PLIN-LWL

Optical Coupler for
LIN Data Transmission

User Manual

Document version 1.2.0 (2019-03-14)

PEAK
System

Relevant products

Product Name	Model	Part number
PLIN-LWL		IPEH-004049

Contents

1 Introduction

For use in explosion-proof areas or for EMC measurements, the PLIN-LWL can be used to replace a stretch of LIN network with a fiber-optic line at any point. The modules are supplied with power externally.

1.1 Properties at a Glance

- Bit rates from 2.4 kbit/s[1] up to 20 kbit/s
- 2 types of the TJA1028T LIN transceiver built in, use depending on the bit rates and EMC requirements
- LED display for power supply and transceiver status
- Switchable master termination
- LIN bus connection via D-Sub, 9-pin
- Fiber-optic duplex line, 62.5/125 µm, ST connectors
- Supply voltage 8 to 30 V DC
- Supply via D-Sub 9-pin or DC connector (jumper)
- Aluminum casing
- Extended operating temperature range from -40 to 85 °C (-40 to 185 °F)

[1] 2.7 kbit/s if 16 (instead of 13) bits are used for the break pulse

1.2 Operation Requirements

⌐ LIN network (Master or Slave termination can be selected per module)

⌐ D-Sub sockets for connection to the PLIN-LWL modules

⌐ Power supply with power supply unit or via the D-Sub connector

1.3 Scope of Supply

⌐ 2 PLIN-LWL modules including power supply units

⌐ A choice of 5 or 10 m FO cable, 62.5/125 µm duplex line ST connector, other lengths available on request

⌐ Manual in PDF format

2 Connectors

2.1 LIN
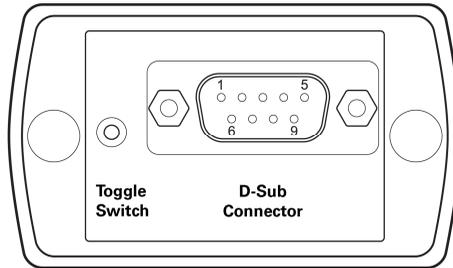
Figure 1: Casing side with toggle switch and D-Sub connector for LIN

The LIN bus is connected to the 9-pin D-Sub connector on the left casing side.
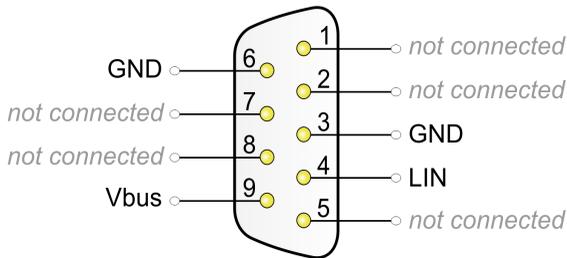
Figure 2: Pin assignment D-Sub connector

Pin 9 can be used to supply a PLIN-LWL module. See section 3.2 *Configuration Power Supply* on page 11 for further information.

2.2 Optical Waveguides (OWG)
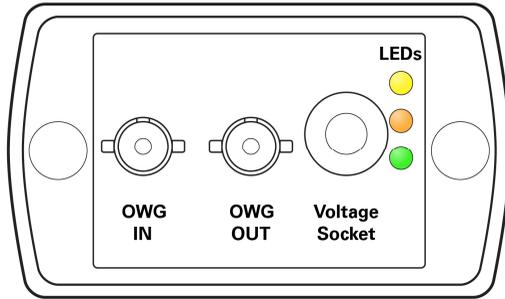
Figure 3: Casing side with OWG connectors, voltage socket, and LEDs

A PLIN-LWL module has two standardized ST connectors for the optical waveguides. The connections are separately in charge of sending and receiving light signals.

Both optical waveguides of the duplex line are marked with colors at each connector (red/black). For both modules, connect the OWG output of one module with the OWG input of the other.

Optical wave guide (marker)	Connector at 1st PLIN-LWL module	Connector at 2nd PLIN-LWL module
Red	OWG IN (gray)	OWG OUT (light gray)
Black	OWG OUT (light gray)	OWG IN (gray)

2.3   Voltage Supply

A PLIN-LWL module needs a DC voltage of 8 to 30 V. At the voltage input socket you can connect the supplied 12-Volt power supply unit.
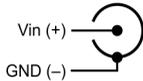
Figure 4:
Assignment voltage input socket

Figure 5:
Diameter barrel connector:
a = 5.5 mm, b = 2.1 mm

See section 3.2 *Configuration Power Supply* on page 11 for further information.

