

IB IL DALI-PAC

**Inline, DALI master,
extension for IB IL DALI/PWR-PAC**



Data Sheet
7608_en_01

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1 Description

The IB IL DALI-PAC terminal is designed for use within an Inline station.

It is a DALI master and is used to control lights with DALI ballasts according to IEC 60929. As defined in the DALI standard, up to 64 ballasts can be addressed individually.

A DALI bus supply is also required in order to operate a DALI system with this terminal. An IB IL DALI/PWR-PAC terminal or a suitable external power supply unit is required for this.

Features

- DALI master without integrated DALI bus supply
- Safe electrical isolation of the DALI bus
- DALI bus protected against accidental connection of the mains voltage (up to 250 V AC)
- Terminal can be used as an extension of an IB IL DALI/PWR-PAC Inline terminal and supplied by its integrated power supply unit
- Alternatively, direct DALI bus supply using a suitable power supply unit
- Communication via process data
- Indicators for diagnostics, transmission, and reception



This data sheet is only valid in association with the IL SYS INST UM E user manual.



Make sure you always use the latest documentation.
It can be downloaded at phoenixcontact.net/product/2897910.



This document is valid for all products listed in the "Ordering data" on page 3

Table of contents

1	Description.....	1
2	Ordering data.....	3
3	Technical Data.....	4
4	Internal Basic Circuit Diagram.....	7
5	Local diagnostic and status indicators	8
6	Terminal point assignment.....	8
7	Connection Notes	8
8	Connection Example.....	9
9	Typical Station Structure.....	10
	9.1 Supply Through the IB IL DALI/PWR-PAC Terminal.....	10
	9.2 External Supply	11
10	Process Data	12
	10.1 Process Data Output Word OUT1	12
	10.2 Process Data Output Word OUT2	12
	10.3 Process Data Input Word IN1	12
	10.4 Process Data Input Word IN2	12
11	Function Description	13

2 Ordering data

Product

Description	Type	Order No.	Pcs./Pck.
Inline, DALI master, Extension for IB IL DALI/PWR-PAC, transmission speed in the local bus: 500 kbps, degree of protection: IP20, including Inline connector and labeling field	IB IL DALI-PAC	2897910	1

Accessories

Description	Type	Order No.	Pcs./Pkt.
Labeling field, width: 12.2 mm (Marking)	IB IL FIELD 2	2727501	10
Labeling field, width: 48.8 mm (Marking)	IB IL FIELD 8	2727515	10
Insert strip, Sheet, white, unlabeled, can be labeled with: Office printing systems: Laser printer, mounting type: insert, lettering field size: 62 x 10 mm (Marking)	ESL 62X10	0809492	1
Insert strip, Sheet, white, unlabeled, can be labeled with: Office printing systems: Laser printer, mounting type: insert, lettering field size: 62 x 46 mm (Marking)	ESL 62X46	0809502	5

Optional Accessories

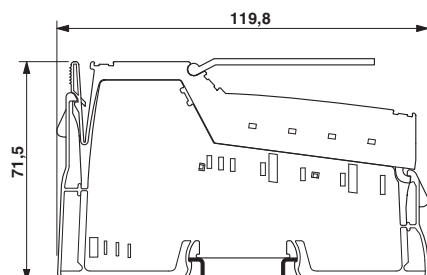
Description	Type	Order No.	Pcs./Pck.
Inline DALI terminal with supply option; complete with accessories (end terminal, connectors, and labeling fields)	IB IL DALI/PWR-PAC	2897813	1
Inline distance terminal; complete with accessories (connectors and labeling fields)	IB IL DOR LV SET-PAC	2861645	1 set (2 pcs.)

Documentation

Description	Type	Order No.	Pcs./Pck.
User manual: "Automation Terminals of the Inline Product Range"	IL SYS INST UM E	2698737	1
DALI documentation	See www.dali-ag.org		

3 Technical Data

Dimensions (nominal sizes in mm)



Width	12.2 mm
Height	119.8 mm
Depth	71.5 mm
Note on dimensions	Housing dimensions

General data

Housing dimensions (width x height x depth)	12.2 mm x 120 mm x 72 mm
Weight	60 g (with connectors)
Operating mode	Process data mode with 2 words
Ambient temperature (operation)	-25°C ... 60°C (Observe derating when using terminal IB IL DALI/PWR-PAC, see data sheet DB EN IB IL DALI/PWR-PAC.)
Ambient temperature (storage/transport)	-25°C ... 85°C
Permissible humidity (operation)	10 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	10 % ... 95 % (non-condensing)
Permissible air pressure (operation)	80 kPa ... 106 kPa (up to 2000 m above sea level)
Permissible air pressure (storage/transport)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20
Protection class	III, IEC 61140, EN 61140, VDE 0140-1

