YASKAWA

AC Drive L1000A

For Lift Applications

Technical Manual Addendum

Type: **CIMR-LCxFxxxxxxx-913x**

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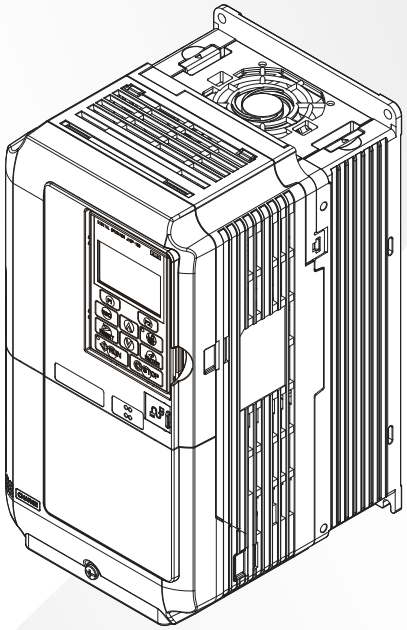

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1 General Overview

This manual is an addendum to the L1000A Technical Manual. All conditions mentioned in the L1000A Technical Manual apply. Always heed Safety Instructions as given in the Technical Manual when replacing a drive or performing installation and setup steps described here.

This documentation is valid for drives:

- with model codes CIMR-LCxFxxxxxxx-913x
- with firmware S3404 or later

2 Brake Monitoring (Unintended Car Movement)

◆ Overview

According to EN81-20:2014, new lifts must be equipped with a system independent of the drive control to prevent unintended car movement (UCM) away from the stop with open doors. This protection device has three functions:

- Recognition
- Tripping
- Braking

With gearless PM motors, the applied brake can be used as the “braking” part of the UCM-device. In this case, the brake function has to be monitored. With a certified brake response monitor function, the motor brake and the drive can act as parts of the UCM protective device.

■ Specification for Brake Response Monitor (BRM) Function

The brake monitor status function supports:

- Checking the status of the brakes at every run command
- Checking the correct switching of the brake within a defined time
- Locking the system if failure is detected

The Brake Response Monitor function is certified according to the normative requirements.

■ Checking the Status of the Brakes

The Brake Response Monitor (BRM) function checks the status of the brakes with every run command.

- Setting 79h: “Brake Feedback” (N.O. signal)
- Setting 5Bh: “Brake Feedback” (N.C. signal)

To comply with the EN81-20:2014 norm, the Brake Feedback function must be selected for two digital inputs simultaneously (e.g.: H1-07 = 79h & H1-08 = 79h).

Selecting the Brake Feedback function once or more than twice, or mixing the functions (selecting 79h & 5Bh) triggers an OPE03 fault if the Brake Response Monitor function is enabled (S6-17 = 1).

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◆ Wiring

The motor is equipped with two brakes. In the figure below the brakes have two Normally Open (N.O.) switches, but Normally Closed (N.C.) operation is also possible.

When the motor brakes close, the switches close as well. This causes the digital inputs used for brake monitoring (e.g. S7 and S8) to change their logic state and unlock the drive allowing the run sequence to start.

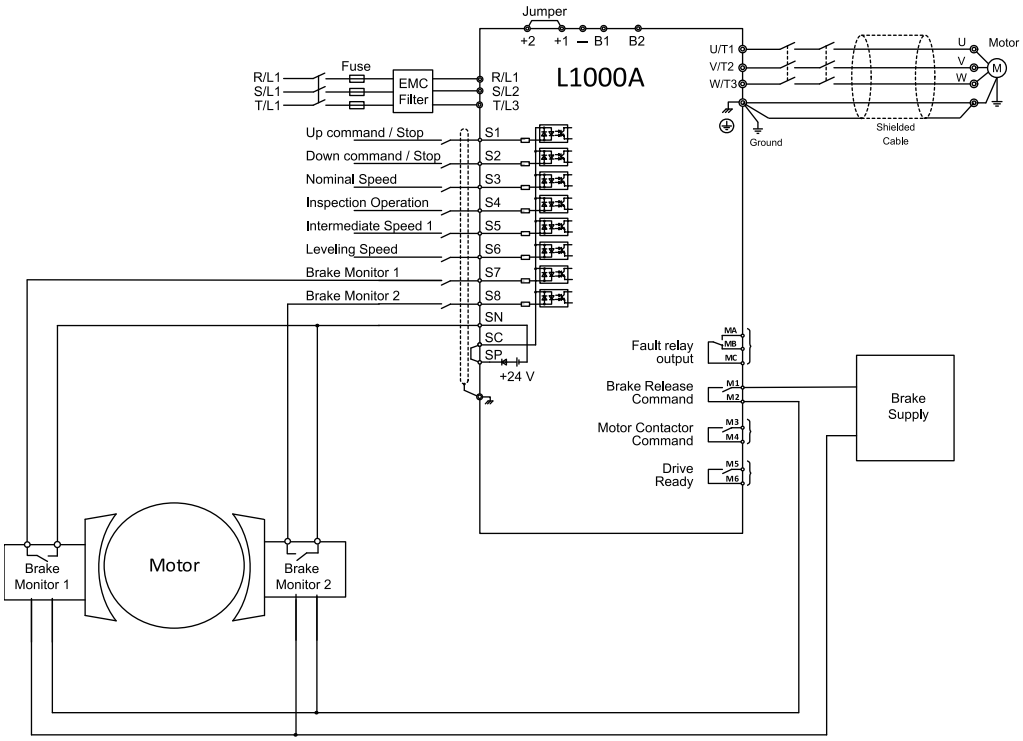

Figure 2.1 Wiring Example: How to Wire the Drive and Motor Brakes

◆ Activation/Deactivation

The following table provides an overview of the parameters necessary for the Brake Response Monitor.

Parameter Number	Parameter Name	Setting Range
H1-xx	Brake Feedback 1	79h (N.O.)
	Brake Feedback 2	5Bh (N.C.)
S6-17	Brake Response Monitor	0 = Deactivated (Default) 1 = BRM Function Active
S6-05	Brake Response Error (SE4) Detection Time	Default 500 ms Min. 100 ms Max. 10,000 ms
S6-06	Brake Response Error (SE4) Detection Time During Run	Default 500 ms Min. 100 ms Max. 60,000 ms
S6-18	SE4 Fault Reset	0 = No reset (Default) 1 = Reset SE4 Fault

The Brake Response Error Detection Time is adjustable in parameter *S6-05*. Default detection time is 500 ms.

The Brake Response Error Detection Time During Run is adjustable in parameter *S6-06*. Default detection time is 500 ms.

■ Activation

The Brake Response Monitor (BRM) function is not active by default. The Brake Feedback function must be programmed to two digital inputs of the drive.

To activate the BRM function, perform the following steps:

- Set *S6-17 = 1*.
- Program the Brake Feedback function to two digital inputs of the drive.
  For example:
  - Input S7 -> *H1-07 = 79h*
  - Input S8 -> *H1-08 = 79h*

If *S6-17 = 0*, but Brake Feedback 1 and Brake Feedback 2 are wired and Brake Control *[H2-xx = 50h]* is used, the L1000A standard Brake Feedback Function is active, but the mode of operation is not A3-compliant. This Brake

Feedback function is just monitoring the brake operation and issues a fault if the brakes' status does not match the brake command.

■ Deactivation

To deactivate the Brake Response Monitor (BRM) function, perform the following steps:

• Set *S6-17 = 0*.

The function is disabled.

◆ Fault Detection/Fault Reset

■ Fault Detection

If during the start or stop process Brake Feedback 1 and/or Brake Feedback 2 do not change their logic state within the time limit specified in *S6-05 [Brake Response Error (SE4) Detection Time]*, an *SE4* fault will be triggered and the drive will be locked.

If during Run Brake Feedback 1 or Brake Feedback 2 change their logic state for a time longer than *S6-06 [Brake Response Error (SE4) Detection Time During Run]*, an *SE4* fault will be triggered and the drive will be locked.

■ SE4 Fault Reset

With the *Brake Response Monitor function* enabled *[S6-17 = 1]*, an *SE4* fault cannot be reset by:

• Using the Reset button
• Power cycling the drive or installation
• Using the *Automatic Fault Reset* function *[L5-xx]*

The *SE4* fault can be reset only by setting parameter *S6-18 = 1*.

With the *Brake Response Monitor (BRM)* function disabled *[S6-17 = 0]*, an *SE4* fault can be reset using the standard procedure.

■ Brake Feedback

Standard Behavior of Brake Feedback

After the Brake Release Command is set (brake open) during start procedure, the drive starts a timer with the value set in parameter *S6-05*. If *Brake Feedback function 79h* is selected, both of the Brake Feedback Inputs must be set within the time set in *S6-05*. If *Brake Feedback function 5Bh* is selected, they must be reset within the time set in *S6-05*.

After the Brake Release Command is reset (brakes closed) during stop procedure, the drive starts a timer with the value set in parameter *S6-05*. If *Brake Feedback function 79h* is selected, both of the Brake Feedback Inputs must be set within the time set in *S6-05*. If *Brake Feedback function 5Bh* is selected, they must be reset within the time set in *S6-05*.

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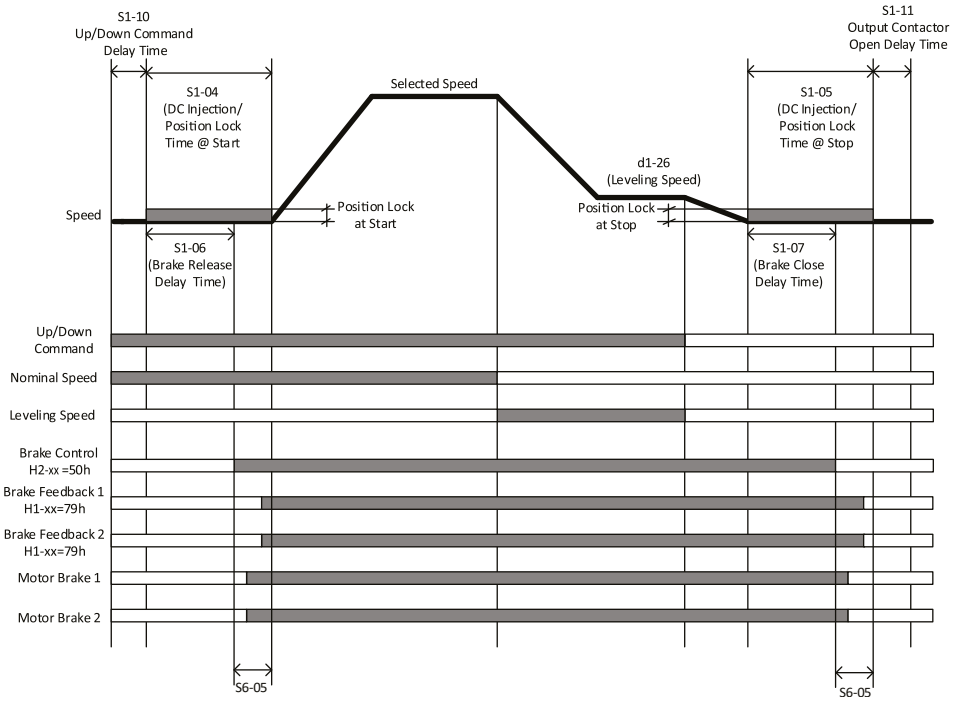

Figure 2.2 Normal Operation with MFDOs set to 79h (N.O.)

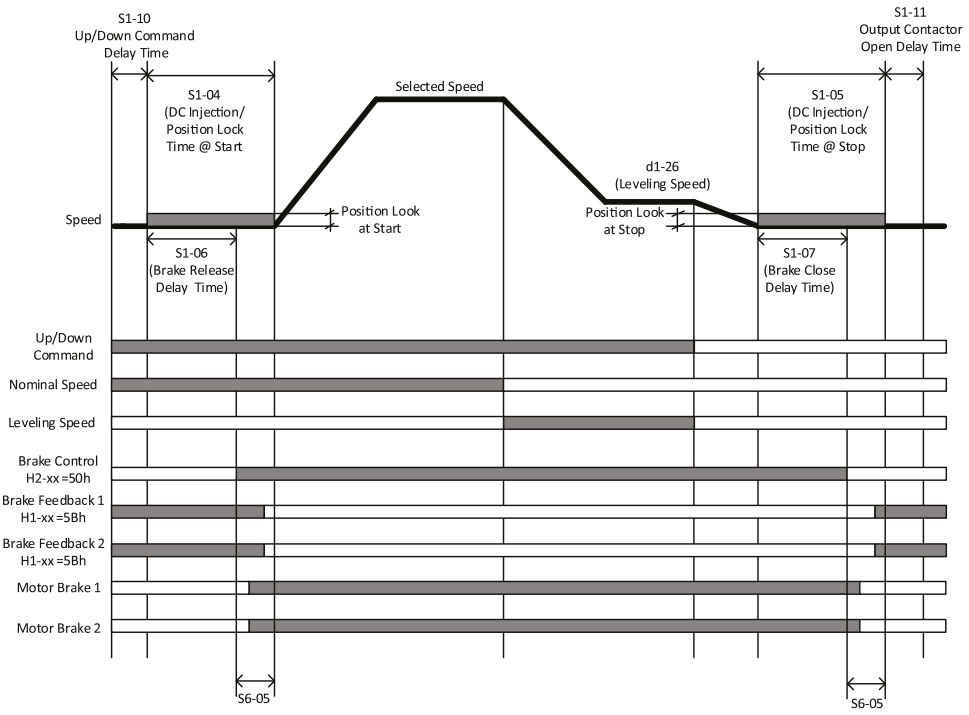

Figure 2.3 Normal Operation with MFDOs set to 5Bh (N.C.)

Fault During Start or Stop

If both Brake Feedback Inputs do not change their logic state within the time set in parameter *S6-05*, the drive stops the start/stop sequence and triggers an *SE4 [Brake Response Error]* fault.

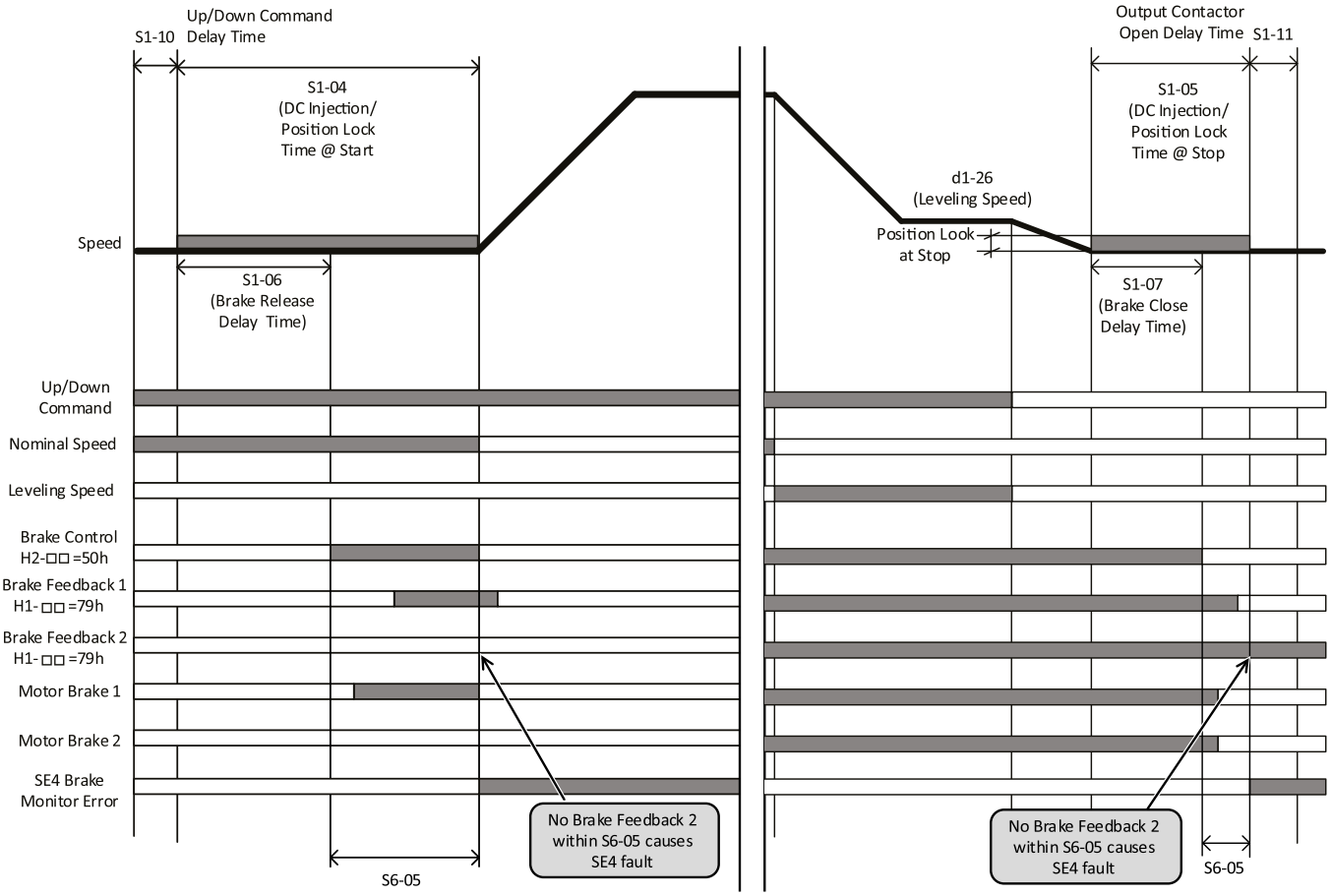

Figure 2.4 Fault during Start (left) and Fault during Stop (right)

Fault Behavior During Run

If at any point during Run the logic state of one of the Brake Feedback inputs changes unexpectedly, a countdown timer with the value of parameter *S6-06* will be initiated. If the timer expires without change of Brake Feedback status to its expected state, an *SE4* Fault will be triggered and the fault message *"Brake Response Error (SE4)"* will be displayed.

