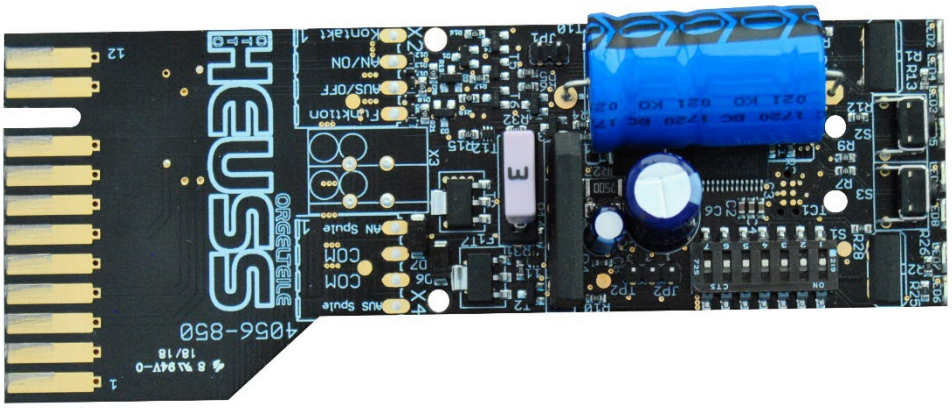
User manual

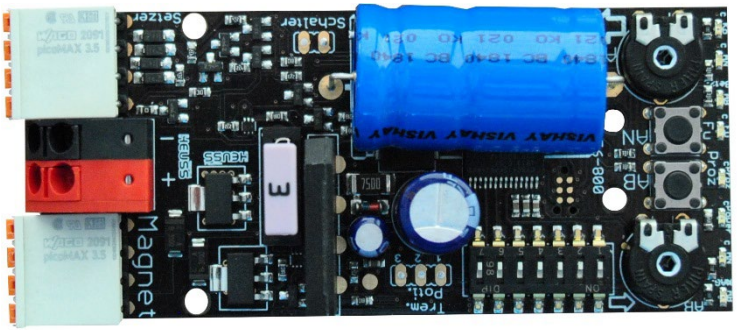
for OTTO HEUSS universal stop motor PCB RM-2

For the operation of:
Stop action sliders (el.), dual stop action sliders (el./mech), couplers and tremulants, with 14V and 24V direct voltage (DC) and alternating voltage (AC)

Order number 4056-850 Type **plug-in PCB**



Order number 4056-800 Type **mounted PCB**



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Mounted-Hardware Version Rev.5
PlugIn-Hardware Version Rev.7

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1 Introduction: The OTTO HEUSS universal stop motor PCB RM-2

In the past, there have been many different variants of motor control cards for different purposes. Sliders in different versions, tremulants, couplers, and much more, available in 14V or 24V, and using DC or AC voltage.
To simplify the variants and to create new, or improve existing, functions, the circuits will, in future, only be divided into two variants that combine all the functions of the previous cards:

- Variant 4056-800, for mounting on the current OTTO HEUSS stop motors R20 and R50. (For mounting on the older motors-R40, R60, and older series of the R50-the adapter plate 4056-900 is required).
- Variant 4056-850, for plugging into all current and past control cabinets for stop motor plug-in cards (not 3x42V slider motors).

2 Technical data

Power supply Operating voltage DC voltage	12-28VDC
Power supply Operating voltage AC voltage	14-26,5VAC (RMS)
Maximum current consumption of the circuit	max. 4,5A (14V Motor with 18V)
Current consumption for inputs	5mA
Switching threshold for inputs (setter - ON/OFF)	6VDC
GND switching (max. resistance to GND)	1kΩ
Common potential of the motor coils	GND
Switching output to setter, labeled "Kontakt"	Voltage = Operating voltage Current = max. 100mA

