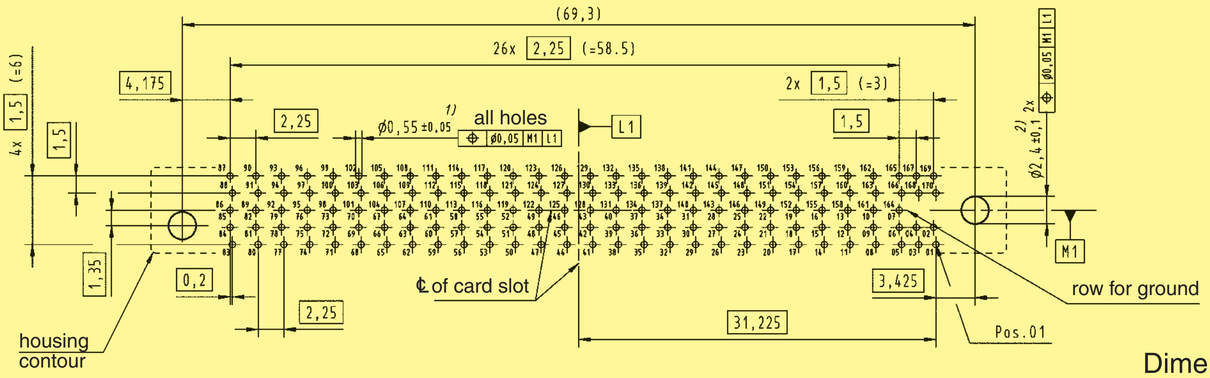


1) recommended plated through hole specification see page 16

2) fixing-hole optional non-metallized drillings

3) optional: use fillister-head tapping screws 2.2 x length, shape C, acc. to ISO 7049 (length = PCB thickness + min. 4 mm)

Board drillings (view magnified)



Dimensions [mm]

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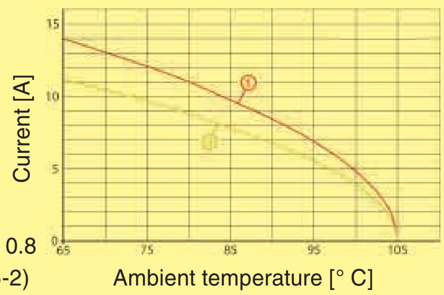
Technical characteristics

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)

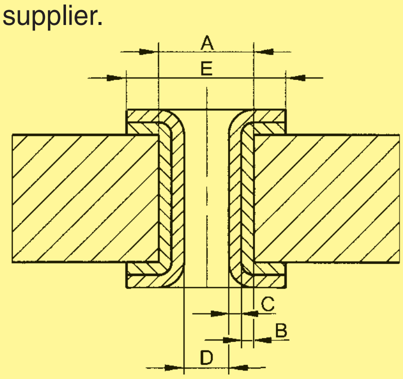
Materials

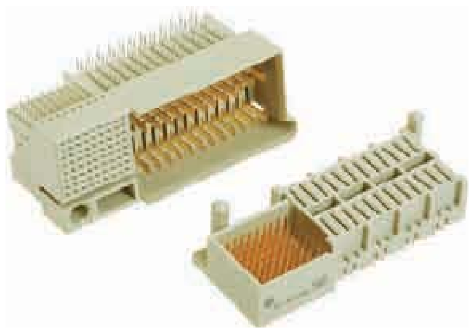
Moulded parts	PBT, glass-fibre filled, UL 94-V0
Contacts	Copper Alloy
Contact surface	
Power contacts:	selectively gold plated
Signal contacts:	selectively Pd/Ni plated
Packaging	Tray packaging (other packaging on request)

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

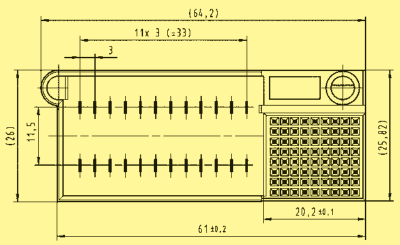
The press-in zone of the MicroTCA™ power connector is tested according to Telcordia/Bellcore GR 1217CORE Part7. It is approved to be used with a plated through hole according IEC 60352-5 with a diameter of $0.60^{+0.05}$ mm (drilled hole $0.70^{\pm 0.02}$ mm).
Based on our experiences regarding the production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



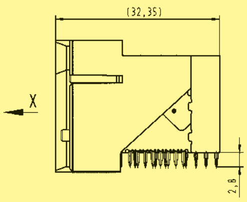


Identification	No. of contacts	Contact length [mm] termination side	Part number
Power output connectors for MicroTCA™			
module version	96	2.8	16 34 096 1101 000
backplane version	96	3.7	16 33 096 1201 000

