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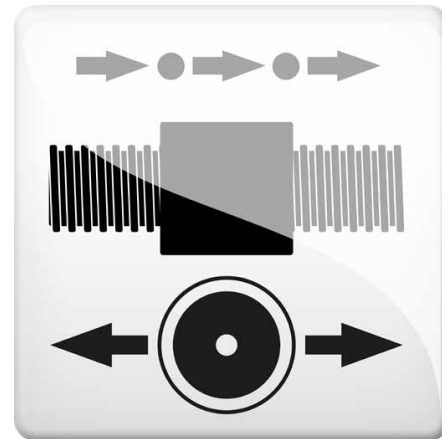
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Integrated in the inverter

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Table positioning

Positioning and movement sequences can be controlled with table positioning. With the available interfaces, control via network as well as local control via digital inputs is possible. For testing purposes, direct internal control with the engineering tool **EASY Starter** is also possible.

Application ranges:

- Transportation facilities
- Rotary tables
- Storage and retrieval units
- Feed drives
- Dosing systems
- Hoists

This documentation describes the various functions of table positioning as a supplement to the parameterization dialogs in the engineering tool **EASY Starter**.

Table positioning is available for the following inverters:

- i650 motec frequency inverter (with additional functions "Logic PLC & table positioning")
- i950 cabinet servo inverter ("table positioning" technology application)

System requirements for engineering tools:

- EASY Starter from version 1.28

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Safety instructions

By safety instructions, we mean information for the use of products that serves to warn the user of hazards and to instruct behavior that will not result in harm to people. In this document, these are distinguished as follows according to ANSI Z535.6:

DANGER!

Indicates an extremely hazardous situation. Failure to comply with this notice will result in severe irreparable injury and even death.

WARNING!

Indicates an extremely hazardous situation. Failure to comply with this notice may result in severe irreparable injury and even death.

CAUTION!

Indicates a hazardous situation. Failure to comply with this notice may result in slight to medium injury.

NOTICE

Indicates a material hazard. Failure to comply with this notice may result in material damage.

Numeric notation

As a rule, a decimal point is used as a decimal separator in this documentation.

Example: 1234.56

Product-specific information

Information that applies only to a specific product series is indicated by the name of the product series preceding it.

Example:

i650 motec

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Engineering tools

To use table positioning, the corresponding parameters must be set in the inverter. These parameters can be accessed in the **EASY Starter** engineering tool via dialog boxes.

- A detailed description of the drive parameters can be found in the commissioning documentation for the respective inverter.

Tip!

To obtain further information about a parameter:

- If you hover the mouse pointer over **I** in a dialog box, a pop-up window will display further information about the parameter.
- If you click in a parameter field in a dialog box and then press the function key <F1>, the device help opens with further information about the parameter.

You will receive the download link for the latest version of the engineering tools free of charge by email after you have completed the download form:

<https://www.lenze.com/en-de/service/software-downloads/easy-engineering-tools>

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Functions

The available functions depend on the inverter series. Observe the features of the inverters.

Kinematics

Among other things, the kinematics parameters describe the motor side with regard to the mechanics used:

- Mass inertia (load/motor)
- Motor/encoder mounting direction
- Motor/encoder gearbox ratio
- Motor/encoder feed constant
- Motor/encoder travel range and cycle length
- Feedback

Positioning functions

These functions can be used to control positioning and motion sequences:

- Profile management for 15 positioning profiles
- Absolute positioning
- Relative positioning
- Continuous positioning
- Positioning with touch probe (residual path positioning)
- Profile chaining with overchange
- Positioning to positive stop
- On-the-fly referencing
- Start/cancel/continue positioning
- External profile parameters
- External speed override

Monitoring functions

These functions monitor travel range limits and adjustable limit values:

- Hardware limit switch
- Software limit positions
- Maximum values for profile parameters
- Following error monitoring system

Help and maintenance functions

These functions are used to set up and maintain the system:

- Virtual mode
- Simulation
- Halt
- Manual jog (inching mode)
- Homing

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Application

The control of the table positioning functions can be flexibly adapted to the application.

- The control word (0x5030:010) and status word (0x5030:110) are used to control table positioning via the network.

- Alternatively, the control of individual functions can be configured using the parameters "Function list: ...":

i650 motec: Parameter 0x2631:xxx

i950 cabinet: Parameter 0x5022:xxx

Example: Function list for i650 motec in the EASY Starter dialog "Parameter list":

Adresse	Anzeigececodestelle	Bezeichnung	Wert	Einheit
0x2631:059	P400:059	Funktionsliste: Quelle HW-Limit negativ	Nicht verbunden [0]	
0x2631:060	P400:060	Funktionsliste: Quelle HW-Limit positiv	Nicht verbunden [0]	
0x2631:061	P400:061	Funktionsliste: Quelle fliegendes Ref.	Nicht verbunden [0]	
0x2631:062	P400:062	Funktionsliste: Quelle Referenzschalter	Nicht verbunden [0]	
0x2631:063	P400:063	Funktionsliste: Handfahren positiv	Nicht verbunden [0]	
0x2631:064	P400:064	Funktionsliste: Handfahren negativ	Nicht verbunden [0]	
0x2631:065	P400:065	Funktionsliste: Halt	Konstant TRUE [1]	
0x2631:066	P400:066	Funktionsliste: Referenzfahrt starten	Digitaleingang 1 [11]	
0x2631:067	P400:067	Funktionsliste: Referenzpos. zurücksetzen	Digitaleingang 2 [12]	
0x2631:068	P400:068	Funktionsliste: Abbrechen	Digitaleingang 3 [13]	
0x2631:069	P400:069	Funktionsliste: Geschw.Overide aktivieren	Digitaleingang 4 [14]	
0x2631:070	P400:070	Funktionsliste: Profilnummer (Bit 0)	Digitaleingang 5 [15]	
0x2631:071	P400:071	Funktionsliste: Profilnummer (Bit 1)	Digitaleingang 6 [16]	
0x2631:072	P400:072	Funktionsliste: Profilnummer (Bit 2)	Digitaleingang 7 [17]	
0x2631:073	P400:073	Funktionsliste: Profilnummer (Bit 3)	Digitaleingang 8 [18]	
0x2631:074	P400:074	Funktionsliste: Start	In Betrieb [50]	
0x2631:075	P400:075	Funktionsliste: Fortsetzen	Betriebsbereit [51]	
0x2631:076	P400:076	Funktionsliste: Touch-Probe deaktivieren	Stopp aktiv [53]	
0x2631:077	P400:077	Funktionsliste: Externe Position aktivieren	Schnellhalt aktiv [54]	

