



## **SK.1S-1P**

### **Digital signal converter for absolute encoders with SSI interface**

#### **Product features:**

- **Input:** synchronous serial interface SSI
- **Output:** parallel, max. 26 bits, 8 ... 30 V, max. 100 mA, short-circuit proof and bus-capable
- **Master/Slave operation** switchable
- **Switchable Gray/Binary input code**
- **Switchable Gray/Binary/BCD output code**
- **Hold and OE inputs**
- **Strobe output**
- **Housing for top-hat rail mounting EN 50022**
- **Connection with plug-in screw terminals and 37-pin Sub-D socket**

<b>Version:</b>	<b>Description</b>
Index 1 (German is the original version)	2018-02
Index 2	2018-03

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## Table of Contents

<b>1. Description .....</b>	<b>4</b>
1.1 Single unit example.....	4
1.2 Example of multiple units on a bus.....	4
<b>2. Safety instructions.....</b>	<b>5</b>
2.1 Symbol explanation.....	5
<b>3. Mounting .....</b>	<b>6</b>
3.1 Place of installation.....	6
3.2 Installation of the signal converter .....	6
<b>4. Electrical connection .....</b>	<b>7</b>
4.1 General instructions .....	7
4.2 Advice on noise immunity .....	7
4.3 Connection and pin assignment.....	8
4.4 Connection of a SSI absolute encoder.....	8
4.5 Power supply connection .....	9
4.6 Parallel outputs connection .....	9
4.7 Signal explanation .....	10
<b>5. DIP switch configuration.....</b>	<b>12</b>
<b>6. Startup .....</b>	<b>14</b>
<b>7. LED functions .....</b>	<b>15</b>
<b>8. Troubleshooting.....</b>	<b>16</b>
8.1 LED 1 remains off.....	16
8.2 LED 1 lighting red.....	16
8.3 LED 2 lighting red.....	16
8.4 Other faults .....	16
<b>9. Technical data.....</b>	<b>17</b>
9.1 Electrical data.....	17
9.2 Mechanical data .....	17
9.3 Environmental conditions .....	17
<b>10. Ordering designation .....</b>	<b>18</b>

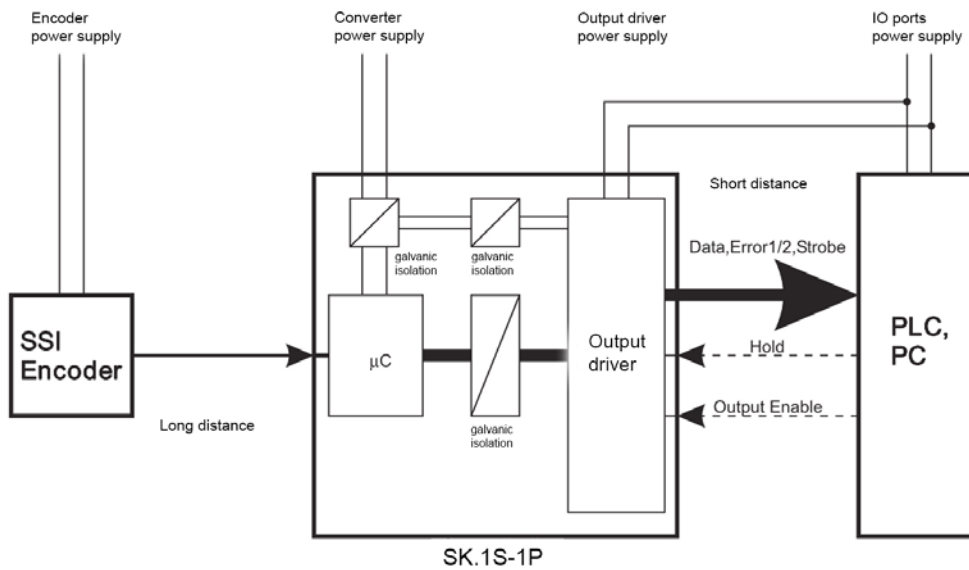
# 1. Description

The digital signal converter SK.1S-1P is used to convert the position of absolute encoders with Synchronous-Serial-Interface (SSI) into a bus-capable parallel output signal.

