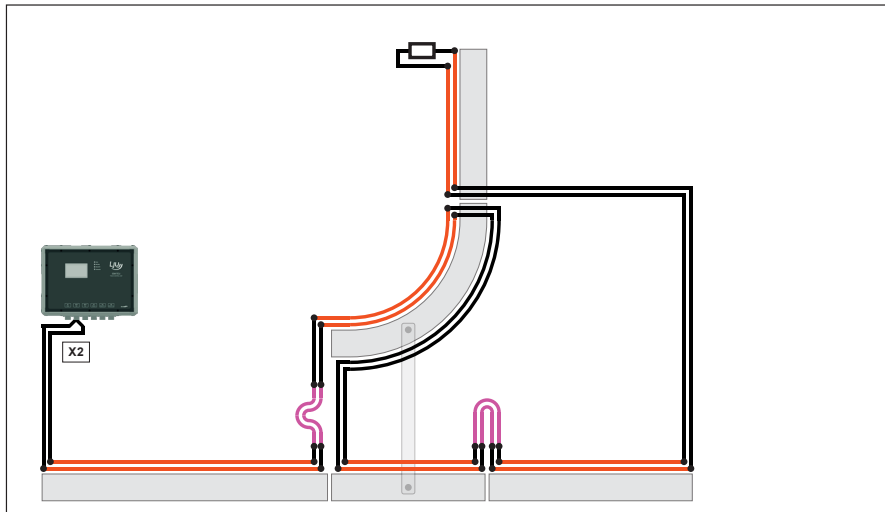


Specifications

Bus laying in rail bus plants
with iDM System



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1 Allgemein

1.1 Revision history

We reserve the right to make changes to the information present in this document, which result from our constant effort to improve our products.

Version	Date	Comment
4	03.2022	New documentation layout Trailing cables section amended Stubs prohibited New terminating resistor
5	01.2023	Chapter "Cable and connection specification" revised

1.2 Notes on this document

This description contains information/specifications for laying the data bus (data loops) in rail bus systems with iDM system.

It provides important information on how to lay the data bus!

Read this description carefully before you start the installation!

It is the only way to ensure trouble-free operation and to avoid errors, damage and injuries. You must also comply with the applicable accident prevention regulations for the area of use and the general safety regulations.

Anyone entrusted with work on the data bus must have read and understood this description before starting work. This even applies if the person has already worked with such a system or has undergone training by the manufacturer.

2 iDM system overview

The iDM system is an intelligent data management system for automatic vehicle and communication management in driver-less transport systems. The iDM system regulates, controls and manages all components and vehicles within the system under the directions of the higher-level system controller (PLC) or an independent soft PLC, in case of smaller systems.

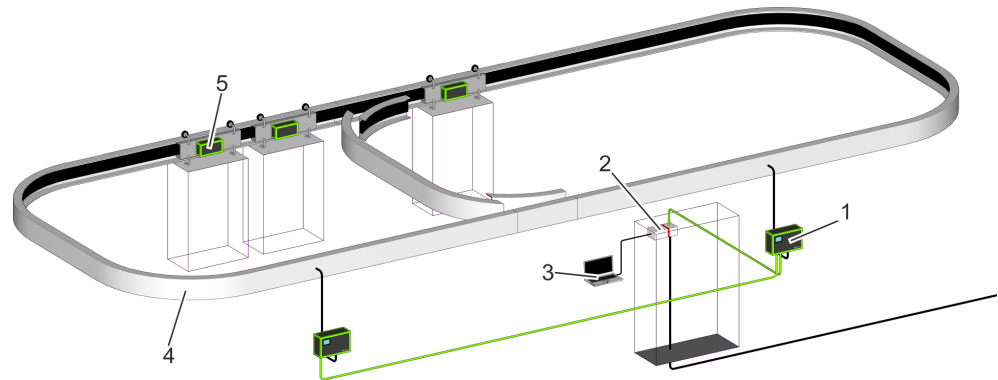


Fig. 1: iDM system overview

- 1 TCU - Track Control Unit
- 2 MCU - Master Control Unit
- 3 SyMa - System Manager
- 4 Driving route with installed data bus
- 5 Vehicle with vehicle control

TCU

Track Control Unit

Communication interface between the MCU and vehicle controls in a TCU area.

MCU

Master Control Unit

Central processing unit that regulates, controls and manages all components and vehicles within the installed iDM system. Interface between the system controller and the iDM system.

SyMa

System Manager

Configuration and simulation software to set up, test, and visualise the iDM system in real-time on-site, remotely or offline on a PC.

3 Rail bus installation

3.1 Introduction

In the iDM system, systems are split into several TCU areas (communication areas).