3 Configuration

At the PLIN-LWL housing, a termination for the Master operation mode can be switched on with a toggle switch. On the circuit board of the module, you can do the following jumper settings affecting the basic operation:

- Choice between High-speed and Low-speed LIN transceiver
- Configuration of the power supply
- Configuration of the internal supply

Tip: At delivery, the PLIN-LWL modules use the High-speed transceiver for the data transmission. The power supply for the module and the LIN bus is configured to be done with the power supply units via the DC socket. If you use this common configuration, a change of the settings as described in this chapter is <u>not</u> needed.

For doing jumper settings, the circuit board must be taken out of the casing.

To do so, do the following:

1. If extant, remove the protecting caps from the OWG connectors (right housing side).

2. Remove the two screws on the left housing side (the one with the D-Sub connector).

3. Pull the circuit board with the lid out of the case.

After changing the settings (see the following subsections), the assembly is done in the reversed order.

3.1   Configuration LIN Transceiver

According the highest bit rate that is used on the LIN bus, you can select between two LIN transceivers:

— max. 10,4 kbit/s: TJA1028T/5V0/10 (Low-speed)

— max. 20 kbit/s: TJA1028T/5V0/20 (High-speed, default setting)

The transceiver with the /10 ending generates less steep slopes, thus the electromagnetic compatibility is enhanced.
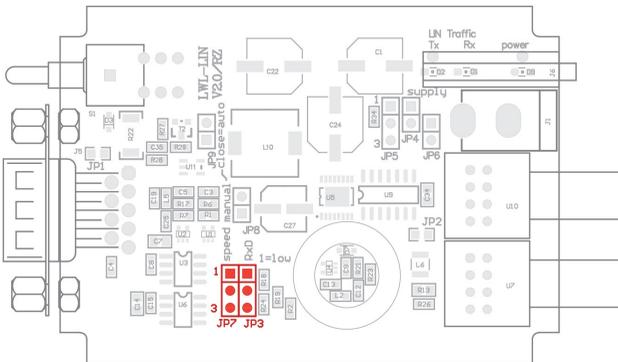
Figure 6: Position of the jumper blocks JP3 and JP7

Transceiver	Jumper setting JP3 and JP7	Comment
Low-speed (/10)	1-2	
High-speed (/20)	2-3	Default setting at delivery

Tipp: Both PLIN-LWL modules being connected with each other can use different LIN transceiver settings.

3.2 Configuration Power Supply

A PLIN-LWL module can be supplied either by an external voltage source (e.g. the supplied power supply unit) via the corresponding input socket or via pin 9 of the D-Sub connector (in each case 8 - 30 V DC). The input for the power supply is set with various jumper blocks. It is possible to determine the supply of LIN and the module separately.

Figure 7: Position of the jumpers JP4, JP5, and JP6

LIN voltage supply via…	Jumper JP5	Comment
D-Sub connector, pin 9	1-2	
Supply socket	2-3	Default setting at delivery

Module voltage supply via…	Jumper JP4 and JP6	Comment
D-Sub connector, pin 9	JP4 closed JP6 open	
Supply socket	JP4 open JP6 closed	Default setting at delivery

When having increased EMC requirements, it is recommended to use a shielded cable for the supply and for LIN. In addition, the power supply via the DC socket should be preferred.

The unused power supply input (according to the setting) is electrically isolated from the actual power supply.

⚠ **Attention!** Switch off the power supply at the D-Sub connector before connecting or removing the D-Sub plug to or from the PLIN-LWL module. Otherwise electronic parts may be destroyed, even on other nodes attached to the LIN bus.

3.3 Configuration Internal Supply

The PLIN-LWL has a linear and a switching regulator for generating the internal 5-volt supply. The jumpers JP8 and JP9 determine which voltage transformer is used.

Switching regulators can cause unwanted oscillations. Linear regulators are no problem regarding electromagnetic interference (EMI), but lead to warming in the upper voltage supply range instead. At delivery the PLIN-LWL is configured to switch automatically from the linear to the switching regulator at 20 V.
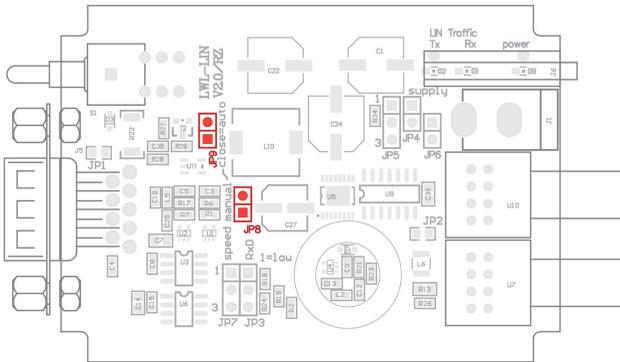
Figure 8: Position of the jumper blocks JP8 and JP9

Jumper	Used voltage transformer
JP8 open JP9 closed	For voltages lower 20 V the linear regulator is used. At 20 V the module switches automatically to the switching regulator. Default setting at delivery
JP8 open JP9 open	Only the switching regulator is used.
JP8 closed JP9 open	Only the linear regulator is used.

