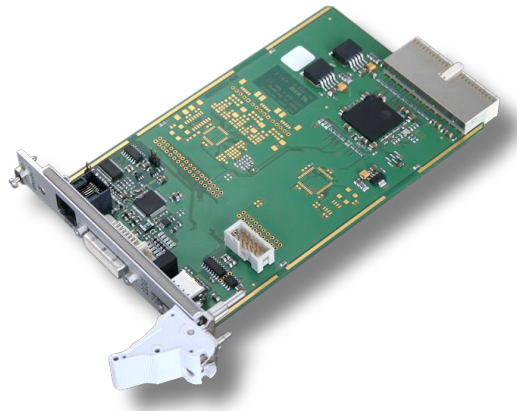




# CPCI-DVI/2

## CompactPCI<sup>®</sup> Graphic Card with Silicon Motion SM502 GPU



## Hardware Manual

to Product I.2311.04



## NOTE

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## Document History

The changes in the document listed below affect changes in the hardware as well as changes in the description of the facts, only.

Revision	Chapter	Changes versus previous version	Date
1.0	-	First English manual	2014-03-25

Technical details are subject to change without further notice.



## Safety Instructions

- When working with the CPCI-DVI/2 follow the instructions below and read the manual carefully to protect yourself from injury and the CPCI-DVI/2 from damage.
- The device is a built-in component. It is essential to ensure that the device is mounted in a way that cannot lead to endangering or injury of persons or damage to objects.
- The device has to be securely installed in the control cabinet before commissioning.
- Protect the CPCI-DVI/2 from dust, moisture and steam.
- Protect the CPCI-DVI/2 from shocks and vibrations.
- The CPCI-DVI/2 may become warm during normal use. Always allow adequate ventilation around the CPCI-DVI/2 and use care when handling.
- Do not operate the CPCI-DVI/2 adjacent to heat sources and do not expose it to unnecessary thermal radiation. Ensure an ambient temperature as specified in the technical data.
- Do not use damaged or defective cables to connect the CPCI-DVI/2.
- In case of damages to the device, which might affect safety, appropriate and immediate measures must be taken, that exclude an endangerment of persons and objects.
- Current circuits which are connected to the device have to be sufficiently protected against hazardous voltage (SELV according to EN 60950-1).
- The CPCI-DVI/2 may only be driven by power supply current circuits, that are contact protected.  
A power supply, that provides a safety extra-low voltage (SELV or PELV) according to EN 60950-1, complies with this conditions.



### Attention !

#### **Electrostatic discharges may cause damage to electronic components.**

To avoid this, please perform the steps described on page 9 *before* you touch the CPCI-DVI/2, in order to discharge the static electricity from your body.

### Qualified Personal

This documentation is directed exclusively towards personal qualified in control and automation engineering. The installation and commissioning of the product may only be carried out by qualified personal, which is authorized to put devices, systems and electric circuits into operation according to the applicable national standards of safety engineering.

### Conformity

The CPCI-DVI/2 is an industrial product and meets the demands of the EU regulations and EMC standards printed in the conformity declaration at the end of this manual.

**Warning:** In a residential, commercial or light industrial environment the CPCI-DVI/2 may cause radio interferences in which case the user may be required to take adequate measures.

### Intended Use

The intended use of the CPCI-DVI/2 is the operation as CompactPCI® Graphic Card.

The guarantee given by esd does not cover damages which result from improper use, usage not in accordance with regulations or disregard of safety instructions and warnings.

- The CPCI-DVI/2 is intended for installation in a CompactPCI-system only.
- The operation of the CPCI-DVI/2 in hazardous areas, or areas exposed to potentially explosive materials is not permitted.
- The operation of the CPCI-DVI/2 for medical purposes is prohibited.

### Service Note

The CPCI-DVI/2 does not contain any parts that require maintenance by the user. The CPCI-DVI/2 does not require any manual configuration of the hardware.

