MCS2 HAND CONTROL MODULE

USER MANUAL

The information given in this document was carefully checked by our team and is constantly updated. Nevertheless, it is not possible to fully exclude the presence of errors. In order to always get the latest information, please contact our technical sales team.

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1 *INTRODUCTION*

This document is a user manual for the SmarAct MCS2 Hand Control Module, which is either an external module connected to the MCS2 main controller or integrated into the MCS2 main controller.

The MCS2 Hand Control Module offers easy and ready-to-go control without the need of complex installation procedures. After power up the device is ready to use and you may start using your positioning system right away. This manual describes how to control your positioners with the integrated or external Hand Control Module. The device offers two joysticks and three knobs to control the positioners, as well as a display and four buttons to configure the device.

The Hand Control Module supports different driver modules and the available options and controls depend on the connected driver module type. Refer to the *MCS2 Programmers Guide* for the differences between the Stick-Slip Piezo Driver and the Electromagnetic Driver.

Chapter 2 describes the setup of the display in general, chapter 3 explains how to control your positioners and chapter 4 shows you how to configure the device.

Generally, the Hand Control Module is always in one of two operation modes:

- **Normal Mode** In this mode you may use the joysticks and the control knobs to move the positioners. This is the default mode that is active after a power-up.

- **Menu Mode** This mode is used to configure the device. The control knobs and buttons are used to navigate through the menu and select configuration options.

In case of an external Hand Control Module the interface supports hot-plugging. Therefore, the device may be attached to or detached from the main controller at any time.

> **NOTICE**
> Detaching the device from the main controller will stop all movements sent by the device. Movements sent by other command sources will remain unaffected.

2 DISPLAY SETUP

Depending on the current operation mode the display has a different setup.

2.1 Normal Mode

In normal operation the display shows information of up to three channels (one channel group, see figure 2.1). Channel groups are shown as tabs on the top of the screen. The active group is highlighted and horizontally centered. Each channel is shown as a row with the channel state on the left side and control parameters on the right side. The header of the channel state shows the name of the channel and it's index in parentheses. Behind the name the current move state of the channel is shown. Below the header most of the space is taken by the current position of the channel. The digits of the position are grouped in blocks of three with the corresponding unit below. On the very left the current calibration and referencing state is shown. If the box is highlighted, the corresponding channel is calibrated or referenced.

The control parameters on the right side show the active control mode and associated parameters. The bottom of the screen features a status bar which will display events received from the main controller and occasionally some hints.
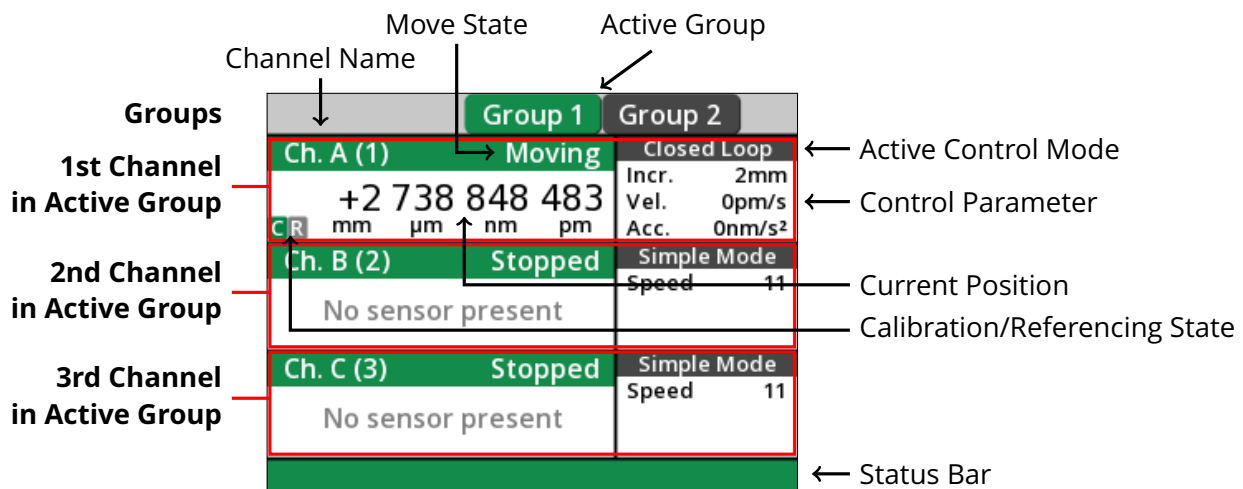