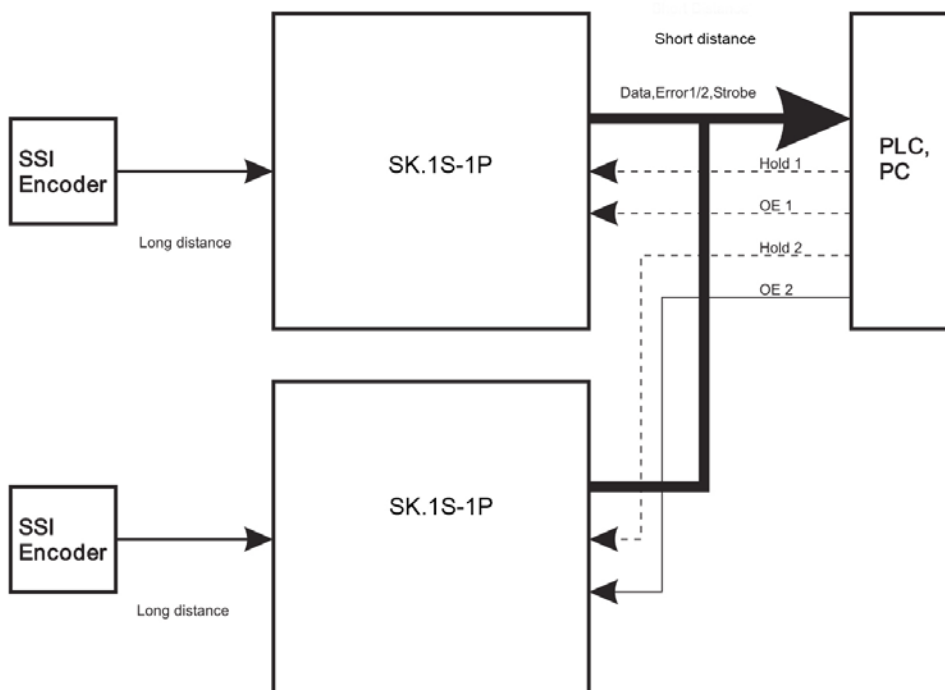
Applications:

- Interference-free SSI communication instead of interference-prone parallel transmission.
- Replacement for parallel absolute encoders

## 1.1 Single unit example



## 1.2 Example of multiple units on a bus







## 2. Safety instructions

This appliance is manufactured in compliance with VDE 0411. It left our factory thoroughly tested and ready for operation. Please read these operating instructions carefully before mounting and commissioning this appliance. The operating instructions include information and warnings that are to be complied with in order to ensure safe operation.

Before commissioning, check the appliance for damages due to improper transport or improper storage. If, due to possible damages, it could be assumed that safe operation is not possible, the appliance shall not be commissioned.

The appliance shall never be operated in conditions that do not meet the stated specifications and the information on the nameplate. Maintenance and repair work shall only be performed by technically trained, skilled persons who are familiar with the associated risks and warranty provisions.

### 2.1 Symbol explanation

 <b>DANGER</b>	This symbol, together with the signal word "Danger", indicates immediately imminent threat to life and health of persons. Ignoring this warning will result in serious damage to health with the possibility of life threatening injuries
 <b>WARNING</b>	This symbol, together with the signal word "Warning", indicates a potential danger to life and health of persons. Ignoring this warning may result in serious damage to health with the possibility of life threatening injuries
 <b>CAUTION</b>	This symbol, together with the signal word "Caution", indicates a potentially dangerous situation. Ignoring this warning may result in minor injuries or to damage to property.
<b>NOTICE</b>	Hints, recommendations and information for efficient and trouble-free operation.
	Is used for information that, if observed, improves operation.