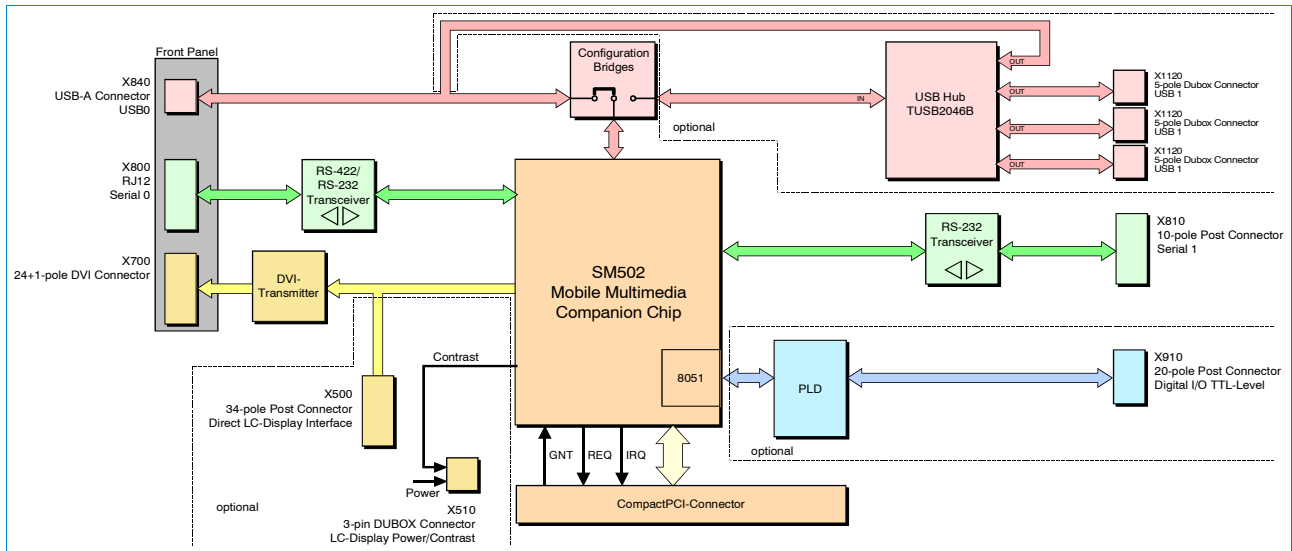
### Disposal

Devices which have become defective in the long run have to be disposed in an appropriate way or have to be returned to the manufacturer for proper disposal. Please, make a contribution to environmental protection.

# Table of contents

1. Overview.....	6
1.1 PCB View with Connectors and Jumpers.....	7
1.2 Position of the Connectors in the Front Panel.....	8
2. Hardware Installation and Configuration.....	9
2.1 Installation.....	9
2.2 Demounting.....	10
2.3 Jumper Setting.....	10
2.3.1 Configuration of SER0 (RS-422/RS-232).....	10
2.3.2 Termination of SER0 (RS-422).....	10
3. Technical Data.....	11
3.1 General Technical Data.....	11
3.2 CompactPCI Bus.....	11
3.3 DVI-I Interface.....	12
3.4 Serial Interfaces.....	12
3.5 USB Interface.....	12
3.6 Software Support.....	13
4. Description of the Units.....	14
4.1 Serial Interface SER0.....	14
4.1.1 Default Setting of SER0.....	14
4.1.2 Configuration of SER0.....	14
4.1.3 Connection of SER0 as RS-422 Interface.....	14
4.1.4 Connection of SER0 as RS-232 Interface.....	15
5. Connector Assignments.....	16
5.1 DVI-I Interface (X700).....	16
5.2 USB.....	17
5.3 Serial Interface.....	18
5.3.1 SER0 (RS-232) interface via RJ12.....	18
5.3.2 SER1-3 via X1140.....	18
6. Declaration of Conformity.....	19
7. Order Information.....	20

# 1. Overview



**Figure 1:** Block circuit diagram

The CompactPCI<sup>®</sup> graphic card CPCI-DVI/2 comes with a with Silicon Motion SM502 GPU industrial graphics controller. The ultra low-power graphics processing unit SM502 offers display modes from 640x480 (true color) at 85 Hz up to 1280x1024 (8 bit colors) at 75 Hz.

