RAIL-STICK

USB-C DIN Rail Memory Stick with Tamper Loop and Disable Input

RAIL-STICK product photograph

Feature summary

- Ultrathin: 8.8 mm DIN rail width (1/2 TE)
- USB-C mass storage, FAT32
- Reversible USB-C connector
- Bus powered – no separate supply
- Galvanically isolated disable input (5 V–50 V)
- Tamper loop for removal detection
- 32 GB storage capacity
- Green activity LED
- Screw terminals, no tools beyond a screwdriver
- Operating range 0 °C to 70 °C

Product description

The RAIL-STICK (USB-C DIN Rail Memory Stick with Tamper Loop and Disable Input) is a USB mass storage device in a 8.8 mm (1/2 TE) DIN rail housing. It stores files inside the control cabinet, where a conventional USB stick has nowhere to sit: machine documentation, PLC backups, commissioning records or service data stay with the machine instead of with a person.

The USB-C receptacle on the front accepts the cable in either orientation. The device is bus powered and needs no separate supply. A green LED on the front indicates activity.

A galvanically isolated disable input between 5 V and 50 V suppresses the USB connection while energized, so the contents cannot be read while the machine is in a state that forbids it. A separate tamper loop runs through the device on its own terminals. Releasing them to take the device out of the cabinet breaks the loop, so a PLC input registers the removal.

Specification overview

Description	Value
Storage	
Interface	USB 2.0
Connector	Type-C
Capacity	32 GB
File system	FAT32
Supply	
Source	USB bus powered
Voltage	5 V
Current	$\leq$ 55 mA
Disable input	
Voltage	5–50 V_{dc}
Isolation	yes
Reverse polarity	protected
Mechanical	
Dimensions WxHxD (mm)	8.8 x 88.4 x 58

Ordering information

Order code	Default Output
RAIL-STICK-32Gb	32 GB – USB-C
Customisation available. Contact DPS.	

Engineering standards

Applied engineering standards	
EN 55032	EN 55035
EN 61000-4-2	EN 61000-4-3
EN 61000-4-4	EN 61000-4-5
EN 61000-4-6	EN 61000-4-8

1 Functional description

1.1 Overview

The RAIL-STICK (USB-C DIN Rail Memory Stick with Tamper Loop and Disable Input) is a USB mass storage device in a 8.8 mm (1/2 TE) DIN rail housing. It stores files inside the control cabinet, where a conventional USB stick has nowhere to sit: machine documentation, PLC backups, commissioning records or service data stay with the machine instead of with a person.

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A galvanically isolated disable input between 5 V and 50 V suppresses the USB connection while energized, so the contents cannot be read while the machine is in a state that forbids it. A separate tamper loop runs through the device on its own terminals. Releasing them to take the device out of the cabinet breaks the loop, so a PLC input registers the removal.

1.2 Internal structure

The device is bus powered: the USB supply reaches the mass storage controller through a current-limited power distribution switch, and that switch is also the point at which the disable input acts. While the disable input is energized the switch is held off, the controller has no supply and the device does not enumerate. The optocoupler of the disable input is the only connection between the external control circuit and the USB side; the tamper loop is a passive bridge between its own two terminals and is connected to neither. The USB data lines and the bus supply are protected by ESD suppressors at the connector; the memory card and the green activity LED are driven by the storage controller.

1.3 Storage

The RAIL-STICK presents itself to the host as a USB 2.0 mass storage device. No driver is required on Windows, Linux or macOS. The medium is delivered formatted as FAT32 and is read/write by default.

1.4 Disable input

The disable input suppresses the USB connection of the RAIL-STICK. It behaves as follows:

- **Not energized (open or 0 V):** the device enumerates normally and behaves as an ordinary USB mass storage device.
- **Energized (5 V–50 V, correct polarity):** the device does not enumerate. A host that is already connected loses the drive; a host connected while the input is energized never sees a drive at all.
- **Returning to 0 V:** the device enumerates again after the host re-detects it. Stored data is unaffected.

