Operating Manual
MyEcc Pupil

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HomeBraceGermany UG (haftungsbeschränkt)
Konrad-Hornschuch-Str. 67 | Halle 24, C1 | 73660 Urbach
+49 7181 20741-0 | info@homebrace.com
www.homebrace.com

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01 Purpose

The special wheelchair control MyEcc Pupil Control ❷ is a manufacturer-independent power wheelchair control in combination with the MyEcc Pupil Frame ❶, a headset specially designed for this purpose, which detects eye movement via a special sensor.
With this headset it is not only possible to drive the wheelchair (and to stop it by closing the eyes), it is also possible to adjust seat-settings of the wheelchair or to move attachments (robot arms etc.). The special feature is, however, that the MyEcc Pupil also works outdoors and in bright sunlight, but also in the dark.
The MyEcc Pupil comes with phototropic lenses. It is also available as sunglasses only, or can be customized for vision correction by your optician.
Any other use is NOT in accordance with intended use and leads to exclusion of liability and loss of warranty (optional/ mandatory interfaces are described in section 08). The same applies to unauthorized retrofits/modifications. Further warnings and safety instructions are provided in the manual.
(Insertion of lenses fitted by an optician does not require special approval)

❶ **MyEcc Pupil**   ❷ **My Ecc Pupil Control**   ❸ **Cable**

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02 Indication and Contraindication

Indication
The product is indicated for anyone unable to perform voluntary muscle movements (such as using a joystick (hand/foot/ chin or other body part) or pressing a button (with a body part)) except with their eyes. Users need to have sufficient vision to safely operate the special control unit in combination with the wheelchair.

Possible medical conditions (this is not a complete list):
Amyotrophic lateral sclerosis (ALS), Multiple sclerosis (MS), Duchenne's muscular dystrophy, Tetraplegia, Infantile cerebral palsy (ICP), Spinal muscular atrophy (SMA), …

Contraindication
Complete loss of vision in both eyes

03 Warnings

This manual contains warnings to protect you from damage to property and physical injury. Always read and observe these warnings. Follow all the instructions in this operating manual and comply with all the actions marked with a warning symbol and word of warning. Read this manual carefully before starting up your MyEcc Pupil. Keep this manual. You may need to consult it later. If you give the device to anybody else for their use, share this operating manual as well.

Do not open the device. It does not contain any parts requiring user maintenance. Opening the device may give you an electric shock and damage the components. Avoid exposure to moisture, dust, sunlight and other sources of heat.

⚠️ **Risk of personal injury**
Non-observance results in death or serious injury.

04 Product liability

Pursuant to the liability of manufacturers for their products as defined in the Product Liability Act, the instructions provided in this brochure must be observed (product information and intended use, improper use, product performance, product maintenance, information and instruction obligations). Non-observance releases the manufacturer from any liability.

MyEcc Pupil Control is only meant to be an interface between power chair and MyEcc Pupil. Any other use is improper and will result in loss of warranty and liability. The same applies to any alterations and modifications.

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05 Important safety instructions

Only experts authorized by HomeBraceGermany may perform assembly, startup and maintenance. This in particular means the individuals referred to in the following as "installers"; for further details, please consult item 13 of the operating manual. HomeBraceGermany will not be liable for any damage or loss resulting from unauthorized changes to the product. HomeBraceGermany accepts no liability or warranty if MyEcc Pupil is combined with other brands, in particular any improper use of MyEcc Pupil with other devices.

Observe the maximum power supply your peripherals can use (USB port 5VDC; 100mA). The use of the mounted module is permitted only by individuals with the appropriate mental capacity and cognitive function. Non-observance of this precaution may endanger the user or other people.
In addition, please observe the information for users in item 14.
HomeBraceGermany accepts no liability or warranty in the event of infringement.

MyEcc Pupil may be used outdoors but only in areas intended for pedestrians such as sidewalks, public places, pedestrian zones, etc. Participation in road traffic is not allowed. The assistance of an accompanying person and compliance with all safety instructions are mandatory. Participation in public road traffic is only permitted in the event of an obstruction / detour and must be carried out by the accompanying person. After the obstacle, the sidewalk must be used again immediately. **Ensure dustproof and splashproof assembly of the MyEcc Pupil Control control box.** If the above criteria are not met or met only in part, outdoor use of MyEcc Pupil is strictly prohibited.

