

DESCRIPTION

The Cielo series of LED drivers generate one constant current output from an AC input. Dual Dimming allows the Cielo high efficiency drivers to be used with compatible 0-10 V or TRIAC/ELV dimmers. This series is not allowed to work in standby mode and is not intended for no-load operation.

MAIN FEATURES

- 120/220-240/277 V_{AC} Input
- Dims with TRIAC and ELV dimmers at 120 V_{AC} only
- Dims with industry standard 0-10 V dimmers (108-305 V_{AC})
- Max Output Power: 10 W to 50 W
- 2 case sizes, 10 ÷ 30 W and 31 ÷ 50 W
- Efficiency up to 87 % (see table below)
- 90 °C Top case rated
- <20 % THD, >0.9 PF
- Fast start up time
- UL 8750 Approved, UL LED Class 2 outputs
- Class II isolation
- Long Life
- RoHS Compliant
- Compliance with Regulation (EU) 2019/2020 (Ecodesign)



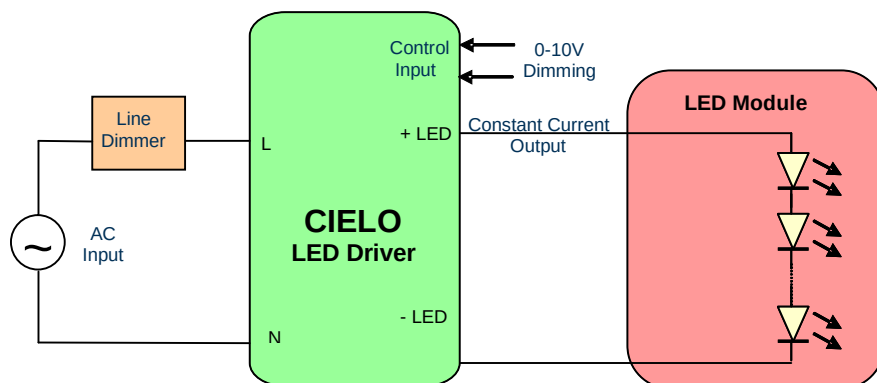
APPLICATIONS AND BENEFITS

Cielo LED drivers are designed for powering LED luminaires using standard lighting controls. Their discreet size easily fits into the space constrained LED fixtures of today's growing Commercial, Residential and Architectural lighting markets.

The modules operate with:

- Standard Light Switches
- 0-10 V Dimmers
- Triac based Incandescent Dimmers (Forward phase – leading edge)
- Electronic Low Voltage Dimmers (Reverse Phase – trailing edge)

The following diagram depicts a typical installation utilizing the CIELO:



CIELO's Dimming Options:

- Analog Dimming (0-10 V) input provides 10-100 % I_{OUT} Dimming
- AC line dimming from Triac or ELV dimmers (120 V_{AC})
- Dimming range down to less than 10 % nominal output current

MODEL CODING AND OUTPUT RATINGS

	Model Number	P _{OUT} Max (W)	I _{OUT} (mA)	V _{OUT} Min (V _{DC})	V _{OUT} Max (V _{DC})	V _{OUT} No_Load	Typical Efficiency ¹ (%)
10 to 30 W Housing							
10 – 15W	RCL010-0250A	10.5	250	24	42	50	82
	RCL015-0350A	14.7	350	24	42	50	86
	RCL015-0440A	15.0	440	24	34	44.2	83
16 – 20W	RCL020-0450A	18.9	450	24	42	50	85
	RCL020-0500A	16.0	500	21	32	41.6	84
	RCL020-0700A	16.8	700	14	24	31.2	84
21 – 30W	RCL030-0500A	21.0	500	24	42	50	86
	RCL030-0620A	26.0	620	24	42	50	86
	RCL030-0700A	22.4	700	21	32	41.6	86
	RCL030-0700B	29.4	700	24	42	50	86
	RCL030-0900B	28.8	900	21	32	41.6	85



