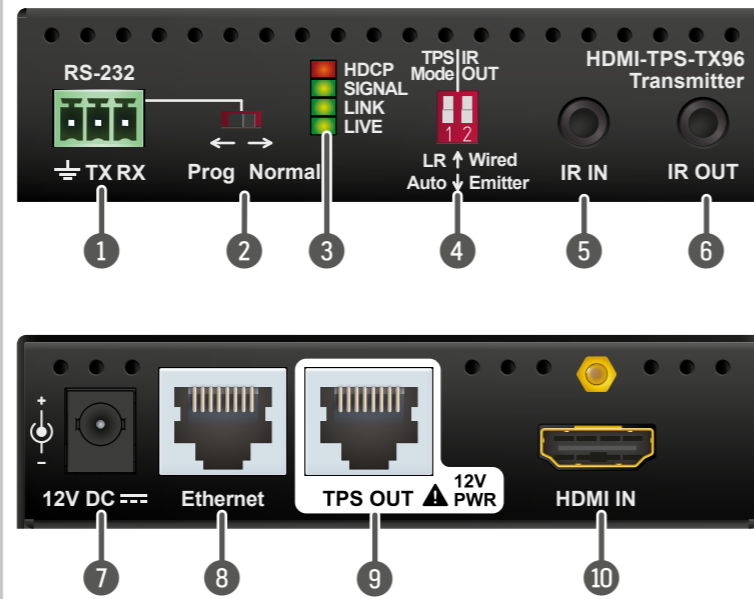**visual engineering**
LIGHTWARE

Quick Start Guide

HDMI-TPS-TX96
HDMI-TPS-RX96

Front and Rear View (HDMI-TPS-TX96)

Front and Rear View Legend (HDMI-TPS-TX96)

1	**RS-232 port**	Local RS-232 port for bi-directional serial data connection and performing firmware upgrade (programming).
2	**RS-232 switch**	**Normal**: serial data is passed through the device. **Prog**: RS-232 pass-through function is disabled, the device is ready for the firmware upgrade.
3	**Status LEDs**	See the next section.
4	**TPS mode switch**	**LR**: Long reach TPS mode; lower resolution (max 1080p), longer distances; **Auto**: TPS mode is determined automatically.
4	**IR mode switch**	IR output signal modulation switch; the 38 kHz modulation can be switched On (**Emitter** position) or Off (**Wired** position).
5	**IR input**	IR signal input connector (for 3.5 mm Jack, 3-pole, TRS plug).
6	**IR output**	IR signal output connector (for 3.5 mm Jack, 2-pole, TS plug).
7	**DC input**	12V DC input for local power supply.
8	**Ethernet port**	The Ethernet data is passed through the device.
9	**TPS port**	TPS port to the other compatible device (extender/ matrix /board). ⚠ *Remote power is always enabled, 12V present on TPS connector. Check the compatibility before connecting devices.*
10	**HDMI port**	Video port for HDMI signal.

Status LEDs

HDCP

☐	OFF	Video output signal is not encrypted with HDCP.
🟥	ON	Video output signal is encrypted with HDCP.

SIGNAL

☐	OFF	No video signal transmission.
🟩	ON	Video signal transmission.

LINK

☐	OFF	TPS connection failed between the devices.
🟩	BLINKING	TPS connection is detected and LPPF link mode is active.
🟩	ON	TPS connection is detected and HDBT or LR link mode is active.

LIVE

☐	OFF	No power supply or out of order.
🟩	BLINKING	Device is powered and ready to use.

Important Safety Instructions

Please read the supplied safety instruction document before using the product and keep it available for future reference.

Introduction

HDMI-TPS-TX96 and -RX96 twisted pair HDBaseT™ extenders provide extension of uncompressed 4K/UHD video with embedded audio for long distances over a single CATx cable. The extender offers uni-directional RS-232, IR, and Ethernet pass-through on the same CATx cable that carries the video signal. The TPS extenders support full HDCP and EDID compliance and work on all standard AV resolutions and also 120 Hz 3D signals. 12V remote powering is available through the single CATx cable, but a local power supply can also be used.