06 Maintenance and cleaning

The product does not require regular maintenance. We recommend regular cleaning and disinfection with a disinfectant and cleaning agent intended for use in hospitals. The cleaning should only be done with a wipe. Wipe all exterior surfaces and allow to dry by itself.
For any repairs, consult an expert. If a malfunction occurs, send in your device to our after-sales service.

07 Reuse

MyEcc Pupil is suitable for reuse. All hardware must be returned to HomeBrace before re-use in order to carry out the following actions:

• Cleaning and disinfection of equipment
• Functional test of MyEcc Pupil Control and MyEcc Pupil Frame
• Software check, software update
• Visual inspection of the hardware (cables etc.)
• Replacement of defective or worn parts if necessary

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Konrad-Hornschuch-Str. 67 | Halle 24, C1 | 73660 Urbach
+49 7181 20741-0 | info@homebrace.com
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08 Mandatory review of the mounted system by the installer

Suitable measures should be taken to check for and protect against crushing, impact, shearing and pinching. The following areas require special review and monitoring:

- Check that the software feature to stop the wheelchair by closing the eyes is working properly (the software must self-deactivate)
- Speed
- Seating options and settings
- ⚠ Environmental hazard check!

09 The following monitoring mechanisms are actively monitored and will stop the wheelchair in the event of malfunction

- Camera-eye contact
- Windows operating system monitoring
- MyEcc Pupil-MyEcc Pupil Control connection
- Cables and connectors from MyEcc Pupil to MyEcc Pupil Control

10 MyEcc Pupil requires the following interfaces with the wheelchair

- Up to 8 jack plugs 3,5 mm, e.g. switch module
- 9-pin D-sub connector, e.g. Omni Display

11 Wheelchair procedure

The power chair needs to be prepared for switch control by the installer (authorized specialists only!). This step is not included with MyEcc Pupil; please contact your contractual partner (system installer or manufacturer) for this purpose. There is no need to install software, just copy a folder. Window size and relay activation are easily changed using a file included in the pack. We have taken great pains to maximize safety and reliability.
For the optimal use of the wheelchair with our MyEcc product group we recommend a corresponding driving stability module of the wheelchair manufacturer (ESP / Gyro).

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Konrad-Hornschuch-Str. 67 | Halle 24, C1 | 73660 Urbach
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12 Installation on the wheelchair

12-01 Technical requirements

A MyEcc Pupil Display with at least a Core i5 Processor and 4 GB of RAM is required for calibration and installation. You will need Windows 10 with all the latest updates (as of 9/1/2019).

The display for wheelchair control does not strictly need to be positioned in the field of vision in combination with the MyEcc Pupil. It can for instance be attached in the eye control scan area for communication and be removed from the vision area for wheelchair control.

12-02 Assembling MyEcc Pupil Control

When wiring and assembling, please check the wheelchair routes. Poorly run cables may be torn off. The MyEcc Control control box should be attached to the wheelchair in a (waterproof) bag if possible, preferably at the back of the wheelchair or the armrest.

The headset can easily be removed at any time!

> ⚠ **Warning**
> Please power down the wheelchair before putting on and taking off, and check the MyEcc Pupil Control safety features afterward.

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12-03 Installing the software (authorized distributors only)

The application runs on Windows PCs (Windows 10 or higher) and uses a USB port (USB-2). To install the software, open the MyEcc Pupil folder using the USB stick supplied with the pack.

Start App Pupil capture. If asked, please issue all the approval options, including for public and private networks. This is necessary for communication between MyEcc Pupil and MyEcc Pupil Control. Run all the routines.

