

# Technical Documentation

for metraTec hyperMux UHF Multiplexer (4, 8 and 16 Port)



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# 1 General Information / Security Advice

## 1.1 Notes on the use of this documentation

This user manual and integration guide uses different symbols to point out potentially dangerous situations. The following signs and symbols are used throughout the document.



### ATTENTION

Declares a potentially hazardous situation. If this is not avoided, the product or something in its surrounding could be damaged.



### NOTE

Declares notes for the user as well as other useful information, where no harmful or dangerous situations can be expected.

## 1.2 Security Advice

The hyperMux-X Multiplexers were not designed for use in dangerous environments. Using these products in applications where a failure could directly result in severe injuries or death ("high risk activities") is not permitted. This includes but is not limited to applications in nuclear facilities, flight control systems, life support systems or weapon systems. The manufacturer denies the suitability of these devices for such scenarios.

## 1.3 Export Restrictions

All metraTec hyperMux-X Multiplexers contain components that underlie US Export restrictions. It is therefore forbidden to export these products to countries that are on the US trade embargo list. The same applies to any countries that are on the EU embargo list.

## 1.4 Further Documents

None

## 2 Product Description

The metraTec hyperMux-4 is an RFID multiplexer for UHF systems with an operating frequency of 868 MHz and 915 MHz, as well as higher frequencies such as 2.4 GHz. It allows connecting up to four, eight or 16 antennas (depending on the product version) to a single reader antenna port. This reduces system complexity and setup costs in cases where many antennas are needed and also lowers hardware system costs as the number of RFID readers needed decreases.

The device works irrespective of the manufacturer of the antennas and readers used. For compatibility of the multiplexer with any other UHF RFID reader, please contact the metraTec team. Furthermore, the multiplexer has a very small size and a minimal power consumption which enables mobile operation. Due to the broad frequency range covered by the hyperMux-X it can be used in UHF systems worldwide. As of today it is already compatible with future RFID systems working at 2.4 GHz making it truly future proof.

Versions with 4, 8 and 16 antenna ports are available.

### 2.1 Intended Use

The hyperMux-X UHF Multiplexer is a device for switching between antenna ports at frequencies between 600 and 3,000 MHz with an RF power of up to 4 Watt. There is no warranty coverage for use in other radio frequencies, e.g. 422 MHz.

### 2.2 Technical Specification

Operating Voltage	12 - 26 V DC
Digital Inputs	2 to 4 x 24 V DC (depending on version), optically isolated
Current Consumption	20 mA
Switching Time	1 $\mu$ s
Operating Temperature	-20 °C to +70 °C
Dimensions	hyperMux-4: 130 x 106 x 44 mm hyperMux-8 / 16: 190 x 104 x 39 mm
Protection	IP 40 (higher on request)
Conformity	CE, e.g. EN 60950-1

## 2.3 Product Drawing

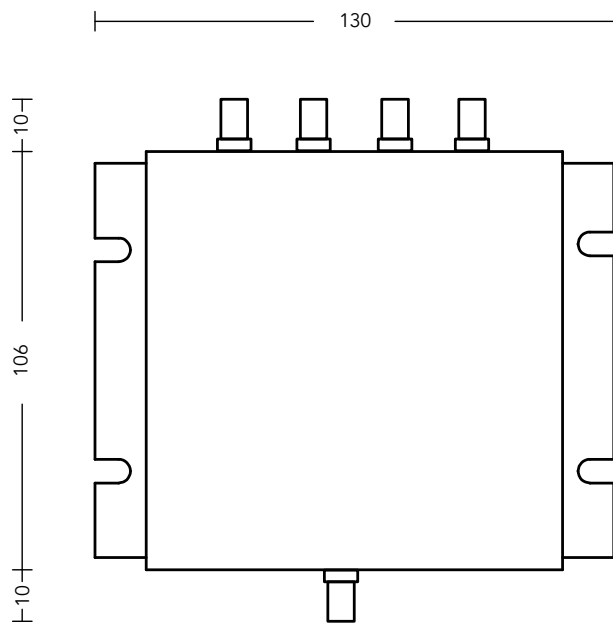


Fig. 1: hyperMux-4 package dimensions

## 2.4 Scope of Delivery

The hyperMux gets shipped with no additional accessories.

### 3 Installation and Operation

Installing the hyperMux-X is an easy task for experienced electrical personnel. Some important notes should be considered as listed at the end of the installation instructions.

#### Step 1:

Place the multiplexer in the desired installation location and attach it there if necessary. The device does not have a preferential mounting orientation.

#### Step 2:

Both the reader connection and the antenna connections are connected via SMA connectors in the standard version of the multiplexer. For an optimal connection, use a matching tool (e.g. like a torque wrench).

#### Step 3:

Connect the control lines between reader (or any other device that controls the multiplexer) and multiplexer. The device has optically isolated 24V inputs as used by many industrial devices. Each input needs a 24V line (e.g. hyperMux-4: Inputs IN1+ and IN2+) as well as a ground line (IN1- and IN2- for hyperMux-4) for the differential signal.

#### Step 4:

Connect the multiplexer with a 24V power source. This can come directly from the reader if it supports this (Pins 24V and GND). All metraTec readers designed for the use in industry applications are equipped with such an output, thus only one cable harness has to be laid from reader to multiplexer.

