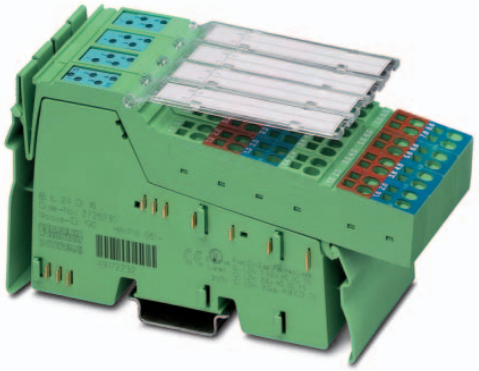
IB IL 24 DI 16 ...

Inline, digital input terminal, digital inputs: 16, 24 V DC



Data sheet
5553_en_07

1 Description

The terminal is designed for use within an Inline station.
It is used to acquire digital signals.

Features

- 16 digital inputs
- Connection of sensors in 2 and 3-wire technology
- Maximum permissible load current per sensor: 250 mA
- Maximum permissible load current from the terminal: 4 A

IB IL 24 DI 16-PAC

WARNING: Explosion hazard when used in potentially explosive areas

When using the terminal in potentially explosive areas, observe the corresponding notes.

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 from the product at phoenixcontact.net/products.

PHOENIX CONTACT
INSPIRING INNOVATIONS

2 Table of contents

3 Ordering data

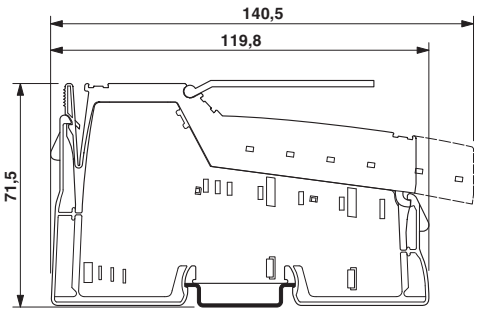
Description	Type	Order No.	Pcs./Pkt.
Inline, Digital input terminal, Digital inputs: 16, 24 V DC, connection method: 3-conductor, transmission speed in the local bus: 500 kbps, degree of protection: IP20, including Inline connectors and marking fields	IB IL 24 DI 16-PAC	2861250	1
Inline, Digital input terminal, Digital inputs: 16, 24 V DC, connection method: 3-conductor, transmission speed in the local bus: 500 kbps, degree of protection: IP20, including Inline connectors and marking fields, connectors numbered individually	IB IL 24 DI 16-PAC/SN	2862958	1
Inline, Digital input terminal, Digital inputs: 16, 24 V DC, connection method: 3-conductor, transmission speed in the local bus: 2 Mbps, degree of protection: IP20, including Inline connectors and marking fields	IB IL 24 DI16-2MBD-PAC	2861959	1
Inline, Digital input terminal, Digital inputs: 16, 24 V DC, connection method: 3-conductor, transmission speed in the local bus: 2 Mbps, degree of protection: IP20, including Inline connectors and marking fields, connectors numbered individually	IB IL 24 DI16-2MBD-PAC/SN	2878120	1
Inline, Digital input terminal, Digital inputs: 16, 24 V DC, connection method: 3-conductor, transmission speed in the local bus: 2 Mbps, degree of protection: IP20, without accessories	IB IL 24 DI16-2MBD	2855114	1

Accessories	Type	Order No.	Pcs./Pkt.
Connector set, for IB IL DI 16, copper, colored identification. (Connector/Adapter)	IB IL DI16-PLSET/ICP	2860989	1
Connector set, for IB IL DI/DO 16, copper, consecutively numbered, no colored identification,	IB IL DI/DO16-PLSET	2860976	1
Connector, color coded, for digital 4, or 16-channel Inline input terminals (Connector/Adapter)	IB IL SCN-12-ICP	2727611	10
Connector, for digital 4 or 16-channel Inline terminals (Connector/Adapter)	IB IL SCN-12	2726340	10
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
VARIOFACE front adapter for Inline modules, for transferring 16 (2 x 8) digital input signals. (Connector/ Adapter)	FLKM 14-PA-INLINE/IN16	2302751	1