	Model Number	P _{OUT} Max (W)	I _{OUT} (mA)	V _{OUT} Min (V _{DC})	V _{OUT} Max (V _{DC})	V _{OUT} No_Load	Typical Efficiency ¹ (%)
31 to 50 W Housing							
31 – 40W	RCL040-0700B	39.2	700	40	56	60	87
	RCL040-0800A	33.6	800	24	42	50	87
	RCL040-0900A	37.8	900	24	42	50	87
41 – 50W	RCL050-1050A	44.1	1050	24	42	50	86
	RCL050-1200A	50.4	1200	24	42	50	87
	RCL050-1400A	44.8	1400	21	32	41.6	85
	RCL050-1400B	47.6	1400	24	34	44.2	86



Table 1: LED Driver Ratings

¹ at max load, 230V_{AC}

INPUT SPECIFICATIONS

Specification	Test Conditions / Notes	Min.	Nominal	Max.	Units
AC Input Voltage		108	120-277	305	V _{AC}
Input Frequency		47	50/60	63	Hz
Input Current	120 V _{AC} (10-30 W models)	-	-	0.35	A
	120 V _{AC} (31-50 W models)	-	-	0.70	A
Inrush Current (peak)	120 V _{AC} Half Value time: 200 µs	-	-	6	A
10-30 W models	230 V _{AC} Half Value time: 150 µs	-	-	12	A
	277 V _{AC} Half Value time: 150 µs	-	-	15	A
Inrush Current (peak)	120 V _{AC} Half Value time: 200 µs	-	-	7	A
31-50 W models	230 V _{AC} Half Value time: 250 µs	-	-	12	A
	277 V _{AC} Half Value time: 250 µs	-	-	14	A
THD	120 V _{AC} Rated Load	-	-	10	%
	230 V _{AC} Rated Load	-	-	15	%
	277 V _{AC} Rated Load	-	-	20	%
Efficiency	See above (Table 1)	-	-	-	%
Power Factor	120 V _{AC} Rated Load	-	0.98	0.99	
	230 V _{AC} Rated Load	-	0.97	0.98	
	277 V _{AC} Rated Load	-	0.95	0.96	

OUTPUT SPECIFICATIONS

Specification	Test Conditions / Notes	Min.	Nom.	Max.	Units
Output Power Rating	10-30 W models	-	-	29.7	W
	31-50 W models	-	-	50.4	W
Output Voltage	10-30 W models	14	-	56	V
	31-50 W models	21	-	56	V
Output Current	10-30 W models	250	-	1100	mA
	31-50 W models	700	-	1400	mA
Ripple Current ²	I _{OUT} _Pk-pk/RMS (except for models identified in the table below)	-	-	40	%
Output Regulation		-	-	±5	%I _{OUT}
Start-up time	With no dimmer connected	-	300	500	ms

Model #	Ripple Current pk-pk/RMS (%)
RCL020-0500A	55
RCL020-0700A	50
RCL030-0700A	65
RCL030-0700B	45
RCL030-0900B	60
RCL050-1400A	70
RCL050-1400B	60

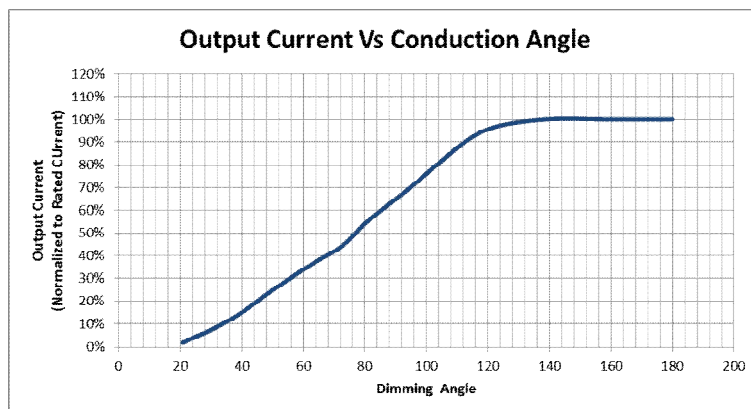
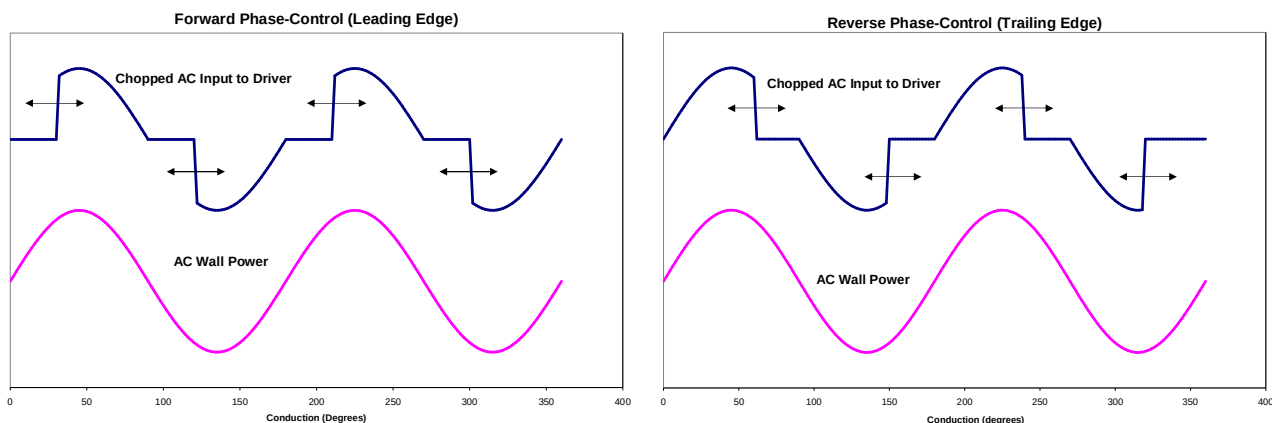
² Ripple exception table

