



## Technical Information

### C20-SATA

#### SATA Dual-Drive Mezzanine Module

Document No. 5421 • Ed. 3 • 22 January 2013



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## About this Manual

This manual is a short form description of the technical aspects of the C20-SATA, required for installation and system integration. It is intended for the advanced user only.

## Edition History

EKF Document	Ed.	Contents/Changes	Author	Date
Text # 5421 c20_tie.wpd	1	Technical Information C20-SATA English, Preliminary Edition	jj	24 February 2009
	2	Added more photos	jj	16 November 2009
	3	Added photo PC1-PCS-C20	jj	22 January 2013



## Related Documents

The C20-SATA is a passive module, intended for use on a suitable active carrier card. For a description of the related carrier board, please consult the associated technical document(s), e.g.

CCI-RAP:	<a href="http://www.ekf.com/c/ccpu/cci/ccie_tie.pdf">www.ekf.com/c/ccpu/cci/ccie_tie.pdf</a>
CCK-MARIMBA:	<a href="http://www.ekf.com/c/ccpu/cck/cck_tie.pdf">www.ekf.com/c/ccpu/cck/cck_tie.pdf</a>
CCL-CAPELLA:	<a href="http://www.ekf.com/c/ccpu/ccl/ccl_tie.pdf">www.ekf.com/c/ccpu/ccl/ccl_tie.pdf</a>
CCO-CONCERT:	<a href="http://www.ekf.com/c/ccpu/cco/cco_tie.pdf">www.ekf.com/c/ccpu/cco/cco_tie.pdf</a>
CE4-PIANO:	<a href="http://www.ekf.com/c/cide/ce4/ce4_tie.pdf">www.ekf.com/c/cide/ce4/ce4_tie.pdf</a>
PCS-BALLET:	<a href="http://www.ekf.com/p/pcs/pcs.html">www.ekf.com/p/pcs/pcs.html</a>

Change path accordingly for other possible carrier boards.

## Nomenclature

Signal names used herein with an attached '#' designate active low lines.

## Trade Marks

Some terms used herein are property of their respective owners, e.g.

- ▶ Intel, Pentium, Celeron, Core: ® Intel
- ▶ CompactPCI ® : ® PICMG
- ▶ Windows XP, WEPOS, POSReady, Windows 7: ® Microsoft
- ▶ EKF, ekf system: ® EKF

EKF does not claim this list to be complete.

## Legal Disclaimer - Liability Exclusion

This document has been edited as carefully as possible. We apologize for any potential mistake. Information provided herein is designated exclusively to the proficient user (system integrator, engineer). EKF can accept no responsibility for any damage caused by the use of this manual.

## Standards

Specifications/Standards	
SATA	Serial ATA 2.5/2.6 Specification ( <a href="http://www.sata-io.org">www.sata-io.org</a> )

Feature Summary

Feature Summary	
Form Factor	Proprietary size mezzanine module, basically fits into the 4HP (20.32mm) envelope of the carrier board, typically delivered as a ready to use assembly unit comprising of carrier board, CPU base board, drive(s), mounting position right (on top of carrier board)
Host I/F Connector (Bottom Mount, to Carrier)	<ul style="list-style-type: none"> <li>▶ J1 High speed female mezzanine connector, corresponds to carrier board male connector</li> <li>▶ Two independent SATA channels, RAID or non-RAID configurable</li> <li>▶ Nominal headroom 6mm between carrier board and C20-SATA (suitable for single top-mount drive), resulting from 4mm height J1 + 2mm height carrier board connector</li> </ul>
SATA Usage	<ul style="list-style-type: none"> <li>▶ J2: Horizontal mount docking connector, suitable for top mount 2.5-inch SATA SSD/HDD</li> <li>▶ Option J3: Horizontal mount docking connector, suitable for bottom mount 2.5-inch SATA SSD/HDD</li> <li>▶ Option P1: Vertical SATA connector suitable for latching SATA cable assembly</li> <li>▶ Options J3 and P1 provided exclusive to each other</li> </ul>
On-Board Storage	<ul style="list-style-type: none"> <li>▶ 2.5-Inch SATA on-board drive option</li> <li>▶ Single drive (top mount) for low profile</li> <li>▶ Dual drive (top &amp; bottom mount) option</li> <li>▶ Solid State Drive (SSD) or Hard Disk Drive (HDD)</li> <li>▶ Intel X-25E Single Level Cell (SLC) SSD recommended for ultra high speed</li> <li>▶ Intel X-25M Multi Level Cell (MLC) SSD recommended for more storage capacity</li> <li>▶ Hard disk recommended for low cost applications and maximum storage capacity</li> </ul>
Thermal <sup>1</sup> Conditions	<ul style="list-style-type: none"> <li>▶ Operating temperature: 0°C ... +70°C</li> <li>▶ Storage temperature: -40°C ... +85°C, max. gradient 5°C/min</li> <li>▶ Humidity 5% ... 95% RH non condensing</li> <li>▶ Altitude -300m ... +3000m</li> <li>▶ Shock 15g 0.33ms, 6g 6ms</li> <li>▶ Vibration 1g 5-2000Hz</li> </ul>
Environmental <sup>1</sup> Conditions	
EC Regulations	<ul style="list-style-type: none"> <li>▶ EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)</li> <li>▶ 2002/95/EC (RoHS)</li> </ul>
MTBF	tbd

<sup>1</sup> Observe degradation of temperature limits and other conditions when hard disk drive is in use - consult manufacturers data sheet - SSD recommended for rugged environment

Not all of the connectors may be present or functional on your actual C20-SATA board; assembly is highly custom specific. Options may be exclusive, i.e. not necessarily concurrently present. Discuss your needs with EKF before ordering.

