

# Temposonics®

## Magnetostrictive Linear Position Sensors

### Temposonics® E-Series

#### Brief Instructions



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## 1. Introduction

### 1.1 Purpose and use of this manual

Before starting the operation of Temposonics® sensors read this documentation thoroughly and follow the safety information. Keep the manual for future reference!

The content of this technical documentation is intended to provide information on mounting, installation and commissioning by qualified automation personnel<sup>1</sup> or instructed service technicians, who are familiar with the project planning and dealing with Temposonics® sensors.

### 1.2 Used symbols and warnings

Warnings are intended for your personal safety and for avoidance of damage to the described product or connected devices. In this documentation, safety information and warnings to avoid danger that might affect the life and health of operating or service personnel or cause material damage are highlighted by the preceding pictogram, which is defined below.

Symbol	Meaning
<b>NOTICE</b>	This symbol is used to point to situations that may lead to material damage, but not to personal injury.

- 1/ The term qualified technical personnel characterizes persons who:
- are familiar with the safety concepts of automation technology applicable to the particular project,
  - are competent in the field of electromagnetic compatibility (EMC),
  - have received adequate training for commissioning and service operations
  - are familiar with the operation of the device and know the information required for correct operation provided in the product documentation.

**2. Safety instructions**

**2.1 Intended use**

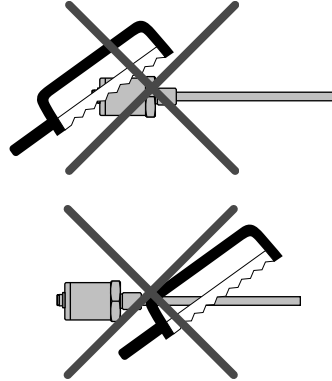
This product may be used only for the applications defined under item 1 only in conjunction with the third-party devices and components recommended or approved by MTS Sensors. As a prerequisite of proper and safe operation the product requires correct transport, storage, mounting and commissioning and must be operated with utmost care.

1. The sensor systems of all Temposonics® series are intended exclusively for measurement tasks encountered in industrial, commercial and laboratory applications. The sensors are considered as system accessories and must be connected to suitable evaluation electronics, e.g. a PLC, IPC, indicator or other electronic control unit.

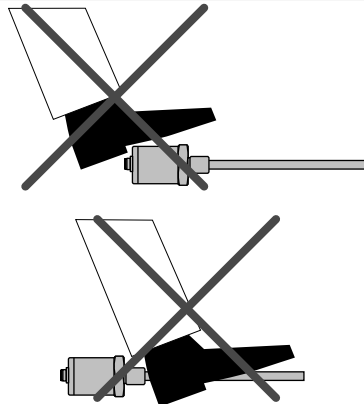
**2.2 Foreseeable misuse**

Foreseeable misuse	Consequence
Wrong sensor connection	The sensor does not work properly or will be destroyed
Operate the sensor out off the operating temperature	No signal output The sensor can be damaged
Power supply is out of the defined range	Signal output is wrong / no signal output / the sensor will be damaged
Position measurement is influenced by an external magnetic field	Signal output is wrong
Cables are damaged	Short circuit – the sensor can be destroyed / sensor does not respond
Spacers are missing / are installed in a wrong order	Error in position measurement
Wrong connection of ground / shield	Signal output is disturbed The electronics can be damaged
Use of a magnet that is not certified by MTS Sensors	Error in position measurement

**Do not reprocess the sensor afterwards.**  
→ The sensor might be damaged.



**Do not step on the sensor.**  
→ The sensor might be damaged.



### 2.3 Installation, commissioning and operation

The position sensors must be used only in technically safe condition. To maintain this condition and to ensure safe operation, installation, connection and service, work may be performed only by qualified technical personnel.

If danger of injury to persons or of damage to operating equipment is caused by sensor failure or malfunction, additional safety measures such as plausibility checks, limit switches, EMERGENCY STOP systems, protective devices etc. are required. In the event of trouble, shut down the sensor and protect it against accidental operation.

#### Safety instructions for commissioning

To maintain the sensor's operability, it is mandatory to follow the instructions given below.

