OptoLyzer® MOCCA compact FD

ISBN: 978-1-5224-2575-5

Table of Contents

List of Figures

List of Tables

Chapter 1 Preface

1.1 Intended Use

The OptoLyzer MOCCA compact FD device is intended to be used for developing, testing, or analyzing CAN®, CAN FD, FlexRay™, LIN®, or MOST® network based automotive products and systems by persons with experience in developing automotive devices.

1.2 Scope of Delivery

The delivery covers the following:

- OptoLyzer MOCCA compact FD device
- Power cable
- Coaxial MOST cable
- USB cable
- USB stick (license dongle, optional)
- CAN termination resistors (optional)
- SYNC cable V3 (optional)
- CAN breakout cable (optional)

Check your shipment for completeness. If you have any objections, direct them to Sales@K2L.de. Providing the delivery note number eases the handling.

1.3 Overview OptoLyzer MOCCA Family

Table 1.1 shows the feature sets of the OptoLyzer MOCCA family devices. The numbers indicate how many interfaces/channels are available.

Table 1.1 OptoLyzer MOCCA Family

	OptoLyzer MOCCA							
INTERFACE	**compact 50e**	**compact 150o**	**compact 150c**	**compact FD**	**CLF**	**CL**	**FD**	**LAN**
Analog Audio Out	**1x**	**1x**	**1x**	**1x**				**1x**
Analog Line IN	**1x**	**1x**	**1x**	**1x**				**1x**
CAN	**6x**	**6x**	**6x**	**4x**[a]	**6x**	**6x**	**4x**[b]	**2x**
CAN FD				**4x**			**2x**[c]	
Ethernet	**1x**	**1x**	**1x**	**1x**	**1x**		**1x**	**4x**[d]
FlexRay[e]	**1x**	**1x**	**1x**	**1x**	**1x**		**1x**	
LIN	**6x**	**6x**	**6x**	**6x**	**6x**	**6x**	**6x**	
MOST	**1x**	**1x**	**1x**	**1x**[f]				
Relay	**1x**	**1x**	**1x**	**1x**	**1x**		**1x**	
S/PDIF	**1x**	**1x**	**1x**	**1x**				
Trigger/ECL	**1x**	**1x**	**1x**	**1x**	**1x**		**1x**	
USB	**1x**	**1x**	**1x**	**1x**	**1x**	**1x**	**1x**	**1x**

a. 4 CAN High Speed interfaces, neither low speed nor single wire CAN interfaces
b. The OptoLyzer MOCCA FD supports 6 CAN channels, 2 of them can be used as CAN FD channels.
c. The OptoLyzer MOCCA FD supports 6 CAN channels, 2 of them can be used as CAN FD channels.
d. 2x TX, 2x T1
e. FlexRay A/B
f. MOST node is connected via I2C.

1.4 Definitions of Terms

For better understanding of the following chapters, this section provides explanation to special terms used in the description of the OptoLyzer MOCCA device user manual.

Table 1.2 Definitions of Terms

TERM / ABBREVIATION	DESCRIPTION
ABI	Automotive Bus Interface
ATS	Automotive Test System
CAN	Controller Area Network
CAN FD	CAN with flexible data rate
cPHY	Coaxial electrical physical layer; used e.g., in OptoLyzer MOCCA compact FD variant
D	Depth
DUT	Device Under Test
ECL	Electrical Control Line, a method to start a diagnosis process over the MOST network.
FlexRay	Automotive network communications bus system
H	Height
LIN	Local Interconnect Network
MDIX	Medium Dependent Interface Crossover
MediaLB®	Media Local Bus
MOST	Media Oriented Systems Transport
RCA	Type of electrical connector used for transmitting audio and video signals (also known as cinch, introduced by Radio Corporation of America).
Sync	Synchronization
S/PDIF	Sony/Philips Digital Interconnect Format
USB	Universal Serial Bus
W	Width

1.5 References

[1] Electrical Physical Layer Specification Version 2.0
Refer to FlexRay Consortium.

[2] International Organization for Standardization
http://www.iso.org

[3] Telecommunications Industry Association
http://www.tiaonline.org

[4] International Electrotechnical Commission
http://www.iec.ch

Chapter 2 Safety Instructions

2.1 Supply and Synchronization

When concatenating OptoLyzer MOCCA devices one of the two Sync/Power connectors is intended to be used for the power supply and the other for cascading the OptoLyzer MOCCA device by using the optional SYNC cable V3.

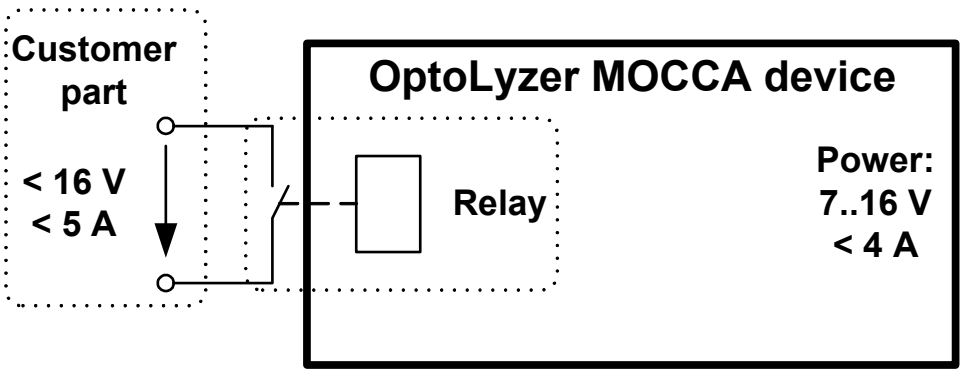
During cascading, caution has to be taken, since the first device in the chain can take the maximum current of 3 A. Do not cascade more than eight devices in chain.

For all setups either a fuse of max. 4 A in the supply cable to the first device or the use of the current limitation of the laboratory power supply is mandatory.

2.2 Relay

The Relay feature of the device is designed to switch other 12 V powered devices. The capability is limited to 5 A at 16 V maximum. Always use core cable ends of appropriate length and diameter to prevent unintended connections. Lengths and diameters depend on country-specific technical specifications. Section 1.3, "Overview OptoLyzer MOCCA Family," on page 7 informs about which device variant of the OptoLyzer MOCCA supports the Relay feature.