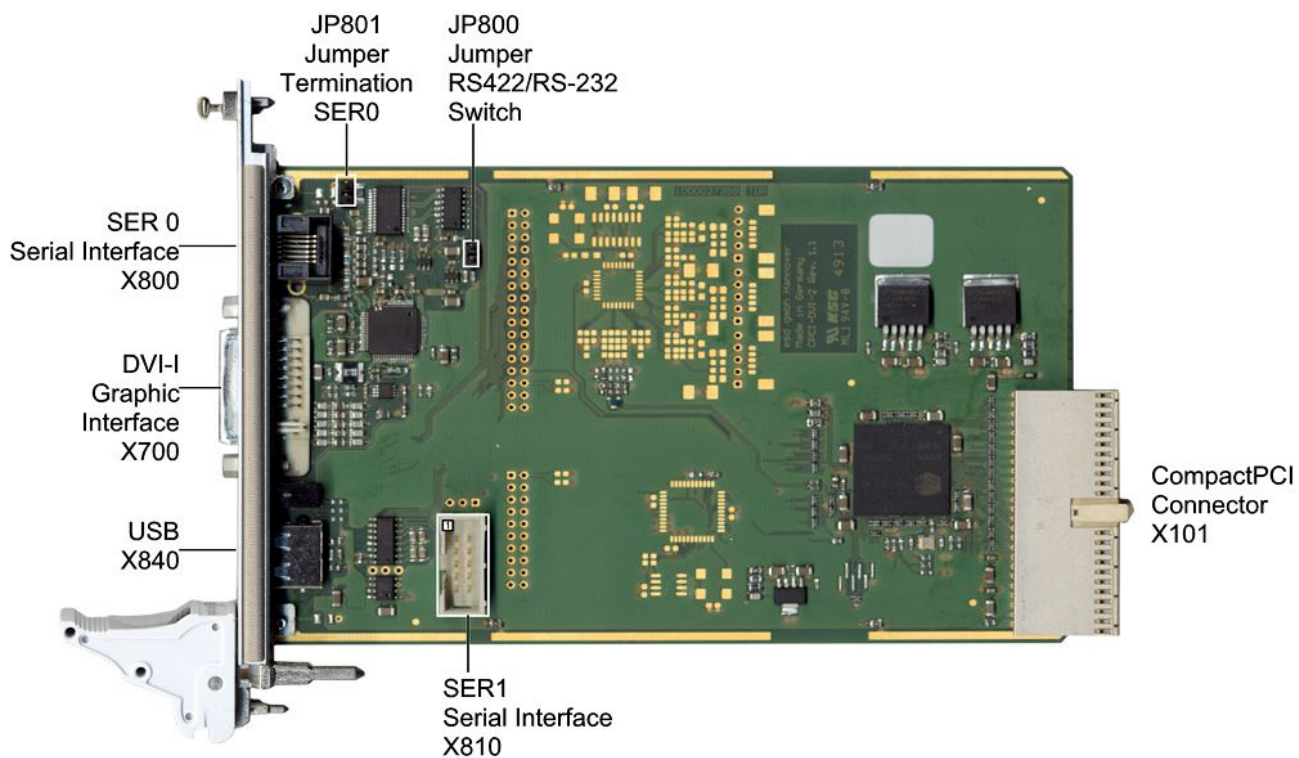
The DVI-I interface (digital video interface) is designed to control CRT-monitors by analog video signals as well as TFT-displays by digital video signals. The DVI-I connector including RGB-analog is accessible via the front panel.

