Operating instructions

FreeCon Contactless Power

Contactless power transmission

IE-CL240W-PP-BASE	1547440000
IE-CL240W-PP-REMOTE	1547450000

Weidmüller

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Contents

1 Safety

1.1 General safety notifications

– Work on the FreeCon product may only be performed by qualified electricians with the support of trained persons. As a result of their professional training and experience, an electrician is qualified to perform the necessary work and identify any potential hazards. A qualified electrician must dimension the cables.

– Before any work is carried out on the FreeCon product the power supply must be switched off and secured against being switched on again.

– The surface temperature of the FreeCon products can exceed 70°C depending on application. To avoid unintentional touch, install a mechanical barrier or a conspicuous security advice.

– A power supply with secure isolation must be used to power the base.

– If faults on a FreeCon product cannot be rectified using the recommended measures, the product concerned must be sent to Weidmüller. Weidmüller assumes no guarantee if the device is tampered with!

– During operation, steps must be taken to ensure that no metallic objects can enter the air gap between the base and remote.

1.2 Intended use

The FreeCon Contactless power system is designed to provide a contactless electromagnetic connection in an industrial environment. The housings comply with IP65 protection. Any other usage is not permitted and may lead to accidents or destruction of the device. The observance of the supplied documentation is part of the intended use.

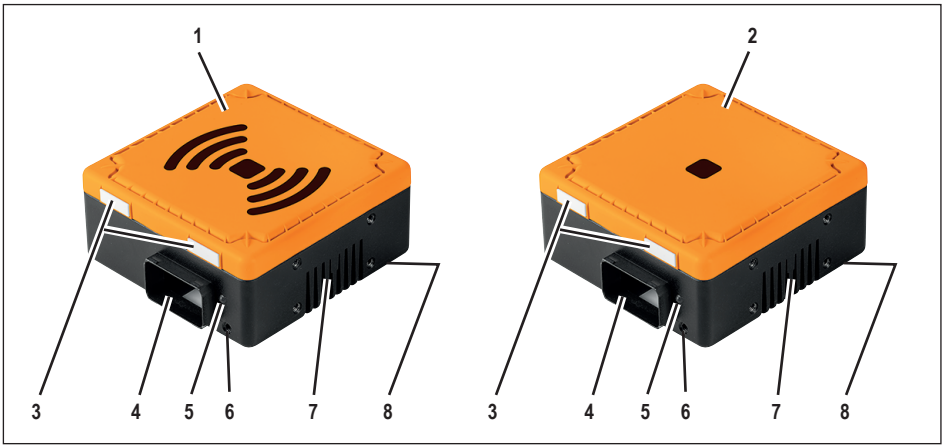
1.3 Conformity with EU directives

The product complies with the EMC directive 2004/108/EC. Weidmüller will provide the CE Declaration of Conformity upon request.

2 Product description

2.1 Device description

The FreeCon Contactless power system (FCP system) consists of a base and at least one remote.



Device overview

1 Base (transmitter)
2 Remote (receiver)
3 Marker (stuck on)
4 PushPull powerport (for PROFINET-compliant connectors)
5 Status LED
6 Earthing connection
7 Cooling fins
8 Type plate

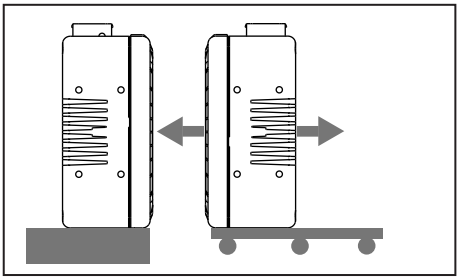
FCP systems are used wherever conventional plug-in connectors are subject to substantial wear and tear (e.g. through frequent plugging cycles, contact erosion, bent contacts), as well as with applications where the energy supply is to be automated.

2.2 Functional description

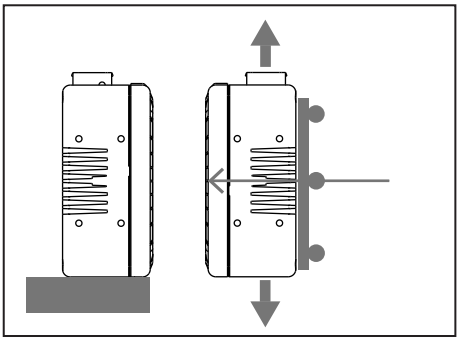
The base with a connected power source transmits electric power to the remote to which a load is connected. The transmission is contactless even over an air gap of max. 5 mm. The two FCP elements can be brought closer together axially, vertically and horizontally. Power can be transmitted even during rotation (rotational axis = centre-point axis).