Figure 2.1 Relay Circuitry



2.3 Restrictions in Operation

The OptoLyzer MOCCA device integrates temperature sensitive components. Therefore do not cover the device with any objects. Covering disables the passive cooling. Make sure to allow enough airflow to the OptoLyzer MOCCA device, when the device is assembled. Do never place the running OptoLyzer MOCCA device in a closed case or box. Do not stack any OptoLyzer MOCCA devices.

Figure 2.2 Device Arrangement

Chapter 3 Definitions Limit Class

3.1 Emission

The OptoLyzer MOCCA device has passed the requirements according to the standard EN 55022:2010, class A.

Warning

The OptoLyzer MOCCA device is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Chapter 4 Introduction

The OptoLyzer MOCCA compact FD device is an out of the box automotive bus interface, combining most of the current automotive field buses. The device features e.g., simulation via PC or can be used as an analyzing device for the different automotive bus systems.

Due to its PC compatible connections including USB 2.0 and 10/100 Mbit/s Ethernet, it is easily possible to control the embedded OptoLyzer MOCCA device software from the PC including monitoring, tracing, and logging of data exchange over the different field bus systems. The OptoLyzer MOCCA device provides comfortable spy and stress functionalities when used within a MOST network.

The OptoLyzer MOCCA compact FD device supports the bus systems CAN, CAN FD, LIN, FlexRay or MOST network (speed grade 150). Refer to Section 1.3, "Overview OptoLyzer MOCCA Family," on page 7 for details.

4.1 Feature Summary

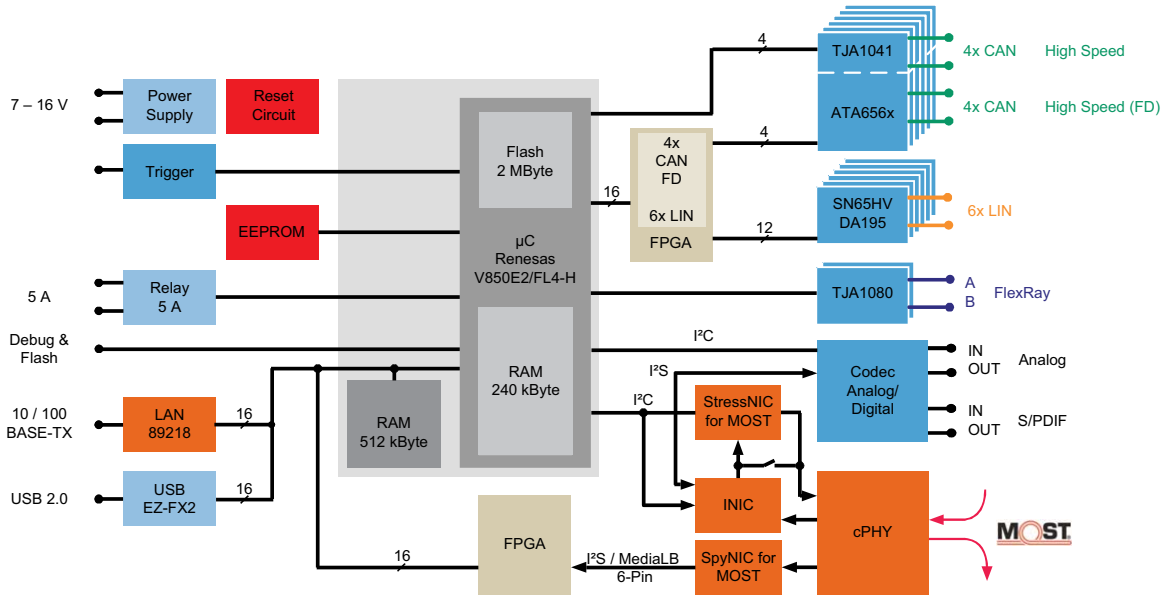
The following list covers the key features of the hardware platform.

- 4 High-Speed CAN interfaces
- 4 CAN FD interfaces
- 1 FlexRay A/B interface
- 6 LIN interfaces
- MOST150 network (cPHY)
- USB 2.0 port supporting Full-Speed with 12 Mbit/s and High-Speed with 480 Mbit/s
- Ethernet connection with 10/100 Mbit/s
- S/PDIF coaxial input and output for audio streaming over MOST network
- Analog audio input and output for audio streaming over MOST network
- Generic trigger in-/output functionality or MOST network ECL support
- Relay to switch external loads of up to 5 A
- Time stamp synchronization with cascaded OptoLyzer MOCCA devices over power cables
- SpyNIC for MOST
- StressNIC for MOST
- Simplex, duplex and duplex endpoint use case support

4.2 Block Diagram

The block diagram shows the features available for the OptoLyzer MOCCA compact FD device.

Figure 4.1 Block Diagram for OptoLyzer MOCCA compact FD



4.3 Properties of Supported Bus Systems

The OptoLyzer MOCCA device is intended to be used as stimulation, test and analysis device for automotive field buses with DUTs connected to them. Therefore the design is constrained to ensure the behavior to be as passive as possible.

4.3.1 CAN

The accuracy of CAN time stamps is 500 µs (or better).

4.3.1.1 High-Speed Transceiver

High-Speed CAN bus systems according to ISO 11898-2:2015 [2] are terminated with 120 Ω at each end. Therefore the OptoLyzer MOCCA device does not terminate the bus. Transmission speed ranges from 33.333 kbits/s to 1 Mbits/s.

4.3.2 CAN FD

CAN FD bus systems according to ISO 11898-2, ISO 11898-2:2016 [2] and SAE J2962-2 are terminated with 120 Ω at each end. The OptoLyzer MOCCA compact FD device can be used at the end of the bus system (in this case plug in the optional termination resistor, Section 1.2, "Scope of Delivery," on page 6) or somewhere between the ends (in this case don't plug in the optional termination resistor). The accuracy of CAN FD time stamps is 1 µs. The OptoLyzer MOCCA compact FD device supports up to 2 Mbits/s for each CAN FD channel in parallel. It is designed to operate with up to 64 byte payload. CAN FD requires a prescaler (data phase) of 1 or 2 for 500 kbit/s and above in case a custom bit rate (named StartCanFdExt in ABI Framework or ConfigureExtended in the K2L Bus Framework) is used.

