



## User Manual

JXM-MUX - Video Splitter

60874930

We automate your success.

Item # 60874930

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**Assignment to product**

This User Manual is an integral part of JXM-MUX:

Type: \_\_\_\_\_  
Serial #: \_\_\_\_\_  
Year of manufacture: \_\_\_\_\_  
Order #: \_\_\_\_\_



To be entered by the customer:

Inventory #: \_\_\_\_\_  
Place of operation: \_\_\_\_\_

### **Significance of this User Manual**

This document is an integral part of the JXM-MUX:

- Keep this document in a way that it is always at hand until the JXM-MUX will be disposed of.
- Pass this document on if the JXM-MUX is sold or loaned/leased out.

In any case you encounter difficulties to clearly understand the contents of this document, please contact Jetter AG.

We would appreciate any suggestions and contributions on your part and would ask you to contact us at the following e-mail address: [info@jetter.de](mailto:info@jetter.de). Your feedback will help us produce manuals that are more user-friendly, as well as address your wishes and requirements.

This document contains important information on the following topics:

- Transport
- Mounting
- Installation
- Programming
- Operation
- Maintenance
- Repair

Therefore, you must carefully read, understand and observe this document, and especially the safety instructions.

In the case of missing or inadequate knowledge of this document Jetter AG shall be exempted from any liability. Therefore, the operating company is recommended to obtain the persons' confirmation that they have read and understood this manual in writing.

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# 1 Safety instructions

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**Introduction**

This chapter informs the user of basic safety instructions. It also warns the user of residual dangers, if there are any. Furthermore, it contains information on EMC.

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## Basic safety instructions

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### Introduction

This device complies with the valid safety regulations and standards. Jetter AG attaches great importance to the safety of the users.

Of course, the user should adhere to the following regulations:

- Relevant accident prevention regulations
  - Accepted safety rules
  - EC guidelines and other country-specific regulations
- 

### Intended use

Intended conditions of use include operation in accordance with this User Manual.

This device has been designed as a peripheral module for use in commercial vehicles and mobile machines and is intended for connection to an already existing controller. The JXM-MUX is a video splitter merging up to 4 video signals into one video signal.

This device meets the requirements of the European Automotive EMC Directive for electric/electronic subassemblies.

It may only be operated within the limits set forth in the technical specifications. The operating voltage of the JXM-MUX is classified as SELV (Safety Extra Low Voltage). Therefore, it is not subject to the EU Low Voltage Directive.

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### Usage other than intended

The device must not be used in technical systems which to a high degree have to be fail-safe.

The JXM-MUX is no safety-related part as per Machinery Directive 2006/42/EC. This device is not qualified for safety-relevant applications and must, therefore, NOT be used to protect persons.

If you intend to operate the device at ambient conditions not being in conformity with the permitted operating conditions, please contact Jetter AG beforehand.

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### Personnel qualification

Depending on the life cycle of the product, the persons involved must possess specific qualifications. The qualifications required to ensure safe handling of the device at different phases of the product life cycle are listed below:

Product life cycle	Minimum qualification
<b>Transport/storage:</b>	Trained and instructed personnel with knowledge in handling electrostatically sensitive components
<b>Mounting/installation:</b>	Specialized personnel with training in electrical/automotive engineering, such as automotive mechatronics fitters
<b>Commissioning/programming:</b>	Trained and instructed experts with profound knowledge of, and experience with, automotive/automation technology, such as automotive engineers for mobile machinery
<b>Operation:</b>	Trained, instructed and assigned personnel with knowledge in operating electronic devices for mobile machinery

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Product life cycle	Minimum qualification
<b>Decommissioning/ disposal:</b>	Specialized personnel with training in electrical/automotive engineering, such as automotive mechatronics fitters

### Modifications and alterations to the module

**For safety reasons, no modifications and changes to the device and its functions are permitted.**

Any modifications to the device not expressly authorized by Jetter AG will result in a loss of any liability claims to Jetter AG.

**The original parts are specifically designed for the device. Parts and equipment from other manufacturers have not been tested by Jetter AG and are, therefore, not released by Jetter AG.**

The installation of such parts may impair the safety and the proper functioning of the device.

Any liability on the part of Jetter AG for any damages resulting from the use of non-original parts and equipment is excluded.

### Transport

The device contains electrostatically sensitive components which can be damaged if not handled properly.

To exclude damages to the device during transport it must be shipped in its original packaging or in packaging protecting against electrostatic discharge.

- Use an appropriate outer packaging to protect the device against impact or shock.
- In case of damaged packaging inspect the device for any visible damage. Inform your freight forwarder and Jetter AG.

### Storing

When storing the device observe the environmental conditions given in the technical specification.

### Repair and maintenance

The operator is not allowed to repair the device. The device does not contain any parts that could be repaired by the operator.

If the device needs repairing, please send it to Jetter AG.

