ELECTROMAGNETIC FLOWMETERS

- Water
- Oil / Petroleum
- Sanitary

ODIN is a leading manufacturer of flowmeters and fittings in Argentina
It has a wide experience in the chemical, food and oil markets
It designs, manufactures and controls all fittings under strict procedures
It calibrates every meter individually and has its error curve delivered
It keeps a continuous inventory and stock of parts
It provides free pre and post sale services and guarantees its entire line of products
Made in Argentina

Made in Argentina

How they work

Electromagnetic flowmeters are systems featuring non-moving parts.

They do not cause any restriction to flow, thus the loss of working load is almost unnoticeable.

Owing to the principle they work on, based on the Faraday law, they provide accurate and reliable measurements.

Their inner coating and the material chosen for their electrodes allow them to be used with corrosive fluids or even with solids in suspension.

Their use is widely known in the chemical, paper and food industries, but they have also extended to public service companies dealing with drinking water and effluents of all kinds as well.

All these applications are fulfilled with the series 4000, which enables the selection of multiple alternatives allowing the configuration of the optimum equipment for each specific requirement.

For the design of the series 4000, ODIN S.A. has analyzed all currently available products in the market to create an enhanced alternative that can compete with the latest technology in the world.

Based on the principle of an electric generator, it complies with the Faraday law which states:

"In an electric conductor moving through a magnetic field, a voltage is induced which is directly proportional to the speed (velocity) of the conductor and the magnitude of the magnetic field".

Voltage E appearing in the electrodes is:

$$E = K.B.D.V$$

But, as $Q = V \times A$ (speed/velocity by duct area, which is flow), then

$$Q = E.\left(\frac{A}{K.B.D.}\right)$$

As all parameters shown between brackets are constant, values for a given design are:

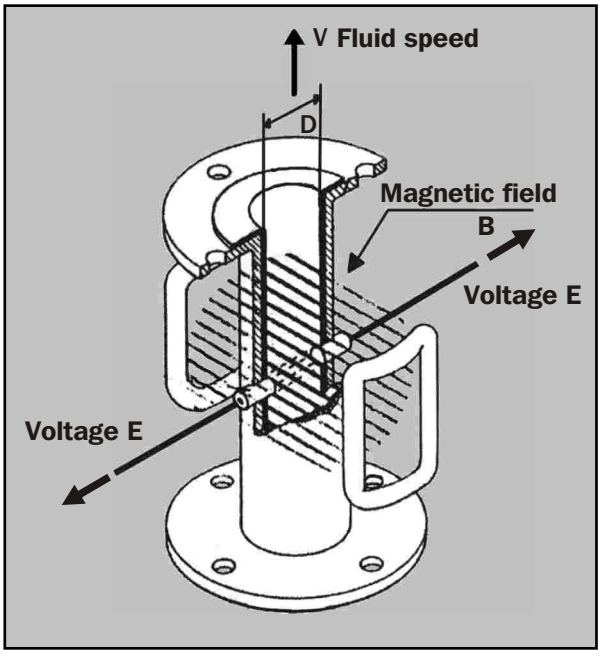
$$Q = E.K$$

Then, flow is proportional to the electromotive power generated. The only basic unavoidable requirements that the fluid must comply with are:

Conductivity: $>5\mu S/cm$

Speed/Velocity: 0.3 m/s $<V<$ 10 m/s of the fluid.