Documentation	Type	Order No.	Pcs./Pkt.
User manual, English, Automation terminals of the Inline product range	IL SYS INST UM E	-	-
Data sheet, English, INTERBUS addressing	DB GB IBS SYS ADDRESS	-	-
Application note, addressing of 16-channel Inline terminals	AH IB IL 24 DI/DO 16 ADDRESS	-	-
Application note, English, Inline terminals for use in zone 2 potentially explosive areas	AH EN IL EX ZONE 2	-	-

4 Technical data

Dimensions (nominal sizes in mm)	



Width	48.8 mm
Height	140.5 mm
Depth	71.5 mm
Note on dimensions	Housing dimensions

General data	
Color	green
Weight	210 g (with connectors)
Operating mode	Process data mode with one word
Ambient temperature (operation)	-25 °C ... 55 °C
Ambient temperature (storage/transport)	-25 °C ... 85 °C
Permissible humidity (operation)	10 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	10 % ... 95 % (non-condensing)
Air pressure (operation)	70 kPa ... 106 kPa (up to 3000 m above sea level) 80 kPa ... 106 kPa (up to 3000 m above sea level, in ATEX Zone 2)
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	
Designation	Inline connector
Connection method	Spring-cage connection
Conductor cross section solid / stranded	0.08 mm² ... 1.5 mm² / 0.08 mm² ... 1.5 mm²
Conductor cross section [AWG]	28 ... 16
Stripping length	8 mm

Connection data for UL approvals	
Designation	Inline connector
Connection method	Spring-cage connection
Conductor cross section solid / stranded	0.2 mm² ... 1.5 mm² / 0.2 mm² ... 1.5 mm²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Interface: Inline local bus	
Number	2
Connection method	Inline data jumper

Transmission speed Inline local bus	
IB IL 24 DI 16-PAC	500 kbps
IB IL 24 DI 16-PAC/SN	500 kbps
IB IL 24 DI16-2MBD-PAC	2 Mbps
IB IL 24 DI16-2MBD-PAC/SN	2 Mbps
IB IL 24 DI16-2MBD	2 Mbps

Communications power U_L (500 kbps)	
Supply voltage	7.5 V DC (via voltage jumper)
Current draw	max. 60 mA
Power consumption	max. 0.45 W

Communications power U_L (2 Mbps)	
Supply voltage	7.5 V DC
Current draw	max. 80 mA
Power consumption	max. 0.6 W

Segment circuit supply U_S	
Supply voltage	24 V DC (via voltage jumper)
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current draw	max. 4 A

IB IL 24 DI 16-PAC

WARNING – Explosion hazard when used in ATEX Zone 2

Make sure that the maximum permissible current of 4 A flowing through potential jumpers U_M and U_S (total current) is not exceeded.

Digital inputs	
Number of inputs	16
Connection method	Spring-cage connection
Connection technology	3-conductor
Description of the input	EN 61131-2 type 1
Nominal input voltage	24 V DC
Nominal input current	min. 3 mA (at nominal voltage)
Sensor current per channel	max. 250 mA
Input voltage range "0" signal	-3 V DC ... 5 V DC
Input voltage range "1" signal	15 V DC ... 30 V DC
Delay at signal change from 0 to 1	typ. 1 ms
Delay at signal change from 1 to 0	typ. 1 ms
Permissible conductor length to the sensor	30 m
Use of AC sensors	AC sensors in the voltage range < U_{IN} are limited in application (according to the input design)

Programming data (INTERBUS, local bus)	
ID code (hex)	BE
ID code (dec.)	190
Length code (hex)	01
Length code (dec.)	01
Process data channel	16 Bit
Input address area	2 Byte
Output address area	0 Byte
Parameter channel (PCP)	0 Byte
Register length (bus)	16 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
Need for configuration data	4 Byte

Electrical isolation/isolation of the voltage areas	
Test section	**Test voltage**
7.5 V supply (bus logics)/24 V supply (I/O)	500 V AC, 50 Hz, 1 min.
24 V supply (I/O) / functional earth ground	500 V AC, 50 Hz, 1 min.
7.5 V supply (bus logics) / functional earth ground	500 V AC, 50 Hz, 1 min.