# 3. Mounting

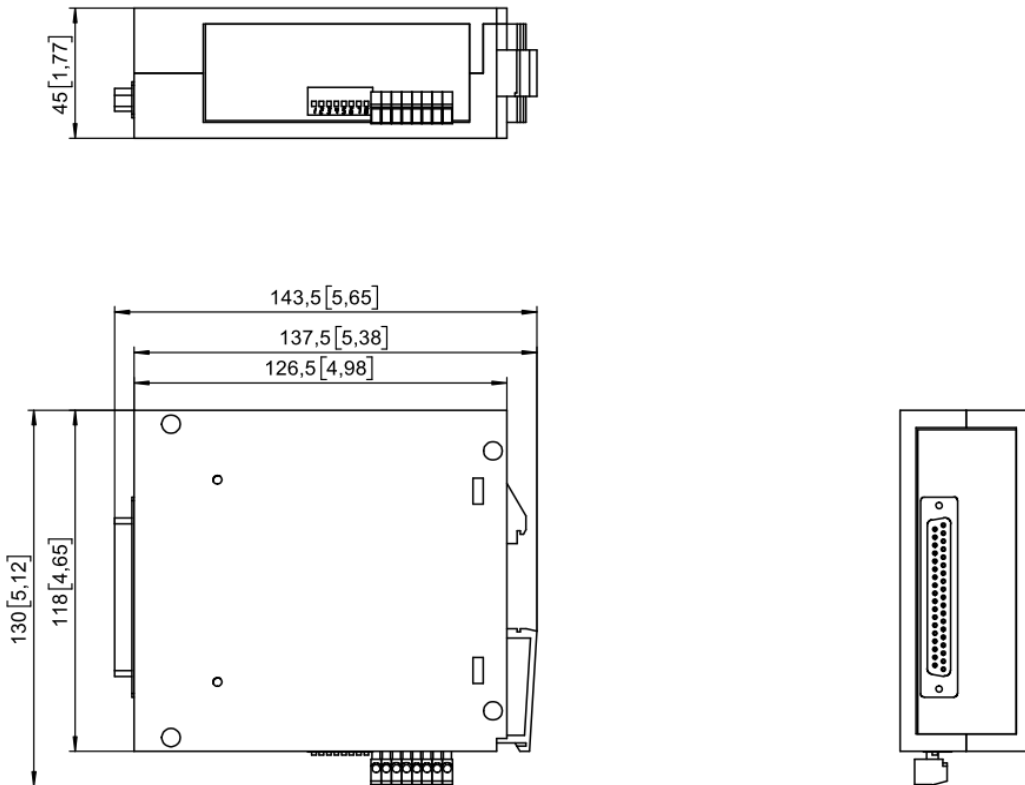
## 3.1 Place of installation

If necessary, the converter must in addition be protected against harmful environmental influences, such as splash water, dust, temperature.

## 3.2 Installation of the signal converter


Through simple snap-on on 35 mm rail (DIN EN 50022).

Dimensions in mm [inch]