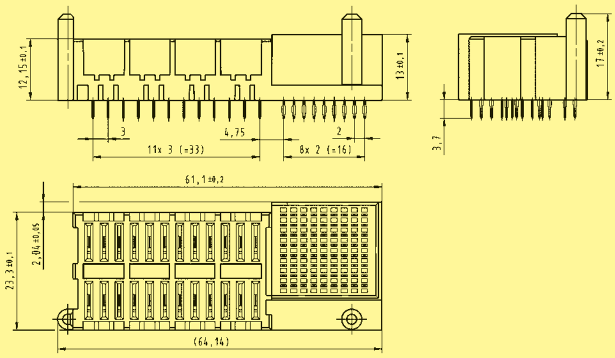
Module version



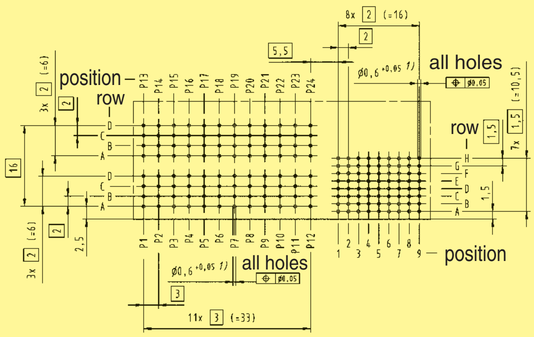
view X

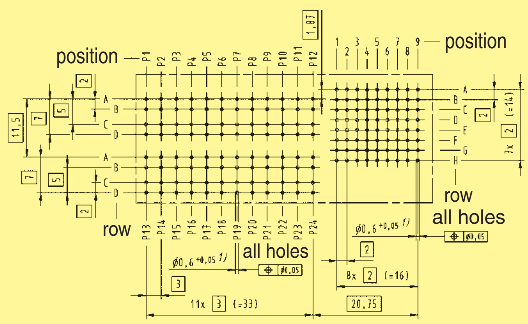


Backplane version



Board drillings





1) recommended plated through hole specification see page 18

Dimensions [mm]

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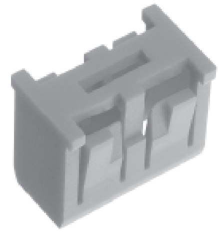
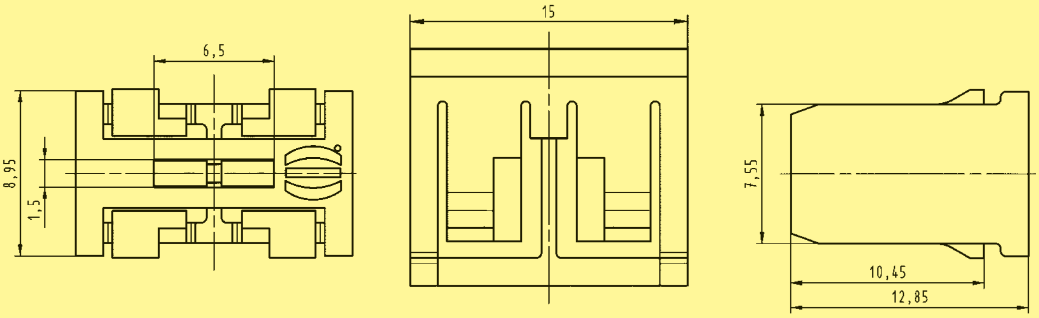


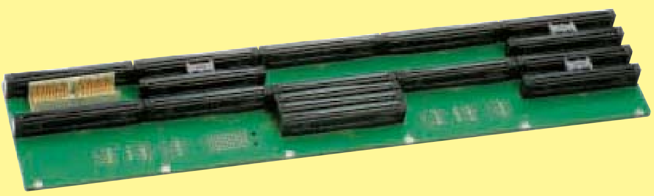
Identification	Part number
MicroTCA™ Protection Block	16 79 000 0010 000



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).

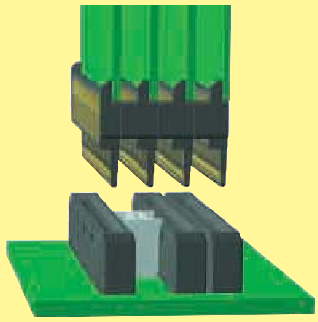
Compact-Size	3 HP	15.24 mm
Mid-Size	4 HP	20.32 mm
Full-Size	6 HP	30.48 mm
MCH	1.5 HP	7.62 mm

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

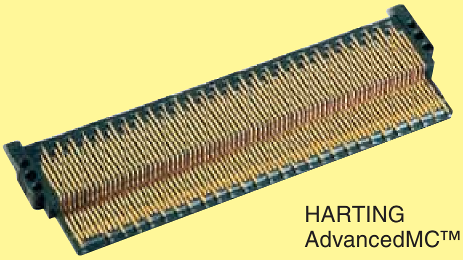
To prevent errors in case of misinsertion, MTCA.0 R1.0 chapter 2.13 outlines protection blocks that occupy the space between two adjacent connectors in a Compact-Size slot. Furthermore this protection block can be used for keying functions of multiple mating interface modules.



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.

As already explained in the chapter „**con:**card**+**“, it is very difficult for a PCB manufacturer to produce the tight tolerances of the AdvancedMC™ module card edge in a consistent process. Furthermore the quality of the card edge gold pads is not well defined in detail by the specification. With the introduction of the **con:**card**+** connectors, HARTING supports the reliable operation of AdvancedMC™ by the different **con:**card**+** features. But some disadvantages of a card edge connection can only be eliminated by a mating half connector.



HARTING
AdvancedMC™ Plug

The most important advantages of the HARTING AdvancedMC™ Plug Connector are the low module insertion forces and enhanced contact surfaces resulting in higher mating cycles with much tighter two piece connector tolerances.

The AdvancedMC™ Plug Connector replaces the gold pads of the module card edge. The AdvancedMC™ module with a Plug Connector is still within the module envelope 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.

The PICMG standard AMC.0 defines hard gold for the card edge interface. But a common and unique definition of hard gold does not exist today. As a result the quality of the gold pads in terms of hardness and roughness is highly unsteady. Additionally, the gaps between the pre and functional pad (which are necessary for the hot-swap ability) require a selective hard gold process which is more complicated than a standard process. This can lead to exposed copper and sharp pad edges.

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 easily adapted to customer demands.