The input is current driven: an internal constant current source supplies the optocoupler with typically 5 mA, so the input current is nearly independent of the applied voltage and no external series resistor is required. The input is protected against reverse polarity; applying the voltage the wrong way round does not damage the device, it simply does not disable it.

The disable input is not a security function. It suppresses the USB connection, it does not encrypt or erase the stored data. Anyone with physical access to the device can remove it and read the medium elsewhere.

1.5 Tamper loop

The two terminals marked **SHORT** are connected to each other inside the device and form a passive loop. The loop carries no internal electronics and no supply: it is wired into an external monitoring circuit – a PLC digital input, an alarm loop or a door-contact chain – which sees a closed contact for as long as the device is wired in.

Removal becomes detectable because the loop has to be undone to remove the device. Both loop conductors are screwed into terminals on the RAIL-STICK itself, so taking it out of the cabinet means releasing them, and the external circuit goes open. There is no switch inside the device that opens by itself: unclipping the device from the rail while leaving the loop wired does **not** break it. What the monitoring circuit detects is that the wiring has been released.

- The loop is **passive**. It does not influence the operation of the RAIL-STICK itself, and the device continues to work with the loop open.
- The loop is **galvanically separate** from the disable input and from the USB side: its two terminals are joined to each other and connect to nothing else inside the device. It may be wired into a circuit up to the terminal ratings given in Section 3.
- Evaluating the loop and reacting to it is the responsibility of the external system.

1.6 Protections

The following protections are in place:

- **Disable input reverse polarity:** the disable input may be connected in reverse polarity up to 50 V without damage.
- **Disable input isolation:** the disable input is coupled to the internal circuit by an optocoupler, so the external control voltage shares no reference with the USB side.
- **USB ESD protection:** the data lines and the bus supply are protected by ESD suppressor diodes at the connector.
- **Current-limited internal supply:** the internal supply of the storage controller is fed through a current-limited power distribution switch, so a fault inside the device cannot load the host port beyond its limit.

1.7 Galvanic isolation

The USB side and the disable input of the RAIL-STICK are separated by an optocoupler. The tamper loop is galvanically separate from both: its two terminals are joined to each other and connect to nothing else inside the device.

- The optocoupler carries the isolation between the USB side and the disable input. The maximum isolation voltage declared for the device is given in Section 3.
- The disable input must be operated from a SELV or PELV circuit.
- The tamper loop may carry the voltage and the current stated in Section 3.

1.8 Safety Information

Read this section before installing or operating the device.

- The device must be installed and commissioned by **qualified electrical personnel** only.
- The supply of the disable input **must** be disconnected and secured against being switched on again before any wiring work is carried out on the device.
- The device **must not** be opened, modified or repaired. It contains no user serviceable parts, and opening it voids conformity.
- The device is intended for installation in a **closed control cabinet or enclosure** for indoor use. It carries no declared IP rating and **must not** be exposed to moisture, condensation, dust or outdoor conditions.
- The device **must not** be operated outside the disable input voltage and ambient temperature limits stated in Section 3. These are absolute limits, not recommendations.
- The RAIL-STICK is **not** a data security product. It provides no encryption, no authentication and no verified erase. Do not store data on it whose disclosure must be prevented by the device itself.

1.9 Ordering Information

The following ordering options are available.

Ordercode	Description	EAN	Weight	HS-Code	Origin
RAIL-STICK-32Gb	32 GB | USB-C	4262542250350	32 g	8523511000	Germany
Customisation available. Contact DPS.					

Table 1: Ordering information of the RAIL-STICK.

2 Pinout

The connections of the RAIL-STICK are shown in Figure 1. All connections are on the two screw terminal blocks and on the front panel; the device has no other user accessible contacts.

