DIOLINE 20

Remote Input Output Modules (RIOM)

General information and technical overview

DIOLINE 20 – General information and technical overview

Index of contents

DIOLINE 20 – General information and technical overview

1 Introduction

1.1 Purpose

This document, DIOLINE 20 – *General information and technical overview*, serves as an overview for the DIOLINE 20 Remote I/O System of LÜTZE Transportation. The purpose of this document is to describe the technical characteristics of the system and to clarify the technical view on the products.

The intention of this document is not to be used as a user's manual, technical specification, or a system description. The usage, specification, and products of DIOLINE 20 are subject of additional documents.

1.2 Intended Audience

The intended audience of this document is people who need a brief overview of the DIOLINE 20 RIOM system concerning the scope of delivery and functionality for possible tenders or projects: Product Management, Project Management, System Engineering and Supply Management.

1.3 Company Introduction

LÜTZE Transportation GmbH
Bruckwiesenstr. 17-19
71384 Weinstadt

Contact persons:

Name:	Andre Kengerter
Function:	Managing Director
Name:	Dimitrios Koutrouvis
Function:	Product manager Train Control Systems
Name:	Franck Grünenwald
Function:	Key Account Manager Southern Europe

1.4 Sales Regions:

With our own companies throughout Europe, the USA and China, we are positioned to service the European, Asian and North American Markets. Our international distribution partners worldwide complement our efforts and provide global product availability and service to our customers.

Germany & Austria
Peter Bartl / bartl-industrievertretung

China
Frank Dong / Luetze Trading (Shanghai) Co. Ltd.

France
Armand Patte / LÜTZE SAS

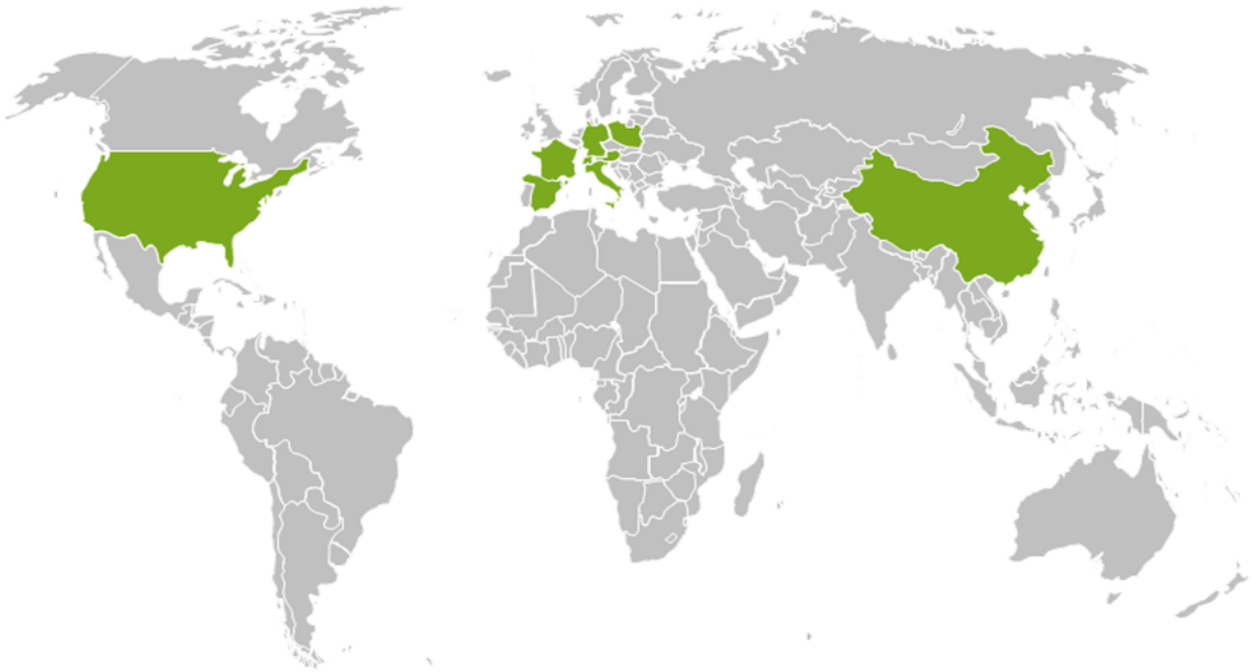
Italy
Walter Merlini / Connex Italiana Srl

Poland
Krzysztof Zieliński / OEM Automatic

Spain
Sergio Valderrama / CONECTORES Y CABLES VAHER S.L.

Switzerland
Peter Burger / Lütze AG

United States
Asa Briggs / ITP Rail Associates

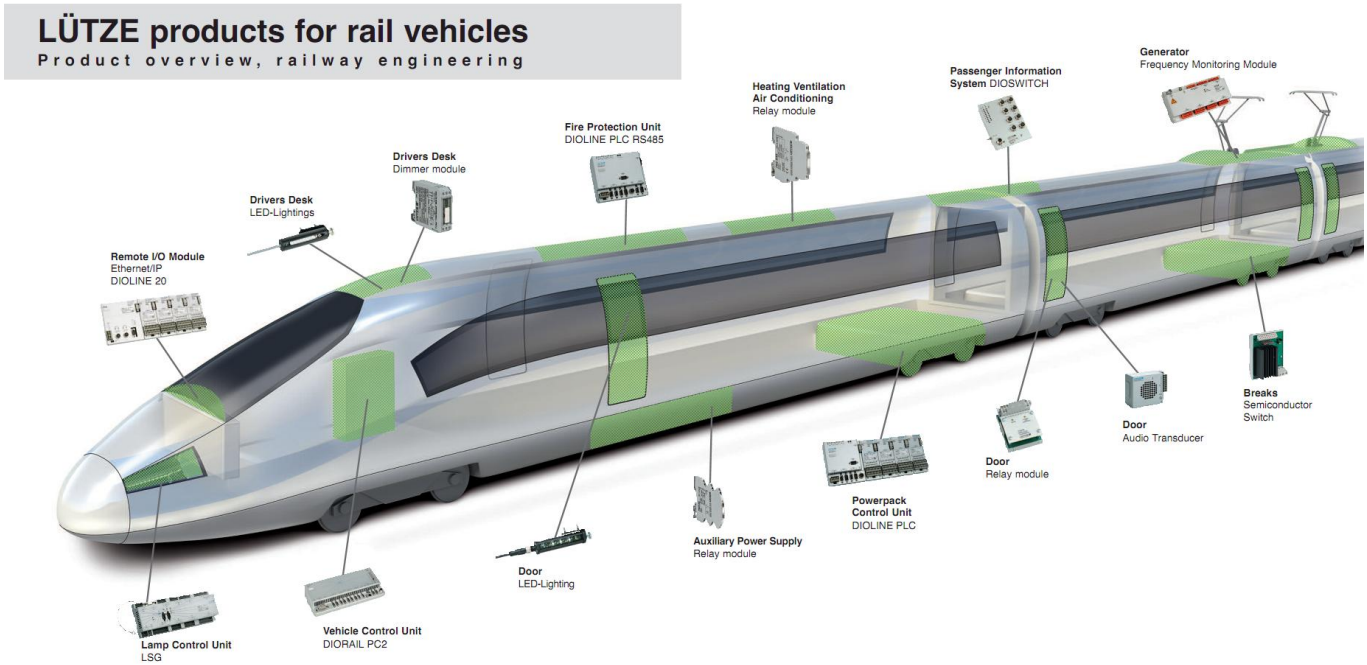


1.5 Product overview LÜTZE Transportation

The LÜTZE product portfolio contains high quality hi-tech control and electronics modules, tried-and-trusted interface components and a comprehensive range of visual and acoustic signal encoders.

Train Control Technology	Interface Technology	Indication Technology
		
Vehicle Control Units Compact Control Units Remote I/O Modules Ethernet Switches	Diode and Resistor Modules Function Relays Semiconductor Switches Power Supplies	Audio Transducers LED Indicator Boards Vehicle Lighting Control Units Dimmer Modules

Numerous locomotives, railcars, and control cars around the world are able to operate safely thanks to LÜTZE know-how.



Temperature variations, vibrations, shock and strong electrical fields are just some of the extremes affecting the electronic assemblies in rail vehicles - continually, over decades. Therefore LÜTZE's rail components are particularly long-lasting and reliable. The development of such assemblies demands comprehensive knowledge of the conditions of use and, in particular, a great deal of experience in the use of electronics on rolling stock. For over two decades LÜTZE has developed and delivered products for this extremely challenging field.

2 Standards

Standard	Description	
EN 50155	Railway applications	Electronic equipment used on rolling Stock
EN 50121-3-2	Railway applications	Electromagnetic compatibility, Part 3-2: Rolling stock apparatus
EN 61373	Railway applications	Rolling stock equipment. Shock and vibration tests
EN50124-1	Railway applications	Insulation coordination, Part 1
EN50126	Railway applications	The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS)
N FF 16-101	Railway rolling stock	Fire behaviour, Material choosing – application for electrical system

3 Acronyms / Abbrevations

Acronym	Full meaning
DL	Dioline – the brand name of this RIOM series
LB	L-Bus – an internal communication bus for data transfer between the Bus Coupler ant the I/O blocks
DI	Digital Input
DO	Digital Output
RO	Relay Output
DIO	Digital Input and Output
AI	Analog Input
AO	Analog Output
AIO	Analog Input and Output
CO	CANopen
MVB	Multi-Vehicle-Bus
RED	Redundancy
BC	Bus Coupler

4 DIOLINE 20 - System Description

4.1 Overview of Subcomponents of DIOLINE 20

Bus Couplers	Digital Inputs	Digital Outputs
BC CANopen (DS401)	DI 16 channels 24V	DO 16 channels 24V/2A
BC MVB (EMD)	DI 16 channels 72V	DO 8 channels 24V/2A with additional diagnostic
BC Ethernet/IP (CIP)	DI 16 channels 110V	DO 6 channels 24V...110V
		RO 6 channels 24...150V

Mixed Inputs / Outputs	Analog Inputs	Analog Outputs
DI 8 channel 24V / DO 8 channels 24V/2A	AI 4 channels 0...10V	AO 4 channels 0...10V
AI2/AO2 all ranges configurable	AI 4 channels 0...20mA	AO 4 channels 4...20mA
	AI 4 channels PT100	
	AI 4 channels PT1000	

4.2 List of DIOLINE 20 products

part-no.	description	function
746409	DL-CO-L LUETZE	CANopen Bus coupler, DC 24V power supply
746416	DL-MVB-L LUETZE	MVB Bus coupler, DC 24V power supply
746423	DL-EN/IP-L LUETZE	Ethernet/IP Bus coupler, DC24V power supply
746400	DL-LB-DI-2X8-24V	16 digital inputs DC 24V, 2 potentials
746417	DL-LB-DI-4X4-24V	16 digital inputs DC 24V, 4 potentials
746408	DL-LB-DI-2X8-72V	16 digital inputs DC 72V, 2 potentials
746425	DL-LB-DI-4X4-72V	16 digital inputs DC 72V, 4 potentials
746413	DL-LB-DI-2X8-110V	16 digital inputs DC 110V, 2 potentials
746402	DL-LB-DIO-8/8-24V/2A	8/8 digital in-/outputs DC 24V, 2A, 2 potentials
746401	DL-LB-DO-16-24V/2A	16 digital outputs DC 24V, 2A, 2 potentials
746412	DL-LB-DO-2X8-24V/2A-R	16 digital outputs DC 24V, 2A, 2 potentials, 8 series diodes for redundant operation
746419	DL-LB-DO-4X2-24V/4A-D	8 digital outputs DC 24V, 2A, 4 potentials, diagnostic
746420	DL-LB-DO-4X2-24V/4A-DR	8 digital outputs DC 24V, 2A, 4 potentials, 8 series diodes for redundant operation
746414	DL-LB-DO-6-110V/0,6A-DR	6 digital Outputs DC24V...110V, 0,6A, diagnostic 6 series diodes for redundant operation
746424	DL-LB-DO-6-110V/2A-D	6 digital Outputs DC24V...110V, 2A, diagnostic
746415	DL-LB-RO-6-150V/0,4A	6 relay outputs, change over
746403	DL-LB-AI-4-U-12	4 analog inputs 0-10V
746404	DL-LB-AI-4-I-12	4 analog inputs 0-20mA
746421	DL-LB-AI-4-I-12	4 analog inputs 0-24mA
746410	DL-LB-AI-4-PT100	4 analog inputs PT100
746411	DL-LB-AI-4-PT1000	4 analog inputs PT1000
746405	DL-LB-AO-4-U-12	4 analog outputs 0-10V
746406	DL-LB-AO-4-I-12	4 analog outputs 4-20mA
746422	DL-LB-AO-4-I-12	4 analog outputs 0-20mA
746407	DL-LB-AIO-2/2-U/I/PT	2/2 analog in/outputs, configurable Voltage / Current / Temperature + Voltage & Current Source
746418	DL-LB-DI-8-SPACER	spacer module
746430	DL-LB-DI-2X8-24V RED	16 redundant digital inputs DC 24V, 2 potentials
746431	DL-LB-DI-4X4-24V RED	16 redundant digital inputs DC 24V, 4 potentials
746435	DL-LB-DI-4X4-72V RED	16 redundant digital inputs DC 72V, 4 potentials
746433	DL-LB-DIO-8/8-24V/2A RED	8/8 redundant digital in-/outputs DC 24V, 2A, 2 potentials
746432	DL-LB-DO-2X8-24V/2A RED	16 redundant digital outputs DC 24V, 2A, 2 potentials
746434	DL-LB-DO-4X2-24V/2A-D RED	8 redundant digital outputs DC 24V, 2A, 4 potentials, diagnostic
746436	DL-LB-DO-3X2-110V/2A-D RED	6 redundant digital outputs DC 24V...110V, 2A, diagnostic

4.3 Introduction of DIOLINE 20

DIOLINE 20 is a **decentral input** and **output** system designed for railway vehicles. The basic idea of the product philosophy of the LÜTZE Remote I/O system, is in the following 3 points:

