User manual

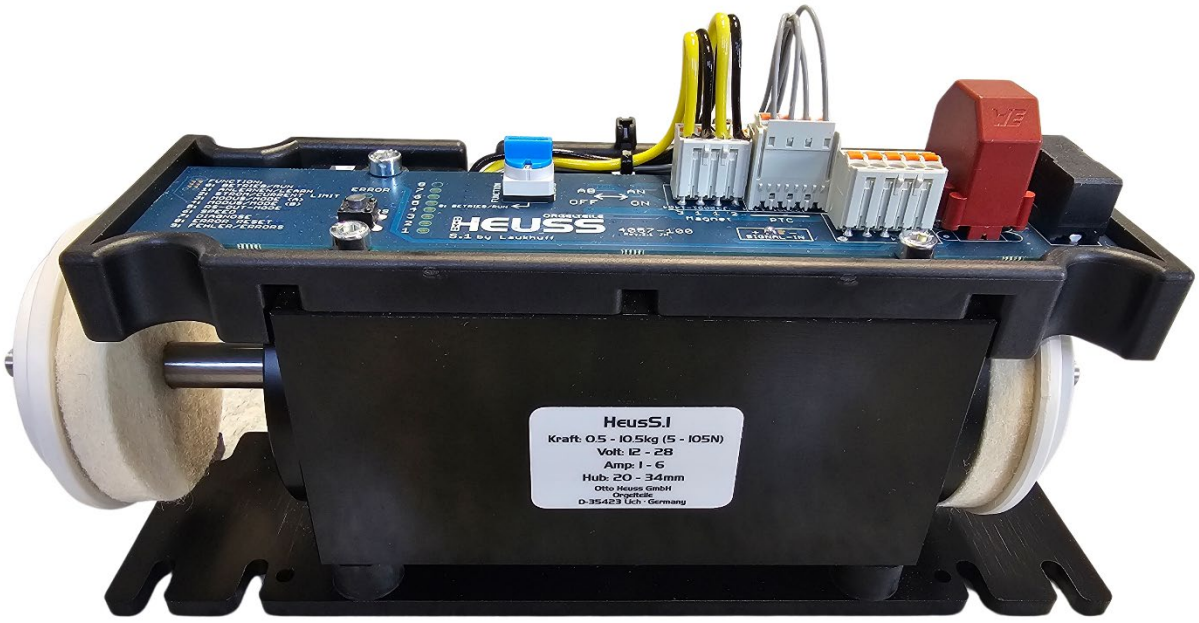
HeusS.I®

Otto Heuss S.1 slider motor

For the actuation of:

- Stop action (electrical)
- Dual stop action (electrical/mechanical)
- Mechanical coupler action

Order number: **4995-212s1**



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Software Version 3.1
Hardware Version 2.1

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1 In Memoriam

In its original version, the S.1 slider motor was developed by the company August Laukhuff GmbH. In the spring of 2021, the company submitted itself to a protective shield procedure; an investor was sought without success. As a result, business activities were discontinued as of June 30, 2021.

In the course of this, the company Otto Heuss GmbH has acquired the data and knowledge of the company Laukhuff for this and other products.

Communication August Laukhuff GmbH:

We are pleased to announce that Otto Heuss Organ Parts has been awarded the contract to continue production of the S.1 and swell motor. They will continue these sophisticated products and maintain the same quality standards as Laukhuff.

In memory of the August Laukhuff GmbH, your almost 200 years of existence and your merits for the worldwide organ building we dedicate these lines to the colleagues from Weikersheim.

2 Introduction

The S.1 is one of the most advanced slider motors in the world. It has four optical sensors to measure the speed of movement of the slider. Independent force regulation automatically sets the ideal speed for quiet, smooth final positioning. When the load changes, the controller automatically adjusts the force and acceleration up or down so that the slider always moves at the optimum speed and still reliably reaches the end position.