During usage with a PLC, the voltage on the remote can be switched on and off from the base.

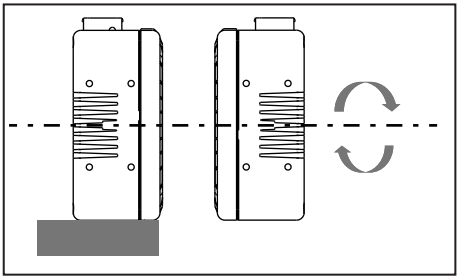
2.3 Usage possibilities



Linear approximation, frontal



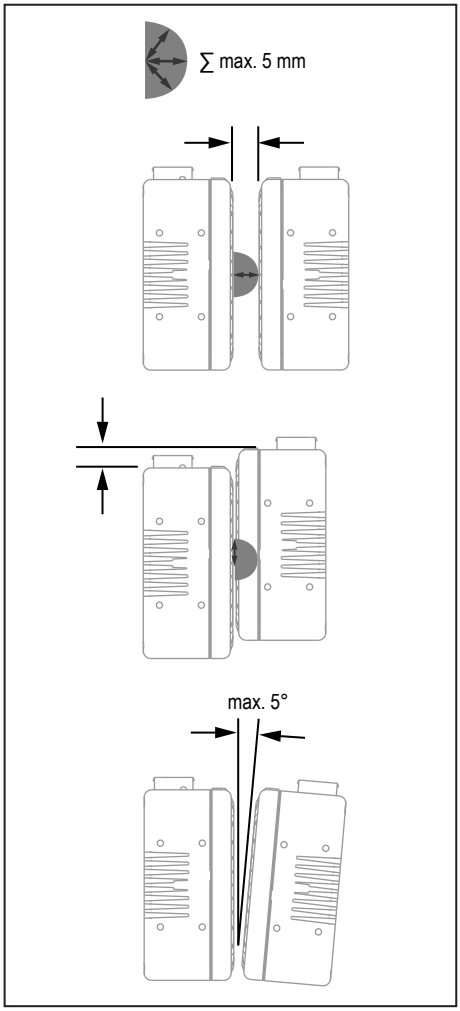
Linear approximation, side



Rotating approximation, frontal

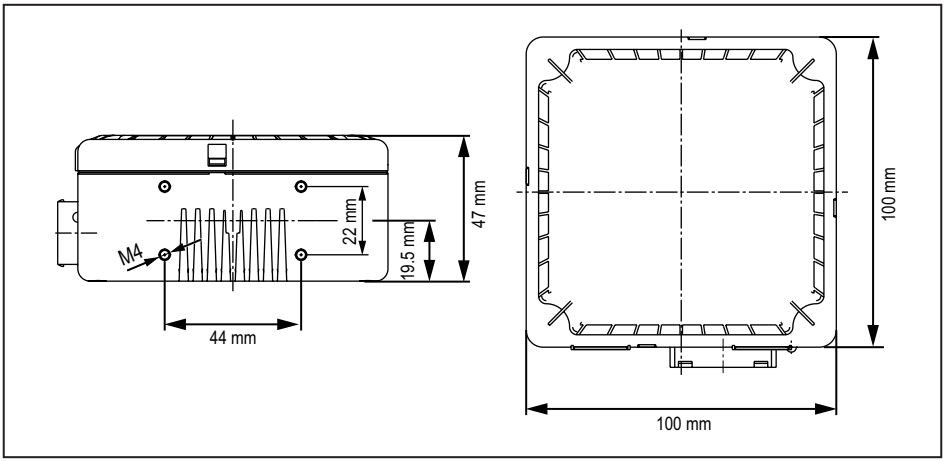
The best efficiency is achieved with as small an air gap as possible and minimal centre offset.

The sum of air gap and centre offset must not exceed 5 mm!