Connection data: Inline connector

Connection method	Spring-cage connection
Conductor cross section solid / stranded	0.2 mm ² ... 1.5 mm ² / 0.2 mm ² ... 1.5 mm ²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Interface: Inline local bus

Connection method	Inline data jumper
Transmission speed	500 kbps

Interface: DALI**General DALI**

Connection method	Inline connector
Transmission speed	1200 bps
Bus protected up to 250 V AC, maximum	yes

DALI when supplied by IB IL DALI/PWR-PAC (via potential jumpers)

Supply voltage	typ. 14 V DC (Bus voltage)
Output current with short-circuit	max. 250 mA
Current carrying capacity	max. 128 mA (Bus load, Observe the derating of the IB IL DALI/PWR-PAC terminal.)

Communications power (U_L)

Supply voltage	7.5 V DC
Current draw	max. 38 mA

Power Dissipation**Formula to Calculate the Power Dissipation in the Terminal**

$$P_{TOT} = P_{BUS} + P_{DRV}$$

$$P_{BUS} = 0.27 \text{ W}$$

$$P_{DRV_{max}} = 0.56 \text{ W} + I_{DALI} \times (I_{DALI} \times 3.85 \Omega + 0.47 \text{ V})$$

$$P_{DRV_{ICS}} = 0.37 \text{ W} + I_{DALI} \times (I_{DALI} \times 4.7 \Omega + 0.58 \text{ V})$$

Where:

P_{TOT}	Total power dissipation in the terminal
P_{BUS}	Power dissipation through bus operation
P_{DRV}	Power dissipation through the DALI bus driver, depends on the bus load and activity on the DALI bus (idle, transmitting, receiving)
$P_{DRV_{ICS}}$	Typical power dissipation through the DALI bus driver when operating the DALI terminal on bus controllers from the Inline Control Server (ICS) range
I_{DALI}	DALI bus load at the IB IL DALI-PAC terminal; 2 mA, typical per DALI slave

Safety Equipment

Surge voltage on DALI bus	275 V varistor
Short circuit on DALI bus	Electronic fuse, no time limit

Programming data (INTERBUS, local bus)

ID code (hex)	BF
ID code (dec.)	191
Length code (hex)	02
Length code (dec.)	02
Process data channel	32 Bit
Input address area	4 Byte
Output address area	4 Byte
Parameter channel (PCP)	0 Byte
Register length (bus)	32 Bit



For the programming data/configuration data of other bus systems, please refer to the corresponding electronic device data sheet (e.g., GSD, EDS).

Configuration and parameter data in a PROFIBUS system

Required parameter data	1 Byte
Required configuration data	5 Byte

Electrical Isolation**Common Potentials**

DALI supply voltage U_{DALI} and DALI bus have the same potential.

Separate Potentials in the IB IL DALI/PWR-PAC Terminal

Test Distance	Test Voltage
7.5 V supply (bus logic)/DALI bus	2500 V AC, 50 Hz, 1 min.
Routine test	1200 V AC, 50 Hz, 1 min.

Error Messages to the Higher-Level Control or Computer System

I/O error message in the event of DALI bus voltage failure or short circuit of the DALI bus

Approvals

For the latest approvals, please visit phoenixcontact.net/products.

