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Best possible deceleration

Best possible deceleration

General information

The "best possible deceleration" specifies the mode of the drive-controlled deceleration of the axis. It is used for error reactions, some fatal warnings, and when drive "On" or drive "Enable" is removed.

Relevance for the user

Relevant if the factory default "best possible deceleration" has to be changed for machine operation.

Application-related information for project planning

Braking torques and braking path or runout path in the case of an error have to be taken into account for the sizing of the machine.

Commissioning

The following dialog is available in ctrlX DRIVE Engineering to parameterize the deceleration reactions of the drive:

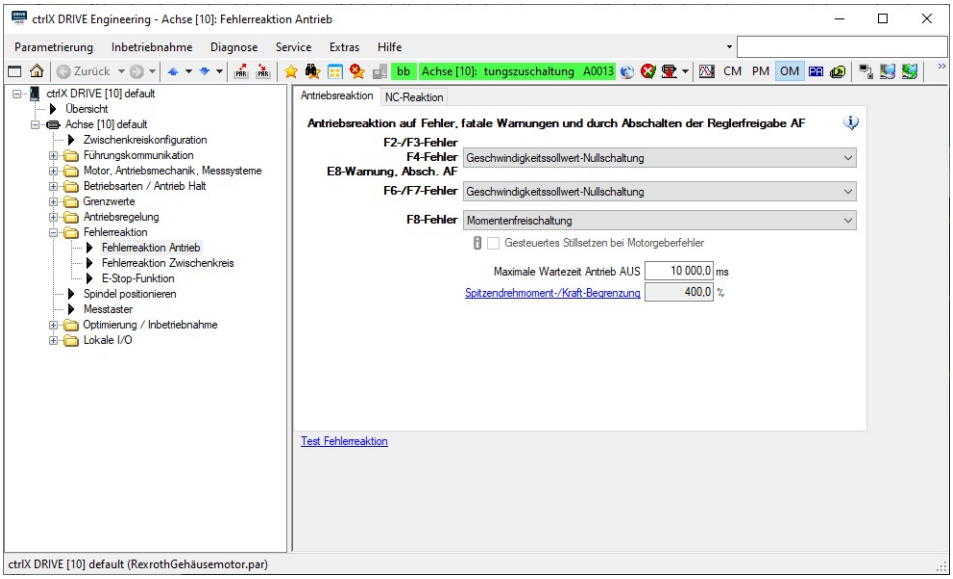

Fig. 333: Parameterizing the deceleration reactions of the drive

For further information about the commissioning process please follow this link:

First setup and execute initial movements with ctrlX DRIVE (https://developer.community.boschrexroth.com/t5/Store-and-How-to/First-setup-and-execute-initial-movements-with-ctrlX-DRIVE/ba-p/14227), Chapter 5 "Adjust drive halt and error response settings".

Additional information and details

The error reaction "Best possible deceleration", which can be configured in "P-0-0119 (/redirect/patternMatch?code=P-0-0119&redirectOrigin=ID1765332_424508587), Best possible deceleration", is executed automatically in the case of the following states:

- Drive enable is removed (P-0-0116 (/redirect/patternMatch?code=P-0-0116&redirectOrigin=ID1765332_424508587), bit 14)
- Drive On is removed (P-0-0116 (/redirect/patternMatch?code=P-0-0116&redirectOrigin=ID1765332_424508587), bit 15)
- Non-fatal errors (F2xxx)
- Non-fatal safety technology errors (F3xxx)
- Interface errors (F4xxx)
- Travel range errors (F6xxx)
- Safety technology errors (F7xxx)
- Fatal errors (F8xxx) if functionally still possible
- Some fatal warnings (E8xxx)

In P-0-0119 (/redirect/patternMatch?code=P-0-0119&redirectOrigin=ID1765332_424508587), one of the following reactions for "best possible deceleration" can be set:

- Velocity command value reset (emergency stop)
- Velocity command value reset with ramp (emergency stop)
- Velocity command value reset with ramp (quick stop)
- Return motion [not in case "Drive On" is removed (P-0-0116 (/redirect/patternMatch?code=P-0-0116&redirectOrigin=ID1765332_424508587), bit 15)]
- "Emergency stop" via motor phase short circuit (synchronous motors only)
- Torque disable
- Torque reset with ramp or motor phase short circuit (device type EDS only)

Options for parameterizing "P-0-0119 (/redirect/patternMatch?code=P-0-0119&redirectOrigin=ID1765332_424508587), Best possible deceleration" and intended use of the best possible deceleration.

