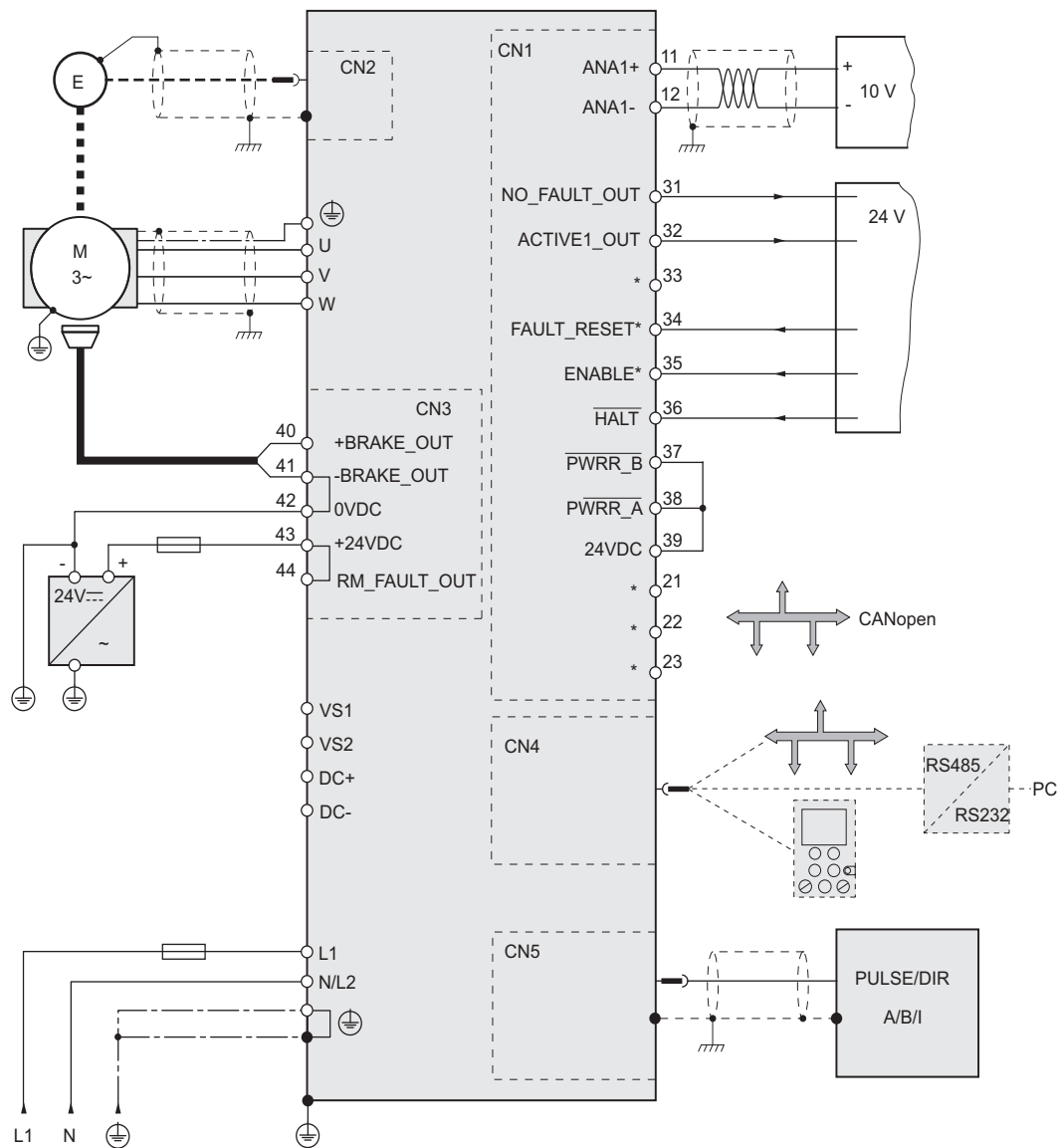