1. Protect the sensor against mechanical damage during installation and operation.
2. Do not open or dismantle the sensor.
3. Connect the sensor very carefully and pay attention to the polarity of connections and power supply.
4. Use only approved power supplies.
5. It is indispensable to ensure that the specified permissible limit values of the sensor for operating voltage, environmental conditions, etc. are met.
6. Check the function of the sensor regularly and provide documentation of the checks.
7. Before applying power, ensure that nobody's safety is jeopardized by starting machines.

### 2.4 Safety instructions for use in explosion-hazardous areas

The sensors are not suitable for operation in explosion-hazardous areas.

### 2.5 Warranty

MTS Sensors grants a warranty period for the Temposonics® position sensors and supplied accessories relating to material defects and faults that occur despite correct use in accordance with the intended application <sup>2</sup>. The MTS Sensors obligation is limited to repair or replacement of any defective part of the unit. No warranty can be provided for defects that are due to improper use or above average stress of the product, as well as for wear parts. Under no circumstances will MTS Sensors accept liability in the event of offense against the warranty rules, no matter if these have been assured or expected, even in case of fault or negligence of the company. MTS Sensors explicitly excludes any further warranties. Neither the company's representatives, agents, dealers nor employees are authorized to increase or change the scope of warranty.

### 2.6 Return

For diagnostic purposes, the sensor can be returned to MTS Sensors. Any shipment cost is the responsibility of the sender <sup>2</sup>. For a corresponding form, see detailed operation manual (available at: [www.mtssensors.com](http://www.mtssensors.com)).

### 2.7 Maintenance & removal

#### Maintenance

The sensor is maintenance-free.

#### Repair

Repairs on the sensor may be performed only by MTS Sensors or a repair facility explicitly authorized by MTS Sensors.

#### List of spare parts

No spare parts are available for this sensor.

#### Transport and storage

The conditions of transport and storage of the sensor match the operating conditions mentioned in this document.

#### Removal from service / dismantling

The product contains electronic components and must be disposed of in accordance with the local regulations.

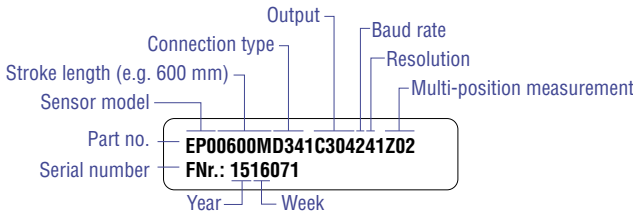
<sup>2/</sup> See also applicable MTS Sensors sales and supply conditions, e.g. at [www.mtssensors.com](http://www.mtssensors.com)

# Temposonics® E-Series

## Brief Instructions

### 3. Identification

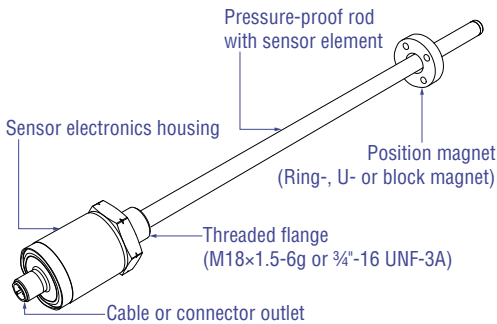
#### Nameplate (e.g. E-Series EP CANopen)



#### Approvals and certificates

You will find approvals and certificates in the sensor specific operation manuals.

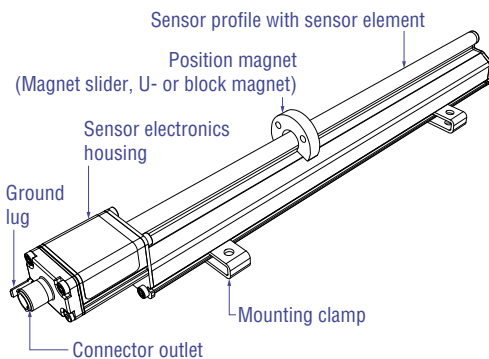
#### 3.1 Temposonics® E-Series EH (rod sensor)