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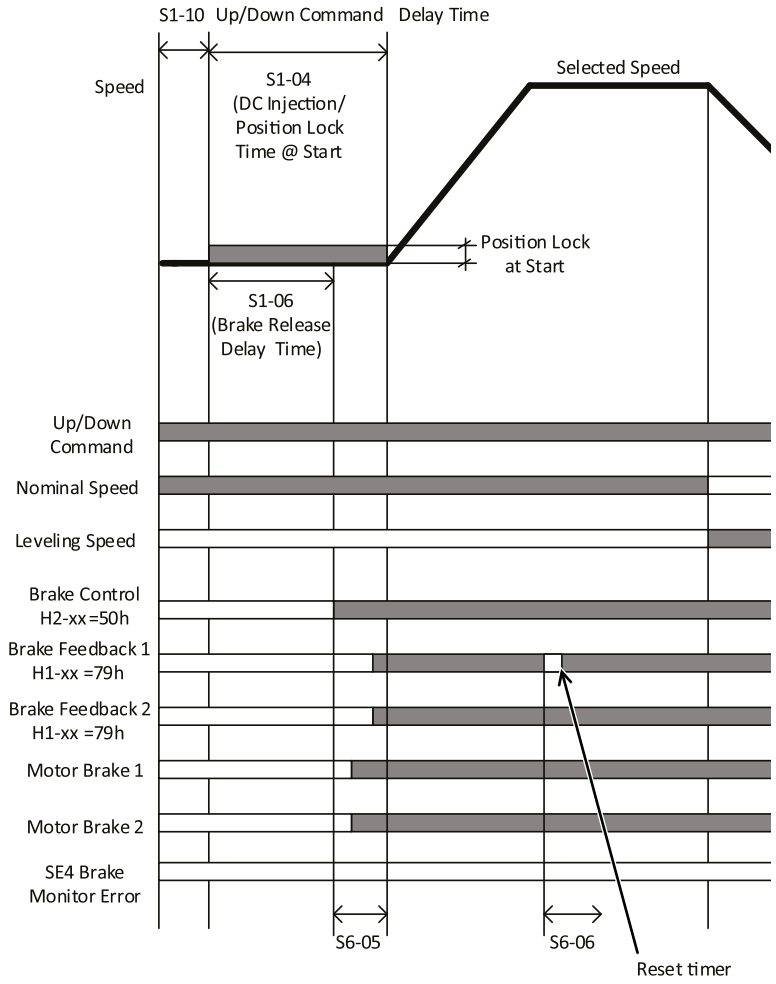

Figure 2.5 Short Disruption of Brake Feedback 1 Input during Run

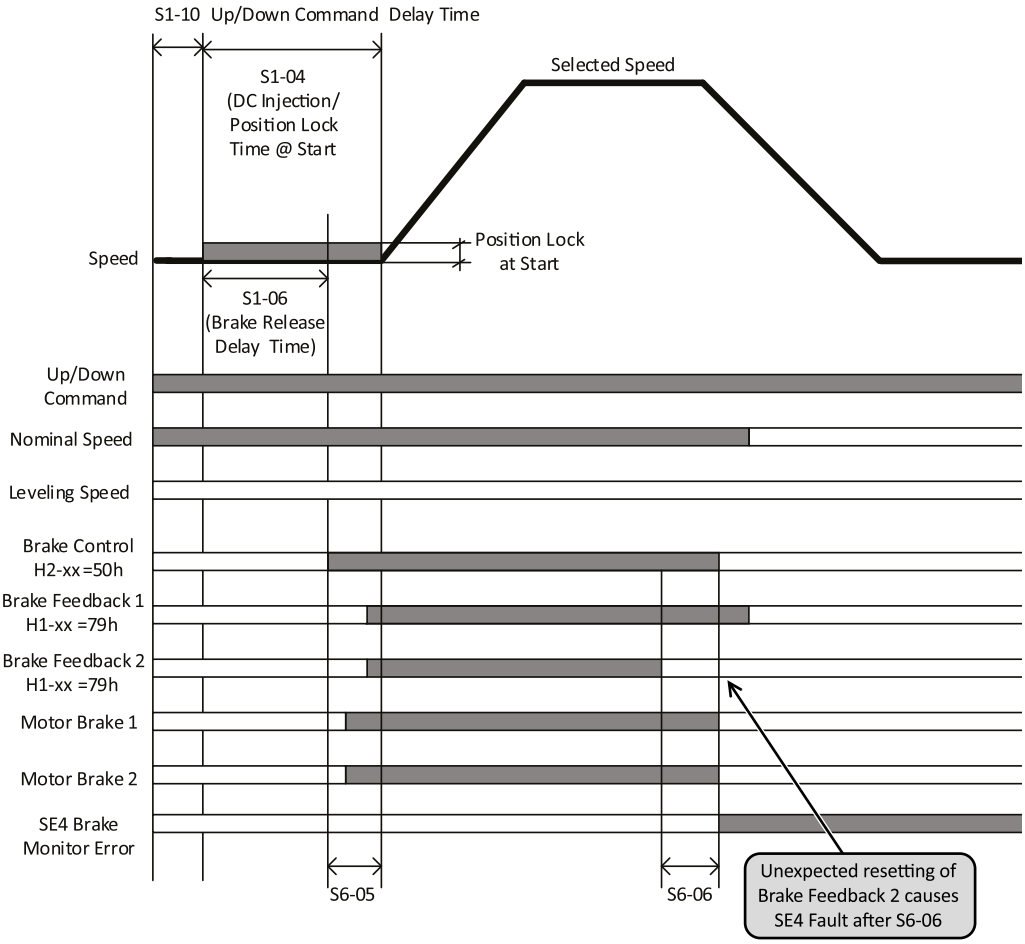

Figure 2.6 Fault during Run

◆ Function Test

Selecting the Brake Feedback function on only one or more than two digital inputs, or mixing the functions (selecting 79h & 5Bh) triggers an *oPE03* fault if the Brake Response Monitor function is enabled *[S6-17 = 1]*.

In case of an *oPE03* fault, check if two inputs have been programmed as Brake Feedback and if they are both programmed to the same function.

For example:

- *H1-07 = 79h & H1-08 = 79h* **or**
- *H1-07 = 5Bh & H1-08 = 5Bh*

If the Brake Response Monitor function is enabled *[S6-17 = 1]* and the *SE4* fault appears, verify the Brake Monitor Function before you can reset the *SE4* fault.

■ Function Test NPN Logic

The following steps have to be performed for the functional test after commissioning when using NPN logic:

1. Disconnect the signal Brake Feedback 1 (e.g. input S7).
2. Execute test travel.
3. During start an *SE4* fault should be triggered and the drive should immediately stop.
4. The drive should be blocked and no further travel should be possible even after power cycle.
5. Reconnect the signal Brake Feedback 1.
6. Execute test travel.
7. The drive should be blocked and no further travel should be possible even after power cycle.
8. Set *S6-18 = 1* to unlock the drive.

9. Execute test travel.
10. The drive should operate normally.

Repeat this NPN logic procedure for Brake Feedback 2 (e.g. input S8).

■ Function Test PNP Logic

The following steps have to be performed for the functional test after commissioning when using PNP logic:

1. Connect 24 V to Brake Feedback 1 (e.g. input S7).
2. Execute test travel.
3. During start an *SE4* fault should be triggered and the drive should immediately stop.
4. The drive should be blocked and no further travel should be possible even after power cycle.
5. Disconnect 24 V on Brake Feedback 1.
6. Execute test travel.
7. The drive should be blocked and no further travel should be possible even after power cycle.
8. Set *S6-18 = 1* to unlock the drive.
9. Execute test travel.
10. The drive should operate normally.

Repeat this PNP logic procedure for Brake Feedback 2 (e.g. input S8).

■ Brake Feedback

The following steps have to be performed to ensure correct operation of the Brake Feedback switches and function.

Brake Monitor 1

- Check if Motor Brake 1 operates correctly.
- Check status of Motor Switch in Brake 1.
- Check if the logic changes like specified.
- Check if Digital Input Brake Monitor 1 works correctly.
- Check in Monitor Parameter *U1-10* if the input status changes.

Brake Monitor 2

- Check if Motor Brake 2 operates correctly.
- Check status of Motor Switch in Brake 2.
- Check if the logic changes like specified.
- Check if Digital Input Brake Monitor 2 works correctly.
- Check in Monitor Parameter *U1-10* if the input status changes.

3 DI-A3 Option Multi-Functional Support

The DI-A3 option can be used to increase the number of digital inputs. To use this function, set parameter *F3-01 = 8 [DIA3 Option Input Selection = Multi-Functional]*. All standard functions can be assigned to the option terminals D0 to D7 by using parameters *F3-04 to F3-11 [Terminal Dx Function Selection]*. If faults and alarms are set to terminals D0 to D7, the display messages *„OEF0“* to *„OEF7“ [DI-A3 Ext Faultx]* will be shown. If no DI-A3 option card is installed, parameters *F3-04* to *F3-11* are not displayed. Parameters *F3-04* to *F3-11* are displayed only when *F3-01 = 8*.

◆ Added and Modified Parameters for DI-A3 Multi-Functional Support

Table 3.1 Added and Modified Parameters

Parameter	MEMOBUS Address (Hex.)	Operator Display *[Parameter Name]*	Description	Range [Default]
F3-01	390	DI-A3 Opt InpSel *[DI-A3 Option Input Selection]*	Option Card Input Selection Select the method to input the option card data. **0 : BCD 1% unit** **1 : BCD 0.1% unit** **2 : BCD 0.01% unit** **3 : BCD 1 Hz unit** **4 : BCD 0.1 Hz unit** **5 : BCD 0.01 Hz unit** **6 : BCD custom setting (5 digit input), 0.02 Hz units** **7 : Binary input** **8 : Multi-Functional**	0 - 8 [8]
F3-04	619	DI-A3 D0 FuncSel *[Terminal D0 Function Selection]*	Terminal function selection for DI-A3 option input. Same setting range as H1-03 to H1-08.	0 - 79 (Hex.) [0F (Hex.)]
F3-05	61A	DI-A3 D1 FuncSel *[Terminal D1 Function Selection]*		
F3-06	613	DI-A2 D2 FuncSel *[Terminal D2 Function Selection]*		
F3-07	614	DI-A3 D3 FuncSel *[Terminal D3 Function Selection]*		
F3-08	615	DI-A3 D4 FuncSel *[Terminal D4 Function Selection]*		
F3-09	616	DI-A3 D5 FuncSel *[Terminal D5 Function Selection]*		
F3-10	617	DI-A3 D6 FuncSel *[Terminal D6 Function Selection]*		
F3-11	618	DI-A3 D7 FuncSel *[Terminal D7 Function Selection]*		

◆ Added Faults and Alarms for DI-A3 Multi-Functional Support

Table 3.2 Added Faults

Fault	Display (Hex.)	Alarm Display *[Alarm Name]*	Description
OEF0 - OEF3	3C - 3F	DI-A3 Ext Fault0 - 3 *DI-A3 External Fault 0 - 3*	Digital Input Option DI-A3 External Fault An external fault has been triggered on an input terminal (D0 - D7) of the DI-A3 option.
OEF4 - OEF7	64 - 67	DI-A3 Ext Fault4 - 7 *DI-A3 External Fault 4 - 7*	

Table 3.3 Added Alarms

Alarm	Display (Hex.)	Alarm Display *[Alarm Name]*	Description
OEF0 - OEF3	2C - 2F	DI-A3 Ext Fault0 - 3 *DI-A3 External Fault 0 - 3*	Digital Input Option DI-A3 External Alarm An external alarm has been triggered on an input terminal (D0 - D7) of the DI-A3 option.
OEF4 - OEF7	49 - 4C	DI-A3 Ext Fault4 - 7 *DI-A3 External Fault 4 - 7*	

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4 Advanced Light Load Search

The *Advanced Light Load Search function [S4-01 = 3]* detects the load condition during normal travel operation. Unlike search methods *1* and *2*, this function does not move the car up and down when detecting the light load direction.

This function is also useful in applications where an excessive discharge of UPS or batteries during Light Load Search operation shall be avoided.

When using Advanced Light Load Search in combination with a controller, it might be desired to determine the Light Load Direction (indicated by D/O function *54h*) by the drive but to let the controller initiate the evacuation

travel with a direction selected by S1/S2. In this case, set *S4-20 = 0 [Light Load Search Direction Override = Disabled]*.

◆ Added and Modified Parameters for Advanced Light Load Search

■ Modified Parameters

Parameter (Hex.)	Operator Display *[Parameter Name]*	Description	Range [Default]
S4-01 (06A6)	LightLoad Search *[Light Load Direction Search Selection]*	**0 : Disabled** **1 : Enabled** **2 : Enabled for Motor 1 only** **3 : Advanced Search**	0 - 3 [0]

Yaskawa recommends a full up/down travel with empty car for calibration.

Note:

You must repeat the calibration after you initialized the drive with *A1-03*.

To reset the calibration, set *S4-01 = 0*. This is recommended in case of changed operating conditions of the elevator.

When you change the setting from *S4-01 = 0* to *S4-01 = 1*, do a new calibration.

■ Added Parameters

Parameter (Hex.)	Operator Display	Description	Value Range [Default]
S4-20 (06DF)	LLS Dir Override	Evacuation in Light Load Direction determined by the drive. **0 : Disabled** Lift controller decides the direction with S1/S2 **1 : Enabled** Drive can override S1/S2 direction Perform a power cycle when changing *H5-13 [Serial Communication Mode]*.	0, 1 [1]

5 Output Phase Loss Protection

Enables or disables the output phase loss detection which is triggered when the output current falls below 5% of the motor rated current.

◆ Modified Parameters for Output Phase Loss Protection

Table 5.1 Modified Parameters

Parameter (Hex.)	Operator Display *[Parameter Name]*	Description	Range [Default]
L8-07 (04B3)	OutputPhLoss *[Output Phase Loss Protection Selection]*	**0 : Disabled** **1 : Triggered by a single phase loss** **2 : Triggered when two phases are lost** **3 : Fault at phase loss at start and during RUN**	0 - 3 [0]

0 : Disabled

1 : Triggered by a single phase loss

An *output phase loss fault [LF]* is triggered when one output phase is lost. The output shuts off and the motor coasts to stop.

2 : Triggered when two phases are lost

An *output phase loss fault [LF]* is triggered when two output phases are lost. The output shuts off and the motor coasts to stop.

3 : Fault at phase loss at start and during RUN

An *output phase loss fault [LF]* is triggered when one or more phases are lost at motor start (before the brake opens) and when motor is moving. When *LF* has been detected, the motor coasts to stop.

When setting *L8-07 = 3*, set parameters *S1-02* (only OLV and V/f) and *S1-04* as follows:

- Set *S1-02 [DC Injection Current at Start]* to a value greater than 15%.
- Set *S1-04 [DC Injection/Position Lock Time at Start]* to a value greater than 100 ms.

An incorrect setting may result in poor performance or nuisance faults or alarms.

6 DCP Interface

The DCP is a point-to-point link between drive controller and lift controller. The two devices are linked via an RS-485 interface in semi-duplex mode.

For DCP serial communications, the terminal connections for RS485 R+/R-/S+/S- have to be used (R+ and S+ / R- and S- bridged).

◆ Network Cable Connection

- With the power shut off, connect the communications cable to the drive and the master. Use terminals R+/S+ and R-/S- for DCP.
- Set DIP switch S2 to ON position.

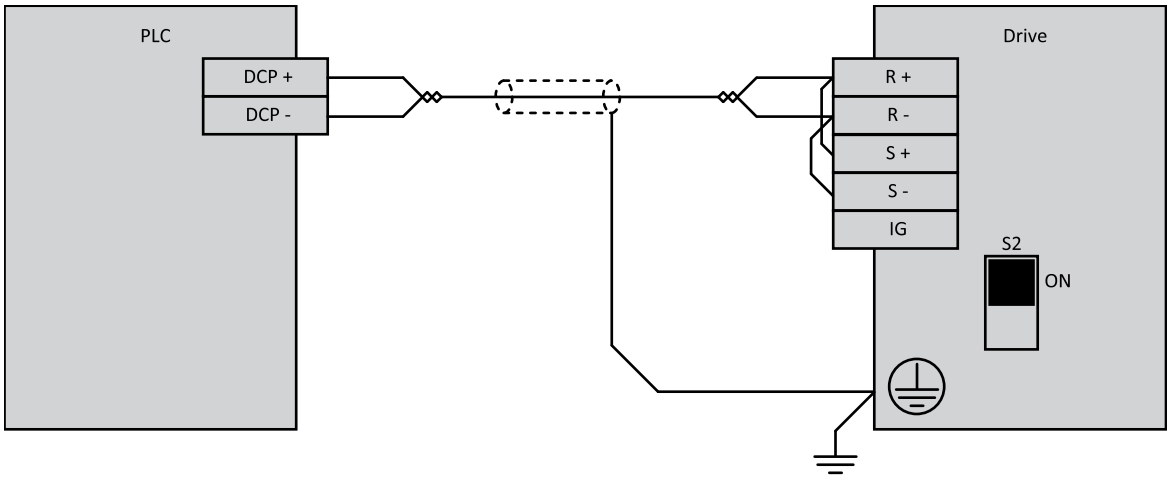


Figure 6.1 RS-485 DCP Connection

Note:

1. Turn on the DIP switch on the drive that is located at the end of the network. All other slave devices must have this DIP switch set to OFF position.
2. Set *H5-07 = 1* when using the RS-485 interface.
3. Cycle power to apply the *H5-07* change.

◆ Introduction

The DCP protocol distinguishes two modes:

DCP3 (for lift controllers without absolute encoder system in the shaft) :

- Drive control via serial DCP link instead of digital inputs
- Status messages, such as fault and over-temperature, are transmitted via DCP link instead of by relay
- Monitoring of speed (such as releveling speed, deceleration speed, and overspeed)

DCP4 (for lift controllers with absolute encoder system in the shaft) :

- Drive control via serial DCP link instead of digital inputs
- Status messages, such as fault and over-temperature, are transmitted via DCP link instead of by relay
- Monitoring of speed (such as releveling speed, deceleration speed, and overspeed)
- Time-optimized direct leveling dependent on remaining distance
- Millimeter-accurate adjustment, dependent on distance
- Supervision of deceleration at the shaft ends

◆ Characteristics of DCP Interface

In DCP mode a Master-Slave-architecture is used. The lift controller is the master device, the drive controller is the slave. Messages for communication between the devices are sent in a 15 ms cycle.

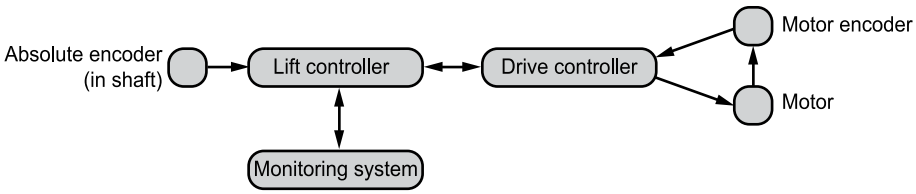


Figure 6.2 Typical DCP Topology

Drive and lift controller are linked via RS-485 using the fixed communication settings:

- Baud rate: 38,400 Baud
- Parity: none
- Data bits: 8
- Stop bits: 1

■ Messages

- Time-critical, high speed process data (e.g. remaining distance, switch-off points, travel commands, etc)
- Non time-critical communication data (e.g. display control, transfer of keypad codes, etc.)
- Not more than 2 bytes of communication data are transferred with each message; the remaining bytes being used for fast process data.
- Each message is provided with a checksum byte

Master Messages from Lift Controller to Drive Controller

Fixed length of 6 bytes

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Command Byte	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

Slave Messages from Drive Controller to Lift Controller

Fixed length of 6 bytes

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Status Byte	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

◆ DCP Master Messages from Lift Controller to Drive Controller

■ Command Byte

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Command Byte	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

The first byte of the message is called command byte. It contains the following information:

Bit B0 : Drive controller enable

DCP3 and DCP4:

Information for the drive that there will be activation soon. This bit is set during a travel.

0 : No activation of the drive (e.g. finish of travel or travel interruption)

1 : Drive activation during travel

Bit B1 : Travel command (DCP3); Change of actual distance (DCP4)

DCP3:

The speed is set with the travel command.

This bit is cleared at the deceleration point and the drive slows down to V0 (Crawl speed).

DCP4:

Remaining Distance Travel: With a travel dependent on distance, bit B1 is cleared since the drive controller itself determines the optimum switch-off point. The speed transferred before the start of the travel is just a limit.

Desired Distance Travel: Not implemented.

Bit B2 : Stop switch

DCP3:

The stop switch replaces terminal input V0 (Crawl speed).

DCP4:

In this mode, the lift controller signals that the drive controller performs a distance-dependent travel. The stop switch is turned on from the start of the travel.

When the drive controller reaches the remaining distance of 0 mm, the mechanical brake is applied. The lift controller then turns off the stop switch.

Bit B3 : Transfer of travel commands in the third byte of message

DCP3 and DCP4:

This bit tells the drive controller that the following 2 bytes (data bytes) are being used to transfer a speed.

Bit B4 : Direction of travel

DCP3 and DCP4:

This bit determines the direction of travel of the lift.

0 : Upwards

1 : Downwards

Bit B5 : Speed change

DCP3 and DCP4:

This bit has the same functionality as B3 (implemented as logical OR combination).

Bit B6 : Desired distance / Actual distance

DCP4:

This bit chooses the type of transmitted distance.

0 : Actual Distance

1 : Desired Distance (not supported)

Bit B7 : Error in last reply message

DCP3 and DCP4:

This bit is set when the lift controller has detected a checksum error in the last message received from the drive controller and has therefore ignored it. In this case, the drive controller repeats the telegram automatically.

■ Data Bytes

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Command Byte	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

The content of the two data bytes depends on the type of transmitted message. Transmitted information:

- Speed Mode
- 15-bit remaining distance
- 16-bit remaining distance

■ Communication Bytes

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Command Byte	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

The exact meaning and function of the communication bytes are described later.

■ Checksum Byte

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Command Byte	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

The checksum is the result of an XOR operation across all 5 data bytes.

■ Definition of Messages

The following two tables show the valid messages of DCP3 and DCP4 Command mode and the meaning of the process information.