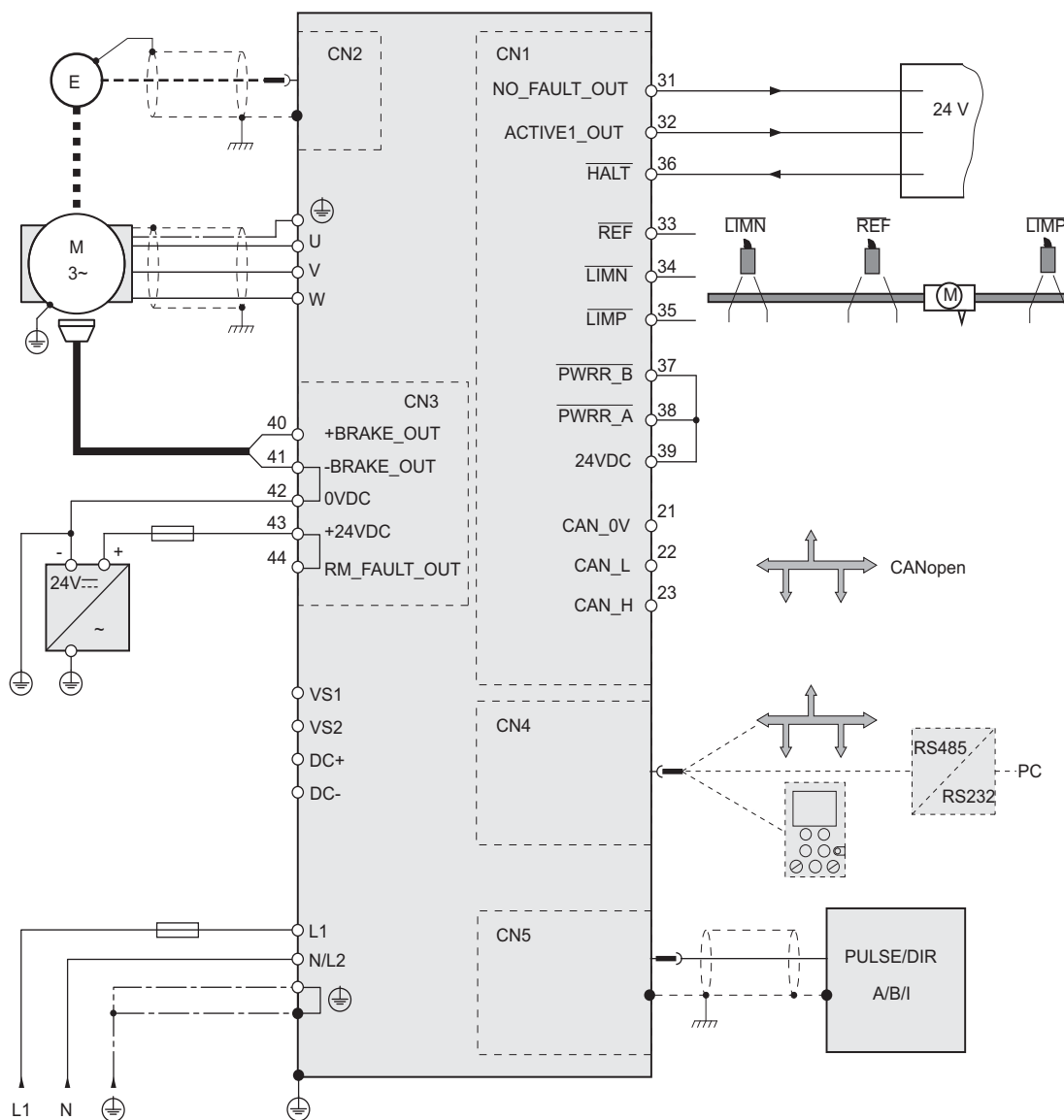


