



## Product Information

SU2-BALLAD • CompactPCI® Serial • Quad Isolated RS-232 I/F

Document No. 8174 • 16 May 2018



## Short Description

*Proven and reliable, RS-232 stays a popular point-to-point low power communication interface.*

*The SU2-BALLAD is a peripheral slot card for CompactPCI® Serial systems, equipped with four front panel RS-232 ports. Isolation barrier transceivers are provided for optimum noise and EMC immunity up to 460kbps data rate, as required for industrial use and operation in harsh environments.*

The SU2-BALLAD is based on an octal PCI Express® to UART bridge. The 950-style UARTs are compatible with all typical asynchronous serial applications and protocols. While four RS-232 ports are available via Micro-D front panel connectors across isolated transceivers conforming to TIA/EIA-232-E specifications, another four UART channels are wired to the CompactPCI® Serial backplane connector P4, as TTL level signals for rear I/O usage by means of a suitable RIO module.



## Feature Summary

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**CompactPCI® Serial**

- ▶ PICMG® CompactPCI® Serial (CPCI-S.0) standard
- ▶ Single size Eurocard 3U 4HP 100x160mm<sup>2</sup>
- ▶ Suitable for CompactPCI® Serial peripheral slot (PCI Express® enabled)
- ▶ CompactPCI® Serial backplane connector P1 for PCI Express®, single lane link
- ▶ Option CompactPCI® Serial backplane connector P4 for rear I/O

**UART**

- ▶ Diodes® (Pericom) PCI Express® octal UART PI7C9X7958
- ▶ High performance 950-class UARTs
- ▶ 16C550 software compatible
- ▶ 128-Byte FIFO for each transmitter/receiver
- ▶ Baud rate up to 15Mbps
- ▶ XON/XOFF in-band flow control
- ▶ CTS/RTS out-of-band control
- ▶ Dedicated DE (driver enable) and RE# (receiver enable) control
- ▶ Data frame 5, 6, 7, 8 and 9 bits
- ▶ Clock prescaling 4 to 46
- ▶ Windows® WHQL device driver support

**RS-232 Transceivers**

- ▶ 2.5kV Isolation barrier RS-232 transceivers (Analog Devices *isoPower*)
- ▶ Transceivers meet EIA/TIA-232-E specifications
- ▶ High data rate up to 460kbps (each board tested @921.6kbps)
- ▶ ±8 kV/±15 kV ESD protection on transceiver input/output pins
- ▶ High common-mode transient immunity >25 kV/μs
- ▶ Suitable for high noise data communications and diagnostic ports

## Feature Summary

### Front Panel I/O

- ▶ 4 x Front panel Micro-D 9-pin high density male connectors
- ▶ RS-232 front ports isolated against each other and board circuitry
- ▶ Micro-D cable assemblies available, e.g. Micro-D to classic style D-Sub male or female
- ▶ Ordering option D-Sub 9-pin front panel connectors (4 ports require 8HP F/P)
- ▶ Option 2 x D-SUB9 front panel connectors on request (4HP, 2 x micro ribbon flat cable assembly)
- ▶ Option 3 x D-SUB9 front panel connectors on request (4HP, front handle replaced by screw lock)
- ▶ Option 4 x D-SUB9 front panel connectors on request (8HP, 4 x micro ribbon flat cable assembly)
- ▶ Option additional 4 front panel ports RS-232 or RS-485 by means of mezzanine expansion connectors and SUA-RIO or SUB-RIO configured as mezzanine module (8HP F/P)

### Rear I/O (Option)

- ▶ 4 x Rear I/O UART ports (TTL Level), wired to P4 for optional usage with RIO module
- ▶ Each rear I/O UART port suitable for versatile use with an appropriate transceiver on a RIO module, e.g. RS-232 or RS-485, isolated or non-isolated
- ▶ Standard rear I/O modules available (SUA-RIO for 4 x RS-232 isolated, SUB-RIO for 4 x RS-485 isolated)
- ▶ Option all 8 ports available for rear I/O
- ▶ EKF offers also custom specific rear I/O module design

## Feature Summary

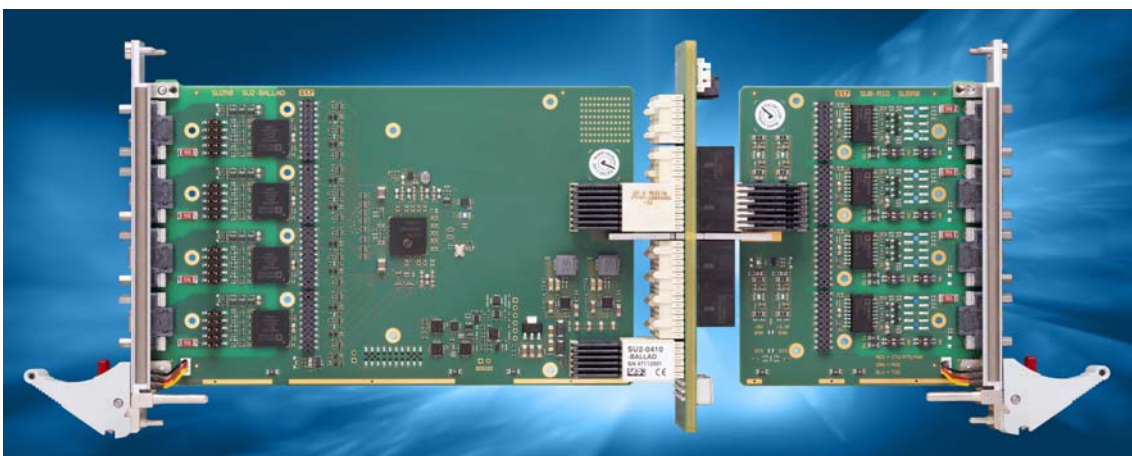
**Environment, Regulatory**

- ▶ Designed & manufactured in Germany
- ▶ Certified quality management according to ISO 9001
- ▶ Long term availability
- ▶ Rugged solution (coating, sealing, underfilling on request)
- ▶ Custom specific modifications on request
- ▶ RoHS compliant
- ▶ Operation temperature -40°C to +85°C (industrial temperature range)
- ▶ Storage temperature -40°C to +85°C, max. gradient 5°C/min
- ▶ Humidity 5% ... 95% RH non condensing
- ▶ Altitude -300m ... +3000m
- ▶ Shock 15g 0.33ms, 6g 6ms
- ▶ Vibration 1g 5-2000Hz
- ▶ MTBF 34.6 years
- ▶ EC Regulations EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)