To achieve electrical isolation between the logic level and the I/O area, supply these areas from separate power supply units. Interconnection of the power supply units in the 24 V area is not permitted (see IL SYS INST UM E user manual).

Approvals

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

5 Additional tables

5.1 Input characteristic curve

Current depending on the input voltage and the ambient temperature T_A			
Supply voltage [V]	Input current [mA]	Input current for t ≥ 20 s [mA]	
		T_A = 25°C	T_A = 55°C
18	3.0	2.9	2.5
24	3.9	3.8	3.5
30	4.5	4.2	3.0
The current is reduced depending on the ambient temperature and the number of inputs that are switched on (internal module temperature).			

5.2 Power dissipation

Formula for calculating the power dissipation of the electronics

– 500 kbps

$$P_{EL} = 0{,}525\ W + \sum_{i=1}^{n} (U_{INi} \times 0{,}003\ A)$$

– 2 Mbps

$$P_{EL} = 0{,}6\ W + \sum_{i=1}^{n} (U_{INi} \times 0{,}003\ A)$$

Where:

P_{EL}	Total power dissipation in the terminal
i	Continuous index
n	Number of set inputs (n = 1 ... 16)
U_{INi}	Input voltage of input i

Power dissipation of the housing

2.8 W, maximum (within the permissible operating temperature)

5.3 Limitation of simultaneity, derating

No limitation of simultaneity, no derating

6 Internal circuit diagram

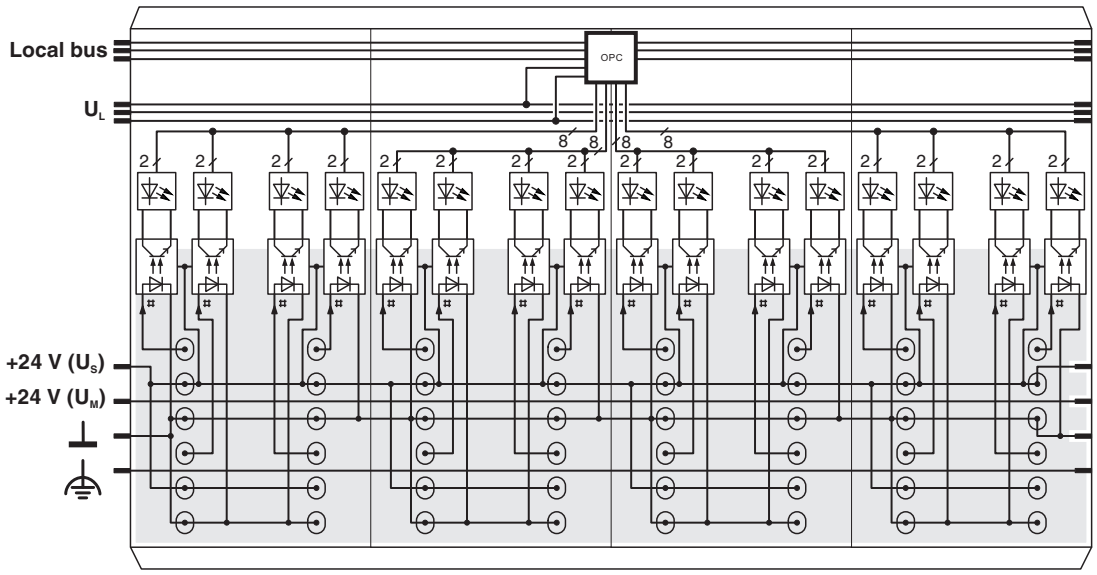


Figure 1 Internal wiring of the terminal points

Key:

OPC — Protocol chip
(Bus logic including voltage conditioning)

LED (status indicator)

Optocoupler

Digital input

Electrically isolated area

Explanation for other used symbols has been provided in the IL SYS INST UM E user manual.