## Schemes

## SD328A connection example with local control

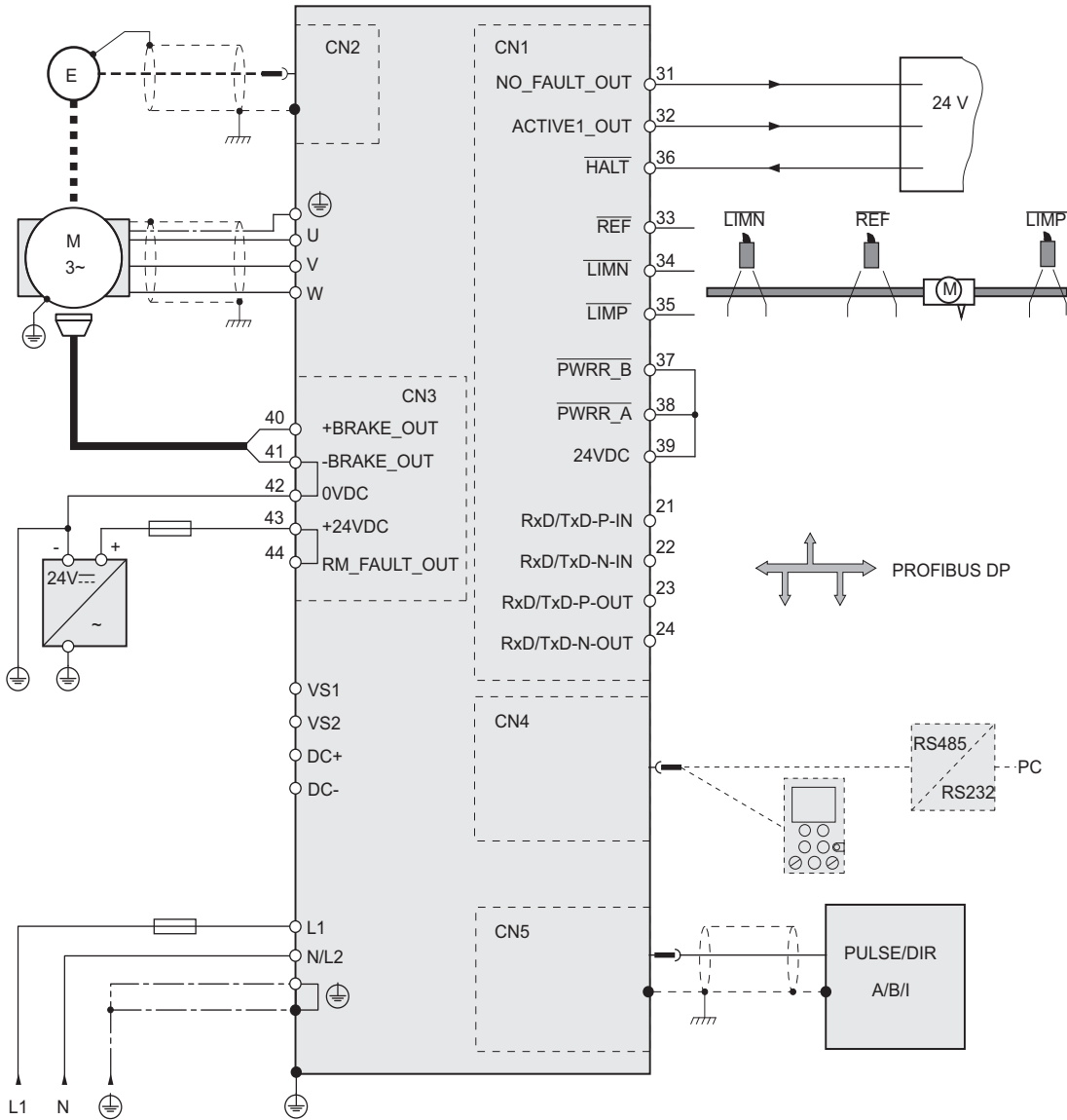
SD328A connection example with local control via  $\pm 10\text{ V}$  analogue signals

## SD328A connection example with fieldbus control



SD328A connection example with fieldbus control (CANopen)

SD328B connection example with fieldbus control



SD328B connection example with fieldbus control (PROFIBUS DP)

### Commissioning functions

The following tools can be used to commission the device:

- Integrated control panel (HMI)
- Remote terminal
- Lexium CT PC commissioning software
- Fieldbus

Two important commissioning functions of the SD328A are explained below. Please refer to the documentation for the stepper motor drive for a detailed description of the commissioning functions.

### Control via fieldbus or local (SD328A only)

When the stepper motor drive is started for the first time, the user must specify whether access and parameterisation will be via local control or via fieldbus. This setting can only be modified by restoring the factory settings. The operating modes available for the stepper motor drive also depend on this setting.