3 Mechanical connection

3.1 Mounted PCB

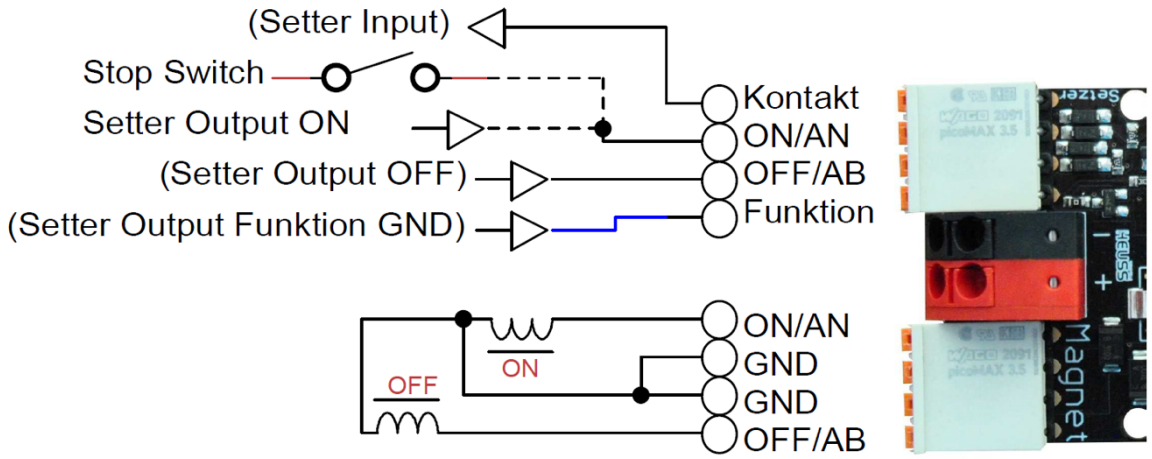
The mounted circuit is usually supplied by us fully assembled and wired. The designation of the connections can be read when the white plug is removed.
The mounted circuit is mounted on the motor by four PCB holders. The four connecting cables of the motor are connected to the corresponding terminals MAGNET AN/COM/COM/AB.
On the PCB, there are arrows next to the potentiometers marked AN (ON) and AB (OFF). These indicate the working direction of the motor. This can also be inverted by means of dip switch 3, as described later.

3.2 Plug-In PCB

The plug-in circuit is plugged into the corresponding slot of the control cabinet.

Attention: For safe insertion and removal of the card, make sure to switch off the organ! The wiring of the motors to the switch cabinet is described in the respective manual for the switch cabinet.

4 Electrical connection



4.1 Mounted PCB

All connection terminals are designed with push-in connection technology. This allows rigid conductors or flexible conductors with cable shoes to be inserted into the terminal without actuating the release-button. To release the cable or to insert flexible conductors without cable shoes, the release-button must be actuated.

For the white 4-way terminals, the release is the orange actuating surface above. On the black/red terminals, the release is the slot-shaped recess between the two circular cable entries located above each other.

The red/black connector is not removable, the designation of the terminals is printed next to it on the board. The connection terminal is intended for cables up to 2.5mm².
The black terminal is labeled "-" and intended for the negative connection (=GND), the red terminal is labeled "+" and intended for the positive connection. The second cable slot can be used to build a cable bridge to the next motor.

Attention: When +/- connecting several PCB´s, please note the required fuse and the cable diameters that depend on it!

The white connectors are designed for cables up to 1.5mm².
The designation of the connections can be read when the white plugs are removed.

The four cables of the motor AN-SPULE/COM/COM/AB-SPULE are connected to the **"motor"** connector at the corresponding terminals. [ON-Coil/COM/COM/OFF-Coil]

At the Setter connector, up to four cables are connected to the associated terminals for Setter control.

The following control lines are provided:

Kontakt [Contact] Status feedback to the setter in case of an el./mechanical dual stop action. For this purpose, a switch must be connected to the two "Schalter"[Switch] connection points, which are located at the bottom (longitudinally) on the edge of the board. If the two connections are connected to each other by closing a switch, a positive signal in operating voltage is output at the "Kontakt" [Contact] connection.

Attention: No external voltage must be applied to this connection.