Figure 2.1: Display setup in normal operation

2.2 Menu Mode

The menu mode is used to configure the Hand Control Module and to execute special commands, e. g. finding reference marks of positioners with sensors. To enter the menu mode press the *Menu* button next to the display (top left). To exit the menu mode press this button again or select the *Exit* item of the main menu.

The menu screen (see figure 2.2) shows the name of the current menu at the top. The main part shows the items available in the current menu and the currently selected item is highlighted. The current item selection can be moved by turning any of the knobs. If the current menu contains more items than fit on the screen, the item list is scrolled vertically once the item selection reaches the top/bottom of the screen. The current scroll position is shown in the scroll bar on the left. The status bar at the bottom shows hints for some menu items.
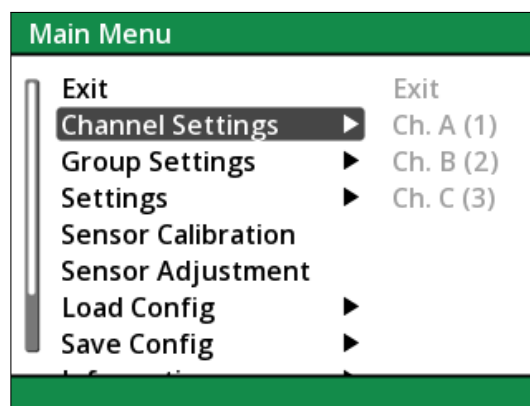

Figure 2.2: Display setup in menu mode

An arrow on the right side of a menu entry indicates a submenu item. Once a submenu item is scrolled to, a preview of the submenu will be displayed in light colors on the right side of the display. The submenu can be entered by pressing any of the knobs. The current submenu may be exited by selecting the *Exit* item on the top or by pressing the *Back* button.

Other menu item types include value items which show their current value on the right side. By selecting the item and pressing any knob the value is cycled through the possible values or an additional value selection screen is opened for items with many possible values.

2.3 Error Reporting

While using the Hand Control Module you may experience a number of different warnings or errors. This section gives an overview of the most common error cases and gives some troubleshooting hints. Please refer to the *MCS2 Programmers Guide* for more information on specific errors.

In *Normal Mode* errors and information are reported using the status bar at the bottom of the screen. In *Menu Mode* errors are reported using message boxes. Possible errors reported by the device are:

Endstop reached The positioner reached a mechanical endstop. Check mechanical setup for free movement if this is unexpected.

Range limit reached The positioner reached the configured range limit. Verify range limit settings if this is unexpected.

Holding aborted While holding the current position the positioner was forcefully moved.

Movement overridden The current movement of the Hand Control Module was overridden by a new movement command from the PC.

No sensor present Performing closed-loop movements requires a positioner with a sensor. Verify that the positioner has a sensor and is properly connected.

Sensor disabled The sensor of the positioner is currently disabled. Enabled it by changing the *Sensor Power Mode*.

Power supply overload The power supply is overloaded. Check wiring and positioner for damages.

Over temperature The amplifier temperature is critically high. Check that the fan is not blocked and the device has sufficient air flow for cooling.

Invalid parameter The entered value is not allowed for the current parameter. Try a different value or check the *MCS2 Programmers Guide* for the allowed value range.

Sensor type not supported The positioner sensor type is not supported by the sensor module. Verify that you have selected the correct positioner type and sensor module for your positioner.

Busy moving The current parameter can't be changed while a movement is in progress. Stop the positioner and try changing the parameter again.

Additionally, you may see a warning symbol in the lower right corner of the screen. This indicates that at least one module is in an error state. You can get more information about the error by checking the *Information* menu. Modules in an error state are highlighted in red. The module state will indicate the type of error.