7 Notes on using the terminal block in potentially explosive areas

Valid for: **IB IL 24 DI 16-PAC**

WARNING: Explosion hazard

Please make sure that the following notes and instructions are observed.

Approval according to ATEX Directive 2014/34/EU

Ⓔx II 3 G Ex nA IIC T4 Gc X

Installation notes

T_{amb} = -25 °C ... +55 °C

The category 3 device is designed for installation in zone 2 potentially explosive areas.

The device meets the requirements of EN 60079–0 and EN 60079–15.

- Observe the specified conditions for use in potentially explosive areas! Also observe the requirements of EN 60079-14.
- Install the device in a suitable approved housing (with at least IP54 protection) that meets the requirements of EN 60079-15.
- Only assemble, disassemble as well as connect and disconnect cables when the power is disconnected.
- Only devices that are designed for operation in Ex Zone 2 and the conditions at the installation location may be connected to the circuits in Zone 2.
- For safe operation, lockable plug connections must have a functional interlock (e. g. locking clip, screw connection etc.). Insert the interlock. Repair any damaged connectors immediately.
- Only connect one cable per terminal point. If you want to connect two flexible cables per terminal point, then use a TWIN ferrule.
- Use transient protection so that short-term surge voltages do not exceed 119 V.
- The air pressure during operation must not exceed 106 kPa.
- Perform a dielectric test after installing the device in the housing.
- For all supply and signal lines connected to the station, make sure that there is a connection to ground potential.
- Make sure that the maximum permissible current of 4 A flowing through potential jumpers U_M and U_S (total current) is not exceeded.
- When using the device in potentially explosive areas, observe the specifications in the application note AH DE IL EX ZONE 2 (German) / AH EN IL EX ZONE 2 (English).

8 Terminal point assignment

The following applies below:

A IB IL 24 DI 16-PAC
IB IL 24 DI 16-2MBD-PAC
IB IL 24 DI 16-2MBD

B IB IL 24 DI 16-PAC/SN
IB IL 24 DI 16-2MBD-PAC/SN

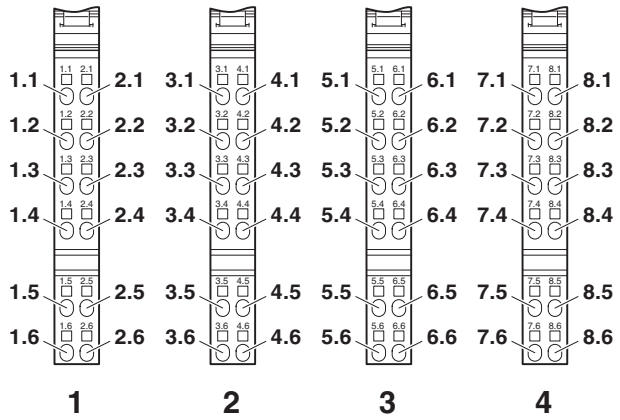


Figure 2 Terminal point assignment (A)

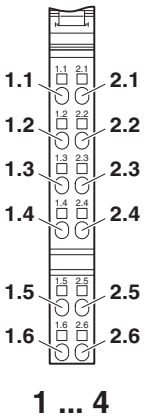


Figure 3 Terminal point assignment (B)

Connector 1		
Terminal point		**Assignment**
A	**B**	
1.1 / 2.1		Signal input (IN01 / IN02)
1.2 / 2.2		Segment voltage U_S
1.3 / 2.3		Ground contact (GND)
1.4 / 2.4		Signal input (IN03 / IN04)
1.5 / 2.5		Segment voltage U_S
1.6 / 2.6		Ground contact (GND)