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3.4 LIN Master Termination

The PLIN-LWL can be operated in a LIN bus as Master or Slave. If using as Master, the toggle switch at the left side must be set to the lower position. This enables a termination of 1 kΩ which enhances the level and the flanks of the transmitted signal.
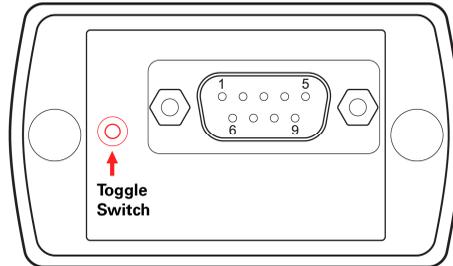
Figure 9: Toggle switch at the casing side with D-Sub connector

4 Operation

4.1 LIN Transmission Rate

When operating the PLIN-LWL modules, it must be ensured that the transmission rate of all participants connected to the LIN bus is identical. There is no conversion or automatic adaptation of the bit rate.

4.2 Status LEDs
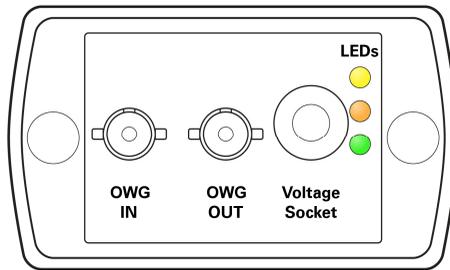
Figure 10: Casing side with OWG connectors, voltage socket, and LEDs

LED	Meaning
Yellow	Transmitting data onto the LIN bus (the orange LED is lit simultaneously)
Orange	Receiving data from the LIN bus
Green	Ready for operation, voltage is applied

5   Technical Specifications

LIN	
High-speed LIN	D-Sub male connector, 9-pin Transceiver: TJA1028T/5V0/20 Bit rates: 2.4^2 - 20 kbit/s
Low-speed LIN	D-Sub male connector, 9-pin Transceiver: TJA1028T/5V0/10 Bit rates: 2.4^2 – 10.4 kbit/s
Optical waveguide	Fiber optic duplex line with ST connector

| Power supply	
Supply voltage	8 - 30 V DC
Current consumption per module	max. 50 mA (at 12 V)

Environment	
Operating temperature	-40 - +85 °C (-40 - +185 °F)
Temperature for storage and transport	-40 - +100 °C (-40 - +212 °F)
Relative humidity	15 - 90 %, not condensing
Ingress protection (IEC 60529)	IP20

Measures	
Size	60 x 35 x 80 mm (W x H x D) See also dimension drawing Appendix C on page 19
Weight per module	150 g

Conformity	
EMV	Directive 2014/30/EU DIN EN 55024:2016-05 DIN EN 55032:2016-02
RoHS 2	Directive 2011/65/EU DIN EN 50581 VDE 0042-12:2013-02

[2] 2.7 kbit/s if 16 (instead of 13) bits are used for the break pulse

Appendix A CE Certificate

EU Declaration of Conformity

This declaration applies to the following product:

Product name: PLIN-LWL

Item number(s):   IPEH-004049

Manufacturer: PEAK-System Technik GmbH
                  Otto-Roehm-Strasse 69
                  64293 Darmstadt
                  Germany

We declare under our sole responsibility that the mentioned product is in conformity with the following directives and the affiliated harmonized standards:

EU Directive 2011/65/EU (RoHS 2)

DIN EN 50581 VDE 0042-12:2013-02
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances;
German version EN 50581:2012

EU Directive 2014/30/EU (Electromagnetic Compatibility)

DIN EN 55024:2016-05
Information technology equipment – Immunity characteristics – Limits and methods of measurement (CISPR 24:2010 + Cor.:2011 + A1:2015);
German version EN 55024:2010 + A1:2015

DIN EN 55032:2016-02
Electromagnetic compatibility of multimedia equipment - Emission Requirements (CISPR 32:2015);
German version EN 55032:2015