Table 6.1 Nomenclature

Setting	Meaning
0	bit is cleared
1	bit is set
x	any

Message Types in DCP3 Mode

Message Type	Command Mode Bits 7 6 5 4 3 2 1 0	Process Data		Communication Data	Checksum	
	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Idle Mode	x 0 x x 0 0 0 0	any	any	0 - 255	0 - 255	0 - 255
Stop Mode	x 0 x x 0 0 0 1	any	any	0 - 255	0 - 255	0 - 255
Re-leveling Mode	x 0 x x 0 0 1 1	any	any	0 - 255	0 - 255	0 - 255
Deceleration Mode	x 0 x x 0 1 0 1	any	any	0 - 255	0 - 255	0 - 255
Travel Mode	x 0 x x 0 1 1 1	any	any	0 - 255	0 - 255	0 - 255
Speed Mode	x 0 x x 1 0 0 1	Speed	Speed	0 - 255	0 - 255	0 - 255
Speed Mode after a Fast Start	x 0 x x 1 1 1 1	Speed	Speed	0 - 255	0 - 255	0 - 255

Message Types in DCP4 Mode

Message Type	Command Mode Bits 7 6 5 4 3 2 1 0	Process Data		Communication Data	Checksum	
	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Idle Mode	x 0 x x 0 0 0 0	any	any	0 - 255	0 - 255	0 - 255
Stop Mode	x 0 x x 0 0 0 1	any	any	0 - 255	0 - 255	0 - 255
Re-leveling Mode	x 0 x x 0 0 1 1	any	any	0 - 255	0 - 255	0 - 255
Remaining Distance Mode *1	x 0 x x 0 1 0 1	Remaining Distance MSB	Remaining Distance LSB	0 - 255	0 - 255	0 - 255
Deceleration Mode	x 0 x x 0 1 0 1	any	any	0 - 255	0 - 255	0 - 255
Travel Mode	x 0 x x 0 1 1 1	any	any	0 - 255	0 - 255	0 - 255
Speed Mode	x 0 x x 1 0 0 1	Speed	Speed	0 - 255	0 - 255	0 - 255
Speed Mode after a Fast Start	x 0 x x 1 1 1 1	Speed	Speed	0 - 255	0 - 255	0 - 255

*1 The next message after a Speed Mode message will decide how a "x 0 x x 0 1 0 1" message is processed:

- If, after a Speed Mode change, a Travel Mode message follows, all occurrences of "x 0 x x 0 1 0 1" messages are processed as Deceleration Mode messages.
- If, after a Speed Mode message, a "x 0 x x 0 1 0 1" message follows, this and all other messages are processed as Remaining Distance Mode messages.

■ Speed Mode

DCP speeds correspond to parameters listed below. Speeds are transferred in bytes 2 and 3 (data bytes) once before a start of travel.

Speed Mode Bits	DCP Name of Speed Mode	L1000A Standard Speed Designation	Related L1000A Parameter	L1000A DCP Designation
G0	V0	Crawl	d1-26	V0 Speed
G1	VN	Re-leveling	d1-23	VN Speed
G2	VF	-	-	VF Speed
G3	V1	Intermediate 3	d1-04	V1 Speed

Speed Mode Bits	DCP Name of Speed Mode	L1000A Standard Speed Designation	Related L1000A Parameter	L1000A DCP Designation
G4	VI	Inspection	d1-24	VI Speed
G5	V2	Intermediate 2	d1-03	V2 Speed
G6	V3	Intermediate 1	d1-02	V3 Speed
G7	V4	Fast	d1-01	V4 Speed
G8	V5	Intermediate 6	d1-07	V5 Speed
G9	V6	Intermediate 5	d1-06	V6 Speed
G10	V7	Intermediate 4	d1-05	V7 Speed

Speed modes V7, V6, V5, V2, and V1 are not available with DCP4.

◆ DCP Slave Messages from Drive Controller to Lift Controller

■ Status Byte

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Status Byte (S7 ... S0)	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

The first byte of the message is called status byte. It contains the following information:

Bit S0 : Drive controller ready

DCP3 and DCP4:

The drive controller is ready for the next run. This status bit is similar to the terminal "Drive controller ready" at the lift controller.

0 : Drive controller is not ready to travel

1 : Drive controller is ready to travel

Bit S1 : Travel active

DCP3 and DCP4:

The drive controller is currently carrying out a run.

0 : Not in travel

1 : In travel

Bit S2 : Stop switch

DCP3 and DCP4:

The travel can be continued to the next floor. In this case, the lift controller should no longer give any travel commands while alarms are active.

Bit S3 : Fault active

DCP3 and DCP4:

The drive controller error flag is set. The drive controller has been switched off, the run contactor was closed, and the brake was applied. Possible causes of the fault include:

- Over-speed
- Over-current
- DC bus over-voltage
- DC bus under-voltage
- Motor parameter setting error
- Power section over-temperature

The command "Drive controller enable" (see command bit B0) must be cleared at this situation. The lift controller will not travel until the fault has been cleared on the drive side.

Bit S4 : Motor speed below leveling speed (v < 0.3 m/s)

DCP3 and DCP4:

The motor speed has dropped to or below leveling speed. This signal is used for monitoring the re-leveling speed (v < 0.3 m/s) by the lift controller.

EN

0 : v ≥ 0.3 m/s

1 : v < 0.3 m/s

Bit S5 : Desired distance / Speed accepted

DCP3 and DCP4:

0 : During Emergency Stop or Stall Prevention

1 : The speed was accepted by the drive controller

Bit S6 : Mechanical Brake

DCP3 and DCP4:

Corresponds to the mechanical brake relay of the drive controller.

0 : Mechanical brake closed

1 : Mechanical brake open

Bit S7 : Error in last message received

DCP3 and DCP4:

This bit is set if the drive controller has detected a checksum error in the last message from the lift controller and has therefore ignored it. In this situation, the lift controller repeats the telegram automatically.

■ Data Bytes

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Status Byte (S7 ... S0)	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

The content of the two data bytes depends on the type of transmitted message. Three different kinds of information can be transmitted:

- Extended status of the drive controller
- 15-bit deceleration distance
- 16-bit deceleration distance

Extended status of the drive controller

Bit 0 : V_{Unlock} Speed for Unlocking Zone

The actual speed is slower than the maximum speed for unlocking zone (v < 0.8 m/s).

0 : The actual speed is faster or equal than the max. speed for unlocking zone (v >= 0.8 m/s)

1 : The actual speed is slower than the max. speed for unlocking zone (v < 0.8 m/s)

Bit 1 : V_{Border} Border Speed

The actual speed is slower than the adjustable border speed *[d1-30]*.

0 : The actual speed is faster or equal than the border speed (v >= v_{Border})

1 : The actual speed is slower than the border speed (v < v_{Border})

Bit 2 : V_{Over} Overspeed

The actual speed is slower than the adjustable overspeed *[d1-31]*.

0 : The actual speed is faster or equal than the overspeed (v >= v_{Over})

1 : The actual speed is slower than the overspeed (v < v_{Over})

Bit 3 : Reserved

Currently not supported.

Bit 4 - 8 : Reserved for Weight Detection

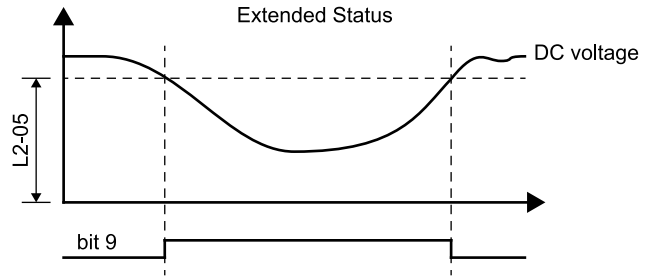
Currently not supported.

Bit 9 : Emergency Power: Reduced DC Bus Voltage (Battery Supply/UPS)

The drive controller has reduced voltage (supplied by battery/UPS) during emergency power.

0 : Reduced DC Bus voltage not active

1 : Reduced DC bus voltage active



Bit 10 : Emergency Power: Recommended Travel Direction

The drive controller recommends the travel direction during emergency power for the next travel.

0 : Upwards (The counterweight is much heavier than the lift car)

1 : Downwards (The lift car is much heavier than the counterweight)

Bit 11 : Information: Temperature Limit "Motor"

If a certain threshold of the motor temperature is reached, the drive controller is signaling "temperature limit motor." The information can be used to avoid an overheating of the motor.

0 : Actual motor temperature has not reached the temperature limit

1 : Actual motor temperature has reached the temperature limit

Note:

1. The motor must be equipped with a PTC.
2. The drive controller has to measure the motor temperature.

Appropriate countermeasures of the lift controller when reaching the temperature limit:

- The lift controller should increase the idle time in order to reduce duty cycle of the motor.
- In case of a lift group, another lift should get the preference for driving.

Unsuitable countermeasures of the lift controller when reaching the temperature limit:

- A reduction of the travel speed is unsuitable to counteract the overheating of the motor.

This functionality is configured by parameters *L1-03* to *L1-05 [PTC input]*.

Bit 12 : Information: Temperature Limit "Drive"

The drive controller is signaling "temperature limit drive", if a certain threshold of the drive temperature is reached. The information can be used to avoid an overheating of the drive.

0 : Actual drive temperature has not reached the temperature limit

1 : Actual drive temperature has reached the temperature limit

Appropriate countermeasures of the lift controller when reaching the temperature limit:

- The lift controller should increase the idle time in order to reduce duty cycle of the drive.
- In case of a lift group, another lift should get the preference for driving.
- If the drive permits, reduce *C6-02 [Carrier Frequency]*.

Unsuitable countermeasures of the lift controller when reaching the temperature limit:

- A reduction of the travel speed is unsuitable to counteract the overheating.

The alarm level can be set with parameter *L8-02 [Drive overheat pre-alarm (oH)]*.

Bit 13 - 14 : Reserved

Currently not supported.

Bit 15 : Mode Identification

The Extended Status information will only be available if the mode identification bit is set.

0 : Braking Distance

1 : Extended Status

15-bit braking distance

The two data bytes are containing the actual 15-bit braking distance. The maximum braking distance is limited to 7FFF (Hex) (32767 mm).

While the lift car is stationary or just starting, the value for the braking distance is clamped at 7FFF (Hex). During acceleration, the value increases from 0. During constant speed, the braking distance remains constant.

EN

Bit 0 - 7 : The LSB of the actual 15-bit Braking Distance

Data Byte 2

Bit 8 - 14 : The MSB of the actual 15-bit Braking Distance

Data Byte 1

Bit 15 : Mode Identification

The braking distance will only be available if the mode identification is cleared.

16-bit braking distance

The two data bytes are containing the actual 16-bit braking distance. The maximum braking distance is limited to FFFF (Hex) (65535 mm).

While the lift car is stationary or just starting, the value for the braking distance is clamped at FFFF (Hex). During acceleration, the value increases from 0. During constant speed, the braking distance remains constant.

Bit 0 - 7 : The LSB of the actual 16-bit Braking Distance

Data Byte 2

Bit 8 - 15 : The MSB of the actual 16-bit Braking Distance

Data Byte 1

Transmitted Information Using Data Information Types

Transmitted Information using Data Information Type ’0’

The two data bytes are alternately filled by the braking distance (indicated to the lift controller by bit 15 being '0') and the Extended Status information (bit 15 being '1'). These values must be handled carefully because each type of transmitted information is updated every 30 ms only. For DCP3, the braking distance always reads 0.

Data Byte 1		Data Byte 2
Bit 15	Bit 8 - 14	Bit 0 - 7
0	15-bit braking distance	
1	Extended status	

Transmitted Information using Data Information Type ’1’

This mode is not used in DCP3. In this mode, the two data bytes will be used only to transmit the actual 15-bit braking distance.

Data Byte 1		Data Byte 2
Bit 15	Bit 8 - 14	Bit 0 - 7
0	15-bit braking distance MSB	15-bit braking distance LSB

If bit 15 = 0, the value is evaluated as 15-bit braking distance.

Transmitted Information using Data Information Type ’2’

In this mode, the two data bytes are used only for transmission of the Extended Status of the drive controller.

Data Byte 1		Data Byte 2
Bit 15	Bit 8 - 14	Bit 0 - 7
1	Extended status	

If data shall be evaluated as Extended Status, bit 15 must be set to ’1’.

Transmitted Information using Data Information Type ’3’

This mode is not used in DCP3. In this mode, the data bytes are exclusively used to transmit the actual 16-bit braking distance.

Data Byte 1	Data Byte 2
Bit 8 - 15	Bit 0 - 7
16-bit braking distance MSB	16-bit braking distance LSB

Transmitted Information using Data Information Type ’4’

In this mode, the data bytes are exclusively used to transmit the Extended Status of the drive controller.

Data Byte 1		Data Byte 2
Bit 15	Bit 8 - 14	Bit 0 - 7
1	Extended status	

■ Communication Bytes

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Status Byte (S7 ... S0)	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

Refer to *DCP Communication Data Channel on page 25*.

■ Checksum Byte

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Status Byte (S7 ... S0)	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

The checksum is the result of an XOR operation across all 5 data bytes. The resulting value must be equal to the checksum, i.e. an XOR operation across all 6 bytes must yield 0.

◆ DCP Communication Data Channel

The communication data channel is embedded in the DCP frame and operated by its own protocol.

Process Data			Communication Data		Checksum
1	2	3	4	5	6
Status Byte (S7 ... S0)	Data Byte 1	Data Byte 2	Communication Byte 1	Communication Byte 2	Checksum

It allows:

- Access to all desired drive controller monitors and parameters
- Drive remote control using keypad and display of the lift controller
- The exchange of additional data between lift controller and drive controller

■ Character Set

Data within the communication data channel is only transferred using ASCII characters.

- The transmitted characters are limited to the ASCII character set from 20 to FF (Hex).
- The remaining 32 characters are available for control purposes (0 to 1F (Hex)).

This offers advantages, especially for remote diagnostics, since an ASCII protocol can be easily integrated into a standardized data frame.

■ Data Transmission and Character Format

Since only ASCII characters from 20 to FF (Hex) are available for data transmission, it must be insured that no character outside this range occurs within the data stream as this would result in malfunctions.

An effective method of avoiding such problems is to convert the data bytes into ASCII format in order to ensure that they lie outside the range of control characters. This method offers the opportunity of an additional plausibility check to pick up transmission errors not detected by calculating the checksum (e.g. 2 bits falsified).

The transmitted data is encapsulated in the 6-byte DCP data frame.

STX Start Character	...	... User Data	...	ETX Stop Character

■ Data Transmission Time-out Control

If messages are not exchanged within one second, the communication devices on both ends are automatically reset to their initial state.

If there is no "ETX" character received within one second after an "STX" character was received, the communication data channel is also reset to its initial state.

■ Control Modes

The communication channel can be operated in the following modes:

- Drive Remote Display Control via lift controller
- Drive Remote Keypad Control via lift controller
- Extended data communication between lift controller and drive controller
- Idle state

All operation of the drive controller is possible by remote control mode. The display lines are transmitted and displayed both at standstill and while traveling. After changing a parameter on the drive controller via remote control mode, bit *S0 [Drive Controller Ready]* must switch off, and no further travel command needs to be accepted.

After leaving the remote control mode without any modifications, the drive controller switches on bit *S0 [Drive Controller Ready]* and is ready to travel.

■ Breakdown of Control Character Range (0 to 1F (Hex))

Characters Common for Remote Keypad and Display Control

Communication Idle	00 (Hex)	Communication Idle
Message Identification	02 (Hex)	STX (Start of Text)
	03 (Hex)	ETX (End of Text)
Control Mode	1C (Hex)	Extended data communications
	1D (Hex)	Reserved
	1E (Hex)	Displaying and saving error messages from the drive controller in lift controller's event memory
	1F (Hex)	Remote control, used for both communication devices

Characters for Remote Display Control of Lift Controller

Line Number (depends on lift and drive controller)	04 (Hex)	Character output in line 1
	05 (Hex)	Character output in line 2
	06 (Hex)	Character output in line 3
	07 (Hex)	Character output in line 4
Cursor Position (depends on lift and drive controller)	08 to 1B (Hex)	Cursor position 0 to 19

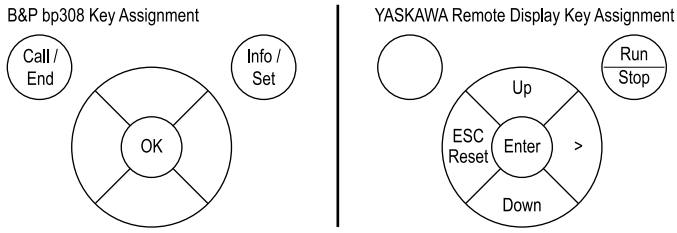
Characters for Remote Keypad Control of Lift Controller

(Number of keys and the meaning of the keypad depend on drive controller)	00 (Hex)	No button pressed
	04 (Hex)	Button 1
	08 (Hex)	Button 2
	10 (Hex)	Button 3
	20 (Hex)	Button 4
	40 (Hex)	Button 5
	80 (Hex)	Button 6

Each button is assigned to one bit. This allows transferring information of simultaneously pressed buttons.

Example 1 :

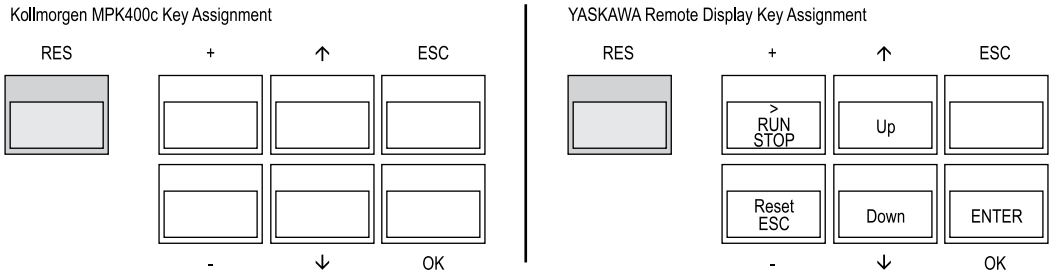
B&P lift controller "bp308" supports only 6 keys to remotely operate the drive controller. Key layout and assignment to the buttons:



The button "ESC/Reset" functions like "ESC" in the programming menu, and like "Reset" in the fault display. The button "Run/Stop" issues a RUN command when not during RUN, and issues a STOP command when during RUN.

Example 2 :

Kollmorgen lift controller MPK400c supports only 5 keys to remotely operate the drive controller. Key layout and assignment to the buttons:



The button "ESC/Reset" functions like "ESC" in the programming menu, and like "Reset" in the fault display. The button "Run/Stop" issues a RUN command when not during RUN, and issues a STOP command when during RUN.

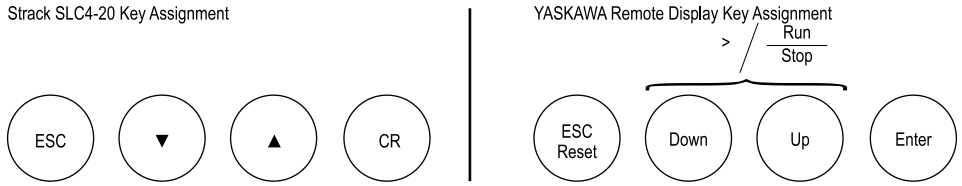
Example 3 :

Schneider Steuerungstechnik GmbH Lisa20 controller supports only 5 keys to remotely operate the drive controller. Key layout and assignment to the buttons:

The button "ESC/Reset" functions like "ESC" in the programming menu, and like "Reset" in the fault display. The button "Run/Stop" issues a RUN command when not during RUN, and issues a STOP command when during RUN.

Example 4 :

Strack Lift Automation SLC4-20 controller supports only 4 keys to remotely operate the drive controller. Key layout and assignment to the buttons:



The button "ESC/Reset" functions like "ESC" in the programming menu, and like "Reset" in the fault display. The button "Run/Stop" issues a RUN command when not during RUN, and issues a STOP command when during RUN. To use the functions ">" or "RUN/STOP" press the buttons "Down" and "Up" at the same time.

Characters for Extended Data Communication

1st Character	49 (Hex)	'I' character - Internal command
2nd Character	30 (Hex)	'0' character - Manufacturer identification
	31 (Hex)	'1' character - Determine data byte 2 and 3 content
	32 (Hex)	'2' character - Switching function
	37 (Hex)	'7' character - Travel distance parameter
	39 (Hex)	'9' character - Actual position

■ Drive Controller Remote Display Control (1F (Hex))

In this mode, the display of the lift controller is used for outputting the drive controller's menu texts. Switching to this mode is initiated with the character string (STX) (1F (hex)) and ends with an (ETX) character. The lift controller recognizes a display control character (line, cursor position) immediately and outputs the subsequently transmitted characters at the required position.

The drive controller starts transferring remote display information as soon as a remote key command has been received from the lift controller. When no remote key has been pressed for more than 30 seconds, the drive controller stops sending remote display information.

Table 6.2 Example 1: Displaying a complete display line

STX	1F	Line	Cursor Position	Character 1	...	Character n	ETX

Table 6.3 Example 1: Displaying a complete display line

STX	1F	Line	Cursor Position	Character 1	Line	Cursor Position	Character 2	...	ETX

If another (STX) character is sent before an output data stream ended, the complete display is cleared (e.g. in case of sporadic interruption of communication), and the transmission is restarted.