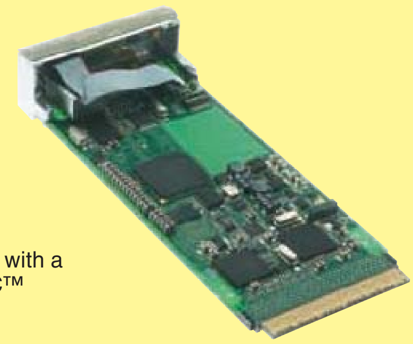
By using a HARTING AdvancedMC™ Plug Connector, the mating interface of the module is defined by the connector instead of the PCB. This fact leads to decisive advantages and provides a wide scope for the module development.

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

The card edge chamfer is important to reduce mating forces and to avoid wearing and damage of the backplane connector. But also the PCB milling process of the chamfer is critical. In contrast to the PCB the Plug Connector has a moulded chamfer with a smooth surface protecting the backplane connector contacts.

As the Plug Connector defines the mating tongue, the restriction of the PCB thickness of 1.6 mm ±10% does not need to be considered anymore. The maximum PCB thickness is only limited by the card guide for the AMC modules. The Plug Connector itself has a thickness of $1.5^{\pm 0.04}$ mm to reduce the mating force. The width of the Plug Connector is near the maximum width of the specification to support high mating reliability when the module is plugged into a connector without the GuideSpring **con:**card**+** feature.

The connector is mounted to the PCB with the „pin-in-hole-reflow“ solder technology (PIHR) and is „pick-and-place“ compatible. Another advantages of this efficient and mechanically stable technology, is that the connector can be replaced. This can avoid the scrapping cost of a module if the mating interface is damaged during handling.



AdvancedMC™ module with a
HARTING AdvancedMC™
Plug Connector

Depending on the application, the additional cost of the connector can be compensated by several savings during the production process of the AdvancedMC™ module. Please contact our local sales office for further information about the advantages of the HARTING AdvancedMC™ Plug Connector.

Technical characteristics for Plug Connectors

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	min. 1.52 A @ 70 °C max. 30 °C temp. rise acc. to pin configuration in AMC.0 spec.
Working current tested with HARTING MicroTCA™ backplane connector	2 A min.
Test voltage	80 $V_{r.m.s.}$
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	0.48 %
Basic-to-extended (diagonal)	0.35 %
Basic-to-extended (opposite)	0.50 %
Multiline (five multi-aggressor differential pairs)	2.15 % max.

Differential propagation delay
- Basic side: 135 ps
- Extended side: 164 ps

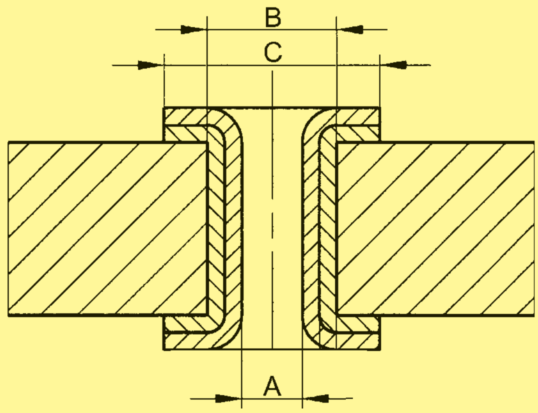
Differential skew
- Between basic and extended side: 29 ps
- Within basic and extended side: ± 2 ps

Temperature range	-55 °C … +105 °C
during reflow soldering	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.
Withdrawal force	65 N max.

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.

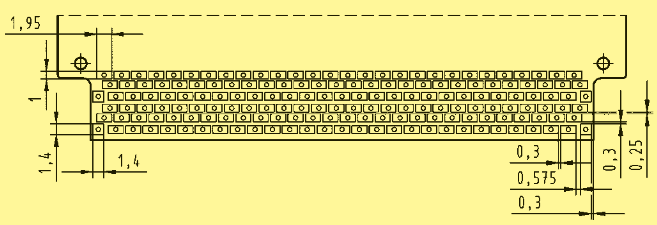
Materials

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	$0.55^{+0.08}_{-0.02}$ mm
B	Drill hole-Ø	$0.65^{\pm 0.01}$ mm
C	Pad size	0.95 mm

Stencil recommendation



Each termination requires a solder paste volume of 0.57 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 0.7 mm.