0x2631:063 (P400:063) Funktionsliste: Handfahren positiv

Wert: Nicht verbunden [0]
 Werkseinstellung: Nicht verbunden [0]
 Rohwert: 0 (0x00)
 Datentyp: USINT - Unsigned short integer (1 byte)

Triggers (selected):
 Digitaleingang 7 [17]
 Digitaleingang 8 [18]
 In Betrieb [50]
 Betriebsbereit [51]
 Stopp aktiv [53]
 Schnellhalt aktiv [54]
 Gerätealarm aktiv [58]
 Gerätealarm aktiv [59]
 Kühlkörpertemp.warnung [60]
 Stopp-Befehl aktiv [68]
 Drehrichtung umgekehrt [69]
 Freq.-schwelle überschritten [70]
 Ist-Geschwindigkeit = 0 [71]
 Stromgrenze erreicht [78]
 Drehmomentgrenze erreicht [79]
 Lastverlust erkannt [83]
 Schwerkraftüberwachung [84]
 Referenzfahrt aktiv [120]
 Referenzfahrt beendet [121]
 Handfahren aktiv [122]
 Halt aktiv [123]
 Motorregel. in Begrenzung [124]

You can assign signal sources as so-called "triggers" to the functions listed in the function list. The digital inputs and internal states of the inverter, for example, can be selected as triggers.

Activate table positioning

i650 motec:

EASY Starter Dialog	i650 motec: Settings > Overview
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To activate table positioning, the operating mode "MS: Position mode [-3]" must be selected.

i950 cabinet:

When using the "Table Positioning" technology application, table positioning is already activated.

General information

- Table positioning
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Properties

The properties of table positioning depend on the inverter series.

	i650 motec frequency inverter	i950 cabinet servo inverter
Number of positioning profiles	15	15
External profile parameters	1 profile data set	Individual parameters
Operating mode for position control	Manufacturer specific position mode	CiA 402 cyclic sync position mode
Kinematics	One gearbox ratio (z1/z2) Internal motor model (32 bits) for SLSM-PSM	Two gearbox ratios (z1/z2 and z3/z4)
Feedback systems	HTL encoders 200 kHz (2 interfaces) IO-Link (e.g multi-turn encoder) Internal motor model (SLSM-PSM)	Resolver HIPERFACE DSL® absolute value encoder HIPERFACE® SinCos absolute value encoder Endat SinCos absolute value encoder SSI absolute value encoder SSI SinCos absolute value encoder TTL encoder HTL encoder
Synchronized movements (master/slave)	HTL encoder Reference frequency ("pulse train")	Onboard EtherCAT
Touch-Probe functionality with time stamp for relative positioning/referencing		
	Sensor connection for touch probe	Digital input 2
	Touch probe detection	Total travel range
Sensor connection for on-the-fly referencing	Digital input	Upper/lower limit can be parameterized
		Digital input

Kinematics

- Mass inertia (load/motor)
- Motor/encoder mounting direction
- Motor/encoder gearbox ratio
- Motor/encoder feed constant
- Motor/encoder travel range and cycle length
- Feedback

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Mass inertia (load/motor)

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Kinematics
	i950 cabinet: Settings > Basic setup > Kinematics

The resulting moment of inertia is composed of the moment of inertia of the motor and the moment of inertia of the load.

Setting of the motor's moment of inertia

EASY Starter Dialog	i650 motec: Settings > Overview > Motor control > Motor control selection
	i950 cabinet: Settings > Basic setup > Motor > Select motor

Kinematics

- Mass inertia
(load/motor)
- Motor/encoder
mounting direction
- Motor/encoder
gearbox ratio
- Motor/encoder
feed constant
- Motor/encoder travel range
and cycle length
- Feedback

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Motor/encoder mounting direction

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Kinematics
	i950 cabinet: Settings > Basic setup > Kinematics

Depending on the mounting direction, the motor rotation direction and/or the encoder rotation direction can be inverted.

Kinematics

Mass inertia
(load/motor)

Motor/encoder
mounting direction

**Motor/encoder
gearbox ratio**

Motor/encoder
feed constant

Motor/encoder travel range
and cycle length

Feedback

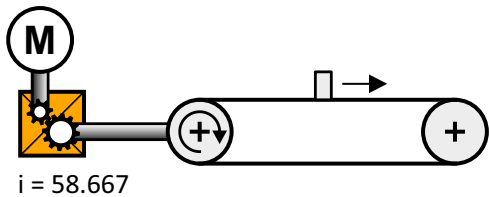
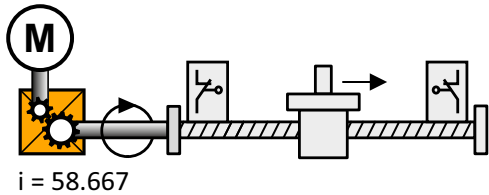
Motor/encoder gearbox ratio

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Kinematics
	i950 cabinet: Settings > Basic setup > Kinematics

The gearbox ratio indicates how many revolutions of the motor axis are required to produce one revolution of the load axis.

- The gearbox ratio is set using a quotient (numerator/denominator).
- The data required for setting the gearbox ratio is listed in the gearbox catalog. For an exact specification of the gearbox ratio, the specified number of teeth z_1 ... z_2 from the gearbox catalog must be used.