3 Technical data

Operating DC voltage	12-28VDC
Maximum current consumption circuit	max. 6A
Travel:	20-34mm
Force:	5-105N (0,5-10,5kg)

Attention: Only use electronically switching power supplies, not transformers/rectifiers, to operate the S.1

4 Mechanical connection

The S.1 is delivered from the factory fully assembled and wired.

The four coil cables of the motor are connected to the corresponding “MOTOR” terminals. The four temperature sensor cables of the motor are connected to the associated “PTC” terminals. Never change the connections of the cables, as this will lead to malfunctions.
Arrows labeled OFF and ON are drawn on the PCB next to the rotary function switch. These indicate the working direction of the motor.

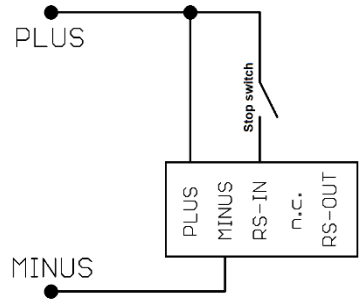
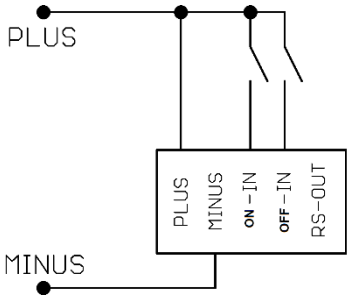
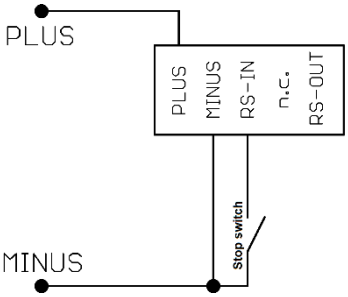
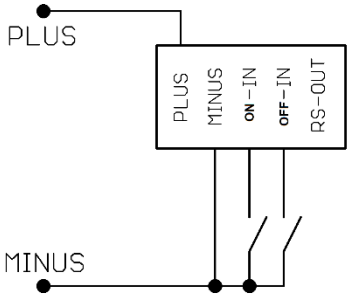
5 Electrical connection

The S.1 works together with practically all combination capture systems. The polarity of the control signal can be changed with a solder bridge on the board.

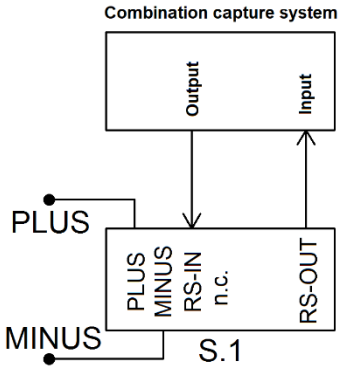
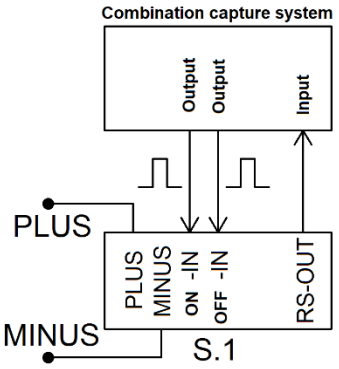
Positive input voltage (Standard) (Negative common)	Negative input voltage (Positive common)
	

The motor can be controlled both with an RS signal, which is present as long as a stop is activated, and with pulse-shaped ON/OFF signals, which some combination capture systems generate.

For electrical stop action:

RS-Mode **(Standard for electrical stop action)**	ON-OFF-Mode
Positive input voltage	Positive input voltage
	
Negative input voltage	Negative input voltage
	

For dual stop action electrical/mechanical:

Dual stop action RS-Mode	Dual stop action ON-OFF-Mode **(Standard for dual stop action)**
Positive input voltage	Positive input voltage
	

The RS-OUT is an output for the combination capture system, it shows if the stop is activated.
All terminal blocks are designed with push-in connection technology. This allows rigid conductors or flexible conductors with ferrules to be plugged into the terminal without having to actuate the associated release. **To release** the cable or to insert flexible conductors without ferrules, the orange release must be actuated.
All plugs are removable and can accept a cable up to 1.5mm² (15 AWG) cross-section.