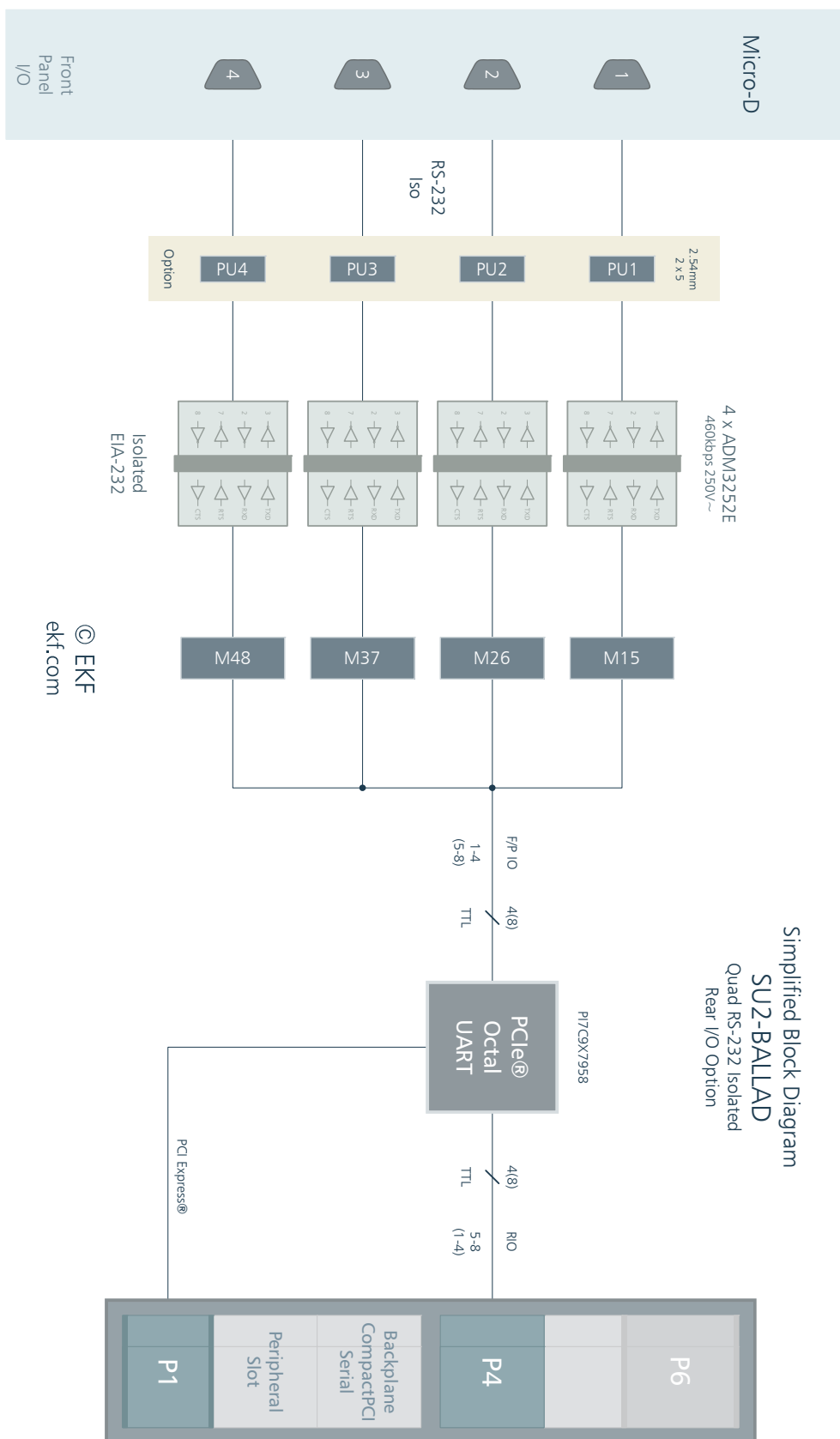




SU2-BALLAD w. SUB-RIO (8-Port 4HP • RS-232 Front, RS-485 Rear)



Block Diagram



Simplified Block Diagram  
SU2-BALLAD  
Quad RS-232 Isolated  
Rear I/O Option

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[www.ekf.com/s/su2/img/su2\\_blk.pdf](http://www.ekf.com/s/su2/img/su2_blk.pdf)

## Theory of Operation

The SU2-BALLAD is equipped with the Pericom PI7C9X7958 PCI Express® octal UART, which is suitable for asynchronous baud rates up to 15Mbps. Four UART channels are wired to Micro-D front panel connectors across isolated RS-232 transceivers. Each port is comprised of the receive and transmit data signals (RXD, TXD), and in addition two hardware handshake signals (CTS, RTS) which may be used to control peripheral devices in order to avoid buffer overflow or underrun, as an alternate method to software control by X-ON/X-OFF characters.

Four ADM3252E transceivers are provided to meet the RS-232 physical layer specifications. The RS-232 signals of any particular Micro-D front panel connector are isolated from the board circuitry, and also isolated from each other front port. Driver and receiver enable is controlled by dedicated UART signals.

Micro-D to Micro-D cable assemblies are available, as well as Micro-D to D-Sub, and pigtail Micro-D cables in addition.

