

Edition

11/2023

OPERATING INSTRUCTIONS

# SIMOTICS

**Low-voltage motor with encoder  
for safety-related applications**

Supplement to the Operating Instructions



## Niederspannungsmotoren

### SIMOTICS Functionally safe encoder

Compact Operating Instructions


<u>Introduction</u>	<b>1</b>
<u>Safety instructions</u>	<b>2</b>
<u>Areas of application and ambient conditions</u>	<b>3</b>
<u>Marking for functional safety</u>	<b>4</b>
<u>Electrical connection</u>	<b>5</b>
<u>Commissioning</u>	<b>6</b>
<u>Quality documents</u>	<b>A</b>


Supplement to the motor operating instructions


## Legal information

### Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 <b>DANGER</b>
indicates that death or severe personal injury <b>will</b> result if proper precautions are not taken.

 <b>WARNING</b>
indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.

 <b>CAUTION</b>
indicates that minor personal injury can result if proper precautions are not taken.

<b>NOTICE</b>
indicates that property damage can result if proper precautions are not taken.


If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

### Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

### Proper use of Innomotics products

Note the following:

 <b>WARNING</b>
Innomotics products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Innomotics. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

### Trademarks

All names identified by ® are registered trademarks of Innomotics GmbH. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

### Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

# Table of contents

<b>1</b>	<b>Introduction .....</b>	<b>5</b>
1.1	Additional languages .....	5
<b>2</b>	<b>Safety instructions .....</b>	<b>7</b>
<b>3</b>	<b>Areas of application and ambient conditions .....</b>	<b>9</b>
<b>4</b>	<b>Marking for functional safety .....</b>	<b>11</b>
<b>5</b>	<b>Electrical connection .....</b>	<b>13</b>
5.1	Safety instructions relating to the electrical connection .....	13
5.2	Circuit diagram .....	13
<b>6</b>	<b>Commissioning .....</b>	<b>15</b>
6.1	Safety instructions for commissioning .....	15
6.2	Checklist for commissioning.....	15
<b>A</b>	<b>Quality documents .....</b>	<b>17</b>
A.1	EU Declaration of Conformity for the encoder.....	17
A.2	Quality documents for SIMOTICS motors .....	17
A.2.1	SIMOTICS TN Series N-compact .....	17
A.2.2	SIMOTICS FD .....	17
A.2.3	SIMOTICS SD/GP/DP .....	17
A.2.4	SIMOTICS HT .....	17



# Introduction

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## Note

The following pages contain the Siemens logo and the Siemens legal information.

Please note that since July 1st, 2023 the Siemens Businesses **Large Drives Applications** and **Low Voltage Motors** are part of **Innomotics GmbH**, Germany.

All rights to and product information on the following pages have been transferred from Siemens to Innomotics.

The re-branding of the document will take place in due course.

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## Technical questions or additional information



If you have any technical queries or you require additional information, please contact Technical Support (<https://support.industry.siemens.com/cs/ww/en/sc/4868>).

Please have the following data ready:

- Type
- Serial number

You can find this data on the rating plate.

## Contact person



If you wish to request on-site service or order spare parts, please contact your local office. They will establish the contact to the responsible service center. You can find your contact person in the relevant contact database: [www.siemens.com/yourcontact](http://www.siemens.com/yourcontact) ([www.siemens.com/yourcontact](http://www.siemens.com/yourcontact))

## 1.1 Additional languages

You can find these instructions in other languages in SIOS (<https://support.industry.siemens.com/cs/ww/en/view/109756319>).



These operating instructions apply to the functionally safe encoder (FSE) mounted on the SIMOTICS motor. The functionally safe encoder is also referred to in the operating instructions as an encoder. These operating instructions supplement the operating instructions for the following motor series:

- SIMOTICS FD
- SIMOTICS TN Series N-compact
- SIMOTICS SD/GP/DP
- SIMOTICS VSD10/VSD4000
- SIMOTICS HT

These operating instructions are part of the motor delivery. Store the operating instructions near the motor. Please read the operating instructions prior to handling the motor and observe the information they contain. This will ensure safe and disturbance-free functioning.

Siemens AG does not accept any liability for damage and failures that result from the non-observance of these operating instructions.

### Functionally safe encoders

The following encoders can be mounted on the motor:

- |              |             |   |
|--------------|-------------|---|
| • Sendix SIL | Kübler      | <a href="http://www.kuebler.com">http://www.kuebler.com</a>         |
| • FSI 862    | Leine&Linde | <a href="http://www.leinelinde.com/">http://www.leinelinde.com/</a> |
| • HOGS 100S  | Baumer      | <a href="http://www.baumer.com">http://www.baumer.com</a>           |

### Operating instructions for the encoder

You can find the relevant technical specifications for the encoder and its operating instructions on the website of the respective manufacturer.

