Multi Switch

Control multiple outputs with one input

Multi Switch (P014-40)

Multi Switch Proximity sensors (P014-41)

Contact & Product

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Hand Warmer User & Installation manual

Contents

Important information about this Manual

Thank you for choosing a mo-Vis product!

This is the Manual of your new mo-Vis device. Before you install or start to use this product, it is important that you read and understand the content instructions (and especially the safety precautions).

The installation instructions will guide you as an installer through the options and possibilities of this device. The operating instructions are primarily intended to acquaint you with the functions and the characteristics of the mo-Vis product and how you can use it in the best manner possible. They also contain important safety and maintenance information, as well as the description of possible problems that can arise during use.

Always keep the operating instructions handy in connection with your wheelchair, since the need for important information can arise concerning its use, safety and maintenance.

All information, pictures, illustrations and specifications are based on the product information that was available at the time of printing. Pictures and illustrations shown in these instructions are representative examples and are not intended to be exact depictions of the various parts of the product. We reserve the right to make changes to the product without prior notice.

If you would like to learn more about mo-Vis and its products, we invite you to go to our website: www.mo-vis.com, where you can also download additional copies of this User & Installation Manual.

Support, scrapping and spare parts

Technical support

Please contact your dealer in case of technical problems. If the dealer is not available, or unknown, please contact mo-Vis bv by email (support@mo-vis.com) or by phone (+32 9 335 28 60).

Always state the device serial number when contacting mo-Vis. This ensures you are provided with the correct information.

Spare parts and accessories

Spare parts and accessories must be ordered by the dealer at mo-Vis bvba.

Scrapping & recycling

For scrapping, adhere to your local waste legislation.

Dispose of obsolete electronic parts responsibly in accordance with local recycling regulations.

Warranty

mo-Vis bv warrants the Multi Switch and Multi Switch Proximity Set to be free from defects in material and workmanship for a period of 2 years under proper use, care and service. All warranties only cover parts and do not extend beyond the initial purchaser from an authorized mo-Vis dealer.

Start of the warranty period

Each warranty shall begin on the date the product is first delivered to the customer.

Repair and replacement

For warranty service, contact the dealer from whom the product was purchased. In the event of a defect in material or workmanship, the dealer must obtain a return authorisation (RMA) number from mo-Vis and the product must be shipped to a service centre designated by mo-Vis. mo-Vis will repair or, at mo-Vis' option, replace any product covered by the warranty.

Disclaimer and Limitations of Remedies

The express warranties set forth in this agreement are in lieu of all other warranties of merchantability or fitness of purpose. In no event shall mo-Vis be liable for any direct, indirect, incidental or consequential damages resulting from any defect in this product.

Warranty of parts subject to "normal wear and tear" (e.g. pads, joystick balls, batteries …) are not covered in the warranty except as it applies to defects in material or construction.

Amendments

No person is authorised to alter, extend or waive the warranties of mo-Vis.

Voiding of warranties

The foregoing warranties are contingent upon the proper installation, use, maintenance and care of the product. The warranty will be void if the product has been installed or used improperly, or if it has been repaired or any part replaced by persons other than mo-Vis or an authorised dealer. The Multi Switch unit and Multi Switch proximity sensors are considered as non-serviceable parts.
The addition of equipment or features that are not manufactured or recommended by mo-Vis could affect the intended function of the mo-Vis product and may invalidate the warranty.

Understanding usage

The authorised installer is responsible for understanding the intended use of the mo-Vis equipment, the specifications and its programming parameters. mo-Vis cannot be held responsible for damage caused by incorrect installation or use of the product.
Misuse, mishandling or storage is not covered by this warranty.

Safety precautions

General

The Multi Switch is intended to control up to four devices/technical aids with one input device (mechanical of proximity switch). The Multi Switch is only intended to support auxiliary wheelchair functions.

Incorrect use or installation may lead to risk of injury to the user and damage to the connected device or other property. In order to reduce these risks, you should carefully read this manual, especially the safety instructions and warning texts.

Only install this product on a wheelchair where the wheelchair manufacturer allows the installation of third party parts.

Any unauthorised use of the product may lead to increased risk of accident. In case of doubt for alterations and adjustments, always contact a qualified service engineer.