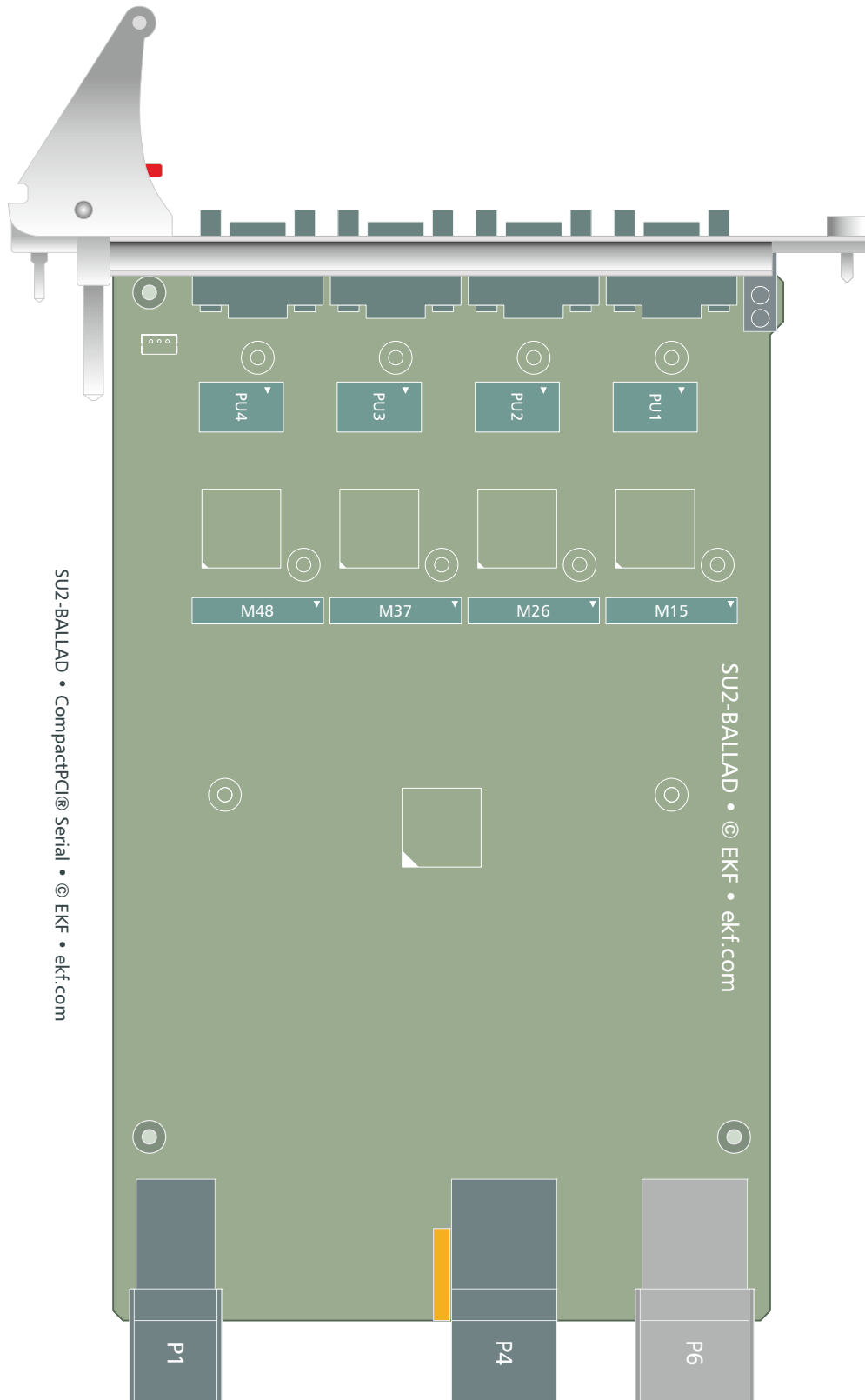
As an alternate to the Micro-D connectors, four 2.54mm pitch 2x5 position pin headers PU1-4 can be optionally populated on-board, for attachment of classic D-Sub 9-pin connectors by means of micro ribbon flat cables, to be combined with a non-standard 4HP or 8HP width front panel.

The SU2-BALLAD can be configured also for rear I/O usage. Four UART ports are wired as TTL level signals to the optional backplane connector P4, for use with a suitable RIO PHY module, typically configured as either RS-232 or RS-485. Hence, with both front and rear I/O capabilities utilised, the SU2-BALLAD is a true 4HP 8-port isolated asynchronous serial interface solution.

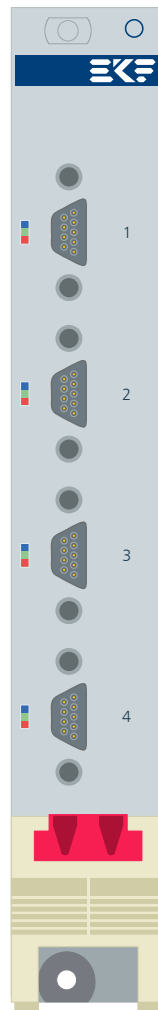
As an alternate to P4 RIO, optional mezzanine expansion connectors M15 - M48 can be provided on-board, for attachment of individual PHY modules (SU\*-Series) and also SUA/SUB-RIO configured as mezzanine card for front panel I/O.