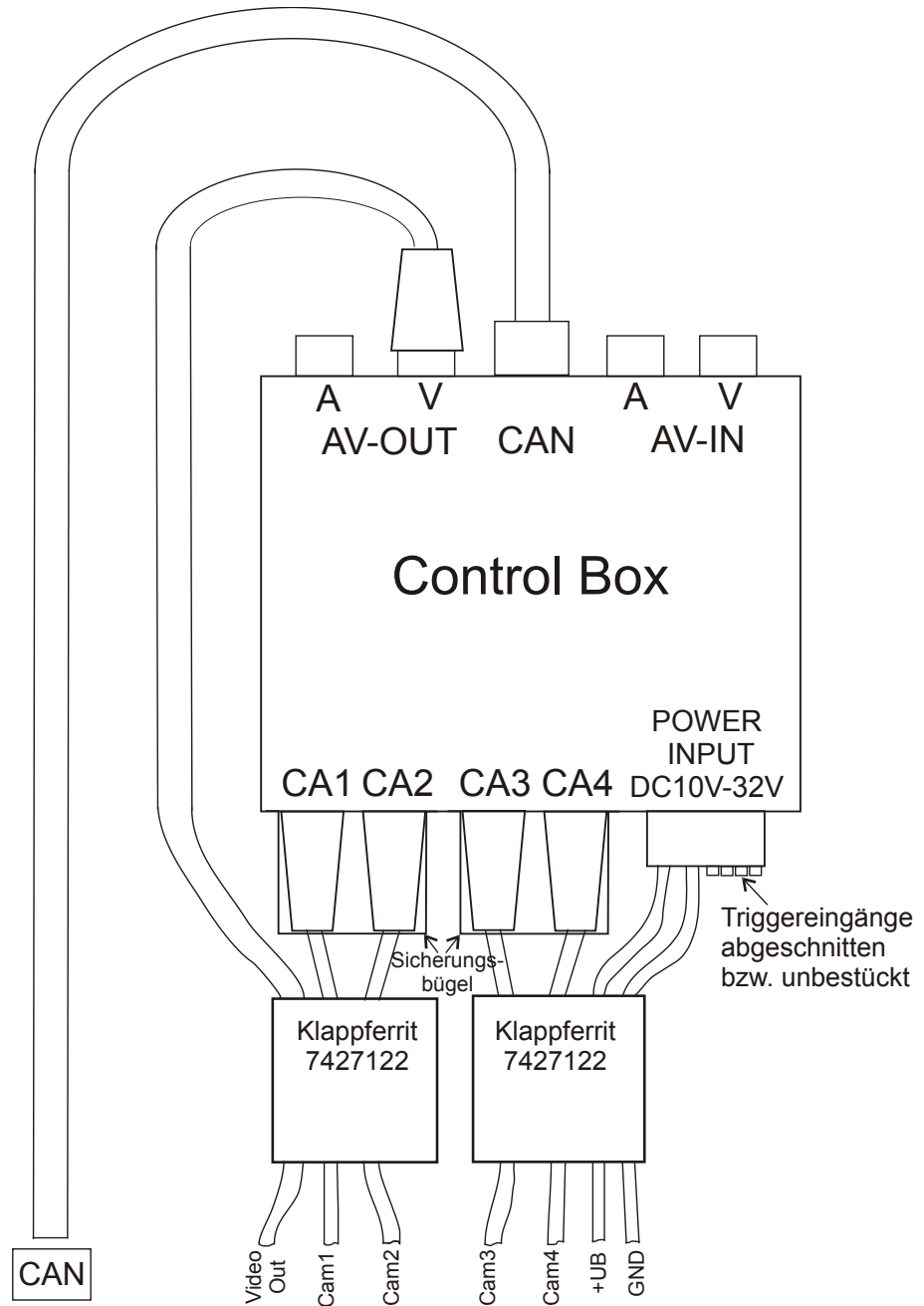
### Disposal

When disposing of devices, the local environmental regulations must be complied with.

## Instructions on EMC

### Wiring Instructions

To ensure immunity to interference the JXM-MUX must be wired as shown below. The jacks CA1 to CA4 are soldered to the JXM-MUX housing.



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## 2 Electrical installation

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**Introduction** This chapter covers design, interfaces and installation of the video splitter JXM-MUX.

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**Wiring Instructions** To ensure immunity to interference follow the **wiring instructions** (see page 10).

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## 2.1 Design of the device

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### Introduction

This chapter describes the design of the device.

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## Product description

### Video Splitter JXM-MUX

The JXM-MUX is a video splitter merging up to 4 video signals. Up to 4 cameras can be connected to it. The signals from these cameras are routed to the monitor. Optionally one to four video signals can be displayed on the monitor. Supported video standards are PAL or NTSC. Each video signal from the cameras can be mirrored, for example when a camera is used as rear view camera.

The video splitter is controlled by a CAN interface with implemented CANopen® protocol.

### Product Image



### Product features

The product features are listed below:

- Video system: NTSC, PAL (5 channels)
- 4 camera ports (5-pin MiniDIN jacks)
- 1 video input (RCA/cinch)
- 1 audio input (RCA/cinch) (not supported)
- 1 video output (RCA/cinch)
- 1 audio output (RCA/cinch) (not supported)
- Controlled by a CAN interface with implemented CANopen® protocol.