- Modularity
- Flat Design of housing
- DIN-Rail-Mounting

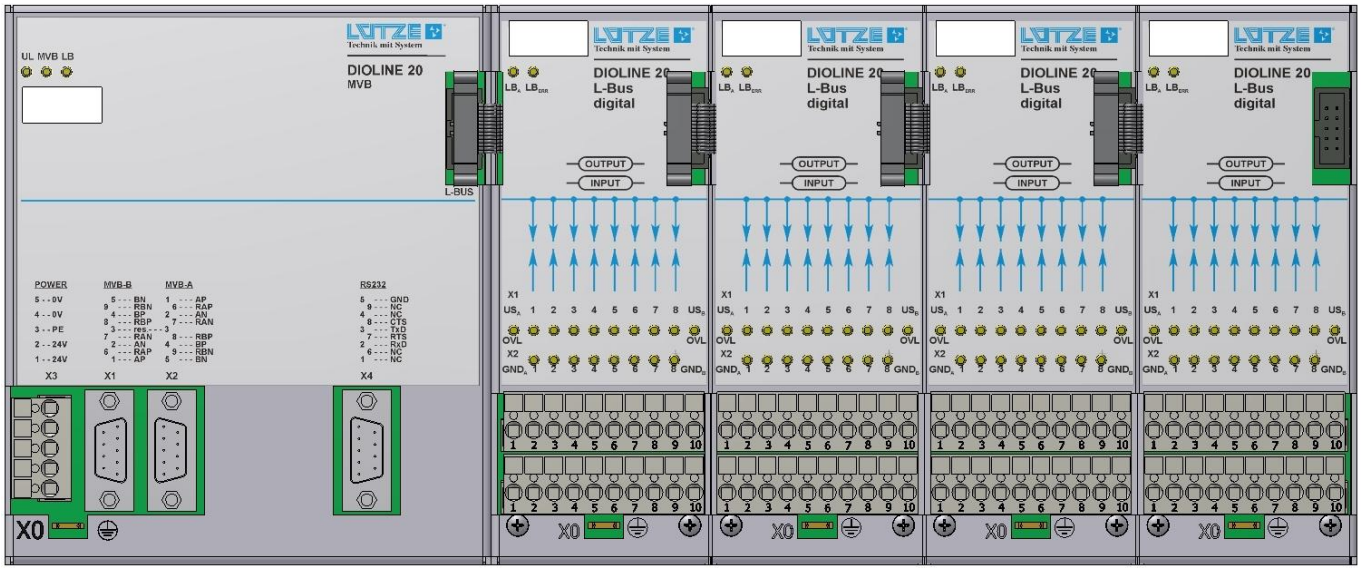
Basic benefits:

- the system allows cost-effective engineering by installing only the blocks which are required.
- the RIOM has low life cycle costs as there can only be replaced a single I/O block if necessary
- the system is flexible to modifications and subsequent extensions
- there is a nearly infinite number of variations in I/O configuration
- the user can switch over quickly to an alternative field bus interface by changing only the bus coupler

4.3.1 System Architecture

The smallest possible I/O station includes a bus coupler with an integrated DC24V power supply and an I/O module. It is possible to add up to 10 I/O modules to one I/O station. The modules are connected over the internal bus (L-Bus).

The I/O modules can be combined randomly. The maximum energy requirement depends on the number and type of the used I/O modules. To set up a totally galvanic isolated I/O station, it is needed to connect the power supply in front of the bus coupler.



4.3.2 Connectors

- Cage clamp spring-type terminals for power supply of bus coupler
- Cage clamp spring-type terminals for signals of I/O blocks
- SUB-D female connector, 9-pin with fastening bolt UNC4/40 for TCMS Interface
- SUB-D male connector, 9-pin with fastening bolt UNC4/40 for Service Interface

4.3.3 Grounding and Shielding

- 6.3mm faston connector at the bus coupler and the I/O blocks
- Screw M4 at the power supply

4.3.4 Switch-On performance

- From battery switch-on to system operation: 5s

4.3.5 End-to-End performance

- Between Fieldbus frame reception up to activation of outputs: 10ms
- Between change of an input to production of Fieldbus frame: 10ms

4.3.6 Environmental Characteristics

- Operating Temperature: -40°C to +70°C (+85°C for 10 min) corresponds to EN 50155 category Tx
- Storage Temperature: -40°C to +85°C

4.3.7 Protection Degree

- IP20

4.3.8 RAMS / LCC

- The hardware is free of maintenance during its life cycle.
- MTTR is 20 minutes in case of failure.

4.3.9 Reliability

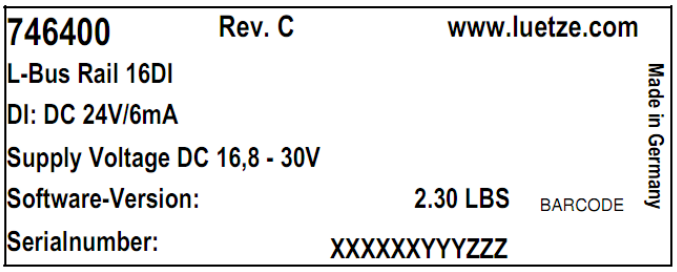
The following values have been calculated with the software tool EXAR Version 10.0 in conformance to DIN EN / IEC 61709 and SN 29500 (Continuous operation 8760 h per year).

part-no.	description	failure rate in fit			MTBF in hours		
		+70°C	+40°C	-40°C	+70°C	+40°C	-40°C
746400	DL-LB-DI-2X8-24V	2783	760	269	359 307	1 316 508	3 720 875
746401	DL-LB-DO-16-24V/2A	5046	1354	336	198 168	738 708	2 980 013
746402	DL-LB-DIO-8/8-24V/2A	4059	1091	311	246 343	916 259	3 214 555
746403	DL-LB-AI-4-U-12	2325	1409	1173	430 021	709 822	852 793
746404	DL-LB-AI-4-I-12	2346	1429	1193	426 310	699 769	838 323
746405	DL-LB-AO-4-U-12	3563	2469	2184	280 647	404 944	457 900
746406	DL-LB-AO-4-I-12	3565	2471	2185	280 502	404 773	457 766
746407	DL-LB-AIO-2/2-U/I/PT	6928	3720	2815	144 342	268 821	355 284
746408	DL-LB-DI-2X8-72V	3194	873	323	313 098	1 146 073	3 097 874
746409	DL-CO-L LUETZE	3033	1672	1354	329 686	598 130	738 600
746410	DL-LB-AI-4-PT100	2439	1440	1187	410 058	694 308	842 276
746411	DL-LB-AI-4-PT1000	2439	1440	1187	410 058	694 308	842 276
746412	DL-LB-DO-2X8-24V/2A-R	5261	1432	341	190 076	698 268	2 935 573
746413	DL-LB-DI-2X8-110V	3177	856	306	314 770	1 168 791	3 269 662
746414	DL-LB-DO-6-110V/0,6A-DR	5348	1551	400	186 989	644 868	2 498 295
746415	DL-LB-RO-6-150V/0,4A	2145	915	557	466 172	1 092 962	1 795 864
746416	DL-MVB-L LUETZE	5198	2238	1507	192 368	446 811	663 614
746417	DL-LB-DI-4X4-24V	2783	760	269	359 307	1 316 508	3 720 875
746418	DL-LB-DI-8-SPACER	932	273	108	1 073 017	3 664 010	9 298 001
746419	DL-LB-DO-4X2-24V/4A-D	4712	1270	379	212 233	787 206	2 641 178
746420	DL-LB-DO-4X2-24V/4A-DR	4927	1349	384	202 968	741 315	2 604 580
746421	DL-LB-AI-4-I-12	2346	1429	1193	426 278	699 681	838 197
746422	DL-LB-AO-4-I-12	3565	2470	2184	280 538	404 815	457 799
746423	DL-EN/IP-L LUETZE	3886	1860	1413	257 303	537 733	707 504
746424	DL-LB-DO-6-110V/2A-D	5342	1569	429	187 186	637 468	2 332 530
746425	DL-LB-DI-4X4-72V	3194	873	323	313 098	1 146 073	3 097 874

4.3.10 Identification

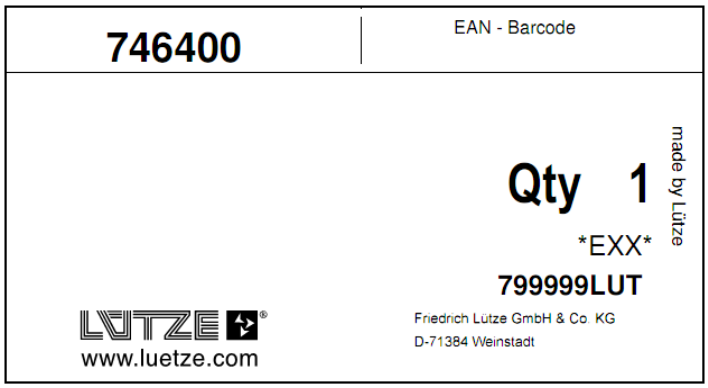
Every device has a label with following information on:

- Version number (HW and SW Version)
- Reference Number
- vendor name
- Device description
- Serial number
- Data-Matrix-Code



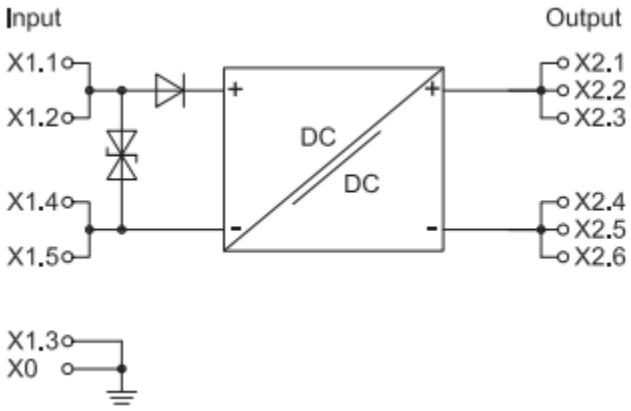
Every box has a label with following data on:

- Part Number
- vendor name
- Device description
- Quantity



4.4 Technical Details of Subcomponents of DIOLINE 20

4.4.1 Power Supply

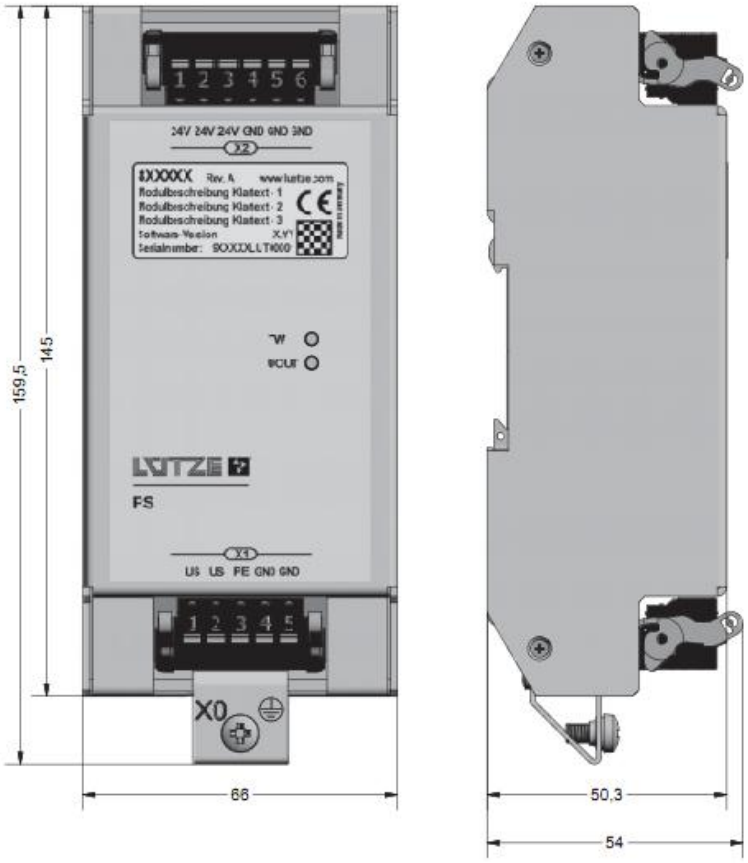


- DC/DC converter NG-6391
- reference number: 716391

- input voltage DC 110V
  (voltage range: DC 77V ... 154V)
- output voltage: DC 24V (± 5 %)
- output current continuous 1,5A@24V (36W)

- short circuit and overload protection
- internal over-temperature protection with automatic restart
- electrical isolation of DC 1500V between input and output voltage

- dimensions (w × h × d): 66mm × 160mm × 54mm
- weight: 420g



4.4.2 Bus Coupler

4.4.2.1 Bus Coupler MVB

- Gateway between MVB (Slave) and L-Bus
- reference number: 746416
- power supply: DC 24V
- max. current on L-Bus: 1A
- 10 I/O-modules can be connected
- operating temperature: -40°C to +70°C
- dimensions (w × h × d): 123mm × 142mm × 48mm
- weight: 420g

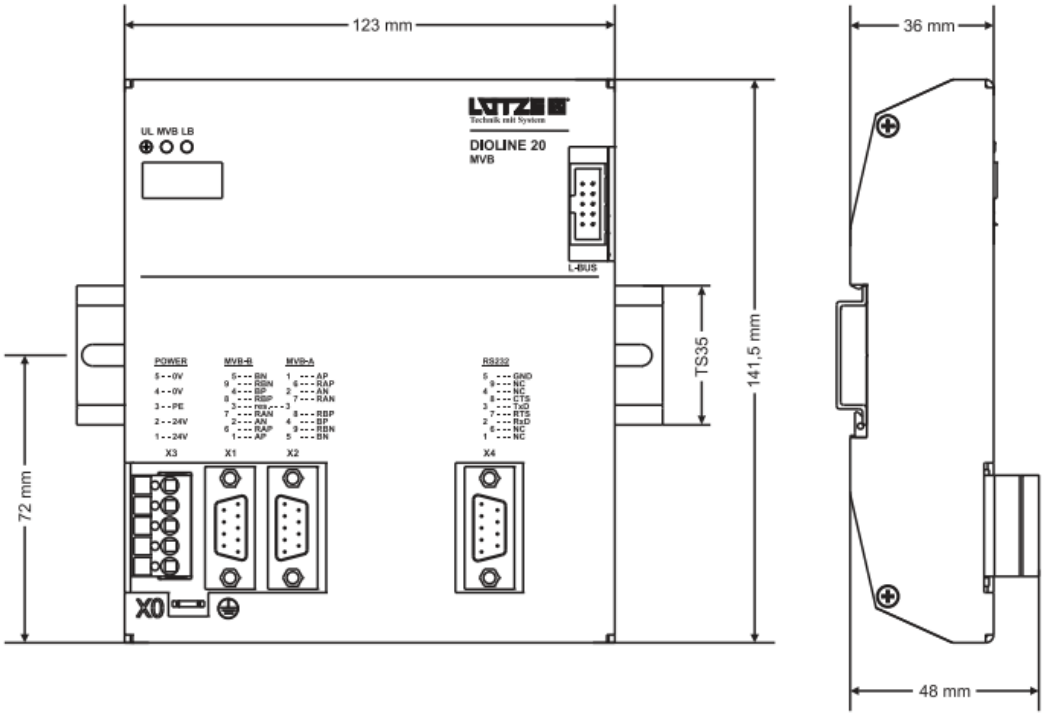
4.4.2.2 TCMS Interface

420200

- physical interface: MVB EMD
- MVB Class 1.3
- Configuration via local download cfg-file