## Short Description

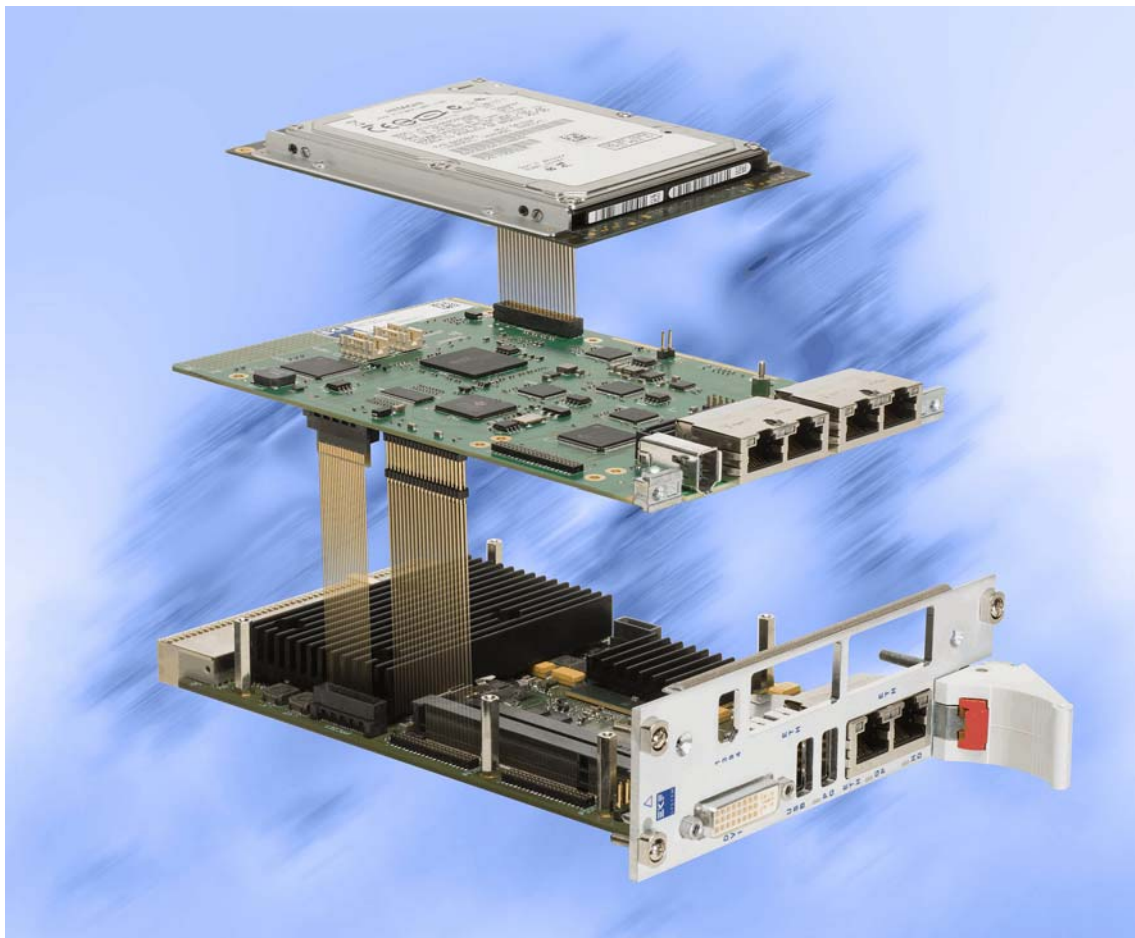
Available as a mezzanine add-on storage module to several CPCI side boards, the purpose of the C20-SATA is to accommodate one or two 2.5-inch SATA drive(s), either SSD (Solid State Drive) or HDD (Hard Disk Drive). With respect to the dual drive solution, either RAID or non-RAID drivers are available. Since only a few components are required on the C20-SATA PCB, it is a moderate cost system storage solution.

The C20-SATA mounts on top of the carrier board. Provided with a single (top mount) drive, the 4HP profile of the associated carrier board would be maintained, resulting in a 8HP total assembly, comprised of the CompactPCI® base board, the expansion carrier card (aka side board), and the C20-SATA storage module.

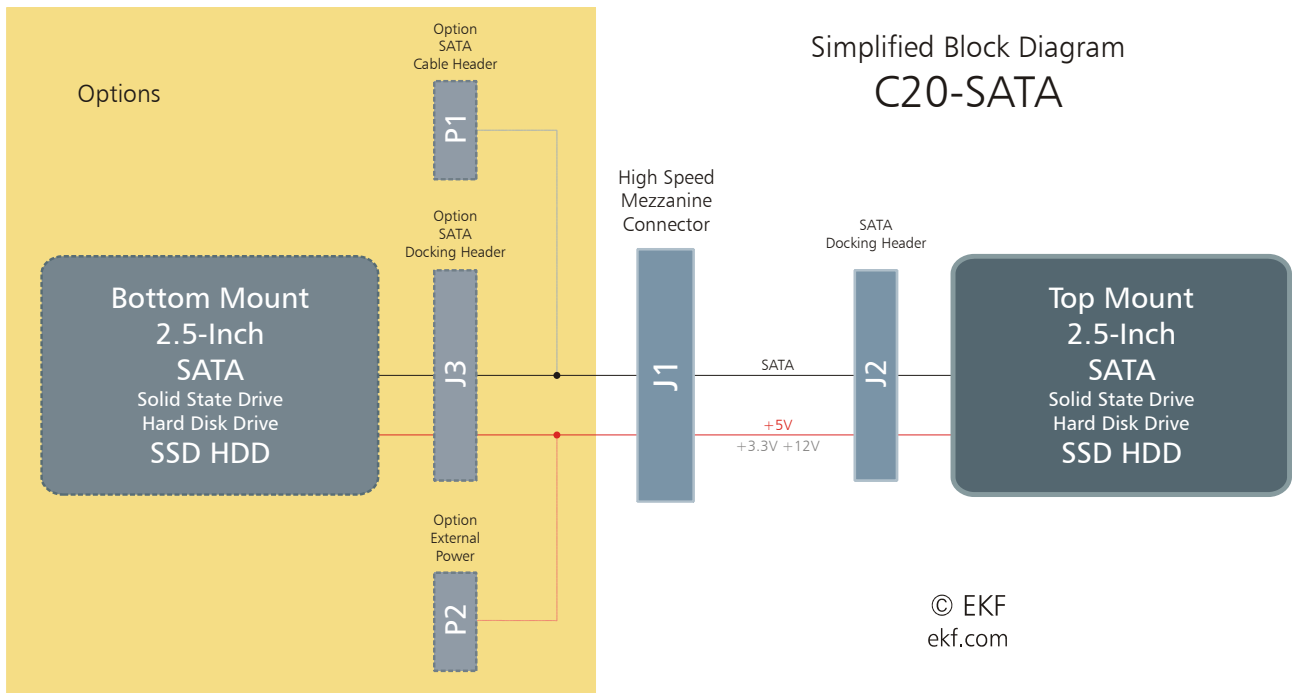
As an option, the C20-SATA can be populated with another (bottom mount) drive, resulting in a 10HP or 12HP assembly stack.