In the case of local control, the integrated control panel (HMI), the remote terminal (equivalent to the integrated control panel in terms of functions) or the Lexium CT PC commissioning software is used for parameterisation. Movements are then preset with a  $\pm 10$  V analogue signal or with RS 422 signals (pulse/direction signals). Limit switches or reference switches cannot be connected in the case of local control.

In fieldbus control mode, all communication takes place via fieldbus commands.

### Determining the logic type of signals (SD328A only)

The signal logic (positive or negative) of the 24 V inputs and outputs can be defined during commissioning.

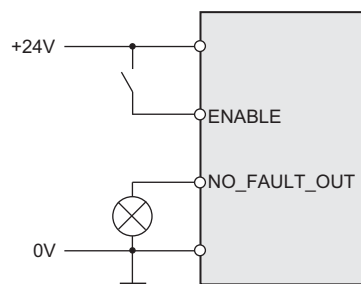
This setting affects the wiring and the way sensors are controlled and must be clarified in the engineering phase with regard to the application.

The SD328A can switch the  $\pm 24$  V signal inputs and outputs as follows:

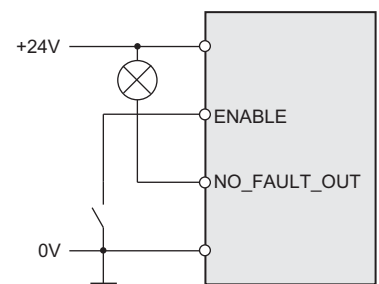
- "Source" logic type:  
signal output supplies current, current flows into the signal input
- "Sink" logic type:  
signal output draws current, current flows from the signal input

By default the device is set to the "Source" logic type.

The PWRR\_A and PWRR\_B signal inputs for the "Safe Torque Off" safety function (Power Removal "PWRR") always have the "Source" logic type regardless of the setting.



Logic type (Source)



Logic type (Sink)

Operating modes					
Overview of operating modes					
Operating mode	with SD3..		Control via		Reference value set via
	28 A	28 B	Fieldbus	Local	
Jog					Fieldbus, Lexium CT PC commissioning software, integrated control panel (HMI)
Oscillator					Fieldbus, Lexium CT PC commissioning software, $\pm 10$ V analogue signals
Electronic gear					Pulse/direction signals, A/B encoder signals
Profile position mode					Fieldbus, Lexium CT PC commissioning software
Profile velocity					Fieldbus, Lexium CT PC commissioning software
Homing					Fieldbus, Lexium CT PC commissioning software
Motion sequence					Fieldbus, Lexium CT PC commissioning software

	Operating mode available
	Operating mode not available

### Jog

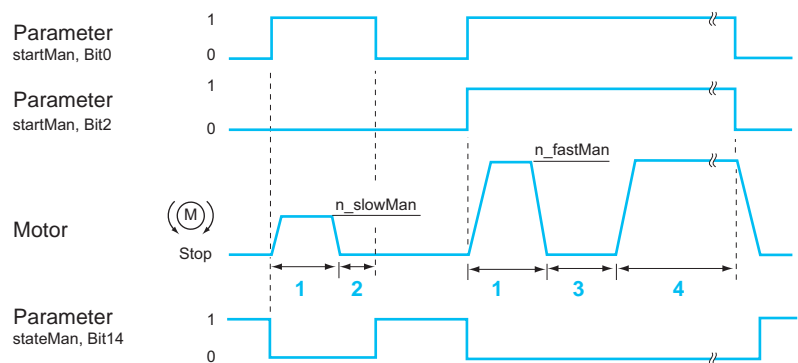
The motor moves by one distance unit or at constant speed in continuous operation. The length of the distance unit, the speed levels and the change-over time in continuous operation can be adjusted manually.

#### Reference value setting

The reference values are set via fieldbus, with the Lexium CT PC commissioning software or the integrated control panel (HMI).

#### Application example

Setting up a machine during commissioning



Jog, slow and fast

- 1 JOGstepusr
- 2  $t < JOGtime$
- 3  $t > JOGtime$
- 4 Continuous operation

Jog distance, wait time and jog speed can be set. If the jog distance is zero, jog starts directly with continuous movement irrespective of the wait time.