Options for parameterizing P-0-0119, Best possible deceleration

Type of deceleration	Intended use	Parameterization for deceleration as response to			
		- Non-fatal errors F2xxx and F3xxx - Interface errors F4xxx - Fatal warnings E83xx, E8034 (/redirect/patternMatch?code=E8034&redirectOrigin=ID1765332_424508587) - Removal of "Drive on" (P-0-0116 (/redirect/patternMatch?code=P-0-0116&redirectOrigin=ID1765332_424508587), bit 15) - Drive-controlled transition to the standstill special mode SMST1/SMST2/SMES	- Travel range errors F6xxx - Safety technology errors (F7xxx)	- Fatal errors F8xxx [2)] - Removal of Drive enable (P-0-0116 (/redirect/patternMatch?code=P-0-0116&redirectOrigin=ID1765332_424508587), bit 14)	fatal error F802 (/redirect/patternMatch?code=F8022&re
" **Emergency stop** " Velocity command value reset	fastest possible deceleration	□□□**0**$_{hex}$	□□**0**□ $_{hex}$		not possible
" **Emergency stop** " Velocity command value reset with ramp and jerk limit	deceleration without stressing the mechanical construction while complying with "Emergency stop" properties	□□□**4** $_{hex}$	□□**4**$_{5)}$□ $_{hex}$		not possible
Quick stop Velocity command value reset with ramp and jerk limit	deceleration without stressing the mechanical construction while complying with quick stop properties	□□□**2** $_{hex}$	not possible		not possible
Return motion	For systematic return motion in the case of error.	□□□**3** $_{hex}$ [3)]	not possible		not possible
		□□□**5** $_{hex}$	□□**5**□ $_{hex}$		not possible

Torque reset with ramp[6)]	Disabling the torque with ramp (reduced jerk) and protection from overvoltage in the DC bus in case of motors in the field weakening range			
" **Emergency stop** " by means of a motor phase short-circuit[1)]	Deceleration of the axis in the case of fatal errors, if control is not possible	□□□**8** **hex**	□□**8**□ **hex**	□**1**□□ **hex**
Torque disable	For slave axes, provided they have been connected to the master axis in friction-locked form	□□□**1** **hex**	□□**1**□ **hex**	□**0**□□ **hex**
Controlled deceleration, sensorless [4)]	Deceleration of the axis in the case of fatal encoder error, if control is not possible	not possible	not possible	not possible

Legend:

1)The braking effect with motor short circuit torque which is considerably smaller than the continuous torque of the motor

2)See also

3)When Drive on is removed (P-0-0116 (/redirect/patternMatch?code=P-0-0116&redirectOrigin=ID1765332_424508587), bit 15) and for some fatal warnings, the r
Instead, the set response bit 4-7 is executed. The return motion must be activated via function enabling.

4) Sensorless motor operation has to be commissioned separately, and the error reaction has to be checked.

5)The behavior of the quick stop via probe input and the fatal warnings E8029 (/redirect/patternMatch?code=E8029&redirectOrigin=ID1765332_424508587), E803
code=E8030&redirectOrigin=ID1765332_424508587), E8042 (/redirect/patternMatch?code=E8042&redirectOrigin=ID1765332_424508587), E8043 (/redirect/patte
code=E8043&redirectOrigin=ID1765332_424508587) and E8044 (/redirect/patternMatch?code=E8044&redirectOrigin=ID1765332_424508587) is derived from this
S-0-0138 (/redirect/patternMatch?code=S-0-0138&redirectOrigin=ID1765332_424508587) Bipolar acceleration value (without jerk limit) is taken into consideratior
reset. For all other settings, the command velocity value is reset.

6)device type EDS only

7)See also

Effective limitation parameters

Depending on the configured best possible deceleration, different limitation parameters take effect in case of error.