PROTECTION FEATURES

Specification	Test Conditions / Notes	Min.	Nominal	Max.	Units
Output Short-Circuit	Hiccup, Auto recovery	-	-	-	-
Over-Temperature Top Case	The output current of the driver will be reduced in order to limit case temperature rise, Auto recovery	-	-	>90	°C
I _{OUT} Over-Shoot	During power on or power off	-	-	10	%
No Load	Unit will not exceed the V _{OUT} Max "V _{OUT} No_Load" rating	-	-	V_No_Load	V
Isolation Primary-to-Secondary	Reinforced/double Insulation meets IEC/EN61347-2-13 Class II				

LINE DIMMING

120 V_{AC} Dimming of the driver is possible with standard TRIAC based incandescent dimmers that chop the AC voltage, or with ELV dimmers. During the rapid rise time of the AC voltage when the dimmer turns on, the driver does not generate any voltage or current oscillations, and inrush current is controlled. During the on-time of the AC input, the driver regulates the output. The RMS value of the driver output current is proportional to the on-time of the AC input voltage. The RMS output current varies depending upon the conduction angle and RMS value of the applied AC input voltage.

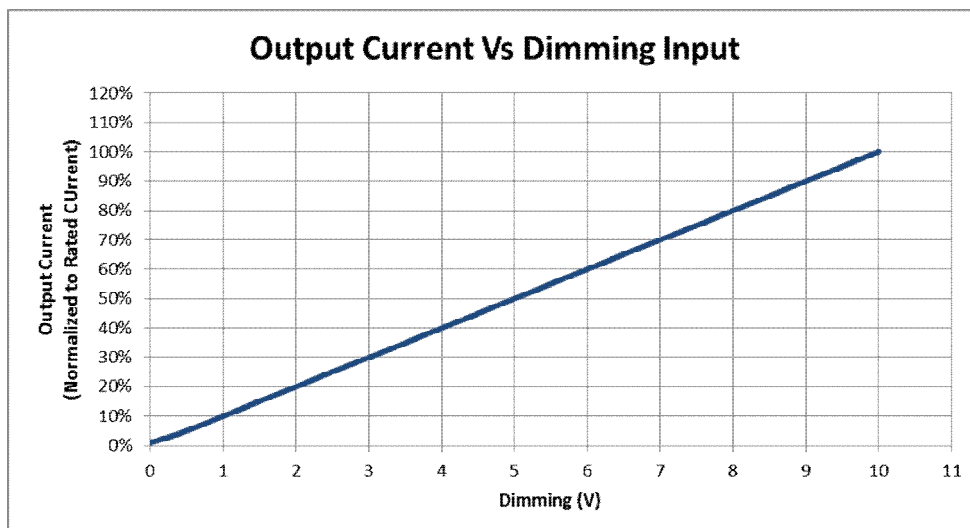


COMPATIBLE LINE DIMMERS

120 V _{AC} Dimmers only					