In each TCU area, a data bus (data loop) is laid out in parallel to the route over which the vehicles in this area communicate with the MCU.

In conductor line systems, the data bus is installed in conductor lines (bus-bars). This data bus is called a rail bus (SB). When laying the rail bus, two separate conductor lines (SB_A and SB_B) are required. (see Fig. 2)



Fig. 2: Separate conductor lines [5] and [6]

3.2 Cable and connection specification

Proper selection of cables is a prerequisite for smooth operation of systems. Only use cables that are intended for the respective system and function.

In principle, the cables used for connecting devices and components must meet the minimum technical requirements or the regulations of the respective country.

- Supply and connection cables in rail bus systems with iDM system
↳ Chapter 'Supply and connection cables' on page 7
- Trailing cables in rail bus systems with iDM system
↳ Chapter 'Trailing cables' on page 8

3.2.1 Supply and connection cables



NOTICE!

The use of incorrect cable types leads to system faults!

- Only use the cable type specified below!

Cable type

The supply or connection cable (fixed laying) must be of the following cable type:

Name	JE-LiYCY 2 x 2 x 0.5 BD
Manufacturer	Lapp
Manufacturer's item number	0034200
Conductix item number	3211556

Connection instructions

- Use the red and blue wires for the data bus!
SB_A = red
SB_B = blue
- Shielding of the supply and connection cables must **not** be connected to PE.

3.2.2 Trailing cables



NOTICE!

The use of incorrect cable types leads to system faults!

- Only use the cable type specified below!

Cable type

The trailing cable (e.g., in switches and levers) must be of the following cable type:

Name	UNITRONIC BUS PB FD P 1 x 2 x 0.64
Manufacturer	Lapp
Manufacturer's item number	2170222

Connection instructions

- As a **trailing cable**, **two cables** must be laid in parallel and wired as in Fig. 3.
- The shielding of the trailing cables must **not** be connected to PE.



Fig. 3: Assembled trailing cable

3.3 Laying guidelines



NOTICE!

Cable routing!

Branching structures in cable routing lead to mismatches and reflections and thus to interference during data transmission!

- To ensure proper functioning of the system, it is only permitted to route cables as a pure linear structure.
- Lateral branches (stubs) are not permitted.

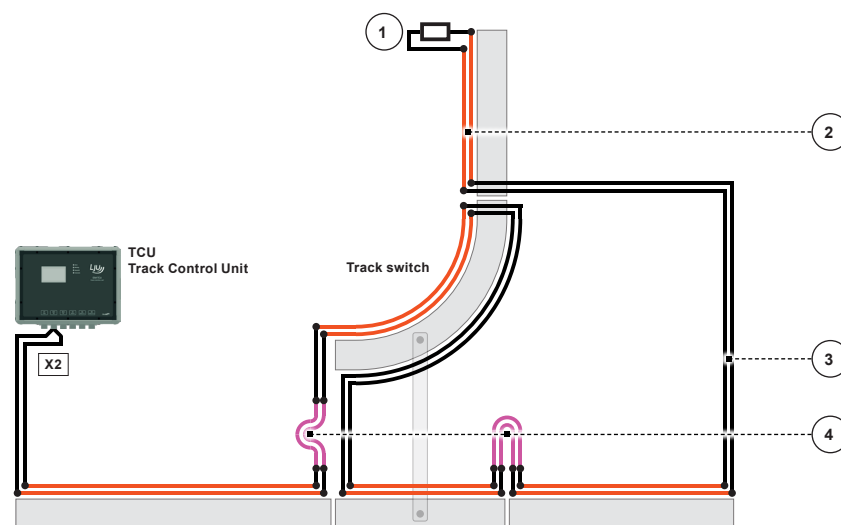


Fig. 4: Bus layout (schematic)

- 1 Data bus termination with terminating resistor
- 2 Conductor lines
- 3 Supply and connection cables
- 4 Trailing cables

Laying instructions:

- Lay the data bus according to the specifications in the plant layout. (☞ *Chapter 'Layout information' on page 10*)
- The maximum bus length of 200 m (including supply/connection and trailing cables) per TCU area must not be exceeded.
- The data bus must be terminated with an 82 Ω resistor (provided with the TCU). The terminating resistor is connected in series at the end of the data bus and must be fitted in a terminal box.

3.4 Layout information



Observe the following instructions!