The Multi Switch unit and Multi Switch proximity sensors are non-serviceable parts.

In case any serious incident occurs in relation to this device, this should be reported immediately to mo-Vis and the competent authority of the Member State in which the user is established.

Warning labels

The following safety labels are used throughout this manual to draw attention to items of significant importance to safety.

⚠️ **CAUTION!**
Signal word to indicate a hazardous situation which, if not avoided, could result in damage to the product or other property.

⚠️ **WARNING!**
Signal word to indicate a hazardous situation which, if not avoided, could result in personal injury or property damage.

Safety precautions

⚠️ **CAUTION!**
Limited liability *mo-Vis accepts no liability for personal injury or damage to property that may arise from the failure of the user or other persons to follow the recommendations, warnings and instructions in this manual.*

⚠️ **CAUTION!**
EMC Requirements: *The Multi Switch complies with the limit values for Electromagnetic Compatibility (EMC) set out in the harmonised standards of the Medical Device Directive 93/42/EEC (EU).*

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⚠️ *WARNING!*
Assembly: The Multi Switch should only be installed or adjusted by a qualified service engineer or someone with adequate knowledge to perform the adjustment in an expert manner.

Maintenance and service: Carry out only the service and maintenance activities specified in this manual. All other service, alterations to and interventions on the Multi Switch unit and Multi Switch proximity sensors must be carried out by a qualified service engineer or someone with adequate knowledge to perform the adjustment in an expert manner. In case of doubt, contact a qualified service engineer or mo-Vis.

⚠️ *Use only spare parts or accessories approved or recommended by mo-Vis. All other use could lead to changes which might impair the function and safety of the product. It could also lead to the warranty becoming void.*

⚠️ *CAUTION!*
Testing: Multi Switch should always be tested in a safe surrounding after the physical installation of the Multi Switch unit and/or a Multi Switch proximity sensor or adjustment of the parameters.

Design and function of the Multi Switch

Purpose

The Multi Switch unit's main functionality is to allow the use of a single input device to control up to four outputs. This offers more operating options to the user.

General

- INPUT (3.5 mm stereo input jack): the Multi Switch accepts two types of switches
    - Mechanical Switch (mono jack 3.5 mm): e.g. mo-Vis Twister
    - Multi Switch Proximity Sensors: no force or clicking is required. Compared to a mechanical switch, there is an increased comfort for the user and increased ability to control the device and outputs.
    - Pressing the connected switch or proximity sensors, cycles you through the output channels of the device.
- OUTPUT: two 3.5 mm stereo jacks that allow to connect up to four separate outputs
    - Every output channel has its own LED that indicates its status and activity.
    - You can adjust the number of outputs by using the mo-Vis configurator software.

- The Multi Switch has a MICRO USB-connection
  - The Multi Switch should be connected to a USB power source to be operational.
  - You can connect the Multi Switch to a PC to set the input and output parameters in the mo-Vis Configurator Software.
- Every activity of the user may be accompanied by an auditory signal, adding additional control for the user.
- A Status LED indicates the status of the device.

The Multi Switch Proximity are available in two sizes:
- The small 12 mm sensor allows installation on a very limited space.
- The regular 24 mm sensor offers a more sensitive activation, thanks to a larger sensor surface.
- The sensitivity of both sensors is fully adjustable with the mo-Vis Configurator software.

Multi Switch

A Multi Switch (P014-40) consists of the following parts:

	Product description	Product code
	Multi Switch unit	P014-40
	USB connection lead A to B micro (100 cm)	PMCAB-00031
	Multi Switch manual, with Serial number sticker	D-P014-40-70

Multi Switch Proximity sensors

The Multi Switch Proximity sensors set (P014-41) consists of the following parts:

	Product description	Product code
	Multi Switch proximity sensor 12 mm	P014-20
	Multi Switch proximity sensor 24 mm	P014-23

Optional: Splitter cable

To connect multiple output devices, a 3.5 mm stereo jack splitter to 3.5 mm mono jack cable is required.

Contact your dealer or mo-Vis for ordering.