Example: In case of 58.667 revolutions (i) of the motor axis, the spindle rotates once.



Kinematics

Mass inertia
(load/motor)

Motor/encoder
mounting direction

Motor/encoder
gearbox ratio

**Motor/encoder
feed constant**

Motor/encoder travel range
and cycle length

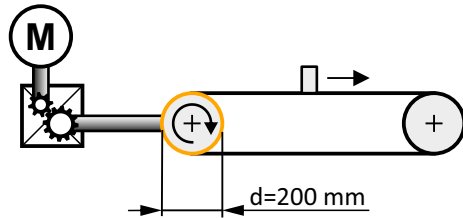
Feedback

Motor/encoder feed constant

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Kinematics
	i950 cabinet: Settings > Basic setup > Kinematics

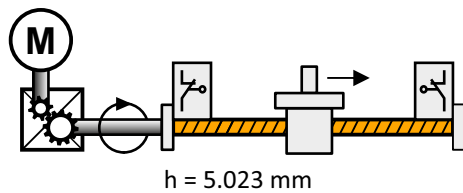
The feed constant corresponds to the machine motion at one revolution of the gearbox output shaft.

- When a turntable is used, the feed constant is = 360°/revolution when defined as an angle.
- The feed constant of a conveyor drive results from the circumference of the drive roll:



circumference $\geq P * \text{Diameter (d)}$

- In a spindle drive (linear axis), the feed constant is derived from the spindle pitch. (h):



The spindle pitch can be found in the technical data for the linear axis.

Notes:

The kinematic parameters for the second encoder can be used to define how an imported encoder position or encoder speed should be converted into machine units.

Kinematics

Mass inertia
(load/motor)

Motor/encoder
mounting direction

Motor/encoder
gearbox ratio

Motor/encoder
feed constant

**Motor/encoder travel range
and cycle length**

Feedback

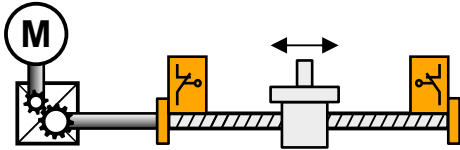
Motor/encoder travel range and cycle length

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Kinematics
	i950 cabinet: Settings > Basic setup > Kinematics

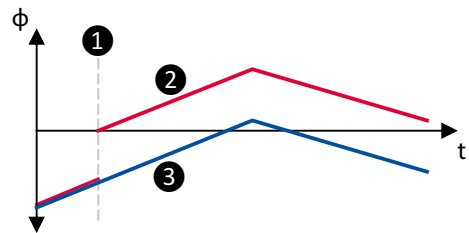
Linearly limited travel range

The travel range is limited in the positive and negative directions mechanically by hardware limit switches and on the software side by software limit positions. After traveling a defined distance, the axis moves in the opposite direction.

Example: Spindle drive (linear axis)



Position representation:

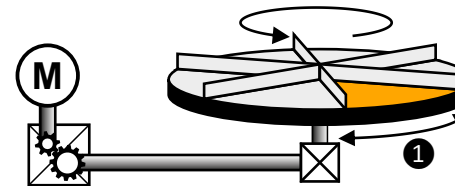


- ① Setting of the home position
- ② Position in the machine measuring system
- ③ Position in the motor measuring system

Unlimited traversing range

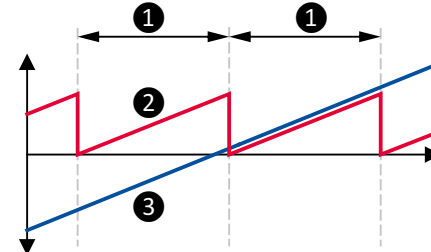
- The measuring system is repeated.
- When the set cycle length is exceeded, a defined overflow occurs.
- The cycle length corresponds to one revolution of a rotary table or one tool distance (end position = start position).
- Software limit positions are not active.
- Absolute targets can be approached by exceeding the measuring system limit.

Example: Turntable



① Cycle length (figure = 60°)

Position representation:



- ① Cycle length
- ② Position in the machine measuring system
- ③ Position in the motor measuring system

Kinematics

- Mass inertia
(load/motor)
- Motor/encoder
mounting direction
- Motor/encoder
gearbox ratio
- Motor/encoder
feed constant
- Motor/encoder travel range
and cycle length
- Feedback



Feedback

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Kinematics
	i950 cabinet: Settings > Basic setup > Kinematics

i650 motec:

Control mode default setting

- [0] Position control via motor encoder (default setting):
- An HTL encoder on DI3/DI4, which is used for motor commutation, can also be used for position control.
 - The "SLSM-PSM" motor control mode uses the internal motor model of a permanently excited synchronous motor.

[1] Position control via load sensor:

- HTL encoder at DI3/DI4
- HTL encoder at DI5/DI6
- IO-Link absolute value encoder (The current position value of the IO-Link absolute value encoder must be mapped to index 0x401E.)

i650 motec:

Motor mounting direction (0x2811:003)

- Not inverted [0]
- Inverted [1]

i950 cabinet:

Mounting direction (direction of rotation) (0x500A:035)

- CW [False]
- CCW [True]

Increments/revolution

- Relevant when selecting an HTL encoder

Gearbox factor

- The gearbox ratio indicates how many revolutions of the motor axis are required to produce one revolution of the load axis.
- The gearbox ratio is set using a quotient (numerator/denominator).

Positioning functions

Profiles	Absolute positioning	Relative positioning	Continuous positioning	Positioning with TP (residual path positioning)	Profile chaining with overchange	Positioning to positive stop	On-the-fly referencing
Start/ cancel/continue positioning	External profile parameters	External speed override					

Profiles

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Profiles
	i950 cabinet: Settings > TA Table Positioning > Profiles

Up to 15 positioning profiles can be stored in the drive for table positioning.