4.4.2.3 Service Interface

- D-SUB9 male connector
- RS232 (galvanic isolation to microcontroller)
- diagnostic monitor via terminal (e.g. hyper-terminal)
- interface to Lütze Slave Configuration Software available

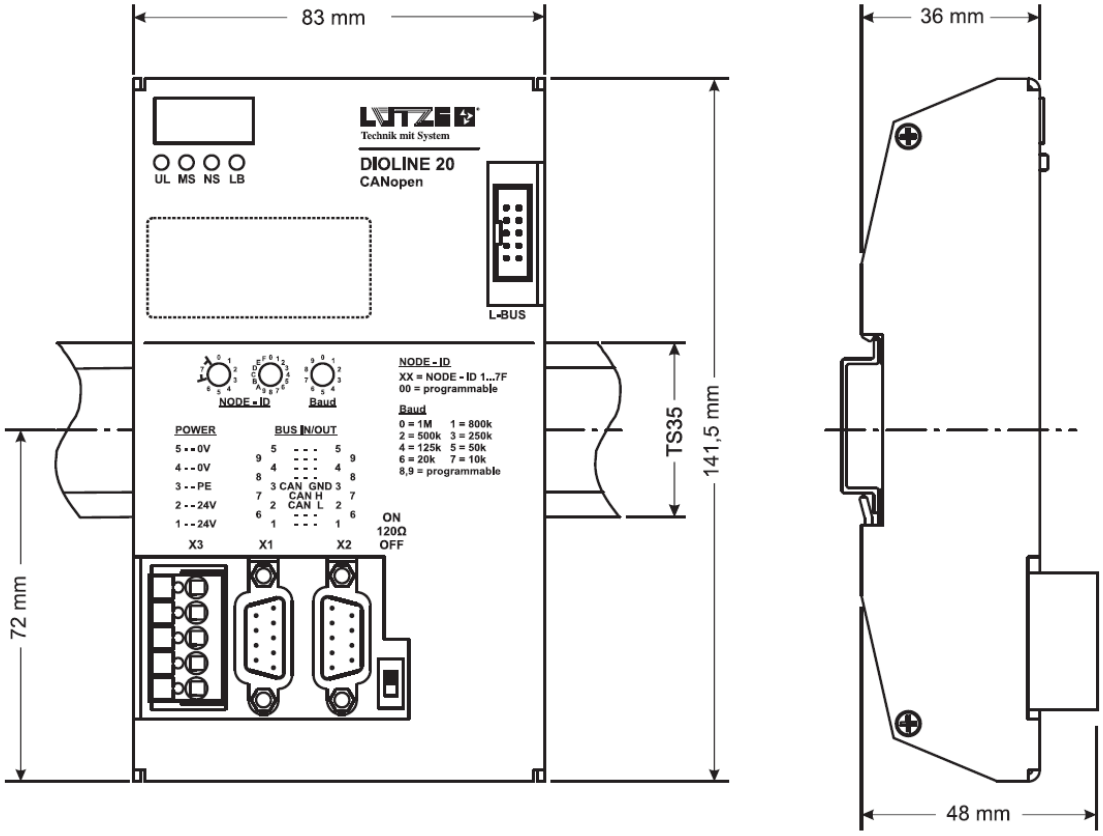


4.4.2.4 Bus Coupler CANopen

- Gateway between CANopen (Slave) and L-Bus
- reference number: 746409
- power supply: DC 24V
- max. current on L-Bus: 1A
- 10 I/O-modules can be connected
- operating temperature: -40°C to +70°C
- dimensions (w × h × d): 83mm × 142mm × 48mm
- weight: 260g

4.4.2.5 TCMS Interface

- CANopen Slave
- DS 301 and DS 401
- Configuration via network download (SDO)
- Setting of baud rate and node id via rotary switch



4.4.2.6 Bus Coupler Ethernet/IP (CIP)

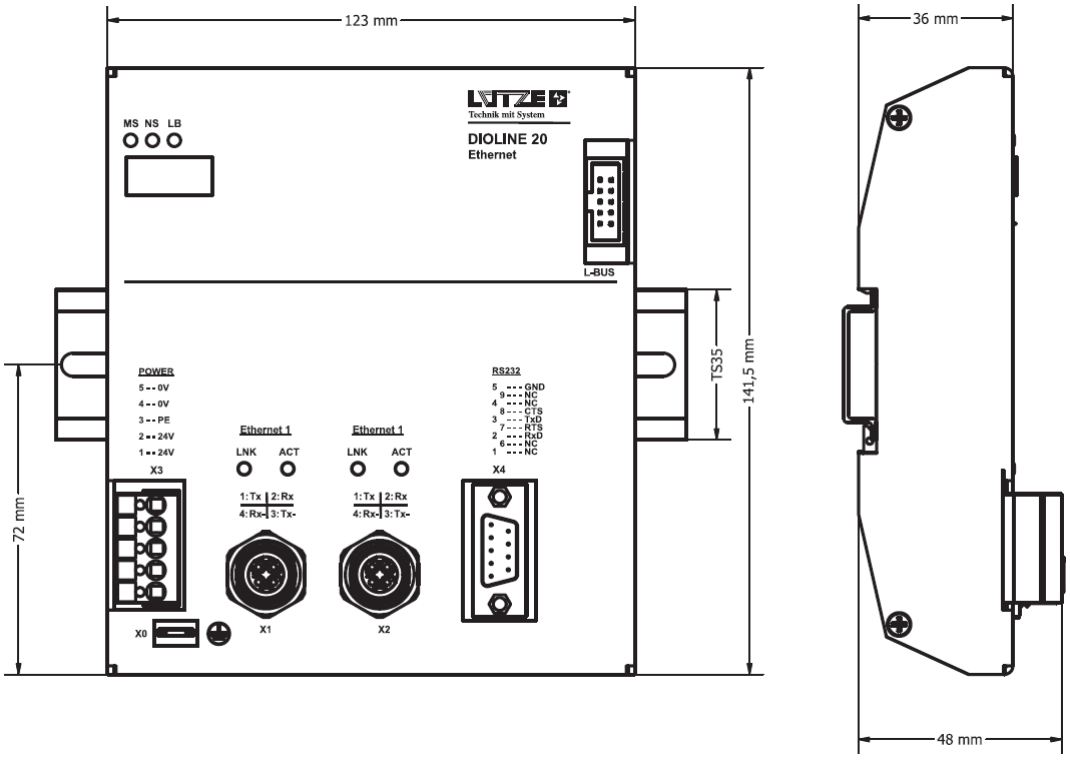
- Gateway between CIP (Ethernet/IP Adapter) and L-Bus
- reference number: 746423
- power supply: DC 24V
- max. current on L-Bus: 1A
- 10 I/O-modules can be connected
- operating temperature: -40°C to +70°C
- dimensions (w × h × d): 123mm × 142mm × 48mm
- weight: 430g

4.4.2.7 TCMS Interface

- physical interface: Ethernet according to IEEE 802.3 10/100 Base Tx
- network configuration via local service interface
- IP addressing methods:
  - static: via the network configuration (IP-address)
  - dynamic: DHCP / BOOTP

4.4.2.8 Service Interface

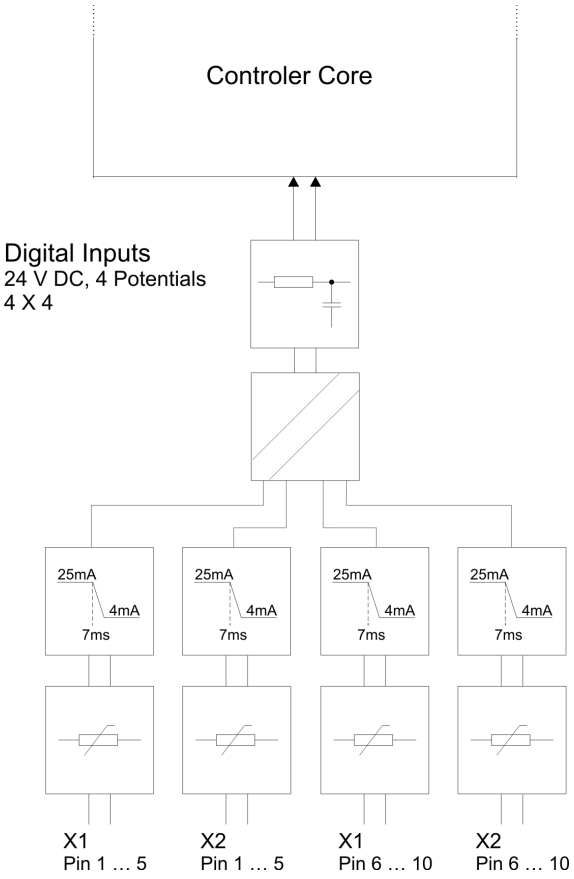
- D-SUB9 male connector
- RS232 (galvanic isolation to microcontroller)
- diagnostic monitor via terminal (e.g. hyper-terminal)
- interface to Lütze Slave Configuration Software available



4.4.3 Digital Modules

4.4.3.1 Digital Input Module 24V

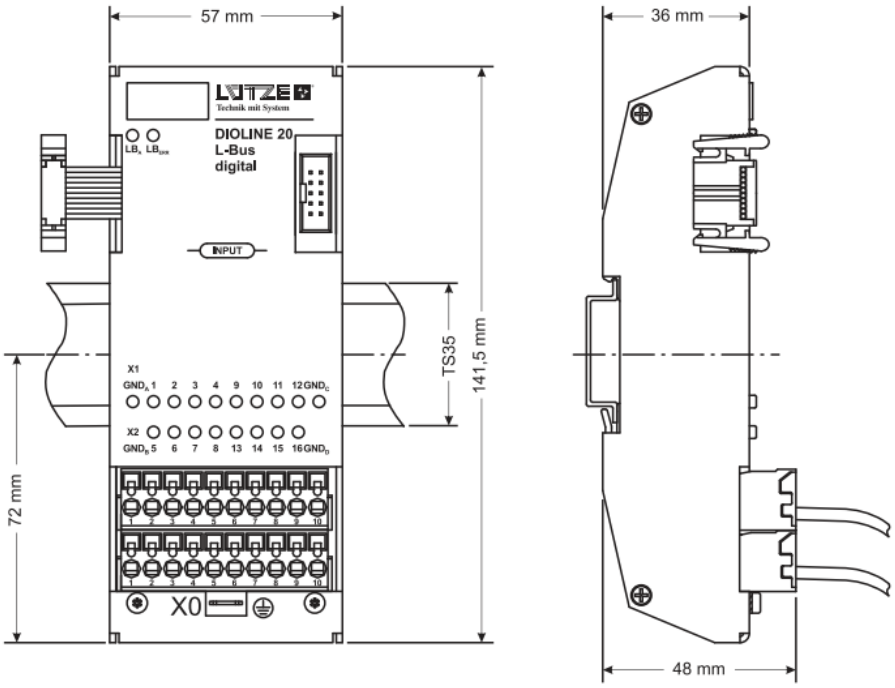
- 16 digital input channels 24V
- reference number:
  - 746400 (2 potential groups)
  - 746417 (4 potential groups)



- electrical isolation
  AC 1,5 kV between inputs and L-Bus controller
  AC 1,5 kV between potential groups

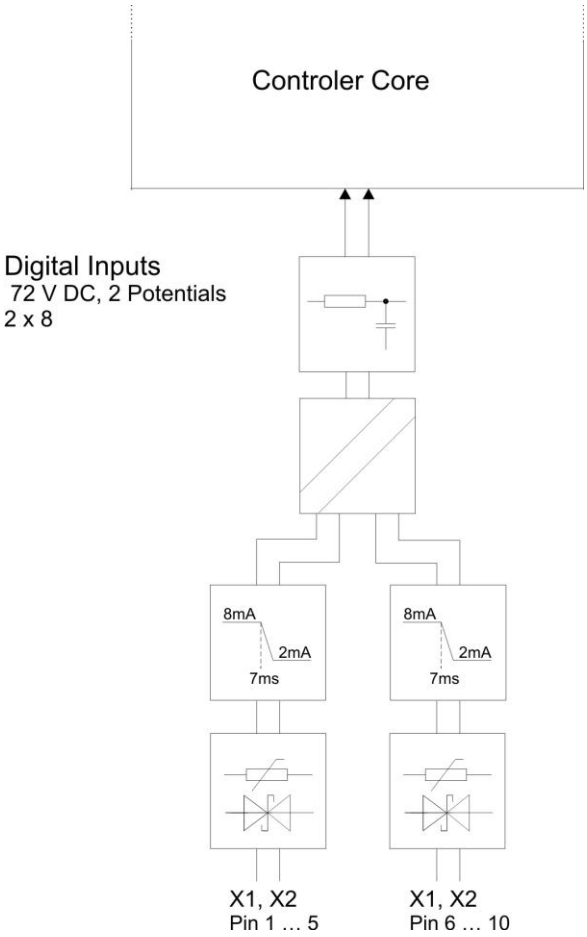
- Input voltage: 0: DC 0 … 6 V
  1: DC 12,5 … 30 V
- Input current: 0: 0 mA
  1: 25 mA for 7 ms then 4 mA
  (contact fritting)

- max. Input current: 50 mA@30 V and 2 mA@16,8V
- inverse polarity protection
- bipolar diode-suppressor for surge protection
- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 200g



4.4.3.2 Digital Input Module 72V

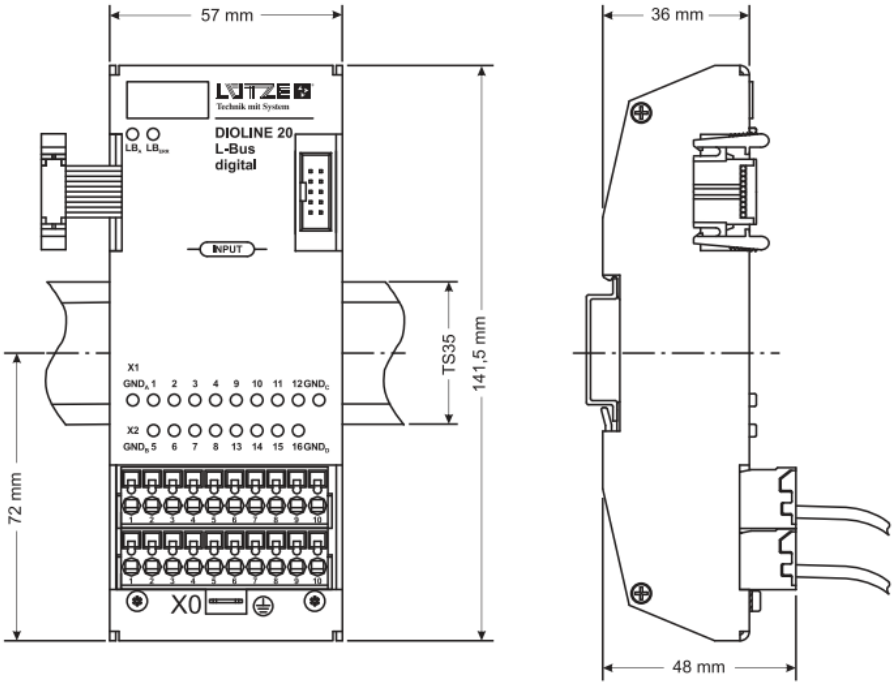
- 16 digital input channels 72V
- reference number:
  - 746408 (2 potential groups)
  - 746425 (4 potential groups)