4.3.3 FlexRay

The termination of a FlexRay bus depends on the bus topology. Two terminations are mandatory in each active branch. The OptoLyzer MOCCA device can be installed in various topologies. Therefore a termination is not implemented in the device. Thus the terminations have to be realized in a different way. In addition, the OptoLyzer MOCCA device does not act as a bus guardian.

The OptoLyzer MOCCA device provides one FlexRay interface and is able to switch from sleep mode to wake-up mode stimulated by the FlexRay bus. The OptoLyzer MOCCA device is capable of transmitting up to 10 Mbit/s as per "Electrical Physical Layer Specification Version 2.0" [1]. The accuracy of FlexRay time stamps is 500 µs (or better) for the static part of the schedule.

4.3.4 LIN

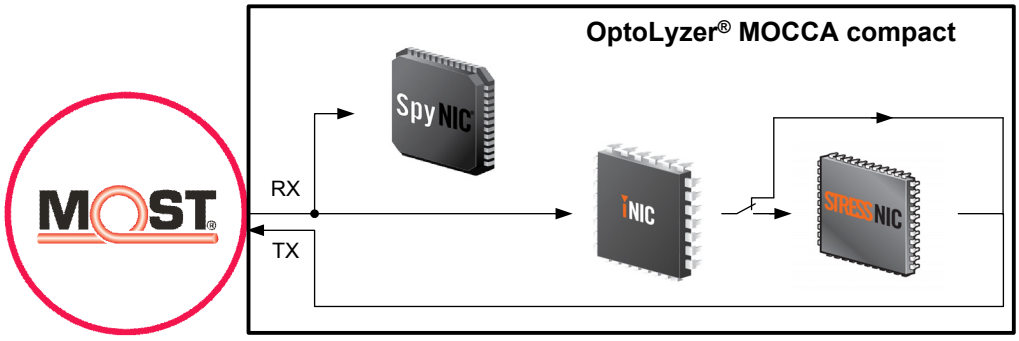
Both LIN master and LIN slave functionality are supported. The accuracy of LIN time stamps is 1 µs. The OptoLyzer MOCCA device supports a maximum transmission speed of 20 kbit/s.

4.3.5 MOST

The OptoLyzer MOCCA compact FD designed for a MOST150 network (cPHY) has a fixed clock mode of 48 kHz. OptoLyzer MOCCA compact FD devices have an INIC, a SpyNIC for MOST and a StressNIC for MOST on-board. If desired, the StressNIC for MOST can be added to the ring via software. The accuracy of INIC MOST network time stamps is 500 µs (or better) for the node and 1 µs for the spy.

When analyzing data e.g., when interpreting an acknowledged code, it is important to know how the chips (INIC, SpyNIC for MOST, StressNIC for MOST) are arranged inside the OptoLyzer MOCCA compact.

Figure 4.2 Order of MOST Network ICs



4.3.5.1 MOST150

Data exchange between the OptoLyzer MOCCA compact FD and the embedded OS81110 INIC is realized by I2C. Right now control messages are supported.

4.3.5.2 SpyNIC for MOST

The OptoLyzer MOCCA compact FD has an appropriate SpyNIC for MOST on-board. The SpyNIC is spying control, packet, and allocation messages. The accuracy of SpyNIC time stamps is 1 µs. In the MOST150 network four synchronous/isochronous channels can be spied all the time.

4.3.5.3 StressNIC for MOST

The OptoLyzer MOCCA compact FD has an appropriate StressNIC for MOST on-board. The StressNIC is supporting dedicated use cases for simulating some common network error situations (e.g., activity, lock stress, buffer full simulation, etc.). By default the StressNIC for MOST is electrically bypassed but can be enabled by appropriate software (e.g., ATS) (see Figure 4.2 on page 15).

4.3.6 Ethernet

Auto MDIX is supported, therefore the LAN interface can connect via straight and crossed patch cables. The physical layer 100Base-TX is supported. Thereby the MAC address of the Ethernet controller has a unique address. The accuracy of Ethernet time stamps is 500 µs (or better).

4.3.7 Sleep Mode

The OptoLyzer MOCCA device is able to scan the four CAN buses (1, 3, 4, 5 but not CAN FD) in sleep mode and if stimulated to switch from sleep mode into wake-up mode. In addition, the OptoLyzer MOCCA device can be woken-up via FlexRay, LIN or ECL. For controlling the sleep mode software has to be developed by the customer on a PC.

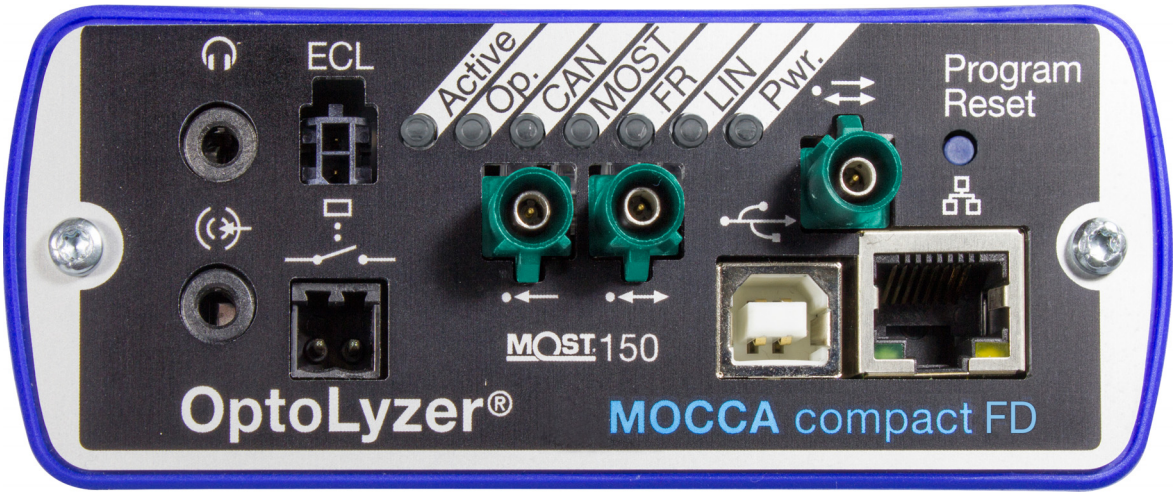
Chapter 5 Hardware Description

The following chapter describes all connectors. To get details which feature set is supported refer to Section 1.3, "Overview OptoLyzer MOCCA Family," on page 7.