Type of deceleration	Torque/ force limit	Acceleration limit values

	P-0-0109 (/redirect/patternMatch?code=P-0-0109&redirectOrigin=ID1765332_424508587)	S-0-0138 (/redirect/patternMatch?code=S-0-0138&redirectOrigin=ID1765332_424508587)	S-0-0429 (/redirect/patternMatch?code=S-0-0429&redirectOrigin=ID1765332_424508587)	S-0-0372
"Emergency stop" Velocity command value reset	■			
"Emergency stop" Velocity command value reset with ramp and jerk limit	■	■	■	
Quick stop Velocity command value reset with ramp and jerk limit	■	■	-	
Return motion	■	-	-	
"Emergency stop" by means of a motor phase short-circuit	Synchronous motors: Motor-dependent and speed dependent braking torque, if required, brake support by servo brake Asynchronous motors: no braking action			
Torque reset with ramp	Synchronous motor: In the field weakening range, braking by motor phase short circuit In the basic speed range and for asynchronous motors, no braking			
Torque disable	**Servo brake:** Friction torque of brake **Main spindle brake:** no braking			
" **Emergency stop** " by controlled stop	max. torque corresponds to approx. 80% of P-0-0109 (/redirect/patternMatch?code=P-0-0109&redirectOrigin=ID1765332_424508587)	■	-	
" **Emergency stop** " Velocity command value reset with ramp	■	■	-	

- S-0-0138 (/redirect/patternMatch?code=S-0-0138&redirectOrigin=ID1765332_424508587) Bipolar acceleration limit value
- S-0-0349 (/redirect/patternMatch?code=S-0-0349&redirectOrigin=ID1765332_424508587) Bipolar jerk limit
- S-0-0372 (/redirect/patternMatch?code=S-0-0372&redirectOrigin=ID1765332_424508587) Quick stop delay
- S-0-0429 (/redirect/patternMatch?code=S-0-0429&redirectOrigin=ID1765332_424508587) Emergency stop delay

- P-0-0058 (/redirect/patternMatch?code=P-0-0058&redirectOrigin=ID1765332_424508587) Return jerk
- P-0-0109 (/redirect/patternMatch?code=P-0-0109&redirectOrigin=ID1765332_424508587) Peak torque/force limitation

Time flow of best possible deceleration

The process of the best possible deceleration comprises the following steps:

- Start of reaction
- Executing the deceleration
- Detection of standstill
- Switching on the brake
- After the "Drive Off" delay time, drive enable is deactivated.

Standstill is detected using the standstill window (S-0-0124 (/redirect/patternMatch?code=S-0-0124&redirectOrigin=ID1765332_424508587)). If the window is greater than 10 rpm for a rotary motor related to the shaft, a fixed value of 10 rpm is used instead. In case of a linear motor, this corresponds to 10 mm/min.

The time span between start of the reaction and detection of standstill is monitored for "S-0-0273 (/redirect/patternMatch?code=S-0-0273&redirectOrigin=ID1765332_424508587), Maximum drive off delay time". If the value entered for "S-0-0273 (/redirect/patternMatch?code=S-0-0273&redirectOrigin=ID1765332_424508587), Maximum drive off delay time" is too low, the error reaction could be aborted without axis standstill!

At the end of each error reaction, the drive goes torque-free. An exception to this is the motor phase short circuit acting instead of a holding brake. In this case, the motor phase short circuit is still maintained after drive enable has been deactivated.

DANGER!

Motor phase short circuit instead of holding brake

In this case, the DC bus voltage is always applied to the motor terminals. Danger!

Velocity command value reset (emergency stop)

Velocity command value reset (emergency stop) is used if a fastest possible deceleration without limitation of the acceleration is required in the case of error.

In the case of an error, the drive is stopped using command value = "0" in velocity control. The drive then decelerates with its maximum allowed torque from parameter "P-0-0109 (/redirect/patternMatch?code=P-0-0109&redirectOrigin=ID1765332_424508587), Torque/force peak limit", without acceleration limitation (see also "Limitations: ").

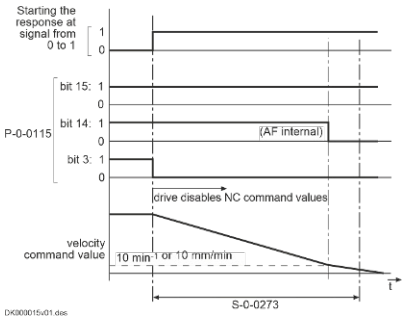

Fig. 334: Time flow of velocity command value reset

S-0-0273 (/redirect/patternMatch?code=S-0-0273&redirectOrigin=ID1765332_424508587)	Maximum drive off delay time
P-0-0115 (/redirect/patternMatch?code=P-0-0115&redirectOrigin=ID1765332_424508587)	Device control: Status word

Velocity command value reset with ramp (emergency stop)

Velocity command value reset with ramp (emergency stop) is used if deceleration that protects the mechanics is required.