- The bus layout illustrated in the system layout is a schematic representation and is to be regarded as a suggestion. The final solution is to be determined by the system engineer.
- Check compliance with the maximum bus lengths in the course of your electrical planning and before installation.
Bus lengths: Chapter 'Summary / technical information' on page 15

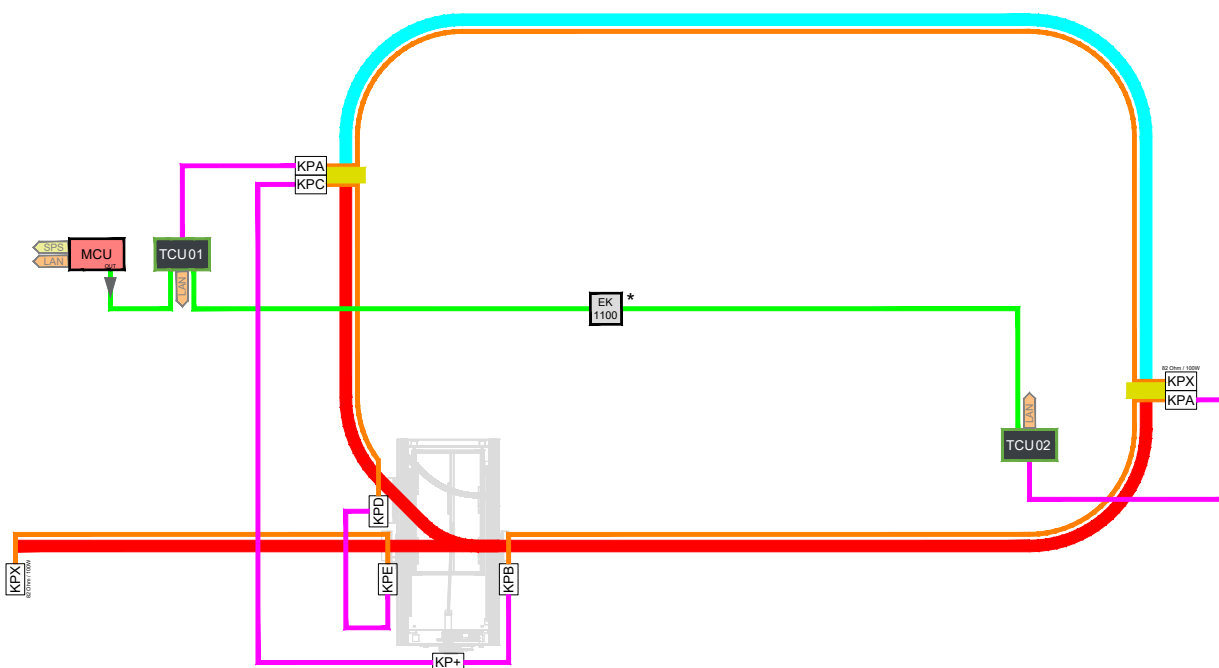


Fig. 5: Example, laying the data bus in the system layout

- EtherCAT connections
- Supply and connection cables
- Conductor lines
- * optional bus coupler

Layout information

- The planned laying of the rail bus can be found in the system layout, in the layer 'LJU_Bus laying'
- In the layout, terminal points are identified with 'KP' and a consecutive letter. Cables are to be laid out in ascending order according to the consecutive letters.

- On moving system components, such as switches, terminal points are identified with 'KP+.' From this point, trailing and connection cables must be used for connecting moving parts. (see also ↪ *Chapter 'Data bus layout in switches' on page 12*)
Subsequently, the laying of the data bus is continued at the terminal points in ascending order.
- The data bus must be terminated at the last terminal point – always indicated with 'KPX.' The size of the terminating resistor to be used is also specified here.

3.5 Data bus layout in switches

NOTICE!



Cable routing!

Branching structures in cable routing lead to mismatches and reflections and thus to interference during data transmission!

- To ensure proper functioning of the system, it is only permitted to route cables as a pure linear structure.
- Lateral branches (stubs) are not permitted.

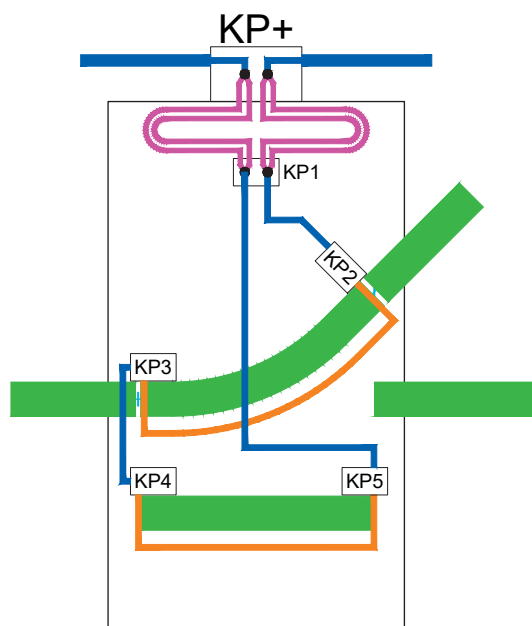


Fig. 6: Connection of switch cables

- Supply and connection cables
- Trailing cables
- Conductor lines
- KP Terminal point

Laying instructions:

- The data bus is laid out as a pure linear structure in switches.
- The cables of switches must be connected in accordance with the specifications in the project-related layout.