The two SATA channels are derived from a carrier board SATA controller (JMB362 as of current), for RAID 0/1/10 operation, or normal usage.

Solid state drives (SSD aka Flash Drive) are recommended for fast and rugged operation. Single level cell (SLC) drives offer the highest transfer speed and superior reliability. A hard drive should be considered as an economic solution, with decreased operating temperature and performance compared to a SSD, but maximum storage capacity as of current.



Block Diagram



C20-SATA on Top of an Assembly Stack

Top/Bottom View Component Assembly



C20-SATA Top View



C20-SATA Bottom View



## Mounting Alternates

The C20-SATA will be mounted with a headroom of either 6mm - 10mm - 14mm or 18mm above the carrier board, depending on the number of drives engaged (one or two), the drive height (7.0mm typically for solid state drives, 9.5mm assumed for hard disk drives), and components on the carrier board e.g. PCIe Mini Card sockets.

The **6mm** headroom assembly fits into the 4HP envelope of the carrier board, which results in a total assembly height of 8HP including the CPU base board. This version is limited to a single drive.

The **10mm** headroom version is suitable for a second drive, bottom mount (SSD 7mm). No components >2.8mm height would be allowed on the carrier board below the C20-SATA. This assembly exceeds the 4HP envelope of the carrier board slightly, if also on top is a SSD populated.

The **14mm** headroom assembly exceeds the 4HP envelope definitely. With a bottom mount 9.5mm hard drive, components on the carrier board situated below the C20-SATA must not be higher than 4.3mm (6.8mm with a 7.0mm SSD).