### Scope of delivery

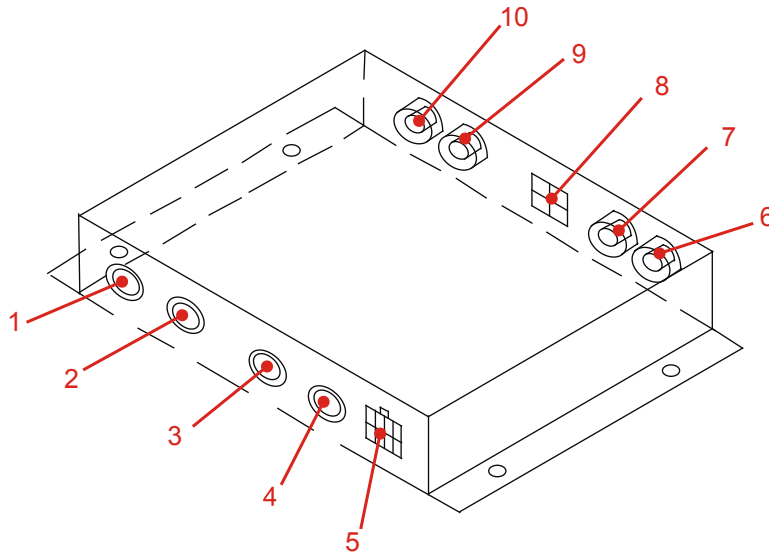
The following items are included in the scope of delivery of a JXM-MUX:

Item no.	Quantity	Description
10000790	1	Video splitter JXM-MUX with power cable (2 m) and 2 retaining clips
60240700	2	Cable snap ferrite
60873457	1	CAN cable 1 m
60873458	1	CAN terminating resistor (120 Ω) for connection to JXM-MUX

## Interfaces of video splitter JXM-MUX

### Ports and interfaces

The JXM-MUX is equipped with the following interfaces:

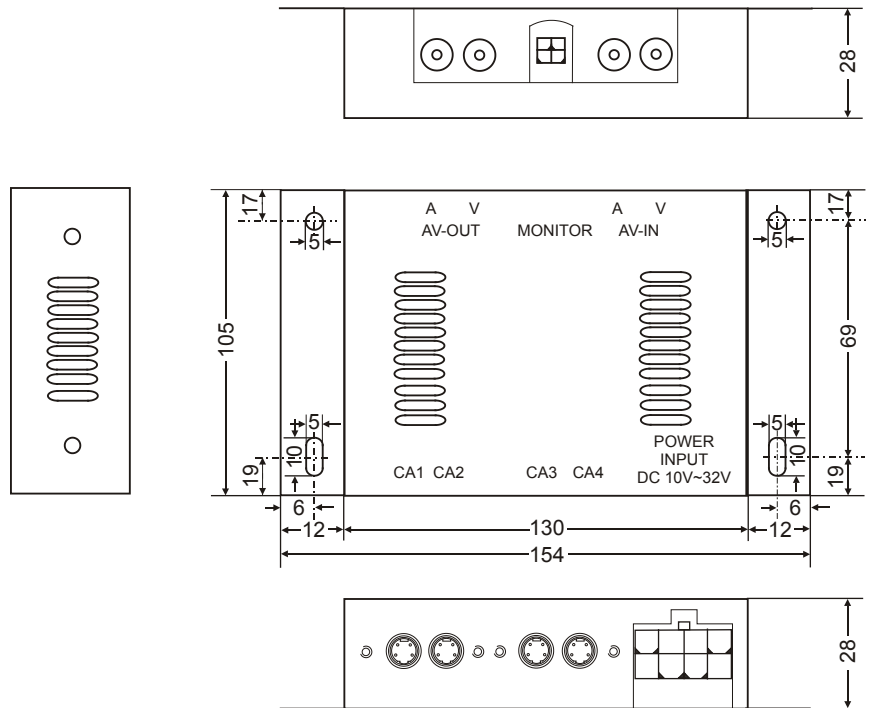


Number	Element	Description
1	CA1	Camera input # 1
2	CA2	Camera input # 2
3	CA3	Camera input # 3
4	CA4	Camera input # 4
5	POWER	Power supply
6	V (AV-IN)	Video input
7	A (AV-IN)	Audio input (not supported)
8	MONITOR	CAN port
9	V (AV-OUT)	Video output
10	A (AV-OUT)	Audio output (not supported)

## Physical dimensions

**Physical dimensions**

The illustration below shows the physical dimensions of the JXM-MUX in millimeters.



**Mounting orientation**

The video splitter JXM-MUX can be installed in vertical or horizontal position.