Component Orientation



## Front Panel



SU2-BALLAD

[www.ekf.com/s/su2/img/su2\\_fpl.pdf](http://www.ekf.com/s/su2/img/su2_fpl.pdf)

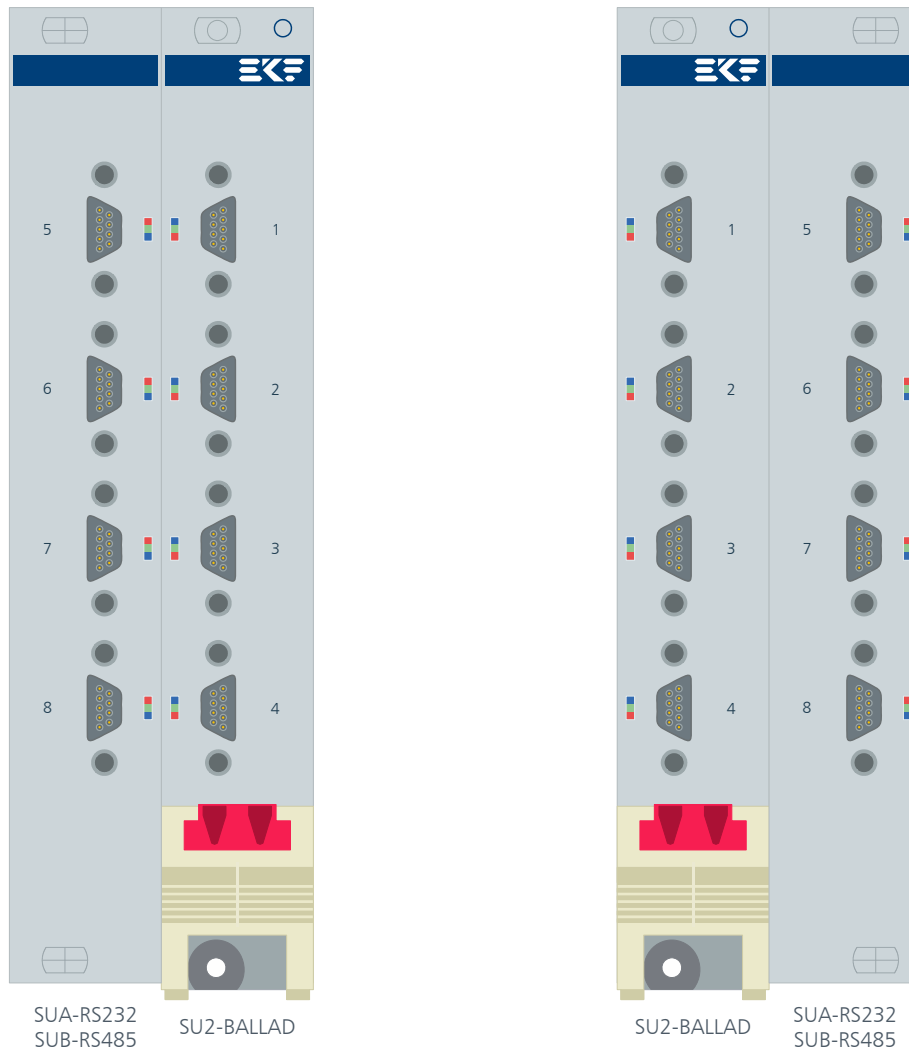
triple color LEDs assigned to each connector/port

red = CTS/RTS

green = RxD

blue = TxD

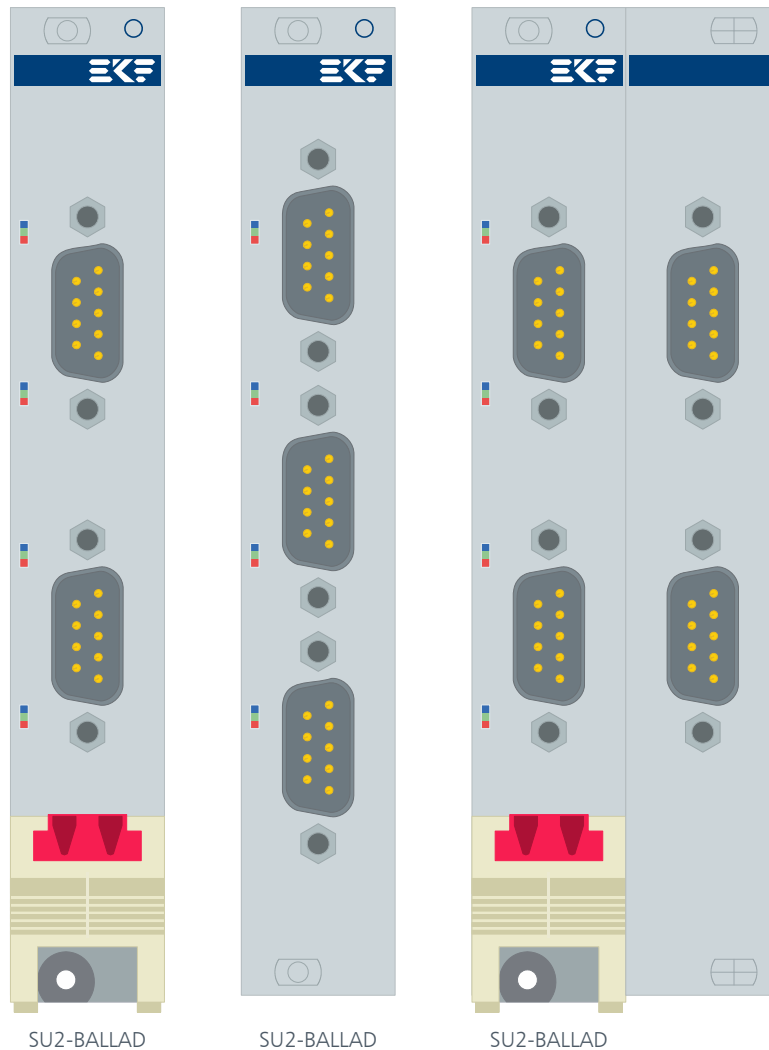
Optional 8HP F/P



[www.ekf.com/s/su2/img/su2\\_sua\\_sub\\_fpl.pdf](http://www.ekf.com/s/su2/img/su2_sua_sub_fpl.pdf)

As an option, the SU2-BALLAD can be ordered with an 8HP front panel for 8 ports. In addition to the SU2-BALLAD, a suitable mezzanine card is required, either SUA (4 isolated RS-232 ports) or SUB (4 isolated RS-485 ports). The mezzanine module may be mounted on top of the SU2-BALLAD (face-to-face) or on bottom (back-to-back), resulting in different front panel styles.