Maximum permissible distance or offset

2.4 Dimensions



Dimensions

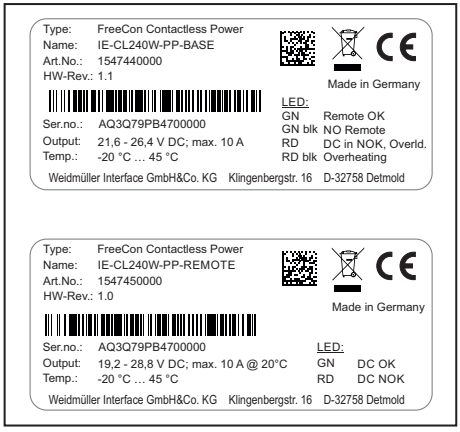
2.5 Included in delivery

– IE-CL240W-PP-BASE (Order No. 1547440000)
  Base with protective cap for transporting on PushPull Powerport, operating instructions
– IE-CL240W-PP-REMOTE (Order No. 1547450000)
  Remote with snap ferrite and protective cap for transporting on PushPull Powerport

2.6 Accessories

– Plug-in connector IE-PS-VAPM-5P-2.5 (Order No. 2465440000)
– Marker ESG 6/17 K MC NE WS (Order No. 1880120000)

2.7 Type plate



Type plates for base and remote

3 Installation and connections

WARNING

Possible danger to life!

► Disconnect the power supply and secure it against being switched on again.

ATTENTION

Material damage possible!

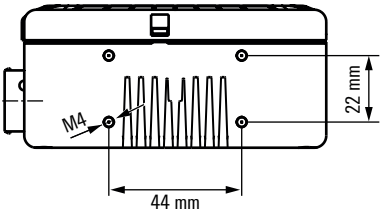
If metallic objects get into the air gap between the base and remote during operation, this may cause heating and damage to the plastic cover.

► Select the installation site so that no metallic objects can get into the air gap.

3.1 Installation

Each FCP element can be secured using one of the three long sides with no connections.

► Secure each element using four M4 bolts (hole dimensions see below, thread depth of the holes 8 mm).



Hole dimensions

The best efficiency is achieved with as small an air gap as possible and low centre offset.

Depending on the application (power/air gap/ambient temperature) the installation site must be designed in such a way that the heat produced is dissipated (e.g. installing on a metal sheet, heat sink or similar).

3.2 Power connection

ATTENTION

Material damage possible!

If the power exceeds the maximum permissible value, this may cause the wiring to overheat, which will cause serious damage to your devices and equipment.

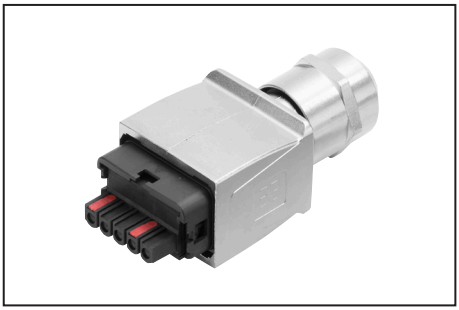
► Calculate the maximum current generated in the individual cables. Note all relevant regulations governing the maximum permissible current for each wire cross-section.

Take the following into account during installation:

– Use a power supply with secure isolation to power the base!

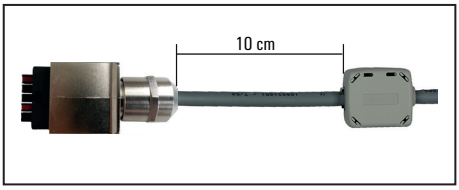
– All cables must have a sufficient core cross-section, which depends on the current demand and the cable lengths. We recommend using cables with a cross-section of at least 1 mm².

– The plug-in connector IE-PS-VAPM-5P-2.5 (accessories) is designed for the range 0.75 ... 2.5 mm².



IE-PS-VAPM-5P-2.5 connector

► Attach the included snap ferrite on the remote cable at a distance of approximately 10 cm from the connecting plug.