#### Available outputs:

- Analog
- Start/Stop
- SSI
- CANopen
- IO-Link

#### 3.2 Temposonics® E-Series EP (profile sensor)

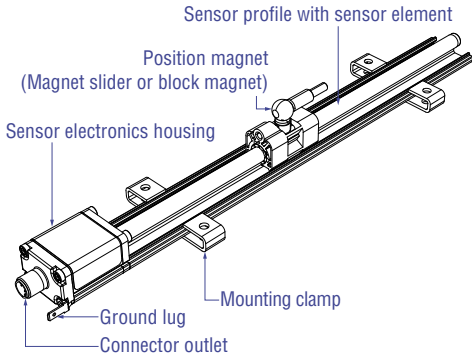


#### Available outputs:

- Analog
- Start/Stop
- SSI
- CANopen
- IO-Link

Manuals & Software available at:  
[www.mtssensors.com](http://www.mtssensors.com)

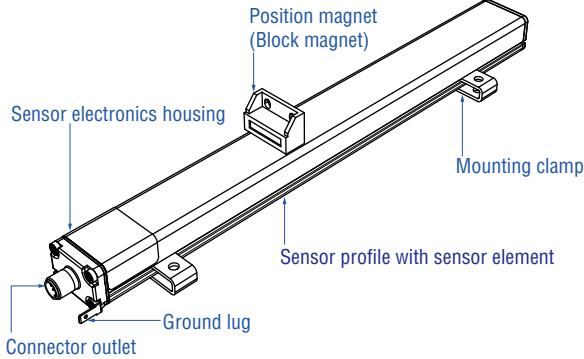
### 3.3 Temposonics® E-Series EL (ultra low profile sensor)



#### Available outputs:

- Analog
- Start/Stop
- SSI
- CANopen
- IO-Link

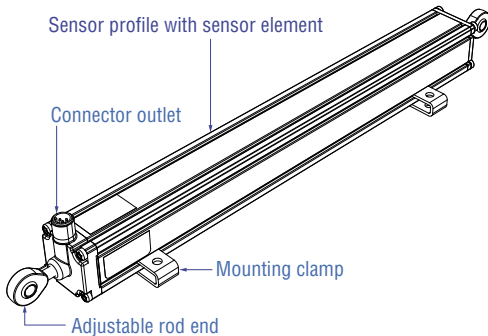
### 3.4 Temposonics® E-Series EP2 (smooth profile sensor)



#### Available outputs:

- Analog
- Start/Stop
- SSI
- CANopen
- IO-Link

### 3.5 Temposonics® E-Series ER (rod & cylinder housing)



#### Available outputs:

- Analog
- Start/Stop
- SSI
- CANopen
- IO-Link

Manuals & Software available at:  
[www.mtssensors.com](http://www.mtssensors.com)

## 4. Installation & mounting

### 4.1 Sensor mounting

#### Rod sensors – E-Series EH

- The flange contact surface must be seated completely on the cylinder mounting surface.
- Note the fastening torque of 50 Nm.
- The cylinder manufacturer determines the pressure-resistant gasket (copper gasket, O-ring, etc.).
- The position magnet should not grind on the rod.
- The plunger borehole  
( $\varnothing$  10 mm rod:  $\geq \varnothing$  13 mm borehole /  
 $\varnothing$  7 mm rod:  $\geq \varnothing$  10 mm borehole)  
depends on the pressure and piston speed.
- The peak pressure should not be exceeded.
- Protect the sensor rod from wear using suitable constructive measures.

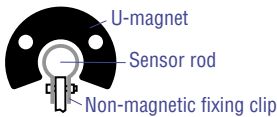
#### NOTICE

For detailed mounting instructions see operation manual.

#### Notice for sensors with stroke lengths $\geq$ 1 meter

Support horizontally installed sensors with a stroke length from 1 meter mechanically at the rod end. Without the use of a support, rod and position magnet may be damaged. A false measurement is also possible. Longer rods require evenly distributed mechanical support over the entire length. Use an U-magnet for measurement.

#### Sensor support (for sensors with stroke length $\geq$ 1 meter)

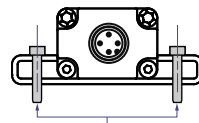


#### Profile sensors – E-Series EP / EL / ER / EP2

The sensor is fitted on a flat machine surface using mounting clamps. A length-dependent number of these clamps are delivered with the sensor and must be distributed over the profile at regular distances.

For fastening, we recommend using M5×20 screws according to DIN 6912 that should be tightened with a fastening torque of 5 Nm.