## 2.2 Ports and interfaces

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### Jack POWER

The function of the jack POWER is as follows:

- Power supply for JXM-MUX
- 

### MiniDIN connectors (female) CA1 to CA4

The function of MiniDIN connectors CA1 to CA4 is as follows:

- Connection of cameras with an operating voltage of 12 VDC
- 

### RCA/cinch jacks V (AV-IN)

The function of the RCA/cinch jacks V (AV-IN) is as follows:

- Additional AUX input for a video signal
- 

### RCA/cinch jacks V (AV-OUT)

The function of the RCA/cinch jacks V (AV-OUT) is as follows:

- Output of a resulting video signal
- 

### CAN port

The function of the CAN interface is as follows:

- Configuration and control of the video splitter JXM-MUX via CANopen® bus
- 

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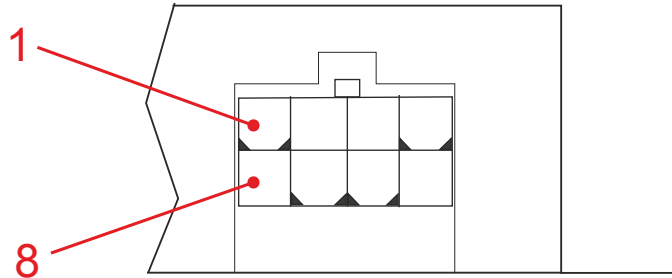


## Power Supply Jack POWER

### Purpose

The jack POWER is for connecting the power supply cord to the JXM-MUX.

### Pin assignment



Pin	Description
1	VIn (DC 10 V ... 32 V)
8	Reference potential (GND)

### Technical specifications

Parameter	Description
Operating voltage	DC 10 V ... DC 32 V
Input current at DC 12 V (typically)	2.0 A max.
Input current at DC 24 V (typically)	1.0 A max.
Power consumption	24 W max.

### Male Connector for POWER jack

An 8-pole connector (male) is included in the scope of delivery of a JXM-MUX. The power supply cord with one red and one black core (each 2 m in length) is connected to the connector terminals.

### Camera Inputs CA1 to CA4

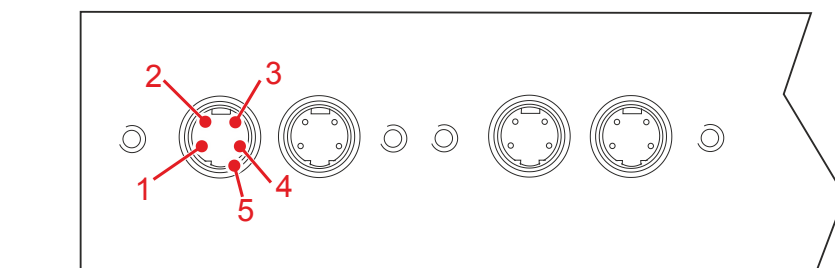
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#### Purpose

The following camera types can be connected to the MiniDIN connectors CA1 to CA4:

- CCD cameras
  - Internal vehicle cameras
  - Rear view cameras
  - Monitoring cameras
  - Cameras with an operating voltage of DC 12 V
  - Cameras with audio output
  - Cameras with PAL or NTSC video signals
- 

#### Contact Assignment of MiniDIN Connectors CA1 to CA4



Pin	Description
1	Power DC 12 V
2	Audio IN
3	Mirror
4	Video IN
5	GND

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## A and V (AV-IN) Connections

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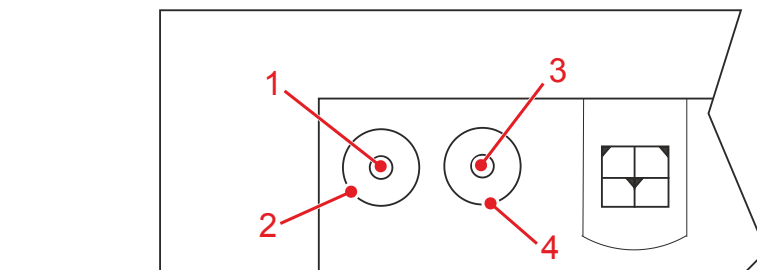
### Purpose of A and V (AV-IN) Connections

The video splitter JXM-MUX offers the option to feed in an additional video signal via AUX input (RCA/cinch jacks).

Audio signals are not supported.

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### Contact Assignment of A and V (AV-IN) Jacks



Pin	Description
1	Video input signal V (AV-IN)
2	Reference potential for video signal
3	Audio input signal A (AV-IN) (not supported)
4	Reference potential for audio signal (not supported)

---

## A and V (AV-OUT) Connections

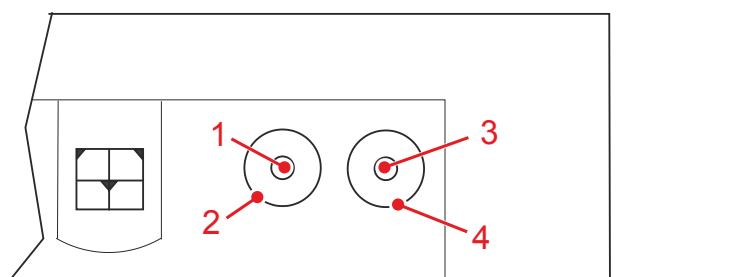
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### Purpose of A and V (AV-OUT) Connections

The JXM-MUX forms a resulting video signal from the incoming video signals. The resulting video signal is output via V (AV-OUT) jacks. Audio signals are not supported.