## 4. Electrical connection

### 4.1 General instructions

 <b>CAUTION</b>	<ul style="list-style-type: none"><li>• Never plug or unplug connectors with the voltage applied.</li><li>• Wiring work may only be carried out in de-energized condition.</li><li>• Wires must be provided with suitable wire end ferrules.</li><li>• Make imperatively sure that the voltage of the auxiliary power supply corresponds to the information on the appliance.</li><li>• Ensure careful grounding of the appliance.</li></ul>
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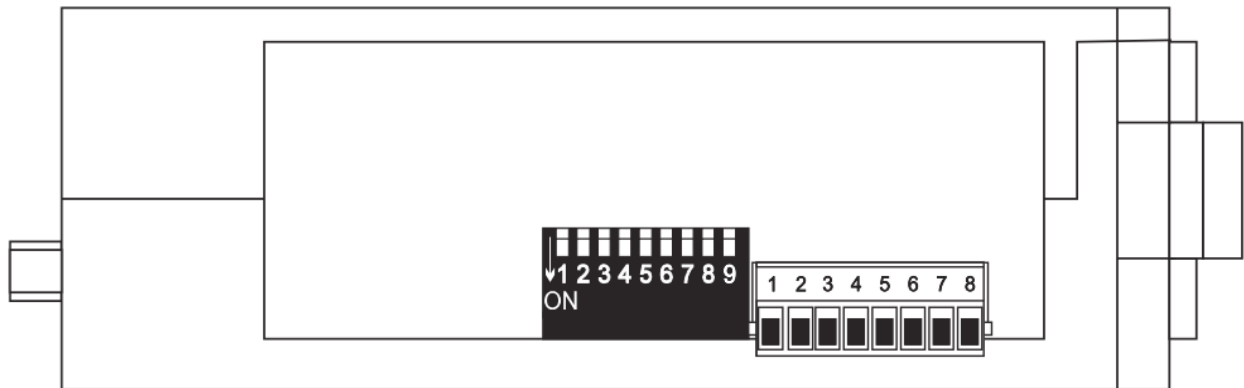
### 4.2 Advice on noise immunity

All connections are protected against external sources of interference. The installation location should however be chosen so that inductive or capacitive interference does not affect the appliance or its connecting lines. Interference can be due e.g. to switch-mode power supplies, motors or contactors. Appropriate cable routing and wiring can reduce interferences.

<b>NOTICE</b>	<p><b>The following basic measures are required:</b></p> <ul style="list-style-type: none"><li>• Use only shielded cables.</li><li>• The wiring of shields and ground (0V) should be star-shaped with a large contact area.</li><li>• The appliance must be installed as far as possible from lines conveying interferences; if necessary, provide additional measures such as shielding plates or metalized housings.</li><li>• Contactor coils must be equipped with spark suppressors.</li><li>• Avoid routing the cables parallel to power lines.</li><li>• Parallel interface signal lines must be kept as short as possible.</li><li>• For RS422 signal lines such as e.g. SSI signals use shielded twisted pair cables.</li></ul>
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### 4.3 Connection and pin assignment

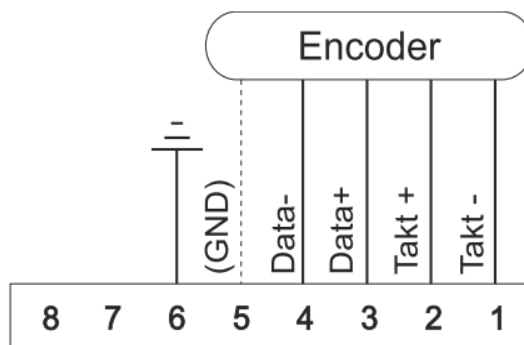
Power supply and SSI encoder are connected through plug-in screw terminals. The parallel outputs use a 37-pin SUB-D socket.



#### Terminal assignment

8	Power supply voltage DC (+)	2	SSI signal input, clock (+)
7	Power supply voltage DC (-)	1	SSI signal input, clock (-)
6	Ground connection	3	SSI signal input, data (+)
		4	SSI signal input, data (-)
		5	SSI-GND (not required)