In case of an error, the drive is stopped using a command value ramp, determined by "S-0-0429 (/redirect/patternMatch?code=S-0-0429&redirectOrigin=ID1765332_424508587), Emergency stop delay" and the jerk limit value "S-0-0349 (/redirect/patternMatch?code=S-0-0349&redirectOrigin=ID1765332_424508587), Bipolar jerk limit" in velocity control. If the value S-0-0429 (/redirect/patternMatch?code=S-0-0429&redirectOrigin=ID1765332_424508587) = "0" or greater than S-0-0138 (/redirect/patternMatch?code=S-0-0138&redirectOrigin=ID1765332_424508587), "S-0-0138 (/redirect/patternMatch?code=S-0-0138&redirectOrigin=ID1765332_424508587), Bipolar acceleration limit value" will be used. A torque/force limitation is derived from the parameter "P-0-0109 (/redirect/patternMatch?code=P-0-0109&redirectOrigin=ID1765332_424508587), Peak torque/force limitation“.

Parameters involved

- S-0-0138 (/redirect/patternMatch?code=S-0-0138&redirectOrigin=ID1765332_424508587), Bipolar acceleration limit value
- S-0-0349 (/redirect/patternMatch?code=S-0-0349&redirectOrigin=ID1765332_424508587), Bipolar jerk limit
- S-0-0429 (/redirect/patternMatch?code=S-0-0429&redirectOrigin=ID1765332_424508587), Emergency stop deceleration

Velocity command value reset with ramp (quick stop)

Velocity command value reset with filter (quick stop) is used if deceleration that protects the mechanics is required.

In the case of error, the drive in velocity control is decelerated with a command value ramp, determined by "S-0-0372 (/redirect/patternMatch?code=S-0-0372&redirectOrigin=ID1765332_424508587), Drive Halt acceleration bipolar" and the jerk limit value "S-0-0349 (/redirect/patternMatch?code=S-0-0349&redirectOrigin=ID1765332_424508587), Bipolar jerk limit". If the value S-0-0372 (/redirect/patternMatch?code=S-0-0372&redirectOrigin=ID1765332_424508587) = "0" or greater than S-0-0138 (/redirect/patternMatch?code=S-0-0138&redirectOrigin=ID1765332_424508587), "S-0-0138 (/redirect/patternMatch?code=S-0-0138&redirectOrigin=ID1765332_424508587), Bipolar acceleration limit value" will be used. The torque/force limitation is derived from the parameter P-0-0109 (/redirect/patternMatch?code=P-0-0109&redirectOrigin=ID1765332_424508587) .

Parameters involved

- S-0-0138 (/redirect/patternMatch?code=S-0-0138&redirectOrigin=ID1765332_424508587), Bipolar acceleration limit value
- S-0-0349 (/redirect/patternMatch?code=S-0-0349&redirectOrigin=ID1765332_424508587), Bipolar jerk limit
- S-0-0372 (/redirect/patternMatch?code=S-0-0372&redirectOrigin=ID1765332_424508587), Drive Halt acceleration bipolar

The parameters take effect as described in the "Drive Halt" function.

"Emergency stop" using motor phase short circuit

This reaction allows for a deceleration of the axis in the case of fatal errors, if motor control is no longer possible.

Depending on the application, it might be better to execute a DC bus short circuit instead of a motor phase short circuit as error response, since the DC bus short circuit usually leads to steeper braking ramp. The DC bus short circuit can only be triggered via the supply unit and not via the axis. If a DC bus short circuit is the preferred error reaction, it has to be triggered via the higher-level control.

If the increased braking effect of the DC bus short circuit is to be used, no motor phase short circuit must have been configured.

Only synchronous motors can be decelerated using a motor phase short circuit.

The braking effect depends on the short circuit current of the motor.

If an F8 error occurs, a holding brake controlled by the controller acts according to the functional principle set in "P-0-0525 (/redirect/patternMatch?code=P-0-0525&redirectOrigin=ID1765332_424508587), Brake control word".