Input

The input is a stereo 3.5 mm jack (red). It accepts two types of switches:

- Mechanical switch with mono jack 3.5 mm: switch connected between *tip* and *sleeve*; *ring* is continuously connected to *sleeve*.
- mo-Vis proximity sensors: *tip* is the sensing input, *ring* is the *shield*, *sleeve* is open.

Outputs

The outputs are all potential free and fully isolated from the rest of the Multi Switch.

The four outputs are arranged as two groups of two. Each group is connected to a stereo 3.5 mm jack:

Output	Location
1	Green tip
2	Green ring
3	Yellow tip
4	Yellow ring

Output LEDs

Four green LEDs on the front of the Multi Switch indicate which output is selected. It makes it easier for the user to select the desired channel.

Status LED

A separate green LED at the front indicates the device status:

Status	LED
Active	Short on, long off
Fault	Number of flashes, long off (see further: § *Troubleshooting*)

Push Button

At the front of the Multi Switch a push button is provided. To learn more about the function of this button, see § *Calibration Mode*.

USB Connection

The Multi Switch is equipped with an isolated micro USB connection at the right side.

Parameter Configuration

Use this connection to connect the Multi Switch to a PC to interact with the mo-Vis Configurator Software and set all the parameters of the in- and outputs.

Power Supply

When the Multi Switch is connected to a USB power source (e.g. USB Charger, power bank, laptop, tablet…), the device will be powered and operational.

The Multi Switch only requires a minimal amount of energy. Most standard power sources are not designed to deliver minimal current over a longer period of time. Contact your dealer or mo-Vis for more information and assistance on choosing the right power source for the Multi Switch.

⚠️ *CAUTION!*

*Ground loop risk: Both the USB port and the input jack are connected to ground. Make sure not to introduce a ground loop by connecting the USB port and the input jack to different circuits both supplied from the same battery. A ground loop can cause a ground current flowing from one circuit to the other over the Multi Switch. If the ground current is too high, the Multi Switch will not work properly or can even be overstressed. **This can lead to permanent damage of the Multi Switch. A good solution is to use an isolated USB power supply.***

Technical description of the Multi Switch Proximity sensors

The mo-Vis proximity sensors are based on the principle of capacitive sensing. They are capable of measuring conductive objects (e.g. a finger or a metal stick) that approach the sensor.

> **CAUTION**
> **Moisture** (e.g. rain) is also a conductive substance. A few drops of rain will not cause issues, but a water film can cause the sensor to be activated all the time.

The bigger the surface of the sensor, the more sensitive it will be (so the 24 mm version is the most sensitive one). The sensor is most sensitive at the front side in the centre. At the sides it is only slightly sensitive and on the bottom it is immune.

A test finger was used to determine the distance versus the sensitivity parameter setting. Know that this is not an exact relationship and sensitivity may vary depending on the size/shape of the finger.

Sensitivity	Distance 24 mm (in mm)	Distance 12 mm (in mm)
100%	10.00	3.00
90%	8.50	2.00
80%	7.00	1.25
70%	5.00	0.50
60%	3.00	0.20
50%	2.00	0.10
40%	1.50	0.05
30%	1.00	<0.05
20%	0.50	<0.05
10%	0.25	<0.05
5%	0.05	<0.05

mo-Vis Configurator software

With the Configurator software it is possible to adjust the working of the Multi Switch according to the users' needs.
Almost all settings are fully adjustable.

Consult the adjustable settings in the parameters list.

Software download

- You can download the software on the mo-Vis website: www.mo-vis.com.
- For all details on how to install and use the software, we advise you to consult the manual of the mo-Vis Configurator software (included in the software download).

Software requirements

Windows version 7, 8 or 10.

User profiles

In the dealer profile, you will be able to configure a number of parameters for the Multi Switch. This profile requires a password. To obtain this password, please contact mo-Vis.

Installation instructions

Safety precautions

⚠️ *CAUTION*

*The Multi Switch is **not waterproof**. Some drops of water will not cause problems, but excess water must be avoided. Mount the device in such a way that no water (rain) can enter the device.*

The Multi Switch should not be used in conditions where malfunctioning of the device can cause potential risk situations.