Connector 2		
Terminal point		**Assignment**
A	**B**	
3.1 / 4.1	1.1 / 2.1	Signal input (IN05 / IN06)
3.2 / 4.2	1.2 / 2.2	Segment voltage U_S
3.3 / 4.3	1.3 / 2.3	Ground contact (GND)
3.4 / 4.4	1.4 / 2.4	Signal input (IN07 / IN08)
3.5 / 4.5	1.5 / 2.5	Segment voltage U_S
3.6 / 4.6	1.6 / 2.6	Ground contact (GND)

Connector 3		
Terminal point		**Assignment**
A	**B**	
5.1 / 6.1	1.1 / 2.1	Signal input (IN09 / IN10)
5.2 / 6.2	1.2 / 2.2	Segment voltage U_S
5.3 / 6.3	1.3 / 2.3	Ground contact (GND)
5.4 / 6.4	1.4 / 2.4	Signal input (IN11 / IN12)
5.5 / 6.5	1.5 / 2.5	Segment voltage U_S
5.6 / 6.6	1.6 / 2.6	Ground contact (GND)

Connector 4		
Terminal point		**Assignment**
A	**B**	
7.1 / 8.1	1.1 / 2.1	Signal input (IN13 / IN14)
7.2 / 8.2	1.2 / 2.2	Segment voltage U_S
7.3 / 8.3	1.3 / 2.3	Ground contact (GND)
7.4 / 8.4	1.4 / 2.4	Signal input (IN15 / IN16)
7.5 / 8.5	1.5 / 2.5	Segment voltage U_S
7.6 / 8.6	1.6 / 2.6	Ground contact (GND)

Segment voltage U_S: for 2 and 3-conductor connection technology

Ground connection (GND): for 2 and 3-conductor connection technology

9 Connection notes and examples

NOTE: Malfunction

The supply voltage U_S is used internally as the auxiliary supply.
If it is not present, the terminal will not operate properly.
Make sure that the supply voltage U_S is available.

When connecting the sensors observe the assignment of the terminal points to the process data.

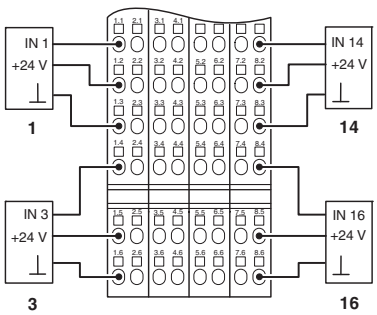


Figure 4 Typical connection of sensors

10 Local diagnostic and status indicators

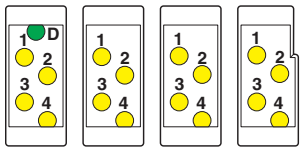


Figure 5 Local diagnostic and status indicators

Designation	Color	Meaning
D	Green	Diagnostics (bus and logic voltage)
For each connector		
1 ... 4	Yellow	Status of the inputs

Function identification

Light blue

2 Mbps: White stripe in the vicinity of the D LED

11 Process data

Assignment of the terminal points to IN process data

The assignment of the process data is shown for the consecutively numbered connectors. It also applies for the individually numbered connectors.

(Word.bit) view	Word	Word 0															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
(Byte.Bit) view	Byte	Byte 0								Byte 1							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Assignment	Slot	4				3				2				1			
	Signal	IN16	IN15	IN14	IN13	IN12	IN11	IN10	IN09	IN08	IN07	IN06	IN05	IN04	IN03	IN02	IN01
	Terminal point (signal)	8.4	7.4	8.1	7.1	6.4	5.4	6.1	5.1	4.4	3.4	4.1	3.1	2.4	1.4	2.1	1.1
	Terminal point (24 V)	8.5	7.5	8.2	7.2	6.5	5.5	6.2	5.2	4.5	3.5	4.2	3.2	2.4	1.4	2.2	1.2
	Terminal point (GND)	8.6	7.6	8.3	7.3	6.6	5.6	6.3	5.3	4.6	3.6	4.3	3.3	2.6	1.6	2.3	1.3
Status indicator	LED	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1

For the assignment of the illustrated (byte.bit) view to your INTERBUS control or computer system, please refer to the DB GB IBS SYS ADDRESS data sheet.