Torque disable

In case of an error, the drive torque is disabled. In this case, the drive is only decelerated by the friction torque. The drive coasts to stop. The time until standstill can be very long, especially with spindles.

NOTICE!

In case of an error, the drive continues to move without braking! Danger to life from parts in motion when the safety door at the machining cell is opened!

Check drive for motion (e.g., using S"S-0-0040 (/redirect/patternMatch?code=S-0-0040&redirectOrigin=ID1765332_424508587), Velocity feedback value of encoder 1", if possible) and wait for standstill!

Return motion

Return motion is used if a specific retracting movement of the axis from the machining area is required in case of an error.

Generating the position command value profile

If "Return motion" has been set as the best possible deceleration, the drive generates a **position command value profile** in order to move by the desired travel distance, if an error occurs. This means that a relative process block is activated in the case of an error. The position command value profile is generated internally like in the "drive-internal interpolation" mode, using predefined process block data (velocity, acceleration, jerk).

The value of "P-0-0055 (/redirect/patternMatch?code=P-0-0055&redirectOrigin=ID1765332_424508587), Return distance" depends on the preceding sign, i.e. positive return distance causes positive motion referring to the coordinate system selected.

The position command value profile is generated using the following parameters:

- P-0-0055 (/redirect/patternMatch?code=P-0-0055&redirectOrigin=ID1765332_424508587), Return distance
- P-0-0056 (/redirect/patternMatch?code=P-0-0056&redirectOrigin=ID1765332_424508587), Return velocity
- P-0-0057 (/redirect/patternMatch?code=P-0-0057&redirectOrigin=ID1765332_424508587), Return acceleration
- P-0-0058 (/redirect/patternMatch?code=P-0-0058&redirectOrigin=ID1765332_424508587), Return jerk.

The values of "P-0-0055 (/redirect/patternMatch?code=P-0-0055&redirectOrigin=ID1765332_424508587), Return distance", "P-0-0056 (/redirect/patternMatch?code=P-0-0056&redirectOrigin=ID1765332_424508587), Return velocity" and "P-0-0057 (/redirect/patternMatch?code=P-0-0057&redirectOrigin=ID1765332_424508587), Return acceleration" can be configured and transmitted in the cyclic telegram (MDT).

In addition, the position command values can be smoothed by the position command average filter, with the order of the average filter (P-0-0042 (/redirect/patternMatch?code=P-0-0042&redirectOrigin=ID1765332_424508587), Current position command average filter order) being automatically calculated at the start of the response using "P-0-0057 (/redirect/patternMatch?code=P-0-0057&redirectOrigin=ID1765332_424508587), Return acceleration" and "P-0-0058 (/redirect/patternMatch?code=P-0-0058&redirectOrigin=ID1765332_424508587), Return jerk“.

$$\text{P-0-0042} = \frac{\text{P-0-0057}}{\text{P-0-0058}}$$

Fig. 335: Calculating the value of P-0-0042 (/redirect/patternMatch?code=P-0-0042&redirectOrigin=ID1765332_424508587)

Parameters involved

- P-0-0042 (/redirect/patternMatch?code=P-0-0042&redirectOrigin=ID1765332_424508587), Current position command average filter order
- P-0-0055 (/redirect/patternMatch?code=P-0-0055&redirectOrigin=ID1765332_424508587), Return distance
- P-0-0056 (/redirect/patternMatch?code=P-0-0056&redirectOrigin=ID1765332_424508587), Return velocity
- P-0-0057 (/redirect/patternMatch?code=P-0-0057&redirectOrigin=ID1765332_424508587), Return acceleration
- P-0-0058 (/redirect/patternMatch?code=P-0-0058&redirectOrigin=ID1765332_424508587), Return jerk

Status messages for acknowledgment

After the drive has traveled the process block, i.e. after it moved to the desired target position, the response is completed. The process block is considered to have been traveled when the following applies:

- target position = active position command value
  → i.e. "S-0-0013 (/redirect/patternMatch?code=S-0-0013&redirectOrigin=ID1765332_424508587), Class 3 diagnostics", bit 12="1"

- and -

- v_{act} = 0
  → i.e. "S-0-0013 (/redirect/patternMatch?code=S-0-0013&redirectOrigin=ID1765332_424508587), Class 3 diagnostics", bit 1="1" (actual velocity lower than "S-0-0124 (/redirect/patternMatch?code=S-0-0124&redirectOrigin=ID1765332_424508587), Standstill window")