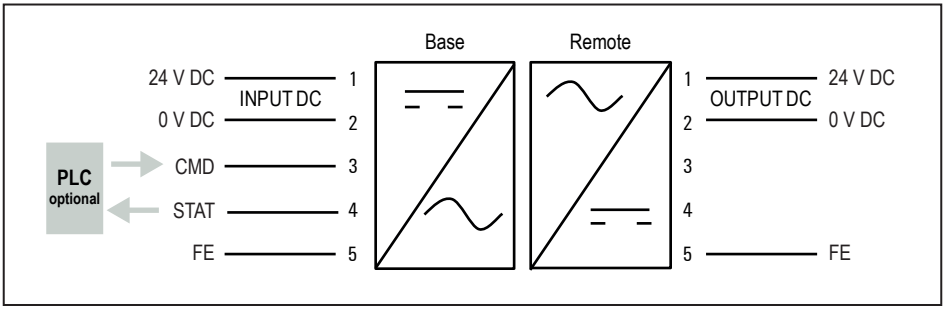
Assembled snap ferrite

3.3 Earthing

As an option, the FCP system can be earthed via an M4 bolt with a toothed washer using the particular blind hole on the housing side with the power connection.

3.4 Pin assignment for power connector

Pin	Base		Remote	
1	L1	24 V DC (US1+)	L1	24 V DC (US1+)
2	N1	0 V DC (US1-)	N1	0 V DC (US1-)
3	CMD; command from PLC (optional)			
4	STAT; status to PLC (optional)			
5	Functional earth (FE)		Functional earth (FE)	



Block diagram for contactless power transmission

3.5 Switching functions and status alerts

In order to disable the transmission, Pin 3 must be set to 0 V. For this reason, either an N-switching module or a relay module must be used when operating with a PLC. P-switching modules must not be used!

Pin 3: Switching function

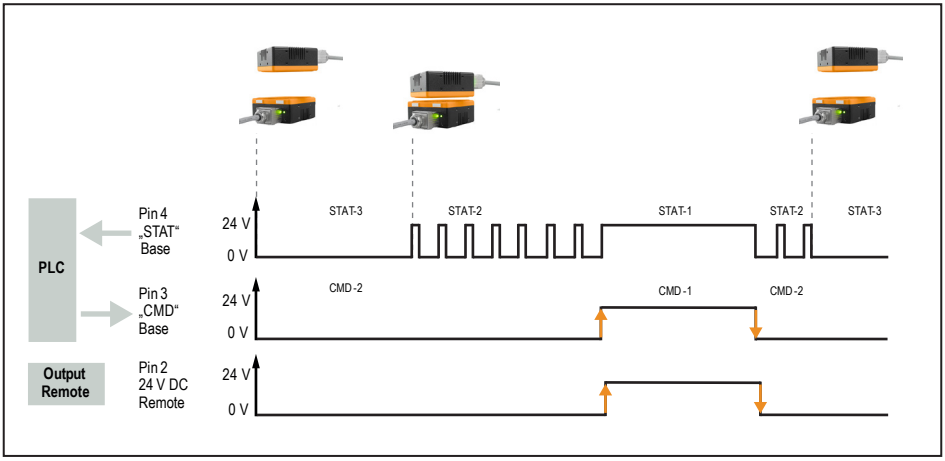
Function	Pin 3 (Base)	Description	Comment
CMD-1	24 V	Power transmission enabled if a valid remote is detected.	This state also applies if Pin 4 is not connected.
CMD-2	0 V	Power transmission **disabled**	„Pin must be set from external to “Low”. (Open collector)“

Pin 4: Status alerts

Function	Pin 4 (Base)	Description	Comment
STAT-1	24 V	Valid remote detected, power transmission is enabled	Open Collector output
STAT-2	24 V 10/30 ms puls	Valid remote detected, power transmission is disabled	
STAT-3	0 V	Invalid remote, power transmissi-on is disabled	

If Pin 3 and 4 of the base are not assigned, the power is switched through as soon as the remote is in the range <5 mm to the base.

The following diagram shows the signals of Pins 3 and 4 if these are interconnected and triggered, as well as the output voltage of the remote.



Signal path and output characteristics

4 Status indicators and maintenance

4.1 LED indicators

There is a status LED on each FCP element next to the PushPull Powerport.