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### Contact Assignment of A and V (AV-OUT) Jacks



Pin	Description
1	Video output signal V (AV-OUT)
2	Reference potential for video signal
3	Audio output signal A (AV-OUT) (not supported)
4	Reference potential for audio signal (not supported)

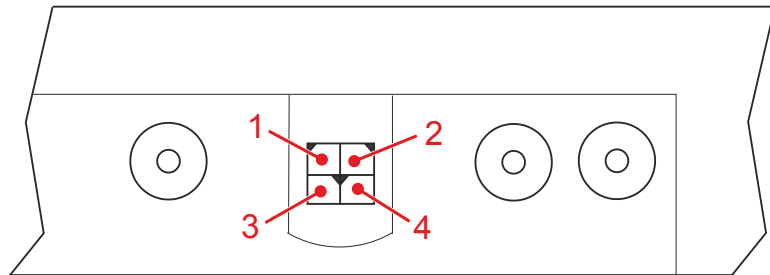
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## CAN port

### Purpose

The CAN interface (MONITOR jack) is for plugging in the CAN cable equipped with the corresponding connector (item # 60873457). Through this cable the video splitter JXM-MUX is connected as CANopen® node to a CANopen® bus.

### Pin assignment



Pin	Description
1	CAN_H
2	CAN_L
3 - 4	Jumper = CAN terminating resistor (120 Ω)

### Male connector for MONITOR jack

A 2-core power supply cord (1 m in length) (item # 60873457) equipped with a 4-pin connector (male) fitting into the CAN interface is included in the scope of delivery of the JXM-MUX.

## 2.3 Mechanical installation

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### Introduction

This chapter describes how to install the JXM-MUX.

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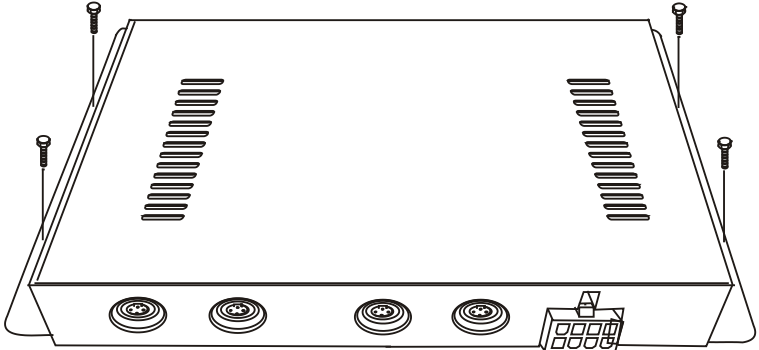
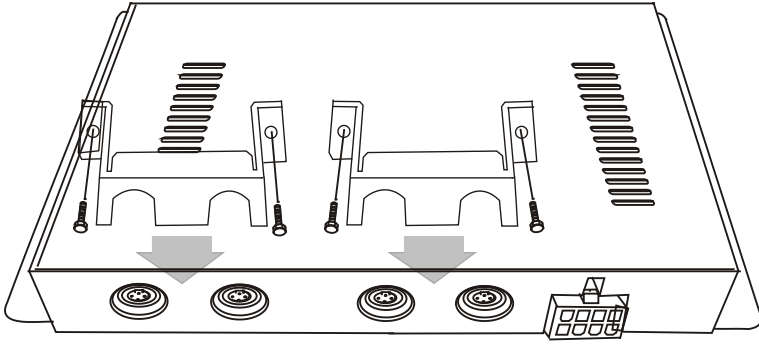
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## JXM-MUX - Installation

### Mechanical installation

To install the video splitter JXM-MUX, proceed as follows:

Step	Action
1	Install the JXM-MUX in a location which has a load carrying capacity of at least 5 kg.
2	Screw down the JXM-MUX as shown in the illustration below. When doing so, use the screws that come with the module. 
3	Plug in the camera cables, <b>then</b> install the retaining clips using the screws that come with the module. 





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# 3 Configuration

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**Introduction**

This chapter describes how to configure the video splitter JXM-MUX via CANopen® interface.