Compatible Devices

The product is compatible with HDBaseT™ third party devices.


Connecting Steps
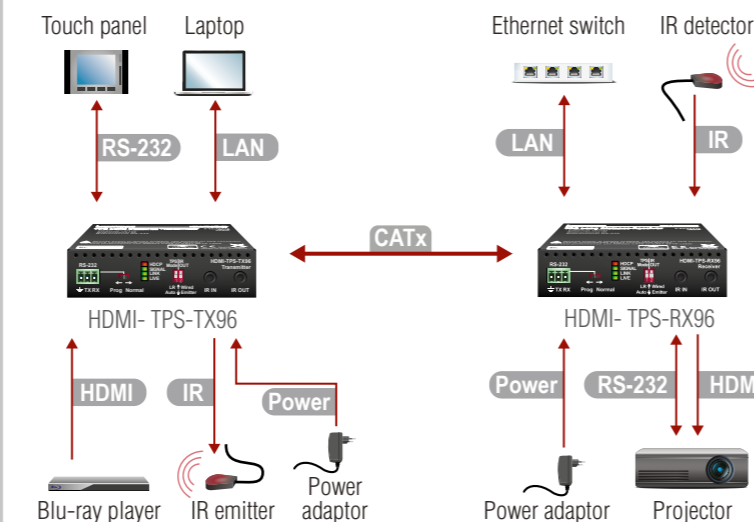
CATx	Connect the TPS output port of the **Transmitter** to the TPS input port of the **Receiver** by a CATx cable.
HDMI	Connect a source to the HDMI (DVI-D) input port of the transmitter.
IR	Connect an IR emitter unit to the IR output port of the transmitter.
RS-232	Connect a controller device to the local RS-232 port of the transmitter. Make sure the RS-232 switch is in **Normal** position.
LAN	Optionally connect a laptop to the Ethernet port of the transmitter.
HDMI	Connect a sink device to the HDMI (DVI-D) output port of the receiver.
RS-232	Connect a serial cable between the sink device and the RS-232 port of the receiver.
LAN	Connect the receiver to Ethernet by a CATx cable.
IR	Connect an IR detector unit to the IR input port of the receiver.
Power	Firstly connect the power adaptor to the DC input of the power injector, then secondly to the AC power socket.

ℹ *Infrared emitter and detector units are optionally available accessories.*

Mounting the Device (with optionally available accessories)

- Under Desk Mounting Kit (UD-kit): to mount **one** extender under any flat surface (e.g. furniture)
- UD Mounting Kit Double (UD-kit double): to mount **two** extenders under any flat surface (e.g. furniture).
- Rack Shelf: 1U high rack shelf provides mounting holes for fastening up to **four** extenders

⚠ *Always use the fixing screws which are supplied with the mounting accessory. If you insert screws longer than 6 mm, the device can be damaged.*
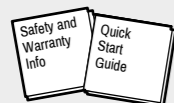
1. Unplug all the cables connected to the device(s).
2. Turn the device(s) upside down.
3. Put the shelf upside down on the device(s). Position it to get the mounting holes aligned.
4. Fasten the device on the shelf with the provided screws.
5. Fix the shelf to the desired place (screws are not supplied).
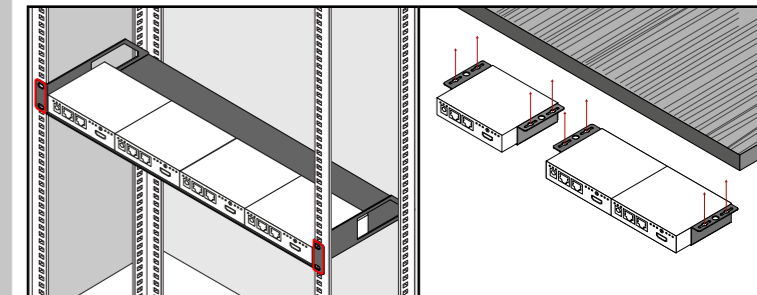
Box Contents
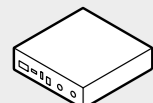
- Extender unit
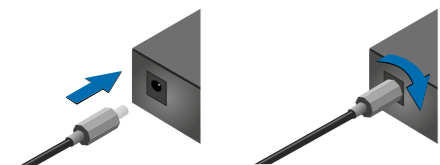- Safety and Warranty info, Quick Start Guide
- 12V DC adaptor with interchangeable plugs
- Phoenix combicon 3-pole connector