Attention: Please NEVER disconnect the PTC plug during operation, as this will destroy the fuse. This is evaluated by the circuit as if the motor would be very hot and must trigger the emergency shutdown.

5.1 Fuse

Under the black cover on the right side is a 5x20mm glass tube fuse 4A fast.

Using very narrow fingers or needle-nose pliers, the insulation cover can be gripped in the groove on the left and right and pulled off to make the fuse accessible.

Attention: Never use other fuses! This can lead to destruction of the electronics!

6 Start-up

6.1 Setting the current upper limit

If the motor is wired, set the current upper limit according to the expected force (see overview, function 2). The default setting is level 5. With a force of approx. 70N at a current of 3.5A (24V), it corresponds to a much stronger version of the traditional R50 at maximum sluggishness.

In extreme cases, up to 105N can be retrieved at a current of 6A.

The automatic force regulation automatically increases the current in case of higher mechanical resistance of the slider, but only up to the preset limit. This limit prevents the overload of the power supply. The current upper limit should be set so that the power supply of the organ can perform simultaneous switching of all solenoids. Only if more power is needed at individual sliders, the current limit should be specifically increased there.

Also, setting a higher speed target (see Function 5), may require a higher current limit.

6.2 Teaching the force control

Once the solenoid is installed and wired, it should be taught using the LEARN function (see Function 1).

The learning function moves the motor back and forth a few times to ideally set the force for the slider.

The LED chain shows the currently required force in relation to the specified maximum current. If the control is already at the upper end of the scale, there may not be sufficient reserves available for readjustment in case of later sluggishness. In this case, check the mechanics of the slider and increase the current limit if necessary (a new teach-in process is then required).

6.3 Error displays

If the slider is too sluggish, LED 8 lights up permanently. In case of a blockage, the error LED starts flashing (see functions 8./9.). In this case, test whether the slider can be moved by hand and start a new teach-in process. If the error LED continues to flash, check the function of the sensors with the diagnostic function 7.

7 Operating modes and function (setting the rotary switch)

7.0 Function 0: BETRIEB / RUN

This is the normal operating state. The pushbutton can be used to operate the motor manually for test purposes. It moves to the respective other position.

LEDs 1 - 8 indicate the current force required:
LED 1 → Force < 60%
LED 2 → Force > 60%
LED 3 → Force > 70%
LED 4 → Force > 75%
LED 5 → Force > 80%
LED 6 → Force > 85%
LED 7 → Force > 90%
LED 8 → Force > 95%

When moving in the ON direction, the required force for ON is displayed and when moving in the OFF direction, the required force for OFF is displayed.

A large deviation of the forces for ON and OFF indicates mechanical problems of the slider. If necessary, please check the mobility of the corresponding slider.

> **Attention:** If only LED 7 flashes, the light sensors are not calibrated and the motor will not move. In this case, carry out a calibration. (see extended diagnostics menu - function 8).

7.1 Function 1: ANLERNEN / LEARN

Learning process:

1. Set the function switch to position "1”
2. LED 5 flashes
3. Press the key to start the teach-in process
4. Motor moves back and forth. LEDs indicate required force (see function 0).
   4a. The learning process is completed when the force display starts flashing.
   4b. If the LEDs show a running light from LED 1 to LED 8, the slider is too stiff or the maximum Force is set too low (see function 2).
5. reset the function switch to position "0" to return the motor to normal operating mode.

The learning process can be stopped and restarted at any time by pressing the pushbutton.

> **Attention:** If only LED 7 flashes, the light sensors are not calibrated and the motor will not move. In this case, carry out a calibration. (see extended diagnostics menu - function 8).

7.2 Function 2: LIMIT / MAX. CURRENT

The maximum permissible current can be set via the pushbutton.