5.1 Front Panel

Figure 5.1 depicts the front panel of the OptoLyzer MOCCA compact FD.

Figure 5.1 Front Panel - OptoLyzer MOCCA compact FD



All possible components of the front panel are described below:

- Table 5.1 describes the connectors from left to right and top to down.
- Table 5.2 describes the LEDs.

Table 5.1 Connectors on the Front Panel

INTERFACE	SYMBOL	DESCRIPTION
Analog Audio OUT		The OptoLyzer MOCCA compact FD device provides an analog audio out interface (a stereo headphone output). It has a 3.5 mm jack plug. Output Power: $P_{o, Max, Rms}$ = 1.4 mW (at R = 16 Ω, V_{out} = 150 mV_{RMS}) The bandwidth (16 bit mono/stereo or 24 bit stereo) specified for this interface is also used for the S/PDIF OUT and vice versa. Rx and Tx transmission must cover the same bit number per channel. Refer to the S/PDIF description inclusive examples in Table 5.3 on page 20.
ECL		ECL can be used to start a diagnosis process over the MOST network according to different ECL implementations. For the pin out refer to Section 6.9, "Trigger/ECL," on page 26.
MOST (cPHY)		The MOST150 network connectors base on a coaxial electrical physical layer (cPHY) described separately below. For the pin out refer to Section 6.10, "MOST Network Connector," on page 26.
MOST (cPHY Rx connector)		The connectors base on a coaxial electrical physical layer (cPHY). This connector provides an Rx interface. It is used ■ in simplex use cases as Rx (indicated by the single-headed arrow).
MOST (cPHY Rx/Tx connector)		The connectors base on a coaxial electrical physical layer (cPHY). This connector provides a duplex interface (Rx/Tx connection). It is used ■ in duplex use cases as Rx/Tx (indicated by the double-headed arrow).
MOST (cPHY Tx and Rx/Tx connector)		The connectors base on a coaxial electrical physical layer (cPHY). This connector provides a Tx or a duplex interface (Rx/Tx connection). It is used ■ in simplex use cases as Tx (indicated by the single-headed arrow) and ■ in duplex use cases as Rx/Tx (indicated by the double-headed arrow) and ■ in duplex endpoint use cases (indicated by the double-headed arrow).
Program Reset		The device can be reset by the push button. If the button is pressed for less than 1 s, the device is reset. The same button is used for switching into the flashing mode if it is pressed for more than 2 seconds. For details see the “K2L Flasher Online Help” that is part of the shipment.
Analog Line IN		The analog Line IN input impedance is 10 kΩ. The analog input is converted into a digital stream with resolutions of 16 bits / channel (mono/stereo) or 24 bits / channel (stereo). It has a 3.5 mm jack plug. It is possible to use either the Analog Line IN or the S/PDIF IN interface. Rx and Tx transmission must cover the same bit number per channel. Refer to the S/PDIF description inclusive examples in Table 5.3 on page 20.

Table 5.1 Connectors on the Front Panel

INTERFACE	SYMBOL	DESCRIPTION
Relay		The relay is able to switch 5 A as a potential free shutter. For safety purposes refer to Chapter 2, "Safety Instructions," on page 10. For the pin out refer to Section 6.8, "Relay," on page 26.
USB		The USB port is a standard USB B-type receptacle.
LAN		The LAN connector is an RJ45 receptacle according to TIA-568 [3].

The OptoLyzer MOCCA compact FD device offers seven LEDs. All LEDs except the Power LED are tri-colors.

Table 5.2 LEDs

INTERFACE	SYMBOL	DESCRIPTION	COLOR	DESCRIPTION
Active	Active	This LED indicates any activity.	Red	Reserved
			Green	Reserved
			Blue (Twinkling)	Slowly: Firmware running Fast: Flash mode
Operation	Op.	This LED indicates different states dependent on the installed firmware (e.g., for ATS etc.).	Red	Depending on firmware
			Green	Depending on firmware
			Blue	Depending on firmware
CAN	CAN	This LED indicates the bus state of the CAN FD bus.	Red	Error
			Green	Operational
			White (Twinkling)	Bus activity
MOST	MOST	This LED indicates the bus state of the MOST network. The LED is only available for variants that are supporting a MOST network.	Red	Error
			Green	Net on
			White (Twinkling)	Bus activity
FlexRay	FR	This LED indicates the bus state of the FlexRay bus.	Red	Error
			Green	Synced
			White (Twinkling)	Bus activity