The CPCI-DVI/2 is equipped with two serial interfaces. The front-side interface can be switched to RS-232 or RS-422 and supports a touchscreen or general purpose serial I/O. The on-board RS-232 interface can be used for general purpose serial I/O.

The board comes with a USB 1.1 interface as keyboard and mouse interface or touch. QNX<sup>®</sup> and Linux<sup>®</sup> driver support for USB is available. All device classes supported by the operating systems can be used. Drivers for other operating systems are available on request.

A hardware options the CPCI-DVI/2 can be enhanced with a USB Hub, direct digital display interface, matrix keyboard control lines via PLD implementation and 8051 firmware.

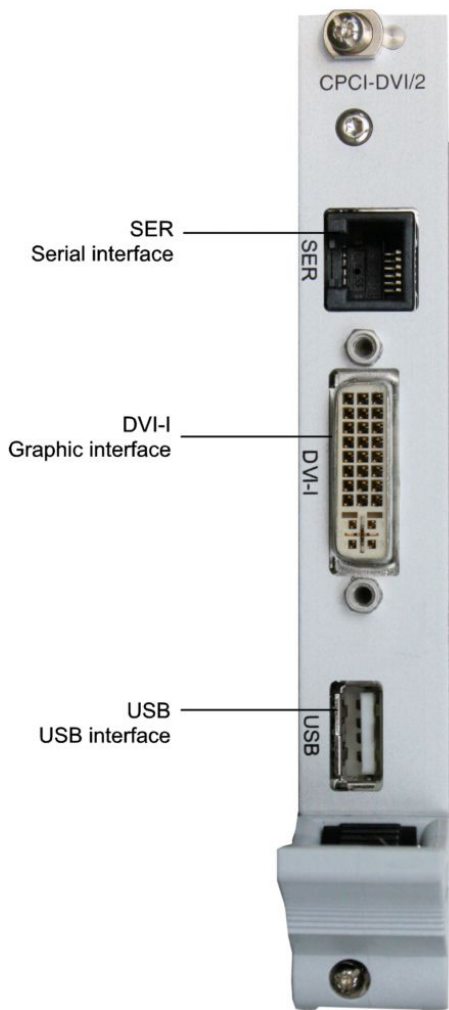
## 1.1 PCB View with Connectors and Jumpers



**Figure 2:** PCB top view of CPCI-DVI-2

See also page 16 for signal assignments of the CAN connectors.

## 1.2 Position of the Connectors in the Front Panel



**Figure 3:** Connectors in the front panel



## 2. Hardware Installation and Configuration



**Read the safety instructions at the beginning of this document carefully, before you start with the hardware installation!**



**Danger!**

Electric shock risk. Never carry out work while power supply voltage is switched on!



**Attention !**

Electrostatic discharges may cause damage to electronic components. To avoid this, please discharge the static electricity from your body by touching the metal case of the CompactPCI system *before* you touch the CPCI-DVI/2.

### 2.1 Installation

**Procedure:**

1. Switch off your CompactPCI system and all connected peripheral devices (monitor, printer, etc.).
2. Disconnect the CompactPCI system from the mains.  
If the CompactPCI system does not have a flexible mains cable, but is directly connected to mains, disconnect the power supply via the safety fuse and make sure that the fuse cannot switch on again unintentionally (i.e. with caution label).



**Danger!**

Never carry out work while power supply voltage is switched on!

3. Discharge your body as described above.
4. Open the case.
5. Make sure that the jumpers for RS-422/RS-232 interface and internal termination of SER0 are set according to the intended usage (see chapter “2.3 Jumper Setting”).
6. Insert the CPCI-DVI/2 board into the selected CompactPCI slot. Carefully push the board until it snaps into place.
7. Connect the interfaces (USB, DVI, SER0) via the connectors in the front panel of the CPCI-DVI/2 and if applicable the serial interface SER1 via the internal connector.
8. Close the CompactPCI system case again.
9. Connect the CompactPCI system to mains again (mains connector or safety fuse).
10. Switch on the CompactPCI system and the peripheral devices.
11. End of hardware installation.
12. Set the interface properties in your operating system. Refer to the documentation of the operating system.