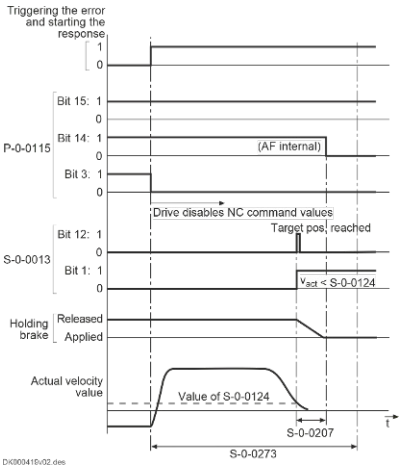

Fig. 336: Time flow of the "Return motion" error reaction

S-0-0013 (/redirect/patternMatch?code=S-0-0013&redirectOrigin=ID1765332_424508587)	Class 3 diagnostics
S-0-0207 (/redirect/patternMatch?code=S-0-0207&redirectOrigin=ID1765332_424508587)	Drive Off delay time
S-0-0124 (/redirect/patternMatch?code=S-0-0124&redirectOrigin=ID1765332_424508587)	Standstill window
S-0-0273 (/redirect/patternMatch?code=S-0-0273&redirectOrigin=ID1765332_424508587)	Maximum drive off delay time
P-0-0115 (/redirect/patternMatch?code=P-0-0115&redirectOrigin=ID1765332_424508587)	Device control: Status word

"Return motion" error reaction in the case of activated position limit values

If the drive-internal position limit values ("S-0-0049 (/redirect/patternMatch?code=S-0-0049&redirectOrigin=ID1765332_424508587), Positive position limit value" and "S-0-0050 (/redirect/patternMatch?code=S-0-0050&redirectOrigin=ID1765332_424508587), Negative position limit value") have been activated, i.e. if

- bit 4 for "Activation of position limit values" is set to "1" in "S-0-0055 (/redirect/patternMatch?code=S-0-0055&redirectOrigin=ID1765332_424508587), Position polarities"
  - and -
- the encoder selected via "S-0-0147 (/redirect/patternMatch?code=S-0-0147&redirectOrigin=ID1765332_424508587), Homing parameter" (bit 3) is in reference ("S-0-0403 (/redirect/patternMatch?code=S-0-0403&redirectOrigin=ID1765332_424508587), Position feedback value status"="1"),

it is ensured that the drive does not leave the defined allowed travel range by executing the "return motion" error reaction.

If the drive is in a position in which executing the return motion would exceed a position limit value, the drive in this case only moves up to shortly before the respective position limit value (exactly "S-0-0057 (/redirect/patternMatch?code=S-0-0057&redirectOrigin=ID1765332_424508587), Position window" before the position limit value).

Sensorless deceleration in the case of encoder error

Deceleration of a field-oriented closed-loop controlled motor with encoder (FOC) if FOC motor control is no longer possible due to a motor encoder defect.

In the case of a motor encoder malfunction ["F8022 (/redirect/patternMatch?code=F8022&redirectOrigin=ID1765332_424508587) Encoder 1: Encoder signals incorrect"], sensorless SVC operation can be applied for deceleration if this has been configured in parameter P-0-0119 (/redirect/patternMatch?code=P-0-0119&redirectOrigin=ID1765332_424508587).

If a holding brake is addressed by the controller, it will react according to the functional principle specified in "P-0-0525 (/redirect/patternMatch?code=P-0-0525&redirectOrigin=ID1765332_424508587), Brake control word" if the F8022 (/redirect/patternMatch?code=F8022&redirectOrigin=ID1765332_424508587) error occurs. See ↘ “Time flow of best possible deceleration” (.html#ID_76baecfa7479f0910a347e867ac2148b-ae9744bcef14dc760a347e8676f4a19e-en-US).

- This is an "SVC emergency mode" of FOC-controlled motors!

- The expected braking effect is reduced compared to a deceleration using FOC control!