### 4.4 Connection of a SSI absolute encoder

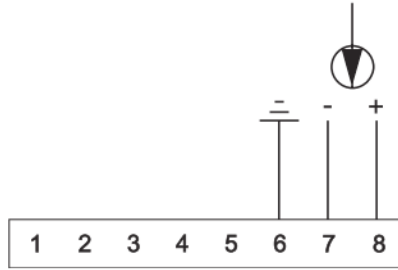


#### NOTICE

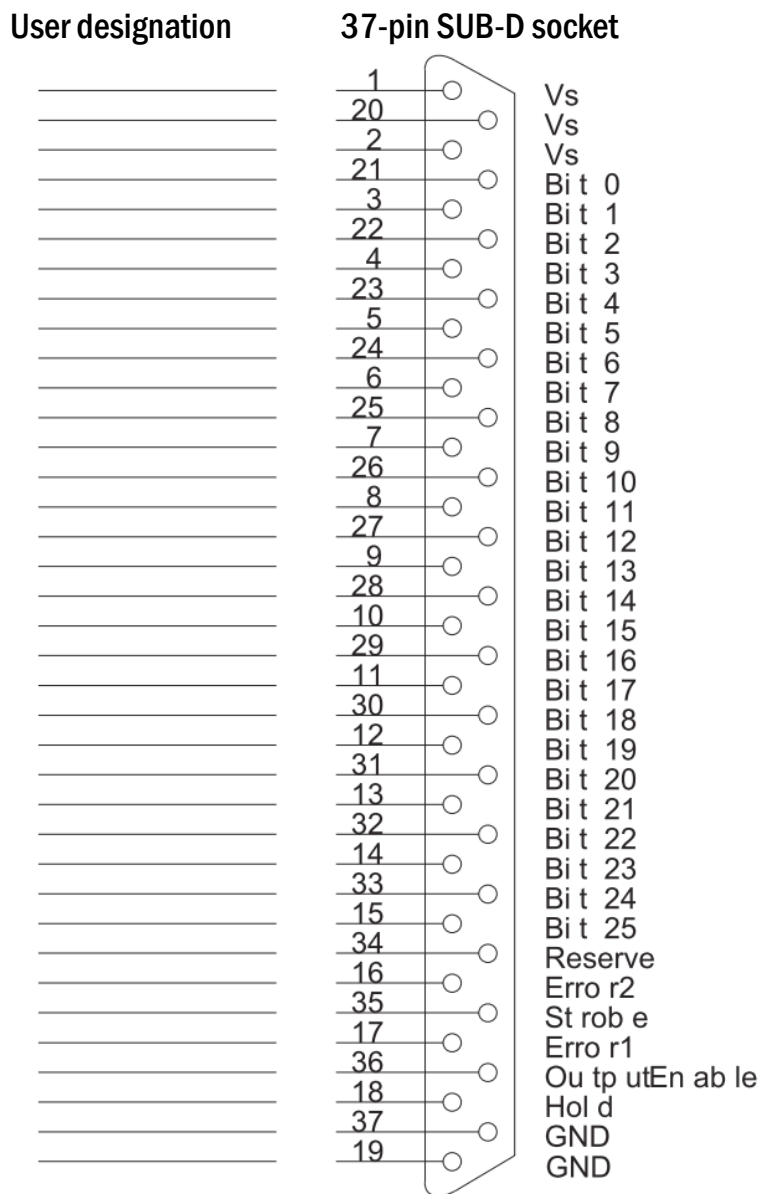
Some SSI encoder manufacturers use a different signal designation. It is therefore possible that the clock and/or data signals must be reversed (reverse +/- of clock and/or data). The SK.1S-1P will not be damaged in case of reversed connections on the SSI signals.



## 4.5 Power supply connection



## 4.6 Parallel outputs connection



## 4.7 Signal explanation

### Vs

Output drivers power supply. This voltage powers the outputs. The inputs of the SK.1S-1P switch approximately at  $1/2 V_s$ .

### Bit 0 - Bit 25

Bus-capable, positive-switching signal outputs.

### Reserve

This bus-capable signal line is provided for future extensions and should not be used.

### Error 1

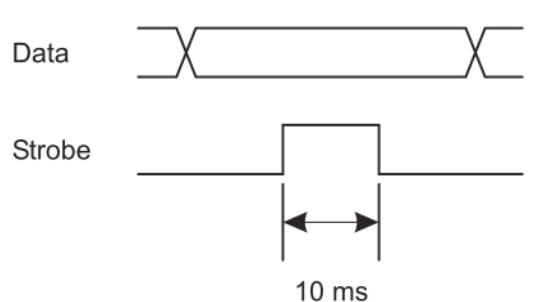
Bus-capable, positive-switching output for signaling SSI errors.