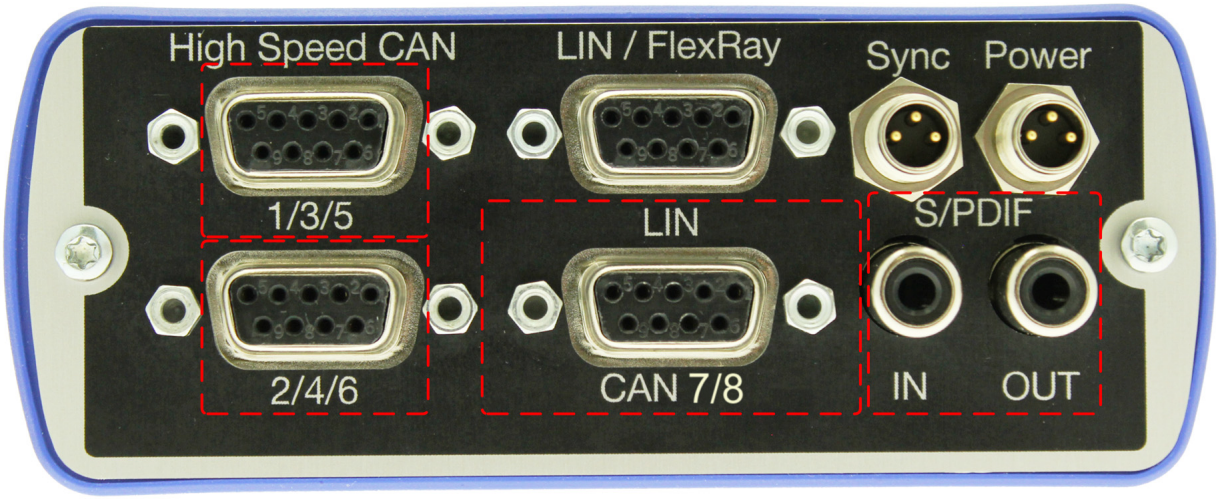
Table 5.2 LEDs

INTERFACE	SYMBOL	DESCRIPTION	COLOR	DESCRIPTION
LIN	LIN	This LED indicates the bus state of the LIN bus.	Red	Error
			Green	Operational
			White (Twinkling)	Bus activity
Power	PWR	This LED indicates a powered device.	Green	Powered device

5.2 Rear Panel

Figure 5.2 depicts the rear panel of the OptoLyzer MOCCA compact FD.

Figure 5.2 Rear Panel - OptoLyzer MOCCA compact FD



Notes: The rear panel (Figure 5.2) shows four DE-9 connectors, two on the left side and two in the middle of the panel. View the red frames above to get an impression which description belongs to which interface.

Table 5.3 describes the connectors of the rear panel from top to bottom and left to right.

Table 5.3 Connectors on the Rear Panel

INTERFACE	DESCRIPTION
High Speed CAN 1/3/5 2/4/6	These two connectors offer six High-Speed CAN instances with baud rates from 33.333 kbit/s to 1 Mbit/s depending on the cable length. The CAN instances 1, 3, 4 and 5 are hard specified as High-Speed CAN interfaces. The CAN instances 2 and 6 can also be used as CAN FD interfaces. The CAN interfaces can be controlled by a customer application. Details about the CAN bus properties are described in Section 4.3.1, "CAN," on page 14. For the pin out refer to Section 6.1, "High-Speed CAN," on page 22.
LIN / FlexRay	This DE-9 socket combines pins assigned to the FlexRay bus and pins assigned to the LIN channels 3, 4, 5 and 6. For the pin out refer to Section 6.2, "LIN / FlexRay," on page 23.
LIN CAN 7/8	This DE-9 socket combines two CAN FD interfaces (CAN instances 7 and 8) as well as two LIN channels (1 and 2). The CAN interfaces can be controlled by a customer application. For the pin out refer to Section 6.3, "LIN / CAN FD 7/8," on page 24.

Table 5.3 Connectors on the Rear Panel

<table>
<tr><th>INTERFACE</th><th>DESCRIPTION</th></tr>
<tr><td>Sync /
Power</td><td>The Synchronization (Sync) and the Power connector have the identical pin assignment i.e., each socket can be used either for synchronization or power purposes. Restrictions are described in Section Chapter 2, "Safety Instructions," on page 10. The OptoLyzer MOCCA device is intended to be powered by the wall power supply (optionally available) or by any other power supply which is capable to deliver 12 V and 1 A. If the wall power supply is not used, the included power cable has to be used to connect the 12 V supply to the OptoLyzer MOCCA device. For the pin out refer to Section 6.4, "Synchronization and Power," on page 24.</td></tr>
<tr><td>S/PDIF
IN /
OUT</td><td>The output is compliant to the specification IEC 60958 [4] with 75 Ω and 0.5 Vpp (+ / - 20%). The output is short circuit proof. The input circuit expects an unbalanced input and has an impedance of 75 Ω. Input sample rates from 32 to 96 kHz are accepted. For the pin out refer to Section 6.5, "Digital Audio In/Out (S/PDIF)," on page 25. The OptoLyzer MOCCA compact FD device offers the bidirectional transfer of audio streams between the MOST synchronous channel and the S/PDIF connectors. An audio stream on a MOST synchronous channel can be routed to the S/PDIF output of the device. It is also possible to route a digital audio stream from S/PDIF input of the device to the MOST synchronous channel at the same time. The bandwidth (16 bit mono/stereo or 24 bit stereo) specified for this interface is also used for the Analog Audio Out and vice versa. Rx and Tx transmission must cover the same bit number per channel. Examples:
■ If a 24 bit signal is selected and activated for Tx transmission, only 24 bit transmission is supported for Rx transmission and vice versa.
■ If a 16 bit stereo signal is selected and activated for Tx transmission, both a 16 bit mono and 16 bit stereo signal transmission is supported for Rx transmission and vice versa.
The following tables describe which S/PDIF formats are supported by the OptoLyzer MOCCA compact FD device.
Direction S/PDIF (IN) to MOST: S/PDIF data from an external S/PDIF source routed to the MOST network. The S/PDIF (IN) is routed through a sample rate converter. The signal can be either a 16 bit mono/stereo signal or a 24 bit stereo signal. It is possible to use either the S/PDIF IN or the Analog Line IN interface.
<table>
<tr><th>IN</th><th>MOST</th><th>Supported Frame Rates</th></tr>
<tr><td>16 bit / channel</td><td>16 bit / channel</td><td>32 - 96 kHz</td></tr>
<tr><td>24 bit / channel</td><td>24 bit / channel</td><td></td></tr>
</table>
Direction MOST to S/PDIF (OUT): S/PDIF data from the MOST network routed to an external S/PDIF sink. The signal can be either a 16 bit mono/stereo signal or a 24 bit stereo signal.
<table>
<tr><th>MOST</th><th>OUT</th><th>Supported Frame Rates</th></tr>
<tr><td>16 bit / channel</td><td>16 bit / channel</td><td rowspan="2">32 - 96 kHz</td></tr>
<tr><td>24 bit / channel</td><td>24 bit / channel</td></tr>
</table>
</td></tr>
</table>

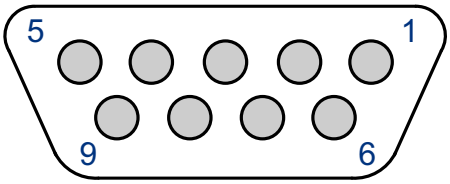
Chapter 6 Pin Assignment of the Connectors

6.1 High-Speed CAN

Connector type for both High-Speed CAN connectors: DE-9

Figure 6.1 shows the connector pin assignment as it is visible on the rear panel.

