



HEIDENHAIN

User's Manual

IOB 49

English (en)
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I Operating Instructions 5

- I General Information 6
 - Connecting the IOB 49 to X10 for executing switching functions (milling) or controlling the constant surface speed CSS (turning) 6
- I – 1 Execution of Switching Functions 7
 - Switching inputs 7
 - Switching outputs 7
- I – 2 Controlling the Constant Surface Speed (CSS) 10
 - Configuration of CSS 11
 - CSS operating mode 12
 - Activating the DAC output 13
 - Connecting the IOB to the inverter of the lathe 14
- I – 3 Diagnostics 15
 - Switching I/O functions 15
 - CSS 16





Operating Instructions



General Information

Connecting the IOB 49 to X10 for executing switching functions (milling) or controlling the constant surface speed CSS (turning)

When the IOB 49 is connected to the ND 780, the functionalities described above are available.

For information on the installation of the IOB 49 in an electrical cabinet, the connection technology and the wiring, please refer to the Operating Instructions. The Operating Instructions are included with every position display unit, or can be requested from HEIDENHAIN.

The position display unit automatically recognizes when an IOB 49 is connected and displays the CSS SETUP option or the SWITCHING OUTPUTS option in the INSTALLATION SETUP menu. These options can be used to configure all functions of the switching unit.



I – 1 Execution of Switching Functions

Switching functions can only be executed when the position display unit is configured for milling applications.

If you want to use both the IOB 49 and the KT 130 edge finder at the same time or if you want to transmit measured values via the external switching output, the distribution cable with ID 532 909-01 is required.

Switching inputs

The IOB 49 provides three inputs that are used to zero the actual value of the assigned axis. A low-to-high transition at the input causes the value for that axis to be set to zero.

Switching outputs

The switching outputs consist of eight (integrated) relays that are activated depending on the position. The relays can be configured to activate when a position display reaches a specific value or within a specified range of zero. The ninth output relay indicates readiness.

Select SWITCHING OUTPUTS from the INSTALLATION SETUP menu to open the SWITCHING OUTPUTS table in which the configuration of the eight outputs is stored. If you want to change the configuration of an output, select it with the arrow keys and press ENTER to confirm your selection. This opens the OUTPUT SETTINGS form in which you define the switching conditions. To reset a relay, select the relay in the table and press the CLEAR RELAY soft key.

SWITCHING OUTPUTS	
1: X < 10.000 ↓, POINT, ON	
2: Y < 5.000 △, RANGE, ON, 1.0 SEC	
3:	
4:	
5:	
6:	
7:	
8:	
	CLEAR RELAY
	HELP

Fig. I.1

- ▶ The CONDITION field is used to assign an axis to the output and to specify whether the axis position is an actual-value or distance-to-go position. You also specify the position display value at which the relay is activated, and the required condition.
- ▶ The POINT/RANGE field is used to define whether the conditions refers to a point on the axis or refers to a range about zero.
- ▶ The OUTPUT field is used to specify the relay operation when the switching condition is met. When the condition is met, the relay is turned OFF or ON.

D:0 | T:1 | F: 0 | 0:00 | MM | | |

OUTPUT SETTINGS (1)		Press an axis key to select the axis. Press the soft keys to select the condition and / setting.	
CONDITION			
X <	10.000		
POINT/RANGE	RANGE		
OUTPUT			
ON	0.5 SEC		
CONDITION []			HELP

Fig. I.2 OUTPUT SETTINGS form

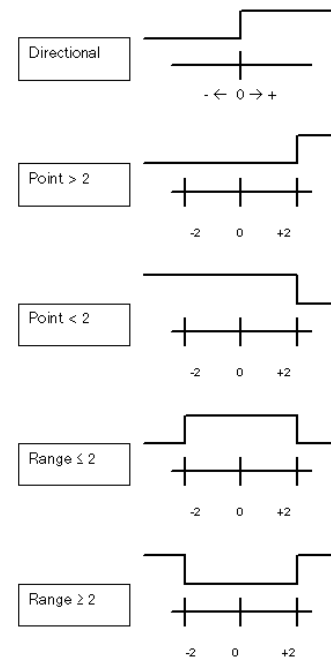




Fig. I.3 Possible switching states of the relays



In PULSED mode, the relay is activated (ON or OFF) for a specific period of time. After the period has timed out, the relay is deactivated. The pulse time is 0.1 to 999 seconds.