For the assignment of the illustrated (byte.bit) view to controllers of other bus systems, please refer to the AH IB IL 24 DI/ DO 16 ADDRESS document.

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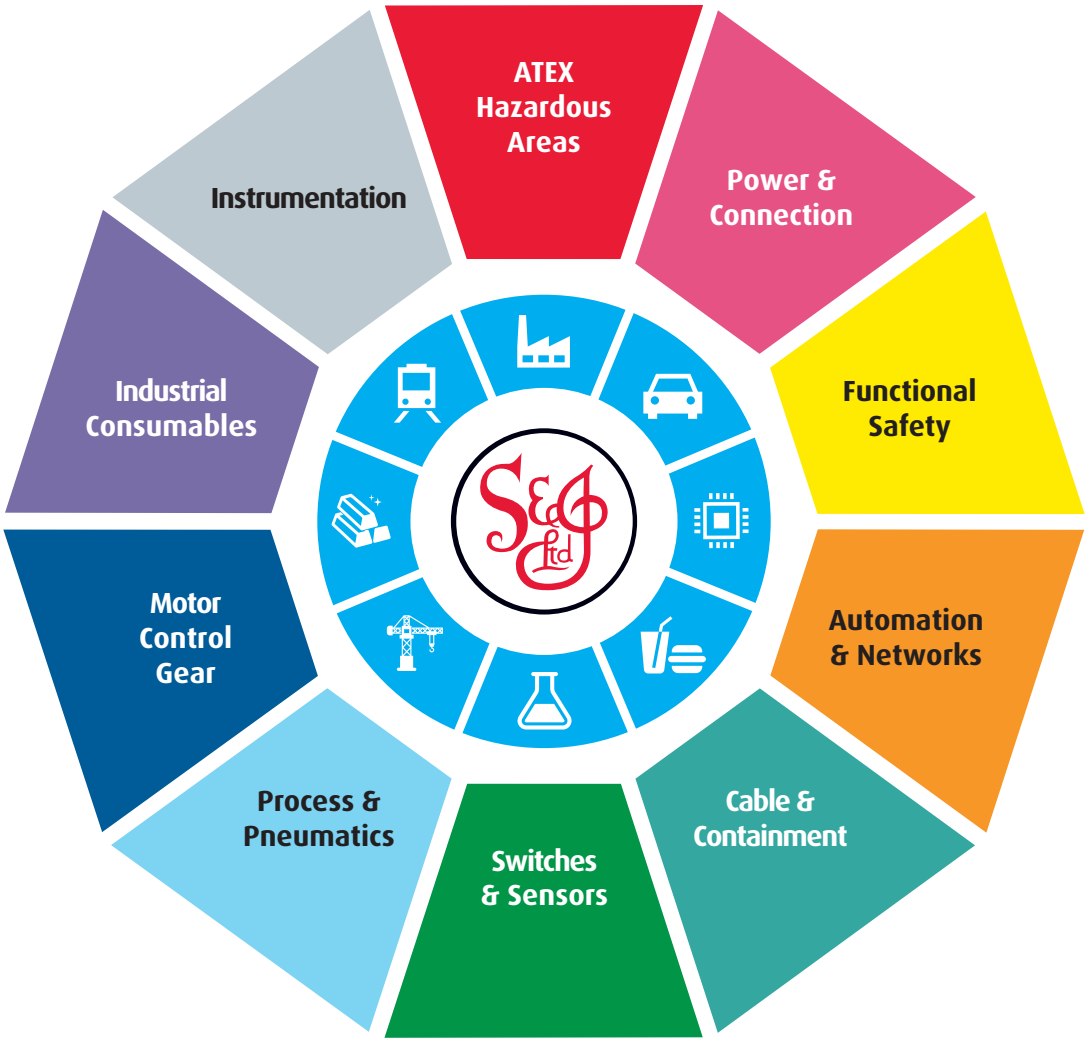

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