The operating instructions for the encoder contain the following:

- General information
- Encoder function
- Functional safety
- Data transfer
- Electrical installation
- Commissioning
- Technical specifications

Read and observe the operating instructions for the encoder.



# Safety instructions

Siemens AG assumes responsibility for ensuring that the directives of functional safety have been observed for the motor with the encoder. The safety-relevant screw connections are sealed with marking paint before delivery. This will then indicate any inadvertent or unauthorized release of the screw connection.

## No functional safety for incorrect use

If the information regarding correct use is not observed, the functional safety may be rendered ineffective.

- Carefully comply with the information provided regarding correct use.
- Changes made by users to the motor and/or the encoder negatively impact operational reliability and are not permitted.
- The motor is intended for installation in a machine. The company operating the machine is responsible for ensuring functional safety. The company operating the machine is responsible for the necessary safety functions and their attributes.

## No functional safety for non-observance of the warning and safety instructions

If the warning and safety instructions are not observed, the functional safety may be rendered ineffective. The safety functions of the system are no longer ensured. This can result in death, serious injury or material damage.

- Please comply with valid regulations and operating instructions.

## No functional safety without safety-relevant encoder evaluation

If the safety-relevant encoder evaluation is not implemented, the safety functions of the system are no longer ensured. This can result in death, serious injury or material damage. The encoder is only safety-relevant when used in conjunction with a suitable encoder evaluation unit.

- Use the encoder together with a safety-relevant encoder evaluation unit.
- Observe the operating instructions for the encoder.

## No functional safety without conformity assessment

The motor is intended for installation in a machine. The operating company is responsible for defining the safety level and its actual implementation in the machine.

- Evaluate the conformity of the machine before commissioning.

## Qualified personnel

Only Siemens service personnel or personnel trained and authorized by Siemens may carry out work on the encoder and the entire mounted components of the encoder. These include the torque arm, bolts and shaft journal, if present. Qualified personnel require knowledge of the following topics:

- Topics relating to functional safety
- Legislation, safety regulations and standards for functional safety
- Content of the associated operating instructions, manufacturing instructions and check lists for assembly and disassembly

Contact Technical Support for the following topics:

- Maintenance and service
- Faults and how to resolve them
- Disposal

## Responsibility and liability

The responsibility and liability regarding the functional safety and its associated traceability is completely transferred over to the operating company:

- If the operating company damages the seal that was applied to safety-relevant screw connections by Siemens AG.
- If the operating company carries out work on the encoder and its mechanical connection.

## Resonance effects in operation

Resonance effects can occur on the motor as a result of the frequency converter or comparable power controlling devices. As a result, the safety functions of the system are no longer ensured. This can result in death, serious injury or material damage.

- Optimize, for example, the controller parameters through an appropriate current setpoint filtering.

## Damage

To ensure the system comprising the motor and the encoder is not damaged:

- Do not use the motor and the parts mounted onto it as a foothold or step.
- Do not place any objects on the motor.
- Position the motor in such a way that the encoder is not damaged.

## Areas of application and ambient conditions

The encoder is suitable for the following areas of application and ambient conditions:

- Safety-relevant systems up to
  - SIL2 / SIL3 acc. to EN 61800-5-2
  - PLd / PLe acc. to EN ISO 13849-1 and EN ISO 13849-2
- Degrees of protection  $\leq$  IP65
- Maximum ambient temperature of +40 °C, for simultaneous use of the motors according to temperature class 155 (F) as a maximum.
- The encoder is designed in accordance with the maximum motor speed.
- Areas of application depending on the encoder

Area of application	FSI 862	HOGS 100S	Sendix SIL
Use in hazardous areas	No	No	No
Typical industrial environment, e.g. indoor installation for conveyor technology	Yes	Yes	Yes
Conditionally in port installations	Yes	Yes	Yes
Harsh industrial environments, e.g. offshore or the chemical industry	Yes	Yes	No
Areas with direct exposure to seawater or spraying seawater	Yes	Yes	No

### Guidelines

- The encoder complies with the relevant standards listed in the Declaration of Conformity for safety-related applications.
- Also take into account the applicable national and regional legislation, standards and regulations.



## Marking for functional safety

The SIMOTICS motor with functionally safe encoder has a signal yellow marking. The marking SI04 for the functionally safe encoder is stamped on the rating plate of the motor. The safety level is marked on the functionally safe encoder.