3 *CONTROL MODES*

In normal operation the joysticks and the knobs are used to control positioners. Each of the three knobs correspond to one of the three channels currently displayed. The left knob controls the first channel on the top, and so on. The four joystick axis may be freely mapped to any of the three channels.

Turning a knob or moving a joystick will perform a movement. The type of the movement depends on the control mode that is currently configured for the channel. There are four different modes to control the positioners:

- Simple Control Mode[1]

- Advanced Control Mode[1]

- Scan Control Mode[1]

- Closed-Loop Control Mode

Each channel may be configured with it's own control mode independently. In general, the distance moved per knob turn is given by an increment or number of steps parameter. The joystick performs a smooth movement with a velocity given by the joystick position and a velocity parameter. The direction of the movement depends on the direction you turned the knob or moved the joystick and also on the invert configuration of the knob or joystick.

To change the control mode of a channel press and hold the *Mode* button next to the display (bottom left). In this state, instead of moving the positioners, the knobs are used to change the control modes of the corresponding channels. By turning the knobs you may cycle through the available control modes in both directions. See the following sections for a detailed description of the control modes and their parameter settings.

Each control mode has its own parameters. The parameter change state can be entered by pressing the knob corresponding to the channel. See section 3.1 "Changing Control Mode Parameters" for a detailed description on how to change control mode parameters.

> **NOTICE**
> When entering the parameter change state using the knob, the corresponding channel is implicitly stopped. This may be useful to abort a movement. Alternatively, the parameter change state can be entered by touching the screen anywhere on the parameter list, which will *not* stop the channel.

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[1]This mode is only applicable for Stick-Slip Piezo Driver.

3.1 Changing Control Mode Parameters

In normal operation mode the right side of each channel shows the current control mode and its associated parameters. These parameters can be changed in multiple different ways.

Pressing the knob of the corresponding channel switches into the parameter change state (see figure 3.1). In this state one of the control mode parameters is highlighted and may be changed by turning the knob. If multiple parameters are available, the active one can be changed by pressing and holding the knob. This will show up/down arrows next to the parameter name. Turning the knob in this state (while pressed) will change the currently selected parameter. Pressing and releasing the knob without having changed the current parameter will exit the parameter change state. The parameter change state can also be entered by touching the screen anywhere on the parameter list and exited by touching the channel state. While this method allows easy and fast changing of parameters, only values of a fixed set may be selected.

Figure 3.1: Channel A (1) is in parameter change state

NOTICE

Note that only up to 3 parameters may be visible at the same time, but some control modes may contain more parameters. Scrolling past the end of the displayed parameters will scroll the parameter list and show the remaining parameters. The visibility of the up/down arrows indicates whether scrolling in a specific direction is possible. Also note that some parameters may be read-only and therefore cannot be selected.

The second method is more flexible and allows arbitrary values (within a certain valid range) to be set. Touching the screen anywhere on the parameter list, while in parameter change state, will bring up the parameter edit screen for the chosen channel (see figure 3.2). The top of the screen shows tabs for each parameter that can be set for the current control mode. The active parameter tab is highlighted and horizontally centered. It can be changed by touching the tab of the parameter or by using the *Group Up/Down* buttons (next to the display on the right side). For the selected parameter the current value is shown inside a text box. The value may be edited by using the displayed number pad and the touch screen. Some parameters allow specifying an additional unit for the value entered into the text box. This is visualized by a number of buttons

next to the number pad, with the currently selected unit highlighted in a darker color. The unit can be changed by touching the corresponding button. Touching the *OK* button accepts the values for all parameters and closes the parameter edit screen. Parameters that are out of range are modified automatically, so that they are just within the valid range. The parameter edit screen can also be exited without accepting the new parameters by touching the red $\times$ in the top right corner or using the *Back* button (bottom left next to the display).
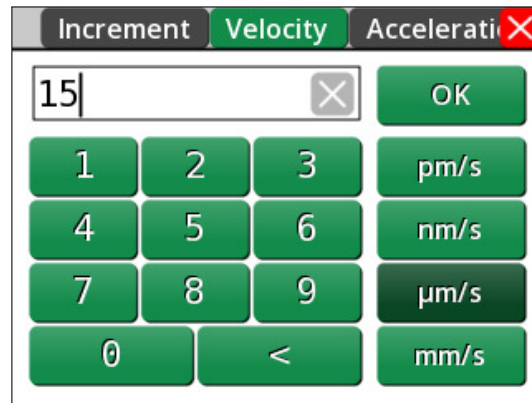