- electrical isolation
  AC 1,5 kV between inputs and L-Bus controller
  AC 1,5 kV between potential groups

- Input voltage: 0: DC 0 … 18 V
  1: DC 36 … 90 V
- Input current: 0: 0 mA
  1: 8 mA for 7 ms then 2 mA
  (contact fritting)

- max. Input current: 15 mA@90 V and 1 mA@50,4V
- inverse polarity protection
- bipolar diode-suppressor for surge protection
- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 200g



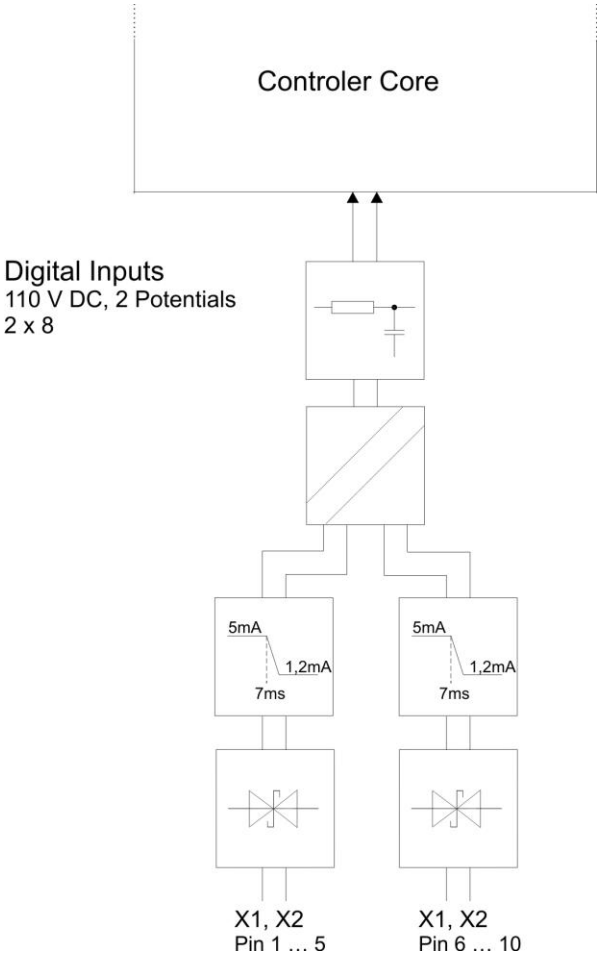
4.4.3.3 Digital Input Module 110V

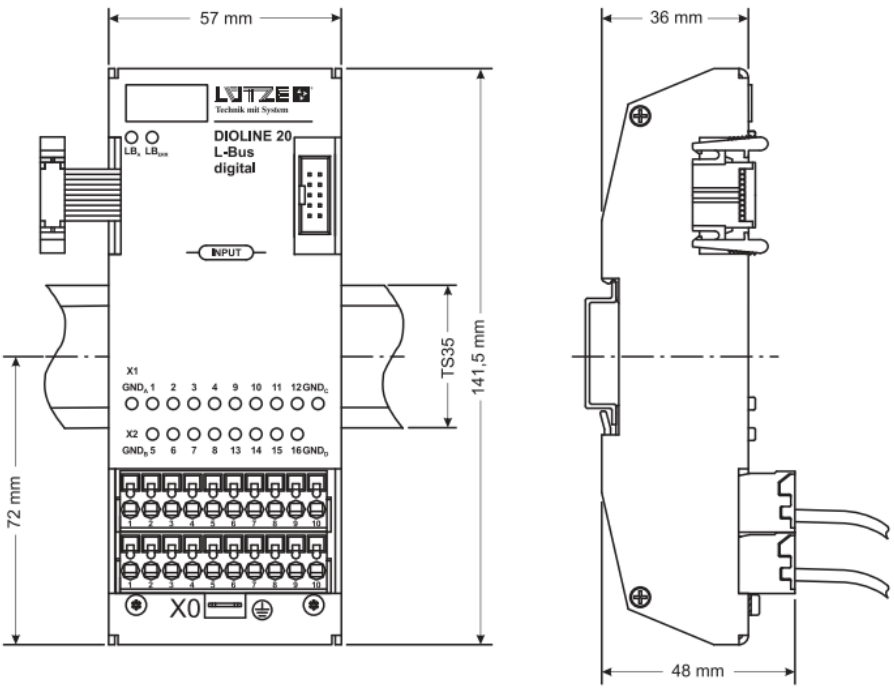
- 16 digital input channels 110V
- reference number: 746413

- electrical isolation of 2 potential groups
  AC 1,5 kV between inputs and L-Bus controller
  AC 1,5 kV between Potential A and Potential B

- Input voltage: 0: DC 0 … 27,5 V
  1: DC 55 … 137,5 V
- Input current: 0: 0 mA
  1: 5 mA for 7 ms then 1,2 mA
  (contact fritting)

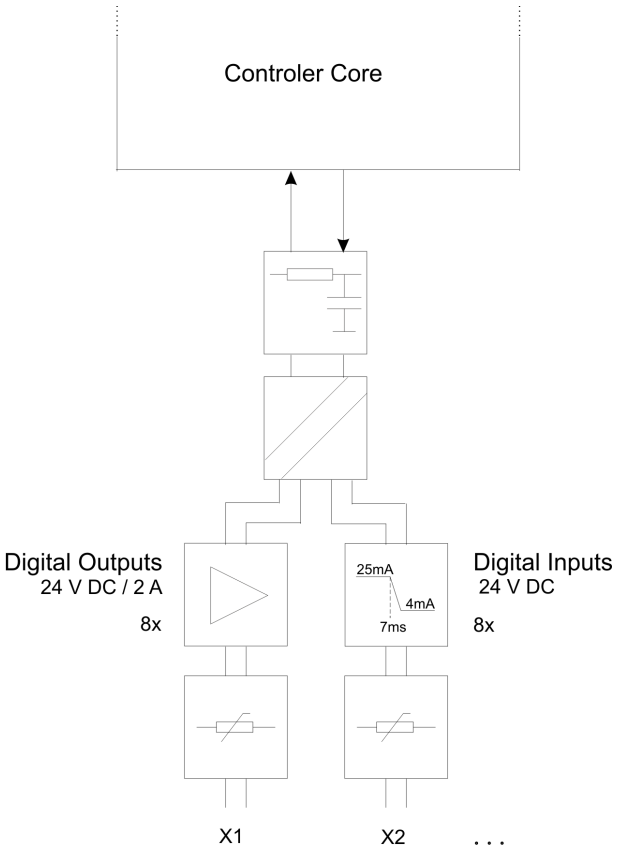
- max. Input current: 9 mA@137,5 V and 0,7 mA@77V
- inverse polarity protection
- bipolar diode-suppressor for surge protection
- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 200g





4.4.3.4 Digital Input / Output Module 24V

- 8 digital input channels 24V (2 potentials)
- 8 digital output channels 24V (2 potentials)
- reference number: 746402
- output type: MOSFET
- rated output voltage: 24V (16,8 ... 30V)
- output current: 2A (Leakage current: 2µA)



- Input voltage: 0: DC 0 … 6 V
  1: DC 12,5 … 30 V
- Input current: 0: 0 mA
  1: 25 mA for 7 ms then 4 mA
  (contact fritting)

- electrical isolation of 2 potential groups
  AC 1,5 kV between inputs/outputs and L-Bus controller
  AC 1,5 kV between Potential A and Potential B

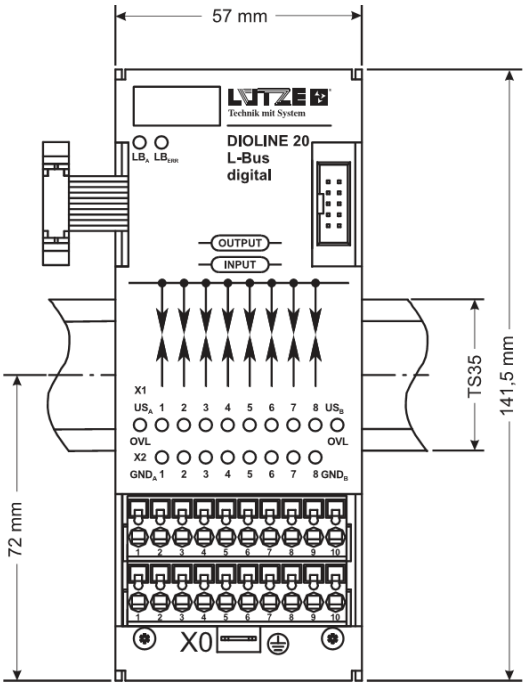
- max. Input current: 50 mA@30 V and 2 mA@16,8V

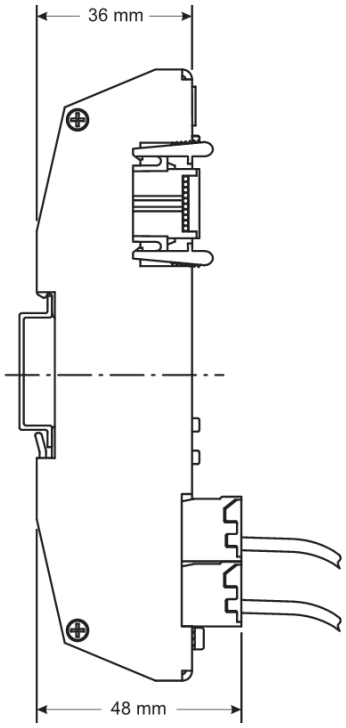
- inverse polarity protection

- short-circuit and over-temperature protection

- dimensions (w × h × d): 57mm × 142mm × 48mm

- weight: 200g





4.4.3.5 Digital Output Module 24V

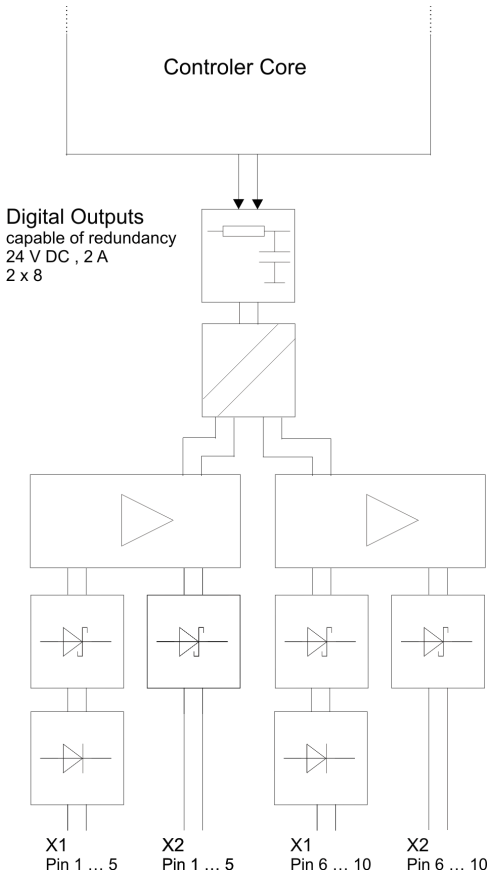
- 16 digital output channels (2 potentials)
- reference number: 746401
- reference number: 746412
  (Outputs 1-4 and 9-12 diode-decoupled)

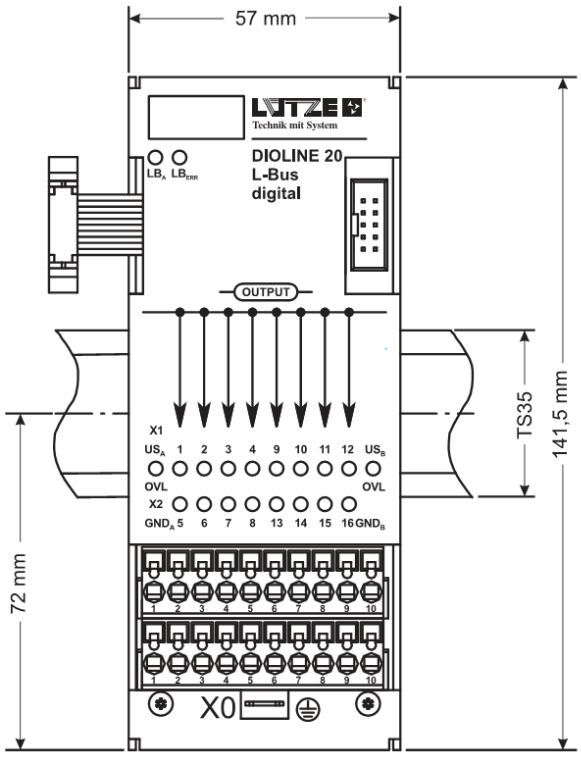
- output type: MOSFET
- rated output voltage: 24V (16,8 ... 30V)
- output current: 2A (Leakage current: 2µA)

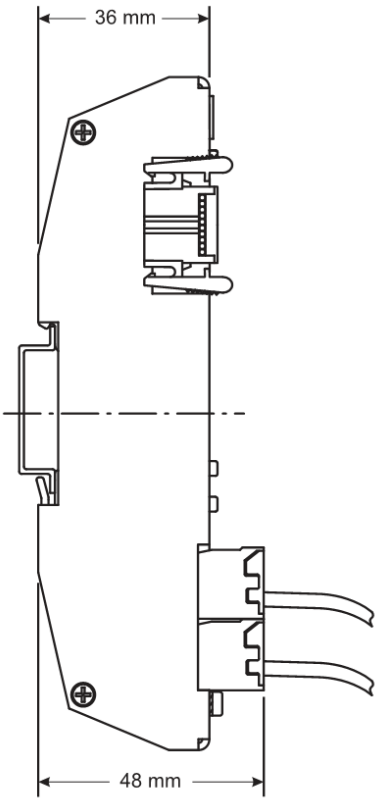
- electrical isolation
  AC 1,5 kV between outputs and L-Bus controller
  AC 1,5 kV between Potential A and Potential B