Locking DC Plug



Twist 90° clockwise to lock.

Power Supply Options

The extenders can be powered by any of the following ways:

1. Local adaptor: 12V DC input for local power supply.

2. Remote power: The extender pair can power each other, when one of them is locally supplied with 12V DC adaptor. The extender sends remote power via **TPS IN** (on the receiver) or **TPS OUT** (on the transmitter) RJ45 connector to other device.
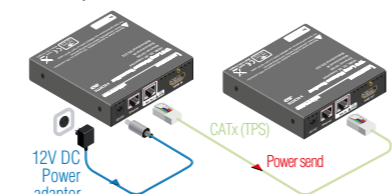
⚠ *Read carefully all the detailed instructions about remote powering devices! Never use remote powering with third-party units!*

Maximum Extension Distances

Below values are valid when the transmitter is powered by a local adaptor; distances may decrease depending on the powering mode (local or remote) and cable quality.

Resolution	Pixel clock rate	Cable lengths (Auto / Long reach TPS mode)		
		CAT5e AWG24	CAT7 AWG26	CAT7 AWG23
1024x768@60Hz	65 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1280x720p@60Hz	73.8 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1920x1080p@60Hz (24bpp)	148.5 MHz	100 m / 130 m*	90 m / 120 m*	120 m / 170 m*
1920x1200@60Hz	152.9 MHz	100 m / NA	90 m / NA	120 m / NA
1600x1200@60Hz	162 MHz	100 m / NA	90 m / NA	120 m / NA
1920x1080@60Hz (36bpp)	222.75 MHz	70 m / NA	70 m / NA	120 m / NA
3840x2160@30Hz UHD **	297 MHz	70 m / NA	70 m / NA	100 m / NA
4096x2160@30Hz 4K **	297 MHz	70 m / NA	70 m / NA	100 m / NA

* Long reach TPS mode supports pixel clock frequencies up to 148.5 MHz.

ℹ *CAT7 SFTP AWG23 cable is always recommended.*

Further Information

TPS Link Modes

The TPS working mode between the transmitter and the receiver parties is determined by the mode set in them. Both parties influence on the setting which determines the final TPS transmission mode. The following TPS modes are defined:

- **Long reach (LR):** Longer CATx cable length, less bandwidth (limited resolution). The LPPF mode is not available in LR TPS link mode.
- **HDBaseT™ (HDBT):** more bandwidth (higher resolutions), shorter CATx cable length. If no video present, the units change to LPPF mode automatically.
- **Low Power Partial Functionality (LPPF):** Only Ethernet, RS-232 and IR are extended.
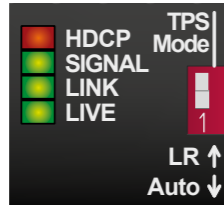
Toggling Between TPS Link Modes

The toggle switch on the extenders can be used to toggle between the LR and Auto TPS modes. If both units have Auto state and there is valid video signal on the transmitter the common mode will be HDBT. If the video signal disappears devices go into LPPF mode.