Screenshot after running the routines
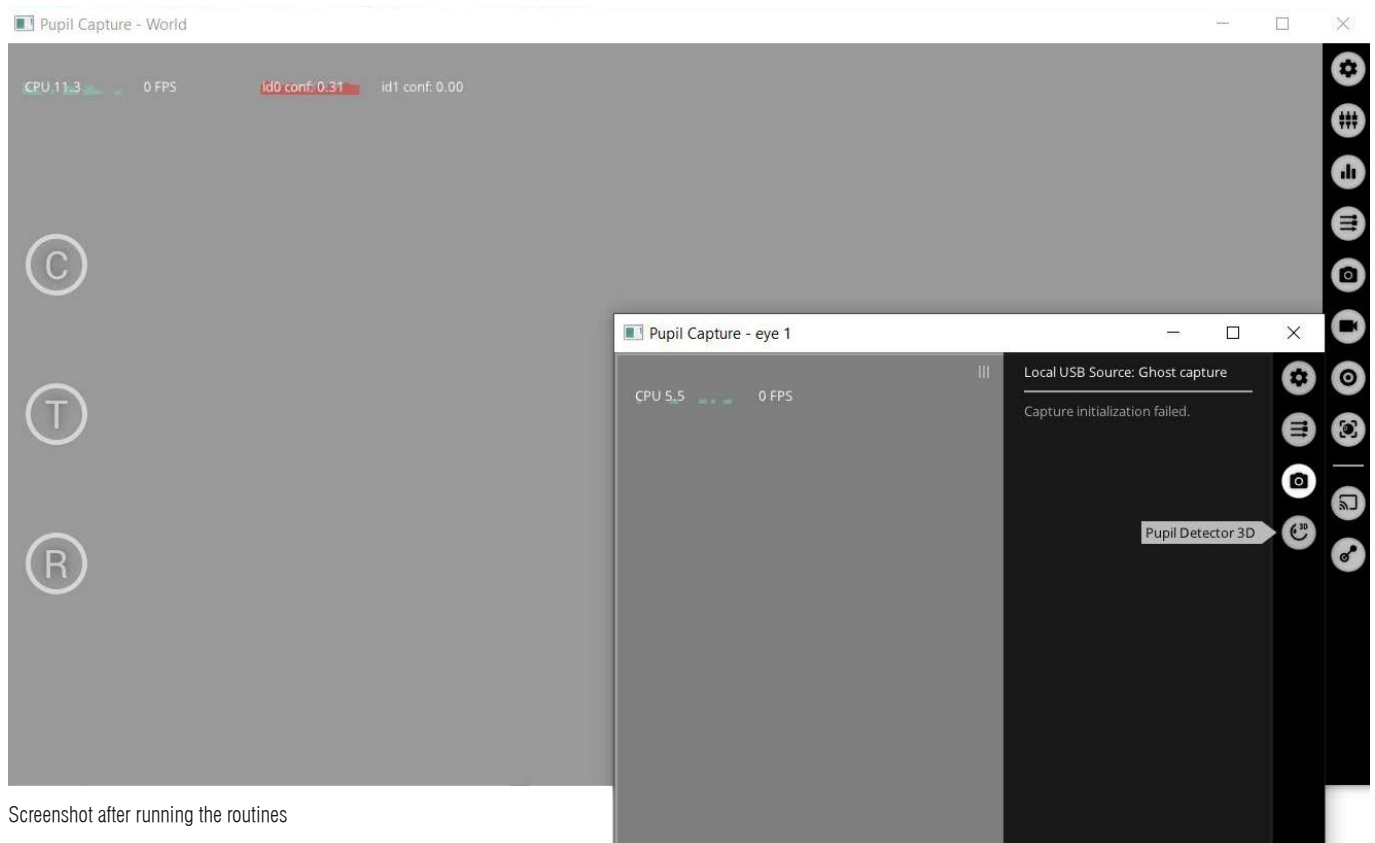
Now restart the computer.
Copy the entire MyEcc_Pupil folder to the computer, ideally to a place that the end customer cannot locate.
8 LEDs on the control box show which relays are switched on when activated.

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Konrad-Hornschuch-Str. 67 | Halle 24, C1 | 73660 Urbach
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13 Startup

Calibration is required beforehand in order to use MyEcc Pupil to control the wheelchair by eye movement. (for further details, see item 15.2). The control always needs to be unlocked before starting to drive (see item 15.3).

13-01 Menu function and settings

The following menu can be used to open and close specific windows. Click once to open and click again to close a window.
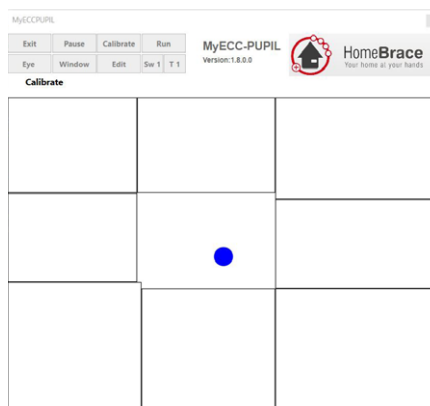

Exit
Use the Exit button to quit the program.

Pause
Use the Pause button to pause and inactivate control. The background is red during pause.