- inverse polarity protection
- short-circuit and over-temperature protection

- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 200g

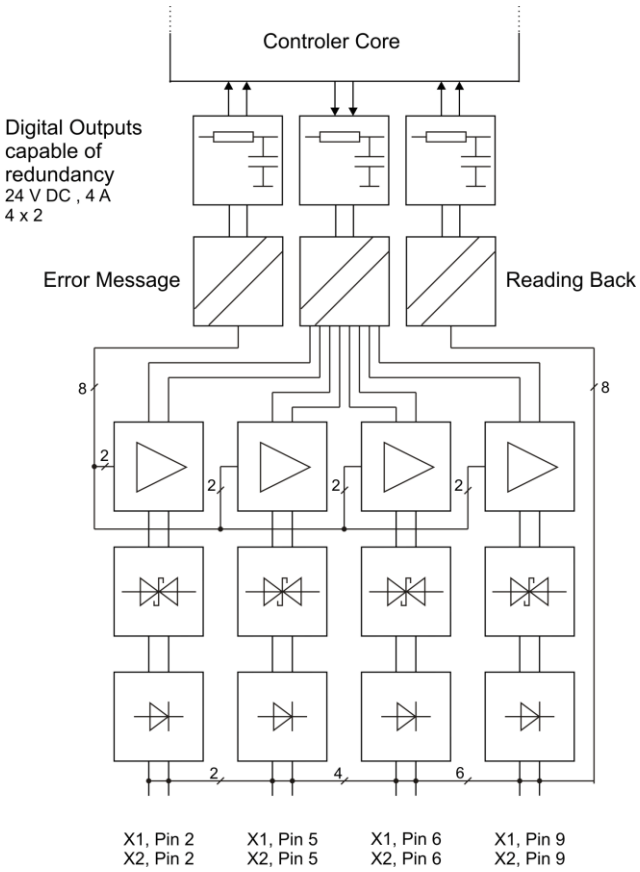






4.4.3.6 Digital Output Module 24V with extended diagnostic functions

- 8 digital output channels (4 potentials)
- reference number: 746417
- reference number: 746420 (Outputs diode-decoupled)

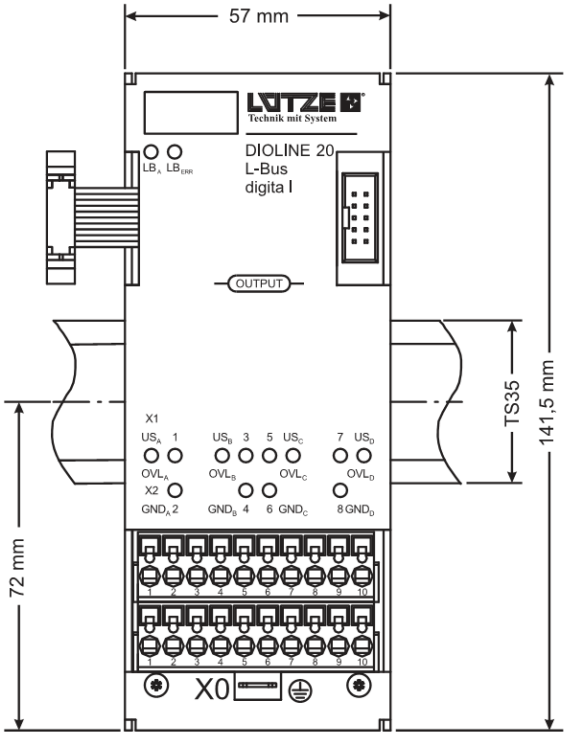


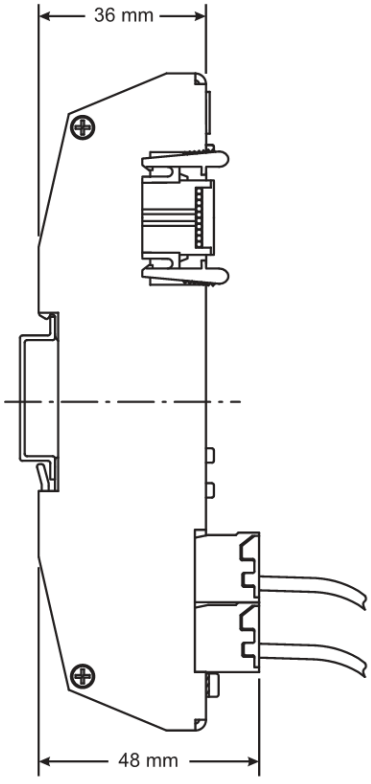
- output type: MOSFET
- rated output voltage: 24V (16,8 ... 30V)
- output current: 3A (Leakage current: 24µA)

- extended diagnostic feature
  each output channel has 2 diagnostic channels:
  a. channel-read back at the connector
  b. error state indication

- electrical isolation
  AC 1,5 kV between outputs and L-Bus controller
  AC 1,5 kV between Potential A and Potential B

- inverse polarity protection
- short-circuit and over-temperature protection
- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 200g





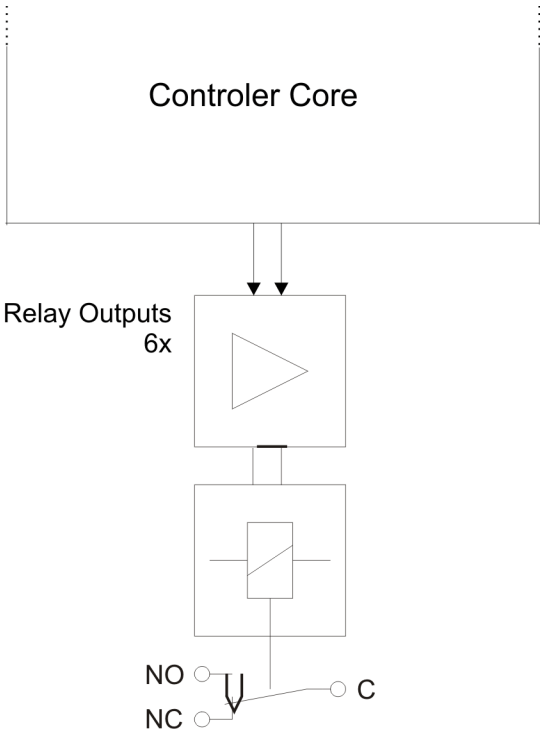
4.4.3.7 Relay Output Module

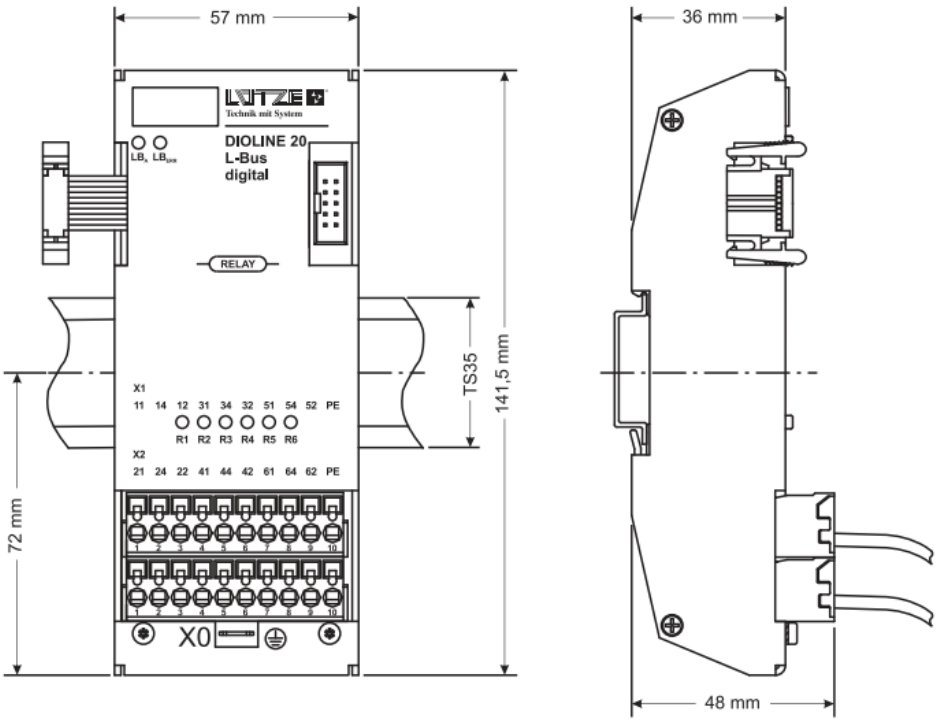
- 6 relays with change-over contacts
- reference number: 746415

- rated output voltage AC/DC 24V…110V
- Output current:
  a. DC 0,4A / DC 150V resistive loads
  b. DC 6A / DC 30V resistive loads
  c. AC 6A / AC 250V resistive loads

- electrical isolation
  AC 1,5 kV between inputs and L-Bus controller
  AC 1,5 kV between Potential A and Potential B

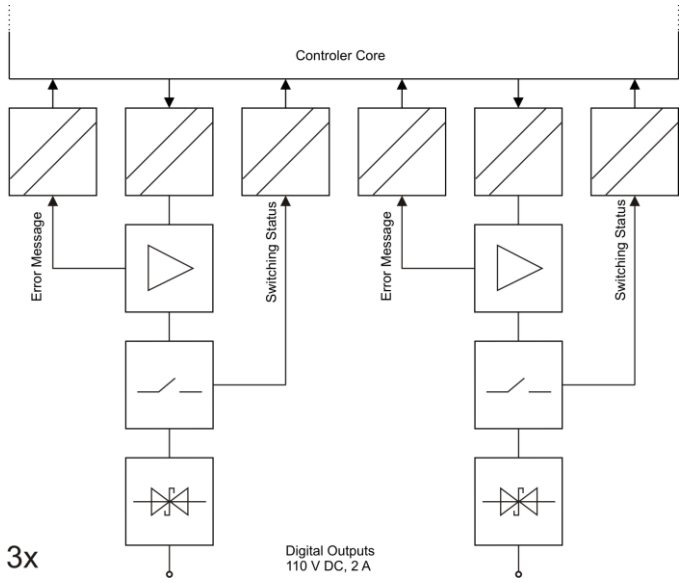
- contacts are hard gold plated
- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 300g





4.4.3.8 Digital Output Module 24V...110V

- 6 digital output channels (3 potentials)
- reference number: 746424
- reference number: 746414 (Outputs diode-decoupled)

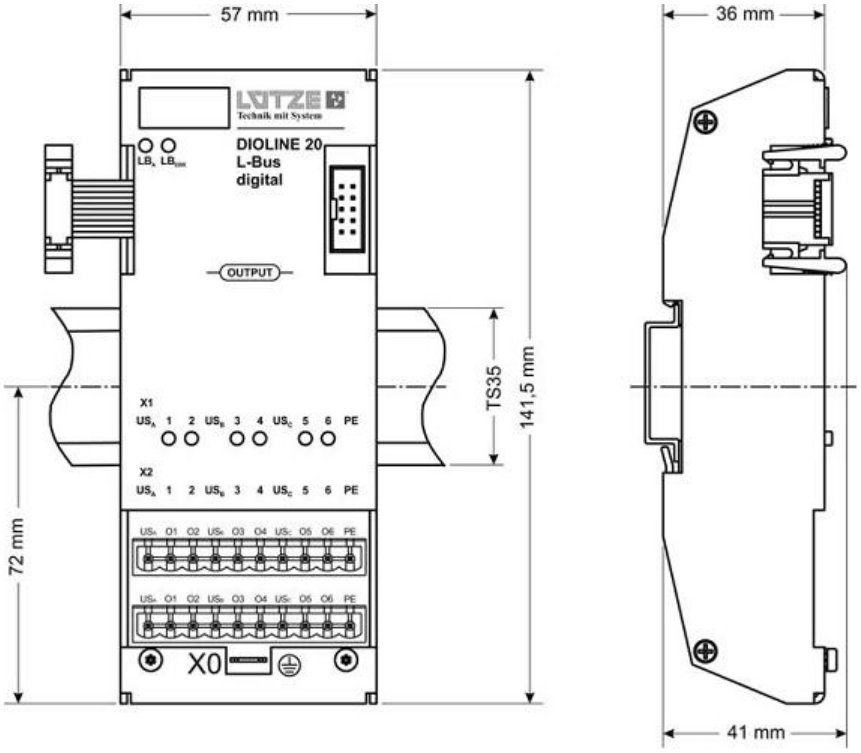


- output type: MOSFET
- rated output voltage: 24... 110V
- output current: 2A (Leakage current: 10µA)

- extended diagnostic feature
  each output channel has 2 diagnostic channels:
  a. channel-read back at the connector
  b. error state indication

- electrical isolation
  AC 1,5 kV between outputs and L-Bus controller
  AC 1,5 kV between Potential A and Potential B

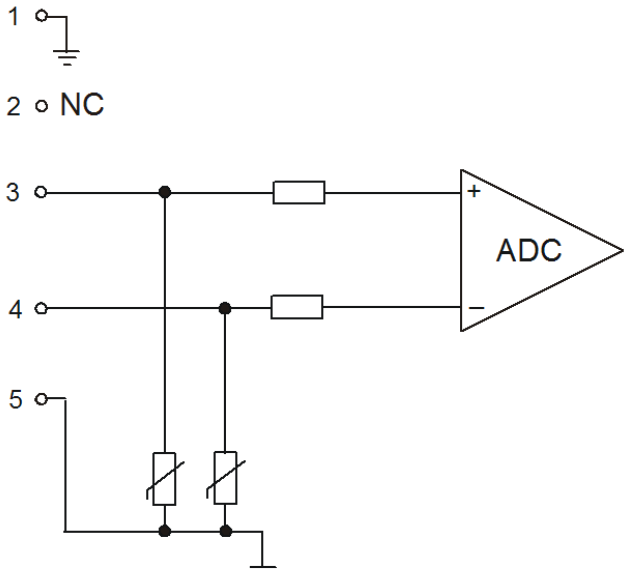
- inverse polarity protection
- short-circuit and over-temperature protection
- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 230g