4 Internal Basic Circuit Diagram

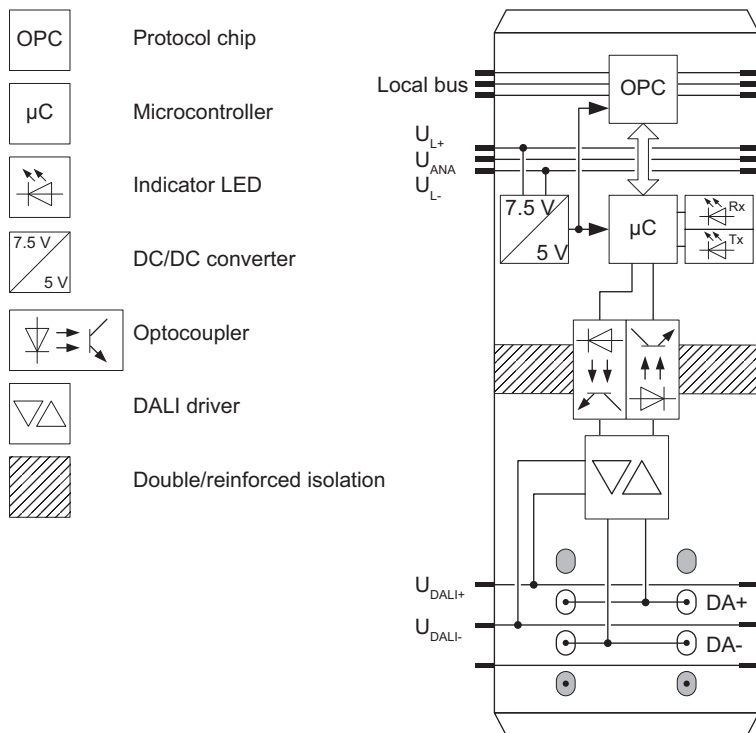


Figure 1 Internal basic circuit diagram



Other symbols used are explained in the IL SYS INST UM E user manual.

5 Local diagnostic and status indicators

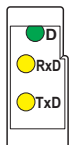


Figure 2 Local diagnostic and status indicators

Des.	Color	Meaning
D	Green	Diagnostics
RxD	Yellow	Terminal is receiving data from the DALI bus
TxD	Yellow	Terminal is transmitting data to the DALI bus

Function Identification

Orange

6 Terminal point assignment

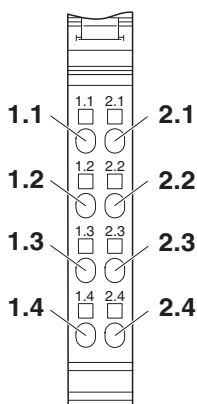


Figure 3 Terminal point assignment

Terminal point	Signal	Assignment
1.1, 2.1	–	Not used
1.2, 2.2	DA+	DALI bus (positive)
1.3, 2.3	DA-	DALI bus (negative)
1.4, 2.4	–	Not used



Terminal points not used by the terminal must not be wired.

Terminal points 2.2 and 2.3 are not available on the device itself. They are connected to terminal points 1.2 and 1.3 inside the connector.

7 Connection Notes

The voltage drop between the transmitter and receiver on the DALI bus cable must not exceed 2 V at 250 mA. The table below contains recommended values for wiring. The maximum cable length between two bus devices should not exceed 300 m.

Cable Length	Minimum Cross-Section
< 100 m	0.5 mm ²
100 m ... 150 m	0.75 mm ²
> 150 m	1.5 mm ²

Special bus cables (twisted or shielded) are not required. Serial and star network topologies or a combination of both can be used. Ring structures should be avoided.

DALI interface insulation in the ballasts of lights only meets the requirements of basic insulation. SELV (safety-extra low voltage) is therefore not ensured on the DALI bus despite the safe isolation of the IB IL DALI-PAC terminal.

8 Connection Example

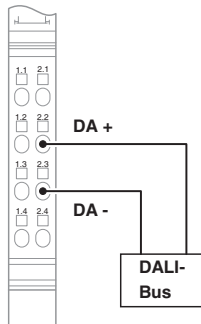


Figure 4 Connection example

The IB IL DALI-PAC terminal is usually used as an extension terminal to an IB IL DALI/PWR-PAC terminal. Up to three extension terminals can be supplied by an IB IL DALI/PWR-PAC terminal.

Alternatively, the DALI bus supply can also be provided directly via the DALI bus, e.g., using a suitable power supply unit or other DALI bus devices with integrated supply.

The following conditions must be met on the DALI bus:

- 9.5 V to 22.5 V DC supply voltage with a minimum load capacity of 135 mA (for full configuration with 64 ballasts)
- Total short-circuit current of ≤ 250 mA, the response time must be less than $10 \mu\text{s}$



The DALI bus supply must only be provided via the potential jumpers U_{DALI} on the side (by an IB IL DALI/PWR-PAC terminal) or directly via the DALI bus.

When using an external DALI bus supply, ensure correct polarity when connecting to the IB IL DALI-PAC terminal. The terminal must be isolated on both sides by an IB IL DOR LV-SET-PAC disconnect terminal set.