	12V Mode		**24V Mode**	
	Current	**Force**	**Current**	**Force**
Level 1	2.0A	ca. 30N	1.4A	ca. 45N
Level 2			2.0A	ca. 51N
Level 3	2.3A	ca. 34N	2.5A	ca. 58N
Level 4			3.0A	ca. 65N
Level 5	2.8A	ca. 41N	3.5A	ca. 72N
Level 6			4.0A	ca. 79N
Level 7	3.0A	max. 45N	4.5A	ca. 86N
Level 8			6.0A	max. 105N

Attention: Keep in mind that a higher force always requires a higher current. This can overload the power supply. Before increasing the force, please check if the power supply of the organ can provide the required current for all motors.

7.3 Function 3: MODE / MODE [A] (Rotating the ON/OFF working direction)

The slider motor has different operating modes for different applications

Mode 1	Mode 2	Mode 3	Mode 4
			
RS-Mode	RS-Mode **inverted**	RS-Mode without PoP	RS-Mode without PoP **inverted**

Mode 5	Mode 6	Mode 7	Mode 8
			
ON-OFF-Mode	ON-OFF-Mode **inverted**	ON-OFF-Mode without feed, when end position is reached	ON-OFF-Mode without feed, when end position is reached **inverted**

PoP = Power-on Positioning (for dual stop action)

In the standard modes (with power-on positioning), the sliders are positioned when the power is turned on. For example, if the organ is switched on with the stop switch ON, the sliders will be positioned ON regardless of the slider position.

In the modes without power-on positioning, the sliders are not positioned when the organ is switched on. For example, if a slider is set to ON and the organ is started with the stop switch turned off, the slider will remain ON.

If after installing the motor it turns out that the slider does not work in the intended ON-OFF direction of the S.1, you can reverse the end positions of the motor with this setting.

LED 8 off → Direction of motion normal
LED 8 on → Direction of motion inverted

If the direction of movement is inverted, the motor moves to the OFF position when the control signal is switched on.

7.4 Function 4: MODE / MODE [B] (Slider or Coupler)

Here the hold function can be activated in different modes.

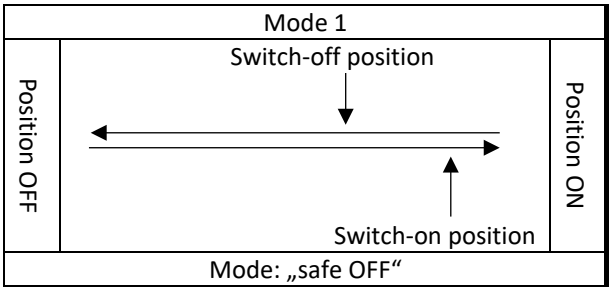
Hold function OFF	Hold function ON	Hold function OFF	Hold function ON + OFF	Hold function ON slowed fall	Hold function OFF slowed fall
					

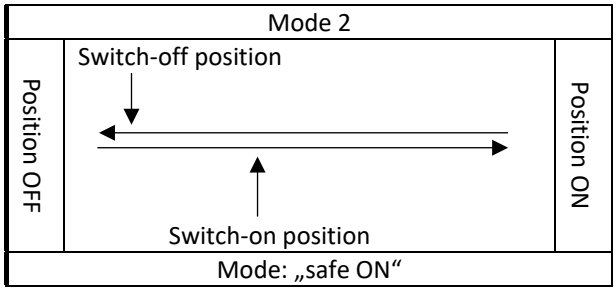
The holding force is used to hold a mechanical coupler, for example. In the hold state, the motor is flown through with 100% of the adjusted current, but no more than 1A. The force cannot be adjusted.

If a coupler moves to an end position on its own, a hold function with slowed fall can be selected. The S.1 then reduces the hold force so that the coupler falls gently into the end position.

7.5 Function 5: RS OUT MODE

The slider motor has several sensors to detect the position of the sliders. This results in different possibilities when the RS signal is output.