### Error 2

Bus-capable, positive-switching output for signaling output drivers errors.

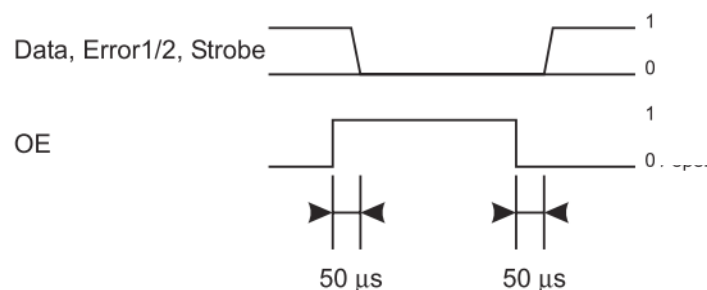
### Strobe

Bus-capable, positive-switching output for generating take-over pulses. This output is active for 10 ms when data is stable and can be processed by the subsequent electronics. If this output is not used, it can be left open.



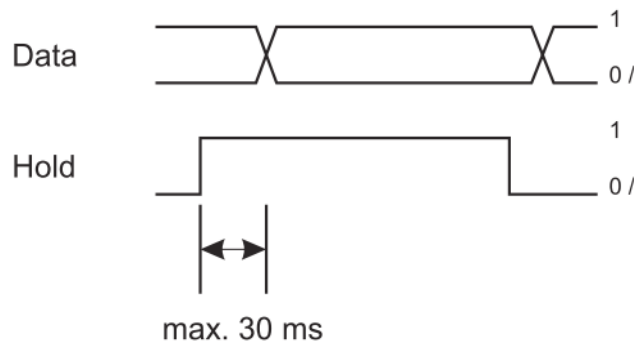
### Output Enable

This input controls the bus-capable outputs. The output drivers are active when this input is open or connected to ground. If the input is connected to  $V_s$ , all outputs are inactive. This signal must be connected to control the bus. If this input is not required, it can be left open or connected to GND.



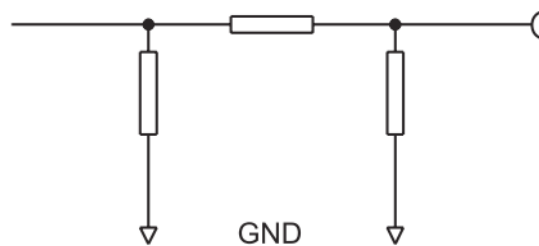
## Hold

This input is used to freeze the output data, e.g. for slower subsequent electronics. If this input is connected to  $V_s$ , no further changes are transmitted to the outputs. If this input is not required, it can be left open or connected to GND.



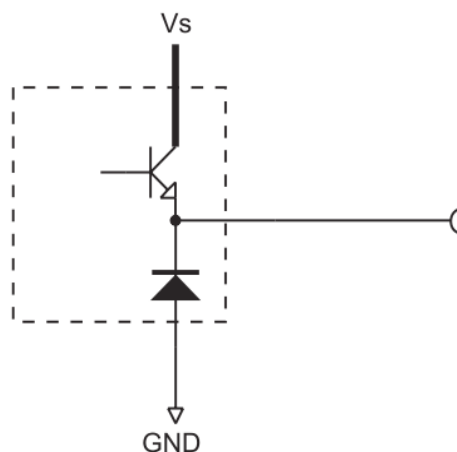
## Input circuit

The inputs of the SK.1S-1P require positive voltage levels. The switching threshold of the inputs is approximately  $1/2 V_s$ .