Figure 3.2: Parameter edit screen

The last method allows quick changing of the increment parameter (*Simple Control Mode* and *Closed-Loop Control Mode* only). Holding the *Mode* button (bottom left) and using the *Group Up-/Down* buttons changes the increment parameter of all channels in the current group.

3.2 Simple Control Mode

The *Simple Control Mode* offers an easy way to move a positioner using a generic *speed level*. This mode performs step movements without sensor feedback (open-loop). This mode is only applicable for Stick-Slip Piezo Driver. Only a single parameter may be configured:

Parameter	Description
Speed (Spd.)	Generic speed level for open-loop movements. Higher values result in a faster movement. This also configures the maximum step frequency for joystick moves.

3.3 Advanced Control Mode

The *Advanced Control Mode* performs the same stepping movements as the *Simple Control Mode* and is only applicable for Stick-Slip Piezo Driver. Instead of a generic speed level, which is internally mapped to a set of movement parameters, the following parameters may be set individually:

Parameter	Description
Steps (Stp.)	Number of steps performed when turning a knob by one notch. This value is ignored for joystick movements.
Amplitude (Amp.)	Voltage amplitude for each step. Higher amplitude values result in a larger step width. The step amplitude is a 16bit value from $1 \ldots 65\,535$, where $65\,535$ corresponds to 100V.
Frequency (Frq.)	Frequency in Hz that steps are performed with. This also configures the maximum frequency for joystick movements.

3.4 Scan Control Mode

In *Scan Control Mode* the positioner doesn't perform any steps. Only the elongation of the piezo element, which depends on the applied voltage, is controlled through this mode. This mode is only applicable for Stick-Slip Piezo Driver. When reaching the minimum or maximum voltage the positioner will stop. In this state a scan movement instruction in the direction of the boundary will have no effect. If you wish to move the positioner further in this direction you must switch to one of the other control modes. The following movement parameters are available for this mode:

Parameter	Description
Increment (Incr.)	Voltage increment that is performed when turning a knob by one notch. The increment is a 16bit value from $1 \ldots 65\,535$, where $65\,535$ corresponds to 100V. This value is ignored for joystick movements.
Speed (Spd.)	Generic speed level for scan movements. Higher values result in a faster scan velocity. This also configures the maximum scan velocity for joystick moves.
DAC	Read-only value showing the current output voltage of the digital-to-analog converter as a 16bit value.

3.5 Closed-Loop Control Mode

With the *Closed-Loop Control Mode* the positioner is controlled using sensor feedback. In this mode the positioner can be moved by a certain relative distance.

The following parameters can be configured in this mode:

Parameter	Description
Increment (Incr.)	Position increment that is performed when turning a knob by one notch. If velocity control is disabled (see velocity parameter below) the maximum joystick velocity is set to 10 times the position increment per second.
Velocity (Vel.)	Velocity of the movement. A value of zero disables velocity control and results in a movement with maximum velocity (only allowed for Stick-Slip Piezo Driver). If this value is not zero, this also configures the maximum movement velocity for joystick moves.
Acceleration (Acc.)	Acceleration of the movement. A value of zero disables acceleration control (only allowed for Stick-Slip Piezo Driver). For this parameter to take effect, the velocity control must be enabled too (velocity != 0). Joystick movements are always performed without acceleration control.
Hold Time (Hld.)[1]	Defines the time the position is held, once the target position is reached.

NOTICE
The closed-loop control mode may be configured for channels without a sensor, but performing movements requires a sensor to be attached.

Note for Electromagnetic Driver Channels

To perform movements with the Electromagnetic Driver the amplifier needs to be enabled first. Trying to start a movement while the amplifier is disabled will open a prompt with the option to enable the amplifier. If the channel is not phased when enabling the amplifier the phasing sequence is automatically started and the positioner enters the closed-loop holding state after the phasing has finished. To stop the channel from actively holding the position and to release the holding force, disable the amplifier again in the channel settings.