7.6 Function 6: SPEED

At switch position 6 the movement speed of the sliders can be adjusted in 8 steps.

The aim of this stage is to minimize operating noise as much as possible. In order to prevent the typical thump when switching sliders, the S.1 motor moves smoothly to the end position at reduced speed, thus enabling an almost noiseless stop action.

This behavior can seem undesirably sluggish, especially with dual stop action. If you want faster actuation, you can increase the speed setting. However, a higher speed is inevitably associated with a louder actuation noise, since the more accelerated mass of slider and motor armature cannot be decelerated just as effectively before reaching the end position.

Level 1	Level 2	Level 3 (Standard)	Level 4	Level 5	Level 6	Level 7	Level 8
							
Lowest Speed							Highest Speed

Attention: Keep in mind that a higher speed also increases the current consumption of the motor. In particular, the highest stages 6-8 can drastically increase the current consumption, for example from 2A at stage 1 to 4A at stage 5.

7.7 Function 7: DIAGNOSE

The diagnostic function can be used to test the function of the light sensors, the inputs, the pushbutton and the RS output.

LED 1 → Light sensor End position OFF
LED 2 → Light sensor path OFF
LED 3 → Light sensor path ON
LED 4 → Light sensor End position ON
LED 5 → Pushbutton
LED 6 → ON(RS)-Input
LED 7 → OFF-Input
LED 8 → RS-Output

*Extended diagnostics menu see below.

7.8 Function 8: ERROR RESET

The S.1 stores error states and indicates them by the flashing error LED. This makes it easy to detect even temporary problems. The errors stored in the system are deleted again via the reset function. Deletion takes place after pressing the button. The stored errors are also deleted when the teach-in process is started.

7.9 Function 9: FEHLER / ERRORS

In this switch position, the LEDs indicate the type of problem:

LED 1 → Blocked in ON-Direction
LED 2 → Blocked in OFF-Direction
LED 3 → Maximum force on ON
LED 4 → Maximum force on OFF

8 Extended diagnostics menu

From software version 3.0 there is an extended diagnostic menu with several functions.

Attention: The extended diagnostics menu should only be used if necessary, as the S.1 can be brought into a non-functioning state.

8.1 Activating the extended diagnostics menu

1. Set function switch to position "7”
2. Press and hold the button for about 5 seconds until the ERROR LED lights up.

The ERROR LED is permanently lit as long as the extended diagnostics menu is active.

In the extended diagnostics menu, special diagnostics functions are selected with the rotary switch.

Diagnostic function 0: Return to normal mode

Pressing the key extinguishes the ERROR LED and exits the extended diagnostics menu.

Diagnostic function 1: Signal quality light sensor end position OFF

Here the signal quality of the light sensor end position OFF is indicated by the LEDs 1 - 7.

The S.1 measures the signal quality of the light barriers with every movement. It thus detects contamination at an early stage and adjusts itself so that the plastic panes are always reliably detected. A good value is when three or four LEDs light up.

Diagnostic function 2: Signal quality light sensor path OFF

Signal quality of the light sensor path OFF. (see extended diagnostics menu - Function 1)

Diagnostic function 3: Signal quality light sensor path ON

Signal quality of the light sensor path ON. (see extended diagnostics menu - Function 1)

Diagnostic function 4: Signal quality light sensor end position ON

Signal quality of the light sensor end position ON. (see extended diagnostics menu - Function 1)

Diagnostic function 5: No function

Diagnostic function 6: No function

Diagnostic function 7: Diagnosis overview

Diagnostic function as in normal mode. LEDs show the signals of the light sensors, the inputs, the pushbutton and the RS output.