Mfg.	Model	Mfg.	Model	Mfg.	Model
Lutron	S-603PG	Lutron	DVELV303P	Lutron	CT103P
Leviton	IPI06-1LZ	Lutron	SELV300P	Cooper	SLC03P
Leviton	6631-2	Leviton	6683-IW	Leviton	IPE04
Lutron	DVCL-153P	Leviton	6161	Lutron	MAELV600
Lutron	DV600P	Leviton	6633-P	Lutron	FAELV500
Lutron	TGCL-153P	Lutron	TG-600P	Lightolier	ZP260QEW
Lutron	S600P	Cooper	DLC03P	Cooper	DAL06P
Leviton	VPE06	Lutron	LG600P		

0-10 V DIMMING

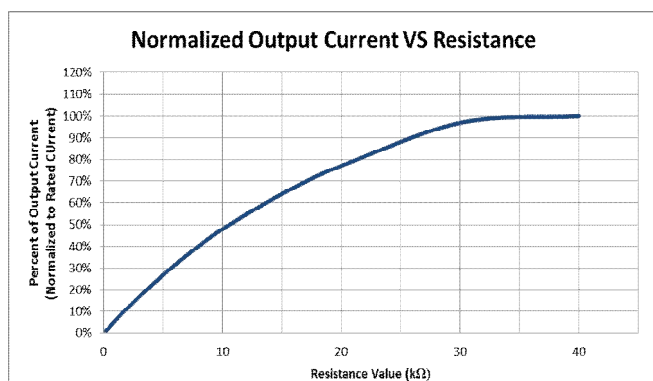
The dimming inputs (purple/pink wires) can be used to adjust the output setting via a standard commercial wall dimmer, an external control voltage source (0 to 10 V_{DC}), or a variable resistor. Any dimmer must be capable of sinking 1 mA per driver from the dimming wires. This input, permits 100 % to 1 % dimming. With the dimming input at 1 V, the output will dim to 10 % of nominal current. At a dimming input of 0.1 V, the output current shall decrease to 1 % of nominal current.



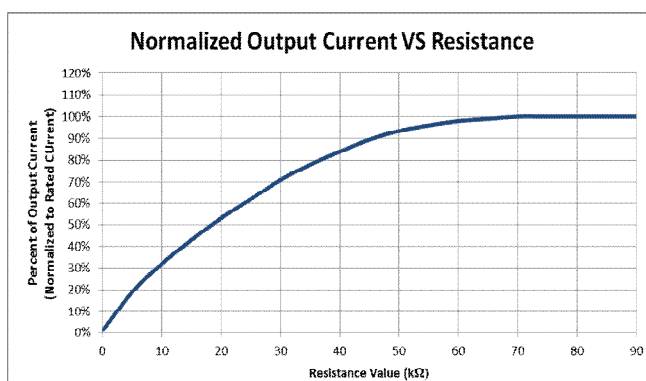
Approved Dimmers: Lutron (Nova NFTV); Lutron (Diva DDTV); Leviton (Illumatech IP710-DL)

RESISTOR DIMMING

The following graphs show the relationship between the value of the resistor connected across the dimming input versus the output current of a single driver.