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[1]This parameter is only applicable for Stick-Slip Piezo Driver.

4 *MENU MODE*

To enter the menu mode press the Menu button next to the display (top left). To return to the normal mode press this button again or select the Exit item of the main menu.

Before using the device for the first time, you should configure it to fit your needs. In particular, a reasonable channel mapping depends on the mechanical setup of your positioners. Positioners that are equipped with sensors should also be configured before using them.

There are several memory slots that you may use to save and load different configurations (see section 4.8). The first slot is the default slot and will automatically be loaded when the device is powered up.

> **NOTICE**
> Changes made to the configuration of the device take effect immediately, but will not be saved to a memory slot automatically. If you power down the device before saving the new configuration to a slot, the changes will be lost.

4.1 Channel Settings

The *Channel Settings* menu allows configuration of channel specific properties. The number of channels is fixed and equal to the number of channels of the connected MCS2. Channels may be given individual names which is the only property that is stored on the Hand Control Module. All other properties exposed through this menu only modify the values stored on the main controller. The following options are available for each channel:

Set Channel Name Opens a text edit screen which is controlled through the touch screen. The displayed keyboard allows entering lower and uppercase letters by using the shift key (⇑). Numbers and special characters are available by pressing the button labeled "?123". Channel names may be up to 8 characters long. The channel names displayed throughout the menus are suffixed with the channel index (one-based) in parenthesis.

Positioner Type For positioners with sensors the correct positioner type must be selected. The type affects the position calculation and closed-loop control. After changing the positioner type the sensor must be calibrated. Please refer to the *MCS2 Positioner Types* document for a list of available positioner types.

Safe Direction Set the safe direction used for calibration and referencing of positioner types that are referenced via a mechanical end stop.

Referencing Direction Set the initial direction for the referencing sequence.

Find Reference This will move the positioner to its reference mark and update the current position according to the logical scale offset. After finding the reference mark the physical position is known. Please refer to section 4.6 "Referencing" for more information.

Set Zero Position Defines the current position as the new zero position. If the physical position is known (see Find Reference above), this also updates the logical scale offset.

Range Limit Min./Max. Defines the range for the software range limit. Once the limits are set the positioner will not move beyond the boundaries of the range limit. The maximum limit must be higher than the minimum limit for this feature to be active.

Max Closed-Loop Freq.[1] Sets the maximum frequency for closed-loop movements. This value should be set to a frequency which doesn't overheat the piezo in the targeted operation environment.

Sensor Power Mode Sets the power mode of the sensor. The default value is *Enabled* which keeps the sensor enabled permanently. In some circumstances it may be desirable to temporarily disable the sensor. This can be achieved by setting the power mode to *Disabled*. In *Power Save* mode[1] the sensor is permanently enabled during movements and only occasionally when the positioner is not moving.

Amplifier Enables or disables the output amplifier. For the Electromagnetic Driver this parameter also triggers the phasing sequence and enables the closed-loop control. Note that disabling the amplifier removes any holding force from the positioner for Electromagnetic Driver channels.

Actuator Mode[1] Sets the actuator driving signal generation. In addition to the normal mode, several special purpose modes are available. The quiet mode reduces the noise that is emitted from the positioners while moving, but results in higher heat-dissipation of the controller. For this reason the quiet mode is not recommended for continuous operation.

Sensor Input/Ctrl. Loop Input When used with an optional analog I/O Module or SmarAct PicoScale as a sensor module, the control loop input can be set to something different than the default position sensor. See section "Auxiliary Inputs and Outputs" of the *MCS2 Programmers Guide* for more information.

> **NOTICE**
> By touching the channel state in normal mode a channel quick config menu is opened. This menu shows the combined options of the 4.1 "Channel Settings" and 4.3 "Group Specific Channel Settings".