Calibrate
Starts calibration. (see item 15-02)

Save Calibration
This button saves the last calibration. After a restart of the software there is no need to calibrate again. The button "Calibrate" now appears green.
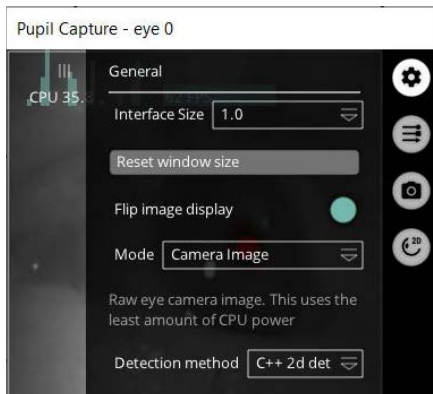

If necessary, it can be recalibrated at any time via „Calibrate".
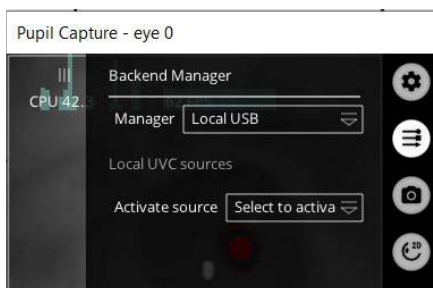
Run (training mode)
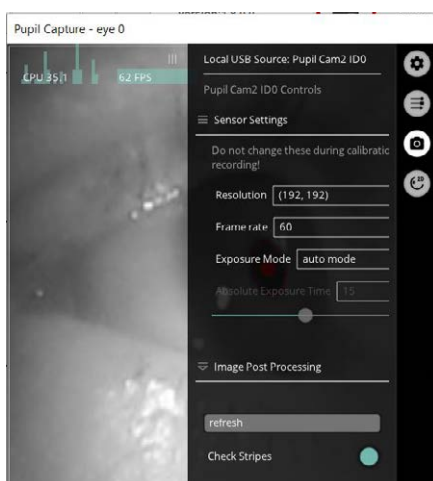These feature allows you to activate the control without unlocking via eye movement.

Eye
The Eye button opens a new window with the following menu items

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General
Please keep the settings.

Backend Manager
Please keep the settings.

Local USB Source
Please keep the settings. The correct settings are 60 Hz and Auto mode.

Pupil Detector 2D
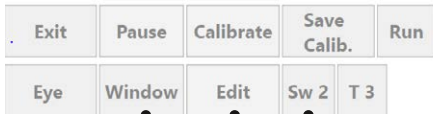The pupil intensity range slider changes the pupil detection intensity.

⚠️ If a high value is necessary for detection (e.g. the user has astigmatism, etc.), it is essential to check the safety shutdown feature.

Pupil min und max
Changes the interior and exterior point of the pupil. The default and recommended setting is min 10 and max 100.

⚠️ **Warning:** When high detection intensity is active, the control system may mistake objects for a pupil and trigger a malfunction. The wheelchair needs to be switched off before putting on or taking off the headset.

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Window button

The window button is necessary for communication between MyEcc Pupil and MyEcc Pupil Control. Please keep the settings as changing them may-cause malfunctions.

You can use Detect eye 0 and Detect eye 1 to choose between the left eye and right eye for control, depending on the headset model.
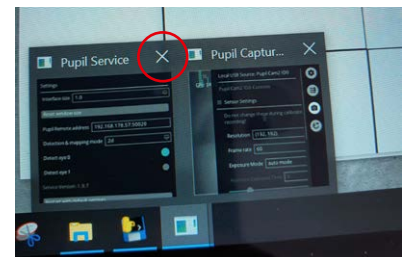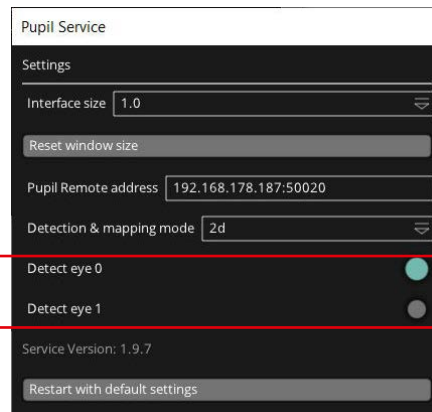

After a change, the windows can be closed via the taskbar and the × to save the new setting.

Button Edit

The software divides the user's field of view into fields whose limits can be varied by dragging/moving the lines in Edit. These settings facilitate eye-movement control depending on the seat position.