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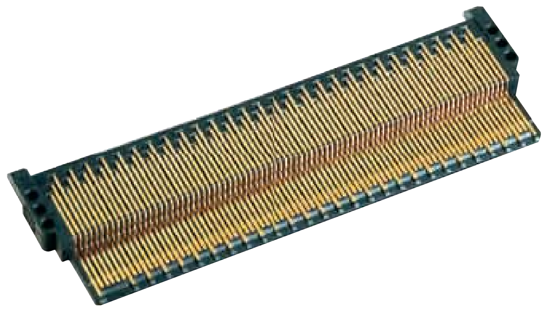
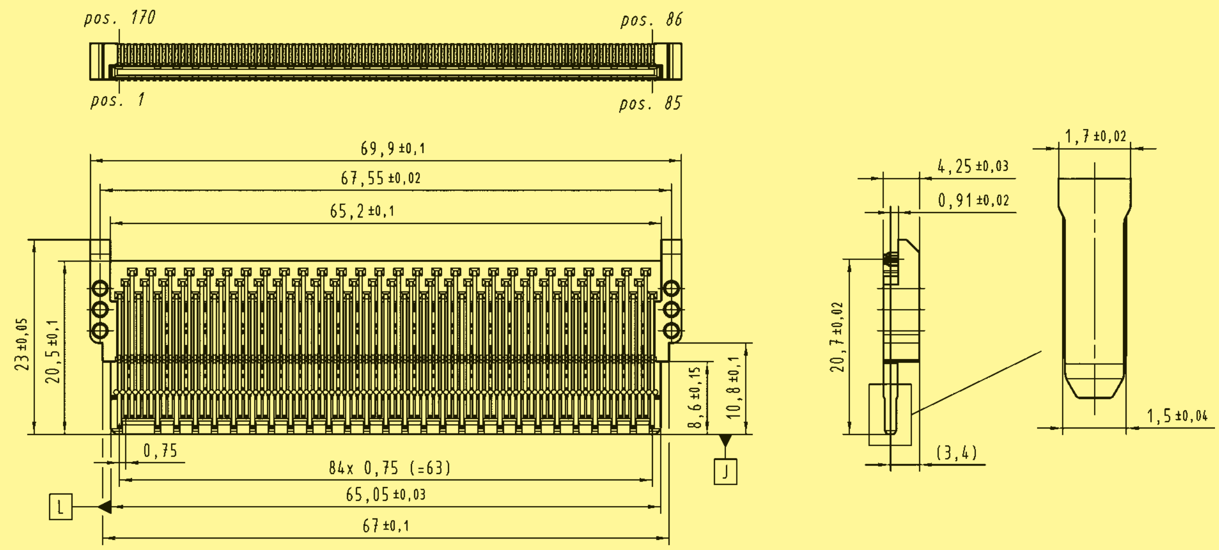
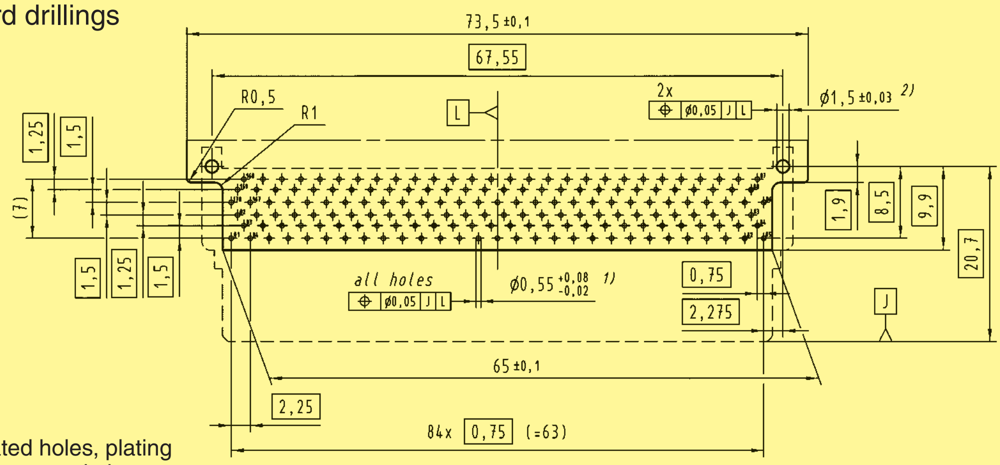


Identification	No. of contacts	Part number
AdvancedMC™ Plug Connector	170	16 21 170 1301 000
AdvancedMC™ Plug Connector with nozzle pad for pick and place assembly	170	16 21 170 1302 000

AdvancedMC™ Plug Connector



Board drillings

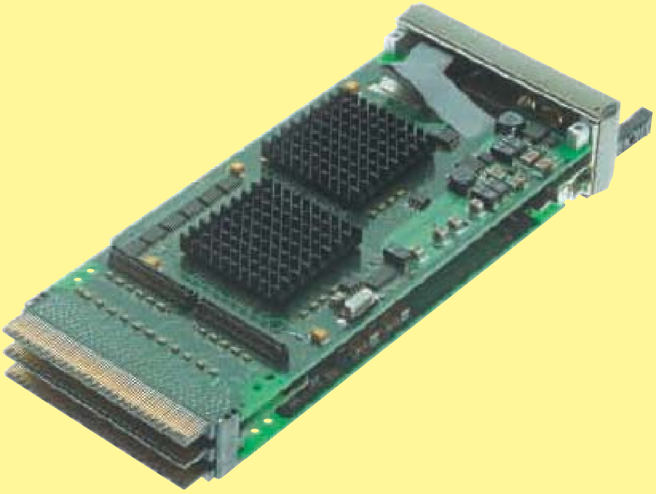


1) Plated holes, plating recommendations see page 22

2) Non-metallized drillings

Dimensions [mm]

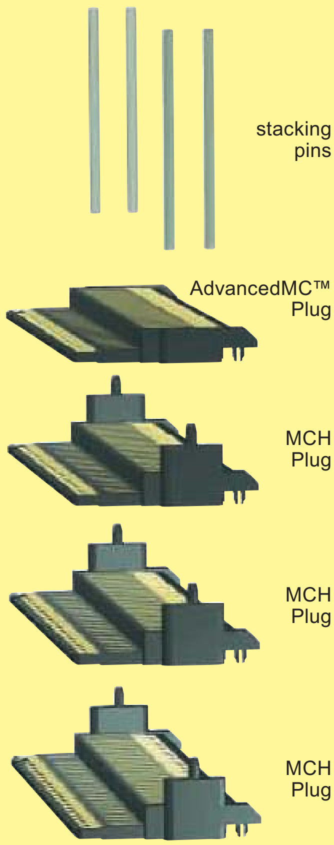
One important component of a MicroTCA™ system is the so called „MicroTCA™ Carrier Hub“, abbreviated MCH. The main functions of an MCH module are the hardware platform management and the management of the fabric connectivity. As the MCH module needs many more connections than a standard AdvancedMC™ module, an MCH can 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.