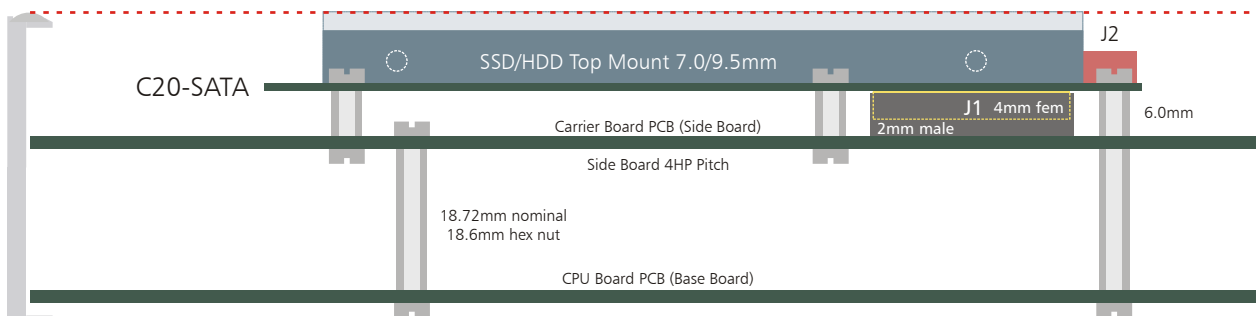
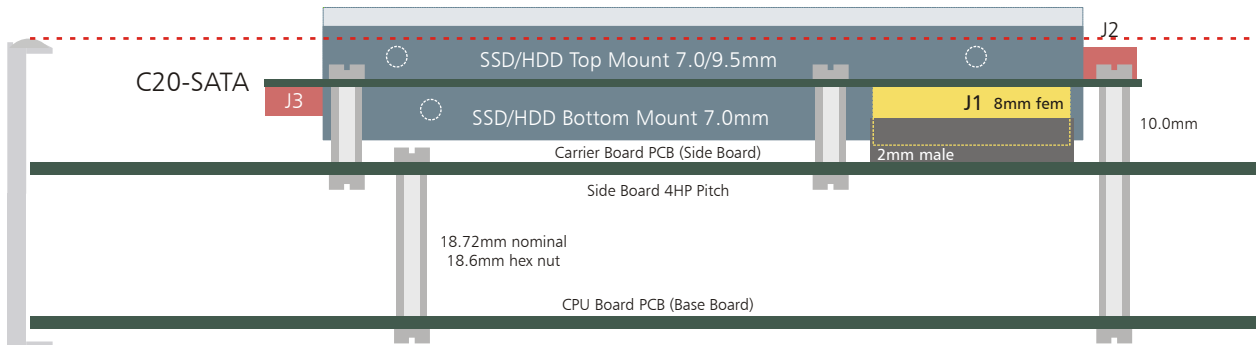
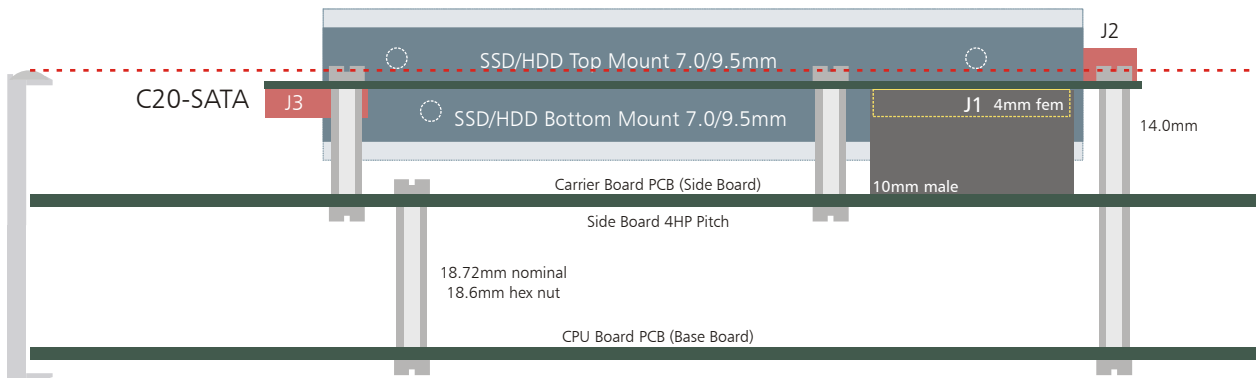
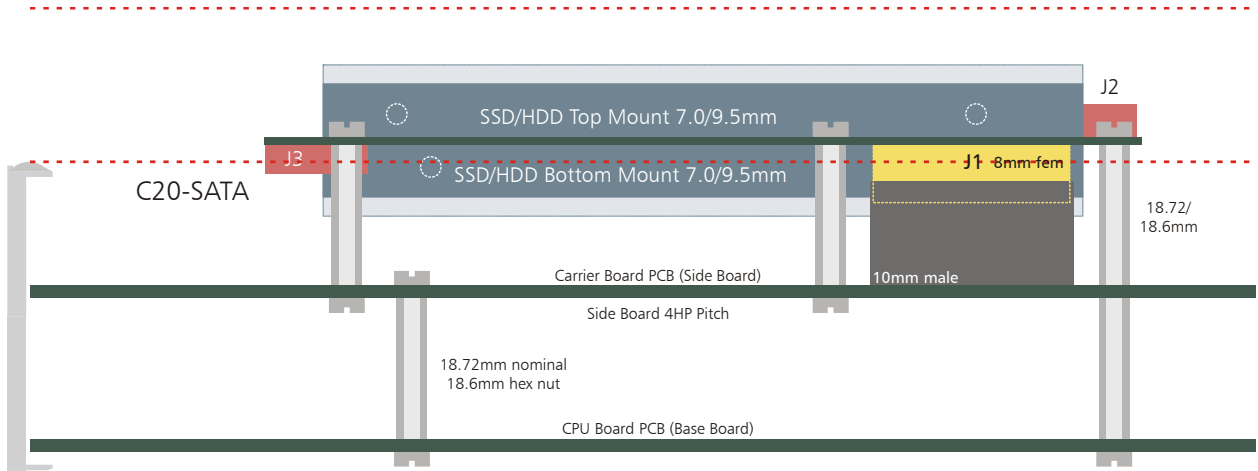
The nominal **18mm** headroom version is suitable for a dual drive C20-SATA, while not imposing too much restrictions on components on the carrier board. With the real 18.6mm stand-off bolts in use, components on the carrier board may be as high as 8.9mm (9.5mm bottom mount HDD), or 11.4mm (7.0mm bottom mount SSD). A common front panel of 12HP is recommended for the entire assembly comprised of CPU base board, carrier side card, and the C20-SATA dual drive module. EKF offers also custom specific front panel design.

The different assembly versions are achieved by choosing mezzanine connectors with a suitable height, on both the C20-SATA and on the carrier board as well. Be sure to specify your individual needs when ordering.