### 2.2 Demounting

#### Procedure

- A1. Switch off the CompactPCI system and if necessary other network participants. Disconnect the connectors in the front panel.
- A2. Disconnect the CompactPCI system from the mains.  
If the CompactPCI system does not have a flexible mains cable, but is directly connected to mains, disconnect the power supply via the safety fuse and make sure that the fuse cannot switch on again unintentionally (i.e. with caution label).



#### **Danger!**

Never carry out work while power supply voltage is switched on!

- A3. Discharge your body as described above.
- A4. Unfasten the mounting screws in the front panel.
- A5. Unfasten the CPCI-DVI/2 by activating the eject lever and pull the module carefully out of the slot.
- A6. Remove the PCI extension if necessary.

### 2.3 Jumper Setting

The CPCI-DVI/2 comes with two jumpers.

1. Demount the module as described in chapter “2.2 Demounting”.
2. Remove or set the jumpers JP800 and/or JP801 (see chapter “2.3.1 Configuration of SER0 (RS-422/RS-232)”, “2.3.2 Termination of SER0 (RS-422)”).
3. Install the module as described in chapter “2.1 Installation”.

#### 2.3.1 Configuration of SER0 (RS-422/RS-232)

The serial interface SER0 in the front panel can be configured as RS-422 or RS-232 interface via jumper JP800. See Figure 2 for the position of the jumper.

Jumper JP800	Configuration of SER0
set	RS-422 interface
not set	RS-232 interface

#### 2.3.2 Termination of SER0 (RS-422)

An internal termination can be set for serial interface SER0 via jumper JP801 if it is used as RS-422 interface. See Figure 2 for the position of the jumper.

Jumper JP801	Termination of SER0
set	internal termination via 150Ω resistor
not set	no internal termination

### 3. Technical Data

#### 3.1 General Technical Data

Power supply voltage	nominal voltage: 3.3 V ( $I_{3.3VMAX} = 350 \text{ mA}$ ), 5 V ( $I_{5VMAX} = 25 \text{ mA}$ ) Power consumption: Typical: 2.5 W (display idle), Max: 10W
	DVI-I (24+1-pole DVI connector, X700) - CRT-socket and TFT-display SER0 (RJ12 socket, X800) - Serial interface SER0, 1x RS-422/RS-232 (switchable) USB (USB socket type-A, X840) - USB 1.1 interface as keyboard and mouse interface or touch SER1 (internal 10-pole post connector, X810) - Serial interface SER1 (RS-232)
Temperature range	0...55 °C ambient temperature
Humidity	max. 90%, non-condensing
Dimensions	Board: 100 mm x 160mm Front panel: 3U x 4HP
Weight	160 g

**Table 1:** General data of the module

#### 3.2 CompactPCI Bus

Host bus	PCI-Bus according to PCI Local Bus Specification 2.2
PCI-data/address bus	32 Bit, 33/66 MHz
Controller	Silicon Motion SM502 graphic controller
Interrupt	Interrupt Signal A
Board dimension	according to CompactPCI-Specification PICMG® 2.0 R 2.1
Connector	
Connector coding	Universal-Board, not keyed (3.3 V or 5 V signalling voltage)

**Table 2:** Data of the CompactPCI bus

### 3.3 DVI-I Interface

Outputs	Simultaneous display of digital TFT-display and analog CRT-monitor with different frequencies via DVI-connector (depending on resolution)
Controller	integrated in Silicon Motion SM502 graphic controller
Display Modes	VGA (640x480) with True Color (24 bit) at 85 Hz SVGA (800x600) with True Color at 85 Hz XGA (1024x768) with High Color (16 bit) at 85 Hz SXGA (1280x1024) with 8 bit colors at 75 Hz