4.4.4 Analog Modules

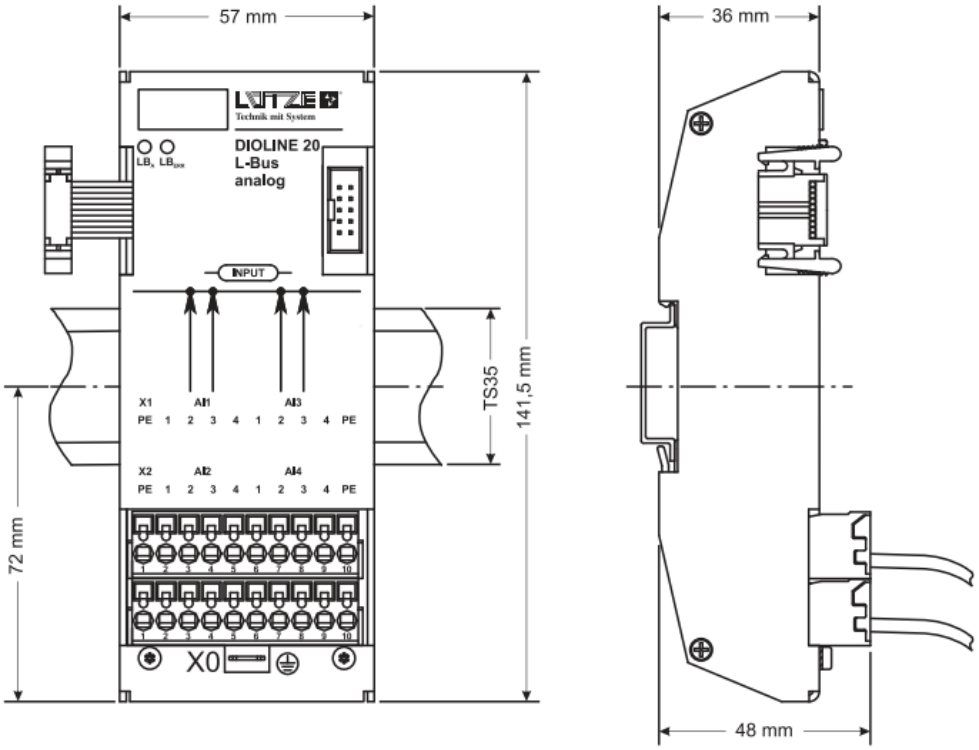
4.4.4.1 Analog Input Module Voltage

- 4 analog input channels voltage
- reference number: 746403
- Input signal: 0...10V
- resolution: 12 bit / Accuracy ±0.5 %



- inverse polarity protection
- input resistance 200 kΩ
- sampling rate 20 Hz (50ms)
- max. input voltage ±35V
- electrical isolation AC500V between inputs and L-Bus

- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 200g



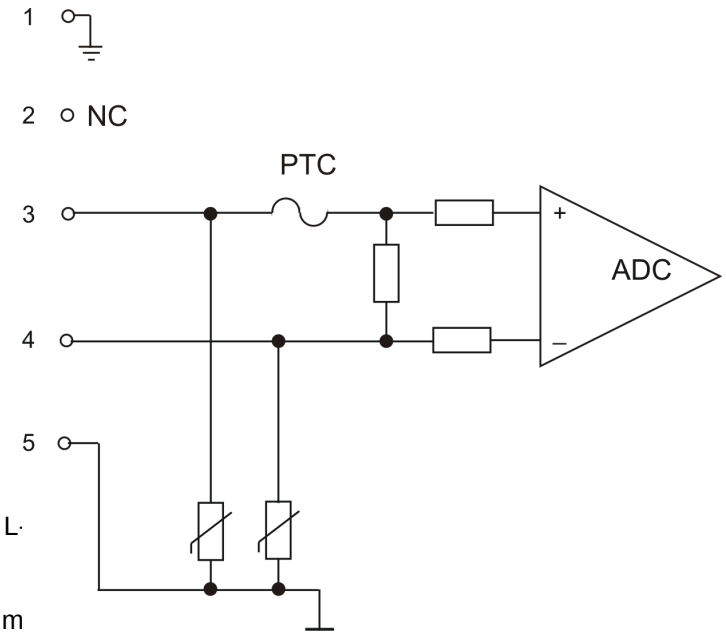
4.4.4.2 Analog Input Module Current

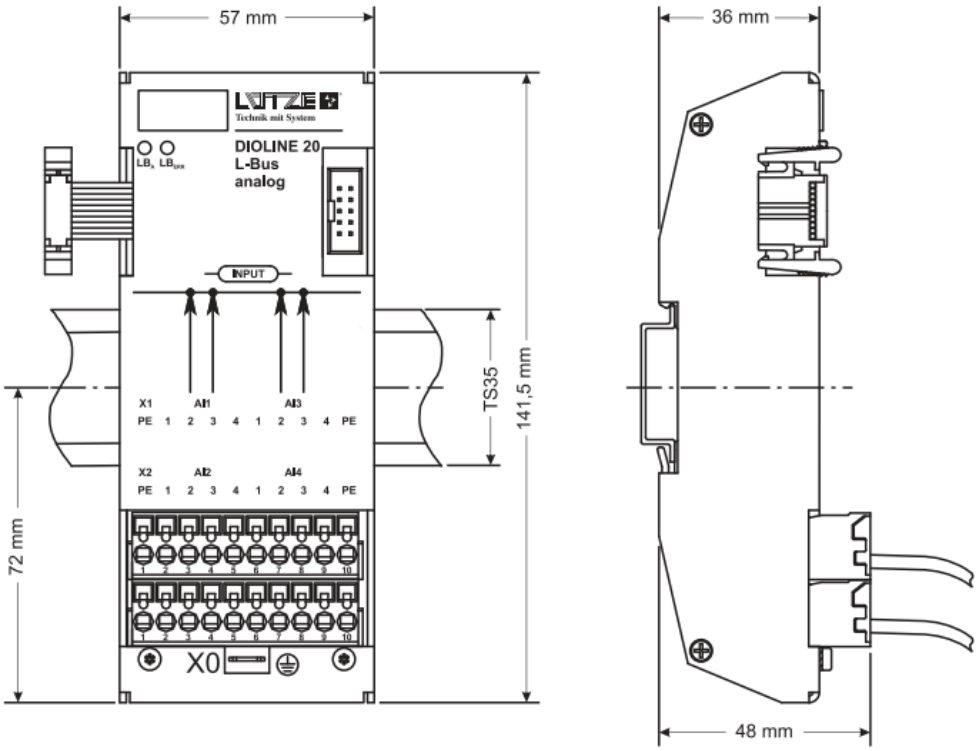
- 4 analog input channels current
- reference number:
  - 746404 (0...20mA)
  - 746421 (0...24mA)

- Input signal: 0...20mA or 0...24mA
- resolution: 12 bit / Accuracy ±0.5 %

- inverse polarity protection
- input resistance 35 to 45 Ω
- sampling rate 20 Hz (50ms)
- max. input voltage ±35V
- electrical isolation AC500V between inputs and L-

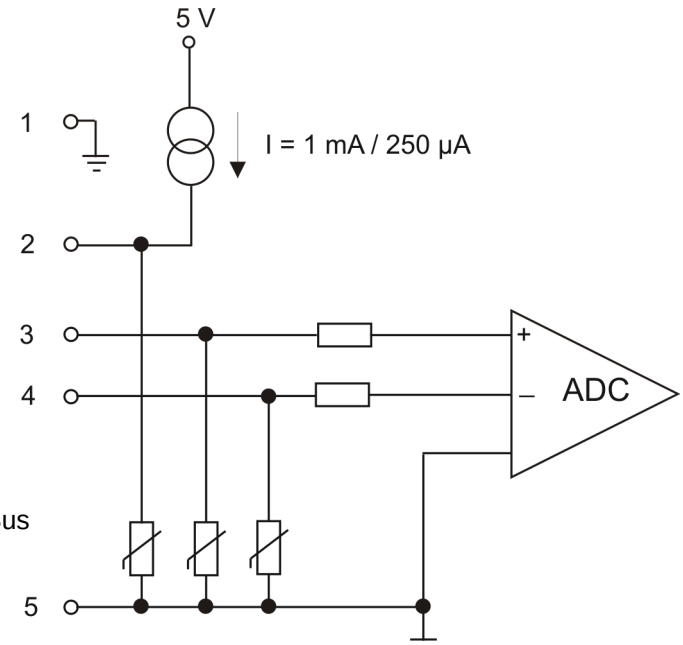
- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 200g





4.4.4.3 Analog Input Module Temperature

- 4 analog input channels temperature
- reference number:
  - 746410 (PT100)
  - 746411 (PT1000)

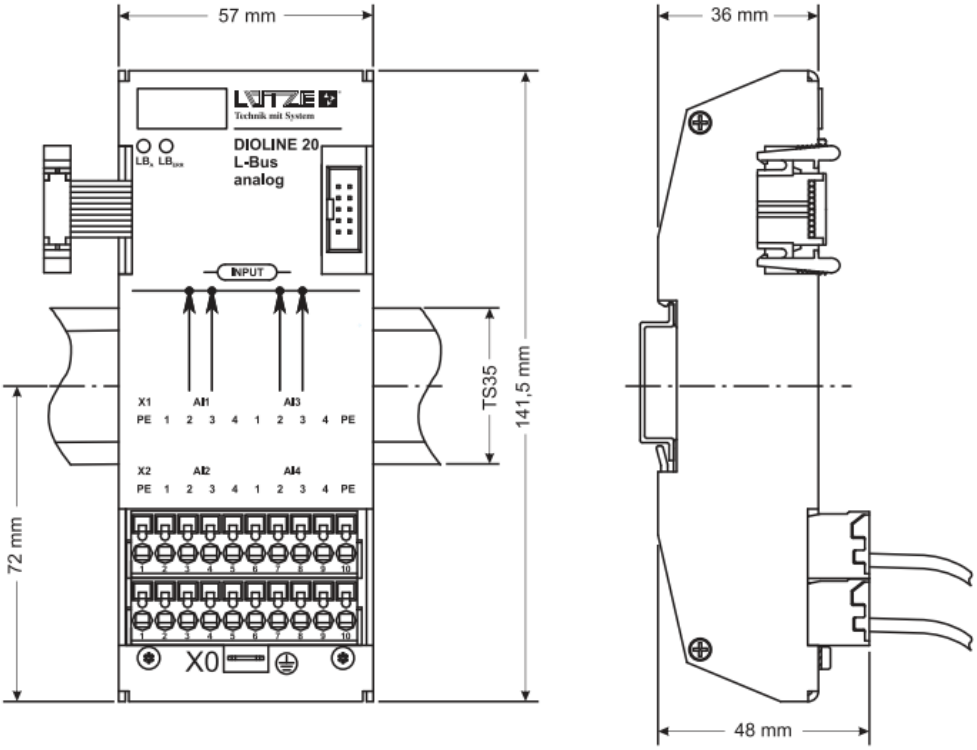


- Input signal: PT100 or PT1000
- 2-, 3- or 4-wire connetion
- resolution: 12 bit / Accuracy ±0.5 %

- input resistance 200 kΩ
- sampling rate 20 Hz (50ms)
- max. input voltage ±35V
- electrical isolation AC500V between inputs and L-Bus

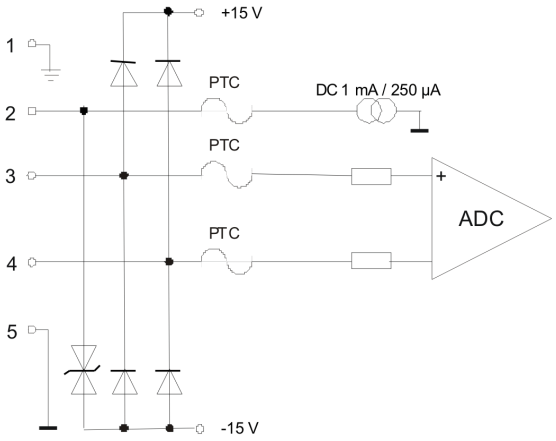
- dimensions (w × h × d): 57mm × 142mm × 48mm

- weight: 200g

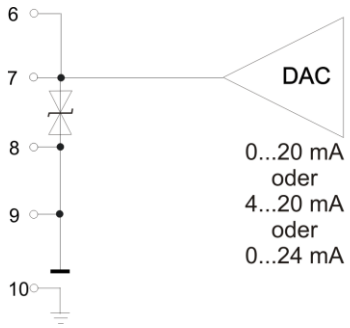


4.4.4.4 Analog Input & Output Module configurable

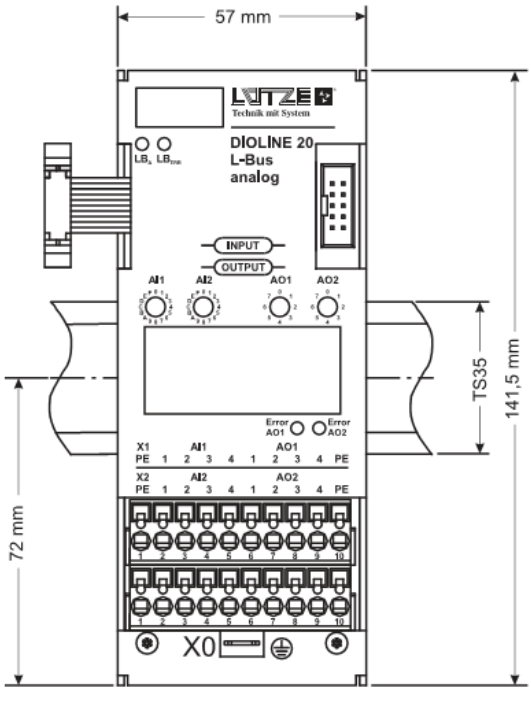
- 2 analog input channels
  2 analog output channels
  Configurable via rotary switches for each channel
- reference number: 746407
- Input signals:
  - Voltage: 0…10V / ±10V
  - Current: 0…20mA / 0…24mA / 4…20mA /0…40mA
  - Temperature PT100 / PT1000

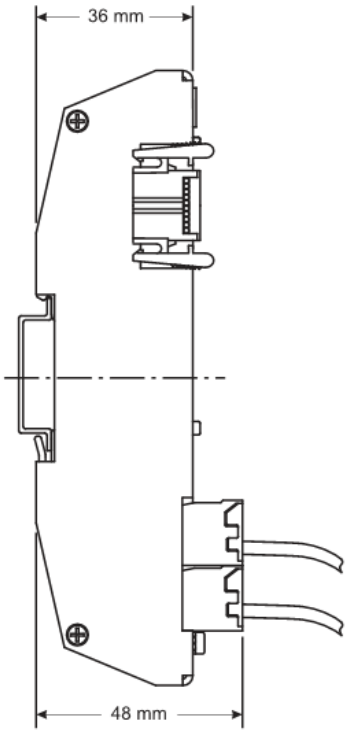


- Output signals:
  - Voltage: 0…10V / ±10V / ±5V
  - Current: 0…20mA / 0…24mA / 4…20mA
  - Temperature: PT100 / PT1000
- Current / Voltage Source
  - Current source: max. 500Ω load impedance
  - Current source: max. 20mA output current
  - Voltage Source: Output voltage 10V
  - Voltage Source: Output current 20mA