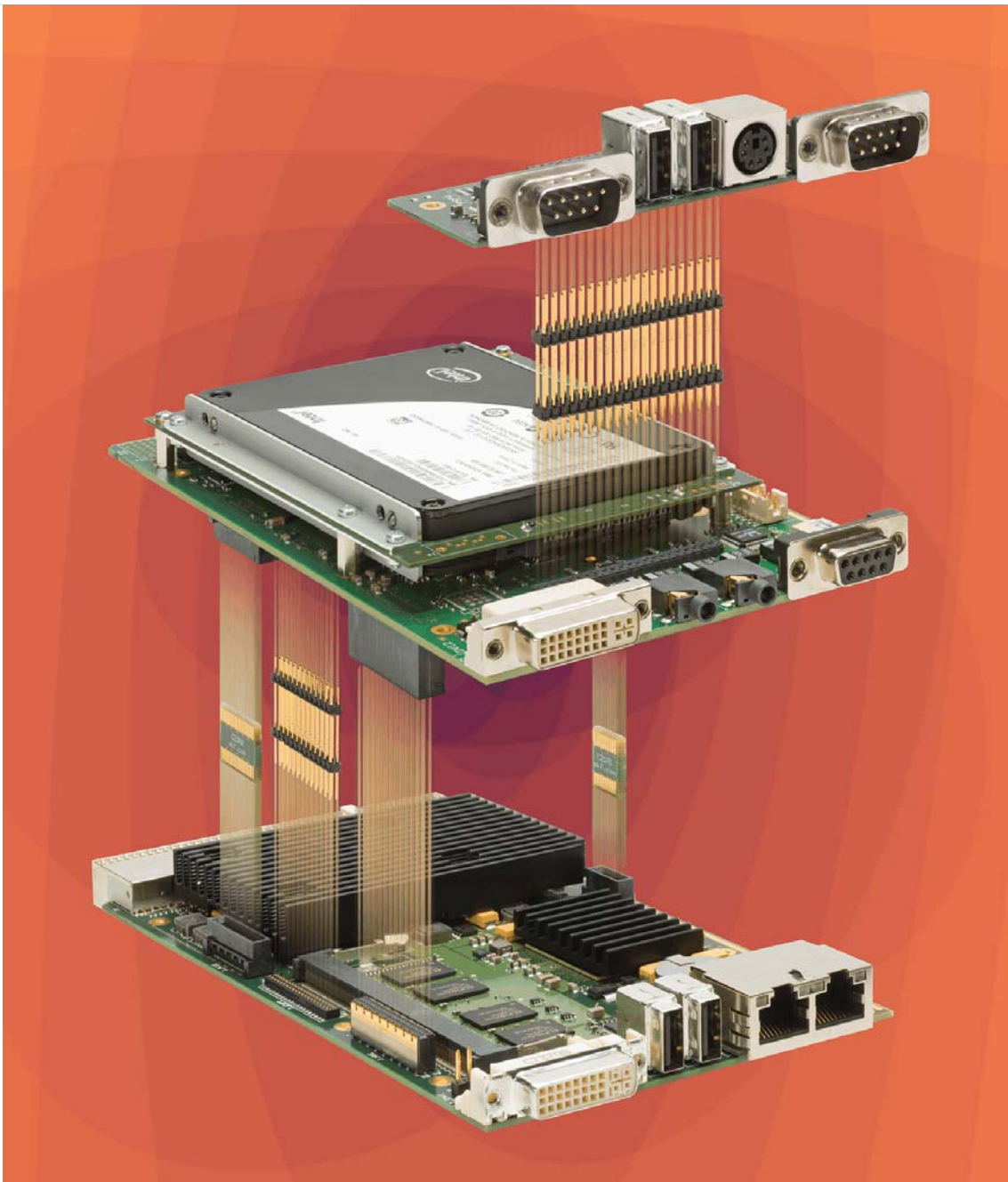
Custom Specific 12HP Front Panel

### C20-SATA Assembly Sectional Drawing (South View)





C20-SATA Dual Drive Profile View



Assembly Stack with C20-SATA

## Installing and Replacing Components

### Before You Begin

#### Warnings

The procedures in this chapter assume familiarity with the general terminology associated with industrial electronics and with safety practices and regulatory compliance required for using and modifying electronic equipment. Disconnect any telecommunication links, networks or procedures described in this chapter. Failure links before you open the system or perform or equipment damage. Some parts of the the power switch is in its off state.



the system from its power source and from modems before performing any of the to disconnect power, or telecommunication any procedures can result in personal injury system can continue to operate even though

#### Caution

Electrostatic discharge (ESD) can damage components. Perform the procedures described in this chapter only at an ESD workstation. If such a some ESD protection by wearing an metal part of the system chassis or board original ESD protected packaging. Retain the antistatic box) in case of returning the board to EKF for repair.



station is not available, you can provide antistatic wrist strap and attaching it to a front panel. Store the board only in its original packaging (antistatic bag and



Typical 4HP Assembly Stack with C20-SATA

## Installing the Board Assembly

### Warning

This procedure should be done only by qualified technical personnel. Disconnect the system from its power source before doing the procedures described here. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage.

Typically you will perform the following steps:

- Switch off the system, remove the AC power cord
- Attach your antistatic wrist strap to a metallic part of the system
- Remove the board packaging, be sure to touch the board only at the front panel
- Identify the related CompactPCI slot (peripheral slot for I/O boards, system slot for CPU boards, with the system slot typically most right or most left to the backplane)
- Insert card carefully (be sure not to damage components mounted on the bottom side of the board by scratching neighbored front panels)
- A card with onboard connectors requires attachment of associated cabling now
- Lock the ejector lever, fix screws at the front panel (top/bottom)
- Retain original packaging in case of return



## Removing the Board Assembly

### Warning

This procedure should be done only by qualified technical personnel. Disconnect the system from its power source before doing the procedures described here. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage.

Typically you will perform the following steps:

- Switch off the system, remove the AC power cord
- Attach your antistatic wrist strap to a metallic part of the system
- Identify the board, be sure to touch the board only at the front panel
- unfasten both front panel screws (top/bottom), unlock the ejector lever
- Remove any onboard cabling assembly
- Activate the ejector lever
- Remove the card carefully (be sure not to damage components mounted on the bottom side of the board by scratching neighbored front panels)
- Store board in the original packaging, do not touch any components, hold the board at the front panel only



### Warning

Do not expose the card to fire. Battery cells and other components could explode and cause personal injury.





### EMC Recommendations

In order to comply with the CE regulations for EMC, it is mandatory to observe the following rules:

- The chassis or rack including other boards in use must comply entirely with CE
- Close all board slots not in use with a blind front panel
- Front panels must be fastened by built-in screws
- Cover any unused front panel mounted connector with a shielding cap
- External communications cable assemblies must be shielded (shield connected only at one end of the cable)
- Use ferrite beads for cabling wherever appropriate
- Some connectors may require additional isolating parts

### Reccomended Accessories

Blind CPCI Front Panels	EKF Elektronik	Widths currently available (1HP=5.08mm): with handle 4HP/8HP without handle 2HP/4HP/8HP/10HP/12HP
Ferrit Bead Filters	ARP Datacom, 63115 Dietzenbach	Ordering No. 102 820 (cable diameter 6.5mm) 102 821 (cable diameter 10.0mm) 102 822 (cable diameter 13.0mm)
Metal Shielding Caps	Conec-Polytronic, 59557 Lippstadt	Ordering No. CDFA 09 165 X 13129 X (DB9) CDSFA 15 165 X 12979 X (DB15) CDSFA 25 165 X 12989 X (DB25)

## Technical Reference - Connectors

### Caution

Some of the connectors may provide operating voltage (e.g. +12V, +5V and +3.3V) to devices inside the system chassis, such as internal peripherals. Not all of these connectors are overcurrent protected. Do not use these connectors for powering devices external to the computer chassis. A fault in the load presented by the external devices could cause damage to the board, the interconnecting cable and the external devices themselves.