## Option D-SUB F/P



SU2-BALLAD

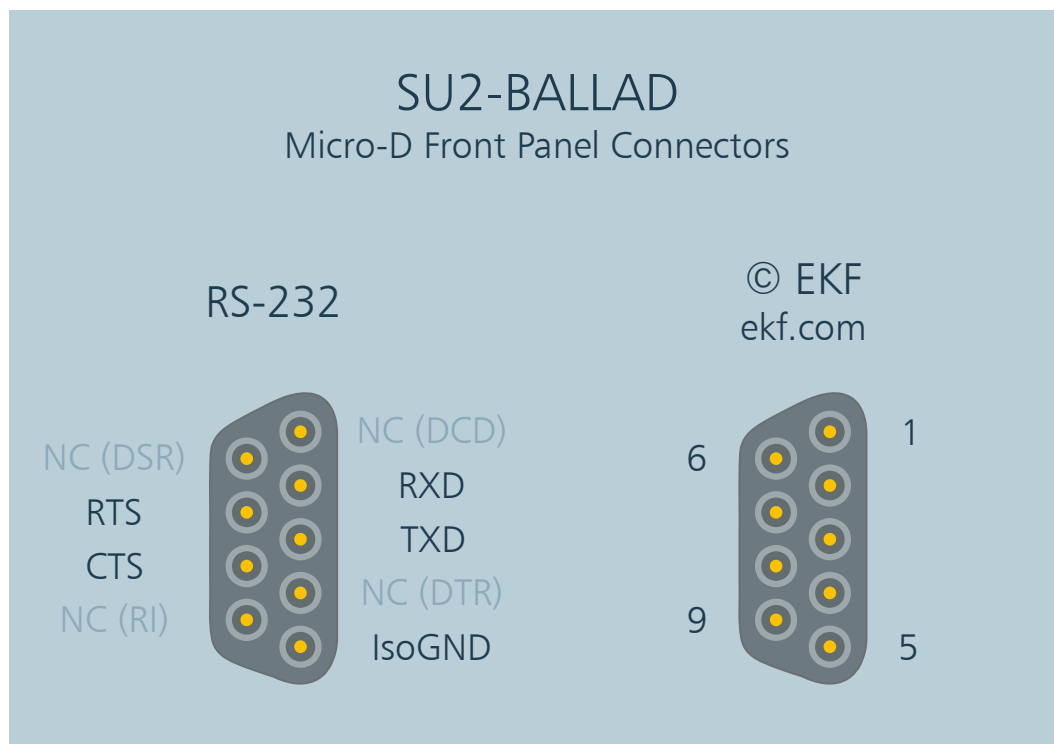
SU2-BALLAD

SU2-BALLAD

As an option, the SU2-BALLAD can be ordered with classic style D-SUB 9-pin male panel mount connectors. Due to space limitations, a 4HP three port configuration comes w/o a front handle (knurled-head screws instead), and a four port solution is available as 8HP assembly only.

## Front Panel Connectors

Due to space restrictions, the SU2-BALLAD is provided with four Micro-D male connectors, which are considerably smaller than standard D-Sub connectors and therefore allow a 4HP front panel for the board. The Micro-D connector pin assignment is illustrated below (front view).



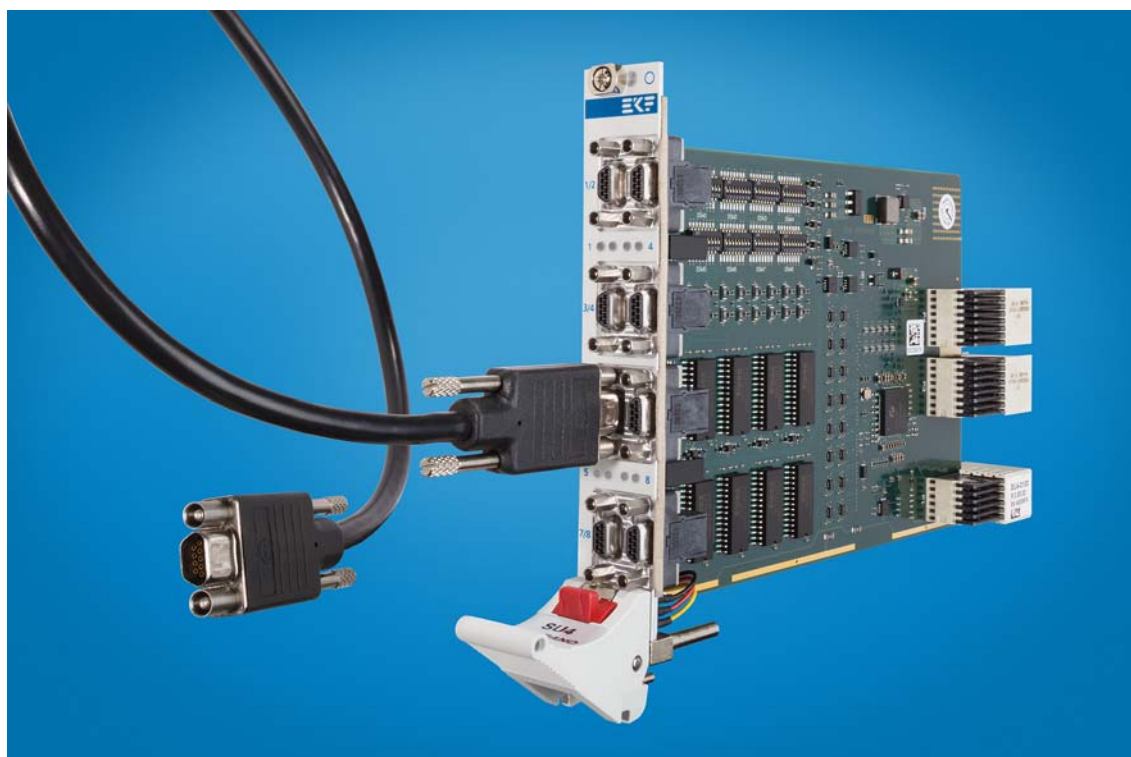
The Micro-D pin assignment replicates the classic COM port 9-position D-SUB. Due to the configuration of the isolated RS-232 transceivers, side band signals DCD, DSR, DTR and RI are not supported (NC). For hardware controlled out-of-band handshake select CTS/RTS UART driver software protocol.