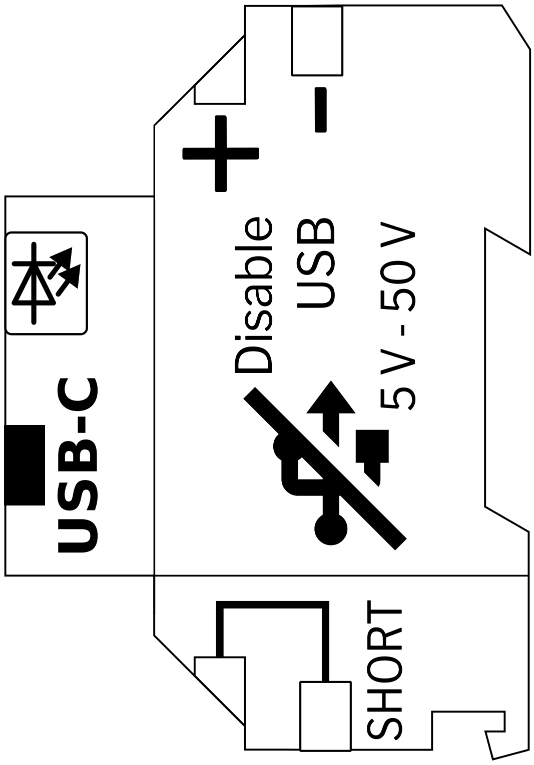

Figure 1: Connection diagram of the RAIL-STICK. Schematic front view, not to scale.

Pin	Functional description
Terminal block, top	
Disable +	Positive disable input pin (5 V–50 V). USB is suppressed while energized.
Disable –	Negative disable input pin (reference of the disable input).
Terminal block, bottom	
SHORT	Tamper loop. The two SHORT terminals are bridged inside the device.
Front panel	
USB C	USB 2.0 Type-C receptacle. Data and bus supply. Reversible – either cable orientation works.
LED	A green LED indicates that the device is powered and shows memory card access.

3 Specification

The specification is given in Section 3.2. If not otherwise specified the following parameters have been used: T_{amb}=25°C.

3.1 Comments on the Specification

Where a figure is not a plain measurement of the assembled device, this section says where it comes from and what it does not cover.

The current consumption figures are the typical values of the storage controller taken from its component datasheet, plus the rated memory card supply. They are **not** measured on the assembled device. All bus currents are referred to V_{BUS} at the USB-C receptacle.

The throughput figures **are** measured on the assembled device, sequentially with 1 MiB blocks at queue depth 1. They are typical values for one specimen at room temperature. Section 4.2 gives the method and shows how the rate depends on block size, queue depth and time – at 4 kB blocks the device is roughly ten times slower than the figures below.

The disable input is isolated from the USB side by an optocoupler. The isolation voltage in the table is the maximum declared for the device between the USB side and the disable input. It is **not** the withstand voltage of the optocoupler, which is higher.

The tamper loop is galvanically separate from every other circuit in the device: its two terminals are joined to each other and connect to nothing else. The figures given for it are the ratings of those terminals.

3.2 Specification Table

	Min	Typ	Max	Unit
USB-Schnittstelle **USB Interface**				
Anschluss Connector	USB Type-C, reversible			
USB-Spezifikation USB specification	USB 2.0 high speed			
Übertragungsrate (Bus) Bus data rate			480	Mbit/s
Geräteklasse Device class	Mass Storage Class 1.0			
Treiber Driver	none (Windows, Linux, macOS)			