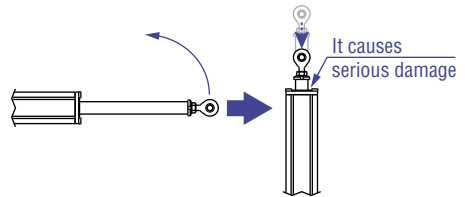
#### Mounting clamps



Screw: M5×20 (DIN 6912)  
Fastening torque: 5 Nm

#### NOTICE

Do not raise up the ER sensor, if the lifting rod is extended.





## 4.2 Magnet installation

### Typical use of magnets



Ring magnet

- For: EH**
- Rotationally symmetrical magnetic field



U-magnet

- For: EH & EP**
- The magnet can be lifted off
  - Height tolerances can be compensated



Block magnet

- For: EP, EL, EP2 & EH**
- The magnet can be lifted off
  - Height tolerances can be compensated



Magnet slider

- For: EP & EL**
- The magnet is guided through the profile
  - The distance between the magnet and the waveguide is strictly defined
  - Easy coupling via the ball joint

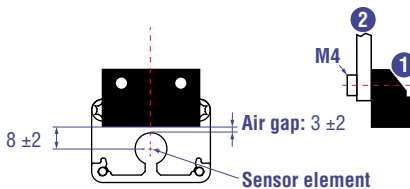
Install the magnet using non-magnetic material for mounting device, screws, spacers etc.. The magnet must not grind on the sensor rod. Alignment errors are compensated via the air gap.

- Max. permissible surface pressure: 40 N/mm<sup>2</sup> (only for ring magnets and U-magnets)
- Fastening torque for M4 screws: 1 Nm; use washers, if necessary
- Minimum distance between position magnet and any magnetic material has to be 15 mm.
- If no other option exists and magnetic material is used, observe the specified dimensions.

### NOTICE

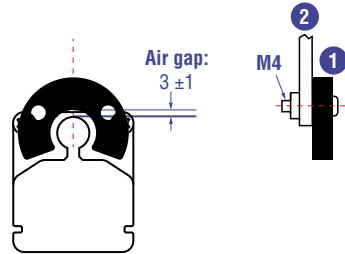
Mount the ring magnet and U-magnet concentrically. Mount the block magnet centrally. The maximum permissible air gap must not be exceeded.

### Centered mounting of block magnet



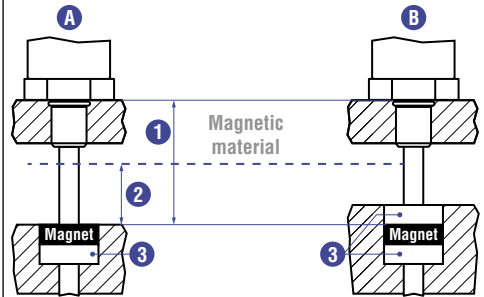
- 1 Block magnet
- 2 Non-magnetic mounting device and screws

### Concentric mounting of U-magnet



- 1 U-magnet
- 2 Non-magnetic mounting device and screws

### Magnet mounting with magnetic material

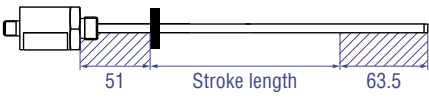
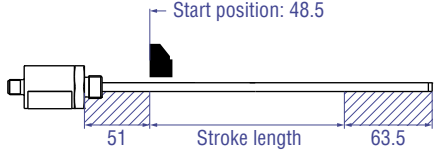
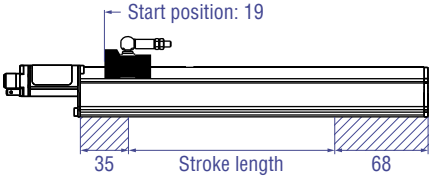
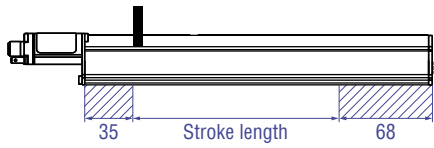
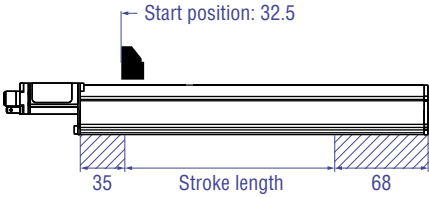
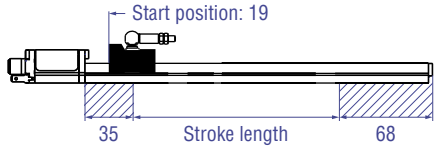
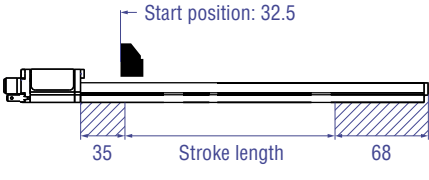
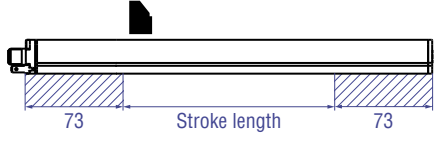