### Please Note

The C20-SATA mezzanine module may be equipped with several connectors for system internal usage. Not all of these connectors may be present on a particular board. Be sure to specify your individual needs when ordering the C20-SATA board. Characteristic features and the pin assignments of each connector are described on the following pages.

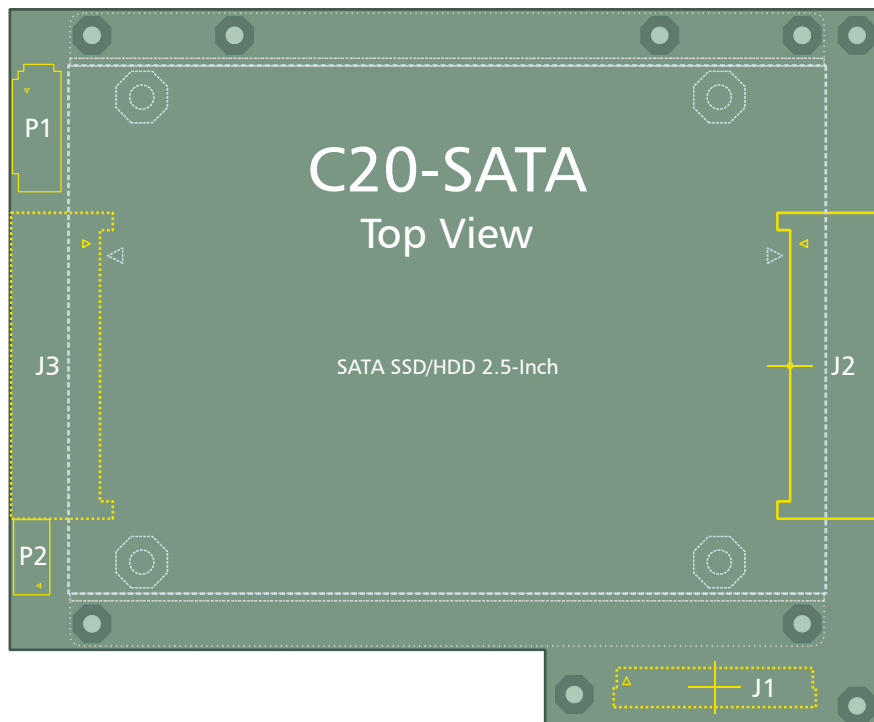


Typical 8HP Assembly Stack with C20-SATA



## I/O Connectors

The C20-SATA is typically provided with several on-board connectors, prominently the SATA docking header(s).



I/O Connectors	
J2	Docking header for 2.5-inch SATA drive, top mount
J3	Docking header for 2.5-inch SATA drive, bottom mount, option
P1	Latching SATA connector (cable assembly), top mount, exclusive to J3, option
P2	External drive power, top mount, option

## J2/J3 SATA Docking Header(s)

The C20-SATA can be equipped with one or two 2.5-inch SATA drive(s), either hard disk (HDD), or silicon state (SSD). The 22-position SATA docking header(s) J2 and J3 allow for direct attachment of the drive(s), without cable assembly.

J2 is the top mount drive connector, and J3 is provided as a bottom mount option only, for a dual drive solution.



Solid State Drive 2.5-Inch

The dual drive array requires additional headroom between the carrier board and the C20-SATA PCB. Hence, the 4mm height mezzanine connector J1 (which is suitable for a single top mount drive) must be replaced by an extended height 8mm connector (which results in  $8\text{mm}+2\text{mm}=10\text{mm}$  total, together with the mating carrier board mezzanine connector). Other mounting alternates (14mm, 18mm headroom) can be achieved by changing also the mating mezzanine connector on the carrier board (10mm version).

SATA software drivers must be installed on the associated carrier card before using any SATA connector on the C20-SATA.

J2/J3 • SATA Docking Connector(s) 15+7 • 256.022.10.01



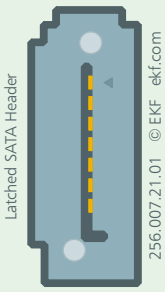
S1	GND
S2	TX+ SATA01 (02)
S3	TX- SATA01 (02)
S4	GND
S5	RX- SATA01 (02)
S6	RX+ SATA01 (02)
S7	GND
P1	+3.3V
P2	+3.3V
P3	+3.3V
P4	GND
P5	GND
P6	GND
P7	+5V
P8	+5V
P9	+5V
P10	GND
P11	RSVD
P12	GND
P13	+12V
P14	+12V
P15	+12V

Signal designations RX/TX shown here with respect to the SATA host controller (JMB362 on the carrier board).

Despite the SATA docking connectors are also provided with reserved pins assigned to +12V and +3.3V, only +5V is required for typical 2.5-inch SATA drives. As a C20-SATA stuffing option, +5V can be derived either from the carrier board, or the connector P2 (for external power supply).