Figure 6.1 DE-9 Connector



The provided GND pins (Table 6.1) must not be used unless there is no other GND connection. These pins must not be used for supply purpose.

Table 6.1 Pin Assignment of Connector High Speed CAN 1/3/5

PIN NO.	SIGNAL	DESCRIPTION
1	CAN 5-Low	Low-level CAN 5 bus line
2	CAN 1-Low	Low-level CAN 1 bus line
3	GND	Signal ground
4	CAN 3-Low	Low-level CAN 3 bus line
5		Not connected
6		Not connected
7	CAN 1-High	High-level CAN 1 bus line
8	CAN 5-High	High-level CAN 5 bus line
9	CAN 3-High	High-level CAN 3 bus line

The table below is valid for both High-Speed CAN interfaces and CAN FD interfaces. The provided GND pins must not be used unless there is no other GND connection. These pins must not be used for supply purpose.

Table 6.2 Pin Assignment of Connector High Speed CAN 2/4/6

PIN NO.	SIGNAL	DESCRIPTION
1	CAN 6-Low, CAN FD 6-Low	Low-level CAN 6 bus line, low-level CAN FD 6 bus line
2	CAN 2-Low, CAN FD 2-Low	Low-level CAN 2 bus line, low-level CAN FD 2 bus line
3	GND	Signal ground
4	CAN 4-Low	Low-level CAN 4 bus line
5		Not connected
6		Not connected
7	CAN 2-High, CAN FD 2-High	High-level CAN 2 bus line, high-level CAN FD 2 bus line
8	CAN 6-High, CAN FD 6-High	High-level CAN 6 bus line, high-level CAN FD 6 bus line
9	CAN 4-High	High-level CAN 4 bus line

6.2 LIN / FlexRay

Connector type (see Figure 6.1): DE-9

The provided GND pin must not be used unless there is no other GND connection. This pin must not be used for supply purpose.

Table 6.3 Pin Assignment of Connector LIN / FlexRay A/B

PIN NO.	SIGNAL	DESCRIPTION
1	LIN 3	3rd LIN channel
2	Channel B BP	Positive bus line
3	GND	Signal ground
4	Channel A BM	Negative bus line
5	LIN 4	4th LIN channel
6	LIN 5	5th LIN channel
7	Channel B BM	Negative bus line
8	Channel A BP	Positive bus line
9	LIN 6	6th LIN channel

6.3 LIN / CAN FD 7/8

Connector type (see Figure 6.1): DE-9

The provided GND pin must not be used unless there is no other GND connection. This pin must not be used for supply purpose.

Table 6.4 Pin Assignment of Connector LIN / CAN 7/8

PIN NO.	SIGNAL	DESCRIPTION
1		Not connected
2	CAN FD 7-Low	Low-level CAN FD 7 bus line
3	GND	Signal ground
4	CAN FD 8-Low	Low-level CAN FD 8 bus line
5	LIN 1	1st LIN channel
6	LIN 2	2nd LIN channel
7	CAN FD 7-High	High-level CAN FD 7 bus line
8		Not connected
9	CAN FD 8-High	High-level CAN FD 8 bus line

6.4 Synchronization and Power

Connector type: Binder sensor connector series 768, 3 pole, ordering number: 09 3419 82 03

Suitable female connector: Binder M8 IP40 series 768, 3 pole, ordering number: 99 3400 100 03

There are two connectors for synchronization and power. Figure 6.2 shows the pins as they are visible on the rear panel for these connectors. For more details about synchronization and power refer to Section 2.1, "Supply and Synchronization," on page 10.

Figure 6.2 Pin Assignment of the Sync and Power Connector

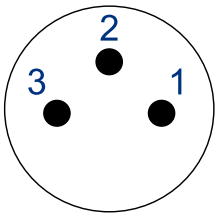


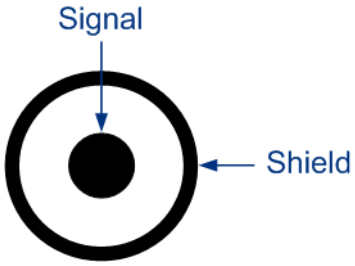
Table 6.5 Pin Assignment of the Sync and Power Connector

PIN NO.	SIGNAL	DESCRIPTION
1	12 V	Power supply
2	Sync	Synchronization line
3	GND	System ground

6.5 Digital Audio In/Out (S/PDIF)

Both digital connectors (S/PDIF In/Out) interface to a RCA phono socket.

Figure 6.3 Pin Assignment of the S/PDIF Connector

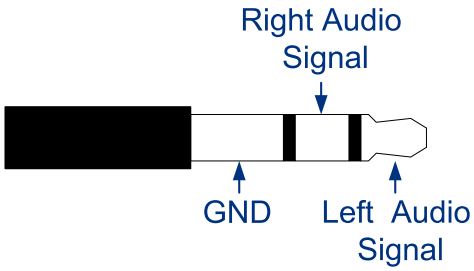


The input circuit expects an unbalanced input and has an impedance of 75 Ω. The shield connects to system ground.

6.6 Analog Audio In/Out

Both the stereo line-in and the stereo headphone output are connected to an audio phone connector.

Figure 6.4 Pin Assignment of the Analog Audio In/Out Connector



6.7 USB

The USB port is a standard USB 2.0 B-type receptacle.

6.8 Relay

The relay is able to switch 5 A as a potential free shutter. Please refer also to Chapter 2, "Safety Instructions," on page 10.

Relay type:

- assembled connector type: RIA 31182102
- connector type to be plugged: RIA 31169102

The pin assignment below is described as it is visible on the front panel.