- 1 Null zone, depends on sensor model
- 2 Distance between position magnet and any magnetic material ( $\geq 15$  mm)
- 3 Non-magnetic spacer ( $\geq 5$  mm) – Recommendation: 8 mm

### Magnet mounting with magnetic material

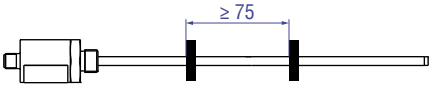
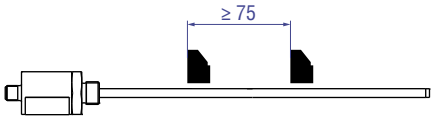
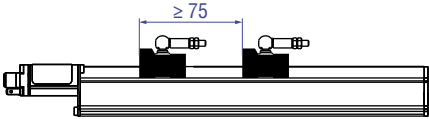
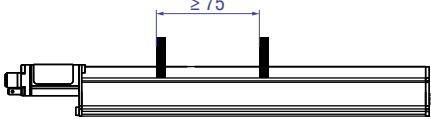
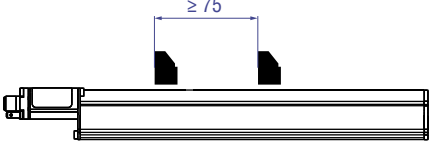
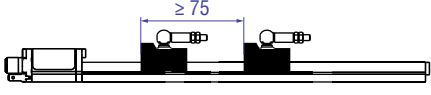
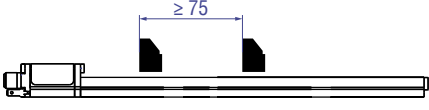
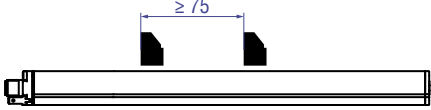
- A.** If the position magnet aligns with the drilled piston rod  
**B.** If the position magnet is set further into the drilled piston rod, install another non-magnetic spacer above the magnet

**4.3 Mounting dimensions of E-Series**

<p><b>E-Series EH with ring- / U-magnet</b></p>  <p>51      Stroke length      63.5</p>	<p><b>E-Series EH with block magnet</b></p>  <p>Start position: 48.5</p> <p>51      Stroke length      63.5</p>
<p><b>E-Series EP with magnet slider</b></p>  <p>Start position: 19</p> <p>35      Stroke length      68</p>	<p><b>E-Series EP with U-magnet</b></p>  <p>35      Stroke length      68</p>
<p><b>E-Series EP with block magnet</b></p>  <p>Start position: 32.5</p> <p>35      Stroke length      68</p>	<p><b>E-Series EL with magnet slider</b></p>  <p>Start position: 19</p> <p>35      Stroke length      68</p>
<p><b>E-Series EL with block magnet</b></p>  <p>Start position: 32.5</p> <p>35      Stroke length      68</p>	<p><b>E-Series EP2 with block magnet</b></p>  <p>73      Stroke length      73</p>

#### 4.4 Multi-position measurement distances

Multi-position measurements with E-Series EH, EP, EL and EP2 sensors with Analog, CANopen output is possible, with a simultaneous measuring up to 2 positions.  
The stroke length influences the maximum number of magnets. Note the minimum distance between the magnets.