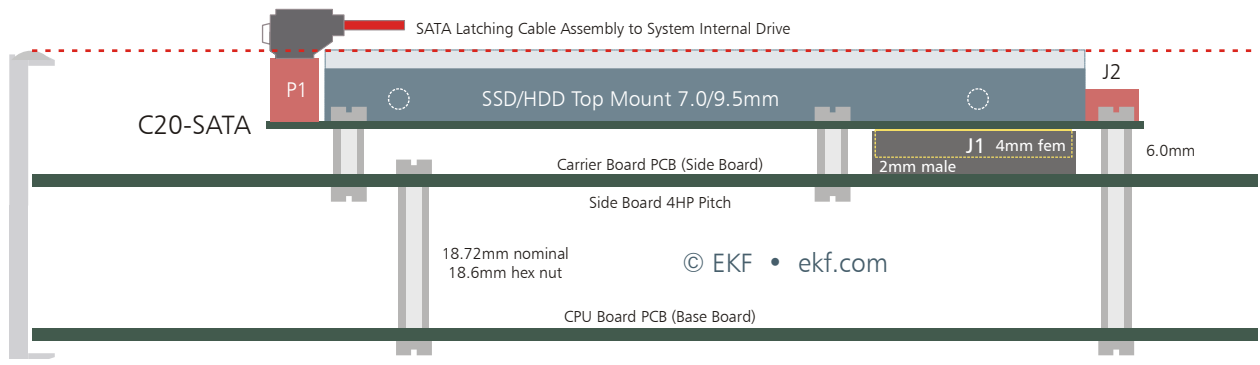
### P1 SATA Cable Header

The C20-SATA can be optionally equipped with a vertical SATA signal header, suitable for latching cable assemblies. P1 is exclusive to J3. Please note, that P1 would definitely violate the 4HP envelope of the carrier board, with the attached cable in mind. P1 is provided as an option, e.g. for attachment of a system internal drive such as an optical disk.

P1 • SATA • 256.007.21.01 Latched SATA Header		
	1	GND
	2	SATA_TX+
	3	SATA_TX-
	4	GND
	5	SATA_RX-
	6	SATA_RX+
	7	GND

TX/RX designation of signals are shown with respect to the SATA controller JMB362 on the carrier board. A latching SATA cable assembly is highly recommended for reliable industrial usage.

SATA software drivers must be installed on the associated carrier card before using any SATA connector on the C20-SATA.

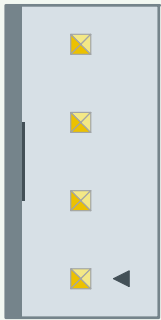


Since P1 is exclusive to J3 (bottom mount drive), P1 is available only in the single drive configuration of the C20-SATA. A right angled cable connector may be used for a minimum height assembly.

## P2 External Power

The C20-SATA module will be normally supplied with +5V drive power across the J1 mezzanine connector from the carrier side board. In turn, the side board +5V power is primarily derived from the CPU base board switched +5V power well, according to the current CPU sleep state.

With the optional connector P2, the systems power supply can be also permanently connected to the C20-SATA transition module, as an alternative. The P2 connector is an AMP EI series 4-position header, being very popular since it has been used also on 3.5-inch floppy disk drives. The current is limited by a resettable fuse. P2 is a stuffing option. If populated, SATA power is not available across J1 (in order to avoid backdriving).

P2 • External Power • 264.02.004.03 (AMP EI-Series 2.50mm pitch straight header)		
<p>264.02.004.03 AMP 171825-4 © EKF • ekf.com</p> 	1	+5V/1.5A
	2	GND
	3	GND
	4	+12V/0.5A

As of current, 2.5-inch SATA drives require +5V only (P2 pin 1). P2 pin 4 (+12V) can be left open. In rare cases the external power source may deliver +12V only. For this situation the C20-SATA can be provided with an on-board DC/DC switched regulator, from +12V to +5V.

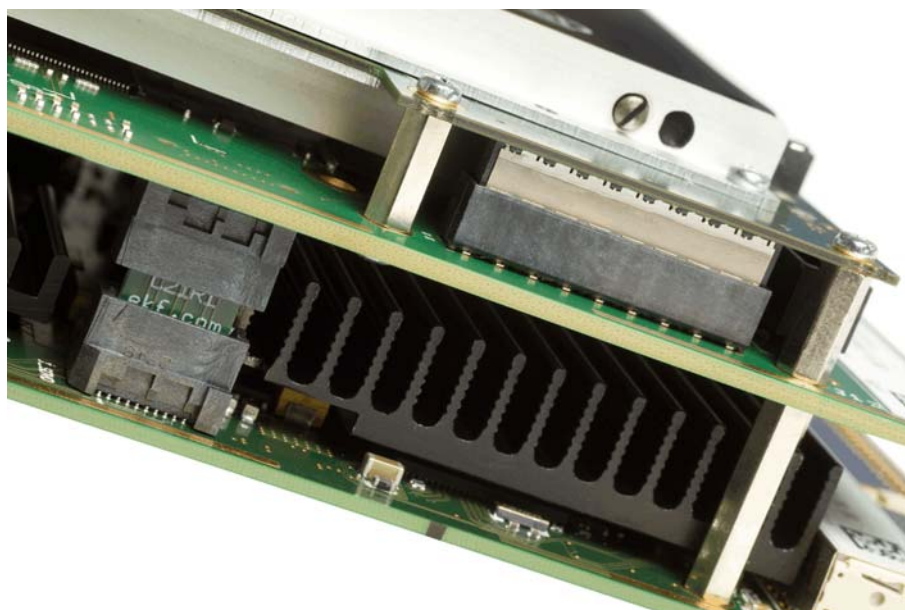
## Inter-Board Connector

The C20-SATA is equipped with a high speed mezzanine connector J1, mating with the associated mezzanine connector on the carrier card (side board). The inter-board connector is situated at the bottom of the C20-SATA and establishes the data path and power link to the carrier board.

J1 is a female connector and comes in either one of the height alternates 4mm or 8mm. The mating male connector on the carrier board has either 2mm or 10mm mounting height. Hence four alternate mounting heights are available for the C20-SATA: 6mm, 10mm, 14mm, 18mm. The 6mm headroom assembly fits entirely into the 4HP profile of the carrier board (single drive).

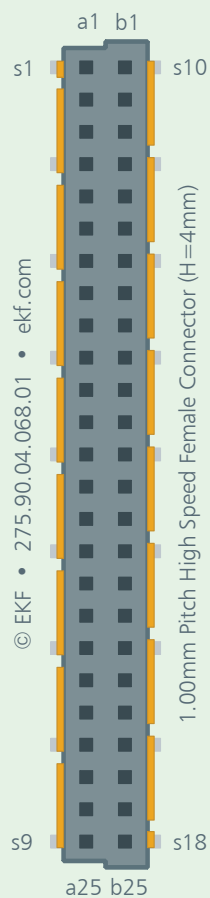
Since the C20-SATA comes typically mounted as a unit together with the CPU carrier board, there is normally no need for the user to get access to the inter-board connector. It is described here as a reference only and for better understanding of the C20-SATA.