	Min	Typ	Max	Unit
Speicher **Storage**				
Speichermedium Storage medium	microSDHC memory card			
Kapazität Capacity	32 GB			
Dateisystem (Auslieferung) File system (as delivered)	FAT32			
Datendurchsatz Lesen Read throughput		32		MB/s
Datendurchsatz Schreiben Write throughput		26		MB/s
Versorgung **Supply**				
Versorgungsart Supply type	USB bus powered			
Busspannung Bus voltage	4.75	5	5.25	V_{dc}
Controllerstrom Leerlauf Controller current, idle		45		mA
Controllerstrom aktiv Controller current, active		50		mA
Controllerstrom Suspend Controller current, suspend		0.3		mA
Kartenversorgung Card supply current			200	mA
Busstrom Leerlauf Bus current, idle		45	50	mA
Busstrom aktiv Bus current, active		50	55	mA
Busstrom Suspend Bus current, suspend		0.3	5.3	mA
Deaktivierungseingang **Disable input**				
Eingangsspannung Input voltage	5		50	V_{dc}
Eingangsstrom Input current		5	10	mA
Eingangscharakteristik Input characteristic	constant current source			
Trennung Isolation	optocoupler			
Isolationsspannung Isolation voltage			100	V
Verpolungsschutz Reverse polarity protection	yes			
Wirkung Effect	USB suppressed when energized			

	Min	Typ	Max	Unit
Sabotageschleife **Tamper loop**				
Ausführung Design	passive bridge, two terminals			
Max. Schleifenspannung Max. loop voltage			400	$V_{ac/dc}$
Max. Schleifenstrom Max. loop current			8	A
Trennung Isolation	galvanically separate			
Gehäuse **Case**				
Montageform Mounting type	DIN rail TS35 (EN 60715)			
Gehäusebauform Housing style	Installation box, 1/2 TE			
Breite Width		8.8		mm
Höhe Height		88.4		mm
Tiefe Depth		58		mm
Gewicht Weight		32		g
Schutzart Degree of protection	none declared			
Sicherheitsmerkmale **Safety features**				
Verpolungsschutz Eingang Reverse polarity, disable input	yes			
ESD-Schutz USB ESD protection USB	yes, suppressor diodes			
Strombegrenzte Versorgung Current-limited supply	yes			
Galvanische Trennung Galvanic isolation	optocoupler isolation			
Betriebsbedingungen **Operating conditions**				
Temperaturbereich Temperature range	0		70	°C
Luftfeuchte Humidity	0		99	$\%_{rel}$
Betauung Condensation	not permitted			
Einsatzort Place of use	indoor, control cabinet			

Table 2: Specification of the RAIL-STICK.

4 Measurements

4.1 Measurement Conditions

The measurement conditions are noted in table 3, if not otherwise noted in the specific measurement.

	Min	Typ	Max	Unit
Supply				
USB bus voltage	4.75	5	5.25	V_{dc}
Environment				
Temperature	20	22	24	°C
Humidity	30	50	90	$\%_{rel}$

Table 3: Measurement Conditions, if not otherwise noted.

4.2 Mass Storage Throughput

Measured on one assembled RAIL-STICK with its 32 GB card, attached to a USB 2.0 host port, under the conditions of Table 3. The load was generated with `fio` 3.42 through the FAT32 file system of the device rather than against the raw block device, because that is how the product is used. Host caching was bypassed (`direct=1`), so the figures describe the device and not the RAM of the host. The test file was 3 GiB, the largest a single FAT32 file may be, and that file is also the whole address range exercised.
Disclaimer: all transfer rates and latencies in this section are **typical** values, measured on a single specimen at room temperature. They are not guaranteed minimums. The rate an installation achieves depends on the host port, the host operating system and its file system driver, the block size and queue depth of the transfer, the fill state and wear of the memory card, and the temperature. Other specimens and other conditions will give other figures.