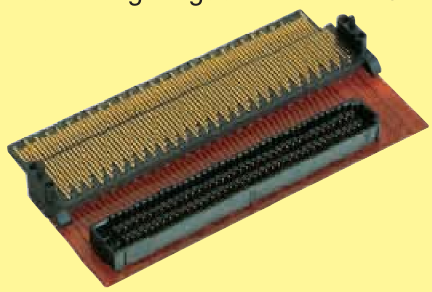
The HARTING Plug Connector system consists of a configuration with two different Plug Connectors. The AdvancedMC™ Plug Connector is mated with the backplane MCH connector. MCH connector 1 is needed for the base function of the system. Furthermore it can be used for any conventional AdvancedMC™ module to replace the PCB gold pads.

The MCH Plug Connector is mated with the backplane MCH connectors 2, 3, 4 depending on the MicroTCA™ configuration. Compared to the AdvancedMC™ Plug, the MCH Plug insulator has standoffs securing the right 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.

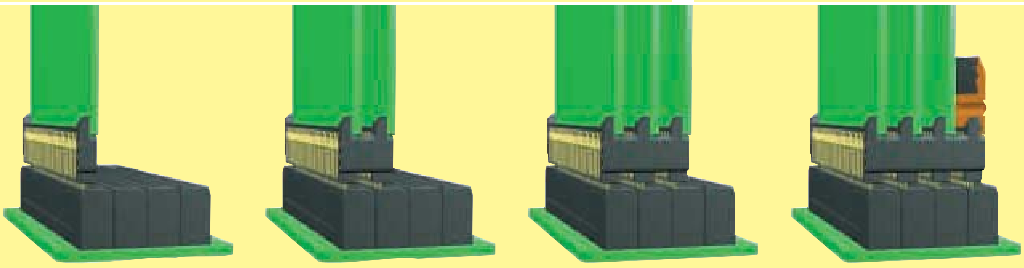


To build a connector stack for two, three or four mating tongues, the HARTING Plug Connectors are mounted like building blocks via pegs and holes of the adjacent Plugs. For additional mechanical stability, the connector stack is fixed by up to four metal stacking pins. The complete connector stack can be easily installed without any special tooling by only handling three different parts (AdvancedMC™ Plug Connector, MCH Plug Connector and the corresponding stacking pins).

For a MicroTCA™ system with more than 6 AdvancedMC™ modules using the switched fabric fat pipe, an MCH module with 4 mating tongues has to be used. Depending on the application, the switched fabric is located only on the third board, so a high speed connection is needed between the mating tongue 4 and the PCB 3.



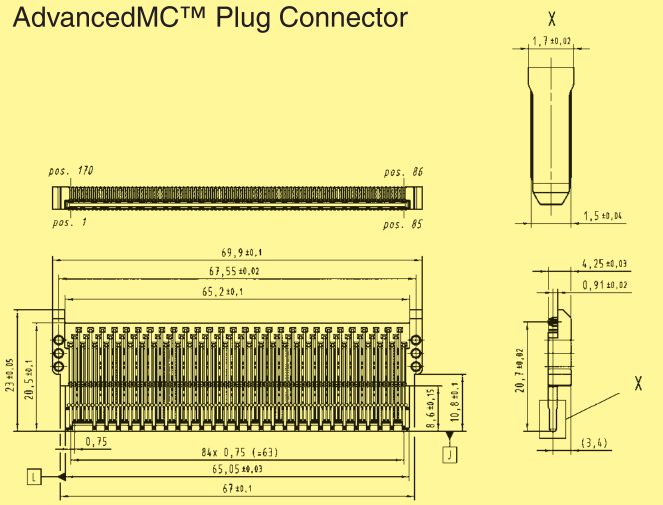
For this purpose, HARTING offers a special high speed adapter. The MCH Flex Adapter offers high speed characteristics with mechanical flexibility. HARTING delivers the complete assembly consisting of one MCH Plug and a mezzanine connector soldered to a flexible PCB. The mating half of the mezzanine connector can be delivered by HARTING also.



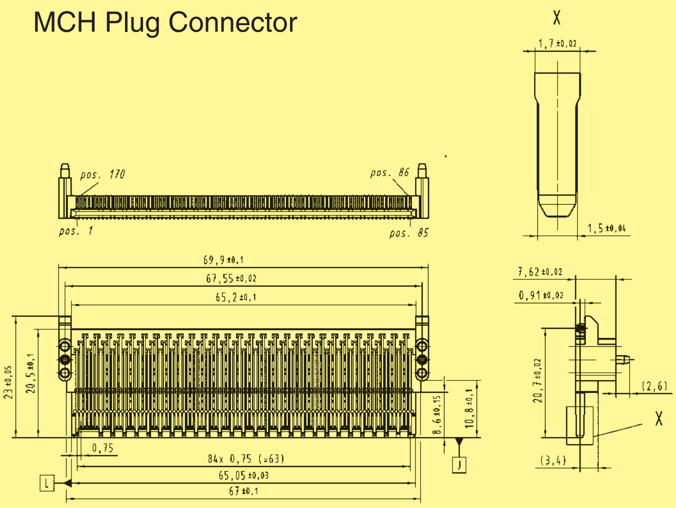
MCH modules can have up to 4 mating tongues. HARTING offers two versions of the Plug and a special Flex Adapter.