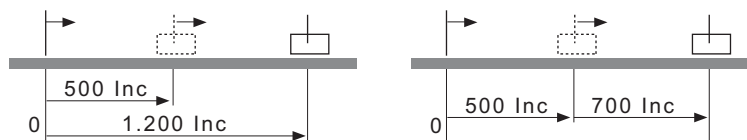
### Profile position mode

In the operating mode "Profile Position", the motor is positioned from a point A to a point B with a positioning command.

#### Settings

The positioning path can be specified in two ways:

- Absolute positioning, reference point is the zero point of the axis
- Relative positioning, reference point is the current position of the motor



Operating mode "Profile Position", absolute and relative

#### Reference value setting

The reference values are set via fieldbus or with the Lexium CT PC commissioning software.

#### Application example

Pick-and-place with a linear robot

### Profile velocity

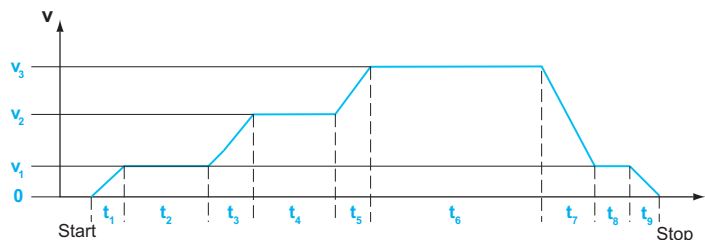
In operating mode "Profile velocity", a reference speed for the motor is set and a movement without a target position is started. This speed is maintained until a different reference speed is specified or the operating mode is changed.

#### Reference value setting

The reference values are set via fieldbus or with the Lexium CT PC commissioning software.

#### Application example

Paint application in CD manufacture



Profile velocity

**t1, t3, t5** = acceleration

**t2, t4, t6, t8** = constant movement

**t7, t9** = braking

## Homing

There are two types of homing:

- Reference movement  
Specifying the dimension reference by approach to a limit or reference switch
- Position setting  
Specifying the position reference relative to the current motor position

### Reference movement

During reference movement, the motor moves to a defined position on the axis. The defined position is defined with a mechanical switch:

- LIMN and LIMP limit switches
- REF reference switch

## Types of reference movements

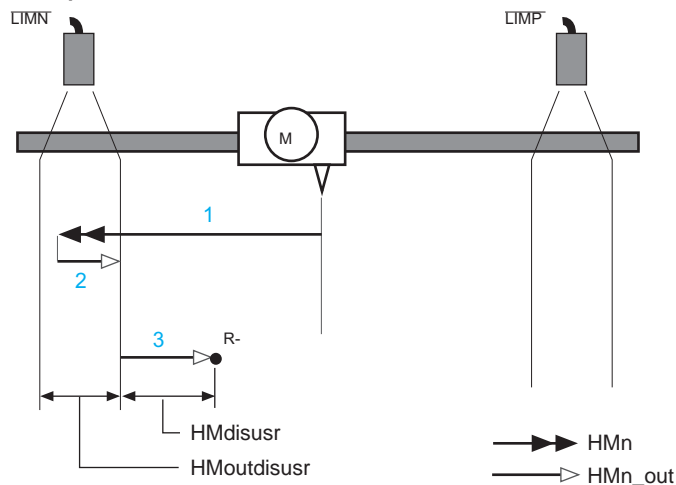
4 standard reference movements are available

- Movement to negative limit switch LIMN
- Movement to positive limit switch LIMP
- Movement to reference switch REF with counterclockwise direction of rotation
- Movement to reference switch REF with clockwise direction of rotation

In addition, a reference movement can be with or without index pulse.