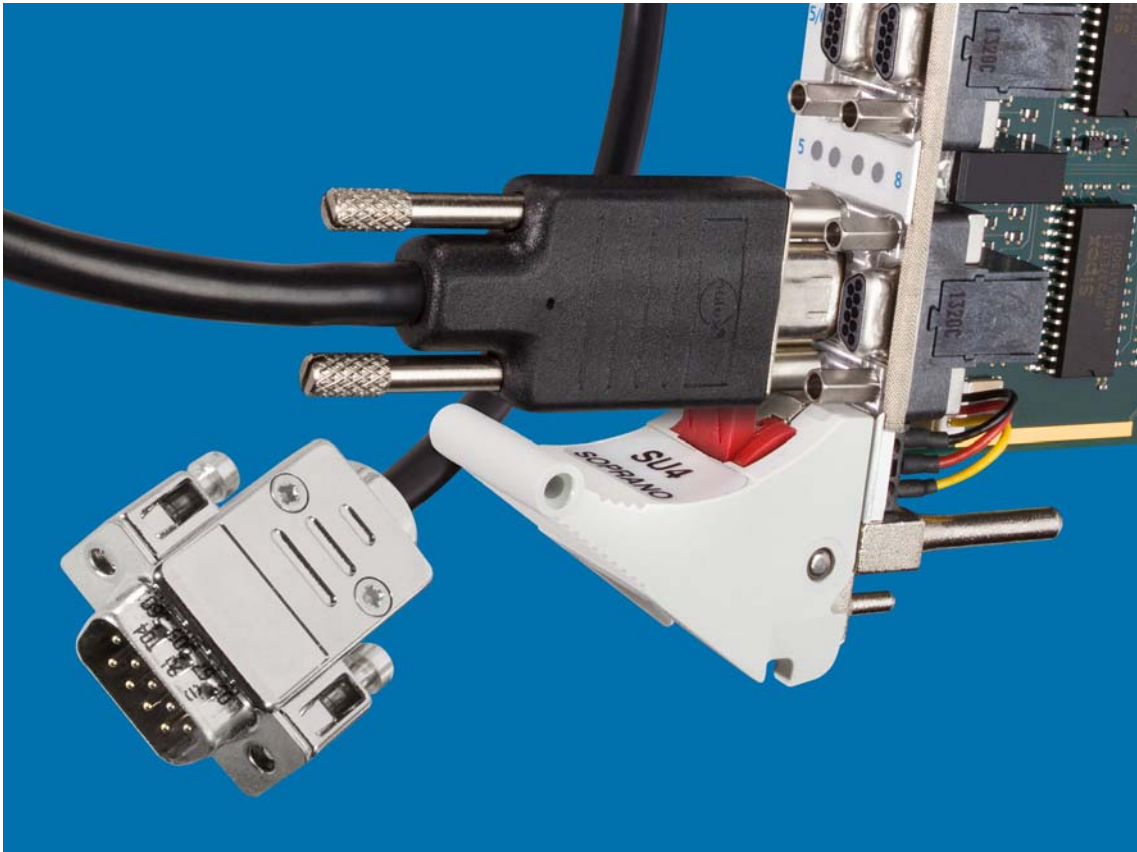
## Micro-D Cables

Some ready to use adapter cable assemblies are available from stock, e.g. Micro-D to D-Sub (female or male), designed for RS-232 operation, wired straight pin to pin. No TXD/RXD cross-over is included by default, as would be required for DCE to DCE communication (e.g. two SU2-BALLAD ports connected). In addition, custom specific cable assemblies are available on request.

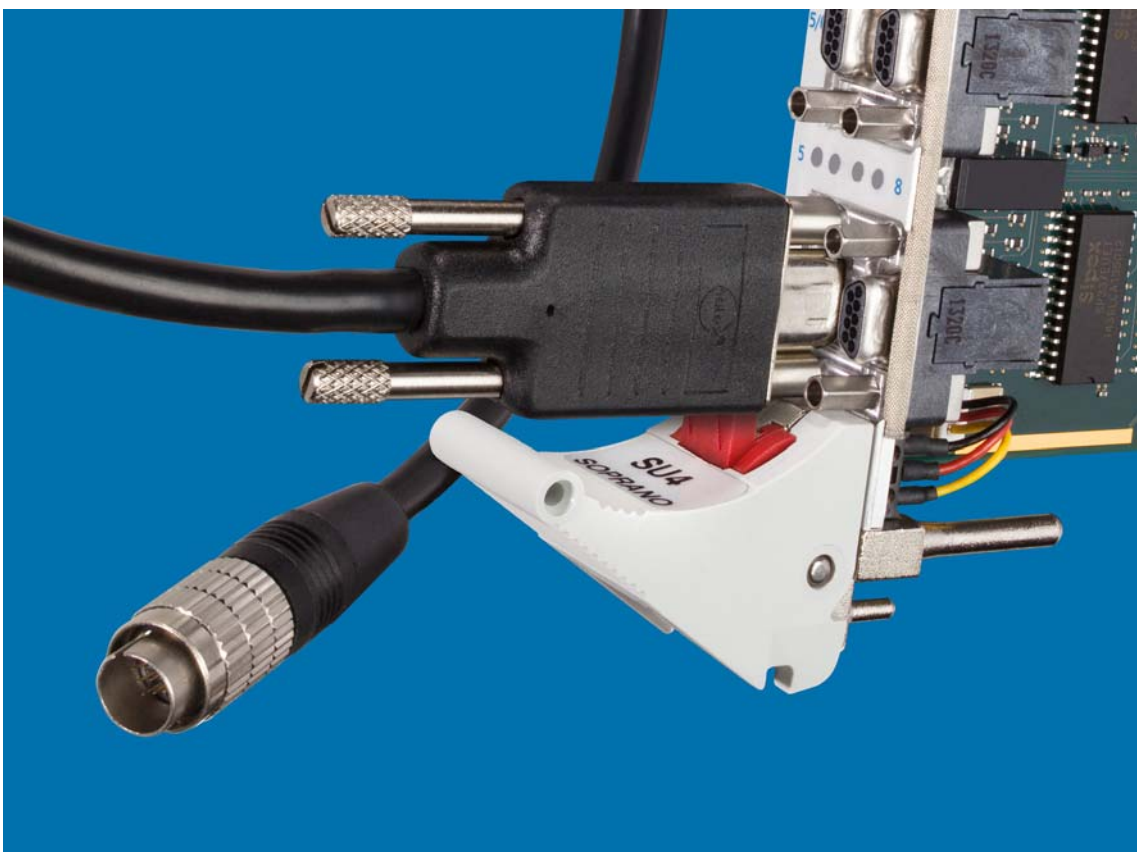
EKF Part Numbers Micro-D Cable Assemblies RS-232	
259.901.0009.18	Micro-D to Micro-D cable assembly, 9 circuits, 1.8m, female to female cable connectors
259.921.0009.18	Micro-D to D-SUB cable assembly, 9 circuits, 1.8m, Micro-D female connector to male D-SUB
259.931.0009.18	Micro-D to D-SUB cable assembly, 9 circuits, 1.8m, Micro-D female connector to female D-SUB
259.951.0009.18	Micro-D single ended cable assembly, 9 circuits, 1.8m, Micro-D female connector to pigtail