AN [ON] Connection for the signal to switch on the motor from the setter or stop switch (RS, RzO). Input optionally positive or negative switching, adjustable with dip-switch 5. When used as an electrical slider motor, a permanent signal is required; if this signal drops off, the magnet is switched off again. When used as el. / mechanical dual stop action, a momentary signal (pulse) is required.

AB [OFF] Connection for the signal to switch off the motor; this is only used for the electrical/mechanical dual stop action version, **otherwise no cable connection required**. Input can be set to either positive or negative switching with dip-switch 5. As this input is only used with an electric/mechanical dual stop action, a momentary signal (pulse) is always required here.

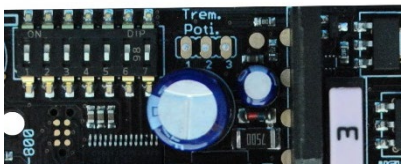
Funktion [Function] Connector for the signal to switch on various special functions such as “stop freeze”. This input always need a negative signal.

Attention: No positive voltage (+1 to 28V) must be applied to this connection from an external source.

Schalter [Switch] 2-pole connection for a closing switch at the bottom longitudinal edge of the board when used with el./mechanical dual stop action. If these two contacts are connected to each other, a signal in operating voltage is given out at "Kontakt".

Attention: The voltage at the two connection points "Schalter"[Switch] on the side of the board is internally less than 6V which is switched by the switch. If the switches of the dual stop action are operated with an external voltage, they must not be connected to the PCB! In this case the switches should be connected directly to the setter without interruption via the board.

Trem. Poti [Tremulant Potentiometer Connection]



3-pin connector for a 10kΩ potentiometer when used with a tremulant motor. This potentiometer is used to control the speed of the tremulant. The center contact of the potentiometer corresponds to the center contact on the board. The two outer contacts of the potentiometer and the circuit board can be connected to each other as required.

4.2 Plug-IN PCB

The wiring of the motors to the control cabinet is described in the respective manual of the control cabinet.
The connections "Schalter"[Switch] and "Trem. Poti." are available on the side of the board, as well as for the surface-mounted version.

4.3 Fuse

There is a fuse on both versions of the circuit. Depending on the version, this can be different in the factory. This is the fuse type "mini flat plug fuse".

5 Setting the dip-switch

The function modes are set by means of dip switches. **After changing the dip switches, the board must be disconnected from the power supply to accept the new setting.**

1	2	3	4	5	6	7	Description
0	0						Stop motor el. stop action (RS/RzO permanent signal)
1	0						Stop motor el./mechanical dual action (RS/RzO pulse signal)
0	1						Tremulant (RS/RzO permanent signal)
1	1						Coupler motor (RS/RzO permanent signal)
		1					Turn working direction ON/OFF-OFF/ON
			1				Microswitch turn output
				1			Inputs ON and OFF negative input signal
					1		End-Boost / alt. tremulant frequency / active coupler switch-off
						1	Temperature shutdown

Switch 1 & 2: Determining which basic function the magnet should have.

Switch 3: When this switch is ON, the input logic is inverted. With a slider motor, this is used to turn the working direction of ON and OFF. With tremulant and coupling magnets, this switch causes the magnet to operate when no RS/RzO signal is present and vice versa.

Switch 4: If this switch is ON, the status of the "Kontakt"[Switch] connection is inverted. (Setter feedback dual stop action). For this, a switch must be connected to the two "Schalter" [Switch] connection points on the side of the board.

Switch 5: If this switch is set to ON, the inputs Setzer-AN [Setter-ON] and Setzer-AB [Setter-OFF] operate by a negative signal (GND). Usually a plus-switched control signal from the stop switch or setter is used, this function can be used to switch to a negative signal. The input "Funktion" is always with negative (GND) signal.
If this dip-switch is switched on, the LEDs of the inputs Setzer-AN and Setzer-AB light up inverted to normal operation. The maximum resistance to ground must not exceed 1kΩ.

Switch 6: If this switch is set to ON, an End Boost is activated. In this case, after a short period of time, the motor is energized with 100% of the voltage for a short period of time for the function el. stop action and el. /mech. dual stop action. This function safely pulls heavy sliders into the end position.
With smooth-running sliders, the end position is reached before the End Boost sets in, so that this is not associated with additional noise.