A positioning profile is defined by the following parameters:

- Positioning modes** (absolute, relative, ...) for the positioning profile.
- Target position** or distance to be traveled (depending on the positioning mode set).
 - In absolute positioning, the target position describes the distance from the zero position.
 - In relative positioning, the current actual position at the starting time of the travel command is taken into account.
- Maximum **profile speed** at which the target position is approached.
 - Depending on the set target position, acceleration, and deceleration, it may be that the maximum speed is not reached at all.
- Profile acceleration** to achieve the maximum speed.
- Profile deceleration** to brake from maximum speed to a standstill.
- Profile jerk** for acceleration and deceleration.
 - If a **profile jerk** is specified for a positioning profile, acceleration and deceleration occur via S-shaped ramps. When profile jerk = 0, jerk limitation is disabled.
 - S-shaped ramps protect machine parts from damage.
 - The S-shaped acceleration and deceleration prolongs the duration of positioning compared to linear acceleration and deceleration.
- Final speed** at which the axis executes the next positioning profile after reaching the target position.
 - If the final speed is set to > 0, the axis is not brought to a standstill at the target position. This setting allows you to implement "Velocity changeover" into the next positioning profile.
- TP window lower limit** and **TP window upper limit**: Limit values for the touch probe window (only for i950 cabinet).
 - Touch probe evaluation is active within this position window.

9. Sequence profile after TP: Number of the positioning profile (1 ... 15) that is executed when a touch probe is detected.

- With the setting 0, no positioning profile is executed after a touch probe is detected.

10. Sequence profile: Number of the positioning profile (1 ... 15) that is executed after the current positioning profile.

- With the setting 0, no further positioning profile is executed.

Select positioning profile

The positioning profile is selected via the control word or via the signal sources that have been assigned to the following functions in the function list.

i650 motec:

Parameter	Function
0x2631:070	Profile number (bit 0)
0x2631:071	Profile number (bit 1)
0x2631:072	Profile number (bit 2)
0x2631:073	Profile number (bit 3)

i950 cabinet:

Parameter	Function
0x5022:060	Profile number (bit 0)
0x5022:070	Profile number (bit 1)
0x5022:080	Profile number (bit 2)
0x5022:090	Profile number (bit 3)

The selection is made using bit coding:

Profile number (bit 3)	Profile number (bit 2)	Profile number (bit 1)	Profile number (bit 0)	Resulting profile number
0	0	0	1	1
0	0	1	0	2
1	0	1	1	3
...				...
1	1	1	1	15

Positioning functions

Profiles	Absolute positioning	Relative positioning	Continuous positioning	Positioning with TP (residual path positioning)	Profile chaining with overchange	Positioning to positive stop	On-the-fly referencing
Start/ cancel/continue positioning	External profile parameters	External speed override					

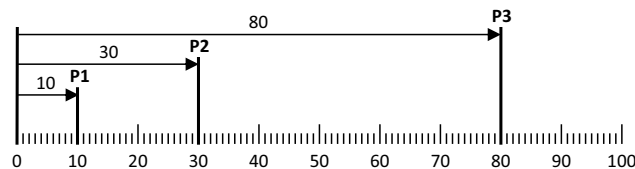
Absolute positioning

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Profiles
	i950 cabinet: Settings > TA Table Positioning > Profiles

Various positioning modes are available for absolute positioning.

Absolute positioning in a limited travel range

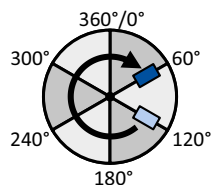
The axis moves to an absolute position.



- The absolute position describes the distance between the zero position and the target position.
- The home position for the absolute position is the zero position.
- The home position must be known.
- The travel range is limited.

Clockwise absolute positioning

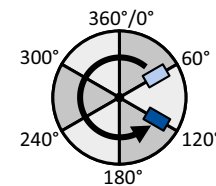
The axis moves clockwise to an absolute position. This may cause the zero position of the axis to be exceeded.



- Only usable in the Modulo measuring system (rotary table application).
- The home position for the absolute position is the zero position.
- The home position must be known.
- The travel range is not limited.

Counterclockwise absolute positioning

The axis moves counterclockwise to an absolute position. This may cause the zero position of the axis to be exceeded.



- Only usable with Modulo measuring system (rotary table application).
- The home position for the absolute position is the zero position.
- The home position must be known.
- The travel range is not limited.

Positioning functions

Profiles

Absolute positioning

Relative positioning

Continuous positioning

Positioning with TP
(residual path positioning)

Profile chaining with
overchange

Positioning
to positive stop

On-the-fly referencing

Start/
cancel/continue positioning

External profile parameters

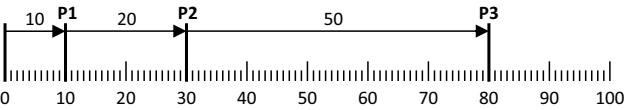
External speed override



Relative positioning

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Profiles
	i950 cabinet: Settings > TA Table Positioning > Profiles

The axis travels a specified distance.



- The home position for the starting point of the path is the target position of the previously executed positioning profile.
- The new target position is calculated by adding the home position to the specified (relative) position.
- In the example for P3: target position = P2 + 50 = 30 + 50 = 80

Positioning functions

Profiles

Absolute positioning

Relative positioning

Continuous positioning

Positioning with TP
(residual path positioning)

Profile chaining with
overchange

Positioning
to positive stop

On-the-fly referencing

Start/
cancel/continue positioning

External profile parameters

External speed override



Continuous positioning

EASY Starter	i650 motec: Settings > Overview > Positioning > Profiles
Dialog	i950 cabinet: Settings > TA Table Positioning > Profiles

- The axis travels at a constant speed until the "Halt" or "Cancel" function is activated.
- No position is approached; instead, the machine travels at the speed set in the positioning profile or specified externally.
 - The travel direction is determined by the sign of the speed. A positive value indicates a clockwise travel direction.
 - If software limit monitoring is activated, positioning to the corresponding software limit position is performed, provided that endless positioning has not been terminated beforehand. The axis brakes with the set deceleration to the position of the corresponding software limit position. The software limit position can then be left in the direction of the permitted travel range.