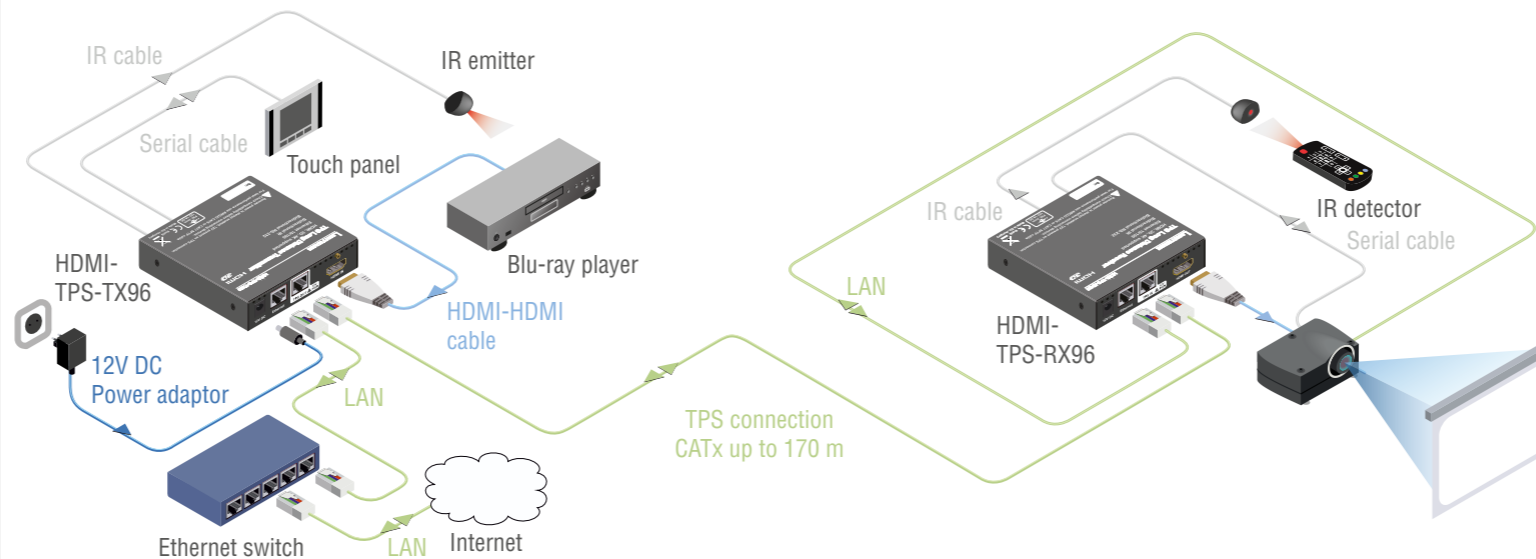### TPS mode between an extender and a port of a matrix board

If an extender and a TPS matrix board are paired the board forces the extender to use the settings of the matrix. The extender's TPS mode switch has no effect.

⚠ *Always use the Auto mode with third-party devices!*

The negotiated TPS working mode		Selected mode (RX)	
		LR	Auto
Selected mode (TX)	LR	LR	LR
	Auto	LR	HDBT

Application diagram

Bi-directional Pass-through Data Lines

The direction of the video extension is fixed from TX towards RX but the pass-through data lines are bi-directional. It means the RS-232, IR, Ethernet source and sink devices can be connected either to the TX or the RX.

Ethernet

The Ethernet port on the RX or on TX can be connected to a LAN hub, switch or router with a LAN cable. The other side behaves as an Ethernet uplink port. Extenders support 10/100 Mbit/sec data transfer rate. The direct access is also supported with cross-link cable. The Ethernet port has auto crossover function. It is able to recognize and handle both cable types: patch and cross TP cables.
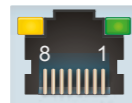
Pin	TIA/EIA T568 A	Color and name	TIA/EIA T568 B	Color and name
1		white/green stripe		white/orange stripe
2		green solid		orange solid
3		white/orange stripe		white/green stripe
4		blue solid		blue solid
5		white/blue stripe		white/blue stripe
6		orange solid		green solid
7		white/brown stripe		white/brown stripe
8		brown solid		brown solid

Mechanical Drawings (HDMI-TPS-RX96)