9 Typical Station Structure

9.1 Supply Through the IB IL DALI/PWR-PAC Terminal

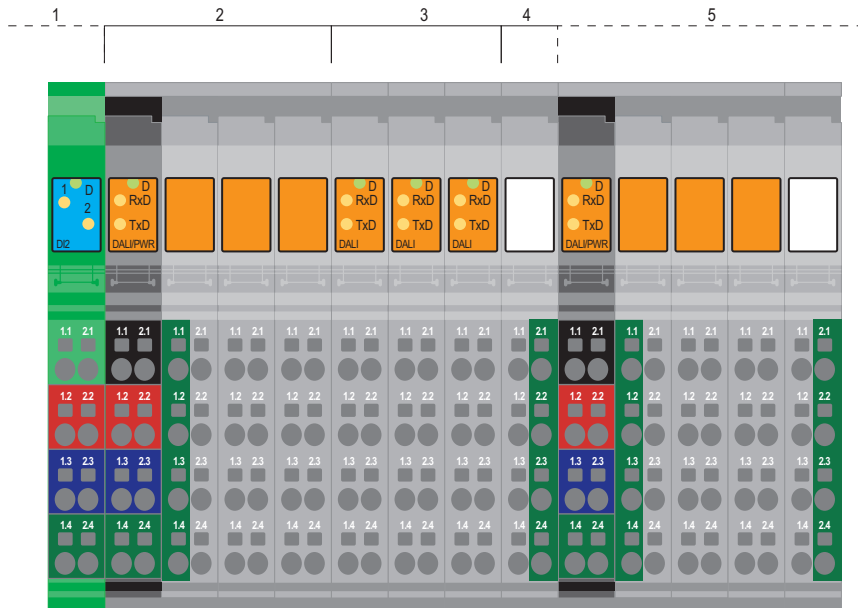


Figure 5 Typical station structure with several DALI terminals

Figure 5 shows a typical station structure when using several DALI terminals. The station consists of the following sections:

- 1 24 V segment.
- 2 IB IL DALI/PWR-PAC terminal.
The DALI bus supply is supplied from the preceding 24 V segment via the potential jumpers (U_M) on the side. U_M and GND of connector 1 remain unwired.
- 3 Up to three IB IL DALI-PAC extension terminals.
The DALI bus supply of these DALI masters is provided by the preceding IB IL DALI/PWR-PAC terminal via the potential jumpers U_{DALI} .
- 4 Distance terminal as the end terminal for the DALI segment. This distance terminal is supplied as standard with the IB IL DALI/PWR-PAC terminal. It must always be used to ensure correct termination of the DALI segment – regardless of how many DALI extension terminals (0 to 3) are used in this DALI segment.
- 5 Next DALI segment starting with an IB IL DALI/PWR-PAC terminal, no DALI extension terminals in the example.
As this terminal is not preceded by a 24 V segment (i.e., 24 V DC is not supplied via the potential jumpers U_M), the DALI bus supply must be supplied via connections 1.2 and 1.3 (or 2.2 and 2.3) of connector 1. The required 24 V DC supply can be tapped from

section 2, e.g., at connector 1 (connections 1.2 and 1.3 or 2.2 and 2.3) (observe maximum permissible currents). This DALI segment must also be terminated by a distance terminal used as the end terminal.



Every DALI segment must be terminated by the end terminal supplied. Otherwise, under certain circumstances the electrical isolation between U_M/U_S and the DALI bus may be compromised.



The DALI busses in section 2 and 3 in Figure 5 are not electrically isolated from one another. Usually this does not present a problem. However, if such isolation is required, the IB IL DALI/PWR-PAC terminals must not be extended by IB IL DALI-PAC terminals (and used to supply them).

However, the DALI busses in section 2 and 3 are electrically isolated from the DALI bus in section 5, even in the event that all sections are supplied from the same 24 V DC supply (U_M).