Cielo 10-30 W Models



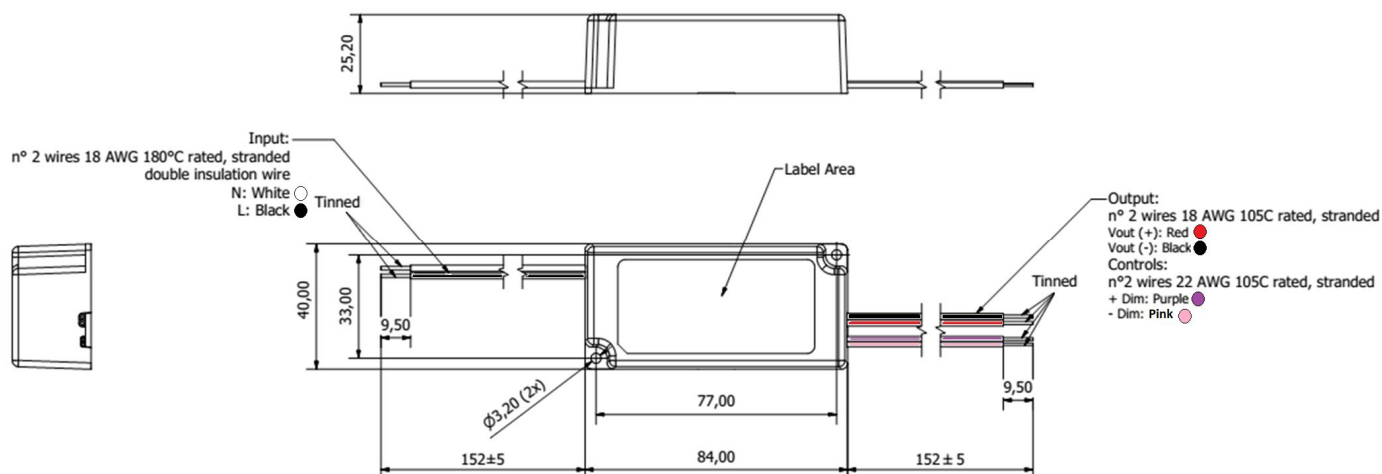
Cielo 40-50 W

DIMMING NOTES

1. The length of the dimming circuit wiring, wire size and the number of drivers connected to the dimming control must be designed so that the total voltage drop is less than 0.3 V between the drivers and the dimming control.
2. Line dimming and 0-10 V dimming interfaces cannot be used at the same time.
3. Trimming of the output current with the resistor applied on the 0-10 V wires is not permitted.

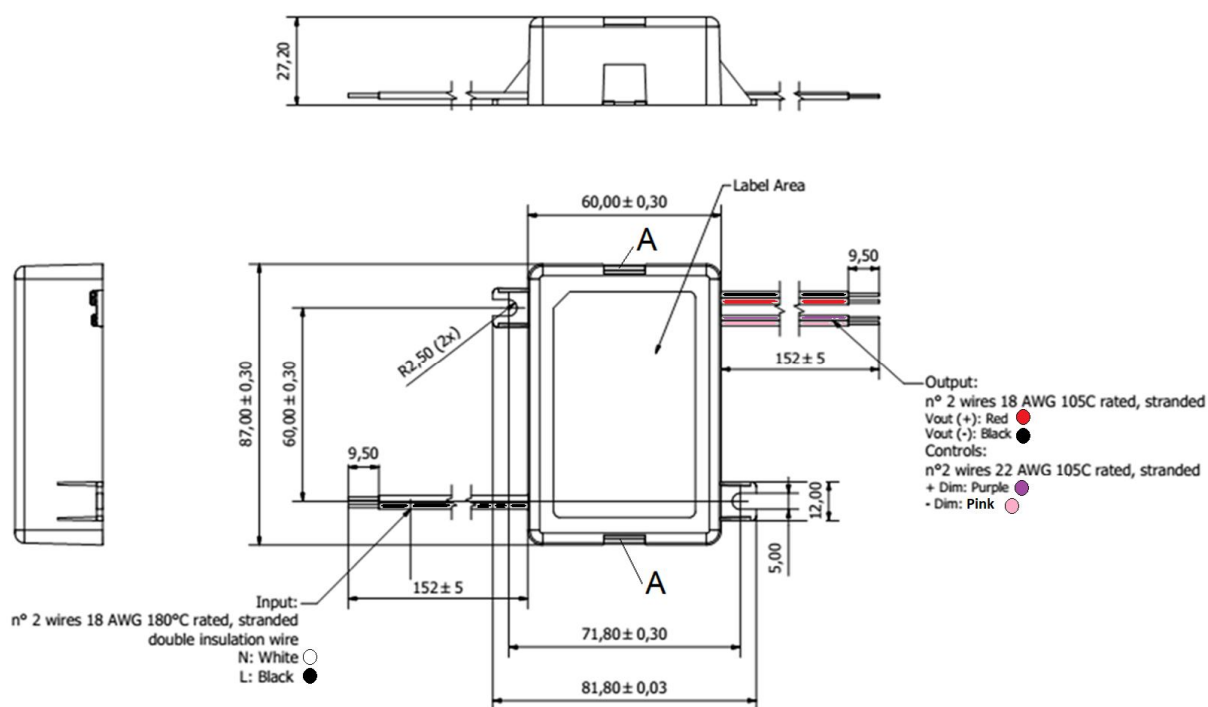
MECHANICAL DETAILS – 10 W TO 30 W MODELS (RCL010, RCL020, RCL030)