**Table 3:** Data of the DVI-I interface

### 3.4 Serial Interfaces

Number	2 asynchronous serial interfaces
Controller	integrated in CPU
Bit rate	Value range: 9600 Baud ... 115200 Baud Default setting: 9600 Baud, 8 Bit, No Parity 1 Stop-Bit
Physical Interface	Serial 0: RS-422/RS-232, switchable via JP801: - RS-232 with RxD, TxD, RTS, CTS - RS-422 with Rx+, Rx-, Tx+, Tx- and TTL-level signals: Serial 1: RS-232 with RxD, TxD, RTS, CTS
Connector	Serial0: 1x RJ12-socket in the front panel, Serial1: 1x 10-pin internal IDC-connector, male X1140

**Table 4:** Data of the serial interface

### 3.5 USB Interface

Number	1x USB
Controller	integrated in Silicon Motion SM502 graphic controller
USB interface	USB 1.1, Full-Speed, 12 Mbit/s
Connector	USB type A plug

**Table 5:** Data of the USB interface

### 3.6 Software Support

Device drivers are available for QNX:

Software	CPCI-DVI/2-QNX (see “7. Order Information”)
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Furthermore Linux drivers are available:

Software	CPCI-DVI/2-Linux (see “7. Order Information”)
Operating system	Linux, Kernel 2.6.x
Adaptation	Driver and API functions are optimized for this system
License information	This product uses the operating system “Linux”. The Linux-source code is released under the terms of the GNU Public License (GPL). The complete text of the license is contained in the esd-document “3rd Party Licensor Notice” as part of the product documentation. esd provides the complete operating system source code on request.

Other operating systems on request.

## 4. Description of the Units

### 4.1 Serial Interface SER0

#### 4.1.1 Default Setting of SER0

The default setting of the serial interface is:

Bit rate: 9600 Baud  
 Data bits: 8  
 Parity: no  
 Stop bits: 1  
 Handshake: none

#### 4.1.2 Configuration of SER0

The serial interface is compatible with 16550 UART and is addressed via PCI. Standard drivers are available for this.

Via jumper JP800 the serial interface can be configured as RS-232 or RS-422 interface (see chapter “2.3 Jumper Setting”).

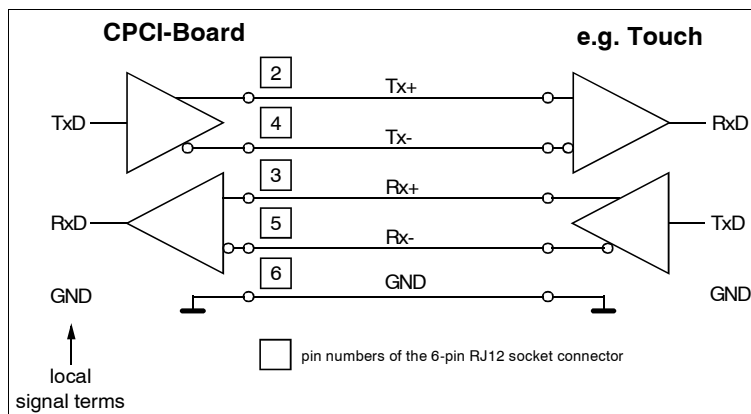
The SP3497E is used as driver of the RS-422 interface and the SP3243E is used as driver of the RS-232 interface.

For details please read the manual of the Silicon Motion SM502 GPU

The procedure to change the bit rate depends on the operating system, it is therefore advisable to refer to the manual of the operating system.

#### 4.1.3 Connection of SER0 as RS-422 Interface

The diagram is used to explain the short terms for signals as used in the chapter connector assignments. The signal terms are exemplary for the connection of the CPCI-DVI/2.