■ Drive Controller Remote Keypad Control (1F (Hex))

In this mode, the keypad of the lift controller is used to pass user input to the drive controller. Switching to this mode is initiated with the character string (STX) (1F (Hex)) and ends with an (ETX) character.

A keystroke transfer has the following format:

STX	1F (Hex)	Button	ETX

■ Idle State

If data is not being communicated on the channel, null bytes are transferred (0 (Hex)), i.e. communication is idling.

0 (Hex)

■ Synchronization / Communication Device Reset

The communication device can be reset to its initial state (display cleared) at any time with the character string (STX) (ETX) (generally recommended before switching control mode 1C, 1E, 1F (Hex)).

STX	ETX

In the initial state, all Tx and Rx communication buffers of the drive are cleared. The drive is ready to receive any new valid message from the lift controller.

■ Saving Device Controller Error Messages (1E (Hex))

It is possible for the drive controller to intervene asynchronously in an exchange of messages at any time in order to display drive controller error messages on the lift controller display and to save it to the lift controller's event log.

If a message transmission is already in progress, the drive controller first completes this message before sending the error message. Following this procedure prevents a loss of data. Switching to this mode is initiated with the character string (STX) (1E (Hex)) and ends with an (ETX) character.

An error message output has the following format:

STX	1E (Hex)	Character 1	Character 2	...	Character n	ETX

n = 1 to 20

The Error message for Yaskawa drives is specified as follows: Only the LCD Message Fault Display is transferred, e.g. "EF3" for External Fault 3, not the fault Message text "Ext Fault S3". The same fault is transmitted only once and is not repeated unless another fault has occurred in the meantime.

■ Extended Data Communication between Lift and Drive Controller (1C (Hex))

In this mode, additional data can be exchanged between lift controller and drive controller. Switching to this mode is initiated with the character string (STX) (1C (Hex)) and ends with an (ETX) character.

Extended Data Transmission in Communication Channel (1C (Hex))

The messages defined by the date of publication of this document are described below. The lift controller always initiates communication. Only the drive controller responds.

Initialization Message ('I' '0')

The lift controller and the drive controller start communication with the following initialization messages. After that, both of the controllers check and adjust their settings.

The drive controller receives the language settings from the lift controller and switches to the same language. When the drive controller is not able to support the received language setting, it needs to switch to English language (same as default setting).

When the drive controller has received no or only a faulty initialization message ('I','0') from the lift controller, the drive controller does not activate any travel sequence. When a travel start sequence is initiated nevertheless, the Drive triggers a fault *DCE2* and forces a time-out of 1 second (Tx and Rx channels are cleared, Rx messages are ignored for 1 second), and the lift controller must send a new initialization message.

Initialization Message from Lift Controller

Typically, the lift controller sends the inquiry after switching on/reset and disconnection (time-out).

STX	1Ch	'I'	'0'	HK1	HK2	V1x.xx	Vx1.xx	Vxx.1x	Vxx.x1	D	D	M	M	Y	Y	LK1	LK2	ETX

Lift controller manufacturer's identification

Version number (tens, ones, tenths and hundredths place)

Date of software

Country identifier (ISO 639) in capital letters (DE for Germany)

Response Initialization Message from Drive Controller

The drive controller responds with the following message after receiving the lift controller's message.

STX	1Ch	'I'	'0'	HK1	HK2	V1x.xx	Vx1.xx	Vxx.1x	Vxx.x1	D	D	M	M	Y	Y	DCP	LK1	LK2	ETX

Drive controller manufacturer's identification (YE for Yaskawa)

Version number (tens, ones, tenths and hundredths place)

Date of DCP implementation

Type of DCP ('0' = DCP Com Channel, '3' = DCP3, '4' = DCP4); selected by parameter H5-13

Country identifier (ISO 639) in capital letters (JA for Japan)

Manufacturer Codes

Table 6.4 Lift Controller Manufacturers

Name	ID	Name	ID
Böhnke + Partner GmbH	BP	OSMA Aufzüge, Albert Schenk GmbH & Co KG	OS
Kollmorgen Steuerungstechnik GmbH	KN	Schneider Steuerungstechnik GmbH	LI
NEW LIFT Steuerungsbau GmbH	NL	Strack Lift Automation GmbH	ST

Table 6.5 Drive Controller Manufacturers

Name	ID	Name	ID
ABB Asea Brown Boveri Ltd	AB	Gefran Deutschland GmbH	SS
Brunner & Fecher Regelungstechnik GmbH	BF	MagneTek (UK) Ltd.	MT
Bucher Hydraulics AG	BH	RST Elektronik GmbH	RS
Control Techniques GmbH	CT	Thyssen Krupp Aufzugswerke GmbH	TY
Danfoss GmbH	DA	Venzke-DriveCon GmbH	VZ
Emotron Lift Center GmbH	DE	Yaskawa Europe GmbH	YE
Fuji Electric GmbH	FE	Ziehl-Abegg AG	ZA

EN

Setting Up the Data-Information-Type ('I' '1')

By transmitting this message during the initialization phase, the following items are determined:

- Whether the lift controller transmits the remaining distance in 15-bit or 16-bit mode
- Whether the drive controller transmits the braking distance in 15-bit or 16-bit mode or not at all
- Whether the drive controller transmits the Extended Status
- Whether the drive controller alternately transmits the Extended Status and the 15 bit braking distance (for DCP3, 0x00 is transferred for the braking distance)
- Whether the drive's response message to the message ('I','9') is transmitted with or without additional information

Data-Information-Type Message from Lift Controller

The lift controller sets up the kind of information in the data bytes while transmitting this message during initialization.

STX	1C	'I'	'1'	Protocol Type	Data Information Type	ETX

Protocol Type "Extended Data Communication" :

'0' Base Protocol ('I','9' response message without additional information)

'1' Extended Protocol ('I','9' response message with additional information)

Data Information Type :

Sets up of the type of information transmitted in data bytes 1 and 2:

Lift Controller Data Bytes	Drive Controller Data Bytes
'0' Remaining distance using 15 bit mode	Braking distance using 15-bit mode and Extended Status of the drive controller are transmitted alternately
'1' Remaining distance using 15 bit mode	Braking Distance using 15 bit mode
'2' Remaining distance using 15 bit mode	Extended Status of the drive controller
'3' Remaining distance using 16 bit mode	Braking Distance using 16 bit mode
'4' Remaining distance using 16 bit mode	Extended Status of the drive controller

If no ('I' '1') message is transmitted by the lift controller, the data-information-type will be set to '0' on both controllers.

Response Data-Information-Type Message from Drive Controller

If the drive controller receives a base protocol request or does not support the extended protocol, it responds with the message:

STX	1C	'I'	'1'	ETX

If the drive controller receives the extended protocol request and does support the extended protocol, it responds with the message:

STX	1C	'I'	'1'	'1'	ETX

Switching Function ('I' '2')

This message is used to realize advanced functions.

Switching Function Message from Lift Controller

To activate the designated function, the data byte 'switching function' is used.

STX	1C	'I'	'2'	Reserve	Switching Function	ETX

Switching Function :

'0' No function selected or function reset

'1' Activate function "Maximum Torque". The next (but only the next) travel is executed with maximum drive torque

'R' Function 'Inverter Fault Reset' is executed

Function "Maximum torque" :

After activating the function "Maximum Torque", the torque limitation in the drive is set to the maximum possible level during the next travel. After the next stop, the drive switches back to the previous torque limit. This allows a monitoring of rope slip or traction ability.

Response to Switching Function Message from Drive Controller

If the message type is supported by the drive, it responds with the message:

STX	1C	'I'	'2'	Reserve	Switching Function	ETX

Switching Function :

‘0' No function in accordance to the message ('I' '2') is active

'1' The function "Maximum Torque" is active

'R' Command 'Inverter Fault Reset' is executed

The torque limits for all quadrants *[L7-01 to L7-04]* are temporarily opened to 300%. After the next stop, the drive switches back to the previously set torque limitation (parameter settings).

Date/Time ('I' '3')

The lift controller can transmit the current time and date to the drive controller. This can be used by drive controllers without a real-time clock to synchronize their calculated clock. This information is not used in L1000A.

Date/Time Message from Lift Controller

The lift controller transmits the message after each initialization message ('I' '0') plus once per day (preferred at "day changeover").

STX	1Ch	'I'	'3'	D	D	M	M	Y	Y	Y	Y	H	H	M	M	S	S	ETX
Day (01 - 31)																		
Month (01 - 12)																		
Year (2000 - 9999)																		
Hour (00 - 23)																		
Minute (00 - 59)																		
Second (00 - 59)																		

If the lift controller doesn't support this message type, no Date/Time-message will be received by the drive controller. In this case, the drive controller has to operate without a synchronization of the clock.

Response to Switching Function Message from Drive Controller

As confirmation, the drive controller sends the following message to the lift controller.

STX	1C	'I'	'3'	ETX

"Emergency Power Supply"/"Energy Saving Mode" Message ('I' '6')

After switching on the emergency supply, the drive controller is sending information to the drive controller. With this information, the drive controller is able to execute the travel with reduced energy consumption. The Energy Saving Mode is enabled only in case of CLV/PM control mode.

"Emergency Power Supply"/"Energy Saving Mode" Message from Lift Controller

After switching on the emergency supply, the drive controller is sending the following message.

STX	1C	'I'	'6'	Power Supply	Energy Saving Mode	ETX

When no message ('I' '6') is sent, normal mains operation without energy-saving mode is set up.

Power Supply :

'N' Normal mains operation

'U' Emergency supply

The 'U' request is taken by the drive controller to reduce the regular undervoltage level *[L2-05]* of the drive. In this condition, the UV level is at 50 V for 400 V units, and at 25 V for 200 V units.

Energy Saving Mode :

'0' No energy saving mode - normal operation

'1' Energy saving mode 1 (In CLV/PM AC Drive control mode only)

'2' Energy saving mode 2 (In CLV/PM AC Drive control mode only)

Response to "Emergency Power Supply"/"Energy Saving Mode" Message by Drive Controller

The drive controller responds with the same telegram in case it supports these modes. If a mode is not supported, it responds with the actual mode it works.

EN

STX	1C	'I'	'6'	Power Supply	Energy Saving Mode	ETX

If the telegram is not supported and the drive does not respond, the controller assumes normal main supply without energy-saving mode.

When energy-saving modes '1' or '2' are switched ON, parameter *b8-01* is set to 1 when in CLV/PM control mode. When '0' is transferred, *b8-01* is set back to 0.

Power Supply :

'N' Normal mains operation

'U' Emergency supply (The drive immediately indicates that it is operating below normal undervoltage levels *[L2-05]* by transferring 'U')

Energy Saving Mode :

'0' No energy saving mode - normal operation

'1' Energy saving mode 1 (In CLV/PM AC Drive control mode only)

'2' Energy saving mode 2 (In CLV/PM AC Drive control mode only)

Start Parameter Message ('I' '7')

Before starting a travel, the lift controller transmits the desired travel distance and the allowed maximum lift speed to the drive controller. After calculation of the optimal speed, the drive controller answers with the minimum distance to travel and the required deceleration distance according to the calculated speed.

Start Parameter Message from Lift Controller

Before each travel, the lift controller sends the following message:

STX	1C	'I'	'7'	V_{max}	Ss1	Ss2	Ss3	Ss4	Ss5	ETX

V_{max} :

'1' = Intermediate Speed 1 (V3 in DCP notation)

'2' = Fast Speed (V4 in DCP notation)

Ss1 ... Ss5 :

Desired distance in cm (ASCII coded decimal format)

(Ss1: 10^4-digit; Ss2: 10^3-digit; Ss3: 10^2-digit; Ss4: 10^1-digit; Ss5: 10^0-digit)

Response to Start Parameter Message by Drive Controller

The drive controller responds with the following message.

STX	1C	'I'	'7'	f_{typ}	Sg1	Sg2	Sg3	Sg4	Sg5	Sv1	Sv2	Sv3	Sv4	Sv5	ETX

f_{typ} :

Type of travel ('s' = short travel, 'l' = long travel, with l (long), the maximum lift speed is reached; with s (short) it's not reached).

Sg1 ... Sg5 :

Total distance in cm (ASCII coded decimal format). If Ss > Sg, a long travel (l) is performed.

(Sg1: 10^4-digit; Sg2: 10^3-digit; Sg3: 10^2-digit; Sg4: 10^1-digit; Sg5: 10^0-digit)

Sv1 ... Sv5 :

Deceleration distance in cm (ASCII coded decimal format). The remaining distance can be extended if it is longer than Sv.

(Sv1: 10^4-digit; Sv2: 10^3-digit; Sv3: 10^2-digit; Sv4: 10^1-digit; Sv5: 10^0-digit)

Weight Measurement State of the Car ('I' '8')

Note:

This function is currently not supported by the drive controller.

To improve the drive's starting behavior, optionally, the lift controller can send the percentage value of the car load weight before starting a travel.

Weight Measurement Message from Lift Controller

Before starting the travel, the lift controller optionally sends the load weight as a percentage of the nominal load.

STX	1C	'I'	'8'	L1	L2	L3	ETX

The function should not be used in conjunction with the Fast-Start function.

L1 ... L3 :

ASCII coded percentage value of the load weight relating to the nominal load in BCD-format. L1: hundreds, L2: tens, L3: ones

Examples :

0: Car empty, load 0%

25: Load 25%

100: Full load 100%

Response Weight Measurement Message from Drive Controller

The drive controller responds with the following message.

STX	1C	'I'	'8'	ETX

Compatibility to Former Lift- and Drive-Controller Software

To achieve compatibility to former lift- and drive-controller software:

- The drive controller must also accept the starting command of the lift controller without getting the "I8" message before.

- The lift controller has to send the starting command also in case of not receiving the drive controller's response of the "I8" message.

Position Message ('I' '9')

The actual position of the lift car is sent from the lift controller to the drive controller after each stop. It is the distance in mm between the actual position and the lowest floor level. That also applies to travels using the speed assignments VI (inspection), V0 (crawl) or VN (re-leveling).

If the extended protocol mode was activated by the message 'I','1' before, the drive controller transmits the travel distance in its response message. This information can be used by the lift controller to calculate the slip.

Position Message from Lift Controller

After each stop, while the drive is stationary, the lift controller sends the position.

STX	1C	'I'	'9'	Sign	P1	P2	P3	P4	P5	P6	ETX

The function should not be used in combination with the Fast-Start function.

SIGN (Sign / Result) :

('E': invalid value, '+': positive value, '-': negative value)

P1 ... P6 :

Position (value in mm from lowest floor level)

Response to Position Message by Drive Controller

The drive controller's response message is dependent on the activated protocol type.

If the **base protocol** is activated or the drive controller supports only the base protocol, the drive responds with the message:

STX	1C	'I'	'9'	ETX

If the **extended protocol** is activated and supported by the drive controller, the drive controller responds with a message containing the distance of its last travel measurement including sign.

STX	1C	'I'	'9'	'SIGN'	'D1'	'D2'	'D3'	'D4'	'D5'	'D6'	ETX

SIGN (Sign / Result) :

('E': invalid value, '+': positive value, '-': negative value)

D1 ... D6 :

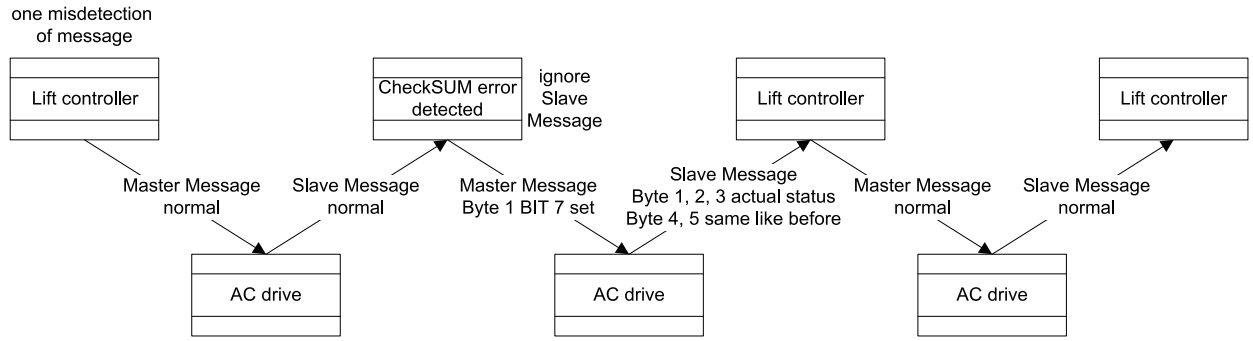
Distance of the last travel in mm with sign calculated from motor encoder.

◆ DCP Behavior in Event of Transmission Errors

■ Lift Controller

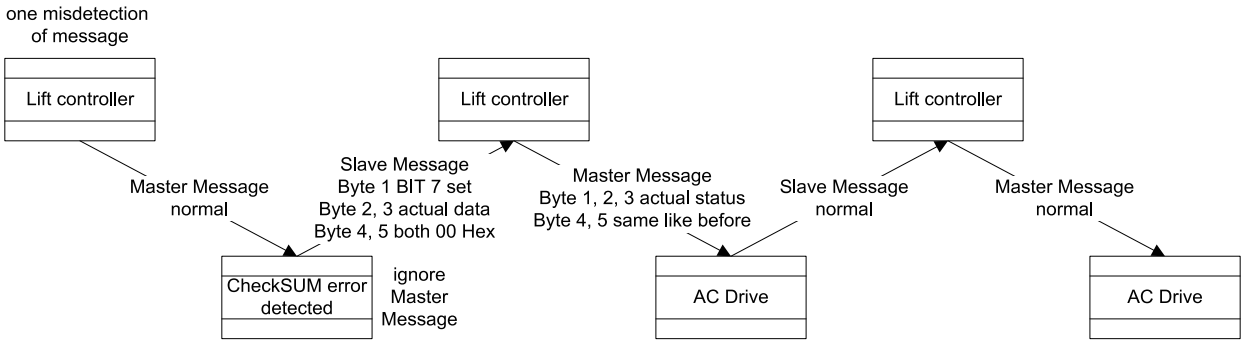
A :

The lift controller has detected a checksum error in the drive controller's reply message.



B :

Bit 7 (error in last message received) is set in the status byte of the reply message.



Bit 7 of byte 1 in master and slave message can initiate a resending of the previous message. In both cases, it is necessary to respond as follows: The type of message must be maintained (i.e. bytes 4 and 5 are the same as in the previous message). The actual values are transferred as commands.

■ Drive Controller

A :

The drive controller has detected a checksum error in the message received from the lift controller. The drive controller ignores the message and sends a reply message with the following content:

- Status Byte: Contains the actual status of the drive controller with bit 7 set (error in the last message received)
- Process Data: Contains the actual extended status or the actual deceleration distance (which is 00 (Hex)in DCP3 mode)

B :

In the message from the lift controller to the drive controller, bit 7 (error in last reply message) is set in the command byte. The current commands are processed normally. The drive controller repeats the last message sent.

Note:

If one of both devices is detecting a checksum error in a message when also bit 7 (error in last message) is set, this bit must be ignored by the receiving device. In DCP4 mode, the drive controller's use of remaining distance message simplifies the behavior:

- The lift controller always sends the current command byte and the remaining distance
- The drive controller always replies with the current status byte
- In the event of transmission errors, only the last communication byte sent is repeated

◆ Basic DCP Serial Communication Parameters

■ Interface

RS485 is used as physical layer. Transmission from the lift controller to the drive controller is serial and asynchronous.

- Baud rate: 38,400 Baud
- Data bits: 8
- Parity: none
- Stop bits: 1

■ Timing

Since a half-duplex interface is used, the corresponding line drivers must be switched on or off dependent on the transmission direction. To avoid collisions, the following timing has to be followed:

- Maximum Tx transmission driver switch-off time: 0.5 ms after the last bit was sent
- Maximum time delay for responding to a lift controller message: 10 ms after the last bit was received
- Lift controller message transmission start: 0 ms
- Latest time for switching off lift controller's Tx driver / Earliest time for drive controller transmission start: 2.0624 ms
- Latest drive controller transmission start: 11.5625 ms
- Latest time for switching off drive controller Tx driver / Earliest start for sending next lift controller message: 13.625 ms
- This leads to a transfer cycle of: 15 ms

The lift controller must ensure that the distance is transmitted at least 30 ms before the corresponding deceleration point is reached. In other words, the reply message from the drive controller, which tells the lift controller whether the new desired distance is accepted, must have arrived at the lift controller before the deceleration point is reached, even if the message exchange has to be repeated due to a transmission error.