Micro-D to Micro-D Cable Assembly (Picture Similar)



Micro-D to D-SUB Cable Assembly (Picture Similar)



Micro-D to Custom Specific Connector Cable Assembly (Picture Similar)

### Pin Headers for Option D-Sub Connectors

The SU2-BALLAD can be equipped with pin headers for attachment of classic male 9-pin D-Sub front panel connectors, as an alternate to the Micro-D connectors. This option however requires an 8HP front panel for a quad port RS-232 solution, and micro ribbon flat cable assemblies. Three D-Sub connectors would be available with a modified 4HP front panel (see photo on next page).

PU1 - PU4 Option Dual-Row Header 2.54mm EKF Part No. 241.1.0205.20.00			
NC	1	2	NC
RXD	3	4	RTS
TXD	5	6	CTS
NC	7	8	NC
IsoGND	9	10	NC

Assuming IDC connectors at both endings of a micro ribbon flat cable, the resulting pin assignment on a 9-position male D-Sub connector is shown in the table below:

SU2-BALLAD 8HP Front Panel Width Option Serial Ports 1 - 4 • Option Male D-Sub 9 1.27mm Pitch Flat Cable IDC Connectors		
<p>SU2-BALLAD RS-232 Option D-Sub</p>	1	NC
	2	RXD (Input)
	3	TXD (Output)
	4	NC (DTR)
	5	Isolated Ground
	6	NC (DSR)
	7	RTS (Output)
	8	CTS (Input)
	9	NC (RI)



Triple D-Sub 4HP F/P Option (Knurled-Head Screws)

### Useful External Documents

ADM3252E	Datasheet • Isolated, Dual Channel, RS-232 Line Driver/Receiver • <a href="http://www.analog.com/static/imported-files/data_sheets/ADM3252E.pdf">www.analog.com/static/imported-files/data_sheets/ADM3252E.pdf</a>
PI7C9X7958	Datasheet • Diodes® PCI Express® Octal UART • <a href="http://www.diodes.com">www.diodes.com</a>


### Standards - Specifications

Term	Document	Origin
CompactPCI® Serial	CompactPCI® Serial Specification, PICMG® CPCI-S.0 R2.0	<a href="http://www.picmg.org">www.picmg.org</a>
PCI Express®	PCI Express® Base Specification	<a href="http://www.pcisig.com">www.pcisig.com</a>
RS-232	TIA/EIA-232-F Standard	<a href="http://www.tiaonline.org">www.tiaonline.org</a>

## Sockets M15 - M48

As an option, the SU2-BALLAD can be equipped with four pass-through sockets, each wired to 2 UART channels, suitable for attachment of EKF SU-series PHY modules and the SUA-RS232 or SUB-RS485 quad transceiver mezzanine cards. Normally the UART ports 1 - 4 are in use on the SU2-BALLAD itself for the on-board RS-232 transceivers, so only the UART ports 5 - 8 are typically available for expansion modules.

A mezzanine expansion module connects to the the SU2-BALLAD carrier card via pin stackers, and can be mounted either on top (face-to-face) or to the bottom (back-to-back). Both alternates result in an 8HP front panel.

M15 - M48 • TTL-Level Serial I/O					
2.00mm Socket Strip 2 x 10 (251.1.0210.10.09)					
© EKF 251.1.0210.10.09 ekf.com	 2.00mm Socket	+5V	1	2	GND
		RTS# (1-4)	3	4	RXD (1-4)
		TXD (1-4)	5	6	+3.3V
		DE (1-4)	7	8	CTS# (1-4)
		RE# (1-4)	9	10	GND
		RE# (5-8)	11	12	GND
		DE (5-8)	13	14	CTS# (5-8)
		TXD# (5-8)	15	16	+3.3V
		RTS# (5-8)	17	18	RXD (5-8)
		+5V	19	20	GND

Driver enable (DE) and receiver enable (RE#) are required for RS-485 mezzanines configured for half-duplex (PartyLine) operation. The driver enable signal is generated by the on-board Pericom UART in conjunction with the Pericom driver software.

Please note: The serial ports 5 - 8 provided by the UART are also available for rear I/O across P4 (stuffing option). In order to avoid signal interference and malfunction, attach a transceiver module or other circuitry to these ports only once, either to the pin headers M15 - M48, or through a rear I/O transition module via P4.