Identification	No. of contacts	Part number
AdvancedMC™ Plug Connector	170	16 21 170 1301 000
AdvancedMC™ Plug Connector with nozzle pad for pick and place assembly	170	16 21 170 1302 000
MCH Plug Connector	170	16 22 170 1301 000
MCH Plug Connector with nozzle pad for pick and place assembly	170	16 22 170 1302 000
AdvancedMC™ – MCH Plug stacking-pin		
double length (for two stacked plugs)		16 79 000 0006 000
triple length (for three stacked plugs)		16 79 000 0007 000
quad length (for four stacked plugs)		16 79 000 0008 000
MCH Flex Adapter	165	16 29 165 1001 000

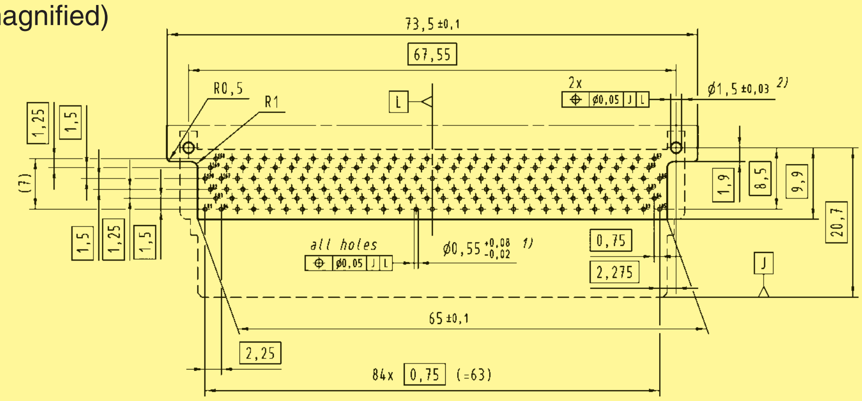
AdvancedMC™ Plug Connector



MCH Plug Connector



Board drillings (view magnified)



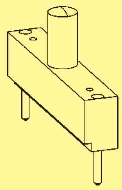
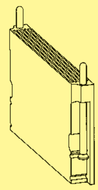
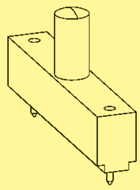
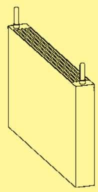
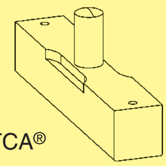
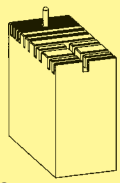
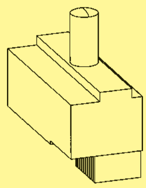
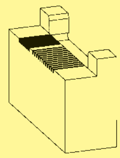
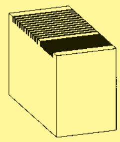
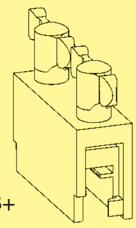
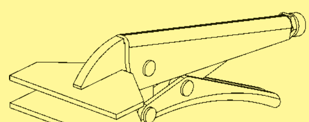
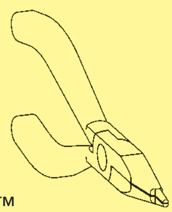
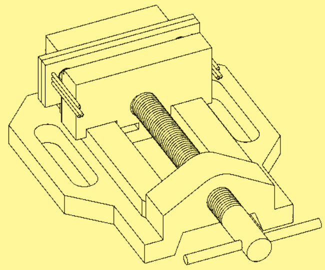
1) Plated holes,
plating recommendations
see page 22

2) Non-metallized drillings

Dimensions [mm]

Press-in tooling

For a reliable and safe press-in process HARTING has developed a special tooling system.
Each tooling is adapted to the special requirements of the individual connector range, thus a good handling and quick adjustment is guaranteed.

Identification	Part No.	Drawing
Top tool for AdvancedTCA® B+ Bottom tool for AdvancedTCA® B+	16 99 000 0001 000 16 99 000 0002 000	Top tool for AdvancedTCA® B+  Bottom tool for AdvancedTCA® B+ 
Top tool for MicroTCA™ Bottom tool for MicroTCA™	16 99 000 0003 000 16 99 000 0004 000	Top tool for MicroTCA™  Bottom tool for MicroTCA™ 
Top tool for AdvancedTCA® Power Male and female connector Bottom tool for AdvancedTCA® Power Male and female connector	02 99 000 0002 16 99 000 0011 000	Top tool for AdvancedTCA® Power and MicroTCA™ Power, module version  Bottom tool for AdvancedTCA® Power 
Top tool for MicroTCA™ Power Module version Backplane version Bottom tool for MicroTCA™ Power Module version Backplane version	02 99 000 0002 16 99 000 0008 000 16 99 000 0010 000 16 99 000 0009 000	Top tool for MicroTCA™ Power, backplane version  Bottom tool for MicroTCA™ Power, module version  Bottom tool for MicroTCA™ Power, backplane version 
Removal tool for AdvancedTCA® B+ Removal tool for MicroTCA™ Repair pliers for MicroTCA™ Removal tool for MCH Plug stacking-pins	16 99 000 0005 000 16 99 000 0007 000 16 99 000 0006 000 16 99 000 0012 000	Removal tool for AdvancedTCA® B+  Removal tool for MicroTCA™  Repair pliers for MicroTCA™  Removal tool for MCH Plug stacking-pins 