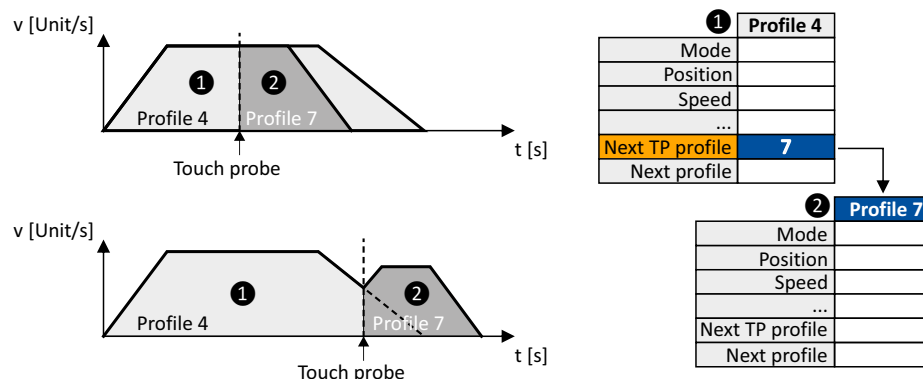
Positioning functions

Profiles	Absolute positioning	Relative positioning	Continuous positioning	Positioning with TP (residual path positioning)	Profile chaining with overchange	Positioning to positive stop	On-the-fly referencing
Start/ cancel/continue positioning	External profile parameters	External speed override					

Positioning with touch probe (residual path positioning)

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Profiles
	i950 cabinet: Settings > TA Table Positioning > Profiles

When positioning with a touch probe (TP), the selected positioning profile is first traversed. If a touch probe is detected during the process, the system automatically switches to the positioning profile set in the "Sequence profile with TP" profile parameter.



If no touch probe was detected and the positioning profile was executed completely, the positioning profile set in the "Sequence profile" profile parameter is then executed.

Notes:

- If the sequence profile starts at a speed at which the remaining distance to be traveled is too short for the set deceleration ramp, the target position will be overtraveled. A reversing movement occurs.
- A counterclockwise movement of the axis can be prevented by the "Safe Direction (SDI)" safety function.

i950 cabinet:

- The profile parameters "Profile TP window - lower limit" and "Profile TP window - upper limit" limit the area in which a touch probe can be detected. If both parameters are set to "0," touch probe detection is activated for the entire positioning profile or the entire travel range.

Set source for touch probe

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning
	i950 cabinet: Settings > TA Table Positioning

i650 motec:

Digital input 2 is used as the source for the touch probe. The trigger edge is adjustable.

i950 cabinet:

A digital input (1 ... 4) or the system bus (EtherCAT) can be set as the source for the touch probe. When using a digital input, the triggering edge can be adjusted.

Deactivate touch probe

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Signal flow
	i950 cabinet: Settings > TA Table Positioning > Signal flow

The "Deactivate Touch Probe" function can be used to deactivate the touch probe functionality. During positioning, no touch probe is detected and there is no change to the positioning profile set in the "Sequence profile after TP" profile parameter.

Deactivation is performed via the control word or via the signal source that has been assigned to the following function in the function list.

i650 motec:

Parameter	Function
0x2631:076	Deactivate touch probe

i950 cabinet:

Parameter	Function
0x5022:131	Deactivate touch probe

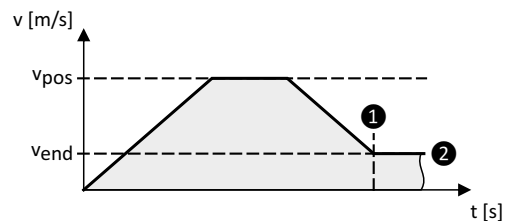
Positioning functions

Profiles	Absolute positioning	Relative positioning	Continuous positioning	Positioning with TP (residual path positioning)	Profile chaining with overchange	Positioning to positive stop	On-the-fly referencing
Start/ cancel/continue positioning	External profile parameters	External speed override					

Profile chaining with overchange

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Profiles
	i950 cabinet: Settings > TA Table Positioning > Profiles

By setting a final speed other than "0" in the positioning profile, an "overchange" can be achieved: When the target position is reached, the axis has reached the final speed and will immediately follow the positioning profile defined in the profile parameter "Sequence profile without TP" without the axis coming to a standstill at the first target position.



1 target position 2 final speed

Notes:

- The final speed is not effective for endless positioning and positioning with touch probe.
- The final speed must not exceed the maximum profile speed.
- When reducing the profile speed using override, this is the maximum value for the final speed. Subsequently increasing the override value has no effect on the limitation that has been implemented.
- For positioning with final speed and use of S-ramps, a plausibility check is performed at the start of the profile to determine whether the end speed can be reached. If this is not the case, positioning is aborted with an error. This often occurs when positioning is interrupted and then resumed.

Positioning functions

- Profiles
- Absolute positioning
- Relative positioning
- Continuous positioning
- Positioning with TP
(residual path positioning)
- Profile chaining with
overchange
- Positioning
to positive stop
- On-the-fly referencing
- Start/
cancel/continue positioning
- External profile parameters
- External speed override



Positioning to positive stop

When positioning to a positive stop, the following error is permanently ignored during positioning. In this way, positioning against an obstacle can be carried out, for example to press materials with defined forces.

Set torque limits

EASY Starter Dialog	i650 motec: Settings > Overview > Motor Control > Motor Protection
	i950 cabinet: Settings > Motion > Limits

For positioning on a positive stop, the torque limits must be set according to the forces required for pressing.

Activate function

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning
	i950 cabinet: Settings > TA Table Positioning

The function can be activated permanently or as needed via the control word. For activation via control word, the control bit to be used must be assigned to the function.