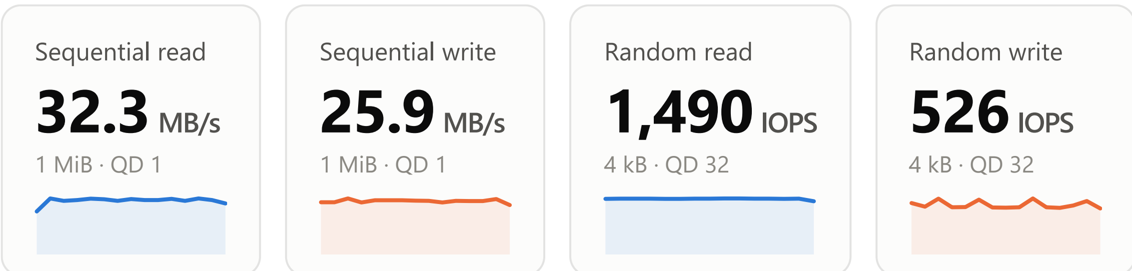

Figure 2: Headline transfer rates of the RAIL-STICK. Sequential access uses 1 MiB blocks at queue depth 1, random access 4 kB blocks at queue depth 32.

4.2.1 Bulk transfer

Moving a 1 GiB payload takes 41.6 s to write and 32.9 s to read back (Figure 3). Both transfers run at a constant rate: plotted as data moved against elapsed time the curves are straight to within the width of the line (Figure 4), so the device does not stall at one-second resolution.

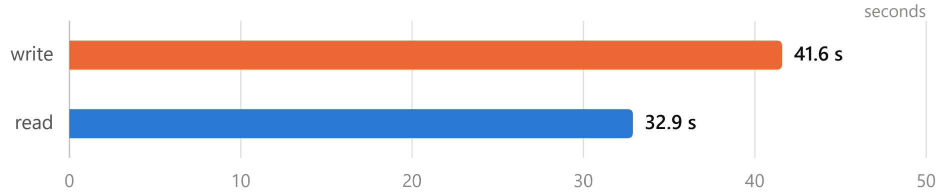

Figure 3: Time to write and to read back a 1 GiB payload, 1 MiB blocks at queue depth 1.

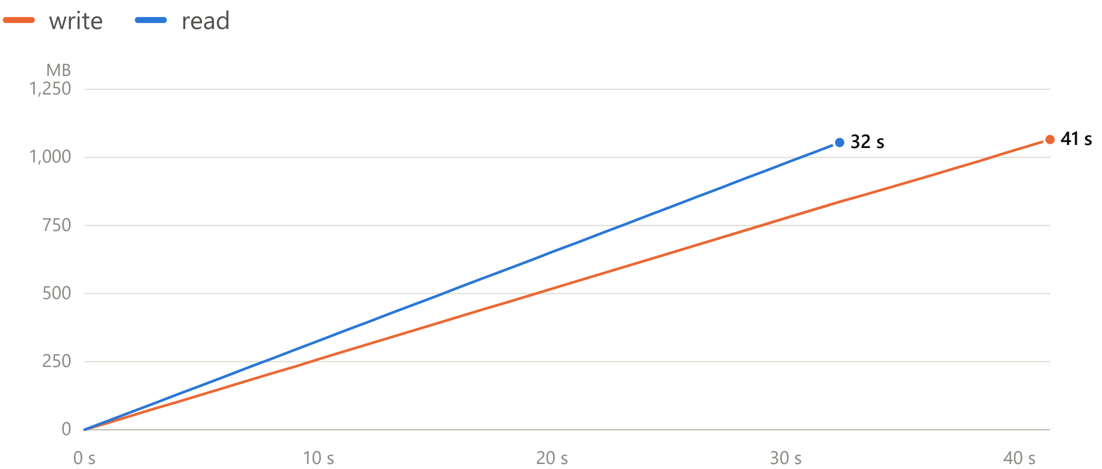

Figure 4: Data moved against elapsed time for the same two transfers. The faint straight chord behind each curve is the same payload at a perfectly constant rate; a step or a sag relative to it would be time the device spent not transferring.

4.2.2 Sustained write

Writing continuously for five minutes moves 7.7 GB at 25.8 MB/s with no downward trend and a worst one-second interval of 22.9 MB/s (Figure 5). Cards of this class often use part of their flash as a fast single-level write cache and fall back to a much lower rate once it is full; no such transition was reached after 7.7 GB of continuous writing. The measurement does not prove that no such limit exists, only that it lies beyond the volume written here.