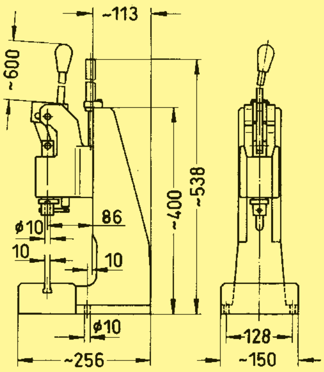
DISAI Automatic Systems

HARTING

Identification	Part No.	Drawing	Dimensions in mm

Hand bench press

Part No.: 09 99 000 0201

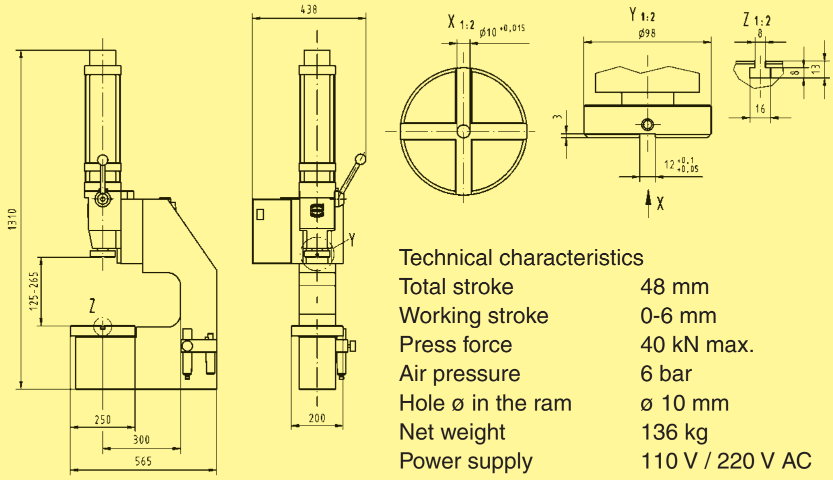


Technical characteristics

Working stroke	25 mm
Press force	15 kN max.
Hole ø in the ram	ø 10 mm
Net weight	approx. 23 kg

Pneumatic press
40 kN

Part No.: 09 99 000 0282



Technical characteristics

Total stroke	48 mm
Working stroke	0-6 mm
Press force	40 kN max.
Air pressure	6 bar
Hole ø in the ram	ø 10 mm
Net weight	136 kg
Power supply	110 V / 220 V AC

CPM *prestige*

Part No.: 09 89 040 0000

Technical characteristics

Drive	electro-mechanical, servo
Press-in force	100 kN
max. PCB dimensions	600 x 1000 mm
Floor space	1200 x 1150 mm
Weight	980 kg
Power supply	208 / 380 / 400 / 415 V
Consumption	< 1 kW
Colour	on request

Adaptor for height compensation[1)]

Part No.: 09 99 000 0279

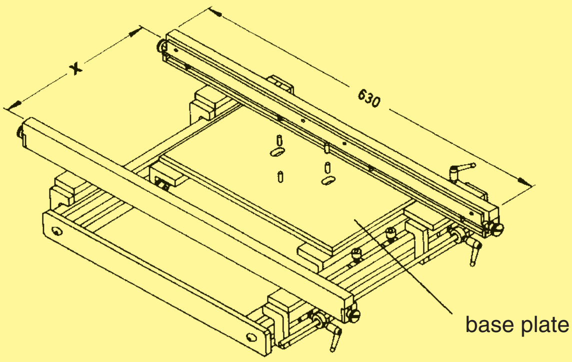
Guide frame with base plate

Standard type
for PCB size
x = 123,5 - 309,5 mm — 09 99 000 0244

Long type[2)]
for PCB size
x = 123,5 - 668,5 mm — 09 99 000 0261

Base plate

Part No.: 09 99 000 0255



1) suitable for 09 99 000 0282 and all CPM machines
2) not suitable for hand bench press

Signal integrity support – Introduction

HARTING offers signal integrity support to the end customers. We provide simulation models and evaluation kits with our products for signal integrity investigations. The evaluation kits are assembled with SMA's to connect them directly with the measurement instruments. The benefit is that the customer saves time and costs for pre-evaluation of the connector. We offer test boards suitable for the connector evaluation itself and have built reference backplanes and test cards for measurements within applications like VME, CompactPCI®, AdvancedTCA® and MicroTCA™. Reference structures and well established measurement techniques allow a full de-embedding of the propagation characteristics of the interconnect itself for test and verification. Furthermore we developed several high-speed test backplane with different connector areas and PCB design topologies.

We can provide footprint and routing recommendations for our products. A variety of testboards, simulation models and further technical data for different products are available on request.

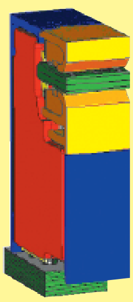
HARTING is also an active member in standardization groups like VITA, PICMG, OBSAI and supports sub-committees for new interconnect solutions. We are in close cooperation with customers, universities and industrial partners for research activities.

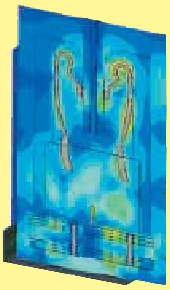
Signal integrity capabilities

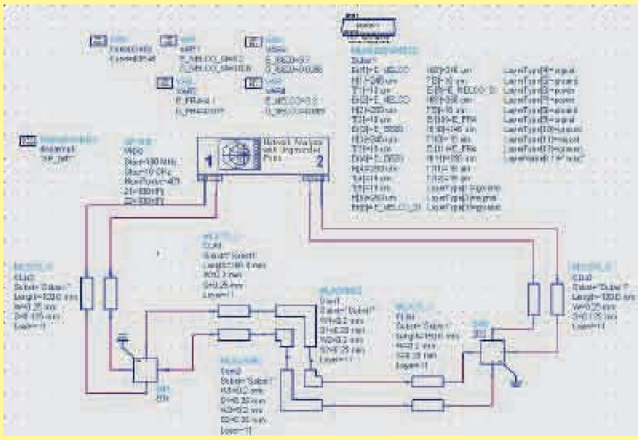
- Simulation and modeling
- Measurement and verification
- Test fixture & reference backplane design
- Design-in support