Status LED

Status LED on the base

Status LED	Meaning	Recommended action
Flashes green	Input voltage OK, no remote coupled (STAT-3)	
Flashes green intermittently	Remote is repeatedly coupled and decoupled (pulses)	Reduce centre offset between base and remote to <5 mm
Lights up green	Input voltage OK, remote coupled (STAT-1)	
Lights up red	Input voltage not OK or overload	Check input voltage Check load for short-circuit
Flashes red	Over-temperature (>85 °C)	Improve heat dissipation or incorporate ventilation Reduce connected load

Status LED on the remote

Status LED	Meaning	Recommended action
Lights up green	Output voltage OK	
Lights up red	Output voltage not OK, current limiting enabled	Reduce connected load

4.2 Maintenance

Clean the surfaces of the FCP elements with a dry or moist cloth. Do not use cleaning agents that contain acetone.

5 Technical data

Electrical data	
Input voltage	21.6…26.4 V DC (24 V DC ±10 %)
Output voltage	19.2…28.8 V DC (24 V DC ±20 %)
No-load current, base	Approx. 40 mA (without remote) Approx. 260 mA (remote without load)
Power connection	PushPull Power plug-in connector (as per PROFINET specification)
Reverse polarity protection	Yes
Overload protection	Yes (>12 A)
Max. load current, remote	10 A (12 A for 50 ms); consider derating, see Annex
Max. power	240 W; consider derating, see Annex
Turn-om time, base	1 s
Coupling time, remote	< 500 ms
Efficiency	Max. 91 %
Operating frequency	Approx. 55 kHz
Mechanical specifications	
Housing main material	Diecast zinc, painted, PBT plastic
Protection degree	IP65 as per DIN EN
Dimensions	100 mm x 100 (108) mm x 47 mm
Weight	1,020 g (per FCP element)
Type of mounting	Four M4 bolts (blind hole depth 8 mm)
Air gap	0…5 mm; consider derating, see Annex
Centre offset	± 5 mm
Angle offset	max. 5°
Coupling range	5...7 mm
Decoupling range	10...18 mm
Environmental conditions	
Ambient temperature (operational)	-20…+45 °C; consider derating, see Annex
Storage temperature	-40…+85 °C
Relative humidity	5...95 %, no condensation

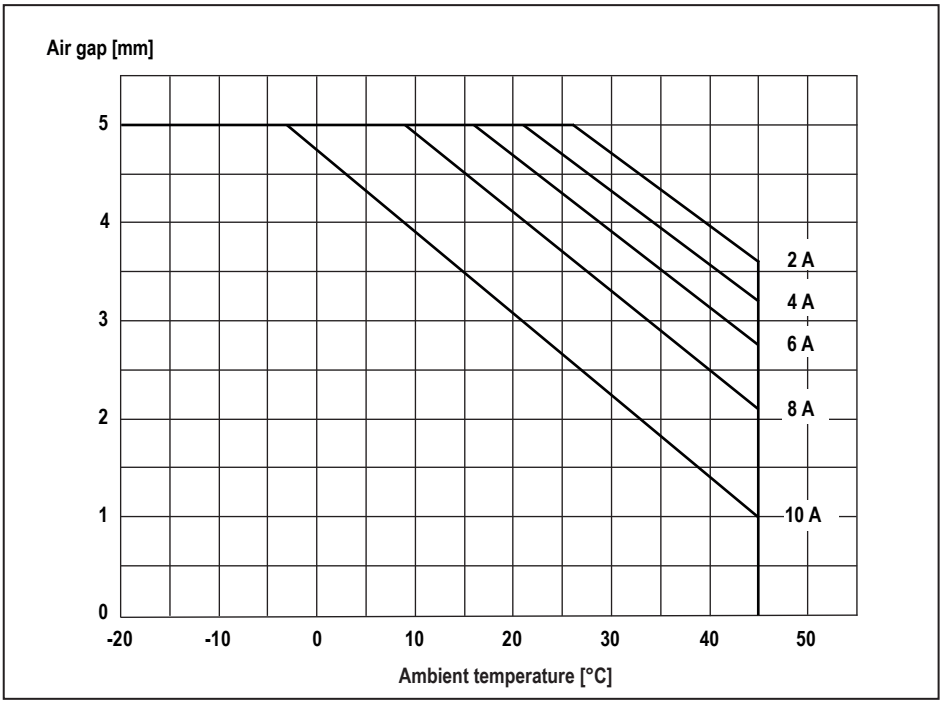
Standards / approvals	
UL	In preparation
EMC / Emissions	EN 61000-6-4, Class A (09/2011)
EMC / Electrostatic discharge immunity	EN 61000-4-2, Criteria B (12/2009)
EMC / Radiated, radio-frequency, electromagnetic field immunity	EN 61000-4-3, Criteria A (04/2011)
EMC / Electrical fast transient/burst immunity	EN 61000-4-4, Criteria A (04/2013)
EMC / Surge immunity	EN 61000-4-5, Criteria B (06/2007)
EMC / Immunity to conducted disturbances	EN 61000-4-6, Criteria A (08/2014)
EMC / Immunity to magnetic fields	EN 61000-4-8, Criteria A (11/2010)
Vibrations	DIN EN 60068-2-6 (10/2008)
Shock	DIN EN 60068-2-27 (02/2010)
CCC	Products with an operating voltage <24 V are exempt from approval.