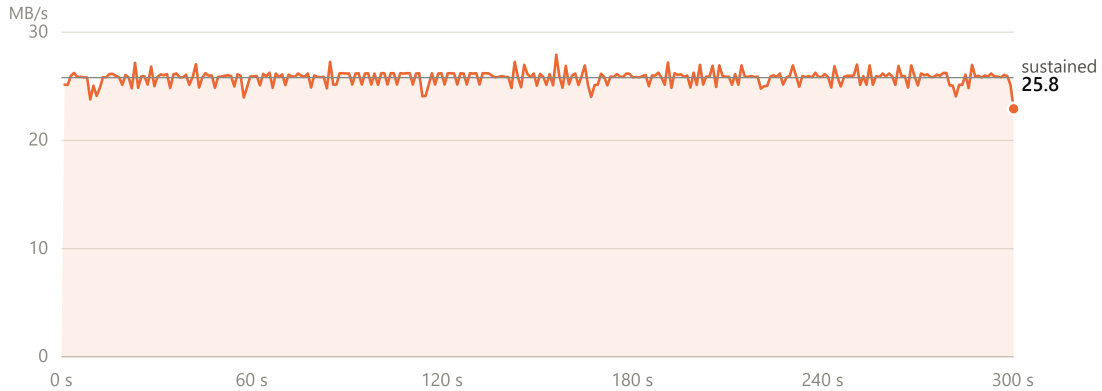

Figure 5: Sequential write rate over time, 1 MiB blocks at queue depth 1, averaged over one-second intervals. The horizontal line marks the mean of the final quarter.

4.2.3 Block size

Transfer rate depends strongly on the block size and levels off from 64 kB upwards (Figure 6). At 4 kB the per-command overhead dominates and the device reaches only 6.1 MB/s reading and 2.3 MB/s writing, against 32.8 and 25.9 MB/s at 4 MB. An application that writes many small records should buffer them into blocks of at least 64 kB; doing so is worth roughly a factor of ten on this device.

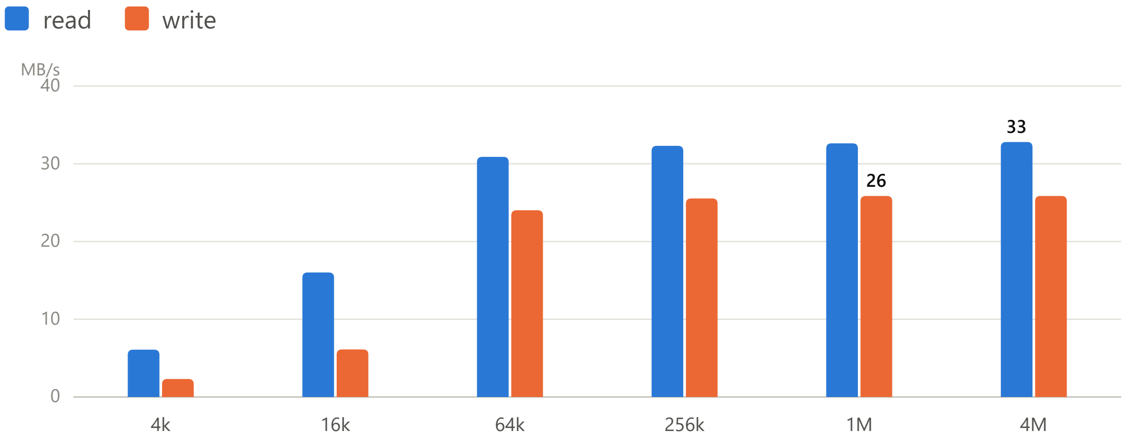

Figure 6: Transfer rate against block size, sequential access at queue depth 1.