Inter-Board Connector	
J1	Mezzanine connector, bottom mount, 2 x SATA & drive power



### J1 Mezzanine Connector

1.00mm Pitch Female Connector 4mm Height (6mm/14mm Headroom) • 275.90.04.068.01  
 1.00mm Pitch Female Connector 8mm Height (10mm/18mm Headroom) • 275.90.08.068.01



GND	a1	b1	GND
SATA1 TXP	a2	b2	
SATA1 TXN	a3	b3	
GND	a4	b4	GND
SATA1 RXN	a5	b5	
SATA1 RXP	a6	b6	
GND	a7	b7	GND
SATA2 TXP	a8	b8	
SATA2 TXN	a9	b9	
GND	a10	b10	GND
SATA2 RXN	a11	b11	
SATA2 RXP	a12	b12	
GND	a13	b13	GND
	a14	b14	
	a15	b15	
GND	a16	b16	GND
	a17	b17	
	a18	b18	
	a19	b19	
	a20	b20	
	a21	b21	
+3.3V	a22	b22	+5V
+3.3V	a23	b23	+5V
	a24	b24	
	a25	a25	

Notes:

- All sx pins (connector shield) are tied to GND
- All TX/RX designations with respect to the SATA controller on the CPU carrier board (TX controller = RX drive, RX controller = TX drive)

## Schematics

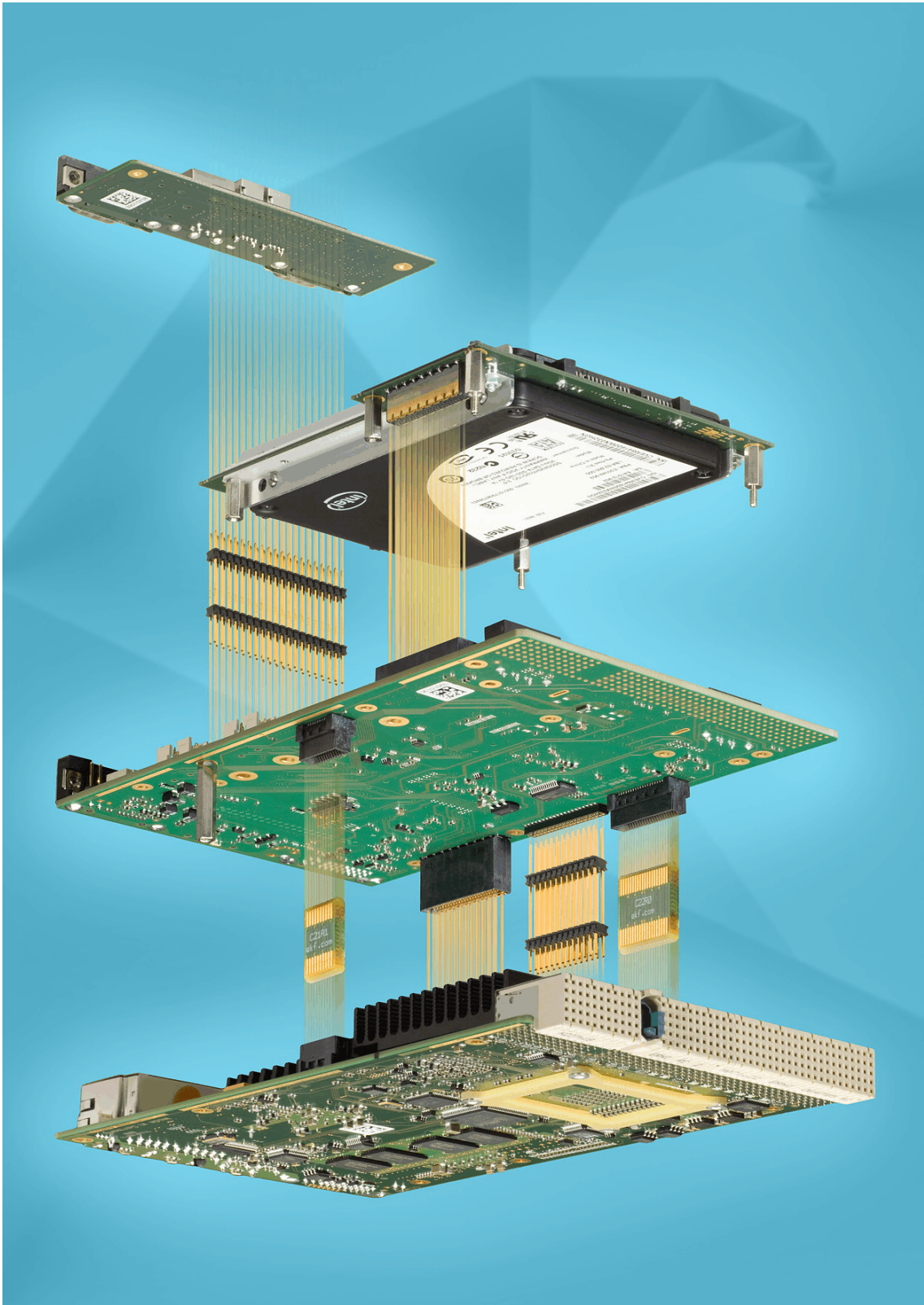
Complete circuit diagrams for this product are available for customers on request. Signing of a non-disclosure agreement would be needed. Please contact [sales@ekf.de](mailto:sales@ekf.de) for details.

EKF reserves the right to refuse distribution of confidential information material for any reason that EKF may consider substantial.



Typical 12HP Assembly Stack with C20-SATA











Industrial Computers Made in Germany  
boards. systems. solutions.

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