■ Time-out Safety Function

During a travel, if 10 successive messages are received incorrectly or were lost completely (corresponds to 150 ms without communication), the drive controller triggers a fault (DCE1). The stopping method is executed according to *b1-03* setting.

While the drive controller is stopped, if further 10 successive messages are received correctly, the operation resumes automatically.

There is no error message when the DCP link is interrupted while the drive is stationary.

Note:

To further improve safety, it is recommended that the lift controller also checks if the messages are received correctly. In case of errors, it should act accordingly.

◆ DCP Travel Sequence Definitions

This chapter explains the nomenclature used for the diagrams in the following chapters.

■ Nomenclature

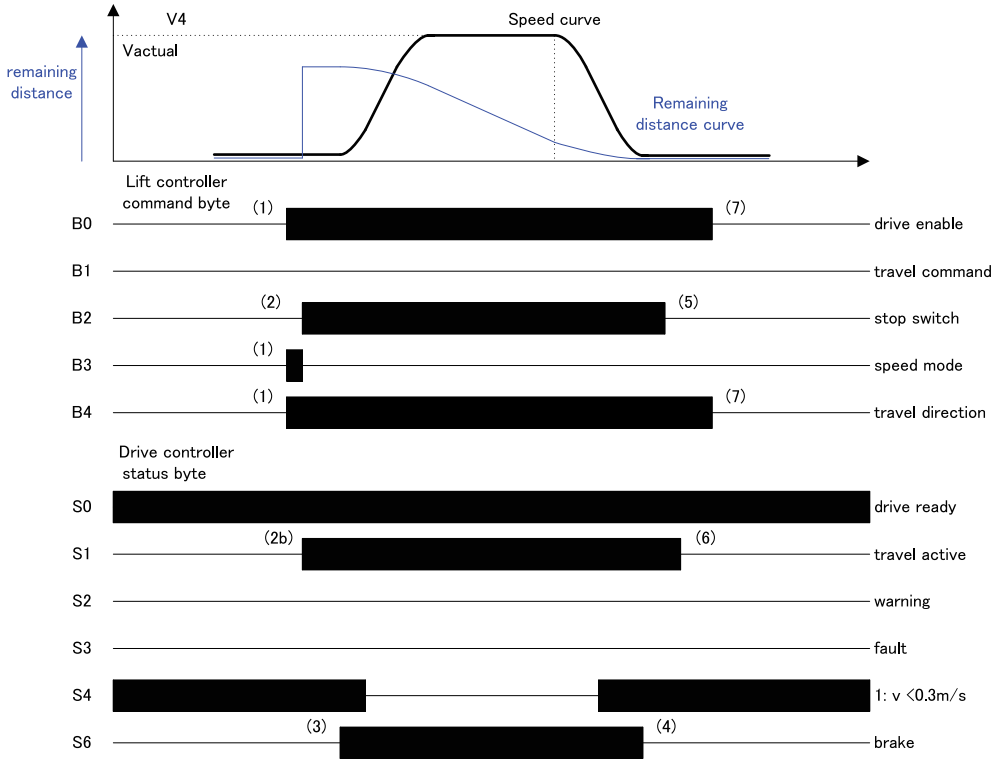
In the following chapters, the DCP speed notation is used. The following abbreviations are used for the remaining distances and travel types:

SV5, SV6, SV7, SV1, SV2, SV3, and SV4	Fixed deceleration distance for DCP3 travels using speeds V5, V6, V7, V1, V2, V3, and V4
SV3' and SV4'	Maximum deceleration distance for DCP4 travel limited to V3 and V4
V3' travel, V4' travel, and VN' travel	Travel dependent on remaining distance and limited to speed V3, V4, and VN

SV3 (distance for DCP3), SV3' (distance for DCP4)

■ Diagrams

The diagrams used in this specification have the following form:



The numbers found in brackets are indicating the chronological order of setting and clearing the individual signals [(1) -> (2) -> (2b) -> (3) etc.]. The sequence (2b) and (2) can occur simultaneously. Thick signals are considered activated (logical TRUE).

EN

◆ Features Common to DCP3 and DCP4

■ Additional Notes on Command and Status Bits

The following notes apply to DCP3 and DCP4.

Command Bit B0 : Drive Controller Enable

Drive controller enable bit B0 must be set whenever the drive shall run.

Drive controller enable bit B0 must be switched off by the lift controller if the safety circuit is interrupted. This is usual when terminating inspection travels. In this case, the drive coasts to stop.

Command Bit B4 : Direction

The travel direction must be available throughout the entire travel. The drive decelerates immediately if the setting changes during the travel, but without the drive controller switching to fault.

Status Bit S0 : Drive Controller Ready

The lift controller only starts a new travel if the drive controller ready bit S0 is set. After power on, bit S0 is held active for 4 seconds in order to give the lift controller the opportunity to send an I6=’U’ telegram to activate reduced undervoltage levels in the drive.

Status Bit S1 : Travel-Active Bit

During normal operation, the lift controller switches the motor contactors ON while S1 = '1'. In case of a regular halt, the drive controller should not set S1 from '1' to '0' before S6 is set to '0', and the lift controller has had time to close the mechanical brake.

Status Bit S2 : Alarm Active

If re-starting is performed although this bit is set, an error message is sent to the drive controller (DOE1, DCP Operation Error 1).

The lift controller only starts a new travel if the alarm active bit S2 is reset. If S2 is activated during the travel, the lift controller should no longer extend the remaining distance.

Status Bit S6 : Mechanical Brake

In case of a regular start, the drive controller should set S6 from '0' to '1' after the Brake Open Delay Time S1-06.

In case of a regular halt, the drive controller should set S6 from '1' to '0' when it has stopped completely. In this situation, the drive controller should hold the torque for about 100 ms (S1-07 = 100 ms), so that the lift controller can close the mechanical brake without coasting of the drive.

Status Bit S3 : Fault Active

When general fault bit S3 is activated, drive controller enable bit B0 has to be reset. The lift controller must not start a new travel until fault active bit S3 has been reset. The stopping method is according to b1-03.

■ Inspection Travel

These travels are common for DCP3 and DCP4.

Inspection Travel with VI :

1. The speed mode "Inspection [bit G4]" (VI) is transmitted before the travel starts.
2. The travel starts with activation of travel command bit B1 and stop switch bit B2.
3. When the lift arrives at one of the end-stops, the lift controller switches off travel command bit B1 in order to start its deceleration ramp. If the stop switch bit B2 is still active, the drive continues to travel at crawl speed (V0).
4. Releasing the inspection button generally opens the safety circuit. That is why an electrical stop is not possible. When the inspection function is deactivated, the lift controller must switch off drive controller enable bit B0.
5. When a stop command is received during leveling speed, the drive should use *C1-02 [Ramp to Stop]* as for nominal travel.

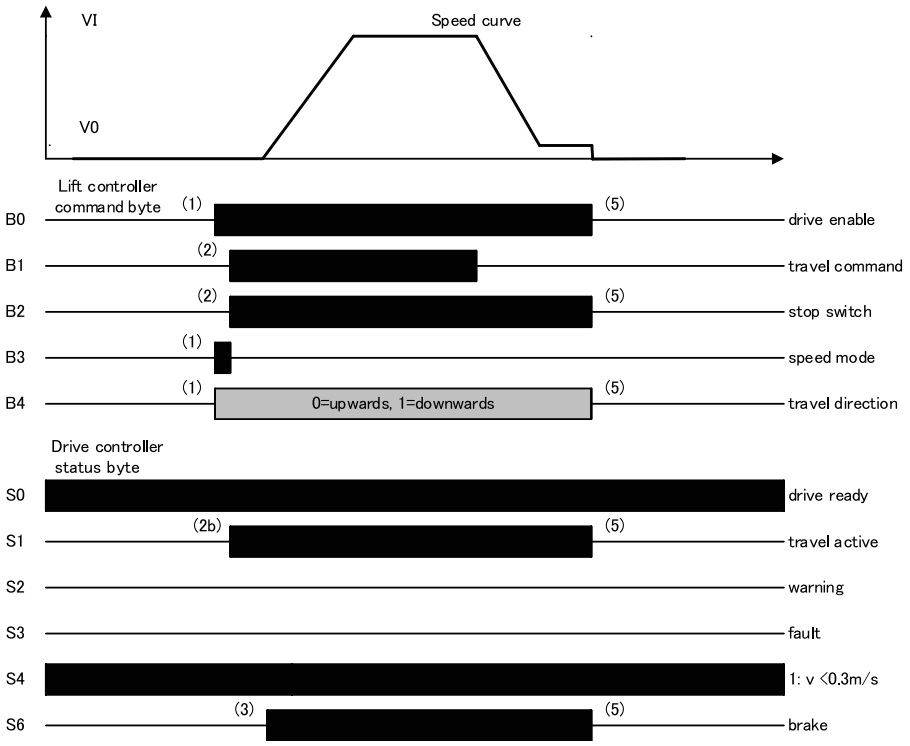


Figure 6.3 Inspection Travel Stopped with Idle Command

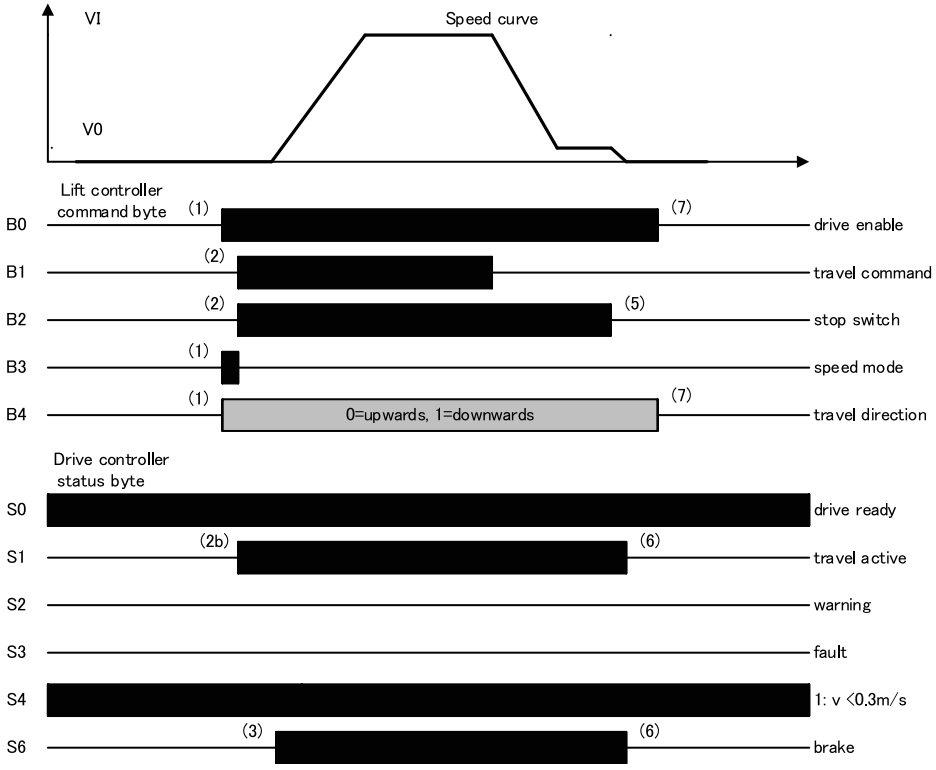


Figure 6.4 Inspection Travel Stopped with Stop Command

Inspection Travel with V0 :

When the car is standing in the range of the end-stops, an inspection travel towards the end may not start with inspection speed (VI). In this case, it must start with crawl speed (V0). This is realized by activating only stop switch bit B2 without activating travel command bit B1.

Note:

Just like the inspection travel with VI, the speed mode "Inspection [bit G4]" (VI) is transmitted before the travel starts. This is necessary because some types of drive controllers in DCP4 mode can only realize an inspection travel with V0 if the "Speed Mode" command is using the speed inspection bit G4 (VI).

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1. The Speed Mode "Inspection [bit G4]" (VI) is transmitted before the travel starts.
2. The travel starts with activation of stop switch bit B2.
3. During the time the stop switch bit B2 is still activated, the drive continues to travel at crawl speed (V0).
4. Releasing the inspection button generally opens the safety circuit. That is why an electrical stop is not possible. When the inspection function is deactivated, the lift controller must switch off drive controller enable bit B0.
5. When during leveling speed a stop command is received, the drive should use *C1-02 [Ramp to Stop]* as for a normal crawl travel.

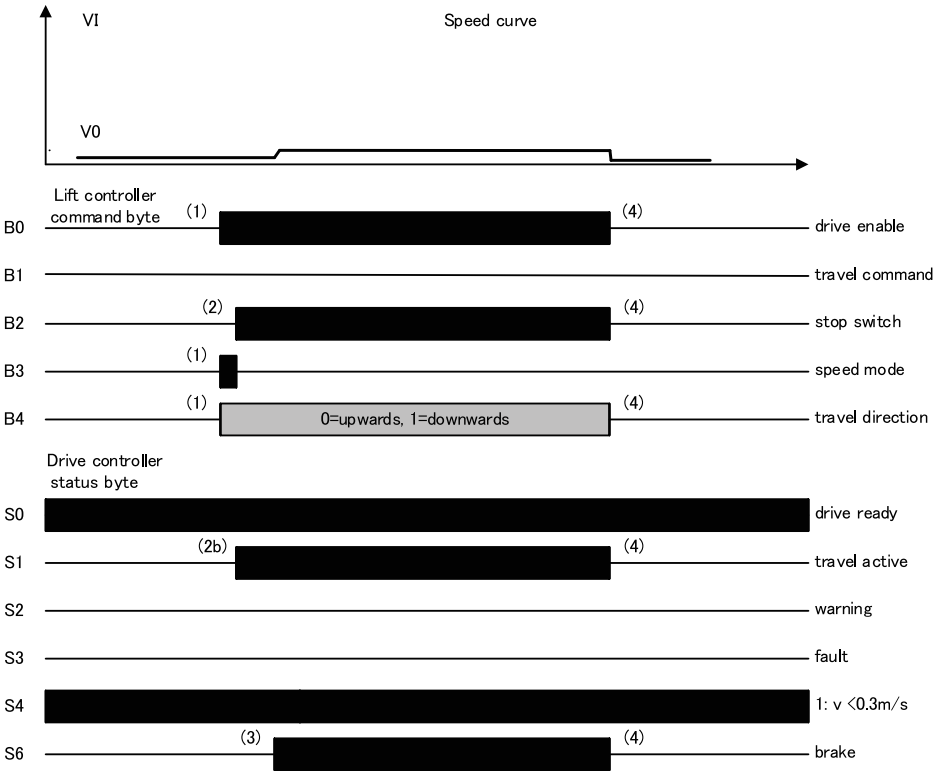

Figure 6.5 Inspection Travel with V0 and Stopping with Idle Command

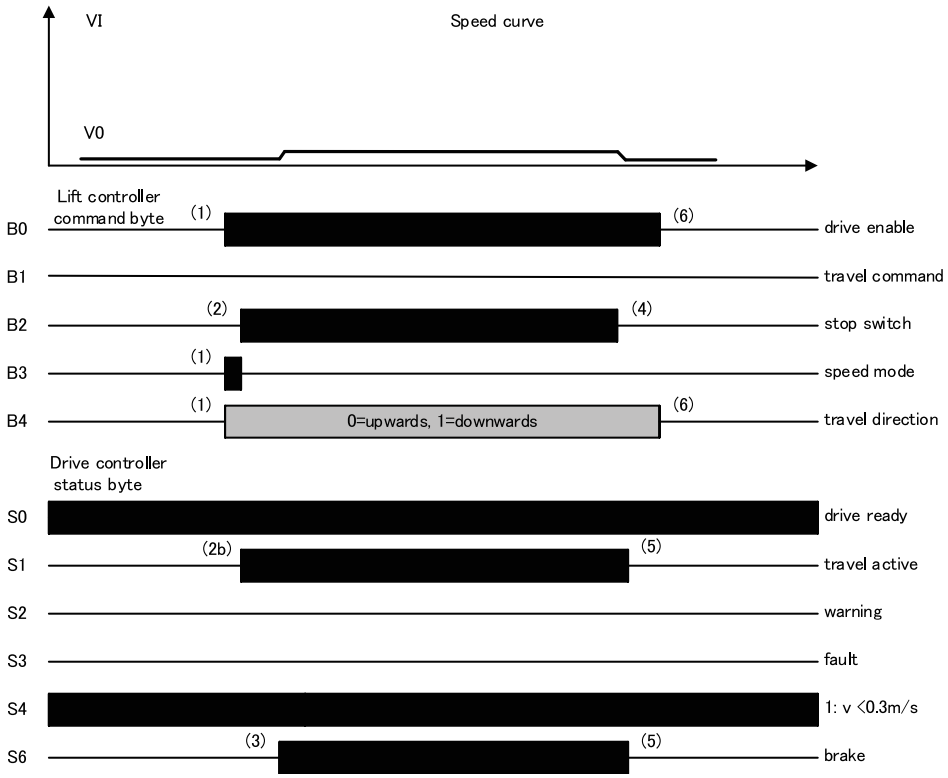

Figure 6.6 Inspection Travel with V0 and Stopping with Stop Command

Re-leveling Travel not Dependent on Remaining Distance :

The re-leveling travel not depending on remaining distance is used for DCP3 and in special cases for DCP4. With DCP4, re-leveling travel dependent on remaining distance is also applied.

Re-leveling Travel not Dependent on Remaining Distance without Electric Stop :

Many lift controllers treat re-leveling as a special case. The mechanical brake and the motor contactors are also switched off along with the re-leveling speed (see step (3)).

1. Before the travel starts, the speed mode "Releveling [bit G1]" (VN) is transmitted.
2. The travel starts with activation of travel command bit B1, but the stop switch is not set.
3. Travel command bit B1 and drive controller enable bit B0 are switched off at the same time.

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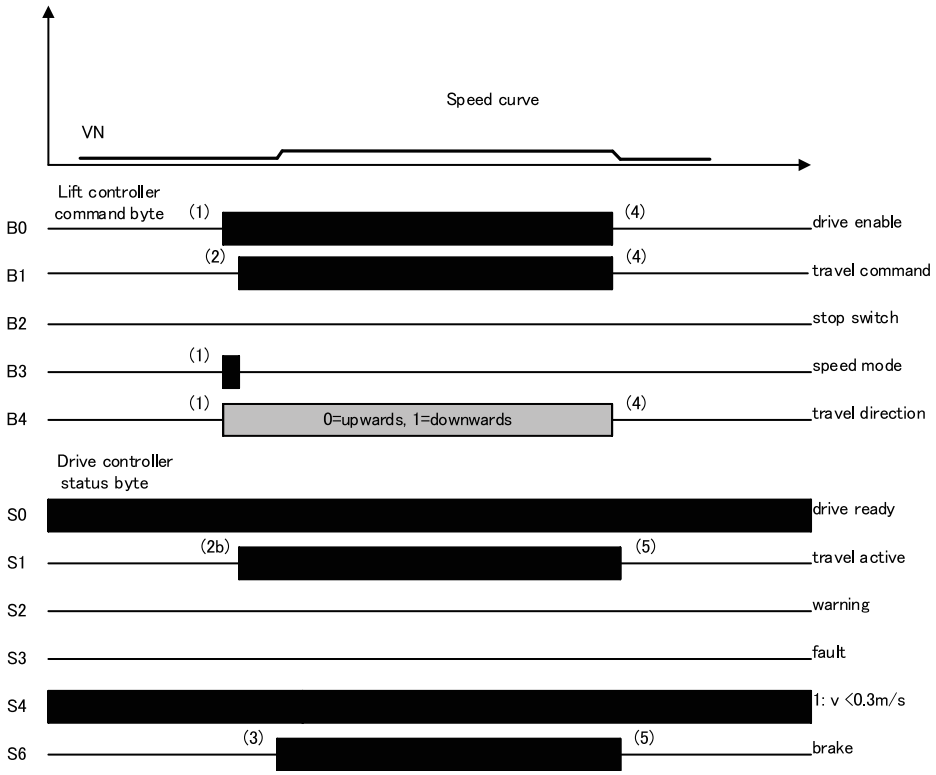

Figure 6.7 Re-leveling Travel without Electric Stop (DCP3)

If the drive controller enable is not switched off, the motor contactors will be carrying current when opened.

Since the motor is not being supplied with power during the time elapsing until the mechanical brake is applied, the drive can coast. Therefore, the method described in the next section is of advantage.