4.2 Group Settings

For display and control purposes channels are organized in groups. New groups can be created by selecting the *Create Group* item. This will create a new empty group, to which you can add channels. Often used channels may be added to multiple groups at the same time. For each

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[1]This option is only applicable for Stick-Slip Piezo Driver.

created group the *Group Settings* menu shows a submenu with the same name as the group. In this submenu the following group settings may be specified:

Set Group Name Opens a text edit screen which is controlled through the touch screen. The displayed keyboard allows entering lower and uppercase letters by using the shift key (⇑). Numbers and special characters are available by pressing the button labeled "?123". Group names may be up to 8 characters long.

Add/Remove Channels Opens a group edit screen which allows assigning channels to groups (see figure 4.1). The left column displays the channels currently in the group. The right column shows available channels not assigned to the group. By turning a knob the selected channel in the active column can be changed. The selected channel may be moved to the opposite column by pressing a knob. The active column can be changed by pressing and holding a knob and turning it while the knob is still pressed. The screen can be exited by pressing the *Back* button.

Channel Config This submenu allows configuring channel properties that are specific to channels in this group. See section 4.3 "Group Specific Channel Settings" for a list of available properties.

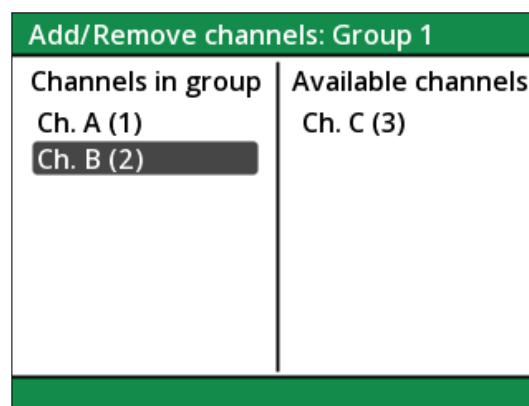**Delete Group** Delete the current group and all associated settings.

Figure 4.1: Group edit screen

4.3 Group Specific Channel Settings

Each channel, which is assigned to a group, carries some group specific parameters. These include control mode parameter, which can be changed as described in section 3.1 "Changing Control Mode Parameters". Additional parameters that can be specified via the menu are:

Joystick Axis Selects the joystick axis that controls this channel. Possible values are *X1*, *Y1*, *X2*, *Y2* and *None*. The X-axis correspond to a left/right movement of the joystick and the Y-axis to an up/down movement. The joystick on the left is identified by the suffix 1 and the right joystick by the suffix 2. Setting the property to *None* disables joystick control for this channel.

Joystick Inversion Invert all joystick movements for this channel. Per default a joystick movement to the right or up increases the current position.

Joystick Move in Menu Allows controlling positioners using the joysticks in menu mode. This way positioners can be moved, e.g., during the PicoScale sensor adjustment. The move mode and settings correspond to the currently active values in normal mode.

Knob Assign the knob that controls this channel. The knobs are numbered from 1 (leftmost) to 3 (rightmost). It is possible to select the same knob for multiple channels, allowing synchronous movements of multiple positioners.

Knob Inversion Invert all knob movements for this channel. Per default a clockwise movement increases the current position.

4.4 General Settings

Network Config (Only for devices with network interface) Opens a screen to view and configure the network interface. This may be especially useful, if the current configuration doesn't work in the target network environment.

Cycle Tabs If enabled, the selected tab will wrap around once the leftmost/rightmost tab is reached and the user tries to select the next tab. With this option disabled the selected tab will remain unchanged.

Cycle Menu Item If enabled, the item selection will wrap around after scrolling past the end of the item list.

Joystick Calibration The joystick calibration screen offers two tabs to configure different settings for the joystick. To exit this screen, press the *Back* button.

First the *Deadzone Width* tab allows configuration of the joystick deadzones (see figure 4.2). The deadzone is the region in which movements of the joystick are ignored by the software. A deadzone is required because of the analog nature of a joystick. The values on the bottom of the screen show the joystick position after correcting for the deadzone. The numbers in parenthesis show the current width of the deadzone. The active deadzone is highlighted and the width can be changed by turning a knob. Pressing a knob will cycle through all four axis.