Darmstadt, 22 February 2019

Uwe Wilhelm, Managing Director

# Appendix B Emission Diagram
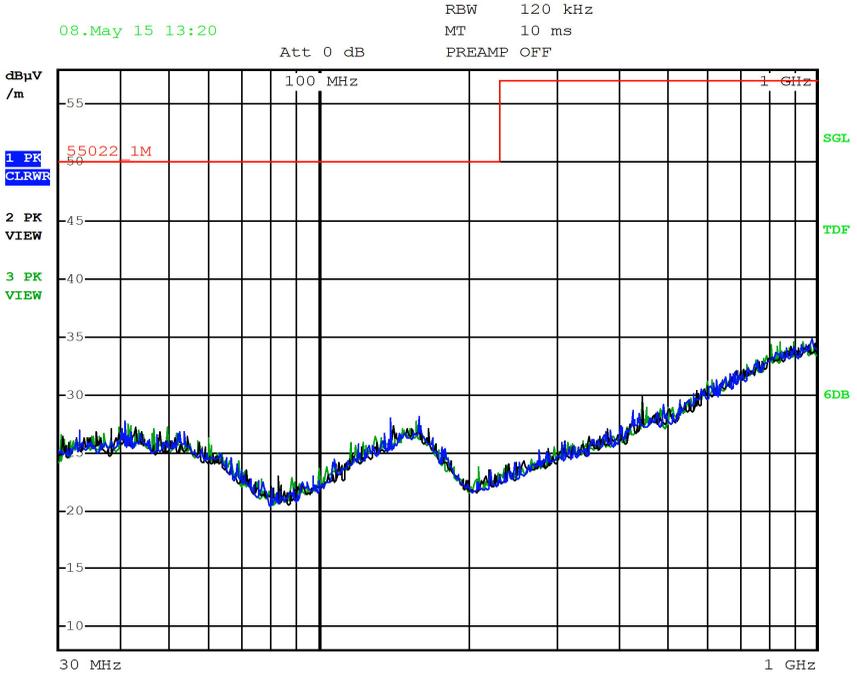
Figure 11: Emission with and without PLIN-LWL

Appendix C Dimension Drawing
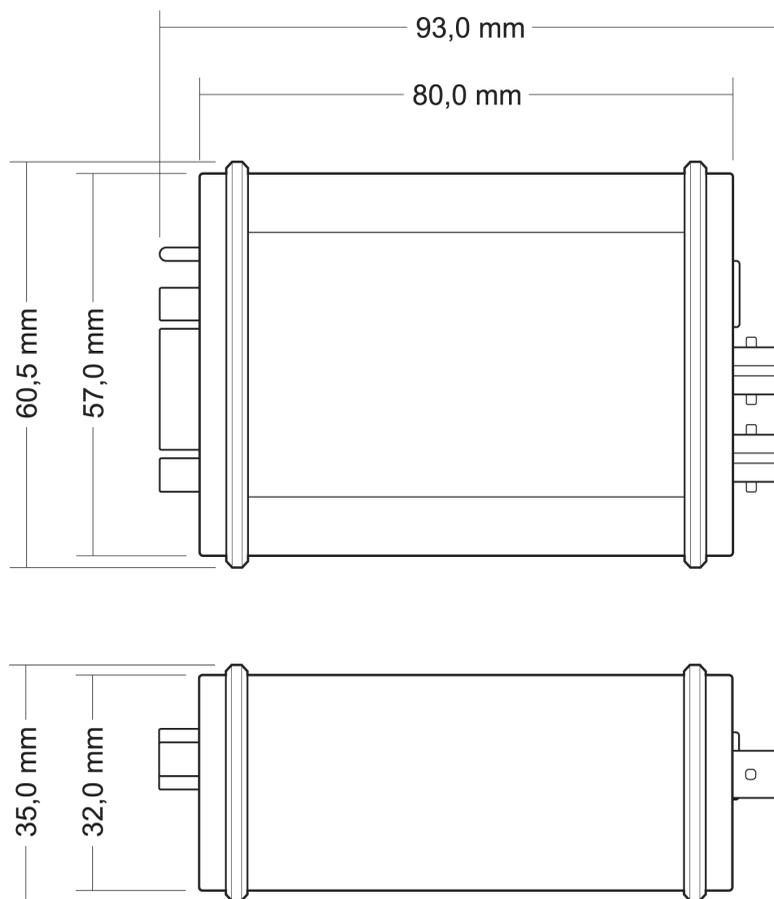
Figure 12: Dimension drawing of the PLIN-LWL

The figure does not show the original size.