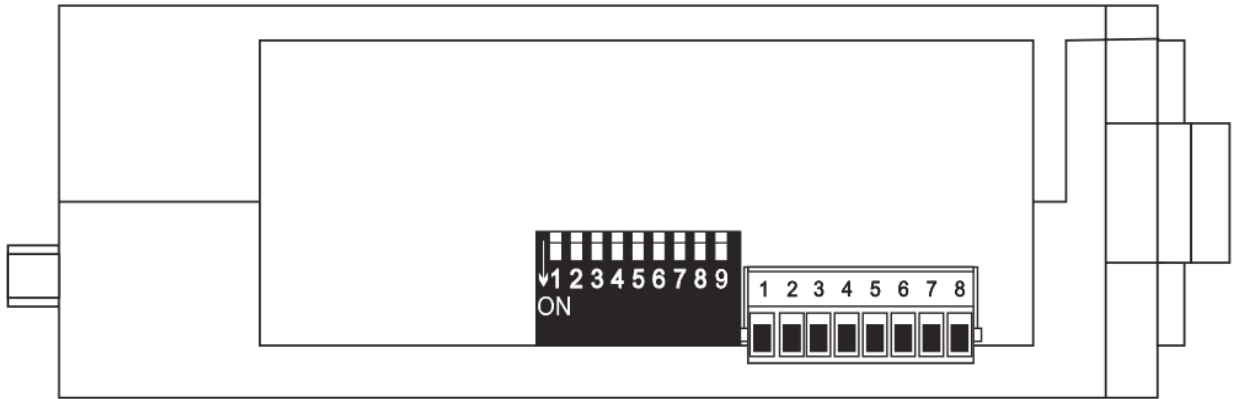
## Output circuits

The outputs of the SK.1S-1P are positive-switching (PNP), bus-capable and short-circuit proof.



To increase switching speed and reduce the susceptibility to disturbances of the parallel outputs, these should be terminated to GND with resistors. 10 k $\Omega$  resistors are recommended.

# 5. DIP switch configuration



Meaning of the DIP switches:

DIP 1	Master/Slave selection
DIP 2	SSI encoder code
DIP 3-5	SSI encoder resolution
DIP 6	Direction of rotation
DIP 7 - 8	Output code type
DIP 9	Reserve

Operating mode setting

DIP 1	Function
OFF	Master operating mode
ON	Slave operating mode

In Master mode, the SSI clock is generated by the SK.1S-1P. In Slave mode, the SSI clock must be generated by another component.

**NOTICE**

Basically, in a SSI interface, only one component may generate the clock (Master). All other components must be set as Slaves.

Setting the code type of the SSI encoder

DIP 2	Function
OFF	SSI encoder with Gray code
ON	SSI encoder with binary code

### Setting the resolution of the SSI encoder

DIP 3	DIP 4	DIP 5	Function
OFF	OFF	OFF	Resolution 10 bits
OFF	OFF	ON	Resolution 12 bits
OFF	ON	OFF	Resolution 13 bits
OFF	ON	ON	Resolution 24 bits
ON	OFF	OFF	Resolution 25 bits
ON	OFF	ON	Resolution 26 bits

### Setting the direction of rotation of the SSI encoder

DIP 6	Function
OFF	Normal direction
ON	Reversed direction

### Setting the output code type

DIP 7	DIP 8	Function
OFF	OFF	Output code Gray
OFF	ON	Output code binary
ON	OFF	Output code BDC

## 6. Startup



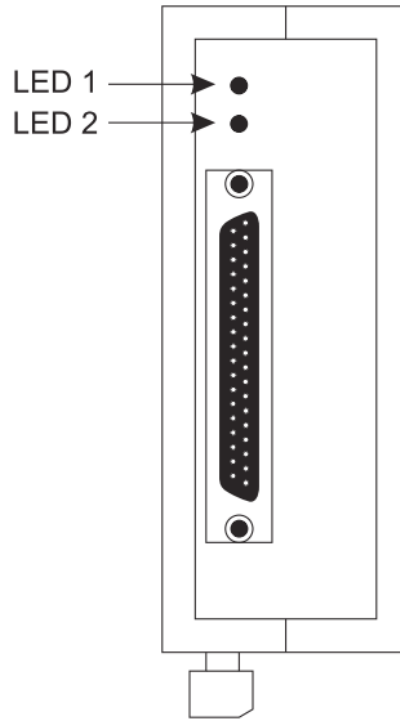
Make imperatively sure that the power supply voltage agrees with the voltage mentioned on the nameplate.