In the second *Zero Offset* tab the zero offset of the joystick can be set. The numbers on the bottom show the current position of the joystick after compensating for the position of the joystick in it's default position. If these values are not close to zero, press any of the knobs, while both joysticks are in the zero position. The values in parenthesis are the raw analog values of the joystick.

> **NOTICE**
> Note that a firmware update resets the **joystick calibration**. If uncalibrated the joysticks may trigger a movement in some cases even if in neutral position. Make sure to run the calibration sequence after a firmware update of the HCM.

Touch Calibration This item will start the touch screen calibration sequence. Usually it's not necessary to calibrate the touch screen, but if you notice a discrepancy between the touched position on the screen and the position registered by the software, a calibration should be
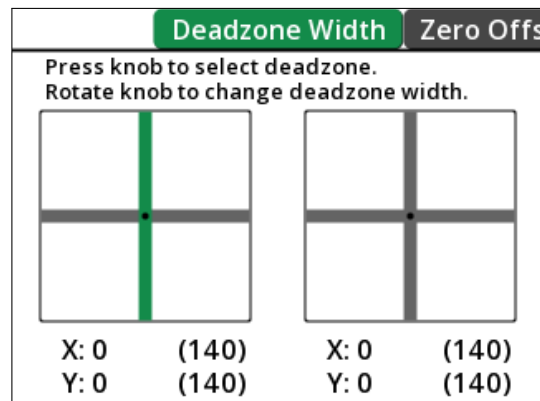
Figure 4.2: Joystick deadzone configuration

performed. After starting this function the screen will show 3 circles one after the other. You have to touch each of the circles to finish the calibration sequence. Note that you cannot cancel the calibration, so you have to touch the screen at least 3 times. After the calibration you will be asked if you want to save the new calibration data.

Screen brightness Adjust the brightness of the screen backlight.

Screensaver Set the timeout value for the screensaver. After no user input has occurred for the duration of the timeout the screen backlight is disabled. Once the next user input event occurs, the backlight is enabled again.

Disable Screen Turn off the backlight of the screen. This option may be useful for applications where the light from the screen may with other equipment, e.g. for optical experiments. Once the next user input event occurs, the backlight is enabled again.

4.5 Sensor Calibration

After changing the positioner type or the mechanical setup (different positioners connected to different channels) the sensor needs to be calibrated. The *sensor calibration* screen shows an overview of all connected sensors, as seen in figure 4.3. Connected sensors can be checked by selecting them using the knob and then pressing the knob. After all channels that should be calibrated are checked the calibration routine can be started by selecting the *Start calibration* item.

> ⚠️ **WARNING**
> As a safety precaution, make sure that the positioner has enough freedom to move without damaging other equipment.

The channel overview will show the status of the calibration for each channel and display an error in case the calibration failed.

Positioners that are referenced via a mechanical end stop are moved to the end stop as part of the calibration routine. For this movement the configured move velocity and move acceleration are

used. Which end stop is used for referencing is defined by the configured safe direction instead of the direction bit of the calibration options property. Note that when changing the safe direction the end stop must be calibrated again for proper operation.
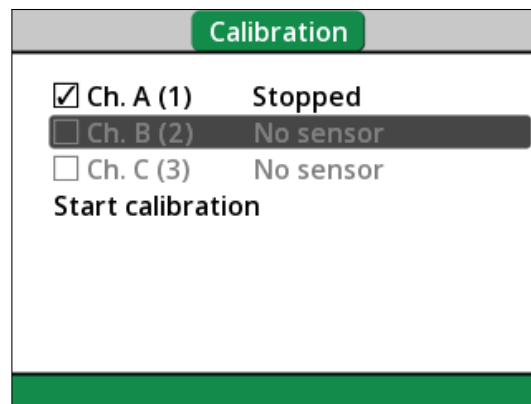

Figure 4.3: Sensor calibration screen

4.6 Referencing

The referencing may be used to instruct a positioner to determine its physical position. It will start to move in the configured search direction and look for a reference. The positioner must have a sensor attached to it and the sensor must be enabled or in power save mode in order to perform the referencing sequence.

Depending on the reference strategy (which is partly predefined by the positioner type and partly configurable) as well as the individual positioner, the referencing takes some time to complete.