<p><b>E-Series EH with ring- / U-magnet</b></p> 	<p><b>E-Series EH with block magnet</b></p> 
<p><b>E-Series EP with magnet slider »S«, »N«, »V«, »G«</b></p> 	<p><b>E-Series EP with U-magnet</b></p> 
<p><b>E-Series EP with block magnet</b></p> 	<p><b>E-Series EL with magnet slider »S«, »N«, »V«, »G«</b></p> 
<p><b>E-Series EL with block magnet</b></p> 	<p><b>E-Series EP2 with block magnet</b></p> 

#### NOTICE

Use only the same magnet type for multi-position measurement!

## 5. Electrical connections

Placement of installation and cabling have decisive influence on the sensor's electromagnetic compatibility (EMC). Hence correct installation of this active electronic system and the EMC of the entire system must be ensured by using suitable metal connectors, shielded cables and grounding. Overvoltages or faulty connections can damage its electronics despite protection against wrong polarity.

### NOTICE

Never connect / disconnect the sensor when voltage is applied.

### Instructions for connection

- Use low-resistant twisted pair and shielded cables and connect the shield to ground externally via the controller equipment.
- Keep control and sign leads separate from power cables and sufficiently far away from motor cables, frequency inverters, valve lines, relays, etc..
- Use only connectors with metal housing and connect the shielding to the connector housing.
- Keep the connection surface at both shielding ends as large as possible.
- Keep all non-shielded leads as short as possible.
- Keep the earth connection as short as possible with a large cross section. Avoid ground loops.
- With potential differences between machine and electronics earth connections, no compensating currents are allowed to flow across the cable shielding.

### Recommendation:

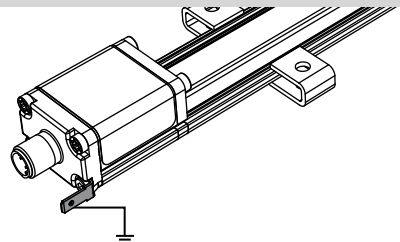
Install potential compensating leads with large cross section, or use cables with separate double shielding, and connect only one end of the shield.

- Use only stabilized power supplies in compliance with the specified connecting values.

### NOTICE

Do not mount the sensors in the area of strong magnetic or electric noise fields.  
Sensors must be grounded via ground lug on the sensor electronics housing. Sensor type EH is grounded via thread. Sensor types EP, EL, ER and EP2 are grounded via grounding lug as shown


### Sensor grounding



## 5.1 Analog

D34

M12 A-coded	Pin	Function
	1	+24 VDC (-15 / +20 %)
	2	Signal
	3	DC Ground (0 V)
	4	2nd signal
	5	DC Ground




for EH only

Color	Function
WH	GND (power supply)
BN	+24 VDC (-15 / +20 %)
PK	GND (Signal)
GY	Signal
YE	2nd signal
GN	Not connected

## 5.2 Start/Stop

D84

M12 A-coded	Pin	Function
	1	Start (+)
	2	Start (-)
	3	Stop (+)
	4	Stop (-)
	5	Not connected
	6	Not connected
	7	+24 VDC (-15 / +20 %)
	8	DC Ground (0 V)




for EH only

Color	Function
WH	GND (power supply)
BN	+24 VDC
PK	Stop (+)
GY	Stop (-)
YE	Start (+)
GN	Start (-)

## 5.3 SSI

D84

M12 A-coded	Pin	Function
	1	Clock (+)
	2	Clock (-)
	3	Data (+)
	4	Data (-)
	5	Not connected
	6	Not connected
	7	+24 VDC (-15 / +20 %)
	8	DC Ground (0 V)




for EH only

Color	Function
WH	GND (power supply)
BN	+24 VDC (-15 / +20 %)
PK	Data (+)
GY	Data (-)
YE	Clock (+)
GN	Clock (-)

## 5.4 CANopen

D34

M12 A-coded	Pin	Function
	1	Shield
	2	+24 VDC (-15 / +20 %)
	3	DC Ground (0 V)
	4	CAN_H
	5	CAN_L




for EH only

Color	Function
WH	GND (power supply)
BN	+24 VDC
PK	CAN_H
GY	CAN_L
YE	Not connected
GN	Not connected

## 5.5 IO-Link

D44

M12 A-coded	Pin	Function
	1	+24 VDC ( $\pm 25$ %)
	2	DI/DQ
	3	DC Ground (0 V)
	4	C/Q







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