**Figure 4:** Connection scheme for RS-422 operation

### 4.1.4 Connection of SER0 as RS-232 Interface

The diagram is used to explain the short terms for signals as used in the chapter “5. Connector Assignments”. The signal terms are exemplary for the connection of the CPCI-DVI/2 via the adapter cable RJ12-DSUB9.

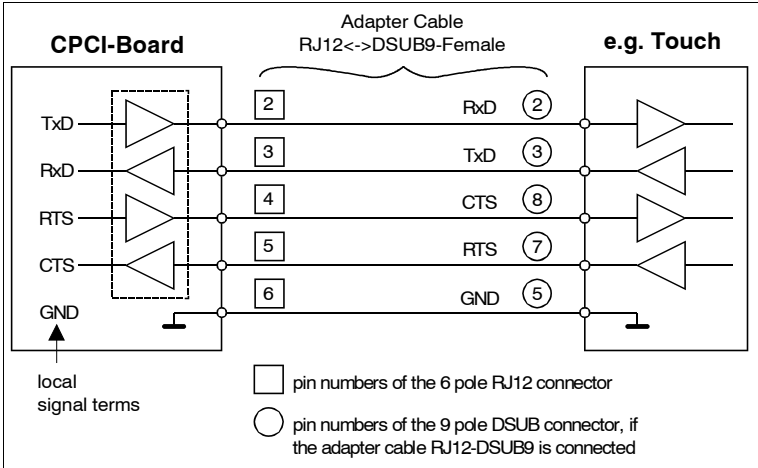


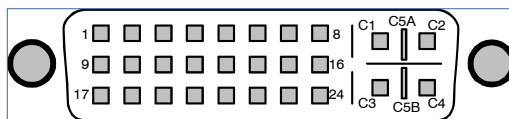
Figure 5: Connection scheme for RS-232 operation

## 5. Connector Assignments

### 5.1 DVI-I Interface (X700)

Device Connector:

Pin Position:



Pin Assignment:

Digital Signals								
Pin	1	2	3	4	5	6	7	8
Signal	DVI_ TX2-	DVI_ TX2+	DVI_ S2/4_ GND	n.c.	n.c.	YDDC_ CLK	YDDC_ DATA	A_ VSYNC
Pin	9	10	11	12	13	14	15	16
Signal	DVI_ TX1-	DVI_ TX1+	DVI_ S1/3_ GND	n.c.	n.c.	XVCC1	GND	Hot plug detect
Pin	17	18	19	20	21	22	23	24
Signal	DVI_ TX0-	DVI_ TX0+	DVI_ S0/5_ GND	n.c.	n.c.	DVI_ CLK_ GND	DVI_ TXC+	DVI_ TXC-

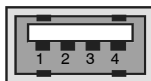
Analog Signals			
Pin	C1	C5A	C2
Signal	A_ RED	DAC GND	A_ GREEN
Pin	C3	C5B	C4
Signal	A_ BLUE	DAC GND	A_ HSYNC



## 5.2 USB

**Device connector:** USB receptacle, standard type A

**Pin Position:**



**Pin Assignment:**

Pin	Signal
1	$V_{BUS}$
2	D-
3	D+
4	GND

**Signal Description:**

$V_{BUS}$ ...      +5 V power supply voltage  
D+, D-...      USB signal lines Data+, Data-  
GND...          Reference potential



**Note:**

The maximum length of the cables connected to the USB interface is  $l_{MAX} = 3m$ .  
To comply with electromagnetic compliance and electromagnetic interference the cable length must not exceed this maximum length!

### 5.3 Serial Interface

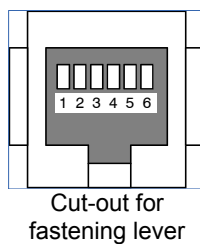
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**Note:**  
 The maximum length of the cables connected to the serial interfaces is  $I_{MAX} = 3m$ .  
 To comply with electromagnetic compliance and electromagnetic interference the cable length must not exceed this maximum length!