9.2 External Supply

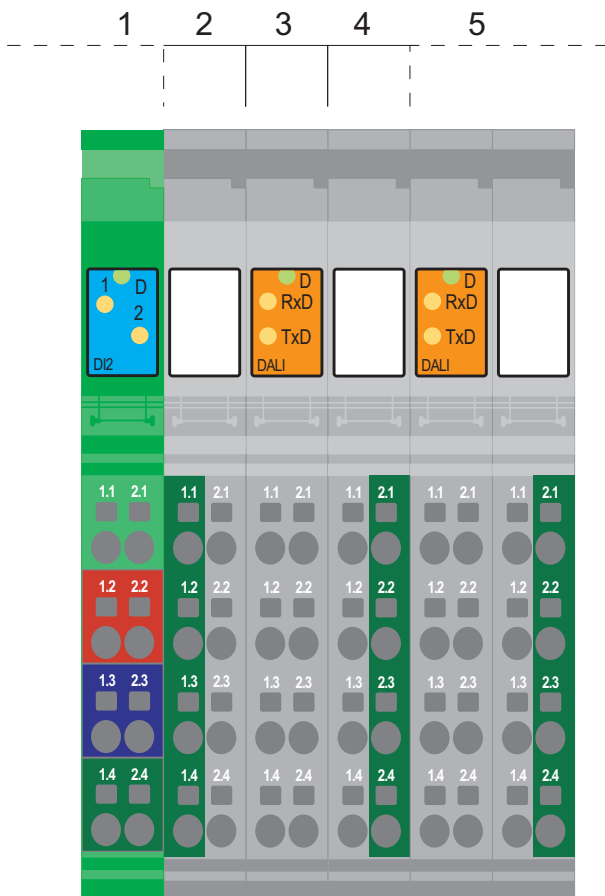


Figure 6 shows the station structure when using external DALI power supply units. Power is supplied by connecting directly to the DALI bus, e.g., at the DALI terminal (observe polarity). The station consists of the following sections:

- 1 24 V segment
- 2 IB IL DOR LV SET-PAC distance terminal
- 3 IB IL DALI-PAC terminal
- 4 IB IL DOR LV SET-PAC distance terminal
- 5 Next DALI terminal with disconnect terminal

If the DALI terminals follow a 230 V segment, the same structure applies in principle. However, the first disconnect terminal is then considered the end terminal for the 230 V segment.



Isolate every DALI terminal that is supplied via an external power supply unit on both sides using an IB IL DOR LV SET-PAC Inline distance terminal set (set contains 2 disconnect terminals). Otherwise, impermissible connections can occur due to the potential jumpers U_{DALI} on the side. As the DALI terminal is polarity-dependent, ensure correct polarity when connecting the external power supply unit.

Figure 6 Station structure when using an external DALI bus supply

10 Process Data

10.1 Process Data Output Word OUT1

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	TB	Command			0	0	0	0	0	0	0	0

Bits 10 to 8: Command

Bit			Command	Description
10	9	8		
0	0	0	Idle	DALI bus in the idle state
0	0	1	Send	Send DALI command
0	1	0	Repeat	Send DALI command again (50 ms)
0	1	1	Reserved	
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Bit 11: TB (Toggle Bit)

This bit is used when commands with the same command field are to be sent consecutively.

10.2 Process Data Output Word OUT2

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Address byte								S = 0: Data byte S = 1: Command byte							
Y	A	A	A	A	A	A	S								

10.3 Process Data Input Word IN1

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SB	K	AW	F	TB	Command			Response							

10.4 Process Data Input Word IN2

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Address byte								S = 0: Data byte S = 1: Command byte							
Y	A	A	A	A	A	A	S								

The input words mirror the output words. Possible differences for IN1:

- **SB** indicates an I/O error (DALI supply failure, short circuit on the DALI bus or error in the driver circuitry)
- **K** is set if an unsupported command has been received via INTERBUS (no action on the DALI bus)
- **AW** (response) is set if a valid response has been received from the ballast; only then is the response field to be evaluated (otherwise as for OUT1)
- **F** is set if an invalid response has been received from the ballast (e.g., fault on the DALI bus)

11 Function Description

The terminal checks incoming process data words for changes to the command byte (high byte of OUT1). The toggle bit is typically inverted by the application of the INTERBUS master on every new DALI transaction.

In OUT2, the terminal transmits the DALI command to be sent to the DALI bus. The data word in OUT2 is therefore not interpreted in any way by the terminal.

The terminal starts sending OUT2 to the DALI bus if:

- A change in the command byte has been detected
- The command byte contains a valid "Send" or "Repeat" command
- The DALI bus is in the idle state (previous transmission with the DALI bus completed successfully)

The terminal then waits around 10 ms for a response from the DALI slave and receives it, if present.

Finally, the terminal copies process data words OUT 1/2 to process data words IN 1/2 and modifies status bits SB, K, AW, and F as well as the response byte accordingly. This acknowledgment indicates that the terminal is ready for the next command.

If a valid DALI response has been received, the terminal waits around a further 10 ms after receiving the response (DALI bus pause). As acknowledgment, bit AW is then set in process data word IN1, and the response is copied to the low byte of IN1.

The "Repeat" command is used to send the DALI command twice in intervals of 50 ms (start of first transmission - start of second transmission). The command is processed in the same way as the "Send" command. Certain DALI commands have to be sent twice in order to be completed correctly. This can be achieved using the "Repeat" command independently of the bus cycles of the local bus.



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