- Reference movement without index pulse
- Movement from switching edge to a parameterisable distance from the switching edge
- Reference movement with index pulse
- Movement from the switching edge to the physical index pulse of the motor

### Example 1: Reference movement to limit switch

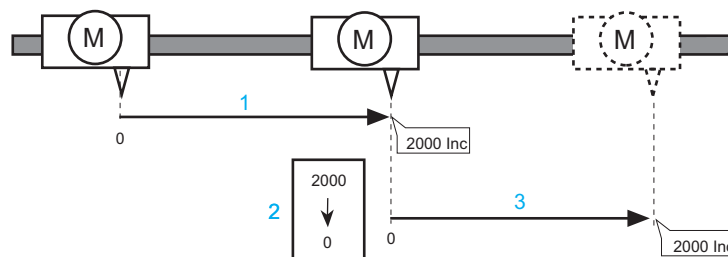


Operating mode "Homing", reference movement to the negative limit switch

- 1 Movement to limit switch at search speed
- 2 Movement to switching edge at clearance speed
- 3 Movement to distance from switching edge at clearance speed

### Example 2: position setting

Position setting can be used to execute a continuous motor movement without overtravelling the positioning limits.



Positioning by 4000 increments with position setting

- 1 The motor is positioned by 2000 increments.
- 2 The current motor position is set to position value 0 by position setting to 0 and the new zero point is defined at the same time.
- 3 The new target position is 2000 increments after a new movement command by 2000 increments is triggered.

This procedure prevents overtravel of the absolute position limits during positioning, because the zero point is set continuously.

### Reference value setting

The reference values are set via fieldbus or with the Lexium CT PC commissioning software.

### Application example

Prior to absolute positioning in "Profile Position" mode.



### Oscillator (SD328A only)

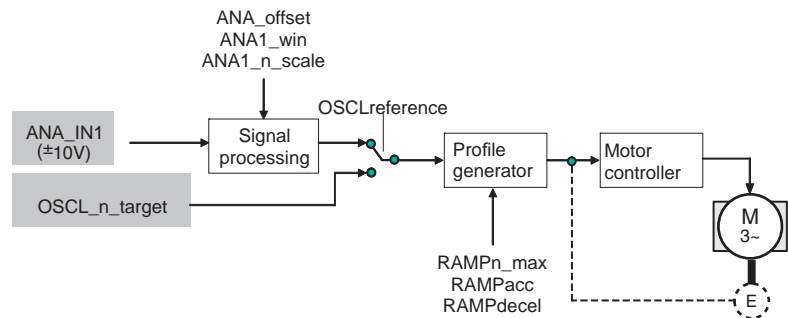
In "Oscillator" operating mode, the speed of rotation of the motor is set via a  $\pm 10$ -V analogue signal or via fieldbus parameters.

#### Reference value setting

The reference values are set via fieldbus, with the Lexium CT PC commissioning software or  $\pm 10$ -V analogue signals.

#### Application example

Roller control in roller conveyors.



Overview of "Oscillator" operating mode

### Electronic gear

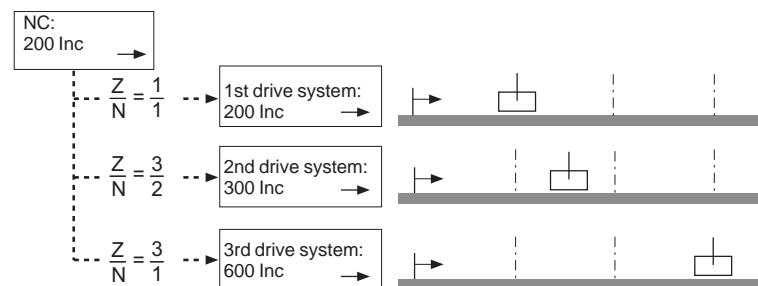
In "Electronic Gear" operating mode, the reference signals are supplied from an encoder (A/B signals) or a controller (pulse/direction signals) and a new position reference value is calculated using an adjustable gear ratio.

#### Reference value setting

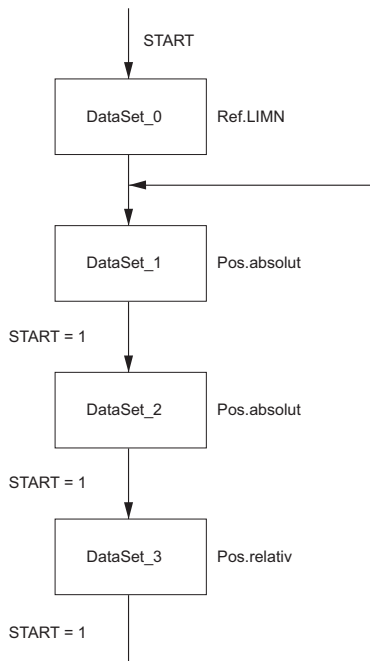
The reference values are supplied as pulse/direction or A/B encoder signals.