LED 1 → Light sensor End position OFF
LED 2 → Light sensor path OFF
LED 3 → Light sensor path ON
LED 4 → Light sensor End position ON
LED 5 → Pushbutton
LED 6 → ON(RS)-Input
LED 7 → OFF-Input
LED 8 → RS-Output

Diagnostic function 8: Calibration of the light sensors

The light barriers of the S.1 are calibrated at the factory during production of the slider motor to ensure the best possible detection of the end plates. If the sensors operate unreliably due to environmental influences, it may be necessary to recalibrate the light barriers. Only carry out this step after consulting OTTO HEUSS.

Procedure:

1. Activate the extended diagnostics menu (see above).
2. Set function switch to position "8
3. Press and hold button for about 5 seconds until LED 8 starts to flash
4. Move motor manually several times to ON and DOWN position
5. The LEDs indicate the quality of the signals
6. Cyclic display of the signals:
    a. LEDs 1 and 8 flash
    b. LEDs 1 - 7 indicate the quality of the light sensor end position OFF
    c. LEDs 2 and 8 flash
    d. LEDs 1 - 7 indicate the quality of the light sensor path OFF
    e. LEDs 3 and 8 flash
    f. LEDs 1 - 7 indicate the quality of the light sensor path ON
    g. LEDs 4 and 8 flash
    h. LEDs 1 - 7 indicate the quality of the light sensor end position ON
    i. Starts again with a.
7. Saving the calibration by pressing the Set button

After calibration, check the signals of the light sensorswith the Diagnostic overview (function 7). If necessary, you can check the signal quality of the individual light sensors with Diagnostic functions 1 to 4 in the extended diagnostics menu.

Diagnostic function 9: Reset

Function 9 can be used to reset the S.1 completely.

All settings, the regulated force and the calibration of the light sensors are deleted.

After a complete reset, a new calibration must be performed to bring the motors back into a functional state!

To reset, the button must be held down for about 8 seconds. During this time, the LEDs 1 to 8 run up. When LED 8 is reached, all LEDs flash until the reset is completed. Then the S.1 is restarted and you are in normal mode as usual.

> **Attention:** After resetting, the S.1 is not functional until the light sensors have been recalibrated.

9 ESD warning

Please do not touch the electronic assemblies without adequate ESD protection. The assemblies, like almost all electronic components, are sensitive to ESD. For this reason, they are supplied in antistatic packaging. To protect the module from damage, the usual ESD regulations must be observed.
Electrostatic discharge (ESD) is a spark or breakdown caused by a large potential difference, which causes a short, high electrical voltage pulse on an electrical device. Under unfavorable conditions, this voltage pulse can damage electrical components in the device. The cause of the potential difference is usually a charge due to frictional electricity (triboelectric effect) or influence. Frictional electricity also occurs, for example, when walking across a carpeted floor, whereby a person can be charged to approx. 30,000 V (from Wikipedia, the free encyclopedia).

10 Precautions

To ensure safe operation, the following precautions must be observed:

- Avoid placing the device near heat sources and/or in humid and/or dusty places.
- To avoid damage, the instrument must be securely and stably fastened due to high working forces.
- An organ is an electrical installation and must be wired, connected and commissioned professionally and in accordance with applicable standards and regulations.
- Avoid strong vibrations during transports, as they may cause damage to the electronics.
- The device should not be placed near equipment that emits high-frequency waves, such as TV sets, radio receivers, microphone systems, transmission towers, etc.
- Strict care must be taken to prevent liquids or metal chips from reaching the unit, as they may cause damage.
- Do not carry out any unauthorized work on the electronic system.
- In the event of a defect, contact the manufacturer.
- Never reach between the engine and the attachment. There are high working forces. Danger of crushing!

11 Warranty

- The company Otto Heuss GmbH grants a two-year warranty from the date of delivery.
- The company Otto Heuss GmbH is not responsible for damage caused by incorrect handling.
- The company Otto Heuss GmbH assumes no responsibility for cancelled or impaired concerts, events or performances.

12 Disposal

Electrical devices that are no longer required or are defective must not be disposed of in household waste; they must be taken to a local collection point for proper disposal.

Used batteries and electrical devices must be disposed of separately in accordance with applicable regulations.

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