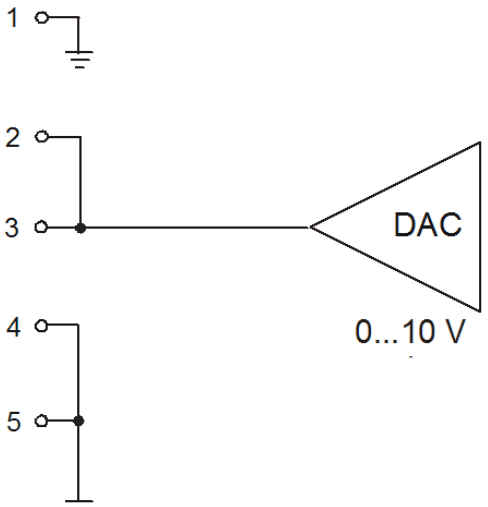


- resolution: 12 bit / Accuracy ±0.5 %
- input resistance current 35-45Ω / voltage 200-220kΩ
- sampling frequency 200 Hz (5ms)
- max. input voltage ±30V
- PTC short-circuit protection / polarity reversal protection / over-current protection
- electrical isolation AC500V between inputs/outputs and L-Bus
- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 210g





4.4.4.5 Analog Output Module Voltage

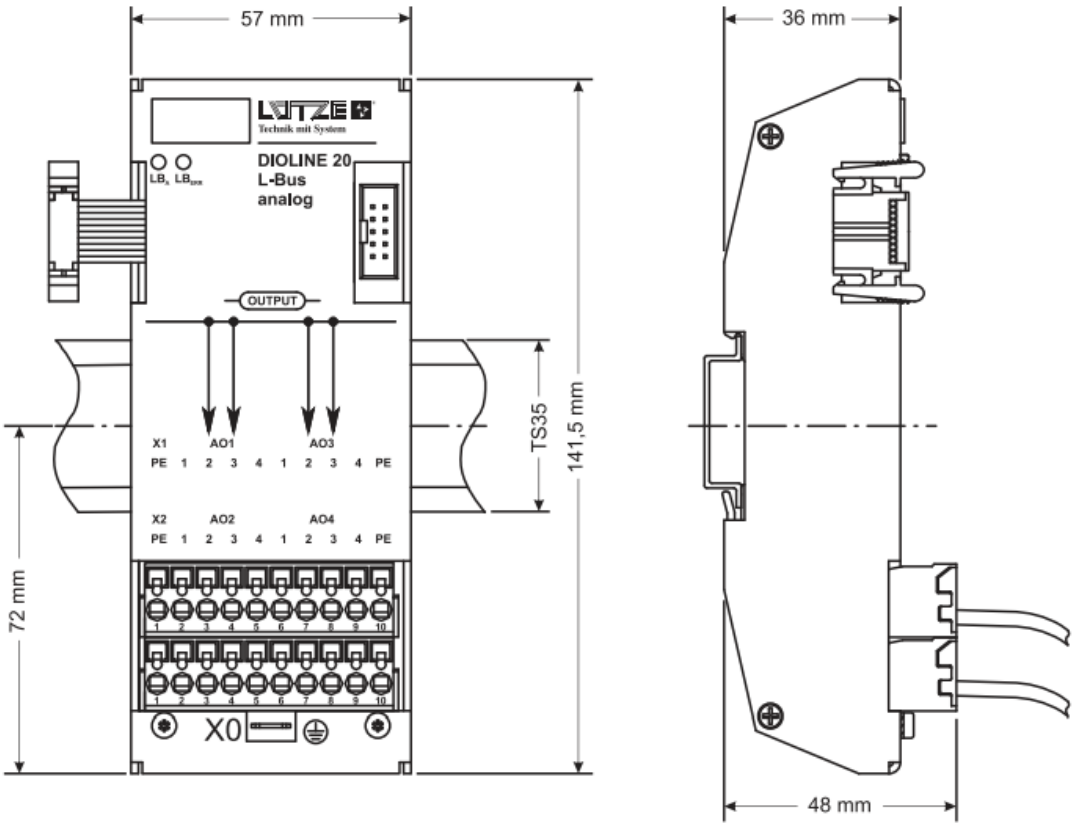


- 4 analog output channels voltage
- reference number: 746405
- Input signal: 0...10V
- output current: max. 10mA
- resolution: 12 bit / Accuracy ±0.5 %
- sampling frequency: 10 Hz

- PTC short circuit protection
- bipolar diode-suppressor for surge protection

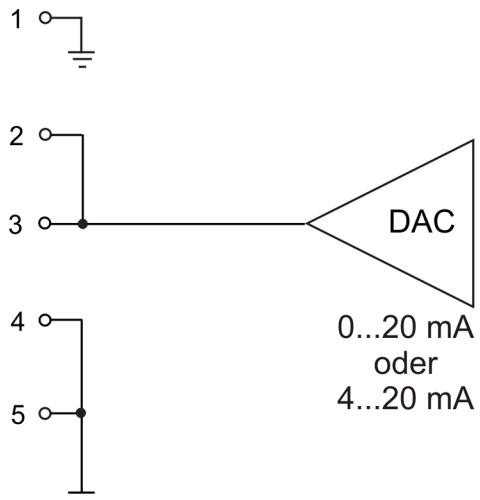
- sampling rate 10 Hz (100ms)
- electrical isolation AC500V between outputs and L-Bus

- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 200g



4.4.4.6 Analog Output Module Current

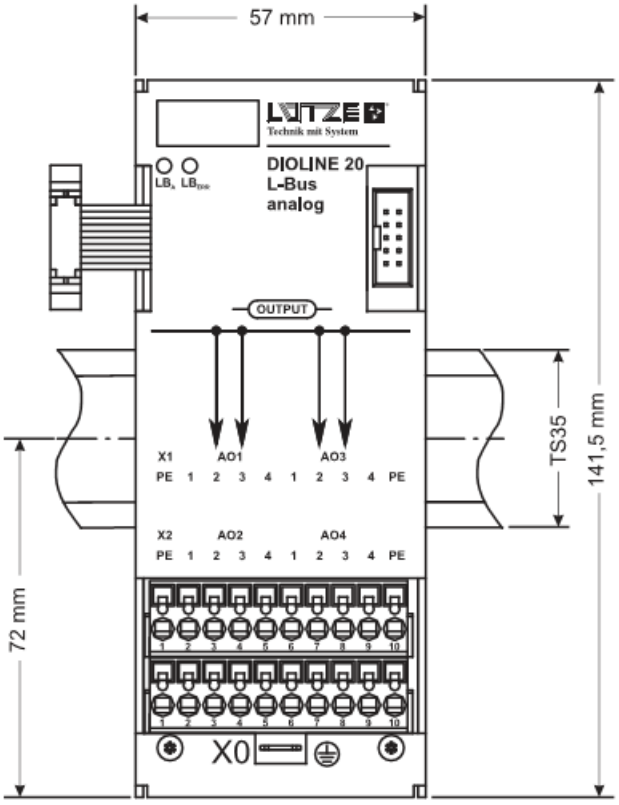
- 4 analog output channels current
- reference number:
  - 746406 (4...20mA)
  - 746422 (0...20mA)

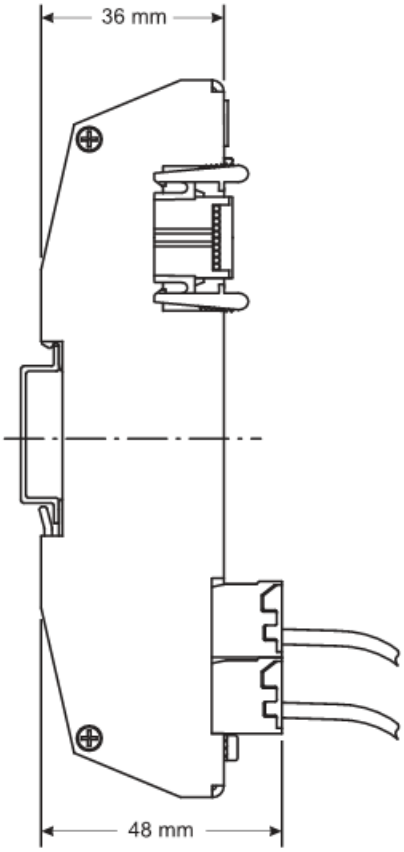


- Input signal: 4...20mA or 0...20mA
- Load impedance: max. 500Ω
- resolution: 12 bit / Accuracy ±0.5 %
- Suppressor diode-suppressor for surge protection

- sampling rate 100 Hz (10ms)
- electrical isolation AC500V between outputs and L-Bus

- dimensions (w × h × d): 57mm × 142mm × 48mm
- weight: 200g

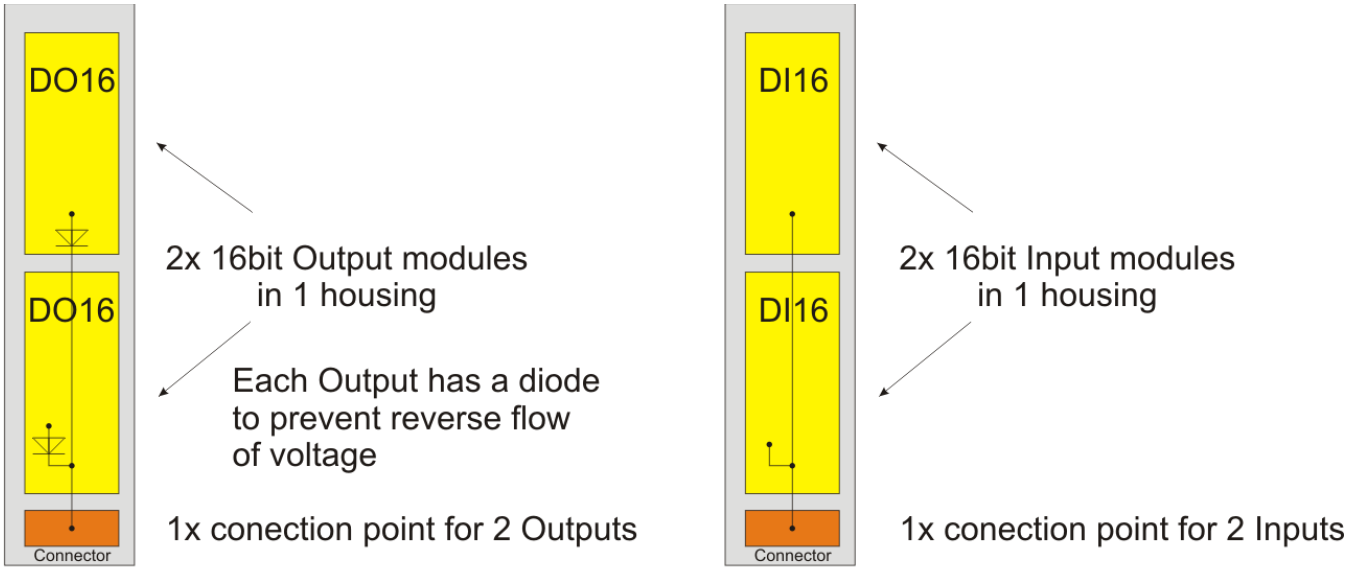


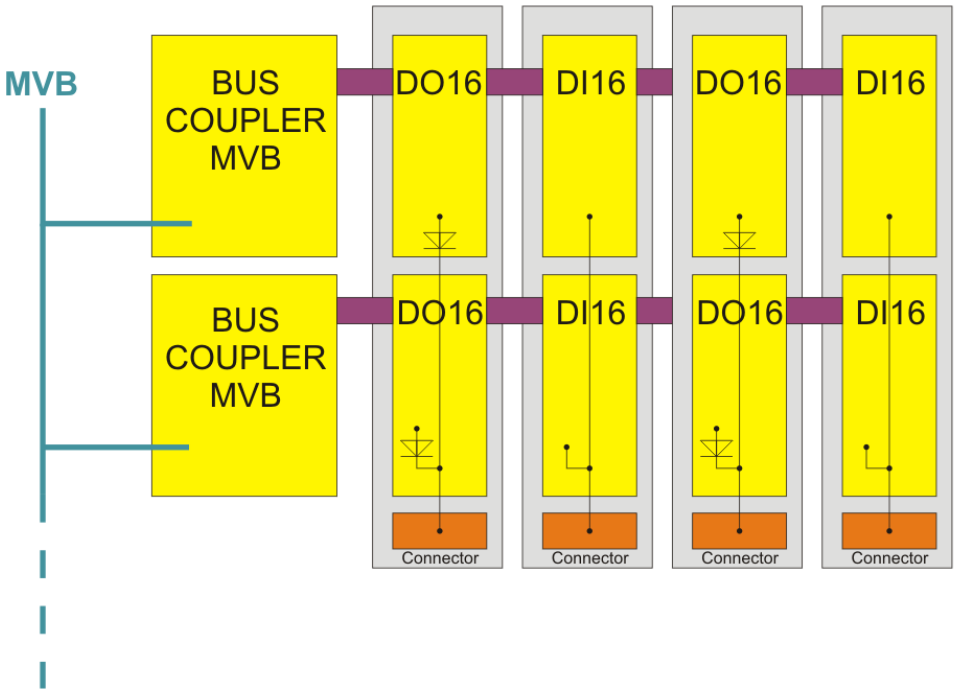


4.4.5 Redundant I/O Modules

The DIOLINE 20 redundant I/O modules are complementing the family by offering a smart and cost-effective way to use output or input redundancy by using only 1 device and 1 connection point. This doesn't only save wiring cost but also additional components as blocking diodes, as they are always integrated.