 The time period begins whenever the switching condition transitions from FALSE to TRUE. If the switching conditions transitions to TRUE before the period has timed out, the timer will start over.

 The switching functions cannot be used for coupled axes or for axes with backlash compensation.

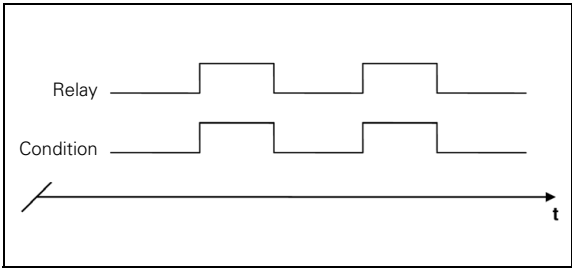


Fig. I.4 CONTINUOUS mode

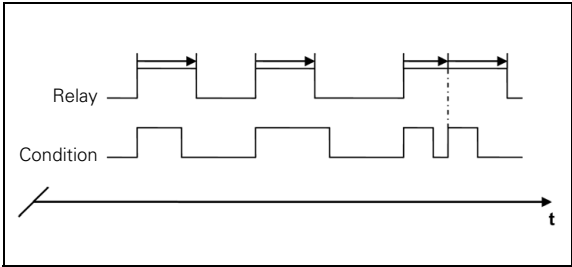


Fig. I.5 PULSED mode



I – 2 Controlling the Constant Surface Speed (CSS)

In CSS mode, a constant surface cutting speed can be maintained on a lathe. The following functions are available:

- CSS mode: The DAC output signal provides constant surface speed by adjusting the spindle speed as the diameter (radius) of the workpiece changes.
- Direct entry of spindle speed: The DAC output signal sets the spindle speed based on the value entered via the numeric keypad.
- Speed limits: The user may set a safe operating range (minimum and maximum speeds) for spindle speed.
- Gear selection: Three different gears can be specified for varying the relation between the actual speed and the DAC output signal.



Configuration of CSS

The spindle control configuration parameters are set up in the INSTALLATION SETUP menu. Select the CSS SETTINGS parameter to open the associated input form.

- ▶ The CSS ON/OFF CONTROL field is used to specify whether the CSS mode is operated by soft key or by an external hardware signal.
- ▶ The current gear may be selected by local control (MANUAL via CSS / DIRECT RPM in the JOB SETUP menu) or remote control (EXTERNAL; via switches in the machine gear). This is defined in the CSS GEAR SELECT field.
- ▶ The VOLTAGE OFFSET function is used to adjust for any inherent offset in the DAC signal. Using a voltmeter, measure the actual voltage at the DAC output. Press INCREASE or DECREASE to adjust the offset until the output is 0 V. The offset range is limited to 0 to 50 (approximately 0 to 122 mV).
- ▶ The VOLTAGE / RPM fields are used to establish the relationship between the DAC output signal (0 to 10 V) and the spindle speed. The minimum and maximum limits for each gear are entered.

If the position display of the third axis is configured to be used for the spindle speed, the rpm in the SETTING field can be set to the current spindle speed by pressing the TEACH soft key.

To set a specific spindle speed, the DAC output S_{Out} uses this linear relationship to determine the corresponding output voltage V_{Out} :

$$V_{Out} = 10 \cdot (S_{Out} - S_0) / (S_{10} - S_0) + V_{Offset}$$

Press ENTER to save the parameters and exit the input form. Press the C key to exit without saving the changes you made.