Dimensions are in mm. Both the transmitter and the receiver have the same sized enclosure.
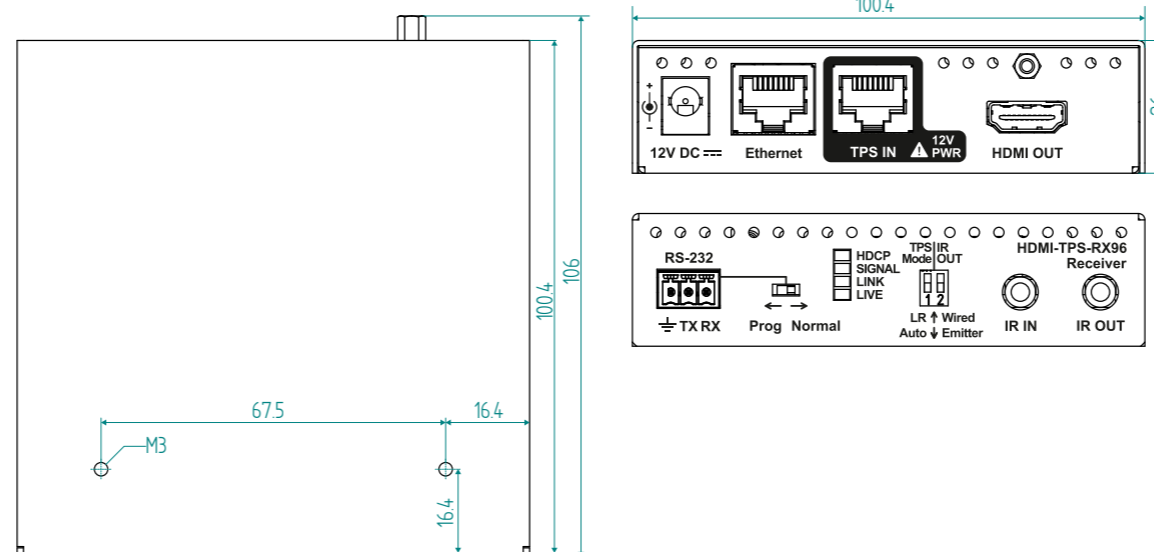
Infra-Red (IR)

One emitter and one detector is enough for remote controlling one IR sink device. If there is an IR sink device to be controlled next to the TX and the other one is next to the RX, two emitter- detector pairs are needed. The IR emitter and the detector have standard 3.5 mm TRS (jack) connectors. The emitter's plug has two poles (mono) and the detector's plug has three poles (stereo).

	Detector – 3-pole-TRS		Emitter – 2-pole-TS
1 Tip	Signal (active low)	1 Tip	+5V
2 Ring	GND	2 Ring	Signal (active low)
3 Sleeve	+5V	3 Sleeve	

ⓘ *IR extension is available only with point-to-point connection of the extenders.*

RS-232

Third party devices with standard RS-232 port are supported as the extenders work in **pass-through** mode. TX and RX provide 9-pole D-sub female connector. Use straight-serial cable to connect a DTE device to an extender and use a cross serial cable in case of pairing a DCE device to the other TPS extender. The RS-232 options – the baud rate and the parity bits are set on the third party devices and it can be anything. The extenders support any kind of serial settings.

The signal levels are the followings:

	Output voltage (V)
Logic low level	3 - 15
Logic high level	-15 - 3

RS-232 connector and plug pin assignment

Pin nr.	Signal
1	Ground
2	TX data
3	RX data

ⓘ *Please read the user's manual of the RS-232 device to get its type. The extenders operate as a DCE unit according to its pin-out.*

Wiring Guide for RS-232 Data Transmission

HDMI-TPS-96 series are built with 3-pole Phoenix connector. See the below examples of connecting to a DCE (Data Circuit-terminating Equipment) or a DTE (Data Terminal Equipment) type device:

Lightware device and a DCE	Lightware device and a DTE
D-SUB 9 - Phoenix	D-SUB 9 - Phoenix
2: TX data 3: RX data 5: Ground	2: RX data 3: TX data 5: Ground

For more information about the cable wiring, see the user's manual of the device or the Cable Wiring Guide on our website.