4.2.4 Queue depth

Queuing several requests at once brings no gain: random throughput is flat from queue depth 1 to queue depth 32 (Figure 7). That is expected rather than a defect – USB Mass Storage Bulk-Only Transport carries one command at a time, so a deeper queue on the host cannot become concurrency on the device.

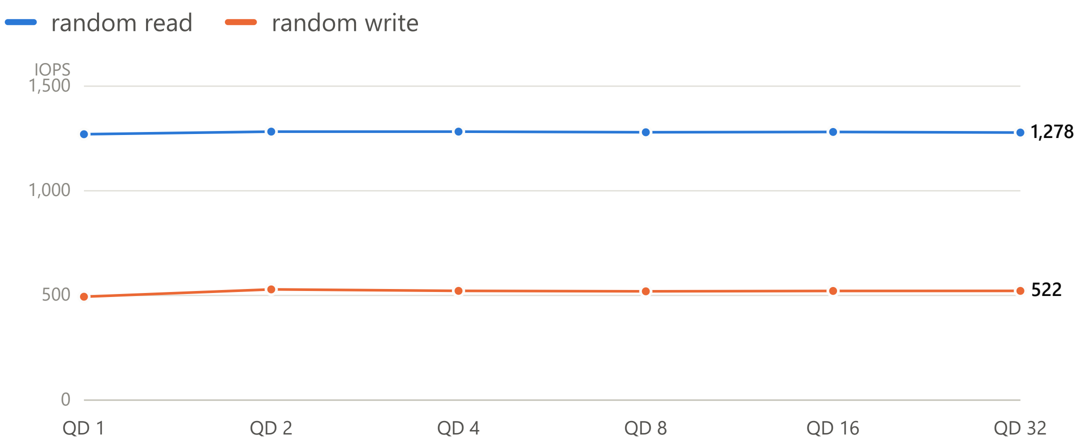

Figure 7: Random 4 kB throughput against queue depth.

4.2.5 Latency

The p99 figures in Figure 8 are the outlier edge, not the mean. The random write value of 240 ms is a consequence of the queue depth rather than of slow media: the same access pattern at queue depth 1 has a p99 of 21 ms, and because the device serves one command at a time, 32 queued requests wait behind each other. Applications that care about worst-case response should keep the queue shallow.

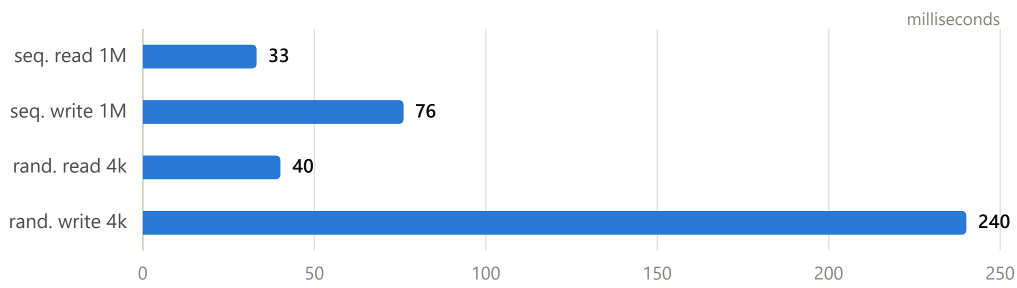

Figure 8: p99 latency of the baseline measurements: 99 % of all transfers completed within the time shown. This is the outlier edge, not the mean.

The values are typical figures for one specimen at room temperature, taken with the method described above. Section 3 carries the two sequential rates in its Typ column.

5 Case

The RAIL-STICK is housed in a half-module (1/2 TE) DIN rail enclosure. The case drawing is shown in Figure 9.