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### JXM-MUX - Configuration

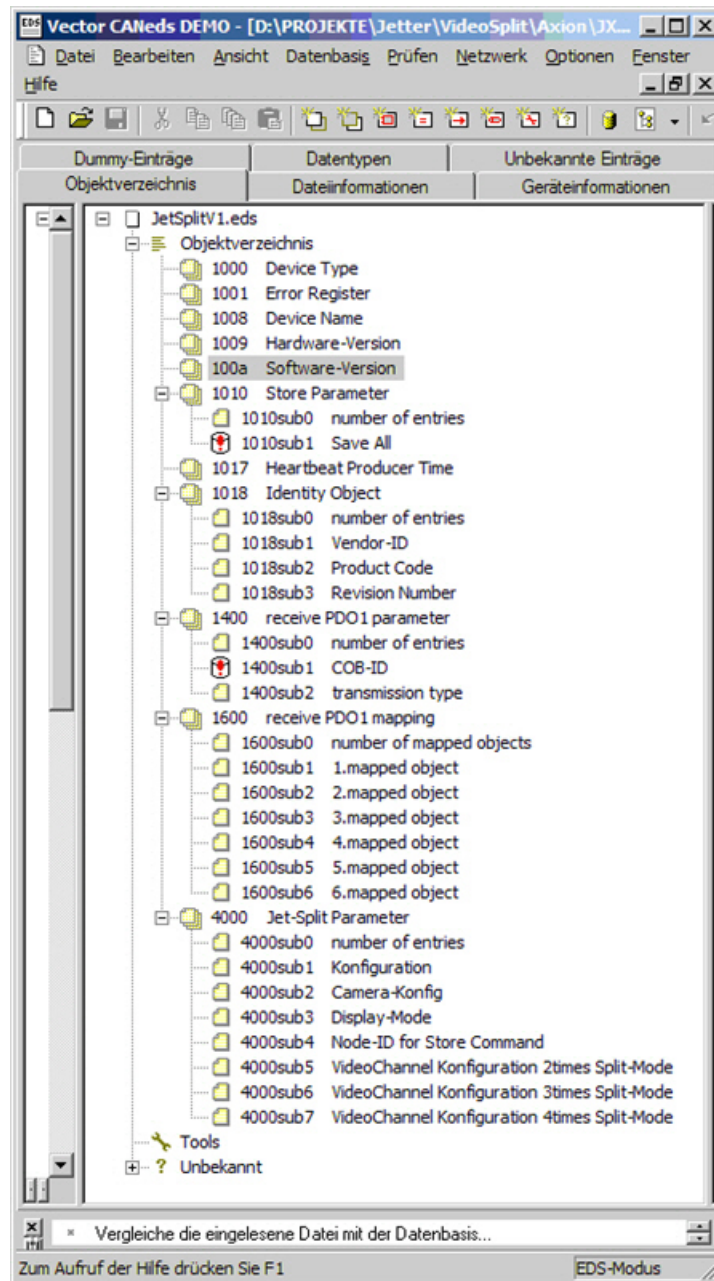
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<b>CANopen® Connectivity</b>	<p>The JXM-MUX features a CANopen® node with a rate of 250 kBaud. Its design complies with profile DS 301.</p> <p>To allow function monitoring, the node acts as heartbeat producer sending a heartbeat object every 500 ms.</p>
<b>Configuring the NODE ID</b>	<p>The NODE ID is stored to the flash memory and is, thus, safeguarded against power loss. To set the NODE ID enter the required value into index 4000, subindex 4, length 1 (e.g. 0x3F). To store the newly set NODE ID to index 1010, subindex 1, length 4 use command <b>Save</b> (0x65766173).</p> <p><b>Important: The Save command must be sent twice!</b></p> <p>Any changes become effective only after the module has been re-initialized.</p>
<b>Default Node ID (as delivered)</b>	<p>At delivery, the JXM-MUX has the default node ID <b>0x7F</b>.</p>

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**Object Directory**

All available objects are listed in the following illustration. For a detailed definition refer to the EDS file.



### 3 Configuration

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#### **PDO assignment and parameters**

PDO is short for Process Data Object. There is a permanently mapped PDO1\_TX (0x200 + Node ID) with the following parameters:

Byte 0	Configuration: Operating parameters (Index 4000, subindex 1)
Bit 0 ... 5	Reserved
Bit 6	Video output 1 = NTSC, 0 = PAL
Bit 7	JXM-MUX operating mode 1 = ON, 0 = OFF
Byte 1	Configuration: Camera (Index 4000, sub-index 2)
Bit 0	CAM1 Mirror
Bit 1	CAM2 Mirror
Bit 2	CAM3 Mirror
Bit 3	CAM4 Mirror
Bit 4 ... 7	Reserved
Byte 2	Configuration: Display mode (Index 4000, sub-index 3)
0	CAM1
1	CAM2
2	CAM3
3	CAM4
4	AUX
5	2-channel split CAM1/CAM2
6	3-channel split CAM1/CAM2/CAM3
7	4-channel split CAM1/CAM2/CAM3/CAM4
Byte 3	Video channel - Display assignment for 2-channel split screen mode (index 4000, sub-index 5)
	(only valid if not 0, and not 0xFF)
Bit 0, 1	Channel (0 ... 3) for left split screen half (default channel 0)
Bit 2, 3	Channel (0 ... 3) for right split screen half (default channel 1)
Byte 4	Video channel - Display assignment for 3-channel split screen mode (index 4000, sub-index 6)
	(only valid if not 0, and not 0xFF)
Bit 0, 1	Channel for left split screen third (default: channel 0)
Bit 2, 3	Channel for top right split screen third (default: channel 1)
Bit 4, 5	Channel for bottom right split screen third (default: channel 2)
Byte 5	Video channel - Display assignment for 4-channel split screen mode (index 4000, sub-index 7)
	(only valid if not 0, and not 0xFF)
Bit 0, 1	Channel for top left split screen quarter (default channel 0)
Bit 2, 3	Channel for top right split screen quarter (default channel 1)
Bit 4, 5	Channel for bottom left split screen quarter (default channel 2)

---

Bit 6, 7      Channel for bottom right split screen quarter (default channel 3)

---

**Important note!**

When assigning channels take into account that one channel cannot be split into several split screens.