In general, the behavior of the reference sequence may be configured with the referencing options property. Please refer to the *MCS2 Programmers Guide* for detailed information on the different referencing options. Note that the Hand Control Module currently only allows to configure the starting direction for the movement. Select the *Referencing Direction* item in the Channel Settings menu to change the starting direction. The velocity and acceleration for the referencing movement is defined by the configured closed-loop parameters for the channel.

Select the *Find Reference* item in the Channel Settings menu to start the actual movement. If the positioner will encounter a physical end stop *before* finding the mark, it will automatically reverse its search direction at the end stop and continue to look for the reference mark. (Except for end stop referenced positioners.) If the positioner encounters a second end stop then the reference sequence will be aborted. The positioner is stopped and an "end stop reached" error is generated.

Once the reference mark is found, the scale is shifted by taking the logical scale offset into account and the positioner will decelerate to zero velocity and turn around to move to the exact location of the reference mark. After this, the referencing is finished.

If a physical end stop is reached while decelerating to zero velocity *after* finding the mark, this is also indicated by an "end stop reached" error. Note that in general the physical position is known as soon as the reference mark was found and *not* after the positioner returned to the exact position of the mark. Nonetheless, to prevent errors the velocity and acceleration parameters

should be configured to reasonable values which allow to decelerate the positioner to zero velocity *after* the reference mark was found and *before* an end stop is reached.

Once the channel "knows" its physical position the "R" indicator of the channel display is high-lighted to indicate this.

4.7 Sensor Adjustment (PicoScale Interferometer)

The MCS2 also supports the SmarAct PicoScale as a sensor. The setup of the PicoScale requires a mirror adjustment before position data is available. Similar to the PicoScale Control GUI the MCS2 Hand Control Module can also be used to perform a mirror adjustment, but doesn't require a PC. For details of this procedure refer to the *PicoScale User Manual*.

The *Sensor Adjustment* screen consists of 3 tabs. The first tab shows an overview of all modules and their connected sensors. Selecting a module with an attached PicoScale starts the manual adjustment and switches to the second tab. This tab allows configuration of the working range. After setting the working range the last tab shows the Lissajous graph for one channel, as shown in figure 4.4. Once the mirrors are adjusted the auto adjustment can be started. This switches back to the first tab and shows the progress of the adjustment. It's not necessary to wait until the auto adjustment is finished before leaving this screen or starting the next adjustment of a different PicoScale.
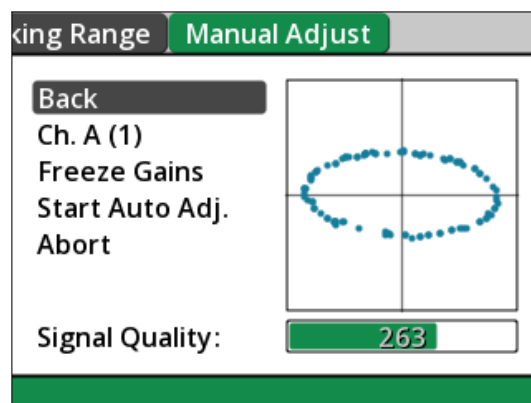

Figure 4.4: PicoScale mirror adjustment

4.8 Load/Save Configurations

The Hand Control Module can store multiple device configurations in non-volatile memory slots. A memory slot contains the full channel and group configuration and also the control mode parameters.

The *Load Config* menu shows an item for each available memory slot. Slots without a valid configuration are grayed out and cannot be loaded. The *Load Default Config* item will restore a default configuration. This procedure will create just enough groups to contain all the available channels

and assigns default values for all parameters. Note that slot 1 is the default slot which will be loaded on a device power-up. If this slot is invalid a default configuration is created.

The current device configuration can be saved using the *Save Config* menu. Saving to an already used slot overwrites the old configuration.

> **NOTICE**
> Don't turn off the MCS2 or unplug the Hand Control Module while a configuration is being saved.

4.9 Information

The *Information* menu shows information about the Hand Control Module and the MCS2 it's connected to. The information is grouped by module and device global values. The information consists mostly of firmware versions, types of connected modules.

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