#### Application example

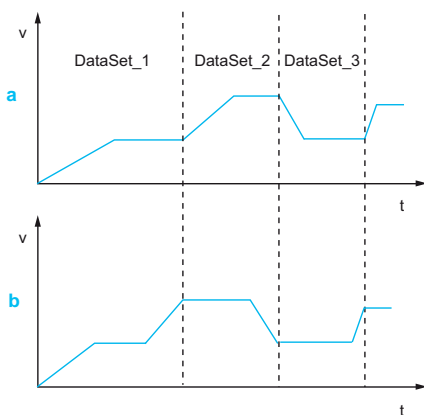
Synchronisation of motion sequences, e.g. cutting material on a conveyor belt.



"Electronic gear" operating mode



Example of sequential selection of movement commands



Blended movement

### “Motion Sequence” operating mode

#### Presentation

In the “Motion Sequence” operating mode, up to 16 data sets with movement commands can be activated directly or sequentially with a PC, fieldbus or digital inputs. The movement commands can include reference movements or positioning commands. This way, a motion sequence can be saved in the drive system and controlled via a master PLC.

The Lexium CT PC commissioning software or the fieldbus is used to enter data sets and parameterise the drive system.

#### Direct selection of movement commands

The direct selection of movement commands is used if a master controller (e.g. PLC) controls the time coordination of the various data sets. The data set to be processed is selected via signal inputs and then activated by a start signal.

#### Sequential selection of movement commands

Sequential selection of the movement commands is used for processing simple motion sequences. The time coordination is programmed in the individual data sets via specification of a wait time, a transition condition and the subsequent data set. A transition condition can be, for instance, a rising edge at the START signal input. A motion sequence can also be executed cyclically with or without return to the initial position.

#### Processing status of a movement command

The processing status of a movement command can be output via the handshake output. In addition, an internal processing status such as “drive system in motion” can be output via an additional signal output.

#### Selection of the motion profile

Speeds and accelerations are saved in motion profiles. One of the motion profiles can be assigned to every movement command data set.

#### Blended movement

In the case of sequential selection of movement commands, a blended movement can be specified as a transition condition in the data set. When the target position is reached, the drive accelerates or decelerates to the speed of the subsequent data set.

There are two types of blended movement:

##### Blended movement a

After reaching the target position, the drive switches to the speed of the subsequent data set.

##### Blended movement b

When the target position is reached, the drive is to have speed of the subsequent data set.

### “Safe Torque Off” (“Power Removal”) safety function

The SD328 stepper motor drive integrates the “Safe Torque Off” (“Power Removal”) safety function which prevents unintended operation of the servo motor. The servo motor no longer produces any torque if the safety function is active.

This safety function:

- Complies with the machine safety standard ISO 13849-1, performance level “d” (PL d).
- Complies with the standard for functional safety IEC/EN 61508, SIL2 capability (safety control-signalling applied to processes and systems). The SIL (Safety Integrity Level) capability depends on the connection diagram for the servo drive and for the safety function. Failure to observe the setup recommendations could inhibit the SIL capability of the “Safe Torque Off” (“Power Removal”) safety function.
- Complies with the product standard IEC/EN 61800-5-2 “Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Functional” for both stop functions:
  - Safe Torque Off (“STO”) corresponds to Category 0 stop according to IEC/EN 60204-1. Standstill by immediate power shutdown to the machine drive elements (i.e. an uncontrolled stop).
  - Safe Stop 1 (“SS1”) corresponds to Category 1 stop according to IEC/EN 60204-1. A controlled stop in which the machine drive elements are retained to effect the standstill. The final shutdown is ensured by an external Emergency stop module with safe time delay, e.g. Preventa XPS-AV (1).