Please note that you will have to recalibrate after making any changes.
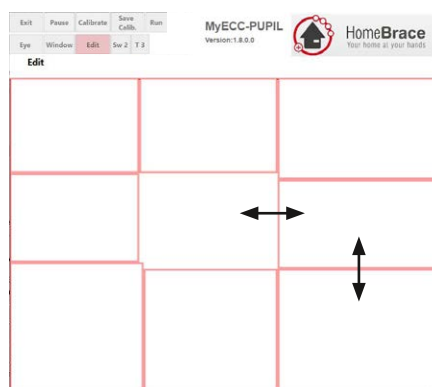
Changes to the fields are only possible if the pause mode is not activated.

Button Sw

You can use the Switch button to choose between various mode control options. Available buttons are center top, center right, center bottom and center left. These buttons can be controlled by the following eye movements

Sw1: look at the chosen button and close your eyes
Sw2: look at the chosen button and blink once (close and open your eyes)
Sw3: look at the chosen button, then blink twice (close, open, close, open)

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Konrad-Hornschuch-Str. 67 | Halle 24, C1 | 73660 Urbach
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	Exit	Pause	Calibrate	Save Calib.	Run
	Eye	Window	Edit	Sw 2	T 3

Time
The Time button indicates the time in seconds left or available for the selected switches.

Example:
Sw1 and T1 selected: keep eyes closed for one second

Example:
Sw2 and T3 selected: blink once (close and open your eyes) within 3 seconds while focusing on the selected button.

Recommended procedure: The sw2 and T3 setting is recommended for switching modes.

13-02 Calibration

Calibration is required before using MyEcc Pupil for control. In the menu, activate the Calibrate button.

Calibrate Ready appears.

Start looking around and focusing in all directions. A sound and a blue dot indicate the first calibration run. A green dot appears, the sound changes and the second stage of calibration starts.
Continue looking around. The sound of a beep indicates that calibration is complete. The system is now ready for activation. The calibration can be saved with the button "Save calibration" and after a restart be called again.

13-03 Activation

Eye focus must alternate between left – right – left. The feedback is a beep and all buttons green (=activated).

13-04 Connecting to the wheelchair

Functions 1 – 5 (drive forward / right / back / left + function 5) are on a 9-pin D-sub connector as indicated in R-Net I/O module SK78814/1 wiring diagram. (D-sub pins 1, 2, 3, 4, 6, common: pin 8). Functions 6 / 7 / 8 are available on separate jacks.
1 = forward
2 = right
3 = back
4 = left
5 = button center top + switch command
6 = button center right + switch command
7 = button center bottom + switch command
8 = button center left + switch command

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13-05 Parameter settings

The eccapp.ini file contains parameters to adjust the application's appearance and behavior and
reflects the settings via the buttons. Some settings can only be adjusted directly in the file:

[GENERAL]
ini file for eccapp_pupil c:Sägesser Engineering, Dottikon, CH

[PUPIL]	
SAMPLES=6	Only adjustable here; describes the number of pictures (in this example, every 6th) used by the camera for control. Higher values give more precise controls but also demand the most from the MyEcc Pupil Display.
LEFT=0	Camera position at left eye activated(=1) | deactivated (=0)
RIGHT=1	Camera position at right eye activated(=1) | deactivated (=0)
REVERSE=0	Changes the key command assignment to the mirror opposite, i.e. looking right will move the wheelchair to the left, looking up will move it backward. To activate, set the value from 0 to 1
[GENERAL]	
SIZEX=691	Initial window size, horizontal (pixels)
SIZEY=636	Initial window size, vertical (pixels)
OFFSETX=400	Initial window position, horizontal (top left corner) on screen (pixels)
OFFSETY=112	Initial window position, vertical (top left corner) on screen (pixels)
TIMECALIBRATION=10000	Minimum time in milliseconds required for calibration
COUNTZEROFORRECALIBRATION=6	Calibration can be started by looking to the center and blinking a certain number of times (6 in this case)
UNLOCKTIMEOUT=2500	Time for left-right-left activation
COUNTZEROLIMIT=10	Time until timeout if the eye is not detected
[RELAIS]	
PULSELENGTH=30	Pulse length to activate drive and switch relays (ms). This setting should not need to be changed.
PULSEINTERVAL=90	Pulse interval to activate drive and switch relays (ms). This setting should not to be changed.
SWITCHMODE=2	Describes sw button setting
SWITCHWAITTIME=3000	
SWITCHONTIME_F1=1000	
SWITCHONTIME_F2=1000	
SWITCHONTIME_F3=1000	
SWITCHONTIME_F4=1000	
[BUTTON]	Describes line values of each button
BUTTON1_Y_PERCENT=28	
BUTTON2_X_PERCENT=38	
BUTTON2_Y_PERCENT=32	
BUTTON3_X_PERCENT=32	
BUTTON4_X_PERCENT=38	
BUTTON4_Y_PERCENT=39	