From software version 2.3.0, an alternative wide-range tremulant frequency of 0.5 - 8 Hz can be activated using this dip switch and a potentiometer.

Switch 7: If this switch is ON, the processor's own temperature sensors are activated. This automatically switches the magnet off if it gets very hot. Normally this function is not needed. In "coupler motor" mode, this function is not useful, because the magnet will most likely become warm or hot during normal operation. To reset after the temperature shutdown has been triggered, the circuit must be switched off and on again.

6 Function types / operating modes of the PCB

6.1 Electrical stop action motor

Usual electrical stop action. There are electric stop switches in the console and additionally the stop motors in the organ. A permanent ON signal is sent by the setter or stop switch as long as the stop is ON.

The potentiometer AN [ON], is used to adjust the force (0-100%) of the ON coil.

The potentiometer AB [OFF], is used to adjust the force (0-100%) of the OFF coil.

The push buttons AN [ON] and AB [OFF] on the board can be used to test the set force. To ensure quieter operation of the motor, the respective "counter-coil" is energized for a short moment before moving in one direction.

If the button is pressed again, in which position the magnet is already located, this can be noticed as a "twitch", as the "counter-coil" is energized again. This can only occur when the button on the board is pressed and not in the regular working mode of the magnet.

When the organ is switched on, the motors automatically energize one side to match the ACTUAL state of the sliders to the SET state of the switches.

6.2 Dual electrical / mechanical stop action motor

Combination of electric stop action together with mechanical stop action. There are no electrical stop switches in the console, only the stop motors which are mechanically connected to the stop action and slider. The setter sends an ON pulse to the input AN [ON] or an OFF pulse to the input AB [OFF] to move the motor electrically.

The potentiometer AN [ON], is used to adjust the force (0-100%) of the ON coil.

The potentiometer AB [OFF], is used to adjust the force (0-100%) of the OFF coil.

The push buttons AN [ON] and AB [OFF] on the board can be used to test the set force. To ensure quieter operation of the motor, the respective "counter-coil" is energized for a short moment before moving in one direction.

If the button is pressed again, in which position the magnet is already located, this can be noticed as a "twitch", as the "counter-coil" is energized again. This can only occur when the button on the board is pressed and not in the regular working mode of the magnet.

In dual stop action mode, the setter (not this PCB) needs a permanent signal from a switch as feedback as soon as the register is pulled. This switch can either be fed directly to the setter separately from the power supply, or it can run over the motor PCB. In this case the switch is connected to the two connection points "Schalter" [Switch] on the side of the board. The

corresponding signal is given out at the "Kontakt" [Contact] output. The output voltage corresponds to the applied input voltage.

Attention: The voltage at the two "Schalter" [Switch] connection points on the side of the board is less than 6V! If the switches of the dual stop action are operated with a different voltage, they must not be connected to the plug-in card! In this case, the switches should be connected directly to the setter without interruption.

6.3 Coupler motor

Permanently energizes the ON coil of the Motor to hold the mechanical coupling rack to the ON position. A permanent ON signal is sent from the setter/switch to the input AN [ON] as long as the coupler is switched on. When the coupler is released, the magnet can be slowed down to minimize noise.

The potentiometer AN, is used to adjust the ON force (0-100%) of the ON coil. The holding force (while the coupler is on) is a fixed 90% of the ON force.

The buttons AN [ON] and AB [OFF] can be used to test the coupler setup. After pressing ON, the coupler remains switched on until AB [OFF] is pressed.

From software version 2.4.0:

Potentiometer AB [OFF] is used to set the ON-time after switching OFF the coupler in order to minimize the noise by catching the mechanical weight against the gravity. The pullback force (as the coupler is released) is a fixed percentage of the ON force when the coupler is activated.

The pullback time and pullback force must be set correctly so that the coupler can drop almost silently.

Pullback time: Is set using potentiometer AB [OFF].