Equipment mounted at an oil field in Tupungato, Province of Mendoza

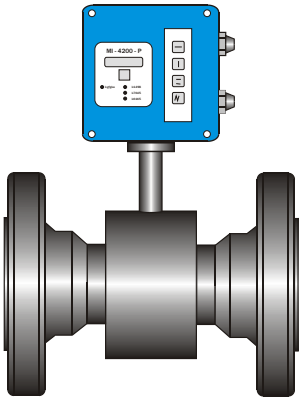
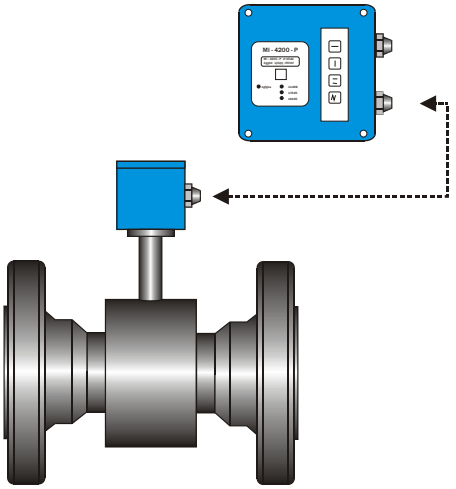
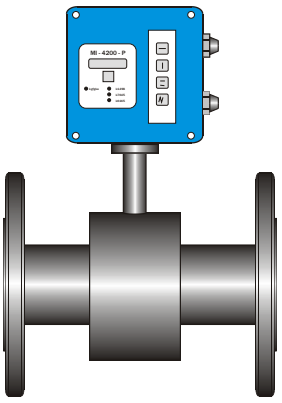
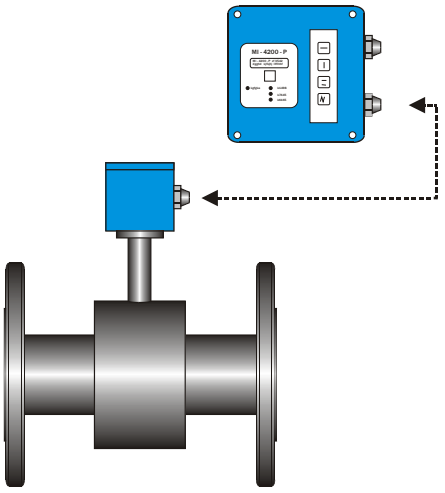


System Configuration

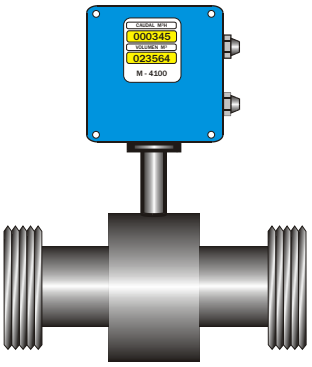
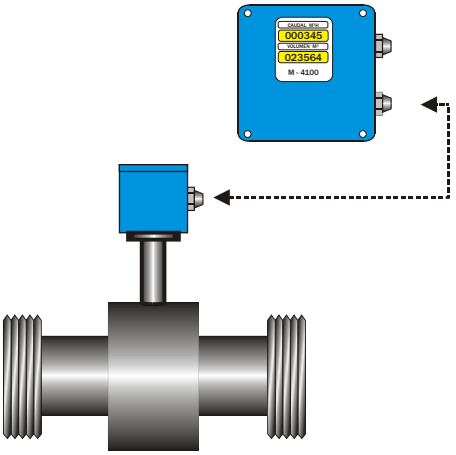
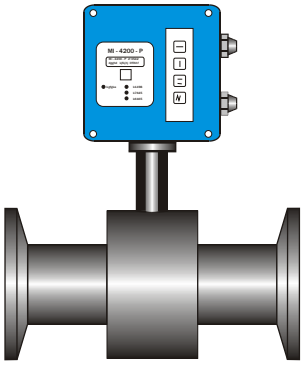
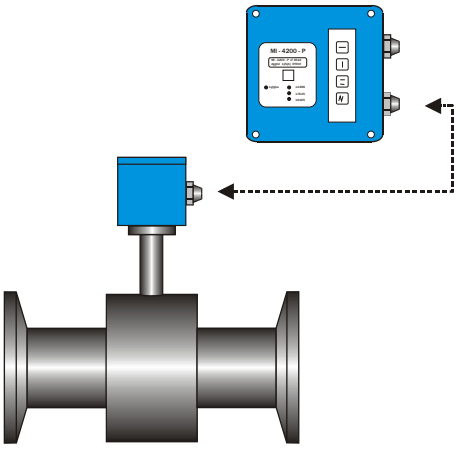
Electromagnetic flowmeters are made up of two subsets: the sensor tube and the electronic unit.