Specification

General

Compliance ....CE
Safety compliance .... IEC/EN 62368-1:2014
EMI / EMC .... EN 55035:2017 / EN 55032:2015
Enclosure... 1 mm steel
Dimensions .... 100.4 W x 100x4 D x 26 H mm
Weight (TX) ....302 g
Weight (RX) ....315 g
Warranty..3 years
Operating temperature..0° to +50°C (+32° to +122°F)
Operating humidity.. 10% to 90%, non-condensing
Cooling...passive

Power

Power supply .... external power adaptor / remote power via TPS
Power adaptor .... Input 100-240 V AC 50/60 Hz, Output 12V DC, 2.5 A
Power consumption (TX) ....
............................3.6 W (no signal) / 4.5 W (max. signal) / 13 W (with remote power)
Power consumption (RX) ....
..........................5.5 W (no signal) / 6.5 W (max. signal) / 12.3 W (with remote power)

Connectors

TX input, RX output ....HDMI connector
TX output, RX input ....RJ45 (TPS interface)
Ethernet RJ45
IR input, output .... 3.5 mm (1.8") jack connector
Serial port..3-pole Phoenix connector
Power... locking DC connector (2.1 / 5.5 mm)

Digital Video Signal
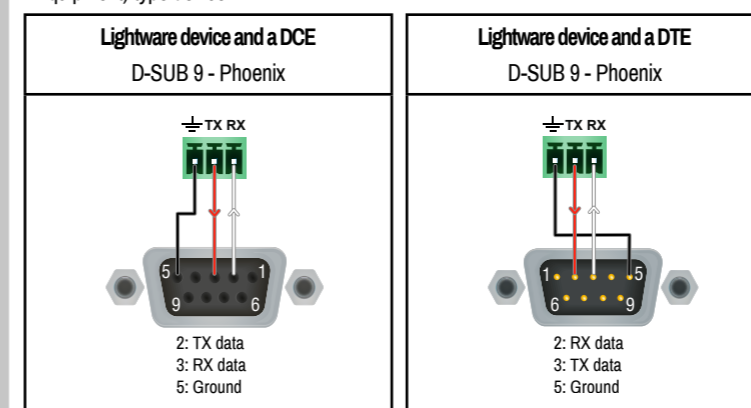
Supported signals .... DVI 1.0, HDMI 1.4
Signal standard .... DVI and HDMI standard which supports embedded audio
Supported resolutions...1920x1080@120 Hz, 24 bit
.... up to 4K / UHD (30Hz RGB 4:4:4, 60Hz YCbCr 4:2:0)
3D support .... yes
HDCP compliant .... yes
CEC support *...transparent
*Only between HDMI-TPS-TX96 and HDMI-TPS-RX96 models.
EDID support .... transparent
Cable length HDMI input port (1080p) .... max. 20 m
Equalization .... adaptive, automatic

TPS port (HDBaseT™-compatible)

Ethernet pass-through .... yes
RS-232 pass-through .... yes
IR pass-through .... yes

Video and Remote Powering Compatibility Table

This device	Remote device	Video / HDBaseT™	Remote Powering
TPS '96 series	'90 series TPS extender	Not recommended	Not compatible
	'96 series TPS extender	Compatible	Available
	'95 series TPS extender	Compatible	Available
	'97 series TPS extender	Compatible	none
	Other TPS extender	Compatible	none
	MX-TPS IB / OB	Compatible	With external PSU
	MX-TPS2 IB / OB	Compatible	none
	MX-TPS2 IB / OB -P	Compatible	none
	25G TPS IO boards	Compatible	none
	MMX TPS series	Compatible	none
	Third-party HDBaseT™	Not recommended	Not compatible