The appliance is set to a basic configuration when delivered (default settings). Before starting it up, it must be configured for the intended use.



When configuring the appliance in an operational facility, it must be made sure that it cannot trigger malfunctions before it is definitively configured.

# 7. LED functions



## LED 1

off	No supply voltage applied or internal fault
Lighting green	Everything OK
Lighting red	SSI interface fault
Flashing red/green	Info that the converter has not received any new SSI value for more than a minute

## LED 2

If LED 2 is on, there is a fault on the output drivers of the parallel outputs. In case of a short-circuit at an output, this output is switched off permanently and LED 2 lights up. To activate this output again, switch the Output Enable state or switch the power supply voltage off and on again.

## 8. Troubleshooting

All appliances are tested for perfect operation and condition both during production and before delivery. It is nevertheless possible that an appliance shows a malfunction. This is not always due to the new appliance; various details can result in such malfunctions. If the SK.1S-1P does not operate straightaway, check first the following points.

### 8.1 LED 1 remains off

- Check the power supply voltage
- Check the power supply wiring

If the fault is still present after these checks, the appliance must be sent back for repair.

### 8.2 LED 1 lighting red

- Check the wiring to the SSI encoder (see Notice on page 7)
- Check the power supply of the SSI encoder
- Check the configuration (are there more than one Master present on the SSI interface? Do the set parameters agree with those of the SSI encoder?)
- Check whether the clock frequency of the Master is lower than 125 kHz (only Slave mode)

If the fault is still present after these checks, the appliance must be sent back for repair.

### 8.3 LED 2 lighting red

- Check the wiring of the parallel outputs for short-circuits
- Check whether the limit values of the outputs are exceeded (even for short periods)
- Check if voltage peaks can reach the appliance

If the fault is still present after these checks, the appliance must be sent back for repair.

### 8.4 Other faults

For all other malfunctions, check the points above. If the fault is still present after these checks, the appliance must be sent back for repair.



## 9. Technical data

### 9.1 Electrical data

SSI signal input Resolution Clock output Clock input Data input	Singleturn or Multiturn 10 ... 26 bits Driver RS422/RS485 Receiver RS422/RS485 Receiver RS422/RS485
Master mode Clock frequency Data entry	Internal, 100 kHz App. 30 values/sec
Slave mode Clock frequency Delay between pulse trains Data entry	External, max. 125 kHz Min. 500 µs App. 30 values/sec
Parallel outputs Logic  Isolation voltage	PNP, max. 30 V 100 mA, short-circuit proof 3 kV / 1 min
DC supply voltage Power consumption Isolation voltage	18 ... 36 V DC Max. 250 mA 500 V / 1 min

### 9.2 Mechanical data

Housing  Dimensions (W x H x D)	Supporting rail mounting DIN EN 50022 35 mm, snap-on 45 x 118 x 137.5 mm [1.77 x 4.65 x 5.41"]
Weight	Approx. 300 g [10.58 oz]
Type of connection	Plug-in screw terminals and 37-pin SUB-D socket

### 9.3 Environmental conditions

Ambient temperature Storage temperature Relative humidity Protection class Application area  EMC Directive 2014/30/EU RoHS Directive 2011/65/EU	0°C ... +50°C [+32°F ... +122°F] -20°C ... +70°C [-4°F ... +158°F] < 80 %, non-condensing Protection class II Pollution level 2 Overvoltage category II EN 61000-6-2, EN 61000-6-3, EN 61000-6-4 EN 50581
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# 10. Ordering designation

Order no.	
Signal converter	<b>8.SK 1S-1P <sup>1)</sup></b> <i>Scope of delivery</i> - Signal converter - Manual



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