The sensor tube may be chosen from among three basic types:

EMPE: Oil / Petroleum Electromagnetic
EMA: Electromagnetic for Water
EMSA: Sanitary Electromagnetic

	Integrated System	Remote System
EMPE		
EMA		

System Configuration

	Integrated System	Remote System
EMSA truck		
EMSA Plant		

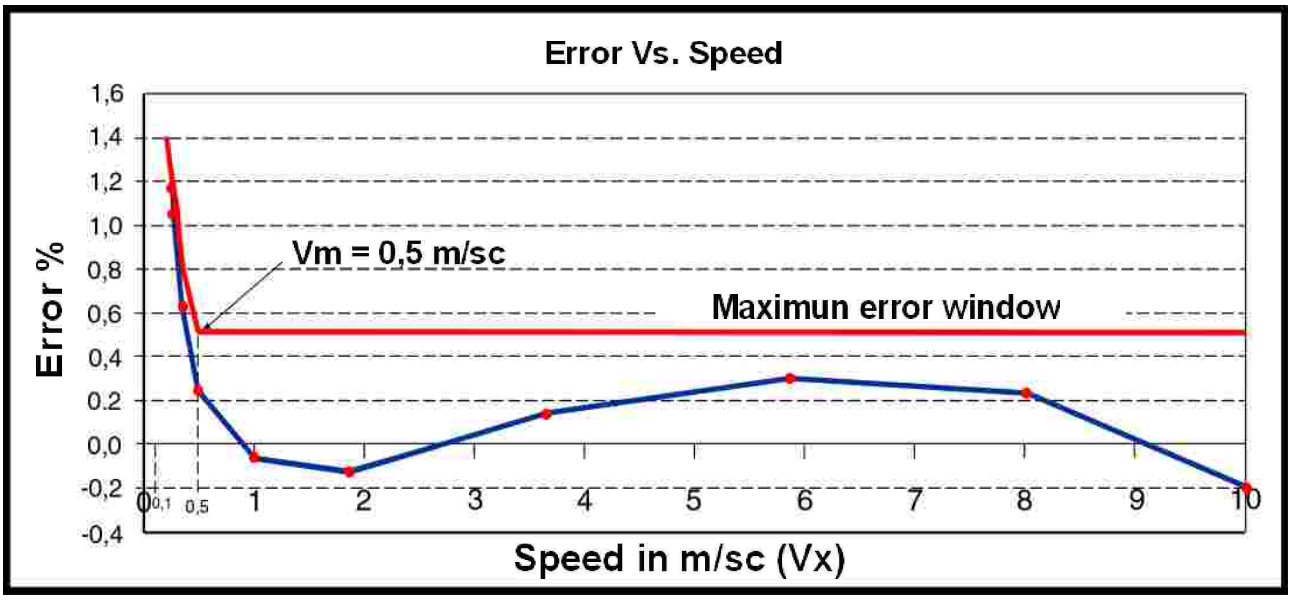
These are combined with M - 4100 and MI - 4200- P electronic units. ODIN modular system allows you to choose the most convenient configuration for each specific application. The electronic unit may be local or remote, and there are two options for provisions and displays.

Measurement Errors

In electromagnetic flowmeters, measurement errors are specified on the output of pulses which are proportional to the flow delivered by the equipment.

A K factor (pulses/litre), which should be constant for the entire measurement range, is to be established. The departure of the K factor from any point determined within the flow range will then be the error measurement at the point taken into account.

A typical error curve obtained at an ODIN S.A. calibration test stand is shown below. The red line indicates the maximum error window, being the real curve of absolute values will be less than those of the window.



Vx: fluid circulation speed Vm: 0.5 m/s

Error:

For Vx > Vm = +/- 0.5% (of the value read)

For Vx < Vm = (+/- 0.5% x $\frac{Vm}{Vx}$)% (of the value read)

For example: If Vx is 0.3 m/s , e = +/- 0.5 x (0.5/0.3) = 0.833%.

If Vx is 0.1 m/s , e = +/- 0.5 x (0.5/0.1) = 1.250%

To find the absolute error measurement of a certain equipment, for example 6", we know that the range is from 20 to 660 m^3/h, according to the applications table. Therefore, the error at 660 m3/h is:

$$e = +/- (0.5/100) \times 660 = +/- 3.3\ m^3/h$$

The error at 21 m3/h is:

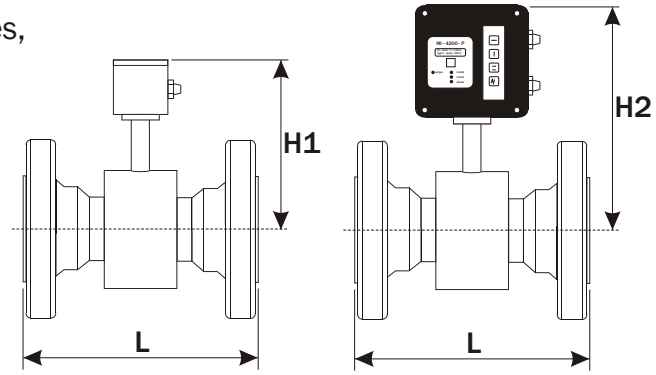
$$e = +/- (0.833/100) \times 21 = +/- 0.166\ m^3/h$$

Sensor Tube Specifications

Oil/Petroleum Model
EMPE

The main characteristics of this sensor are its capability to stand the high pressures involved in secondary recovery operations while being chemically resistant and compatible with the aggressiveness of connate waters.

The sensor tube wall corresponds to Sch 80 which is suitable for operating pressures of up to 350 Bar. Depending on the pressure values, the corresponding flanges may be the following:



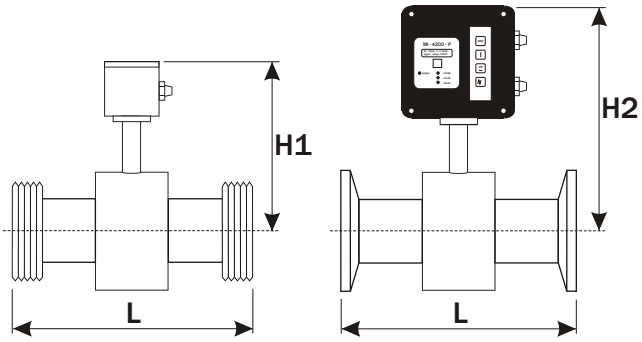
Coupling Code

1. Flanges ANSI B 16.5 slip-on 300 RF
2. Flanges ANSI B 16.5 slip-on 600 RF
3. Flanges ANSI B 16.5 slip-on 900 RF
4. Flanges ANSI B 16.5 slip-on 1500 RF
5. Others

MODEL	SIZE		RANGE (M³H)		DIMENSIONS (mm)		
	DN	INCHES	0.3 m/Sc	10 m/Sc	(L)	(H1)	(H2)
M – 4400 - C - P	25	1"	0.5	16	250	230	330
M – 4400 - D - P	40	1 ½"	1.2	40	250	254	355
M – 4402 - P	50	2"	2.1	70	300	254	355
M – 4403 - P	80	3"	4.5	150	350	254	355
M – 4004 - P	100	4"	7.8	260	400	280	380

Sanitary Model
EMSA

In sanitary applications, the sensor tube has threaded couplings of a sanitary or clamp type, in all cases 316 stainless steel. Materials also in contact with the fluid are the teflon coating and the electrodes.



Coupling Code

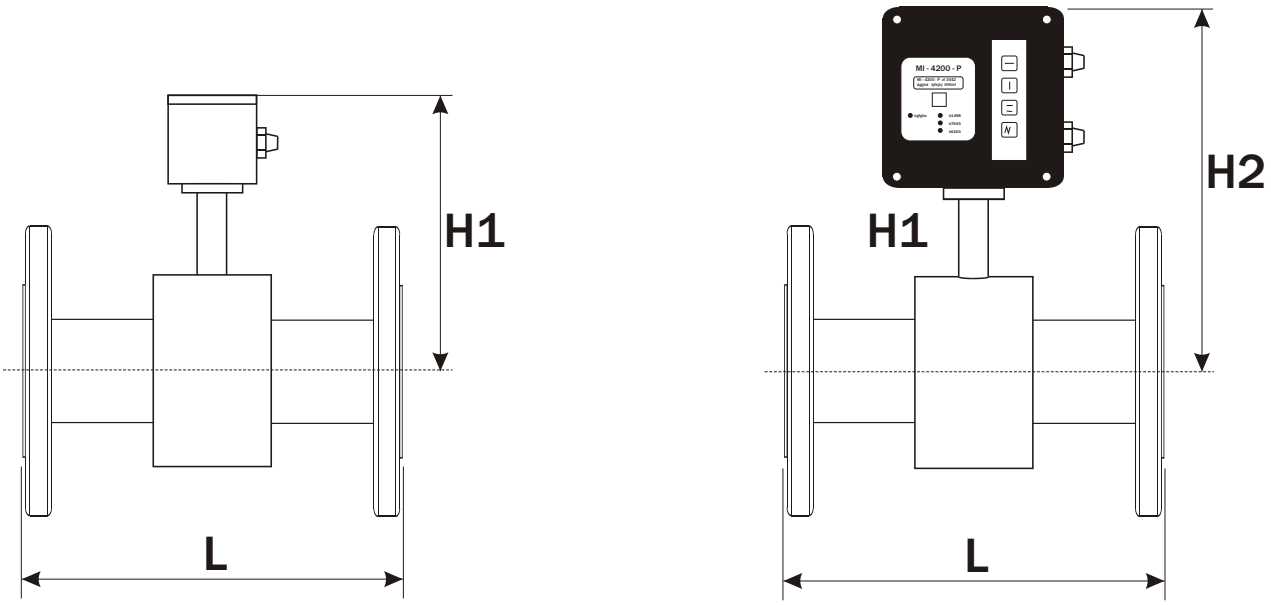
1. Clamp Conection
2. Sanitary thread
3. Others