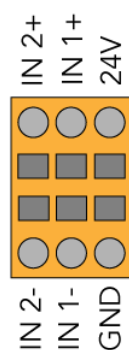


Fig. 2: Connector description of the hyperMux-4

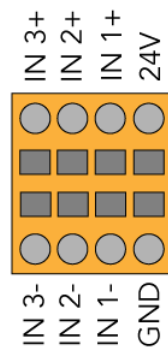


Fig. 3: Connector description of the hyperMux-8

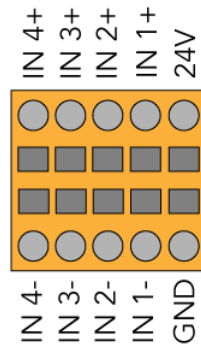


Fig. 4: Connector description of the hyperMux-16



#### ATTENTION

The output power of the reader may not exceed the maximum input power of the multiplexer (4W). The RF in- and outputs may not be supplied with DC offsets greater than 10 V. Disregarding may result in a damaged device in both cases.



#### ATTENTION

The multiplexer is not terminated. If there is no 50 Ohm load connected to the selected antenna port, the signal will be reflected to the reader. This can potentially damage the reader permanently. Please observe the maximum voltage standing wave ration (VSWR) of your reader.

## 4 Use of the device

The active antenna is selected using the digital inputs of the multiplexer. Depending on the version there is 2 (for hyperMux-4), 3 (for hyperMux-8), and 4 (for hyperMux-16) inputs. Inputs are being enumerated in binary numbers with no. 1 being LSB. See the following table for a complete overview. The multiplexer has a fail-safe feature. If there is no control signal, the multiplexer will connect antenna port 1 as active port.

<i>Input 1</i>	<i>Input 2</i>	<i>Input 3 (8x / 16x)</i>	<i>Input 4 (16x)</i>	<i>Active Antenna</i>
LOW	LOW	LOW	LOW	Antenna 1
HIGH	LOW	LOW	LOW	Antenna 2
LOW	HIGH	LOW	LOW	Antenna 3
HIGH	HIGH	LOW	LOW	Antenna 4
LOW	LOW	HIGH	LOW	Antenna 5
HIGH	LOW	HIGH	LOW	Antenna 6
LOW	HIGH	HIGH	LOW	Antenna 7
HIGH	HIGH	HIGH	LOW	Antenna 8
LOW	LOW	LOW	HIGH	Antenna 9
HIGH	LOW	LOW	HIGH	Antenna 10
LOW	HIGH	LOW	HIGH	Antenna 11
HIGH	HIGH	LOW	HIGH	Antenna 12
LOW	LOW	HIGH	HIGH	Antenna 13
HIGH	LOW	HIGH	HIGH	Antenna 14
LOW	HIGH	HIGH	HIGH	Antenna 15
HIGH	HIGH	HIGH	HIGH	Antenna 16

Furthermore, the multiplexer is hot switchable. This means that the antenna port can be switched without having to turn off the HF signal. The power supply has to be connected, however. Due to the very short switchover times, the reader is unaffected by the antenna switching, making it possible to operate the multiplexer by a different device (e.g. SPS) and use the reader to focus on reading tags only.



## 5 RF Specification

The following table shows the insertion loss (dampening of the signal when switched on) and the channel isolation between the antenna ports of the multiplexer. The values were measured in the standard version of the multiplexer with SMA connectors.

<i>Frequency</i>	<i>Insertion Loss</i>	<i>Channel Isolation</i>
900 MHz	1.1 dB	31 dB
2.4 GHz	2.3 dB	20 dB

The input reflection behavior depends strongly on the type of connector used and on the quality of the connection (e.g. dependent on connector wear). For best results it is recommended to use only slightly worn or new SMA connectors tightened with a matching tool.

## 6 Further Notes

### 6.1 Environmental

Electronic devices like the hyperMux-X are covered by the (German) ElektroG (electronic waste law) as well as the European WEEE directive and as such may not be disposed of by way of the normal household trash. Instead they have to be recycled properly. For you as our customer this is no additional burden, however, as you can send the device back to us for proper recycling. We assure you that the devices received back will be recycled properly and in an environmentally friendly way. Our WEEE Registration ID is DE 56060482.

When selecting electronic components we additionally made sure that all components are free of heavy metals and other harmful substances as required by the RoHS Directive for many industries. Hence, our products are produced in the most environmentally friendly way possible.



### 6.2 Declaration of Conformity

The hyperMux-X complies with all directives and regulations applicable in the European Union for this kind of device. This especially includes all laws regarding use of spectrum and EMC. The product therefore bears the CE sign, as required by Directive 1999/5/EC (Radio & Telecommunication Terminal Equipment Directive).

The product is currently not registered for use in the US or Canada. However, metraTec is registered as a manufacturer of electronics at the FCC and IC. A certification of this product is therefore possible, if required. Please ask us or your system integrator for further information.

## 7 Version Control

<i>Version</i>	<i>Change</i>	<i>edited by</i>	<i>Date</i>
1.0	created	KD	07.05.2010
1.1	hyperMux-8 / 16 added	KD	16.12.2013
1.2	adapted to HW r0102	TM	11.06.2014
1.3	small edits and layout	CS	06.10.2014
1.4	dimensions corrected, conformity note added, minor changes	CS	18.06.2015
1.5	update address	KS	07.12.2016

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