Parameter	Function
0x5030:009	Activate positioning to positive stop
	0 Function is permanently disabled.
	1 Function is permanently activated.
	124 Function is activated via bit 24 of the control word.
	125 Function is activated via bit 25 of the control word.
	126 Function is activated via bit 26 of the control word.
	127 Function is activated via bit 27 of the control word.

Positioning functions

Profiles	Absolute positioning	Relative positioning	Continuous positioning	Positioning with TP (residual path positioning)	Profile chaining with overchange	Positioning to positive stop	On-the-fly referencing
Start/ cancel/continue positioning	External profile parameters	External speed override					

On-the-fly referencing

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning
	i950 cabinet: Settings > TA Table Positioning

The "On-the-fly referencing" function can be used to set the home position of a mechanism while it is moving. There is no jerk and no compensating movement.

- If the function is activated and the selected sensor is triggered, the set home position is set.
- The function can be executed when the axis is at standstill or in motion.

Set source for sensor

The sensor for on-the-fly reference can be connected to a digital input. The input used must be set in the following parameter.

i650 motec:

Parameter	Function
0x2631:061	Source for on-the-fly referencing

i950 cabinet:

Parameter	Function
0x5020:010	Source for on-the-fly referencing

Activate function

The function can be activated permanently or as needed via the control word. For activation via control word, the control bit to be used must be assigned to the function.

Parameter	Function
0x5030:008	Activate on-the-fly referencing
0	Function is permanently disabled.
1	Function is permanently activated.
124	Function is activated via bit 24 of the control word.
125	Function is activated via bit 25 of the control word.
126	Function is activated via bit 26 of the control word.
127	Function is activated via bit 27 of the control word.

Positioning functions

Profiles	Absolute positioning	Relative positioning	Continuous positioning	Positioning with TP (residual path positioning)	Profile chaining with overchange	Positioning to positive stop	On-the-fly referencing
Start/ cancel/continue positioning	External profile parameters	External speed override					

Start/cancel/continue positioning

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Signal flow
	i950 cabinet: Settings > TA Table Positioning > Signal flow

The "Start," "Cancel," and "Continue" functions are available for controlling the positioning process.

Preconditions:

- The axis must be ready for operation.
- At least one valid positioning profile must be defined.
- The corresponding positioning profile must be selected.

Start: Positioning is started.

Cancel: The active movement is canceled.

- The axis is guided to standstill via the active profile deceleration.
- The deceleration is canceled when a new movement is instructed.

Continue: Interrupted positioning is continued.

Activate functions

The functions are activated via the control word or via the signal sources that have been assigned to the following functions in the function list.

i650 motec:

Parameter	Function
0x2631:074	Start positioning
0x2631:068	Cancel positioning
0x2631:075	Continue positioning

i950 cabinet:

Parameter	Function
0x5022:101	Start positioning
0x5022:034	Cancel positioning
0x5022:121	Continue positioning

Positioning functions

Profiles

Absolute positioning

Relative positioning

Continuous positioning

Positioning with TP
(residual path positioning)Profile chaining with
overchangePositioning
to positive stop

On-the-fly referencing

Start/
cancel/continue positioning

External profile parameters

External speed override

External profile parameters

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Signal flow
	i950 cabinet: Settings > TA Table Positioning > Signal flow

External profile parameters can be transferred to the inverter via the network interface and integrated into a positioning profile.

- Existing values in the selected positioning profile are overwritten when the external values are transferred.

Select positioning profile

The positioning profile to be changed is selected via the control word or via the signal sources that have been assigned to the following functions in the function list.

i650 motec:

Parameter	Function
0x2631:070	Profile number (bit 0)
0x2631:071	Profile number (bit 1)
0x2631:072	Profile number (bit 2)
0x2631:073	Profile number (bit 3)

i950 cabinet:

Parameter	Function
0x5022:060	Profile number (bit 0)
0x5022:070	Profile number (bit 1)
0x5022:080	Profile number (bit 2)
0x5022:090	Profile number (bit 3)

Activate function

The external profile parameters are transferred via the control word or via the signal sources that have been assigned to the corresponding functions in the function list.

i650 motec:

All external profile parameters are always activated simultaneously: External setpoint position, external speed, external acceleration, external deceleration, and external jerk.

Parameter	Function
0x2631:077	Activate external profile parameters

i950 cabinet:

The external profile parameters can be activated separately. For example, it is possible to transfer only the external setpoint position or all external profile parameters to the selected positioning profile.

Parameter	Function
0x5022:181	Activate external setpoint position
0x5022:191	Activate external speed
0x5022:200	Activate external acceleration/deceleration/jerk
0x5022:210	Activate external torque limit

i950 cabinet:

Automatically apply external profile parameters when starting a positioning operation

The external profile parameters can optionally be automatically transferred to the selected positioning profile when positioning is started. Only those profile parameters whose transfer was activated with the functions listed above will be transferred.

Parameter	Function
0x5030:150	Activate external profile parameters when starting positioning

Positioning functions

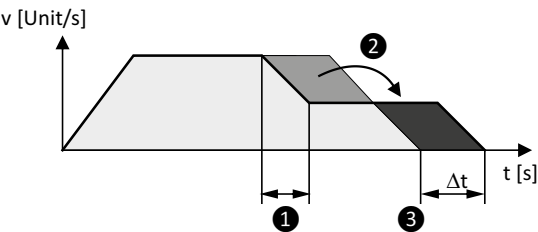
- Profiles
- Absolute positioning
- Relative positioning
- Continuous positioning
- Positioning with TP
(residual path positioning)
- Profile chaining with
overchange
- Positioning
to positive stop
- On-the-fly referencing
- Start/
cancel/continue positioning
- External profile parameters
- External speed override

External speed override

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Signal flow
	i950 cabinet: Settings > TA Table Positioning > Signal flow

The "External Speed Override" function can be used to reduce the speed during positioning by a certain percentage. This ensures that the target position defined in the positioning profile is reached precisely.