Simulation and modeling

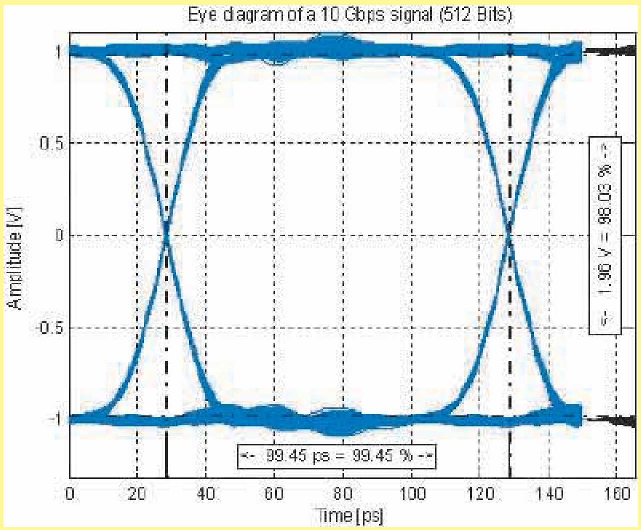
Capability to perform full 3D-FEM simulations of the CAD-geometry with different well established tools like CST Microwave Studio and Ansoft HFSS. Post-processing of the data for field-distribution and full S-parameter and time-domain analysis within the software packages themselves and additional Matlab tools.





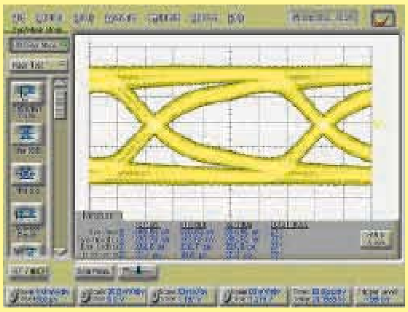


For SPICE-modeling, impedance calculation and field distribution analysis of the geometry S-parameter models are used in combination with static 3D-FEM, 2D-FEM and planar field solvers depending on the desired bandwidth of the signal. These models are used as library parts for channel simulations including particular chip, trace, vias and connector subcircuits. Eye-diagram, S-parameter and waveform analysis of the entire channel are performed with tools like HSPICE and ADS (Advanced Design System).



Signal integrity support – Measurement and verification

Time-domain measurements

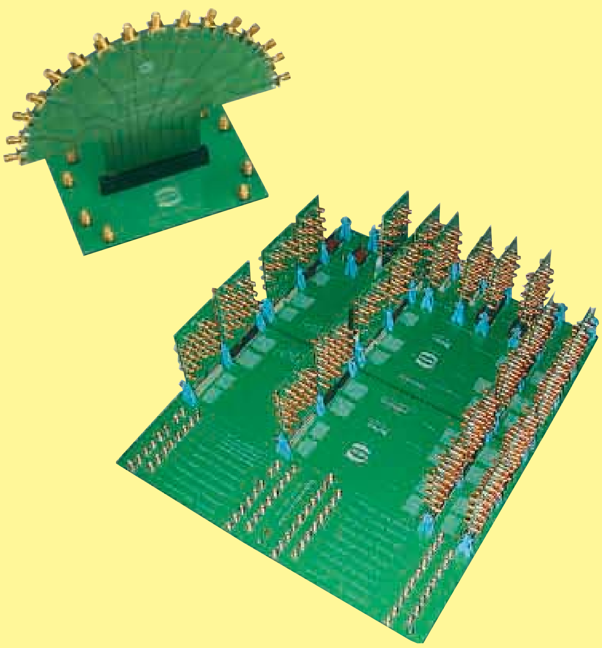


Parameters:
- Characteristic impedance
- Propagation delay
- Rise time degradation
- Reflection
- Crosstalk
- Eye-diagram and mask-test
- Bit-error rate testing (BERT) up to 12.5 Gbps per differential line

Frequency-domain measurements

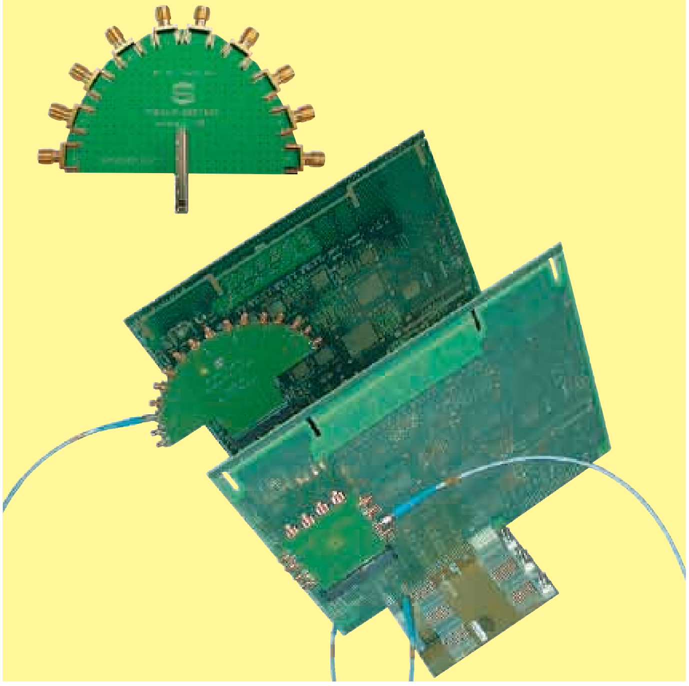
Parameters:
- 4 port S-parameter analysis (up to 40 GHz)
- Insertion- and return loss, crosstalk, VSWR
- Fourier-transformation, gating, error-location
- PLTS software to calculate time-domain data, eye-diagrams, etc.

Test fixture & reference backplane design



Design-in support

- Customized PCB design close to the real application
- Footprint and routing recommendations
- Full measurement characterization and test report
- Simulation models



List of part numbers

Catalogue order information

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Application brochure

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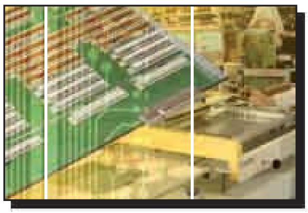
Device Connectivity DeviceCon

☐ 

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