Table 6.6 Pin Assignment of the Relay Connector

PIN NUMBER	DESCRIPTION
1 (left pin)	Shutter input
2 (right pin)	Shutter output

6.9 Trigger/ECL

This connector provides two pins: The upper pin is for connecting the Trigger/ECL signal, the lower pin for connecting GND.

Connector type:

- assembled connector type: Molex 43045-0201
- connector type to be plugged: Molex 43025-0200

Table 6.7 Technical Values

PARAMETER	VALUE
Frequency	0..20 kHz
V_{Out}	7..16 V
R_{out}	20..60 kΩ
$V_{In,\ Low,\ Max}$	0.4 V_{Bat}
$V_{I,\ High,\ Min}$	0.6 V_{Bat}
$V_{In\ Hysteresis}$	0.175 V_{Bat}

6.10 MOST Network Connector

6.10.1 MOST150 Network Coaxial Connector

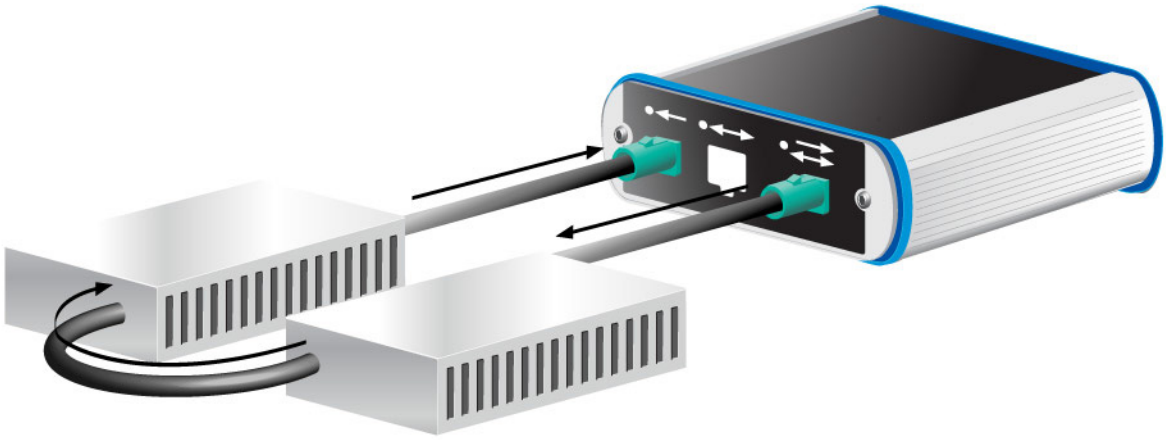
Connector type: 59S20X-40ML5-Z FAKRA

Three different use cases are supported. They are shown together with the appropriate connection diagrams in the following sections. Each use case presents logically a ring, even if the devices are

physically connected by one cable (e.g., duplex endpoint use case). For more details about the coaxial interfaces refer to Table 5.1 on page 17.

6.10.1.1 Simplex Use Case

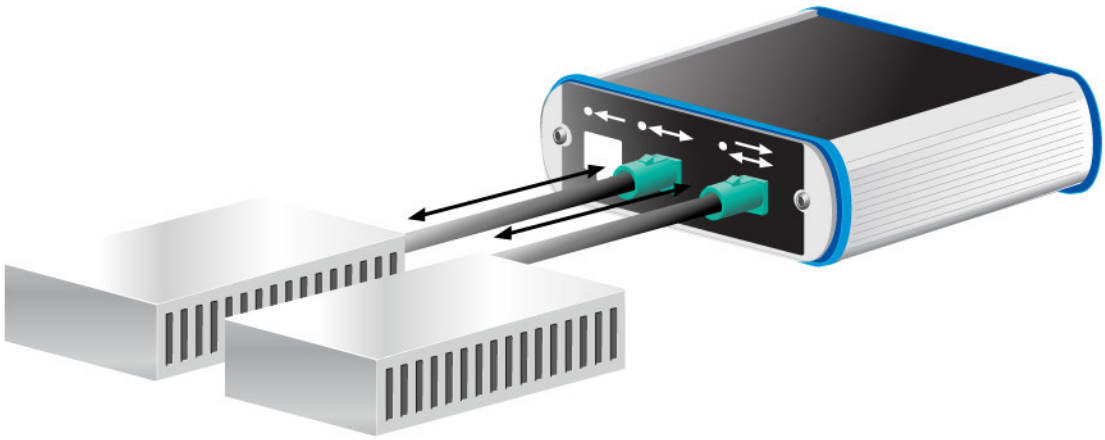
Figure 6.5 Simplex Use Case



In this use case the OptoLyzer MOCCA compact FD observes and participates in a simplex ring. Data is transmitted in one direction. Thereby the single-headed arrow shows the direction. The OptoLyzer MOCCA compact FD can appear as an extra node in the ring.

6.10.1.2 Duplex Use Case

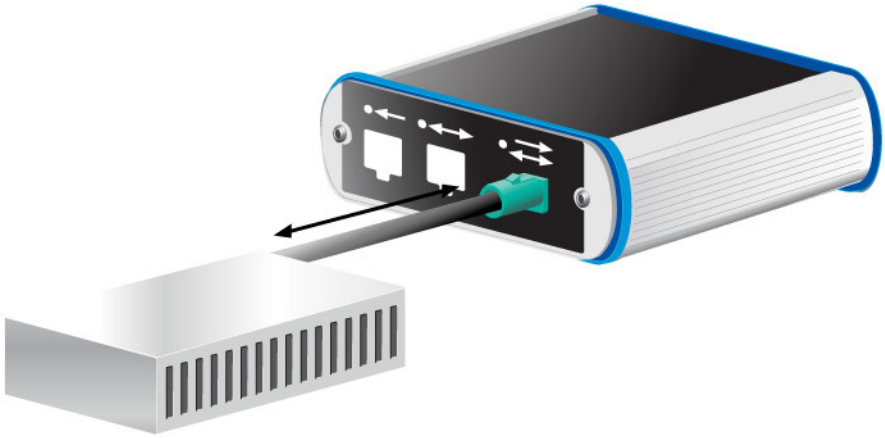
Figure 6.6 Duplex Use Case



In this use case the OptoLyzer MOCCA compact FD observes and participates in a duplex ring e.g., between a head unit and a camera. Data is transmitted in both directions indicated by double-headed arrows. The OptoLyzer MOCCA compact FD can appear as an extra node in the ring.