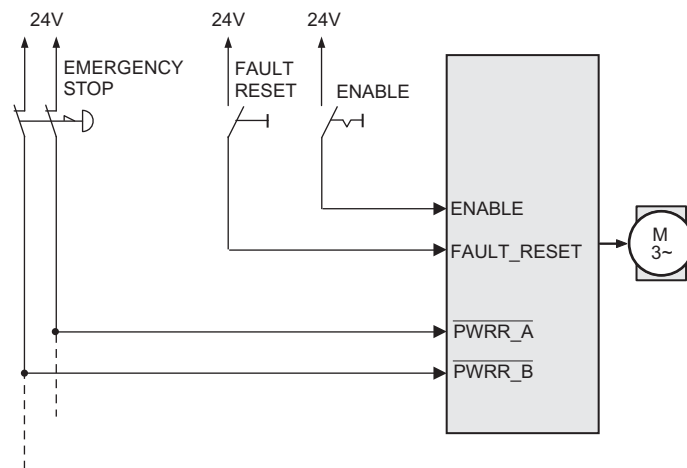
The “Safe Torque Off” (“Power Removal”) safety function has a redundant electronic architecture which is monitored continuously by a diagnostics function (2).

This PL d and SIL2 safety function is certified as conforming to these standards by the TÜV certification body in the context of a voluntary certification.

(1) Please refer to the “Safety functions and solutions using Preventa” catalogue.

(2) Redundant: Consists of mitigating the effects of the failure of one component by means of the correct operation of another, assuming that faults do not occur simultaneously on both.

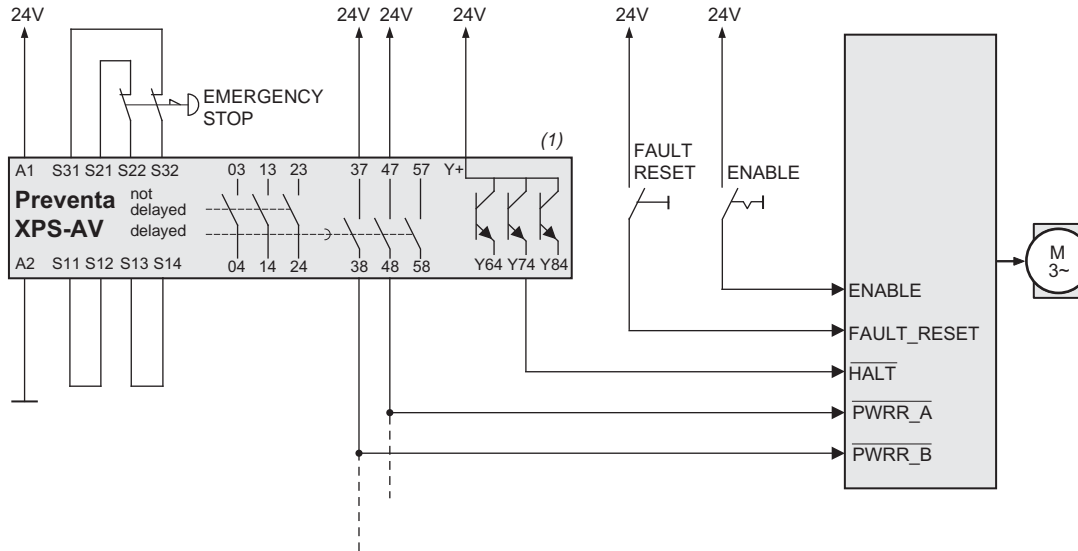
### Examples of applications of the safety function



Example category 0 stop

### “Safe Torque Off” (“Power Removal”) safety function (continued)

#### Examples of applications of the safety function



Example category 1 stop

### Additional operating functions

Additional monitoring and operating functions can be activated via fieldbus, the Lexium CT PC commissioning software or the integrated control panel (HMI):

- Setting motor phase current
- Monitoring functions
  - Status monitoring during movements
  - Monitoring of axis signals
  - Monitoring of internal device signals
  - Earth (ground) fault and short-circuit monitoring
- Scaling for conversion of user-defined units to internal units
- Setting motion profile via profile generator
- Triggering Quick Stop function
- Setting HALT signal
- Fast position capture
- Velocity window
- Triggering brake functions for motors with holding brake
- Configurable inputs and outputs
- Reversing direction of rotation of motor
- Restoring default values

(1) Preventa XPS-AV, please refer to the “Safety functions and solutions using Preventa” catalogue.