Enclosure Material: Plastic, Polycarbonate (PC), white, Sabic - LEXAN 945
I/O Connections: Flying leads
Ingress Protection: IP20, UL damp rated
Weight: 154 g (5.4 oz)
Dimensions: 84 x 40 x 25.2 mm (3.30 x 1.57 x 0.99 in)



MECHANICAL DETAILS – 31 W TO 50 W MODELS (RCL040, RCL050)

Enclosure Material: Plastic, Polycarbonate (PC), white, Sabic - LEXAN 945
I/O Connections: Flying leads
Ingress Protection: IP20, UL damp rated
Weight: 222 g (7.8 oz)
Dimensions: 87 x 60 x 27.2 mm (3.47 x 2.36 x 1.07 in)



A: 2x additional mounting metallic clips as an optional (RHML000690-xx upon request)

ENVIRONMENTAL SPECIFICATIONS

Specification	Test Conditions / Notes	Min	Nom	Max	Units
Top Case Temperature Range	Refer to the Top Case measurement point	-30	-	90	°C
Storage Temperature		-40	-	85	°C
Operating Relative Humidity	Non-condensing	5	-	95	%
Surface Temperature	Exposed surfaces temperature under all operating conditions	-	-	90	°C
Cooling	Convection cooled	-	-	-	
Shock EN 60068-2-27	Operating: Half sine, 30 g, 18 ms, 3 axes, 6x each (3 positive and 3 negative). Non-Operating: Half sine, 50 g, 11 ms, 3 axes, 6x each (3 positive and 3 negative).				
Vibration EN 60068-2-64	Operating: 5 – 500Hz, 1gRMS (0.02 g ² /Hz), 3 axes, 30 min. Non-Operating: 5 – 500Hz, 2.46gRMS (0.0122 g ² /Hz), 3 axes, 30 min.				
Vibration EN 60068-2-6	Operating Sine, 10 – 500Hz, 1g, 3 axes, 1 oct/min., 60 min.				
MTBF	Rated Load, 70°C Top Case, Bellcore	250k	-	-	Hours
Useful Life	70 °C Top Case	-	50k	-	Hours

ELECTROMAGNETIC COMPATIBILITY (EMC) – EMISSIONS

Phenomenon	Conditions / Notes	Standard	Equipment Performance Class
Conducted and Radiated Emission	Test at 230 V _{AC}	EN55015	
Conducted and Radiated Emission	Test at 120 V _{AC}	FCC CFR47- part 15/subpart B	Class B
Conducted and Radiated Emission	Test at 277 V _{AC}	FCC CFR47- part 15/subpart B	Class A
Harmonic Current Emissions		EN61000-3-2	Class C
Voltage Changes, Fluctuation and Flicker		EN61000-3-3	

ELECTROMAGNETIC COMPATIBILITY (EMC) – IMMUNITY

Phenomenon	Conditions / Notes	Standard	Note
Equipment for general lighting purposes - EMC Immunity Requirements		EN 61547	
ESD (Electrostatic Discharge)		EN 61000-4-2	
Radiated Radio-Frequency electromagnetic field		EN 61000-4-3	
Electric Fast Transient / Burst	2 kV on AC input	EN 61000-4-4	
Surge	Level ±1.5 kV L-N	EN 61000-4-5	
Conducted disturbances induced by Radio-Frequency fields		EN 61000-4-6	
Voltage Dips, short interruptions and Voltage Variations		EN 61000-4-11	
Non-repetitive damped oscillatory transient, Ring wave	2.5 kV	ANSI C.62.41	Category A

SAFETY AGENCIES APPROVALS

Certification Body	Safety Standards	Category
	UL Recognized ANSI / UL8750, 1 st Ed., CSA C22.2 No.250-13, 7 th Ed. Models with output voltages <60 V _{DC} include UL and CSA approval (cULus) as LED Class 2 output LED Driver suitable for dry and damp location	MARK
	To obtain the “CE Declaration of Conformity” please contact info@enedopower.com	MARK
	IEC/EN 61347-2-13 electronic control gear for LED Modules IEC/EN 62384 DC or AC supplied electronic control gear for LED modules – Performance Requirements	MARK

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