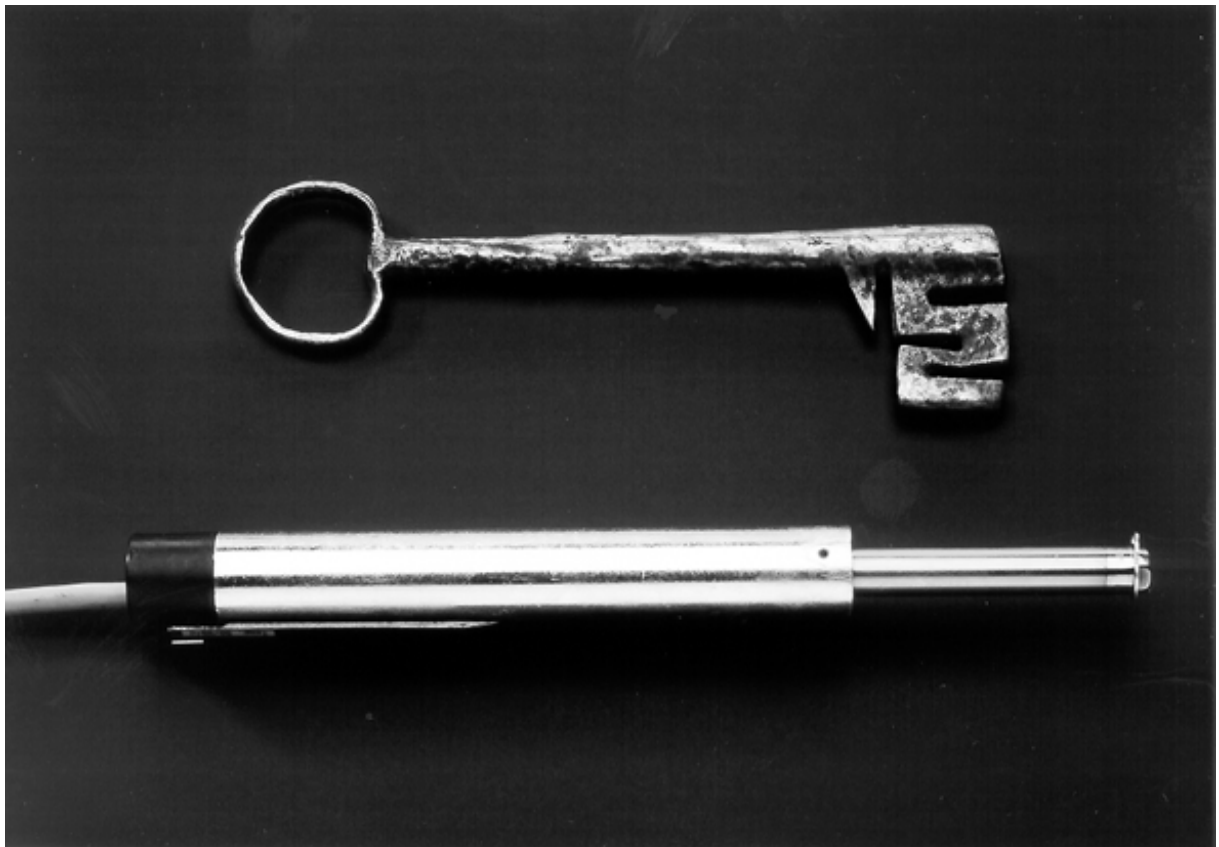


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# *LinMot*<sup>®</sup>

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## ***TINA***

Teach-Mode Applicationsoftware

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# 1. System description

## 1.1 System overview

This firmware addition allows the user to change the function of a *LinMot*<sup>®</sup> servo controller to Teach-Mode without the need for a supervisory control. The sliders can be moved by hand to new positions. With trigger signals these new positions can be taught. The Teach-Mode can be used for linear motors which are operated in the "Two Point" or "Analog" mode with the MT controller.

### Applications

The Teach-Mode is intended for applications where a quick and easy adjustment of final positions is needed. For example:

- Replacement of pneumatic cylinders, with the advantage of very short setting-up times and long cycle life.
- Adapt stroke in Pick & Place applications quickly to different products.
- When the position can not be preprogrammed and must be set "on the fly".

## 1.2 Operation state Teach-Mode

To enable the *LinMot*<sup>®</sup> servo controller in the teach mode the new operation state **TEACH-MODE** is introduced. This operation state is a sub-state of the **DISABLE** state.

To enter the **TEACH-MODE** state the **FREEZE** signal must be activated in the **DISABLE** state. If the servo controller is set to the **DISABLE** state this is signalled by fast double flashes of the STAT 'A' and STAT 'B' LED's. A transition from the **RUN** state to the **DISABLE** state is activated by deactivating the **RUN** signal.