Re-leveling Travel not Dependent on Remaining Distance with Electric Stop :

The following method allows smooth stopping:

1. Before the travel starts, the speed mode "Releveling [bit G1]" (VN) is transmitted.
2. The travel starts with activation of travel command bit B1, but the stop switch is not set.
3. After the travel command bit B1 has been switched off, drive controller enable bit B0 remains activated. The drive decelerates to 0 and holds the car until the mechanical brake is applied.
4. Drive controller enable bit B0 and the motor contactors are not switched off until the mechanical brake bit S6 and travel activated bit S1 are switched off.

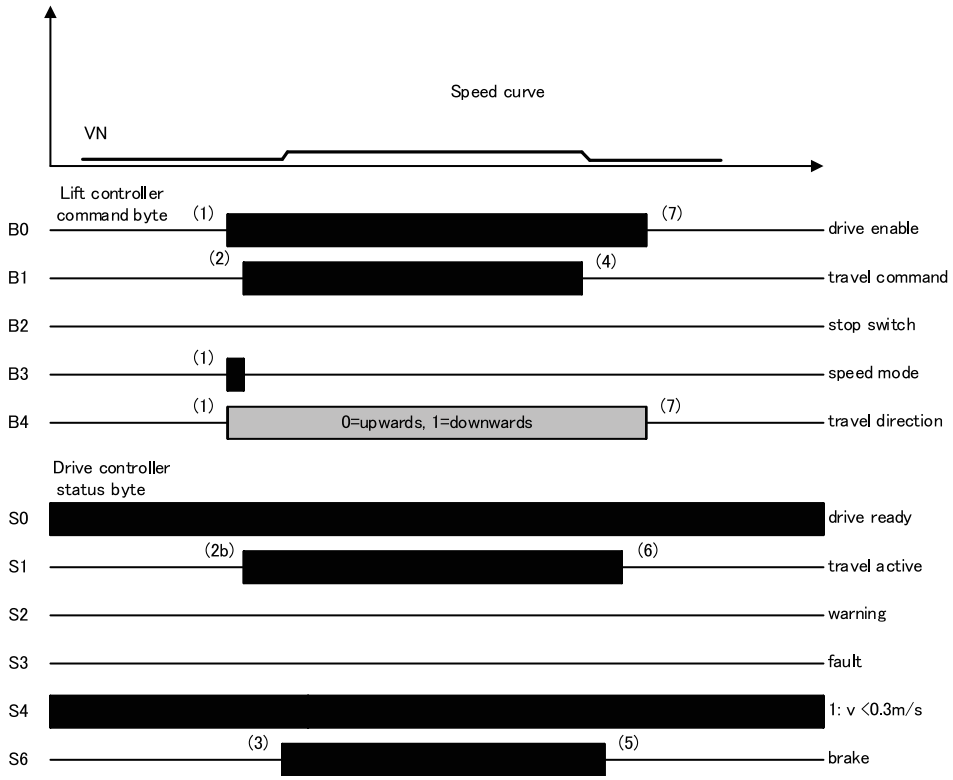

Figure 6.8 Re-leveling Travel with Electric Stop

◆ DCP3: Lift Controller without Absolute Sensor System

■ Travels at V4 followed by Constant Deceleration Distance SV4

Long Travel at High Lift Speed V4 :

1. Before the travel starts, the speed mode "Fast [bit G7]" (V4) is transmitted.
2. The travel starts with activation of travel command bit B1.
3. After the travel command has been switched off, the drive decelerates to crawl speed within the fixed distance SV4. The distance is supplied by the motor's incremental encoder. Stop switch bit B2 must be activated not later than at this point in time.
4. The lift controller positions the lift car with the stop switch bit B2.
5. The lift controller switches the travel contactors off when the drive controller ends the travel at S1 = 0.

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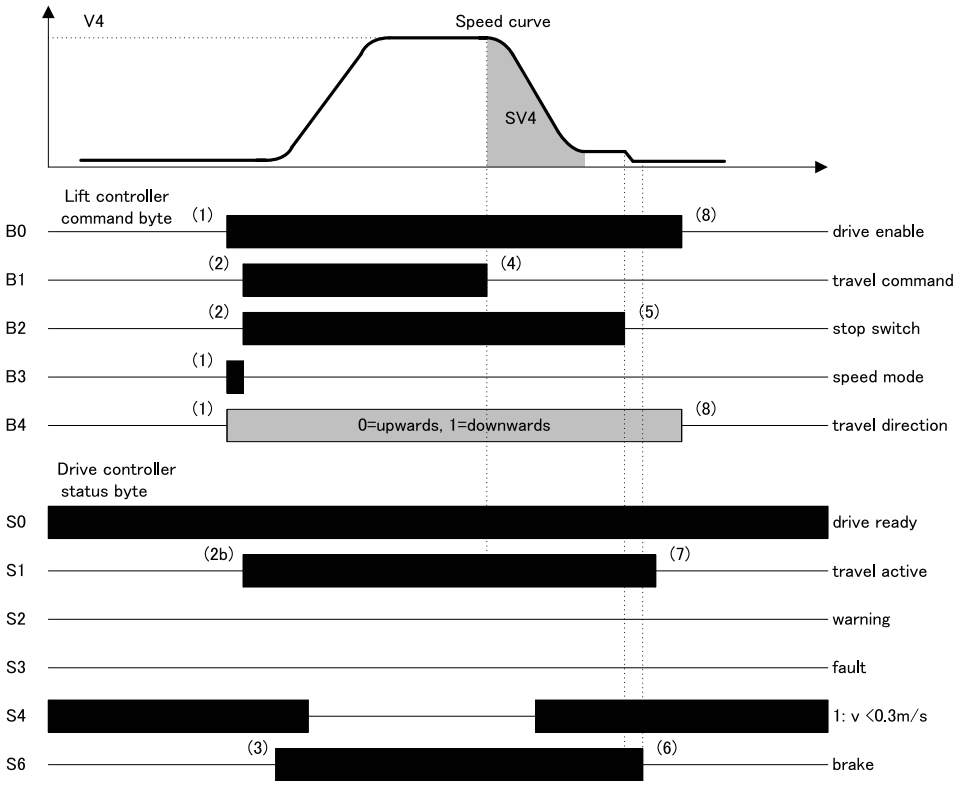

Figure 6.9 V4 Long Travel (DCP3)

Time-Optimized Short Travel at Lift Speed V4 :

1. Before the travel starts, the speed mode "Fast [bit G7]" (V4) is transmitted.
2. The travel starts with activation of travel command bit B1.
3. In contrast to above sequence, travel command bit B1 is switched off before fast speed (V4) is reached. The same fixed remaining distance (SV4) as for the long travel is traversed when slowing down to crawl speed (V0).

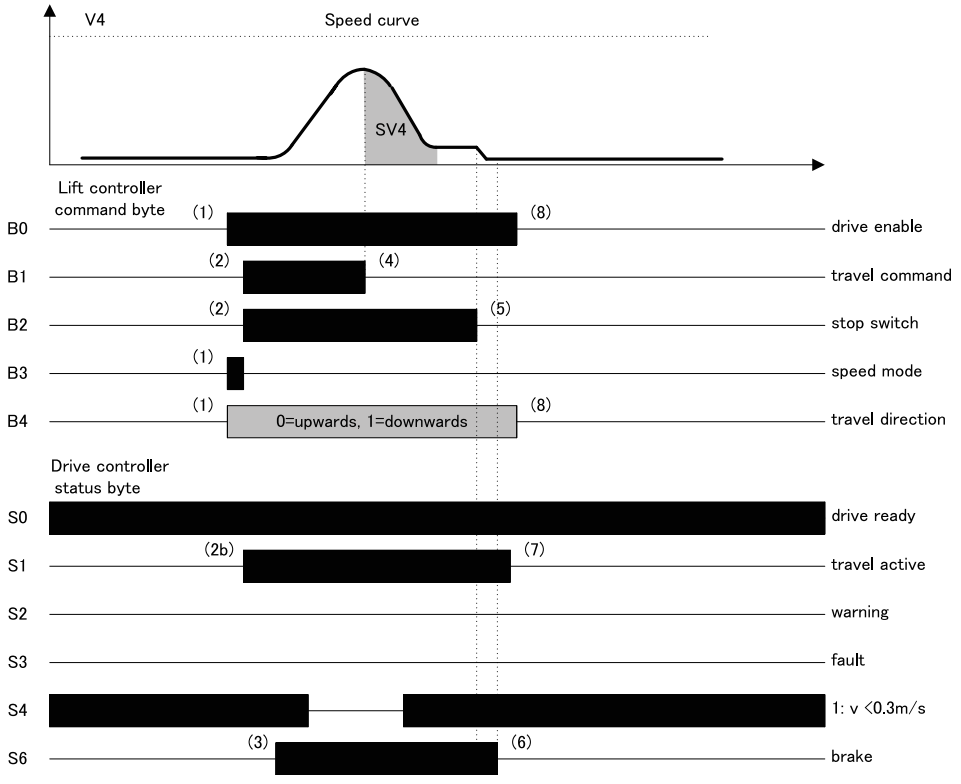

Figure 6.10 V4 Short Travel (DCP3)

■ Travels at Intermediate Speeds V7, V6, V5, V3, V2, and V1

For additional description, also refer to *Travels at V4 followed by Constant Deceleration Distance SV4 on page 41*.

Long Travel at Intermediate Speed :

The same procedure as in Figure 6.9 with fast speed applies whereas in step (1), the appropriate intermediate speed must be transmitted. The deceleration distance is dependent on the selected speed.

- V3 (Intermediate 1 [Bit G6]) > SV3
- V2 (Intermediate 2 [Bit G5]) > SV2
- V1 (Intermediate 3 [Bit G3]) > SV1
- V7 (Intermediate 4 [Bit G10]) > SV7
- V6 (Intermediate 5 [Bit G9]) > SV6
- V5 (Intermediate 6 [Bit G8]) > SV5

Time-Optimized Short Travel at Intermediate Speed :

The same procedure as described in Figure 6.10 with fast speed applies whereas in that step (1), the appropriate intermediate speed must be transmitted.

■ Crawl Travel in DCP3

1. Before the travel starts, the speed mode "Crawl [bit G0]" (V0) is transmitted.
2. The travel starts with activating the travel command bit B1 and the stop switch bit B2.
3. After travel command bit B1 and the stop switch bit B2 have been reset, the drive decelerates.
4. Drive controller enable bit B0 must not be switched off until the mechanical brake bit S6 and the motor contactor bit S1 have been switched off.

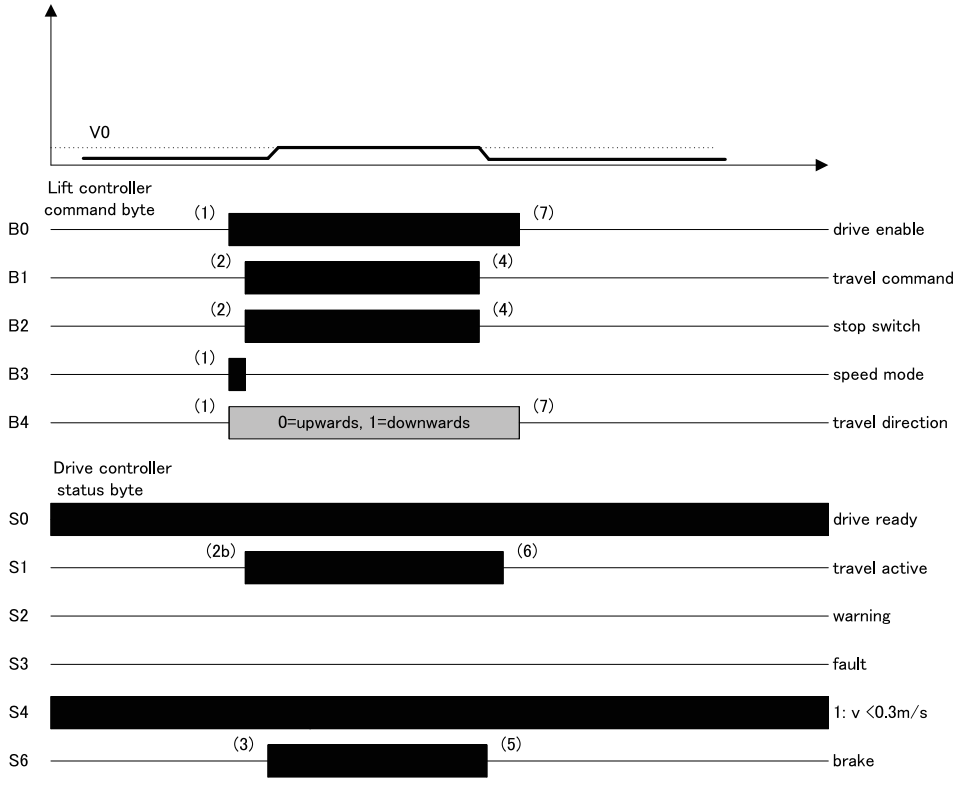

Figure 6.11 Crawl Travel (DCP3)

Note:

The lift can also be operated without travel command bit B1. For travels with stop switch bit B2 only, the speed selection is automatically set to crawl speed V0. B1 can be set or reset at any time. The important bit for crawl travel is B2.

◆ DCP4: Lift Controller with Absolute Sensor System

With DCP4, travels are normally carried out time-optimized and dependent on remaining distance. Furthermore, travels not dependent on remaining distance as described later are supported here, allowing special kinds of travels, e.g. teaching travels for the absolute sensor system.

There are two ways to control a drive using DCP4:

1. DCP4 mode with transfer of desired travel distance and braking distance before start
   Before starting, there is a data exchange between controller and drive using message 'I','7'. The drive does not have to be able to transmit the braking distance while driving.
2. DCP4 mode with transfer of current braking distance while driving
   Before starting, there is no data exchange by using message 'I','7' telegram. While traveling, the drive permanently sends the actual braking distance.

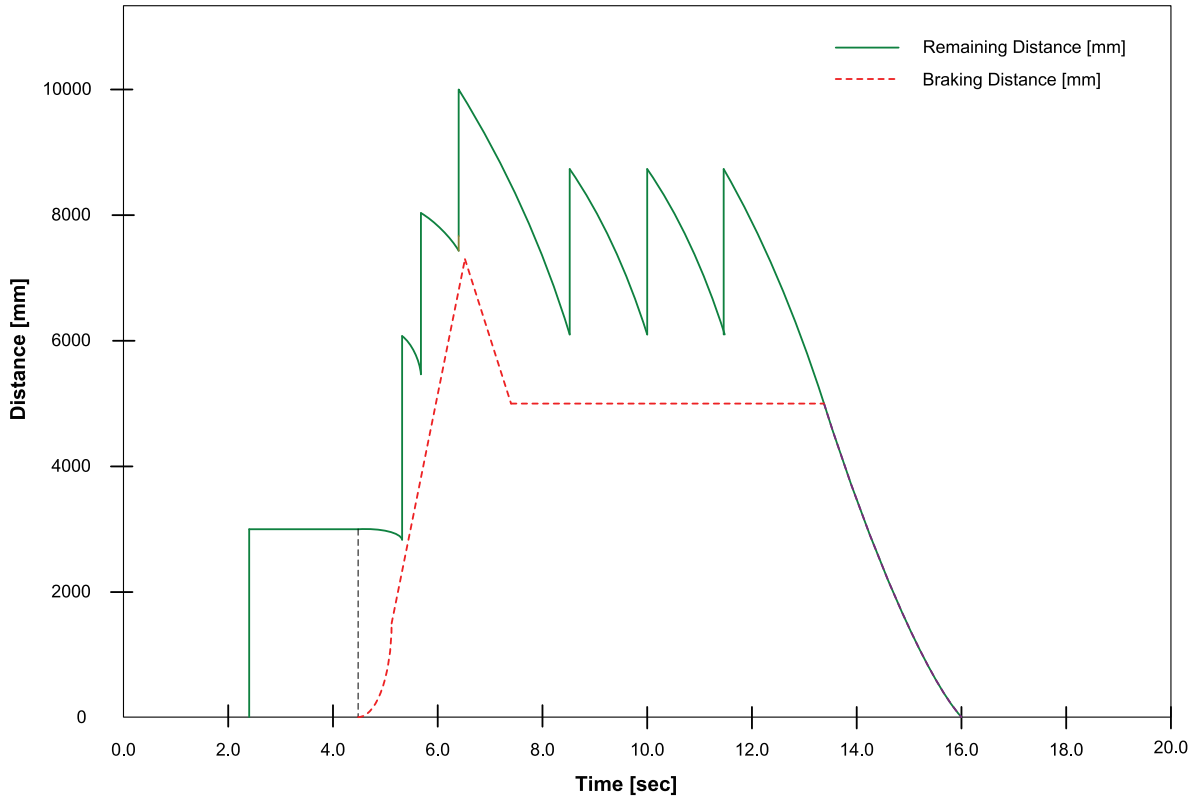

Figure 6.12 Travel with Remaining Distance and Actual Braking Distance (DCP4)

■ Time-Optimized Direct Leveling Dependent on Remaining Distance

With time-optimized travels dependent on remaining distance, there are no points at which lift speeds are switched. Dependent on the distance to be traveled, the corresponding maximum speed V5, V3, or VN might not be reached during the travel. Instead, the optimum speed for reaching the destination is determined. The lift travels to the destination at this speed. To clearly distinguish them from DCP3 travels, the DCP4 mode travels are therefore identified with an apostrophe (').

The travels described below have the following common features:

- Before the travel starts, a preselected speed is transmitted. This is just a limit that the drive controller is not allowed to exceed. The actual value of the speed is decided by the drive controller itself by calculating the time-optimized travel curve based on the actual remaining distance.
- The travels dependent on remaining distance are executed without travel command bit B1.
- Right from the travel start, the absolute remaining distance is read via DCP.
- Stop switch bit B2 remains active until the lift car reaches the level and the drive controller switches the mechanical brake bit S6 off.

V4' Travel :

1. Before the travel starts, the speed mode "Fast [bit G7]" (V4) is transmitted.
2. The travel starts with activation of the stop switch bit B2. After starting the travel, the absolute remaining distance can be read via DCP.
3. The drive decelerates until the lift car comes to the level without driving crawl speed. The drive controller then switches the mechanical brake bit S6 off.
4. The controller does not withdraw the stop switch bit B2 until mechanical brake bit S6 is switched off. The maximum deceleration distance is SV4'.

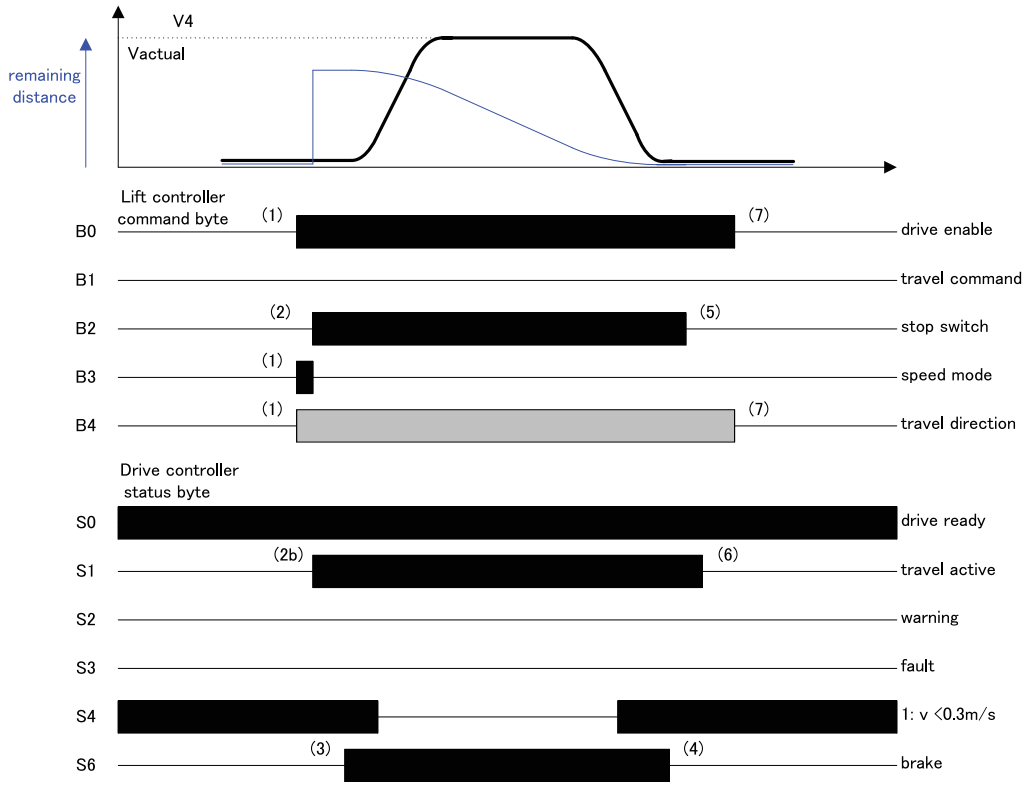

Figure 6.13 V4' Long Travel (DCP4)

Note:

The controller can increase the remaining distance while it is greater than the braking distance the drive controller had transmitted before the beginning of the travel.