MODEL	SIZE		RANGE (M³H)		DIMENSIONS (mm)		
	DN	INCHES	0.3m/Sc	10 m/Sc	(L)	(H1)	(H2)
M – 4200 - C - SA	25	1"	0.45	15	200	230	330
M – 4200 - D - SA	40	1 ½"	1.1	33	200	254	355
M – 4202 - SA	50	2"	1.4	45	200	254	355
M – 4003 - SA	80	3"	3	105	300	254	355

Sensor Tube Specifications

Model for Water
EMA

Whenever water needs to be measured, sensors are always flanged, in ANSI B16.5, 150 RF or DIN 2501/2633. They can be manufactured with 300 series flanges or DIN standards as an option. The coating covers the RF face.



Coupling Code

1. Flanges ANSI B 16.5 slip-on 150 RF
2. Flanges ANSI B 16.5 slip-on 300 RF
3. Flanges DIN 2501
4. Flanges DIN 2633
5. Others

MODEL	NOMINAL DIA		RANGE Sch 40 (M³H)		DIMENSIONS (mm)		
	MM	INCHES	0.3 m/Sc	10 m/Sc	(L)	(H1)	(H2)
4000 A	15	½"	0.13	4.5	180	220	320
4000 B	20	¾"	0.3	10	180	220	320
4000 C	25	1"	0.5	17	200	220	320
4000 D	40	1 ½"	1.3	43	200	250	350
4002	50	2"	2.2	72	200	250	350
4003	80	3"	5	165	250	250	350
4004	100	4"	9	285	300	275	375
4006	150	6"	20	660	300	300	400
4008	200	8"	35	1150	350	320	420
4010	250	10"	54	1800	450	340	440
4012	300	12"	78	2600	500	370	470

Optional Materials

Different materials can be chosen for coatings, electrodes and flanges on the basis of fluid requirements.

A Tube coating

Material	Temp. Máx ºC
1- PTFE (teflón)	100
2- Neopreno (rubber)	60
3- Poliurethane	90

B Electrodes

Standard	Special
1- SS-316	4- Titanium
2- Monel	5- Tantalum
3- Hastelloy C	

C Flange material

Standard	Special
1- carbon steel	2- SS - 304
	3- SS - 316

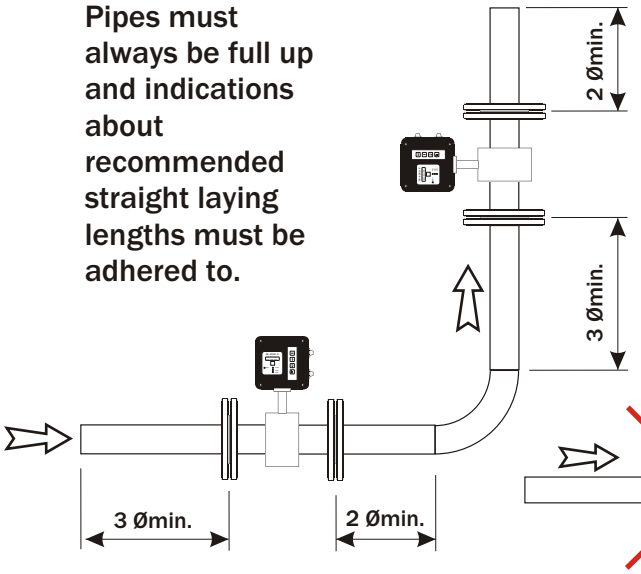
Note: Flanges are not in contact with the fluid.