*The device contains a controller that continuously checks the integrity of the device: whenever a problem is detected, the device will be switched off automatically. When this happens, check the **fault flash code** or use the configurator to check why the device stopped.*

*Make sure that **cabling** is mounted in such a way that excessive wear and tear is avoided.*

⚠️ *CAUTION*

*The Multi Switch Proximity Sensors may be influenced by **moisture**: a few drops of rain will not cause issues, but a water film can cause the sensor to be activated all the time.*

*Keep **radio transmitters** (e.g. mobile phone) at least 30 cm away from the sensor and its connecting cable.*

*In case **high sensitivities** are used (>70%), make sure the sensor is well fixed and the cables are well routed. Moving the sensor/cable can have an influence on the sensitivity or even produce false contacts.*

Preparations

Installation plan

Set up an installation plan before starting the installation. Based on the users' needs this plan should specify:

- Where which part of the Multi Switch should be placed
- How the Multi Switch will be operated
- The Multi Switch parameter settings

Serial number sticker

The additional serial number sticker (included in the package) has to be adhered to the back of this manual.

> ⚠ *CAUTION*
> *Only a **qualified service engineer** may install the Multi Switch.*

Configuration

You can adjust the Multi Switch configuration before or after mounting of the device.

1. Connect the Multi Switch with the USB connection lead to a PC on which the mo-Vis Configurator software is installed. The device will be powered on automatically and an USB connection will be established allowing to use the mo-Vis configurator.
2. Adjust all settings according to the installation plan.

Mounting

The Multi Switch can be mounted on any location in function of user's needs.

To install the Multi Switch, proceed as follows – according to your installation plan:

1. Define the place and position of the Multi Switch unit / proximity sensors and all cabling.

Make sure that the user has visual contact with indication LEDs at the front of the Multi Switch, to enable him to check the status. Although every action can trigger an auditory signal, it is not advised to have this signal as only available check for the user.

2. Secure all cables with straps or fasteners.

Usage

Dealer assistance

During first time use by the user it is advised that the dealer or service engineer assists and explains the different possibilities to the customer (the user and/or his attendant).

If needed, the dealer can make final adjustments.

User testing

It is important that the customer is fully aware of the installation, how to use it and what can be adjusted to optimise his experience.

As a dealer, proceed as follows:

1. Explain and show the customer how you have executed the installation, and explain the function of every (new) button.

2. Have the user test the position of the Multi Switch:

- Is the Multi Switch positioned in such a way the user gets visual and/or auditory feedback?

     – Does the Multi Switch and its cabling not hinder the user?

3. Have the user test all possibilities of the button/proximity sensor:

     – Are they well positioned for the users' needs?

     – Can the user safely operate them with the least effort?

4. Has the user tested all possible uses of the switch:

     – Is every function accessed by the switch understood by the user?

     – Is every function accessed by the switch functioning providing the least effort for the user?

5. If needed, adjust the Multi Switch (with the mo-Vis Configurator software) and retest until there's optimal position and functioning.

6. Explain to the customer possible problems and how to address them (see *§ Troubleshooting*).

Operation modes

> **Note**: when power is removed from the Multi Switch, all outputs will return to their open condition.

Select Modes

There are several possibilities to activate the outputs. The default mode is by Select by Click.

Select by Click

In this mode, clicking shortly once or more times will activate the output (short close/open input). After the clicks are given:

- The output will be closed for a set time (depending on the output's *Close Time* setting)

  OR

- The selected output is locked until released (depending on the output's *Lock* setting)

The period between the clicks needs to be shorter than the *Action Delay.*

Start Scanning by Click

A short click will start the scanning of the active outputs. A corresponding number of beeps and a selection of LEDs indicate where the Multi Switch is in its scanning process.

When the desired output is selected, press again to activate it. The output will react:

- The output will be closed as long as the input is kept closed

OR

- The output is locked until released (depending on the output's *Lock* setting)

If you wait too long, the selection process will stop and no output will be activated. This is a built-in feature to cancel any unwanted input.

The scanning of the outputs is done at an interval of *Select/Scan Time*.

Hold while Scanning

Keep the input closed and a scanning of the active outputs will start. A corresponding number of beeps and a selection of LEDs indicate where the Multi Switch is in its scanning process.