#### 5.3.1 SER0 (RS-232) interface via RJ12

For details on the connection of serial interfaces please refer to chapter “Serial Interface SER0” on page 14. From the principle circuit diagrams represented in that chapter, you will be able to clearly determine the signal direction (Rx<->Tx).

**Pin Position:**



**Pin Assignment:**

Pin	Signal RS-232 Interface		Signal RS-422	Optional Pin Assignment on request only
1	n.c.	(not connected)	n.c.	SER0_VCC, GND
2	SER0_TxD	Data Output	SER0_Tx+	-
3	SER0_RxD	Data Input	SER0_Rx+	-
4	SER0_RTS	Handshake Output	SER0_Tx-	-
5	SER0_CTS	Handshake Input	SER0_Rx-	-
6	GND		GND	-

The data direction of the signals is given as viewed from the CPCI-DV1/2 board.

#### 5.3.2 SER1-3 via X1140

**Device connector:** 10-pin IDC connector, male

Signal	Pin	Pin	Signal
n.c.	10	9	GND
n.c.	8	7	n.c.
SER1_CTS	6	5	SER1_Rx
SER1_RTS	4	3	SER1_Tx
n.c.	2	1	n.c.

See Figure 2 for pin position.

## 6. Declaration of Conformity

### EG-KONFORMITÄTSERKLÄRUNG EC DECLARATION OF CONFORMITY



Adresse **esd electronic system design gmbh**  
Address **Vahrenwalder Str. 207**  
**30165 Hannover**  
**Germany**

esd erklärt, dass das Produkt  
*esd declares, that the product*

**CPCI-DVI/2**

Typ, Modell, Artikel-Nr.  
*Type, Model, Article No.*

**I.2311.04**

die Anforderungen der Normen  
*fulfills the requirements of the standards*

**EN 61000-6-2:2005**  
**EN 61000-6-4:2007+A1:2011**

gemäß folgendem Prüfbericht erfüllt.  
*according to test certificate.*

**H-K00-0531-14**

Das Produkt entspricht damit der EG-Richtlinie „EMV“  
*Therefore the product corresponds to the EC-Directive 'EMC'*

**2004/108/EG**

Das Produkt entspricht der EG-Richtlinie „RoHS“  
*The product corresponds to the EC-Directive 'RoHS'*

**2011/65/EU**

Diese Erklärung verliert ihre Gültigkeit, wenn das Produkt nicht den Herstellerunterlagen entsprechend eingesetzt und betrieben wird, oder das Produkt abweichend modifiziert wird.  
*This declaration loses its validity if the product is not used or run according to the manufacturer's documentation or if non-compliant modifications are made.*

Name / Name T. Ramm  
Funktion / Title CE-Koordinator / CE Coordinator  
Datum / Date Hannover, 2014-02-07

Rechtsgültige Unterschrift / *authorized signature*

## 7. Order Information

Type	Properties	Order No.
CPCI-DVI/2	CompactPCI graphic card with Graphics Processing Unit SM502 and RS422 Interface (switchable to RS232)	I.2311.04
<b>Software</b>		
CPCI-DVI/2-QNX	QNX driver (object) incl. documentation, has to ordered only once	I.2311.15
CPCI-DVI/2-Linux	Linux driver (object) incl. documentation, has to ordered only once	I.2311.19

For detailed information about the driver availability of your special operating system, please contact our sales team.

**Table 6:** Order information

### PDF Manuals

For availability of manuals see table below.

Please download the manuals as PDF documents from our esd website [www.esd.eu](http://www.esd.eu) for free.

Manuals		Order No.
CPCI-DVI/2-ME	Hardware manual in English	I.2311.23

**Table 7:** Available manuals

### Printed Manuals

If you need a printout of the manual additionally, please contact our sales team: [sales@esd.eu](mailto:sales@esd.eu) for a quotation. Printed manuals may be ordered for a fee.