Annex

Derating

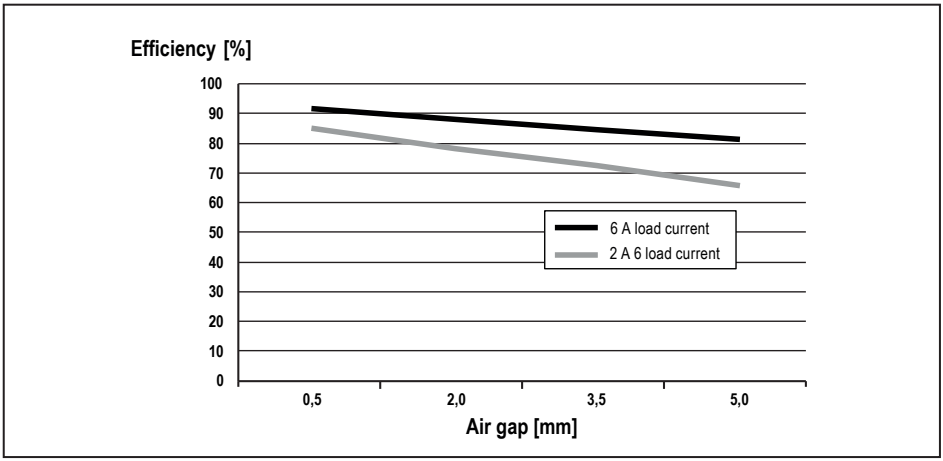
The derating curve shows the dependence of the current strength on the air gap and ambient temperature if the centre offset is 0 mm. With a centre offset >0 mm the permissible air gap or the transmissible power is reduced.

The derating figures only apply if a heat sink with 1.5 K/W or better is used during operation or comparable heat dissipation is ensured.

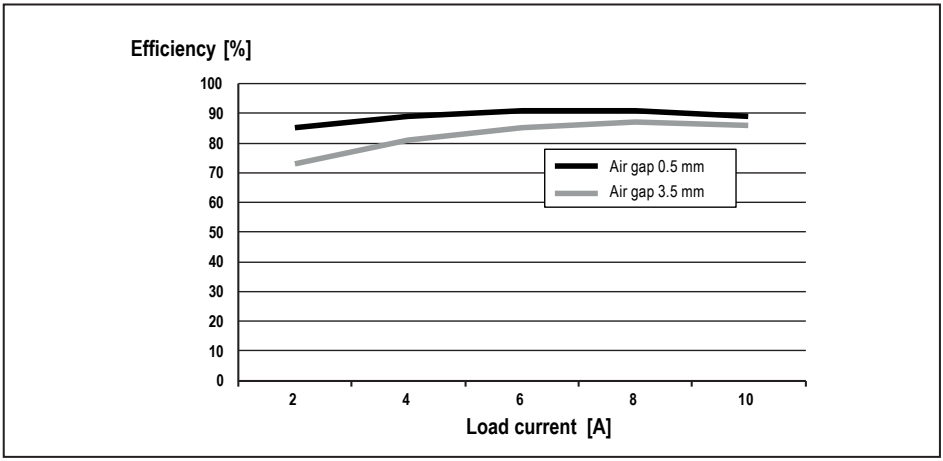


Current strength depends on air gap and ambient temperature

Dependence of efficiency on air gap or load current



Efficiency dependent on air gap (24 V DC, 15 °C)



Efficiency dependent on load current (24 V DC, 15 °C)

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