When the desired output is selected, release the input device. The output will react:

- The output will be closed for a set time (depending on the output's *Close Time* setting)

OR

- The output is locked until released (depending on the output's *Lock* setting)

If you wait too long, the selection process will stop and no output will be activated. This is a built-in feature to cancel any unwanted input.

The scanning of the outputs is done at an interval of *Select/Scan Time*.

Select Timed Click

In this mode, the selected output depends on the duration and/or number of clicks.

- To operate output 1 to 3: keep the input closed and the Multi Switch will start to scan the first 3 active outputs. A number of beeps, will be generated. The corresponding LEDs will also be activated.
  - Short press (< *Select/Scan Time*): output 1
  - Medium press (> Select/Scan Time, but < than 2x *Select/Scan Time*): output 2
  - Long press (> 2x *Select/Scan Time*): output 3
- To operate output 4: execute a double click within the *Select/Scan Time*.

When the desired output is selected, release the input to activate it. The output will react:

- The output will be closed for a set time (depending on the output's *Close Time* setting)

OR

- The selected output is locked until released (depending on the output's *Lock* setting)

If you wait too long, the selection process will stop and no output will be activated. This is a built-in feature to cancel any unwanted input.

Continuous Scanning

In this mode, the active outputs are scanned all the time (continuously).

When the desired output is selected, close the input to activate it. The output will react:

- The output will be closed as long as the input is kept closed

OR

- The output is locked until released (depending on the output's *Lock* setting)

Momentary/Timed or Switched

Momentary/Timed

- The output will be closed as long as the input is closed (momentary)

OR

- The output will be closed for a set time (timed)

Switched

The output will toggle between open and closed. This is useful to switch something on continuously.

Lock Mode

The Lock mode can be a very useful mode if you want to control a device for a longer time, e.g. a communication or environmental device.

There are several options:

- No (default): normal operation, after the output was operated, we will return to selection mode.

- Timed Closed: the output will be locked in the selected output. To escape this mode (i.e. to break the lock), we need to close the input continuously for longer than the *Quit Time*. When working in this mode, the output will be closed when the input is closed. This means, that as you break the lock, your output will react as well**.**
- Timed Open: the output will be locked in the selected output. To break the lock, we need to close the input continuously for a time longer than the *Quit Time*. When working in this mode, the output will be closed when the input is released.
- Nudge: The output will be locked in the selected output. To break the lock, we need to close the input shortly for a time shorter than the *Quit Time*). The output will be closed only if you hold longer than the *Quit Time*.

Output modes in *Lock* mode:

- Momentary/Timed: the output will be closed **at least as long as** the Close Time or longer.

    Example with a Close Time of 500 mS

    - *Close input 200 mS => output is closed 500 mS*
    - *Close input 800 mS => output is closed 800 mS*
- Switched: output will toggle between open and closed.

Calibration Mode

The calibration mode is only useful in combination with proximity sensors.

Auto

The Multi Switch will automatically calibrate over time. This is only usable when the user of the device is able to keep a distance of at least 30mm from the sensor when not operated.

Manual

The use of manual calibration is necessary when the activating part of the body remains constantly close to the sensor (less than 30 mm distance). It is therefore appropriate to calibrate manually at regular intervals (every day or after a few days).

Ask the user to go to the position where he would like the input to be open. Then press the button on the box and the system will store that position as the open reference.

When the calibration is successful, a continuous beep will sound. If it was unsuccessful or if calibration mode is set to auto or a mechanical switch connected, a number of short beeps will be produced.

Troubleshooting

Flash codes

When a fault occurs the LED will start to flash. There is a long delay and then a number of flashes with a short delay. Count the number of flashes and look up the according code in the table below.

Flash Count	Reason	Required Action
1	-	-
2	-	-
3	Power Supply, Under/Over Voltage	Check power connections and power cable
4	Sensor	Replace PCB
5	-	-
6	ADC (Internal Analog to Digital Converter)	Replace PCB
7	Test Flag failed or diagnostic failed	Redo tests. Replace PCB.
8	CPU fault	Replace PCB
9	Scheduler fault	Update software. Replace PCB
10	Coding Error	Update software. Replace PCB.

If the problem persists after intervening, please contact your local dealer or mo-Vis Service Engineer to attend to the problem.