The **TEACH-MODE** state is left by deactivating the **FREEZE** signal or by leaving the **DISABLE** state. Fig 1-1 shows the different operation states and transitions.

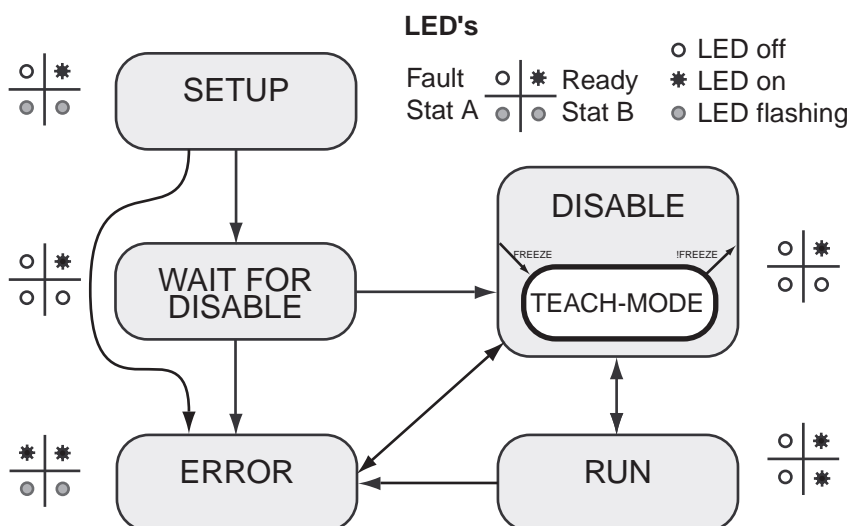
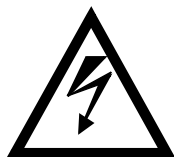


Abbildung 1-1: Operation States

If the **FREEZE** signal is set in the **RUN** state and changed to the **DISABLE** state afterwards, the servo controller changes directly to the **TEACH-MODE** state.



If the **RUN** signal is activated in the **TEACH-MODE** state, the slider is moved slowly to the last position before deactivating of the **RUN** signal. This position can be outside of the new defined positions! If the **FREEZE** signal is deactivated then, the slider is moved to the actual commanded position with the configured acceleration and velocity.

### 1.3 Teaching positions

New positions can be thought on all axis with the following restrictions:

- The actuator is a *LinMot<sup>®</sup> P* linear motor
- The linear motor is operated in the “Two Point” or in the “Analog” mode

#### Teach-Mode for the “Two Point” mode

In the “Two Point” mode the linear motor is moved between two defined positions using digital triggersignals. These positions are called the “0” and the “1” position. A logical zero (<2V) represents the “0” position and a logical one (>4V) the “1” position.

If the servo controller is in the **TEACH-MODE** state new positions can be taught with signals on the **TRIG/ANALOG IN A-D** inputs. A rising edge (the input signal changes from <2V to >4V) teaches the “0” position. On a falling edge (the input signal changes from >4V to <2V) the “1” position is taught. Fig 1-2 shows the relation between the input signals necessary for teaching new positions.

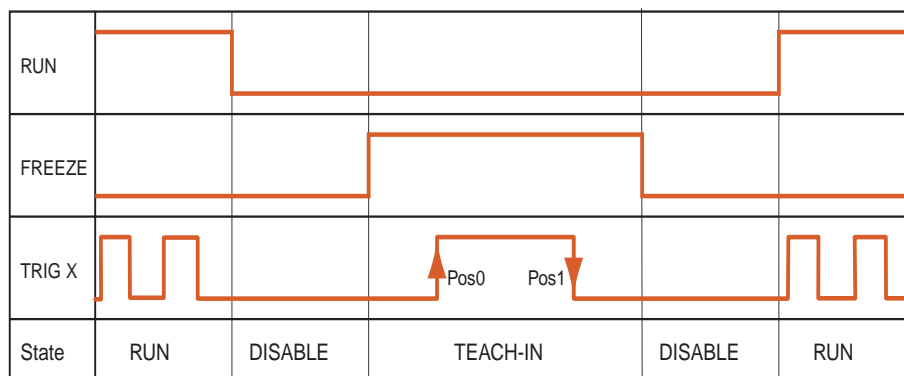


Abbildung 1-2: Teach-Mode signals for “Two Point” mode

The new positions are stored in the nonvolatile memory of the servo controller and are saved even if power is removed from the servo controller.

### Teach-Mode for the “Analog” mode

In the “Analog” mode the position of a linear motor is controlled by an analog voltage (0V to 10V) applied to the **TRIG/ANALOG IN A-D** inputs. The position corresponding to 0V is called the “0V” position the position corresponding to 10V is called the “10V” position. With the *Teach-Mode* application this two positions can be redefined without using a PC.