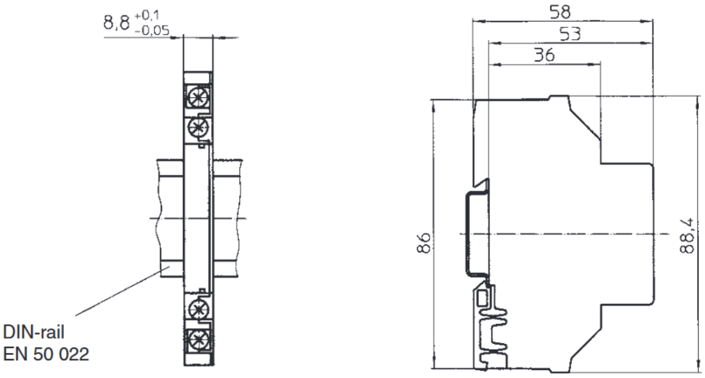

Figure 9: Case drawing of the RAIL-STICK. All dimensions in mm.

The front panel of the RAIL-STICK carries the USB-C receptacle and the green LED; the two screw terminal blocks sit at the top and at the bottom of the housing, see Figure 1.

6 Product label

The product label of the RAIL-STICK is shown in Figure 10.

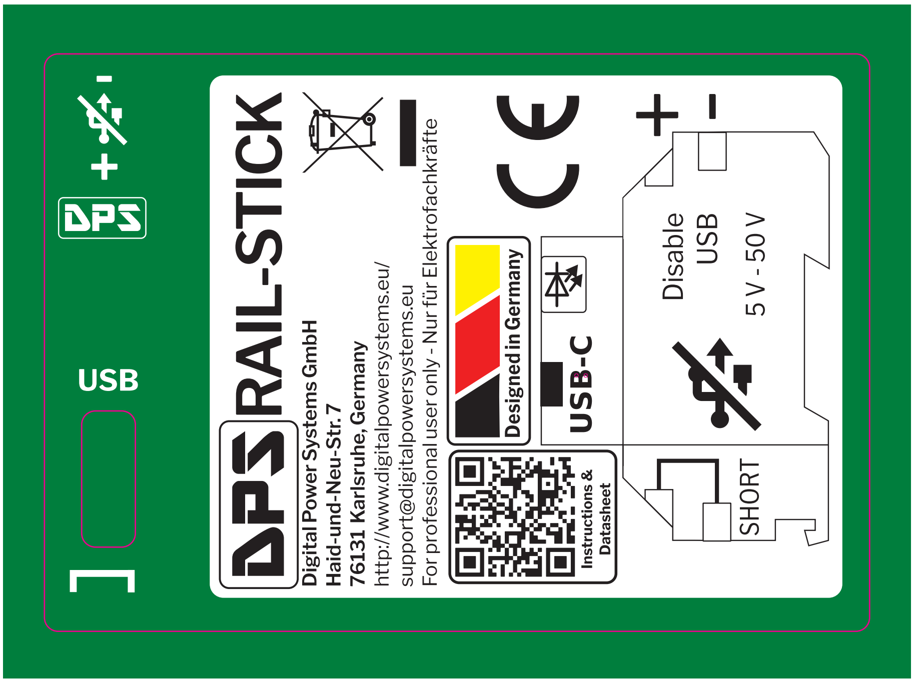

Figure 10: Product label of the RAIL-STICK.

7 Revision History

The revision history is depicted in the following table.

Date	Changes in Revision
22.9.2026	Initial release.

8 Contact Information

This is a product of the Digital Power Systems GmbH (DPS).
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Visit our website: https://digitalpowersystems.eu/

8.1 Latest version of this document

The latest revision of this datasheet, together with the EU Declaration of Conformity (`DPS-RAIL-STICK-CE.pdf`), is available on the product page: https://digitalpowersystems.eu/din-rail-stick. Please check that the revision date in Section 7 matches the version published there before relying on this document.

8.2 Feedback on this document

DPS welcomes corrections and suggestions concerning this datasheet. If you find an error, an ambiguity or a missing specification, please contact us via https://digitalpowersystems.eu/contact-us/ and state the product name, the revision date of this document and the section concerned.