## CompactPCI® Serial Backplane Connectors

### Rear I/O Connector P4 (Option)

Four or even all eight SU2-BALLAD UART ports (TTL level signals) can be used for rear I/O usage. In addition, a suitable rear I/O module would be required for rear I/O operation, which provides the physical transceivers and rear panel I/O connectors.

Population of P4 may be optional - please consider your requirements before ordering.

P4 CompactPCI® Serial Peripheral Slot Backplane Connector Type B												
EKF Part #250.3.1208.20.00 • 96 pos. 12x8, 16mm Width												
P4	A	B	C	D	E	F	G	H	I	J	K	L
8	GND	+3.3V	+3.3V	GND	UART 1 RXD	UART 1 RTS#	GND	UART 1 RE#	UART 1 DE	GND	UART 1 TXD	UART 1 CTS#
7	+5V	I2C CLK	GND	UART 5 CTS#	UART 5 TXD	GND	UART 5 DE	UART 5 RE#	GND	UART 5 RTS#	UART 5 RXD	GND
6	GND	+3.3V	+3.3V	GND	UART 2 RXD	UART 2 RTS#	GND	UART 2 RE#	UART 2 DE	GND	UART 2 TXD	UART 2 CTS#
5	+5V	I2C DAT	GND	UART 6 CTS#	UART 6 TXD	GND	UART 6 DE	UART 6 RE#	GND	UART 6 RTS#	UART 6 RXD	GND
4	GND	+3.3V	+3.3V	GND	UART 3 RXD	UART 3 RTS#	GND	UART 3 RE#	UART 3 DE	GND	UART 3 TXD	UART 3 CTS#
3	+5V	I2C PWR	GND	UART 7 CTS#	UART 7 TXD	GND	UART 7 DE	UART 7 RE#	GND	UART 7 RTS#	UART 7 RXD	GND
2	GND	+3.3V	+3.3V	GND	UART 4 RXD	UART 4 RTS#	GND	UART 4 RE#	UART 4 DE	GND	UART 4 TXD	UART 4 CTS#
1	+5V	RIO ACT#	GND	UART 8 CTS#	UART 8 TXD	GND	UART 8 DE	UART 8 RE#	GND	UART 8 RTS#	UART 8 RXD	GND

all signals TTL level compliant, +3.45V maximum input voltage

UART ports 1 - 4 normally in use for front I/O



SUB-RIO



## CompactPCI® Serial Peripheral Slot Connector P1

The SU2-BALLAD is equipped with a PCI Express® based UART (Gen1 single lane). The card can be inserted in any PCIe enabled peripheral slot of the CompactPCI® Serial backplane for proper operation.

P1 CompactPCI® Serial Peripheral Slot Backplane Connector												
EKF Part #250.3.1206.20.02 • 72 pos. 12x6, 14mm Width												
P1	A	B	C	D	E	F	G	H	I	J	K	L
6	GND	PE TX02+	PE TX02-	GND	PE RX02+	PE RX02-	GND	PE TX03+	PE TX03-	GND	PE RX03+	PE RX03-
5	PE TX00+	PE TX00-	GND	PE RX00+	PE RX00-	GND	PE TX01+	PE TX01-	GND	PE RX01+	PE RX01-	GND
4	GND	USB2+	USB2-	GND	PE CLK+	PE CLK-	GND	SATA TX+	SATA TX-	GND	SATA RX+	SATA RX-
3	USB3 TX+	USB3 TX-	GA0	USB3 RX+	USB3 RX-	GA1	SATA SDI	SATA SDO	GA2	SATA SCL	SATA SL	GA3
2	GND	I2C SCL	I2C SDA	GND	RSV	RSV	GND	RST#	WAKE#	GND	PE EN#	SYS EN#
1	+12V	STBY	GND	+12V	+12V	GND	+12V	+12V	GND	+12V	+12V	GND

pin positions printed white/grey: not connected

## Driver Software

UART drivers are available for download from Diodes (diodes.com) or the EKF website at <http://www.ekf.com/s/su2/drv/>.

## Ordering Information

### Ordering Information

For popular SU2-BALLAD SKUs please refer to  
[www.ekf.com/liste/liste\\_21.html#SU2](http://www.ekf.com/liste/liste_21.html#SU2)

### Related Links

Related Links	
SU1-TWIST (Isolated RS-485)	<a href="http://www.ekf.com/s/su1/su1.html">www.ekf.com/s/su1/su1.html</a>
SU2-BALLAD (Isolated RS-232)	<a href="http://www.ekf.com/s/su2/su2.html">www.ekf.com/s/su2/su2.html</a>
SU4-SOPRANO (RS-232/485 Selectable)	<a href="http://www.ekf.com/s/su4/su4.html">www.ekf.com/s/su4/su4.html</a>
SUA-RIO (Rear I/O Isolated RS-232)	
SUB-RIO (Rear I/O Isolated RS-485)	<a href="http://www.ekf.com/s/sub/sub.html">www.ekf.com/s/sub/sub.html</a>
CompactPCI® Serial UART Solutions	<a href="http://www.ekf.com/s/serial.html#SU">www.ekf.com/s/serial.html#SU</a>
CompactPCI® Classic UART Solutions	<a href="http://www.ekf.com/c/ccom/ccom.html">www.ekf.com/c/ccom/ccom.html</a>
XMC Module UART Solutions	<a href="http://www.ekf.com/d/dcom.html">www.ekf.com/d/dcom.html</a>

## High Performance Embedded

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EKF Elektronik GmbH  
Philipp-Reis-Str. 4 (Haus 1)  
Lilienthalstr. 2 (Haus 2)  
59065 HAMM  
Germany



Phone +49 (0)2381/6890-0  
Fax +49 (0)2381/6890-90  
Internet [www.ekf.com](http://www.ekf.com)  
E-Mail [sales@ekf.com](mailto:sales@ekf.com)