Special case: Advantage of DCP4 with time-optimized travel depending on remaining distance. If, at the start of the travel, a remaining distance is set too short, so that the speed V4 cannot be reached, the drive controller calculates a time-optimized lift travel curve (pointed arch shape). The initial remaining distance can be very much shorter than the maximum deceleration distance SV4' required.

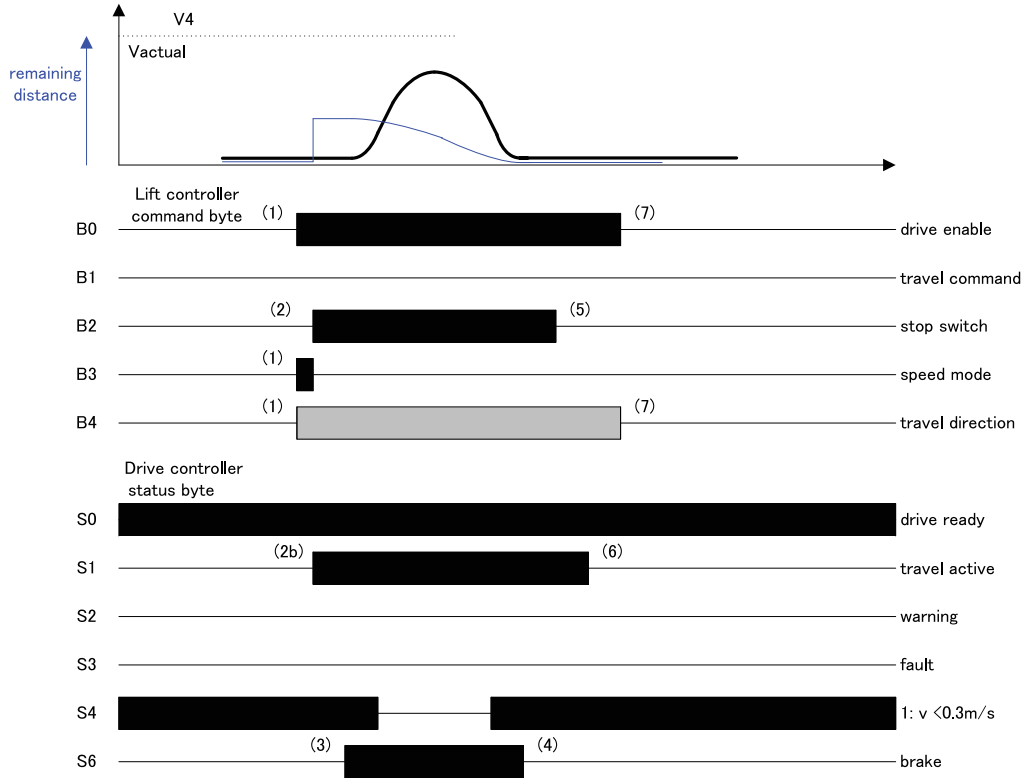

Figure 6.14 V4' Short Travel (DCP4)

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Note:

If the remaining distance at the start of travel is less than 20 cm, the drive controller automatically limits the maximum speed to crawl speed (V0).

Exchange of Parameters between Lift Controller and Drive Controller before the Travel

To enable the lift controller to track the floor level correctly and to know which calls it can still accept during a travel, additional information from the drive controller is required. Before starting, the drive controller receives information via communication channel on how far the lift has to travel. It responds by transferring the minimum distance the lift has to travel at the calculated speed and how long the remaining distance has to be to allow an extension.

Lift Controller :

STX	1C	'I'	'7'	V_{max}	Ss1	Ss2	Ss3	Ss4	Ss5	ETX

V_{max} :

'1' > max. speed is V3

'2' > max. speed is V4

Ss1 ... Ss5 :

Desired distance in cm (ASCII coded in BCD format)

Drive Controller :

STX	1C	'I'	'7'	V_{max}	Sg1	Sg2	Sg3	Sg4	Sg5	Sv1	Sv2	Sv3	Sv4	Sv5	ETX

f_{typ} :

's' ' short travel

'l' ' long travel

Sg1 ... Sg5 :

Minimum travel distance in cm (ASCII coded in BCD format)

Sv1 ... Sv5 :

Deceleration distance in cm (ASCII coded in BCD format)

A travel can be extended if actual remaining distance > Sverz (deceleration distance)

V3' Travel :

Same procedure as described above. Difference: The speed mode "Intermediate 1 [bit G6]" (V3) is transmitted. This limits the speed to V3.

Application: For short travels also, the lift can be operated with preselected speed V4 as described before. In cases in which it is desirable to limit the speed, V3 can be used.

VN' Re-leveling Travel Depending on Remaining Distance :

The usual method of re-leveling is often just a compromise. With DCP4, however, commanding the remaining distance makes re-leveling accurate to the millimeter.

1. Before the travel starts, the speed mode "Releveling [bit G1]" (VN) is transmitted.
2. The travel starts with activation of stop switch bit B2. From the start of the travel, the absolute remaining distance is read via DCP.
3. The drive decelerates dependent on the remaining distance until the lift car reaches the exact floor position.
4. The lift controller does not withdraw the stop switch bit B2 until the mechanical brake bit S6 is switched off.
5. The lift controller must not switch off the drive controller enable bit B0 until the end of the travel S1=0.

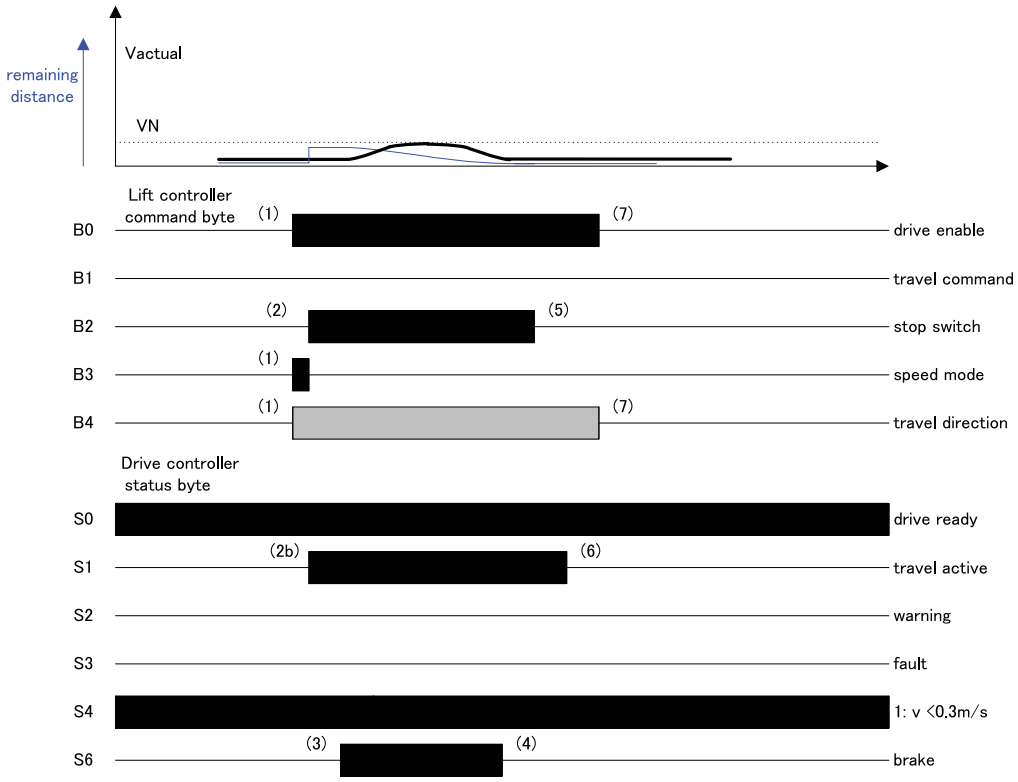

Figure 6.15 VN' Re-leveling Travel (DCP4)

■ Crawl Travel in DCP4

There is no definition of a crawl travel sequence in DCP4. The lift controller chooses one of the described travel sequences dependent on the remaining distance.

Exception:

- If the remaining distance at start is less than 20 cm, the drive controller limits the maximum speed to crawl speed.
- The inspection and rescue travels are independent of the DCP3 and DCP4 modes. In this case, the speed is limited to crawl speed when the lift levels at the end stop.

◆ DCP Fast-Start Function

The 'Fast-Start Function' allows magnetizing the motor already when the doors are closing and holding the lift car with opened brake in the level position. This function can be used with DCP3 and DCP4. If the 'Fast-Start Function' is active and the doors are completely closed, the car can immediately start moving without losing time for magnetizing the motor and opening the brakes.

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Note:

Some additional wirings and shaft signals are necessary to meet the requirements of the EN81-1.

■ Start Sequence

The following figure shows the start sequence for DCP3 and DCP4.

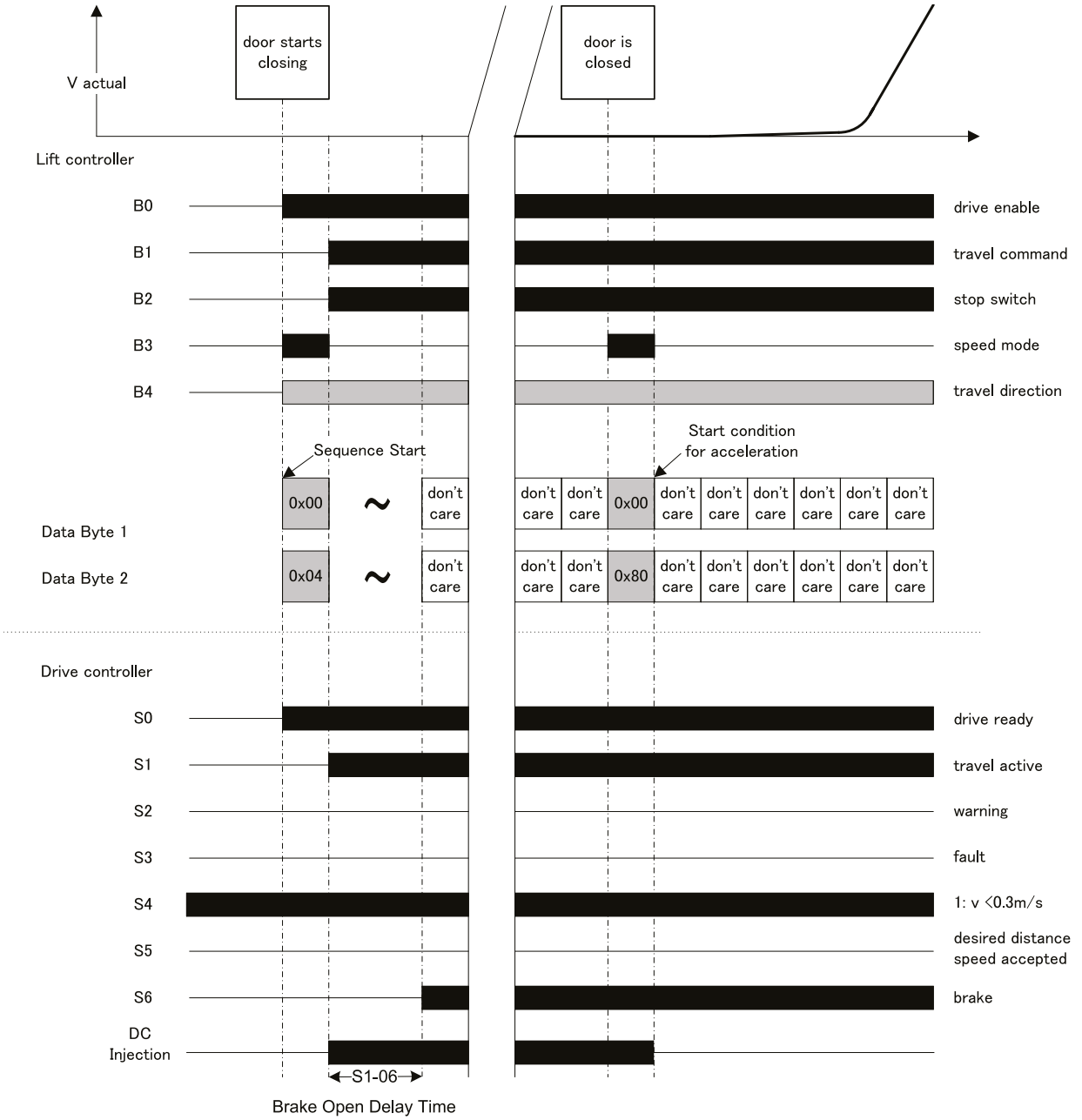

Figure 6.16 Fast-Start Sequence DCP3

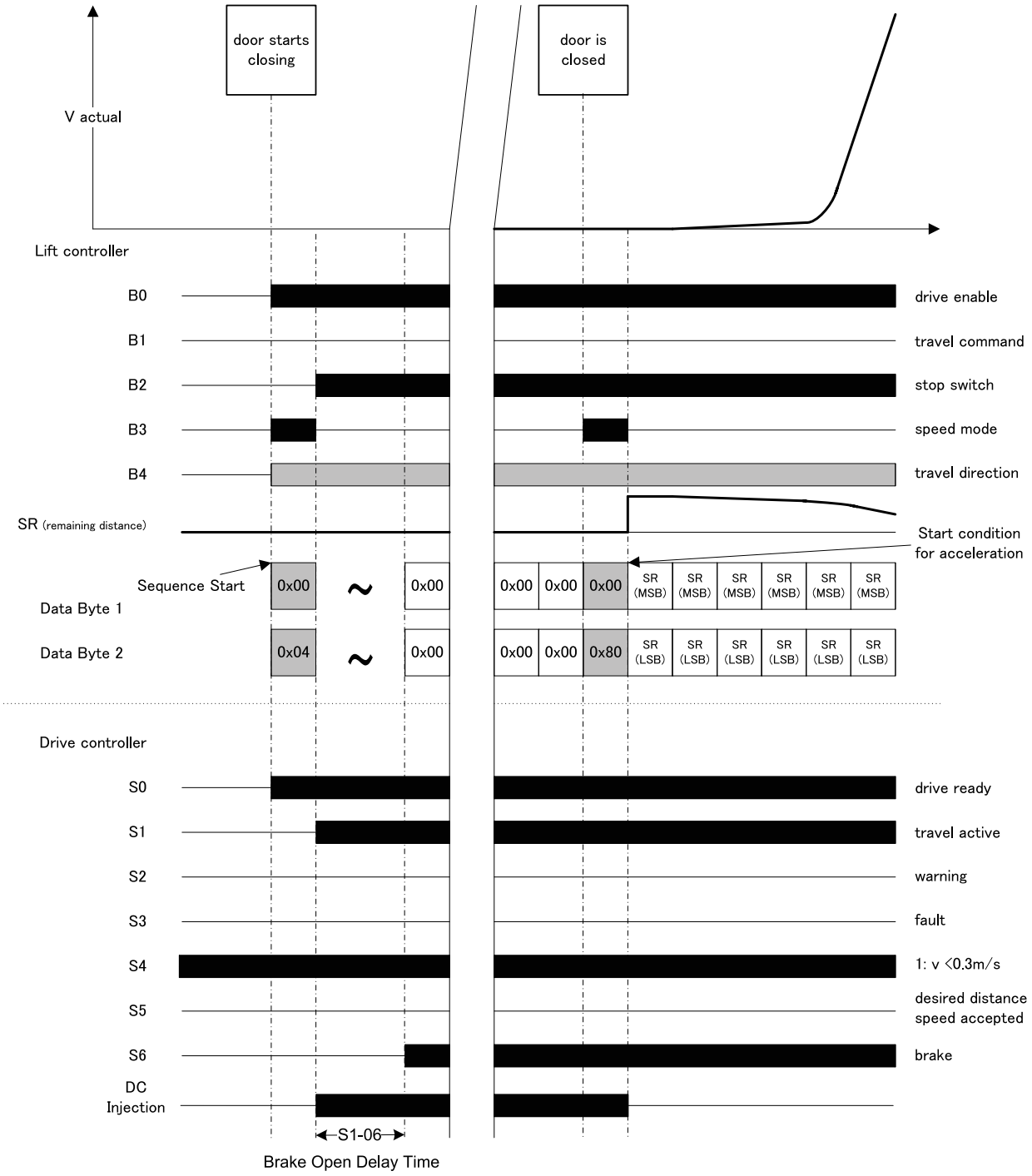

Figure 6.17 Fast-Start Sequence DCP4

Activation of the 'Fast Start Function' :

The 'Fast-Start Function' is activated when the travel sequence starts with a speed message (B3=1, B2=0, B1=0, B0=1) using speed mode VF (4h) in the lift controller's data bytes.

Actions and Controls during 'Fast-Start Function' :

When the 'Fast-Start Function' is active, the drive applies DC-Injection / Zero-Servo to hold the car in position while the brakes are opened by the drive controller. The time during which the 'Fast-Start Function' is active should be limited and monitored on lift controller side.

Transition from 'Fast-Start Function' to Normal Travel :

An additional speed message (DCP3: B3=1, B2=1, B1=1, B0=1; DCP4: B3=1, B2=1, B1=0, B0=1) with a regular speed mode in the lift controller's data bytes terminates the 'Fast-Start Function' and initiates the normal travel with the selected speed.

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■ Premature Termination of the 'Fast-Start Function'

There are some situations where it is necessary to abort the 'Fast-Start Function'. Examples for these situations are:

- The doors are reversing (opening again).
- A time-out occurs (e.g. the doors can't be closed because they are blocked).
- A fault occurs (e.g. motor thermistor or a leaving of the door zone).

In principle, there are two ways how the 'Fast-Start Function' can be aborted:

- Immediate termination regardless of the state of the drive controller's status bit S6 'mechanical brake'.
- Premature termination considering the state of the drive controller's status bit S6 'mechanical brake'.

Immediate Termination Regardless of S6 'Mechanical Brake' Status :

The 'Fast-Start Function' can be terminated immediately by clearing the lift controller's command byte.

Note:

A termination of the 'Fast-Start Function' regardless of the state of the drive controller's status bit S6 'mechanical brake' can cause a drifting of the car and a disconnection of the main contactors under load. Therefore, whenever possible, termination considering the state of the drive controller's status bit S6 'mechanical brake' should be preferred.