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```
BUTTON5_Y_PERCENT=31
BUTTON6_X_PERCENT=35
BUTTON6_Y_PERCENT=39
BUTTON7_X_PERCENT=30
BUTTON8_X_PERCENT=36
BUTTON8_Y_PERCENT=31
ACTIVEDELAYTIME=400
```
Describes the time the software takes to activate a command from the center button

```
ACTIVEDELAYTIMEGAP=400
```
Time the software takes to activate a drive command from another button

```
OVERCALIBRATIONPERCENT=10
```
In this case, 10% is deducted from the maximum calibration

```
[MAPPING]
FUNCTION1=1
FUNCTION2=2
FUNCTION3=3
FUNCTION4=4
FUNCTION5=5
FUNCTION6=6
FUNCTION7=7
FUNCTION8=8
```
The buttons can swap functions
Drive forward
Drive right
Drive in reverse
Drive left

Tip: If using MyEcc Pupil from a reclining position, operation is easier if functions 1 and 3 swap places, i.e. looking down will drive the chair forward and looking up will drive it back.

14 Important for users

14-01 Operation

Please note all the information in this operating manual before starting operations (especially items 01 to 14)! The application will run only if the control box is connected. Messages will appear if the control box is not recognized at the USB port. You can make the application window larger or smaller but these changes will not be saved in eccapp.ini.

⚠ You must check the MyEcc safety features.

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Konrad-Hornschuch-Str. 67 | Halle 24, C1 | 73660 Urbach
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14-02 Troubleshooting

A "Joystick in center position" error message can have the following causes:
If you operate the joystick before or immediately after switching on the control system, a "Joystick displaced" message appears in the display. This message can also appear if you give multiple commands simultaneously by moving your eyes rapidly in different directions. To reset the display, switch the control system off and back on again.

⚠ **Any claim under the warranty in accordance with our General Terms and Conditions of Business shall lapse if the customer independently remedies the defect, in particular by opening the device.**

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15 Technical Data

Connections
- 1 × USB B
- 8 × 3,5-mm-jack
- 1 × 9-pin D-sub connector

Operating/storage environment
- Maximum ambient temperature during operation: 0°C (32°F) to 55°C (131°F)
- Maximum humidity during operation: 0% - 85% relative humidity
- Maximum ambient temperature during storage: -20°C (-4°F) to 75°C (167°F)
- Maximum humidity during storage: 5% - 85% relative humidity
- MyEcc Control and MyEcc Pupil Frame are splash-proof (IP 22)

Power requirements
USB to 5VDC connector (100mA)

Contents of the pack
- MyEcc Pupil Control control box
- MyEcc Pupil software supplied as an executable app, no installation required, contained on a USB memory stick only
- Connecting cable; 3 × jack cables, 9-pin D-sub cable, USB cable
- HomeBrace bag
- MyEcc Pupil Frame inluding phototropic lenses and cable

Weight/dimensions
- MyEcc Pupil Control
  0,325 kg
  120 × 95 × 50 mm (Length × Width × Depth)
- MyEcc Frame
  0,285 kg (incl. cable)
  150 × 158 × 30 mm (Length × Width × Height)

Service Life
With proper use and because of its components and design, MyEcc Pupil has a service life of 5 to 8 years.
UDI-DI
4260737430013

MyEcc Pupil/Control disposal
MyEcc Pupil/Control consists of recyclable materials that do not belong in household waste and should be recycled. That is why you as a consumer are obliged under the Electrical and Electronic Equipment Act („Gesetz über das Inverkehrbringen, die Rücknahme und die umweltverträgliche Entsorgung von Elektro- und Elektronikgeräten") in force in Germany to ensure that electrical and electronic equipment is disposed of properly and separately from household waste. Please help protect the climate and environment by returning the MyEcc Pupil/Control to your recycling center or an appropriate collection point.

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Konrad-Hornschuch-Str. 67 | Halle 24, C1 | 73660 Urbach
+49 7181 20741-0 | info@homebrace.com
www.homebrace.com

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16 Contact

HomeBraceGermany UG (haftungsbeschränkt)
CEO: Thomas Rosner

Postal and delivery address
Konrad-Hornschuch-Str. 67
Halle 24, C1 | 73660 Urbach

Headquarters and billing address
Birkenweg 12 | 73660 Urbach
+49 7181 20741-0 | info@homebrace.com

www.homebrace.com/en