D:0 T:1 F: 0 0:00 MM	
CSS SETTINGS	
CSS ON/OFF CONTROL	Select SOFT KEY to control CSS from the readout soft key.
SOFT KEY	
CSS GEAR SELECT	
MANUAL	Select EXTERNAL to control CSS through an external hardware signal.
VOLTAGE OFFSET	
3	
SOFT KEY EXTERNAL	
	HELP

Fig. I.6 CSS SETTINGS (1) form

D:0 T:1 F: 0 0:00 MM	
CSS SETTINGS	
VOLTAGE/RPM (1)	For the gear selection shown in parenthesis, enter the spindle speed when the CSS output is at 0V.
0 V: 100 RPM	
10 V: 3000 RPM	
VOLTAGE/RPM (2)	
0 V: 500 RPM	
10 V: 5000 RPM	
	NOTE HELP

Fig. I.7 CSS SETTINGS (2) form



CSS operating mode

The operating parameters are set in the CSS / DIRECT RPM form. Press the CSS SETUP soft key to open the form or select the parameter from the JOB SETUP menu.

- ▶ The SETTINGS field is used to select the mode of operation and the control settings. The spindle is controlled by selecting CSS or by entering the spindle speed directly. The values to be entered depend on the selected option.

If CSS was selected to maintain a constant surface speed, the surface speed entered with the numeric keys is maintained. As the diameter of the part changes, the spindle speed will be adjusted.

To set a specific spindle speed, select DIRECT / RPM and enter the value with the numeric keypad.

If the position display of the third axis is configured to be used for the spindle speed, the rpm in the SETTING field can be set to the current spindle speed by pressing the TEACH soft key.

Select OFF when spindle control is not needed.

- ▶ The GEAR SELECTION field is used to manually enter the operating gear with the numeric keypad.



If the gear control parameter in INSTALLATION SETUP is set to EXTERNAL, the field will show the current gear selection based on the external inputs. The field can then not be selected and is skipped.

- ▶ The LIMITS field is used to establish the minimum and maximum limits of the controlled spindle speed. When operating in the CSS or DIRECT RPM modes, the DAC output will not be set to a speed above or below these limits.

If the position display of the third axis is configured to be used for the spindle speed, the rpm in the SETTING field can be set to the current spindle speed by pressing the TEACH soft key.

Press ENTER to save the parameters and exit the input form. Press the C key to exit without saving the changes you made.

The settings will be lost when the ND 780 is switched off.

D:0 T:1 F: 0 0:00 MM	
CSS/DIRECT RPM	
SETTING	
100 M/MIN	
GEAR SELECTION	
2	
LIMITS	
MIN	100 RPM
MAX	1000 RPM
OPERATION [CSS]	
Enter the desired surface speed.	
NOTE	HELP

Fig. I.8 Form in which the speed limits are defined



Activating the DAC output

After selecting the operating mode and entering its parameters, the DAC output must be enabled to begin controlling the spindle.

The output to the spindle inverter drive is an open loop signal. The system does not monitor the actual spindle speed. The output signal is based solely on the inverter's speed input versus the input voltage profile.

- ▶ Depending on the operating mode selected, the RPM or CSS soft key is displayed on the fourth page of the soft key menu. If the current state indicated on the soft key is ON, the DAC output is active. Press the soft key to OFF to disable the spindle control.

If CSS is active, the CSS icon appears next to the X-axis display. If the entered surface speed or rpm cannot be maintained because the speed is outside the range for the current gear or outside the limits from the CSS/RPM SETTINGS form, an arrow will appear after the CSS icon (**CSS↑** or **CSS↓**). The direction of the arrow indicates whether the speed is at the upper or lower limit.



The soft key to enable CSS or RPM control will not appear if the operating mode is set to OFF.