Schematic representation of speed override (with setting Override = 50 %):



- 1. The speed is reduced to 50 %.
- 2. In order to continue reaching the target position, the missing area must be added.
- 3. More time is required for positioning.

Activate function

The function is activated via the control word or via the signal source that has been assigned to the following function in the function list.

i650 motec:

Parameter	Function
0x2631:069	Activate speed override

i950 cabinet:

Parameter	Function
0x5022:040	Activate speed override

Monitoring functions

Hardware limit switch

Software limit positions

Maximum values for profile parameters

Monitoring of the following error

Hardware limit switch

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Limits
	i950 cabinet: Settings > TA Table Positioning > Limits

Hardware limit switches can be connected to the digital inputs to monitor the travel range limits.

When the hardware limit switches are reached, an adjustable response can be triggered.

Set source for limit switch

The digital inputs used must be set in the following parameters.

i650 motec:

Parameter	Function
0x2631:059	Source of negative hardware limit switch
0x2631:060	Source of positive hardware limit switch

i950 cabinet:

Parameter	Function
0x5020:005	Source of negative hardware limit switch
0x5020:004	Source of positive hardware limit switch

Notes:

- For fail-safe monitoring, an inversion of the digital inputs can be set, i.e., a TRUE signal is then expected from both sources for the idle state.
- If you do not want to monitor the travel range limits (e.g., for a rotary axis), leave both functions at the default setting "0".

Monitoring functions

- Hardware limit switch
- Software limit positions
- Maximum values for profile parameters
- Monitoring of the following error



Software limit positions

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Limits
	i950 cabinet: Settings > TA Table Positioning > Limits

- The software limit positions to be adjusted via parameters are used to limit the travel range on the software side and prevent travel commands from being executed that would result in the permissible travel range being exceeded.
- If software limit position monitoring is activated, positioning to the corresponding software limit is performed, provided that the travel command (e.g., "manual jog" has not been terminated beforehand. The axis brakes with the set deceleration to the position of the corresponding software limit position. The software limit position can then be left in the direction of the permitted travel range.
 - In the event of an error, the response set for this monitoring is triggered (e.g., output of a warning).

Notes:

- The home position must be known in order to evaluate and monitor the software limit positions.
- The software limit positions are not active in the "Modulo" travel range and when homing is active.
- If an error stop is triggered by the integrated functional safety system, exceeding the software limit positions does not result in an error response.

Monitoring functions

- Hardware limit switch
- Software limit positions
- Maximum values for profile parameters
- Monitoring of the following error



Maximum values for profile parameters

EASY Starter	i650 motec: Settings > Overview > Positioning > Limits
Dialog	i950 cabinet: Settings > TA Table Positioning > Limits

Maximum values for speed, acceleration, and jerk can be set for the motion functions (positioning and manual jog).

- The respective limit is only effective if a maximum value other than "0" is set.
- The profile parameters are automatically limited to the set maximum values.
- If a generated setpoint exceeds the set maximum value (e.g., due to external profile parameters), the response set for this monitoring is triggered (e.g., the output of a warning).

Monitoring functions

- Hardware limit switch
- Software limit positions
- Maximum values for profile parameters
- Monitoring of the following error



Monitoring of the following error

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Basic
	i950 cabinet: Settings > Motion > Basic

The following error is the difference between the setpoint position and the actual position. The following error should ideally be "0". If the position control is set optimally, only a minimum following error is formed. The following error is regulated dynamically and does not increase continuously.

However, certain processes require that the following error does not exceed a certain limit value, as otherwise the system part will not reach the defined target position in time, for example. For such processes, two limit values for the following error can be set and activated.

With active monitoring:

- If the first limit value ("warning threshold") is exceeded, a warning is displayed. However, the current movement of the axis is not interrupted.
- If the second limit value ("error threshold") is exceeded, the response set for this monitoring is triggered (e.g., quickly bringing the axis to a standstill).

Help and maintenance functions

- Virtual mode
- Simulation
- Halt
- Manual jog (inching mode)
- Homing

Virtual mode

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Kinematics
	i950 cabinet: Settings > Basic setup > Kinematics

With the "Virtual mode" function, the application can be tested without a connected motor. If the function is activated, the setpoint values generated in the application are not forwarded to the drive. The actual values (e.g. position and speed) are generated from the setpoint values.

Notes:

- The kinematics parameters have no influence in virtual mode. Only the travel range and cycle length parameters are used for the machine measuring system.

Help and maintenance functions

Virtual mode

Simulation

Halt

Manual jog (inching mode)

Homing

Home

Info

Refresh

Printer

Signal

Tools

Warning

Simulation

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Interface
	i950 cabinet: Settings > TA Table Positioning > Interface

For testing purposes, a simulation of the control signals and control words can be activated. The simulation can be activated individually for the control signals and each individual control word. The data received via the network interface is then no longer used; instead, this data can be set manually in EASY Starter. A simulation of the status signals can be activated in the same way.

Help and maintenance functions

- Virtual mode
- Simulation
- Halt
- Manual jog (inching mode)
- Homing



Halt

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Basic
	i950 cabinet: Settings > Motion > Basic

The "Halt" function can be used to bring the axis to a standstill based on the current setpoints using the values parameterized for this function for deceleration and jerk.

Activate function

The function is activated via the control word or via the signal source that has been assigned to the following function in the function list.

i650 motec:

Parameter	Function
0x2631:065	Halt

i950 cabinet:

Parameter	Function
0x5022:025	Halt

Help and maintenance functions

Virtual mode

Simulation

Halt

Manual jog (inching mode)

Homing

Manual jog (inching mode)

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Manual jog
	i950 cabinet: Settings > Motion > Manual jog

The "Manual jog" function enables manual movement of the axis ("inching mode") using the values parameterized for this function for speed, acceleration, deceleration, and jerk.