Error codes

The system maintains a fault log with counters. Each time a specific fault occurs its counter will be incremented by one. The fault log can be accessed by the configurator (Dealer Level), it is possible to clear one fault counter or all counters.

In the case of error codes, please contact mo-Vis to learn about the required actions.

Maintenance

Cleaning

Clean all parts of the Multi Switch and the optional Proximity sensors on a regular basis (monthly), or whenever needed.

- Gently remove dust and dirt with a damp cloth.
- Use only non-aggressive disinfectant cleaning agents

> *WARNING!*
> *Do not immerse the unit in water or do not use excessive amounts of liquid.*

Monthly check

Monthly, or whenever needed, check whether:

- All bolts and screws are still firmly tightened
- There is no damage to any wiring
- There is no excessive wear to any of the parts

Multi Switch unit maintenance

The Multi Switch unit is maintenance-free. Under regular use circumstances, the Multi Switch unit and different parts do not require additional maintenance.

Parameter settings

With the mo-Vis Configurator Software you can change the parameters of the Multi Switch. Depending on your user profile (user, attendant, dealer, OEM), you will be able to change a number of parameters.

Input Settings

Parameter	Min	Max	Default/ options	Description
Select Mode	-	-	**Select by Click**	See § *Operation Modes*
			Start Scanning by Click	
			Hold while Scanning	
			Select Timed Click	
			Continuous Scanning	
Active Outputs	1	4	1	Number of outputs used. If set to '1', the switch will never enter Select mode.

Calibration Method (proximity mode only)	-	-	**Auto**	See § *Operation Modes*
			Manual	
Sensitivity (proximity mode only)	10	100	50	Sensitivity of the proximity sensors. The higher the value, the more sensitive the device becomes. Reduce this value in case of false contacts.
Output Sequence	-	-	**Tip-Tip**	The Select Sequence is: Green Tip - Yellow Tip - Green Ring - Yellow Ring.
			Tip-Ring	The Select Sequence is: Green Tip - Green Ring - Yellow Tip - Yellow Ring.
Action Delay	10	2500	50	In mS
Select/Scan Time	100	5000	1000	In mS This is also the scan time.
Input beep	-	-	**None**	No sound (default)
			Short	A short beep
Select beep	-	-	None	No sound

			Medium	A normal (medium) beep (default)
			Long	A long beep
Output beep	-	-	None	No sound
			Short	A short beep (default)
			Medium	A normal (medium) beep
Quit beep	-	-	None	No sound
			Medium	A normal (medium) beep
			Long	A long beep (default)

Output Settings

There are four groups, one group for each output. The parameters for each group are equal.

Parameter	Min	Max	Default/ options	Description
Mode			**Momentary/ Timed**	The output will be closed as long as the input is kept closed, or the output will be closed for a set time.

			Switched	The output will toggle between open and closed.
Close Time	20	60000	200	The time the output will be closed. Only in case of a timed output.
Lock	-	-	**No**	See § *Operation Modes*
			Timed Close	
			Timed Open	
			Nudge	
Quit Time	200	60000	5000	The time needed to close the input in order to open the Lock. The parameter 'Lock' needs to be set 'Yes' for this output.

Technical data

Product description & code

- Multi Switch Unit (P014-40)
- Multi Switch Proximity Sensors (P014-41)
- Multi Switch Proximity Set (P014-42)
- Multi Switch Sensor 12 mm (P014-20)
- Multi Switch Sensor 24 mm (P014-23)

Dimensions Multi Switch unit

- 36 mm x 40 mm x 17 mm (HxWxD)
- 1.42 in x 1.57 in x 0.67 in (HxWxD)

Voltage supply

- Over micro USB   : 5V

Power consumption

- 14 mA

Input

- mechanical switch (Closed max 200 Ohm, Open min 150 kOhm)
- mo-Vis proximity sensor, 12mm or 24mm

Output

- Max : 60V, 75mA,
- Output On resistance : 10 Ohm

Cable length

- Sensor 12 mm : 120 cm (0.49 ft.)
- Sensor 24 mm : 120 cm (5.9 ft.)

Tested According (relevant sections)

EN12182

Installation date: . . / . . / . . . .

Dealer: . . . .

mo·vis
move with vision

Dealer stamp:

Serial number sticker