---

**JetSym STX program  
Activating camera 1**

The following program is for connecting camera 1 to video output of the JXM-MUX module.

```
#Include "CanOpen.stxp"

Const
// CAN no. 0
    CAN_CONTROLLER_0 = 0;
// Node ID of JVM-407
    NodeID_JVM_407 = 0x0A;
// Node ID of JXM-MUX
    NodeID_JXM_MUX = 0x7F;
// Event time in ms
    Event_Time = 1000;
// Inhibit time in ms
    Inhibit_Time = 100;
End_Const;

Var
// Permanent PDO mapping of CAN data to JXM-MUX
    PDO1tx: Array [6] of Byte;
End_Var;

Task JXM_MUX_Control_Example_1 Autorun

Var
    SW_Version: String;
End_Var;

SW_Version := 'v4.3.0.2004';

// Initializing CAN 0 by JVM-407
CanOpenInit (CAN_CONTROLLER_0, NodeID_JVM_407, SW_Version);

// Transferring data via PDO to JXM-MUX

// Permanently assigning video output to camera 1
// Activating JXM-MUX
PDO1tx[0] := 0x80;
// No mirroring
PDO1tx[1] := 0;
// Assigning the video output to camera 1
PDO1tx[2] := 0;
```

### 3 Configuration

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```
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 0, CANOPEN_BYTE, 1, PDO1tx[0], Event_Time,
Inhibit_Time, CANOPEN_ASYNC_PDO | CANOPEN_NORTR);
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 1, CANOPEN_BYTE, 1, PDO1tx[1], Event_Time,
Inhibit_Time, CANOPEN_ASYNC_PDO | CANOPEN_NORTR);
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 2, CANOPEN_BYTE, 1, PDO1tx[2], Event_Time,
Inhibit_Time, CANOPEN_ASYNC_PDO | CANOPEN_NORTR);

// All nodes on the CAN bus are in PREOPERATIONAL state
// Setting all devices on the CAN bus to OPERATIONAL status
CanOpenSetCommand (CAN_CONTROLLER_0, CAN_CMD_NMT_Value
(CAN_CMD_NMT_ALLNODES, CAN_CMD_NMT), CAN_NMT_START);

// ...
// ...
// ...

End_Task;
```

#### JetSym STX program Selecting a 4-channel split screen

The following program is for selecting 4-channel split screen mode of the JXM-MUX module. The image of camera 4 is displayed in the top left quarter of the monitor. The image of camera 3 is displayed in the top right quarter of the monitor. The image of camera 2 is displayed in the bottom left quarter of the monitor. The image of camera 1 is displayed in the bottom right quarter of the monitor.

```
#Include "CanOpen.stxp"

Const
// CAN no. 0
CAN_CONTROLLER_0 = 0;
// Node ID of JVM-407
NodeID_JVM_407 = 0x0A;
// Node ID of JXM-MUX
NodeID_JXM_MUX = 0x7F;
// Event time in ms
Event_Time = 1000;
// Inhibit time in ms
Inhibit_Time = 100;
End_Const;

Var
// Permanent PDO mapping of CAN data to JXM-MUX
PDO1tx: Array [6] of Byte;
End_Var;

Task JXM_MUX_Control_Example_2 Autorun

Var
```

```
        SW_Version: String;
End_Var;

SW_Version := 'v4.3.0.2004';

// Initializing CAN 0 by JVM-407
CanOpenInit (CAN_CONTROLLER_0, NodeID_JVM_407, SW_Version);

// Setting display mode to 4-channel split
// Assigning channels: top left channel 3; top right channel 2
// Assigning channels: bottom left channel 1; bottom right channel
0
// Activating JXM-MUX
PDO1tx[0] := 0x80;
// No mirroring
PDO1tx[1] := 0;
// Setting video output to 4-channel split: CAM1/CAM2/CAM3/CAM4
PDO1tx[2] := 7;
// Video channel assignment in 2-channel split screen mode (default)
PDO1tx[3] := 0x04;
// Video channel assignment in 3-channel split screen mode (default)
PDO1tx[4] := 0x24;
// Video channel assignment in 4-channel split screen mode
PDO1tx[5] := 0x1B;

CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 0, CANOPEN_BYTE, 1, PDO1tx[0], Event_Time,
Inhibit_Time, CANOPEN_ASYNC PDO | CANOPEN_NORTR);
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 1, CANOPEN_BYTE, 1, PDO1tx[1], Event_Time,
Inhibit_Time, CANOPEN_ASYNC PDO | CANOPEN_NORTR);
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 2, CANOPEN_BYTE, 1, PDO1tx[2], Event_Time,
Inhibit_Time, CANOPEN_ASYNC PDO | CANOPEN_NORTR);
CanOpenAddPDOTx (CAN_CONTROLLER_0, CANOPEN_PDO1_TX
(NodeID_JXM_MUX), 5, CANOPEN_BYTE, 1, PDO1tx[5], Event_Time,
Inhibit_Time, CANOPEN_ASYNC PDO | CANOPEN_NORTR);

// All nodes on the CAN bus are in PREOPERATIONAL state
// Setting all devices on the CAN bus to OPERATIONAL status
CanOpenSetCommand (CAN_CONTROLLER_0, CAN_CMD_NMT_Value
(CAN_CMD_NMT_ALLNODES, CAN_CMD_NMT), CAN_NMT_START);

// ...
// ...
// ...

End_Task;
```

---

# Appendix

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**Introduction**

This appendix contains electrical and mechanical data, as well as operating data.

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# A: Technical specifications

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**Introduction**

This section of the appendix contains information on both electrical and mechanical data, as well as operating data of the module JXM-MUX.

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## Technical specifications

### Technical specifications - Electrical system: Power supply

Parameter	Description
Operating voltage	DC 10 V ... DC 32 V
Input current at DC 12 V (typically)	2,0 A max.
Input current at DC 24 V (typically)	1.0 A max.
Power consumption	24 W max.

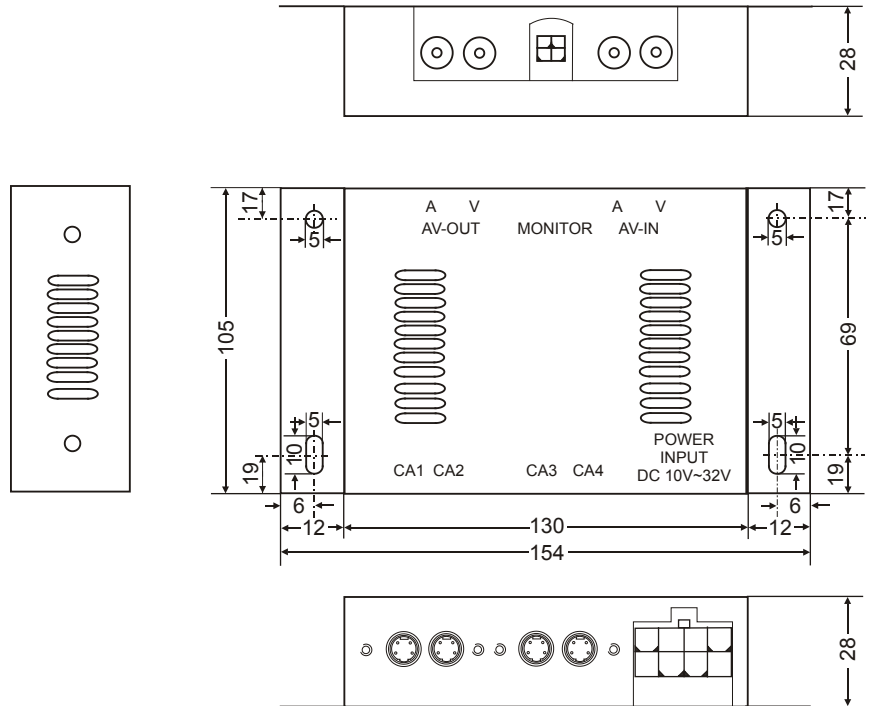
### Video system

Parameter	Description
Video system	NTSC, PAL standard signal
Synchronous system	integrated
Video inputs	5 channels (4 MiniDIN, 1 RCA/cinch), composite 1 Vp-p 75 Ohm
Audio inputs	5 channels (4 MiniDIN, 1 RCA/cinch) (not supported)
Video output	1 RCA/cinch composite 1 Vp-p 75 Ohm
Audio output	1 RCA/cinch 150 mV RMS, 47 kOhm (not supported)

## Physical dimensions

### Physical dimensions

The illustration below shows the physical dimensions of the JXM-MUX in millimeters.



### Mounting orientation

The video splitter JXM-MUX can be installed in vertical or horizontal position.

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## Operating parameters - Environment and mechanics

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### Environmental conditions

Parameter	Value	Standard
Operating temperature range	-10 ... +60 °C	
Storage temperature range	-25 ... +80 °C	

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### Mechanical parameters

Parameter	Value	Standard
Vibrations	3 G	
Degree of protection	IP20	DIN EN 60529
Place of Installation	Only indoors	
Mounting orientation	Vertical or horizontal	
Housing	Steel	
Weight	Approx. 0.5 kg	

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