## Electrical connection

### 5.1 Safety instructions relating to the electrical connection

#### Danger due to incorrect installation

If the encoder is electrically installed by inadequately qualified personnel, the functional safety may be rendered ineffective. The safety functions of the system are no longer ensured. This can result in death, serious injury or material damage.

- Only qualified personnel are permitted to work on the encoder.

#### Danger due to pre-existing damage to, or destruction of, the encoder

Electrostatic discharge can cause the encoder to fail. The safety functions of the system are no longer ensured. This can result in death, serious injury or material damage.

- Ensure that the ESD measures are observed.

#### Operating instructions for the encoder

Observe the operating instructions for the encoder.

### 5.2 Circuit diagram

- If the encoder is freely accessible, use the pin assignment specified in the operating instructions for the encoder.
- If the encoder is not freely accessible: You can find the pin assignment for the encoder in the terminal box or auxiliary terminal box on the circuit diagram provided in the terminal box.





# Commissioning

## 6.1 Safety instructions for commissioning

### Danger due to inadequately qualified personnel

If the encoder is electrically installed by inadequately qualified personnel, the functional safety may be rendered ineffective. The safety functions of the system are no longer ensured. This can result in death, serious injury or material damage.

- Only qualified personnel are permitted to mount or remove the encoder.
- Personnel require knowledge of the following topics:
  - Topics relating to functional safety
  - Legislation, safety regulations and standards for functional safety
  - Content of the detailed operating instructions provided

### Conformity


The encoder is intended for installation in a machine. Commissioning is prohibited until it has been established that the end product conforms with Directive 2006/42/EC.

### Operating instructions for the encoder

Follow the encoder operating instructions when commissioning it.

## 6.2 Checklist for commissioning

Complete the checklist before commissioning the encoder.

 <b>WARNING</b>
<p><b>Danger to life if the functional safety is not guaranteed</b></p> <p>It is possible that the functional safety is disabled if not all of the measures listed in the checklist are answered with "yes". The safety functions of the system are no longer ensured. This can result in death, serious injury or material damage.</p> <ul style="list-style-type: none"> <li>• Only commission the motor and the encoder when all of the points have been answered with "Yes".</li> </ul>

6.2 Checklist for commissioning

Table 6-1 Checklist for commissioning the encoder

Encoder serial number on the type plate: .....		
Measure	Yes	No
Is the signal yellow "Safety Integrated" marking present on the front cover and the "SIO4" marking on the rating plate?		
Is the motor free of damage?		
Are the operating instructions for the encoder available and have the corresponding specifications and instructions been observed?		
Has the motor been correctly assembled and designed so that the permissible vibrations and shocks of the motor are not exceeded?		
Is the thermal motor protection evaluated, if available?		
Have qualified personnel connected the encoder to the encoder evaluation?		
Was a suitable, shielded connecting cable with twisted conductor pairs used?		
Were the connecting cables attached to the encoder without any strain, the cable and connector installed and securely attached?		
Is the connecting cable shield connected at both ends through a large surface area and grounded?		
Was it checked and ensured that the supply voltage has the correct level and polarity?		
Check the encoder function: Do the direction of rotation and count direction on the encoder match?		

See also

Safety instructions relating to the electrical connection (Page 13)

# Quality documents

## A.1 EU Declaration of Conformity for the encoder

The EU Declaration of Conformity for the encoder is provided with the motor, and is additionally in SIOS (<https://support.industry.siemens.com/cs/ww/en/view/109756368>), from where it can be downloaded.



Figure A-1 EU Declaration of Conformity in SIOS

## A.2 Quality documents for SIMOTICS motors

### A.2.1 SIMOTICS TN Series N-compact



You can find the quality documents here (<https://support.industry.siemens.com/cs/ww/en/ps/13320/cert>):

### A.2.2 SIMOTICS FD



You can find the quality documents here (<https://support.industry.siemens.com/cs/ww/en/ps/13318/cert>):

### A.2.3 SIMOTICS SD/GP/DP



You can find the quality documents here (<https://support.industry.siemens.com/cs/ww/en/ps/13310/cert>):

### A.2.4 SIMOTICS HT



You can find the quality documents here (<https://support.industry.siemens.com/cs/ww/en/ps/13324/cert>):





## More information

Siemens:  
[www.siemens.com/simotics](http://www.siemens.com/simotics)

Industry Online Support (Service and Support):  
[www.siemens.com/online-support](http://www.siemens.com/online-support)

IndustryMall:  
[www.siemens.com/industrymall](http://www.siemens.com/industrymall)

Innomotics GmbH  
Vogelweiherstrasse 1-15  
90441 NUERNBERG  
Germany

A5E44248729A