3.6 Conductor line sections at TCU area transitions

NOTICE!



At TCU area transitions, care must be taken to ensure that the separating sections are not bridged by the collectors for the data transmission, leading to a short circuit between the data buses of two TCU areas (as shown in Fig. 7).

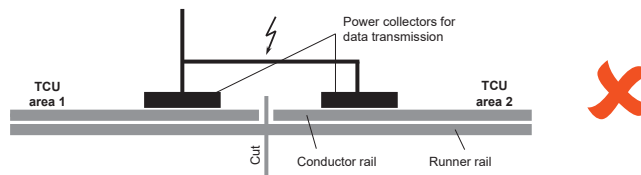


Fig. 7: Incorrect design of TCU area transition

Execution of sections

To exclude data bus short circuits, a communication-free area must be provided at each TCU area transition.

- To do this, create two separation sections (as shown in Fig. 8).
- Do not connect the intermediate area to the data communication system.

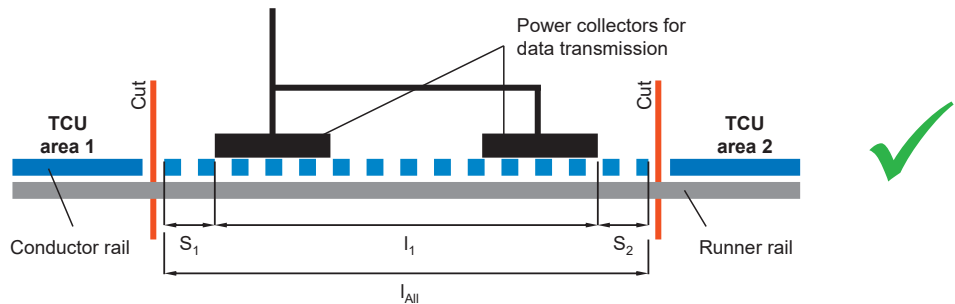


Fig. 8: Correct execution of TCU area transitions

- I_{Tot} communication-free area
- I_1 Total length of the current collector pair for data transmission
- S_1 Safety area 5 mm min. / 10 mm max.
- S_2 Safety area 5 mm min. / 10 mm max.

Calculation formula

$$I_{Tot} = I_1 + S_1 + S_2$$

If the communication-free area is $I_{Tot} < 200$ mm, this can be increased to $I_{Tot} = 200$ mm max.

4 Summary / technical information

TCU area

Number of TCU areas	70 max.
TCU area length	Max. 200 m
Number of vehicles per TCU area	TCU area without Safety Controller SCS: 30 max. (can be extended to 45 max.) TCU area with Safety Controller SCS: 15 max.
Couplings (transitions) to adjacent TCU areas	20 max.
Connections between TCU areas (transmission rate)	EtherCAT (100 Mbps)
Cable length between TCU – TCU (EtherCAT connection)	Max. 100 m ¹⁾

¹⁾ can be extended with optional hardware

Data bus

Type	Rail bus (SB)
Bus protocol / transmission rate	LJU bus / 500 kbit/s max. (configurable) ²⁾
Data bus length per TCU area ³⁾	Max. 200 m
Bus layout	in cable structure
Bus termination	82 Ω / 100 W

²⁾ max. transmission rate depends upon the vehicle control system series deployed

³⁾ including supply/connection and trailing cables

Cable types

Cable specification TCU – TCU (EtherCAT connection)	Network cable Cat.5 min. pursuant to DIN EN 50173-1
Cable specification Supply and connection cables	Type: JE-LiYCY 2 x 2 x 0.5 BD Manufacturer: Lapp Manufacturer's item number: 0034200 Conductix item number: 3211556
Cable specification Trailing cables ⁴⁾	Type: UNITRONIC BUS PB FD P 1 x 2 x 0.64 Manufacturer: Lapp Manufacturer's item number: 2170222

⁴⁾ As a **trailing cable**, there must be **two cables** laid out in parallel.

5 Customer service and addresses

Customer service

Our service team is available to provide technical information.

- **Conductix-Wampfler Automation - Service**

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Service forms

Service forms are available for download under www.conductix.com.

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