6.10.1.3 Duplex Endpoint Use Case

Figure 6.7 Duplex Endpoint Use Case



In this use case the OptoLyzer MOCCA compact FD observes and participates at one end in a duplex ring e.g., is acting either as a head unit or a camera. Data is transmitted in both directions indicated by a double-headed arrow. The OptoLyzer MOCCA compact FD can appear as an extra node in the ring.

Chapter 7 Technical Specifications

The table below covers characteristics of the OptoLyzer MOCCA compact FD device and its networking interfaces.

Table 7.1 Device and Bus Characteristics

PARAMETER		VALUE
RAM		512 kB external / 240 kB internal
Flash Memory		2 MB internal
Controllers		
µController		Renesas V850E2/FL4-H @ 160 MHz
CAN Transceivers		
	CAN FD	ATA656x
	High-Speed CAN Transceiver	NXP TJA 1041
FlexRay Transceiver		NXP TJA 1080
LAN Transceiver		Microchip LAN89218
LIN Transceiver		SN65HVDA195
MOST Network Controllers and Transceivers		
MOST150 Controller	MOST150	Microchip OS81110
MOST150 cPHY Transceiver	MOST150 (coaxial)	Microchip OS82150
S/PDIF		I/O electrical via 2 x cinch, input sample rate 32 - 96 kHz
USB		Cypress EZ-USB 2.0

The table below covers mechanical characteristics of the OptoLyzer MOCCA compact FD device.

Table 7.2 Mechanical Characteristics

PARAMETER	VALUE	UNIT
Dimensions (H x W x D)	45 x 112 x 116	mm
Weight	360	g
Ambient Temperature Range	-40..+70	°C

The table below covers electrical characteristics of the OptoLyzer MOCCA compact FD device.

Table 7.3 Electrical Characteristics

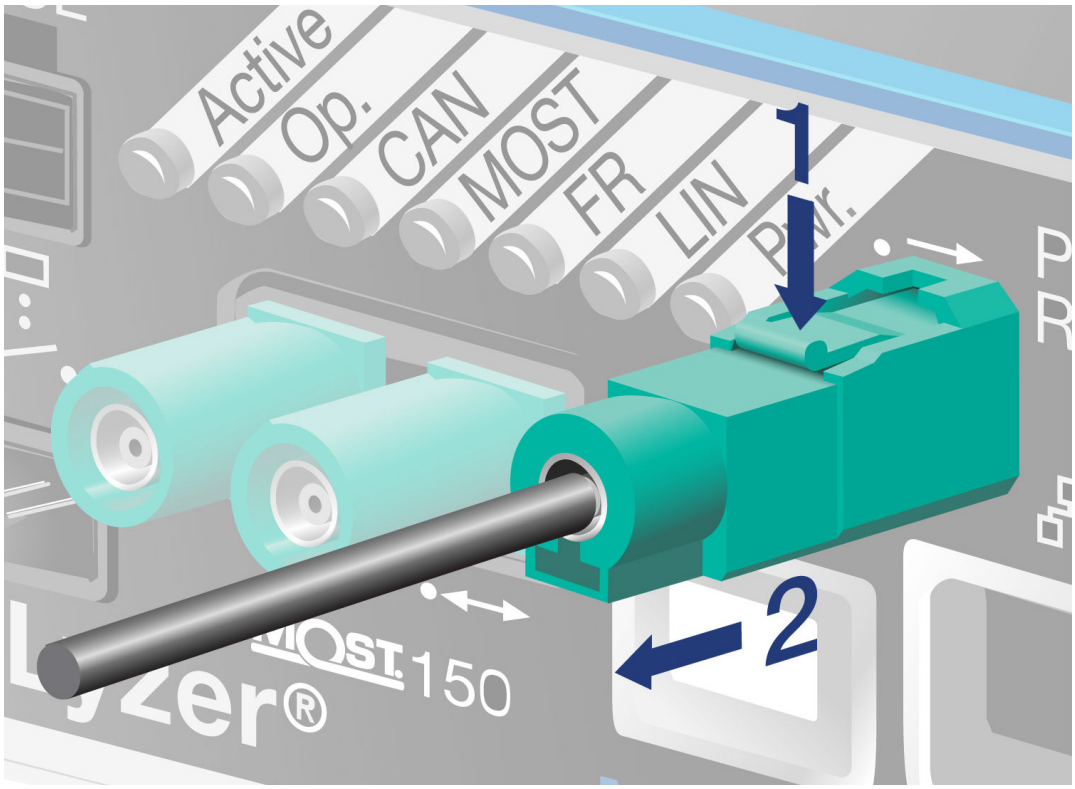
PARAMETER	MIN	TYP	MAX	UNIT	COMMENT
Operating Voltage Range	7		16	V	
OptoLyzer MOCCA compact device Current Consumption (operation)		500		mA	
Current Consumption (sleep)		< 1		mA	
Relay for external load (potential free shutter)			5	A	@ 12 V DC

Chapter 8 Maintenance

8.1 How to Release cPHY Connector

Figure 8.1 shows how a cPHY connector of the OptoLyzer MOCCA compact FD can be released or exchanged.

Figure 8.1 How To Release cPHY Connector



Follow these steps:

1. Press the locking tab of the snap-on coupling.
2. Pull the jack away from the device while still pressing the locking tab.

Chapter 9 Revision History

Table 9.1 Customer Revision History

REVISION LEVEL	SECTION/FIGURE/ ENTRY	CORRECTION
DS60001526B	Cover page	Figure exchanged.
	Section 4.3.2, "CAN FD," on page 14	Valid prescaler values added for 500 kbit/s and above.
DS60001526A	Initial Version	

Further Information

For more information on K2L automotive products, including integrated circuits, software, and MOST® development tools and modules, visit our web site: http://www.K2L.de. Direct contact information is available at: http://www.K2L.de/contact.

K2L GmbH & Co. KG
Emmy-Noether-Str. 14
76131 Karlsruhe
Germany

Technical Support

Contact information for technical support is available at: http://www.K2L.de/contact.