If the CSS control parameter under INSTALLATION SETUP is set to EXTERNAL, the CSS or RPM operation cannot be controlled by soft key. The soft key will show the current state, but pressing it will have no effect.

- ▶ The SPEED + and SPEED – soft keys are used to increase or decrease the current surface speed or spindle speed. The value is increased or decreased by 5% each time the soft key is pressed.



Connecting the IOB to the inverter of the lathe

TURNING APPLICATION 1—Automatic CSS/Pot Control

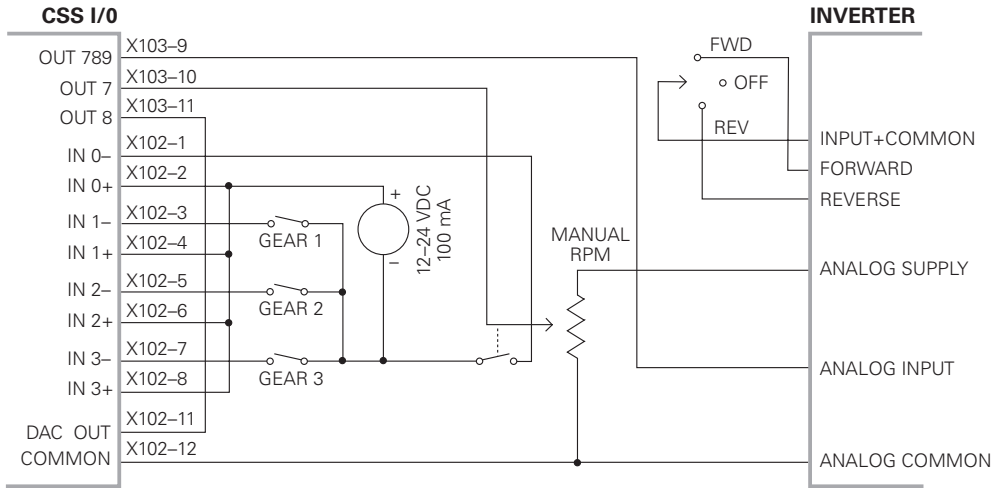


Fig. I.9 Example of gear detection and switching to manual spindle speed control

TURNING APPLICATION 2—Manual CSS/Pot Control

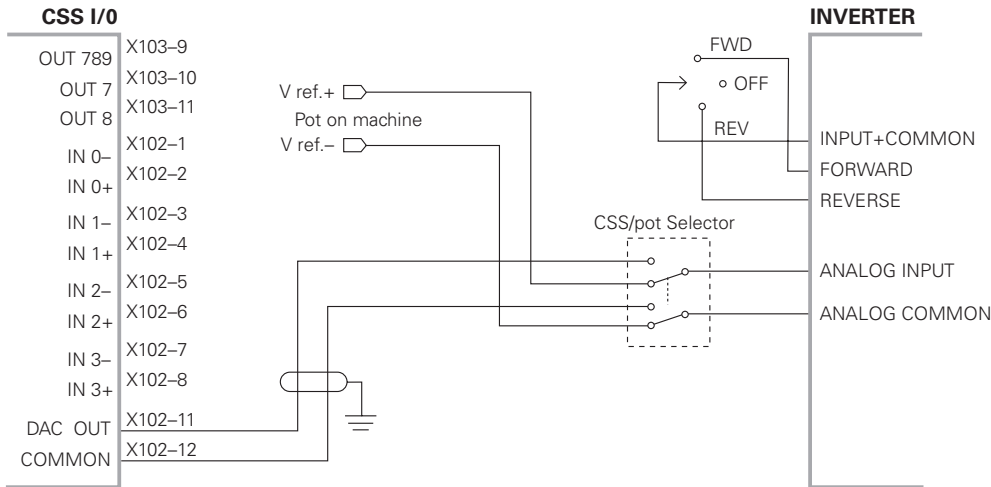


Fig. I.10 Example of switching to manual spindle speed control