4.4.5.1 General description





4.4.5.2 Type Description

- **746430**
  DL-LB-DI-2X8-24V RED
  16 redundant digital inputs DC 24V, 2 potentials
  Use of 2x 746400

- **746431**
  DL-LB-DI-4X4-24V RED
  16 redundant digital inputs DC 24V, 4 potentials
  Use of 2x 746417

- **746435**
  DL-LB-DI-4X4-72V RED
  16 redundant digital inputs DC 72V, 4 potentials
  Use of 2x 746425

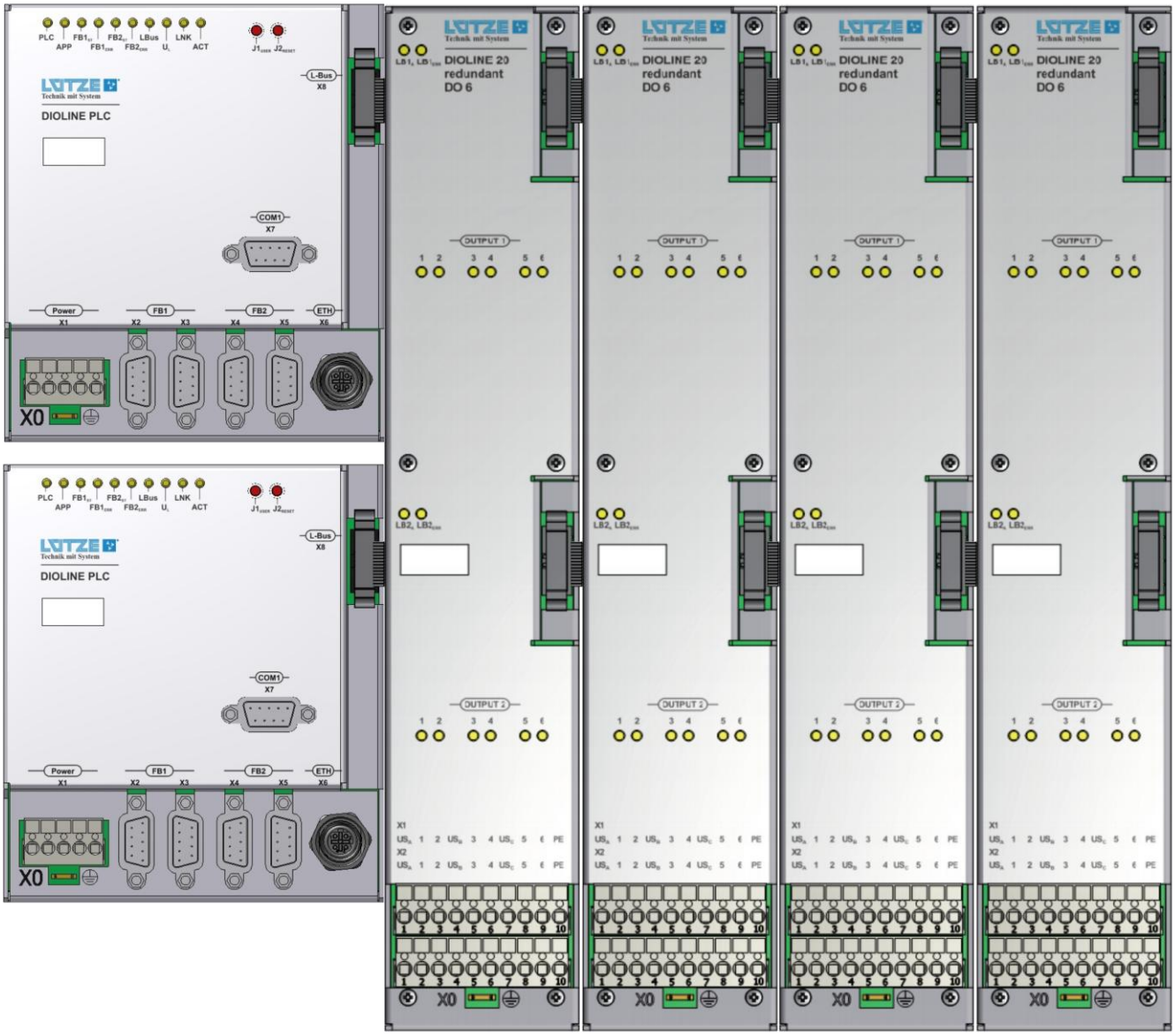
- **746433**
  DL-LB-DIO-8/8-24V/2A RED
  8/8 redundant digital in-/outputs DC 24V, 2A, 2 potentials
  Use of 2x 746402

- **746432**
  DL-LB-DO-2X8-24V/2A RED
  16 redundant digital outputs DC 24V, 2A, 2 potentials
  Use of 2x 746401

- **746434**
  DL-LB-DO-4X2-24V/2A-D RED
  8 redundant digital outputs DC 24V, 2A, 4 potentials, diagnostic
  Use of 2x 746419

- **746436**
  DL-LB-DO-3X2-110V/2A-D RED
  6 redundant digital outputs DC 24V...110V, 2A, diagnostic
  Use of 2x 746414

4.4.5.3 Example Configuration



5 Case study for several applications

5.1 RIOM CANopen for 24V

5.1.1 Definition of RIOM 24V configurations

Type	Power Supply	Bus System	Digital Input Channels	Digital Output Channels	Analog Input Channels Current	Analog Input Channels Temp.	Analog Output Channels Voltage
RIOM 1 (64/32/8/4)	24V	CANopen	64	32	4	4	4
RIOM 2 (32/16/4/0)	24V	CANopen	32	16	4	0	0
RIOM 3 (24/8/0/0)	24V	CANopen	24	8	0	0	0

Type	BC CANopen	DI 16 24V	DO 16 24V / 2A	DI8 DO 8 24V / 2A	AI 4 0...20mA	AI4 PT100	AO 4 0...10V
RIOM 1 (64/32/8/4)	1	4	2	0	1	1	1
RIOM 2 (32/16/4/0)	1	2	1	0	1	0	0
RIOM 3 (24/8/0/0)	1	1	0	1	0	0	0

5.1.2 Dimensions and Weight per RIOM CANopen 24V

Type	Dimensions (w x h x d)	Weight
RIOM 1 (64/32/8/4)	596mm × 142mm × 48mm	2,060 kg
RIOM 2 (32/16/4/0)	311mm × 142mm × 48mm	1,060 kg
RIOM 3 (24/8/0/0)	197mm × 142mm × 48mm	660 kg

5.1.3 MTBF for RIOM CANopen 24V

Type	Failure Rate in fit	MTBF [h] @ +40°C ambient temperature
RIOM 1 (64/32/8/4)	12.758	78.382,19 h
RIOM 2 (32/16/4/0)	5.975	167.364,02 h
RIOM 3 (24/8/0/0)	3.523	283.848,99 h

5.2 RIOM MVB for 110V

5.2.1 Definition of RIOM 110V configurations

Type	Power Supply	Bus System	Digital Input Channels	Digital Output Channels	Digital Relay Output Channels	Analog Input Channels Current	Analog Output Channels Voltage
RIOM 4 (64/24/4/4)	110V	MVB	64	24	0	4	4
RIOM 5 (32/12/0/0)	110V	MVB	32	16	4	0	0
RIOM 6 (16/6/0/0)	110V	MVB	24	8	0	0	0

Type	Power Supply	BC MVB	DI 16 110V	DO 6 110V/2A	RO 6 110V	AI4 0...20mA	AO 4 0...10V
RIOM 4 (64/24/4/4)	1	1	4	4	0	1	1
RIOM 5 (32/12/0/0)	1	1	2	1	1	0	0
RIOM 6 (16/6/0/0)	1	1	1	0	1	0	0

5.2.2 Dimensions and Weight per RIOM MVB 110V

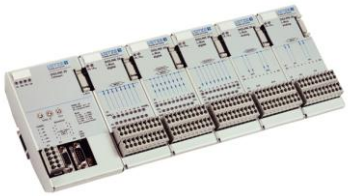
Type	Dimensions (w x h x d)	Weight
RIOM 4 (64/24/4/4)	759mm × 142mm × 48mm	2,960 kg
RIOM 5 (32/12/0/0)	417mm × 142mm × 48mm	1,770 kg
RIOM 6 (16/6/0/0)	303mm × 142mm × 48mm	1,340 kg

5.2.3 MTBF for RIOM MVB 110V

Type	Failure Rate in fit	MTBF [h] @ +40°C ambient temperature
RIOM 4 (64/24/4/4)	16.714	59.830,08 h
RIOM 5 (32/12/0/0)	8.689	115.088,04 h
RIOM 6 (16/6/0/0)	6.282	159.184,97 h

6 References – Competence in I/O Products

6.1 Products and Quantities

DIORAIL I/O System CANopen	DIOLINE 20 I/O System CANopen & MVB	DIOLINE 67 I/O System IP67 CAN
		
Market Launch: 2000 **Delivered units:** 31.524 (Dec. 2011)	**Market Launch:** 2004 **Delivered units:** 17.847 (Dec. 2011)	**Market Launch:** 1999 **Delivered units:** 27949 (Dec. 2011)

6.2 Vehicles

Bombardier Transportation Locomotive TRAXX	ALSTOM Transport Coradia Regiolis (PP)	Siemens Mobility Locomotive VECTRON
		
Products: - DIORAIL I/O CANopen - DIORAIL 1.1 I/O CANopen **Application:** - Remote I/O modules	**Products:** - DIOLINE PLC MVB - DIOLINE 20 I/O **Application:** - Powerpack Control unit	**Products:** - DIOLINE 20 I/O MVB **Application:** - Remote I/O modules

DIOLINE 20 – General information and technical overview

Bombardier Transportation Locomotive ALP45 DP	Bombardier Transportation Locomotive TRAXX DE ME	Stadler Pankow Light Rail Variobahn
		
Products: - DIOLINE PLC - DIOLINE 20 I/O **Application:** - FOGTEC Fire Detection	**Products:** - DIOLINE PLC CANopen - DIOLINE 20 I/O **Application:** - Gateway J1939 for DE ME	**Products:** - DIOLINE 20 I/O CANopen - DIORAIL PC2 **Application:** - TCMS System

Windhoff MPV / LRZ	Stadler Regional Train KISS	ALSTOM Transport Metro Buenos Aires
		
Products: - DIOLINE 20 I/O CANopen - DIORAIL PC2 **Application:** - TCMS System	**Products:** - DIOLINE PLC CANopen - DIOLINE 20 I/O **Application:** - FOGTEC Fire Detection	**Products:** - DIOLINE 20 I/O MVB **Application:** - Remote I/O modules

HARSCO Track Maintenance	CAF Metro Sao Paolo & CPTM	Bombardier Transportation Monorail Sao Paolo
		
Products: - DIORAIL IP67 I/O **Application:** - Remote I/O modules	**Products:** - DIOLINE PLC CANopen - DIOLINE 20 I/O **Application:** - FOGTEC Fire Detection	**Products:** - DIOLINE PLC CANopen - DIOLINE 20 I/O **Application:** - FOGTEC Fire Detection

7 IRIS Certification

C E R T I F I C A T E

awarded to

Friedrich Lütze GmbH
Bruckwiesenstrasse 17-19
71384 Weinstadt
Germany

DQS GmbH

confirms, as an IRIS approved certification body, that the Management System of the above organization has been assessed and found to be in accordance with the

International Railway Industry Standard (IRIS)
Revision 02, May 2009

for the activity of Design and development & Manufacturing
for the scopes of certification 9 (On board vehicle control)
Electrical and electronic components and solutions for the automation technology

Certificate valid from: 21/05/2013 Certificate valid until: 20/05/2016 *

G. Blechschmidt

Current date: 08/07/2013
Certificate-Register-No.: 001737 IRIS

* Providing that the subsequent surveillance audits are successful before the anniversary of this validity date.
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1/2

Enclosure 1 of Certificate No.: 001737 IRIS

Friedrich Lütze GmbH
Bruckwiesenstrasse 17-19
71384 Weinstadt
Germany

The location is supported by the following remote locations:

Address	Scope / Process
Lütze Transportation GmbH Bruckwiesenstrasse 17-19 71384 / Germany	Sales Marketing

The location is supported by the following site extensions:

Address	Scope / Process
Elfra SRO Pardubicka 1407 53701 Chrudim / Czech Republic	Production

G. Blechschmidt

Current date: 08/07/2013
Certificate-Register-No.: 001737 IRIS

* Providing that the subsequent surveillance audits are successful before the anniversary of this validity date.
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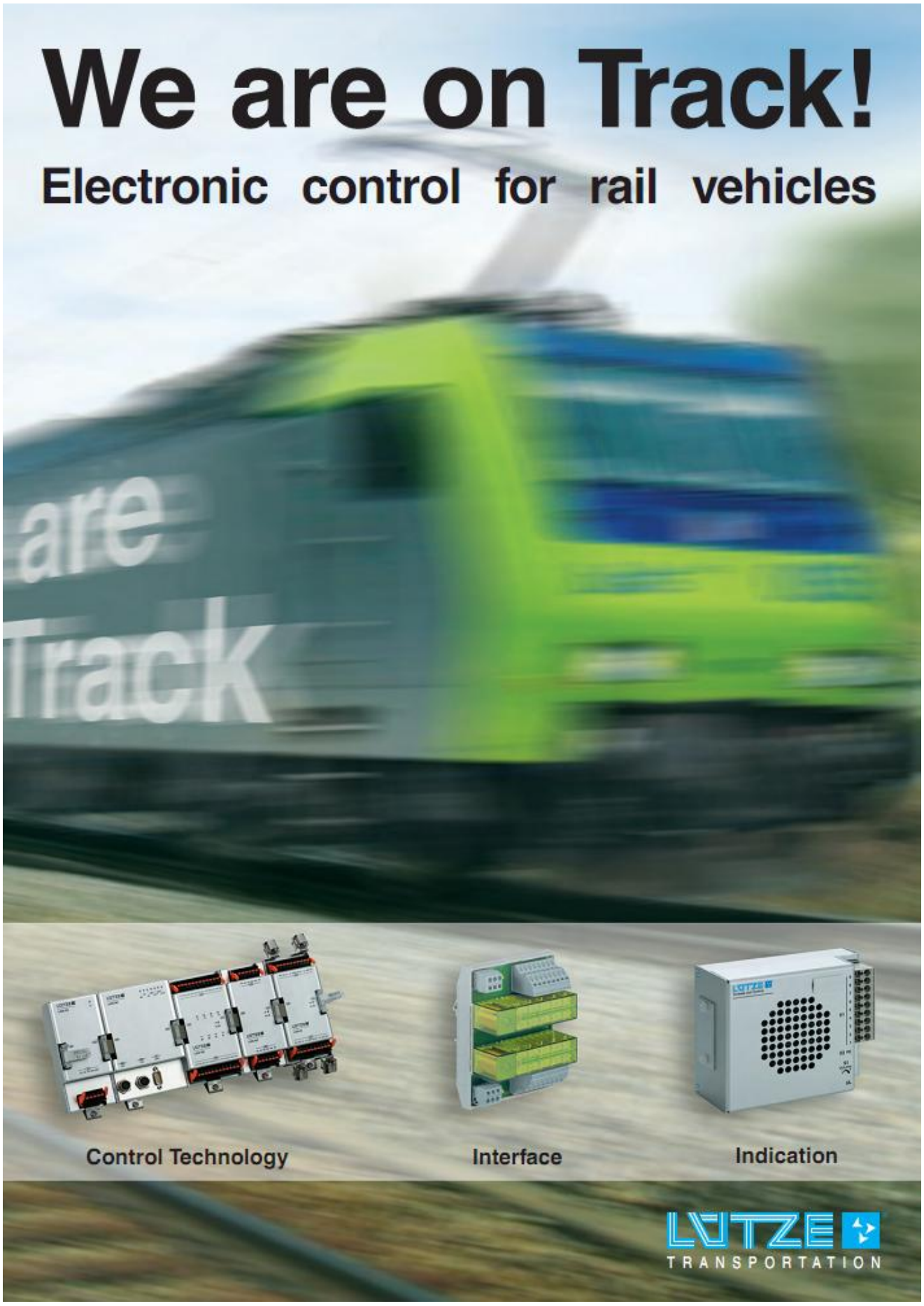
2/2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