Activate function

The function is activated via the control word or via the signal sources that have been assigned to the following functions in the function list.

i650 motec:

Parameter	Function
0x2631:063	Manual jog positive
0x2631:064	Manual jog negative

i950 cabinet:

Parameter	Function
0x5022:016	Manual jog positive
0x5022:019	Manual jog negative

Notes:

- As long as one of the two functions is activated, the axis moves in the corresponding direction.
- If both functions are activated simultaneously, the axis stops.
- If the reference is known and monitoring of the software end positions is activated, positioning to the corresponding software limit position is performed, provided that the function has not been terminated beforehand. The axis brakes with the set deceleration to the position of the corresponding software limit position.
- If the reference is unknown or if monitoring of the software limit positions is deactivated, the axis only stops at the hardware limit switch, provided that the function has not been terminated beforehand.
- "Retracting" from activated hardware limit switches is also supported; in this case, only movement in the corresponding retracting direction is automatically possible.

Help and maintenance functions

Virtual mode

Simulation

Halt

Manual jog (inching mode)

Homing

Homing

EASY Starter Dialog	i650 motec: Settings > Overview > Positioning > Homing
	i950 cabinet: Settings > Motion > Homing

In order to perform **absolute positioning**, the axis must be referenced to a defined starting position (home position) within the permissible travel range. From this home position, positions such as the zero position can then be determined and approached. The zero position serves as a home position for absolute positioning.

By selecting the homing mode, you specify whether the home position is to be set directly or whether homing is to be performed.

- Various modes are available for homing.
- For homing, two profile data sets with different speeds and accelerations can be parameterized. This shortens the duration of the reference run and increases the accuracy of the home position.
 - Profile data set 1: Fast approach to the hardware limit switch or reference switch (depending on the selected mode).
 - Profile data set 2: Slow and more precise approach of the touch probe sensor or departure from the hardware limit switch or reference switch (depending on the selected mode).
 - If speed 2 is set to "0" (default setting), there is no switchover to profile data set 2. Homing takes place with the profile parameters of profile data set 1.
- After setting the home position, relative or absolute positioning to the set target position can optionally be performed immediately afterwards.
- The information that homing has been successfully completed and that the inverter knows the home position is provided in the status word of the table positioning.

After selecting a homing mode, the EASY Starter dialog displays the respective homing sequence with the corresponding setting parameters.

Start homing/ Set home position / Reset home position

These functions are activated via the control word or via the signal sources that have been assigned to the following functions in the function list.

i650 motec:

Parameter	Function
0x2631:066	Start homing or set home position directly (depending on the homing mode)
0x2631:067	Reset "Home position known" status

i950 cabinet:

Parameter	Function
0x5022:028	Start homing or set home position directly (depending on the homing mode)
0x5022:031	Reset "Home position known" status

Notes:

- For absolute value encoders, the zero position must be determined once during initial commissioning.
- For encoder types that do not have absolute position detection, the zero position must be redefined after each restart of the inverter.

Abbreviations used for homing modes

Abbreviation	Meaning
CwTorqueLimit [-2] CwTorqueLimit [-1]	Homing to positive stop
SetPositionDirect [0]	Set home position directly
CcwLimitSwitchCwTP [1] CwLimitSwitchCcwTP [2]	Homing with hardware limit switch and touch probe sensor
CwRpCcwRnTP [3] CcwRpCwRnTP [5]	Homing with reference switch and touch probe sensor
CcwLimitSwitch [17] CwLimitSwitch [18]	Homing with hardware limit switch
CwRpCcwRn [19] CcwRpCwRn [21]	Homing with reference switch
CcwTP [33] CwTP [34]	Homing with touch probe sensor
Cw = in positive direction, Ccw = in negative direction	

Troubleshooting

Diagnostics

Event IDs



Diagnostics

The inverter provides many diagnostic parameters which are helpful for operation, maintenance, error diagnosis, error correction, etc.

In the EASY Starter you have access to the diagnostic parameters of the inverter via the "Diagnostics" tab.

Reset error via »EASY Starter«

Errors can be reset with the "Reset" button ("Diagnostics" tab).

- Condition: Cause of error has been eliminated and no blocking time is active.

Troubleshooting

Diagnostics

Event IDs

Event IDs

The following table contains the event IDs of the i650 motec frequency inverter that are relevant for table positioning.

Event ID	Event	Classification	Remedy	Blocking time [s]
0x8680	Overrun positive software limit	Warning	– Check the setting of the software limit positions – Check movement specifications	0
0x8681	Overrun negative software limit	Warning		0
0x8682	Overrun positive hardware limit switch	Warning	Check movement specifications	0
0x8683	Overrun negative hardware limit switch	Warning		0
0x8684	Following error - Warning level exceeded	Warning	Check controller settings, encoder parameterization and mechanics.	0
0x8685	Following error - Error level exceeded	Warning		0
0x8690	Invalid profile parameters	Warning	Check profile parameters	0
0x8691	Invalid positioning mode	Warning	Check profile parameters for positioning mode	0
0x8692	Invalid acceleration	Warning	Check profile parameters for acceleration	0
0x8693	Invalid deceleration	Warning	Check profile parameters for deceleration	0
0x8694	Invalid velocity	Warning	Check profile parameters for velocity	0
0x8695	Axis not homed	Warning	Execute homing	0
0x8696	Maximum value exceeded	Warning	– Check profile parameters – Adjust the maximum values for speed, acceleration and jerk.	0
0x8697	Target position outside software limits	Warning	– Check the setting of the software limit positions – Check profile parameters	0
0x8698	Parameterization of positioning is implausible	Warning	Adapt profile parameters Background: In the first driving cycle, the profile parameters result in a mathematically longer braking distance than the total distance. When braking during an overchange profile, the final speed to which deceleration is to take place is greater than the speed currently being generated.	0

The i950 cabinet servo drive has significantly more event IDs. These are listed in the corresponding commissioning manual.