Pullback force: Is set using a button combination. Press and hold the AB [OFF] button until the blue LED lights up. The force can now be set using the AB [OFF] potentiometer. Turning the potentiometer to 100% results in a very strong pullback force. Turning the potentiometer to 0% results in no pullback force at all. It is best to select the middle position first. Then release the AB [OFF] button and set the time with the AB [OFF] potentiometer. You can then use the AN [ON] and AB [OFF] buttons to switch the coupling on and off to test the result. You may have to repeat this process until you have found the best setting. Ideally, the braking impulse should start just before the coupling shaft reaches the stop and the coupling drops almost silently.

From software version 2.3.0, dip switch 6 can be used to make the motor actively move to the OFF position instead of dropping due to gravity. This function is similar to the ON and OFF movement of a slider but with continuous current on ON.

The potentiometer AN [ON], is used to adjust the force (0-100%) of the ON coil.
The potentiometer AB [OFF], is used to adjust the force (0-100%) of the OFF coil.
The pullback function for braking the falling coupling shaft is switched off here.

6.4 Tremulant motor

Tremulates between AN und AB coils. A permanent ON signal is sent from the setter/switch to the input AN [ON] as long as the coupler is switched on.

The potentiometer AN is used to adjust the ON force (0-100%) of the ON coil. The potentiometer AB is used to set the ratio between the ON and OFF sides.

To set the frequency **1.5 – 4 Hz**, a third potentiometer (10kΩ) must be connected to the three connection points “Trem. Poti.” (see chapter "Electrical connection"). This can also be mounted at the console location, wired using a long, shielded cable.

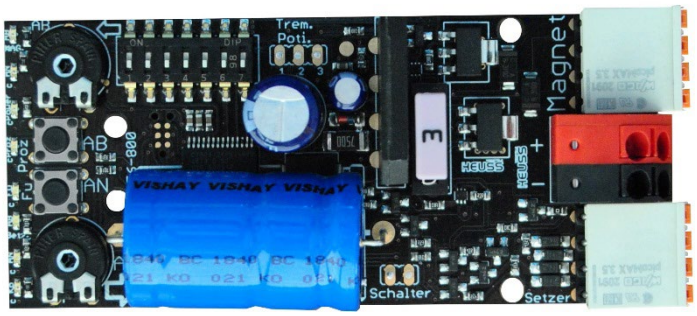
From software version 2.3.0, an alternative wide-range tremulant frequency of 0.5 - 8 Hz can be activated using dip switch 6.

7 LED-indicators

Several LEDs are mounted on the board, which optically represent various functionalities.

Green = Inputs
Red = Outputs

Inscription	Color	Lit when:
AB	Red	off coil is energized
AN	Red	on coil is energized
Power	Yellow	supply voltage is connected
Proz	Blue	Processor works
Fu	Green	Input „Funktion“ is not connected to GND
AB	Green	Off-Input voltage applied
AN	Green	On-Input voltage applied
Ko	Red	Contact-Output voltage out



If dip switch 5 is switched on, the LEDs of the inputs Setzer-AN [setter-on] and Setzer-AB [setter-off] light up inverted to normal operation. (Similar to input "Funktion" [Function])

8 ESD-warning

Please do not touch the electronic modules without sufficient ESD protection. Like almost all electronic components, the modules are sensitive to ESD. For this reason, they are delivered in an 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 over a carpet, whereby a person can be charged to approximately 30.000V.

9 Precautionary measures

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

- Avoid placing the unit near heat sources and/or in humid and/or dusty places.
- To avoid damage, the unit must be securely and stably fastened due to high workloads.
- 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 transport, as these can damage the electronics.
- The device should not be placed near installations that emit high-frequency waves, such as television sets, radio receivers, microphone systems, transmitter masts, etc.
- Strict care must be taken to ensure that no liquids or metal shavings reach the device, as these can 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 magnet and attachment. There is a high workload. Danger of crushing!

10 Warranty

- The company Otto Heuss GmbH provides a two-year warranty from the date of delivery.
- 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.

11 Disposal

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

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