Parameterization

The sensorless SVC operation of motors requires additional motor control parameters in comparison to FOC operation with encoder:

- For Rexroth motors, the parameter values for FOC and SVC operation are provided by the manufacturer: Either via the encoder data memory of the motor or when the parameter values of the connected motor type are loaded via the drive database of ctrlX DRIVE Engineering.
- During initial commissioning of third-party motors, the parameter values for FOC and FXC operation are determined by executing the command "C3600 (/redirect/patternMatch?code=C3600&redirectOrigin=ID1765332_424508587) Command Motor data identification".

The sensorless SVC operation possibly also requires different axis control parameters in comparison to FOC operation with encoder. For this reason, dedicated velocity control parameters are available for SVC emergency operation of FOC-controlled motors to switch to in case of an error:

- For SVC: "P-0-0608" instead of for FOC: "S-0-0100 (/redirect/patternMatch?code=S-0-0100&redirectOrigin=ID1765332_424508587), Velocity controller proportional gain"
- For SVC: "P-0-0609" instead of for FOC: "S-0-0101 (/redirect/patternMatch?code=S-0-0101&redirectOrigin=ID1765332_424508587), Velocity controller integral action time"

Commissioning

Precondition for use of sensorless motor deceleration is operational readiness of the motor with sensorless SVC procedure. For this reason, the motor equipped with motor encoder also needs to be put into operation using the sensorless SVC procedure and needs to be parameterized and checked for maximum possible deceleration (braking).

The values of the velocity control parameters (S-0-0100 (/redirect/patternMatch?code=S-0-0100&redirectOrigin=ID1765332_424508587), S-0-0101 (/redirect/patternMatch?code=S-0-0101&redirectOrigin=ID1765332_424508587)) for sensorless SVC motor operation may deviate from the values of FOC motor operation with encoder. In case of deviating values, the determined S-0-0100 (/redirect/patternMatch?code=S-0-0100&redirectOrigin=ID1765332_424508587) value has to be applied to P-0-0608 and the determined S-0-0101 (/redirect/patternMatch?code=S-0-0101&redirectOrigin=ID1765332_424508587) value to P-0-0609. By default, P-0-0608/P-0-609 is preset with the values S-0-0100 (/redirect/patternMatch?code=S-0-0100&redirectOrigin=ID1765332_424508587)/S-0-0101 (/redirect/patternMatch?code=S-0-0101&redirectOrigin=ID1765332_424508587) of the FOC-controlled motor.

The effect of sensorless motor deceleration in the case of error F8022 (/redirect/patternMatch?code=F8022&redirectOrigin=ID1765332_424508587) should be checked for actual suitability during axis commissioning, also see ↘ “Generating test errors”

Parameters involved

- S-0-0138 (/redirect/patternMatch?code=S-0-0138&redirectOrigin=ID1765332_424508587), Bipolar acceleration limit value
- S-0-0273 (/redirect/patternMatch?code=S-0-0273&redirectOrigin=ID1765332_424508587), Maximum drive off delay time
- S-0-0349 (/redirect/patternMatch?code=S-0-0349&redirectOrigin=ID1765332_424508587), Bipolar jerk limit
- S-0-0372 (/redirect/patternMatch?code=S-0-0372&redirectOrigin=ID1765332_424508587), Drive Halt acceleration bipolar
- S-0-0429 (/redirect/patternMatch?code=S-0-0429&redirectOrigin=ID1765332_424508587), Emergency stop deceleration
- P-0-0055 (/redirect/patternMatch?code=P-0-0055&redirectOrigin=ID1765332_424508587), Return distance
- P-0-0056 (/redirect/patternMatch?code=P-0-0056&redirectOrigin=ID1765332_424508587), Return velocity
- P-0-0057 (/redirect/patternMatch?code=P-0-0057&redirectOrigin=ID1765332_424508587), Return acceleration
- P-0-0058 (/redirect/patternMatch?code=P-0-0058&redirectOrigin=ID1765332_424508587), Return jerk
- P-0-0109 (/redirect/patternMatch?code=P-0-0109&redirectOrigin=ID1765332_424508587), Torque/force peak limit
- P-0-0119 (/redirect/patternMatch?code=P-0-0119&redirectOrigin=ID1765332_424508587), Best possible deceleration
- P-0-0525 (/redirect/patternMatch?code=P-0-0525&redirectOrigin=ID1765332_424508587), Brake control word
- P-0-0569 (/redirect/patternMatch?code=P-0-0569&redirectOrigin=ID1765332_424508587), Maximum stator frequency slope