If the servo controller is set in the **TEACH-MODE** state new positions can be taught with signals on the **TRIG/ANALOG IN A-D** inputs. A rising edge (the input signal changes from <2V to >4V) teaches the “0V” position. On a falling edge (the input signal changes from >4V to <2V) the “1V” position is taught. Fig 1-3 shows the input signals necessary for teaching new positions.

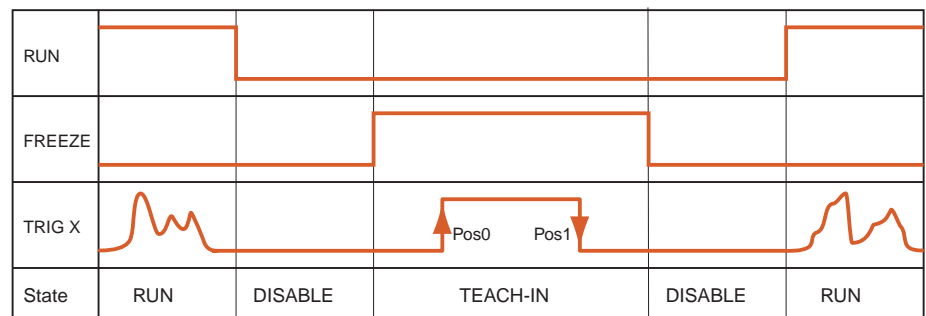
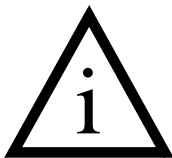


Abbildung 1-3: Teach-Mode signals for “Analog” Modus



In the “Analog” mode the same physical inputs are used for positioning and teaching. When used for positioning they are used as analog inputs when used for teaching as digital inputs.

It is not possible to view the new taught positions online. Values of taught positions are only visible in the *LinTalk* program directly after login. If new positions are defined by the *LinTalk* Program the taught positions are lost.

**CAUTION:** if the “Update” button in the *LinTalk* Program is clicked the values visible on the screen are written to the servo controller.

## 1.4 Debouncing

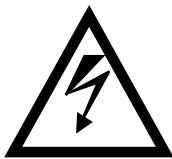
To prevent wrong positions from being taught by bouncing of the input signals the inputs are filtered by the servo controller. The input signals have to be stable for at least 50ms.

## 2. Installation

The *Teach-In* application software can be installed on all servo controllers of the *LinMot® MT<sup>1</sup>* series. This applications software extends the AT functionality of the servo controller. The multitrigger functionality is not available after the installation of the Teach-Mode software.

### 2.1 Installation of the *LinMot® Teach-In* application software

The *Teach-In* application software is delivered as an *install package*. This *install package* contains everything needed to operate a *LinMot®-MT* servo controller with the Teach-Mode extension.



It must be noted that by the installation of this application all parameters stored in the servo controller are reset to their basic values and all curves are deleted. If current configuration must be available for further use, they must be saved as a file using *LinTalk*.

Procedure for installing the *Teach-Mode* application is as follows:

- 1 Terminate any open *LinTalk* programs.
- 2 Select "Install Package" from "Special" menu in *LinTalk*.
- 3 Log in with ID: "Install" and password "NTI" (capital letters)
- 4 In the file dialog appearing, select the installation package TINAxxxx.ipk (where xxxx stands for the actual revision) from the diskette and click OK.
- 5 Wait until the installation is completed.

### 2.2 Configuration of the *LinMot®* servo controller

To use the Teach-Mode functions, the following parameters must be set in the servo controller beside the parameters for the motors.