Considerations about mounting requirements

For the flowmeter to work properly, minimum requirements in the design of the facilities must be fulfilled.

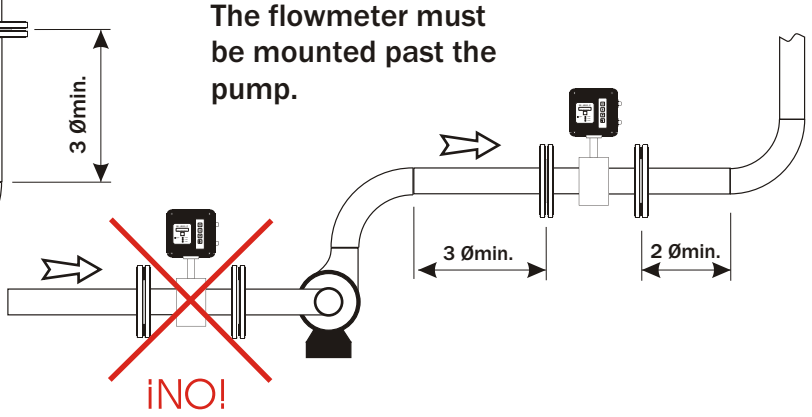
1 Straight Laying Lengths

Pipes must always be full up and indications about recommended straight laying lengths must be adhered to.



2 Location beyond the pump

The flowmeter must be mounted past the pump.



Selection of electronic units

There are two alternatives to choose: M - 4100 and Mi - 4200 - P. Both electronic units can be attached to either EMPE, EMSA or EMA sensor tube.

M - 4100

Integrated Instalation
M - 4100 - I

Remote Instalation
M - 4100 - R

4100 Technical Specifications	
Cabinet Protection:	IP – 67
Feed:	12 Vcc +/- 10% with external battery
Power:	10 W
Display:	Two 6-digit, 12.5 mm-high liquid crystals
Units:	Keyboard programmable
Output:	Proportional to flow:0 – 1000 Hz 4 – 20 mA
Room Temperature:	-20 a +50 ºC
Cut - Off:	Keyboard setting

MI - 4200 - P

Integrated Instalation
MI - 4200 - P/I

Remote Instalation
MI - 4200 - P/R

4200 Technical Specifications	
Cabinet Protection:	IP – 67
Feed:	24 Vcc +/- 10% 220 Vca +/- 10 % 50/60 Hz +/- 2% 110 Vca +/- 10 % 50/60 Hz +/- 2%
Power:	10 W
Display:	2-line & 16-character lighted Alphanumeric
Units:	Programmable by magnet over reed Flow: LPS, LPM, LPH, MCH, MCD, MCM
Output:	Proportional to flow (adjustable): 0 – 1000 Hz 4 – 20 mA
Room Temperature:	-20 a +50 ºC
Cut - Off	Adjustable

Codes for Ordering

For sensor tubes

With the various tube options, the code is built according to the following arrangement:

Type	Model	Códigos			
		coupling.	coating.	electr.	Flange

Example 1: 2" sanitary flowmeter, threaded coupling, teflon coating, 316 stainless steel electrodes.

Type	Model	coupling.	coating.	electr.	Flange
EMSA	M-4202-SA	2	2	1	——

Example 2: 4" oil flowmeter, 1500 RF carbon steel flanges, 316 stainless steel electrodes, teflon coating

EMPE	M-4004-P	4	1	1	1

For electronic units

The options are:

	Integ.	Remote		Integ.	Remote
M - 4100			MI - 4200 - P		

If the system is to be remote, please specify the cable length:

5 mt.	1	10 mt.	2	15 mt.	3
30 mt.	4	+ 30 mt.	5		

Example 1: for a remote system with 10 m cable and 12 Vcc battery power:

M	4100	R	2

Example 2: for an integrated system and 220 V 50 Hz power:

MI	4200	I	——

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