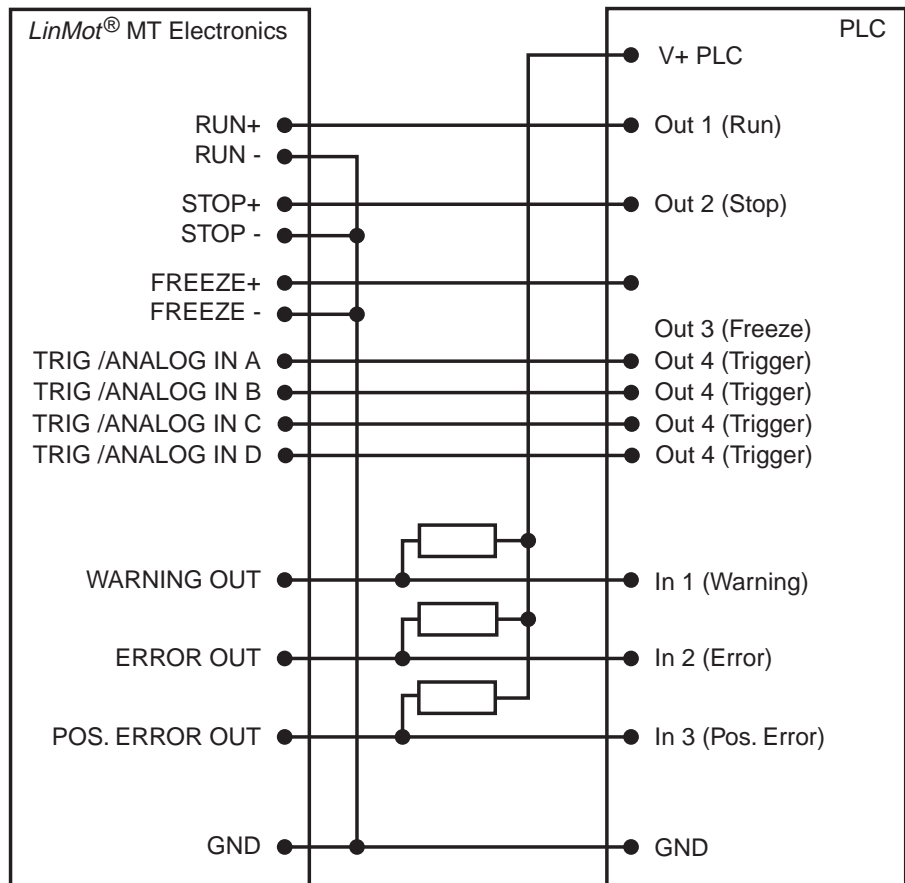
- System → IO Configuration → Run Input
- System → IO Configuration → Freeze Input
- System → Command Interface → AT
- Drives → Drive X → Set Value Configuration → Run Mode → Analog or Two Point

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1) The application software can't be run on servo controllers of the *LinMot®-E AT* series.

### 2.3 Connecting to a PLC

Fig 2-1 shows how the *LinMot*<sup>®</sup> servo controller is connected to a PLC.



**Abbildung 2-1: Connecting a *LinMot*<sup>®</sup> servo controller to a PLC**

The open-collector output can switch a maximal current of 50mA to ground. The pull-up resistors must be rated with at least 480Ω when supplied with 24V.

## A. Examples

### A.1 Teach-Mode for a two axis system

<b>Scenario</b>	A two axis system consisting in a <i>LinMot</i> <sup>®</sup> <i>E200-MT</i> servo controller and two <i>LinMot</i> <sup>®</sup> <i>P</i> linear motors. Both motors are operated in the "Two Point" mode. The servo controller is in the <b>RUN</b> state and all <b>TRIG/ANALOG IN</b> inputs are deactivated.
<b>Task</b>	The two positions of motor B have to be redefined without changing positions of motor A.
<b>Solution</b>	<p>The following steps relate to Figure 1-2.</p> <ol style="list-style-type: none"><li>1 To set the servo controller from the <b>RUN</b> state into the <b>DISABLE</b> state the <b>RUN</b> signal must be deactivated.</li><li>2 By activating the <b>FREEZE</b> signal the servo controller changes in the <b>TEACH-MODE</b> state.</li><li>3 Motor B can be moved to the desired "0" position now.</li><li>4 When the motor is moved to the desired location the "0" position is thought by setting a high level (&gt;4Vdc) on the <b>TRIG/ANALOG IN B</b> terminal. <b>CAUTION:</b> the <b>TRIG/ANALOG IN B</b> signal must be hold high.</li><li>5 The motor can be moved to the next desired "1" position now.</li><li>6 When the motor is moved to the desired location the "1" position can be thought by setting a low level (&lt;2V) on the <b>TRIG/ANALOG IN B</b> terminal.</li><li>7 The "0" and the "1" position have now been defined. By deactivating the <b>FREEZE</b> signal the <b>TEACH-MODE</b> is disabled.</li><li>8 As soon as the <b>RUN</b> signal is activated, the linearmotor moves to the actual demanded position with the chosen acceleration and velocity.</li></ol> <p><b>CAUTION:</b> during the teach mode procedure only the <b>TRIG/ANALOG IN B</b> signal must be activated. Otherwise the positions of the other motor will be lost. There is no effect to motor A's program if motor A is moved during teach mode of motor B.</p>

### A.2 Redefine a single position

The following procedures describes how to redefine only one of the two positions:

- for position "0" or "0V"  
After the "0"/"0V" position was taught with a rising edge on the trigger input deactivate the **FREEZE** signal first and the trigger signal next.
- for position "1" or "10V"  
Before entering the **TEACH-MODE** state (**FREEZE** signal low) activate the triggersignal of the corresponding motor. Now the **FREEZE** signal can be activated and the motor can be moved to the new position. By deactivating the triggersignal a falling edge is generated and "1"/"10V" position is taught.