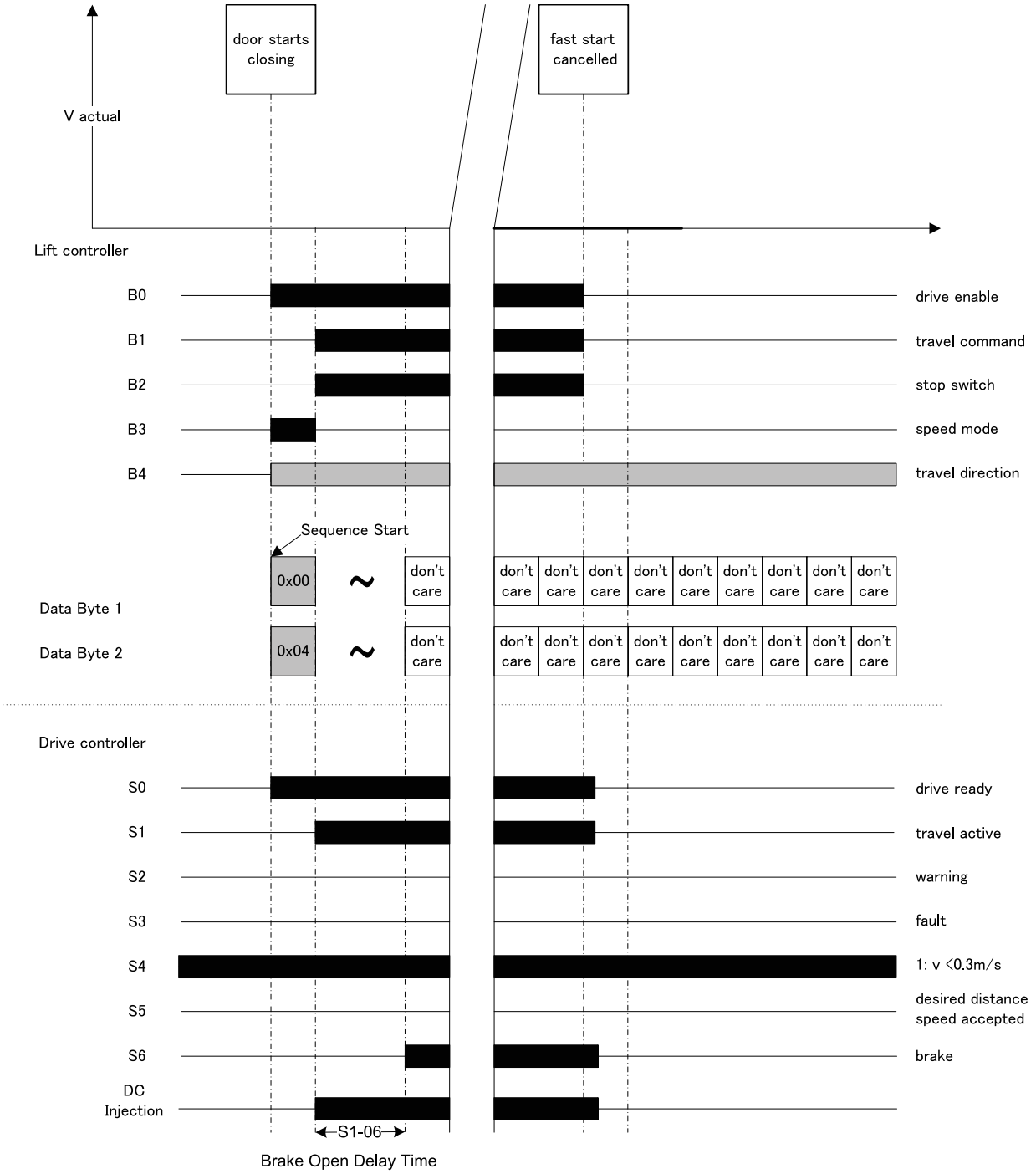

Figure 6.18 Immediate Termination of Fast-Start Sequence DCP3

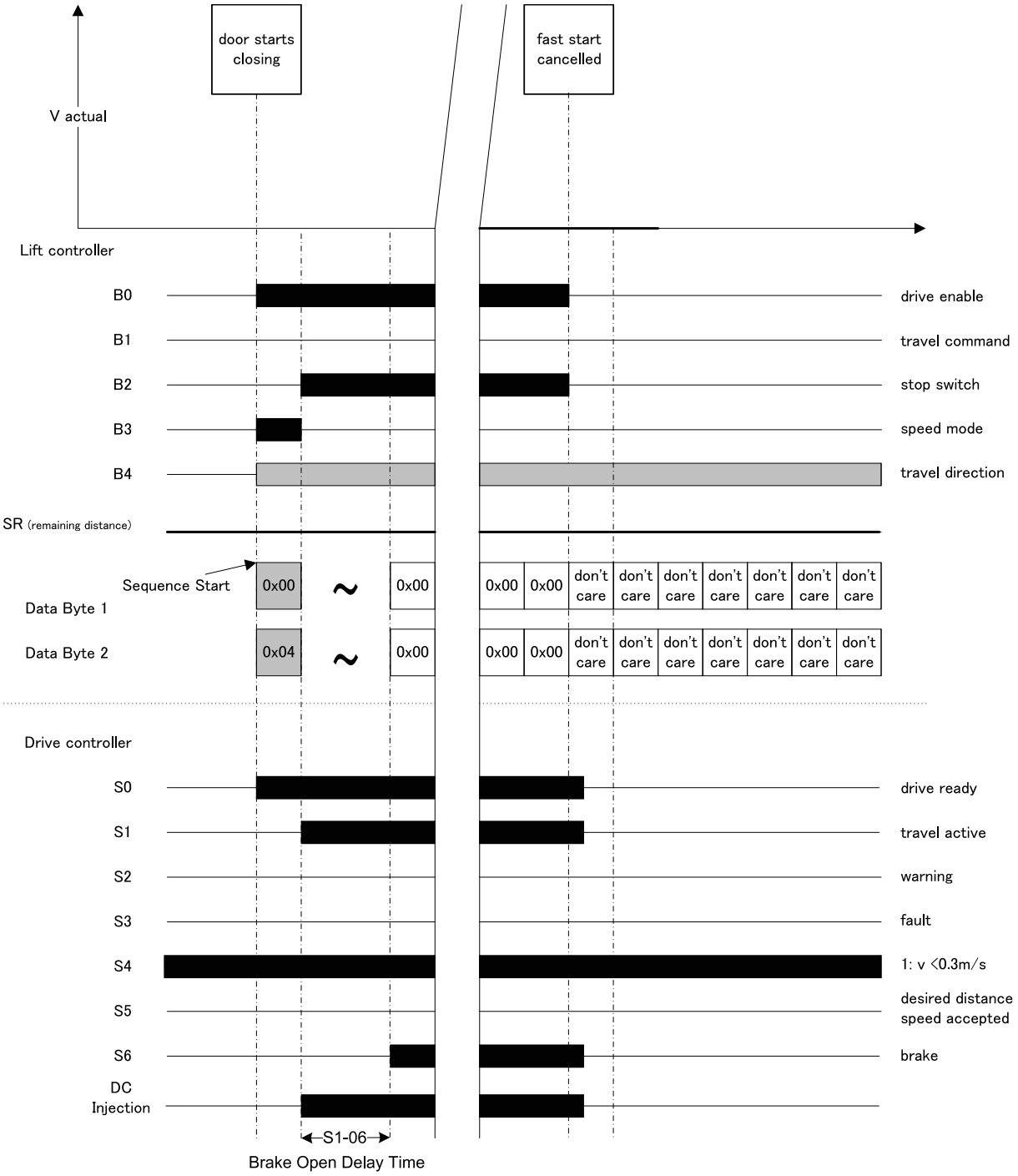

Figure 6.19 Immediate Termination of Fast-Start Sequence DCP4

Premature Termination Considering S6 'Mechanical Brake' Status :

The controlled premature termination of the 'Fast-Start Function' is initiated by a stop message (B2=0, B1=0, B0= 1). This will cause the drive controller to immediately close the brakes. After completing the brake sequence and demagnetizing the motor, the drive controller or lift controller opens the main contactors.

Whenever possible, the lift controller should use this method for premature termination as it prevents the car from drifting and the main contactors from disconnecting under load.

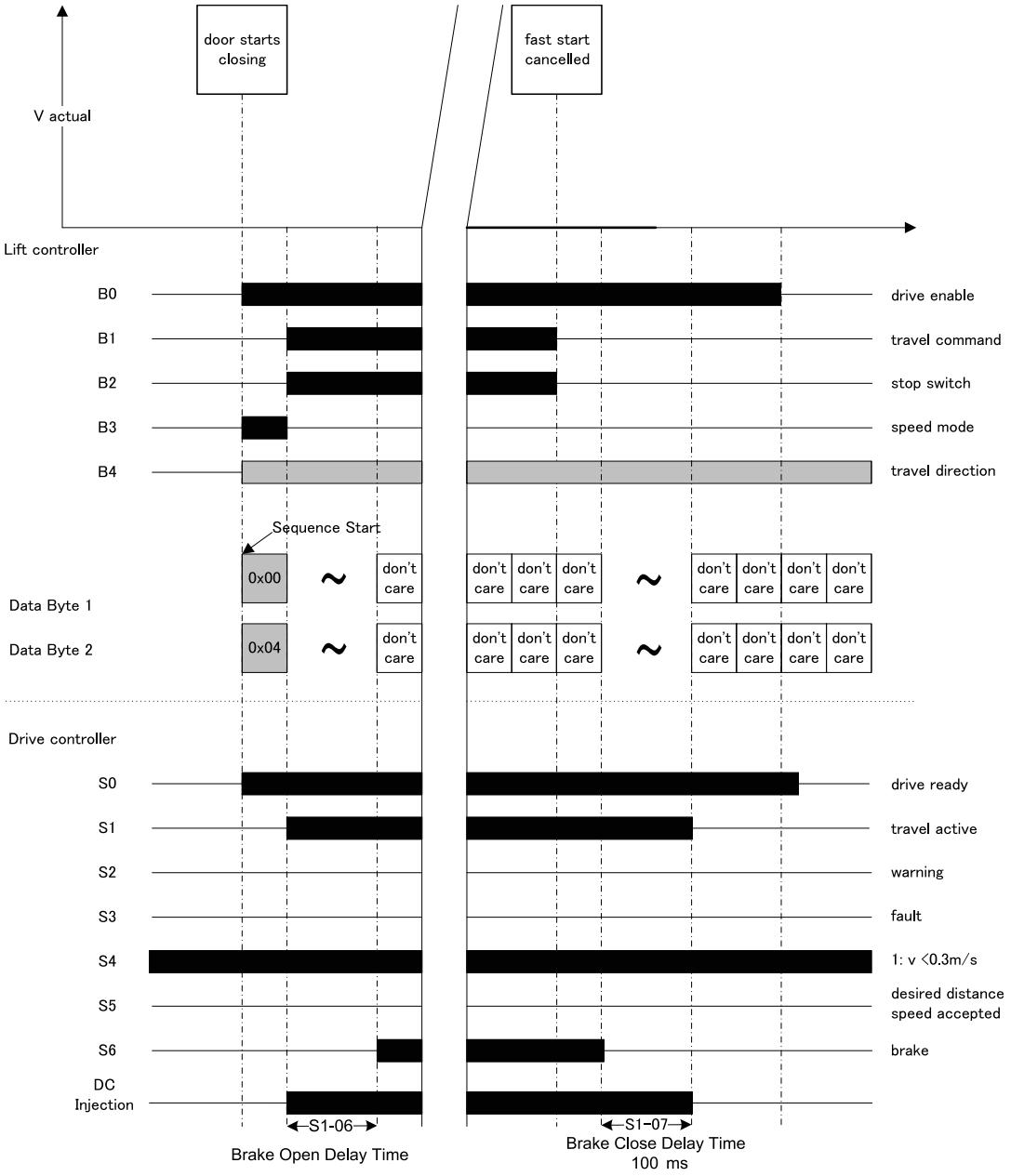

Figure 6.20 Premature Termination DCP3

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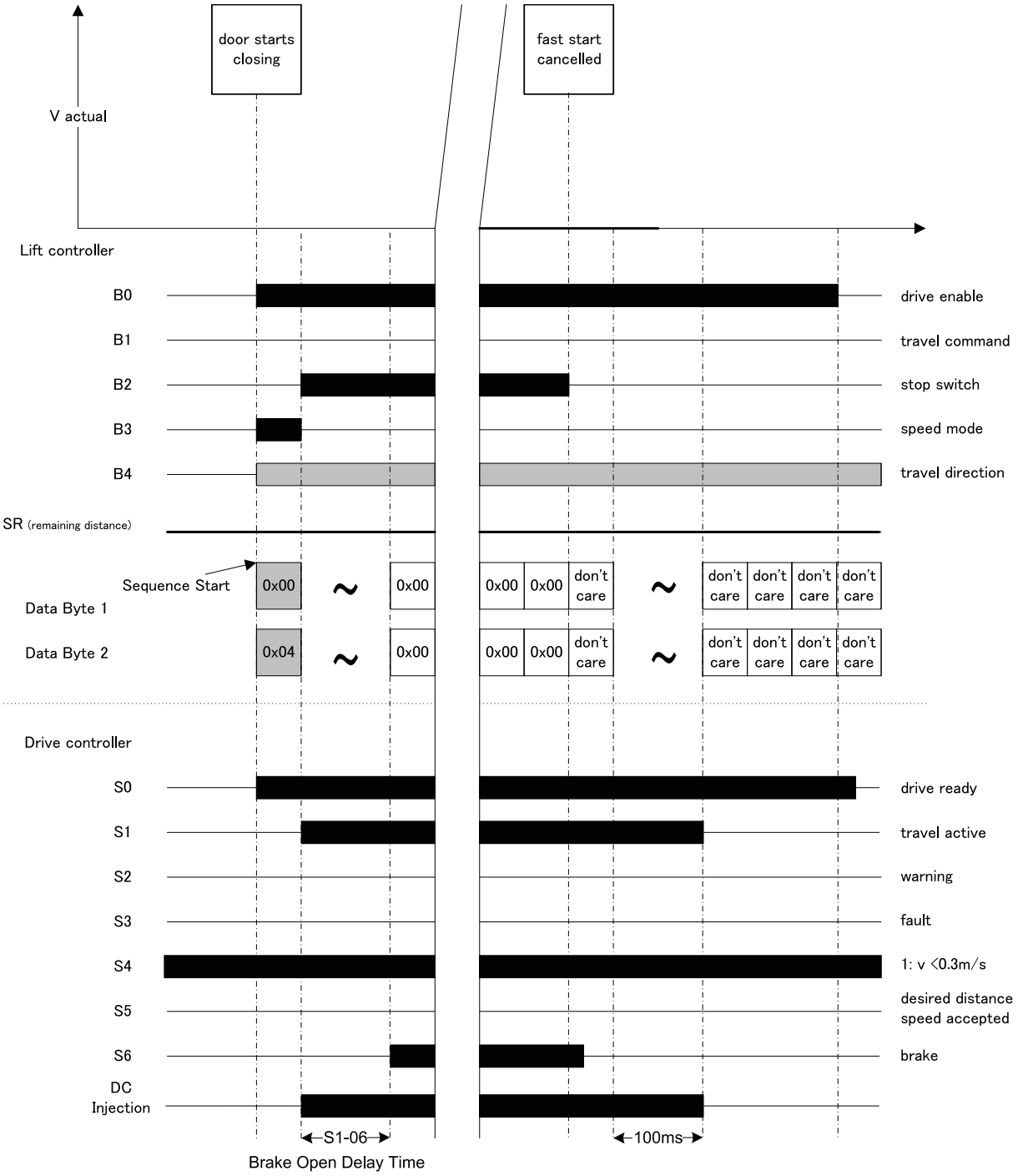

Figure 6.21 Premature Termination DCP4

◆ DCP Fast-Stop Function

The Fast-Stop Function stops the motor with a dedicated Fast-Stop ramp. It can be used to position the car during commissioning or as failure reaction after an identified malfunction. The electrical braking method is often faster than stopping with mechanical brake.

The functionality is independent of operation mode DCP3 or DCP4.

■ Activation of the Fast-Stop Function

The control of the Fast-Stop Function is based on the Fast-Start function control.

The Fast-Stop function is activated using an additional speed mode command (DCP3: B3=1, B2=1, B1=1, B0=1; DCP4: B3=1, B2=1, B1=0, B0=1) during the travel, applying speed VF (4h) in the data bytes.

■ Executing the Fast-Stop Function

After activation of the Fast-Stop function, no other travel command will be accepted and the motor stops with the Fast- Stop ramp (C1-09). When Zero-Speed is reached, the mechanical brake will be applied.

Note:

The Fast-Stop function is no safety function. If safety requirements have to be applied, the deceleration has to be monitored by an auxiliary safety system.

◆ DCP Overview Diagrams

Master Message (lift controller)

byte 1								byte 2								byte 3								byte 4	byte 5	byte 6
command byte								data byte 1								data byte 2								comm. byte 1	comm. byte 2	checksum
B7	B6	B5	B4	B3	B2	B1	B0	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0			
error in last replay message	distance (0: actual, 1: desired)	speed change	travel direction (0 = up, 1 = down)	speed mode	v0 off switch	travel command (only in DCP3)	drive controller enable	16bit–remaining distance (only in DCP4 if command byte B3 = '0' and data–information is set to '3') MSB LSB																extended data communication remote keypad control	extended data communication remote keypad control	the checksum is the result of an XOR operation of the bytes: byte 1, byte 2, byte 3, byte 4 and byte 5
								15bit–remaining distance (only in DCP4 if command byte B3 = '0' and data–information is set to '0', '1' or '2') MSB LSB																		
								speed mode (if command byte B3 = '1') MSB LSB																		

speed mode (encoded in data byte 1 and 2 when bit 3 is set in the command byte)															
data byte 1 (MSB)								data byte 2 (LSB)							
0x80 –	0x40 –	0x20 –	0x10 –	0x08 –	0x04 V7 Intermediate 4	0x02 V6 Intermediate 5	0x01 V5 Intermediate 6	0x80 V4 fast	0x40 V3 Intermediate 1	0x20 V2 Intermediate 2	0x10 VI Inspection	0x08 V1 Intermediate 3	0x04 VF Fast start/stop	0x02 VN releveling	0x01 V0 crawl

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Slave Message (drive controller)																											
byte 1								byte 2								byte 3								byte 4	byte 5	byte 6	
status byte								data byte 1								data byte 2								comm. byte 1	comm. byte 2	checksum	
S7	S6	S5	S4	S3	S2	S1	S0	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0				
error in last replay message	open mechanical brake	desired distance/speed accepted	0: v>=0,3m/s; 1: v<0,3m/s	general fault active	advanced warning active	travel active	drive controller ready	16bit-remaining distance (if data-information is set to '3') MSB LSB																extended data communication remote keypad control	extended data communication remote keypad control	the checksum is the result of an XOR operation of the bytes: byte 1, byte 2, byte 3, byte 4 and byte 5	
								0	15bit-remaining distance (if data-information is set to '0' or '1') MSB LSB																		
								1	15bit-remaining distance (if data-information is set to '0' or '2')																		
									not used	not used	drive over temperature	not used	recommended direction	reduced interm.circ.-volt.	reserved	reserved	reserved	reserved	reserved	reserved	over speed (0: >=; 1: <)	bord. speed (0: >=; 1: <)	0:v>=0,8m/s; 1:V<0,8m/s				

◆ Related Parameters and Functions

■ Added Standard Parameters

Parameter	Operator Display	Description	Value Range	Default Value
d1-30	Border Speed	If drive speed exceeds this speed, bit 1 of DCP Extended Status is set.	0.0 ... 150.0%	120.0%
d1-31	Over Speed	If drive speed exceeds this speed, bit 2 of DCP Extended Status is set.	0.0 ... 150.0%	120.0%
H5-13	Serial Comm Mode	**0 : DCP Communication Channel** **1 : Memobus/Modbus** **3 : DCP3** **4 : DCP4** **5 : CANopen-Lift** Perform a power cycle when changing the *Serial Communication Mode [H5-13]*.	0, 1, 3, 4, 5	1
S3-05	ZSV Max Speed	Sets the maximum speed allowed during ZeroServo correction	0.00 ... 10.00%	0.00%

■ Added Parameters for Positioning Mode (H5-13 ≥ 4)

This table applies for DCP4 and CANopen-Lift in profile Position Mode.

Parameter	Operator Display	Description	Value Range	Default Value
S7-01	In Pos Width	If remaining distance of the shaft is smaller or equal to the In-Position Width for the In-Position Time, the drive sets the In-Position bit. The S6 bit for DCP controller is reset after *S1-07*. In-Position check ends with *S1-07*. The controller closes the brake if S6 bit is reset.	0 ... 10 mm (0.00 ... 0.39 in) *1*	3 mm (0.12 in) *1*
S7-02	In Pos Time		0.00 ... 5.00 s	0.60 s
S7-08	ShftInp FltrTme1	Sets the input filter time of the Shaft Encoder position error signal. This is a first order lag filter.	0.00 ... 50.00 s	0.00 s
S7-09	Shaft P Gain	Sets the proportional gain of the Shaft Encoder position controller in quadrature pulses/mm.	0 ... 10,000 qpls/mm	10 qpls/mm
S7-10	Shaft I Time	Sets the integral time of the Shaft Encoder position controller.	0.00 ... 500.00 s	0.00 s
S7-11	Shft FltrTme	Sets the filter time of the Shaft Encoder position controller output. This is a first order lag filter.	0.00 ... 50.00 s	0.00 s
S7-12	Shaft PI Limit	Set the PI limit (+/-) of the Shaft Encoder position controller output. Set in quadrature pulses/ms.	0 ... 1000 qpls/ms	1000 qpls/ms
S7-13	Shft Output Gain	Sets the output gain of the Shaft Encoder position controller.	0.00 ... 100.00	2.00
S7-14	ShftFltrTmeZSV	Low-pass filters the shaft error value before feeding it into Zero Servo position lock controller.	0.00 ... 50.00 s	0.00 s

Parameter	Operator Display	Description	Value Range	Default Value
S7-17	ShftInp FltrTme2	Defines the, usually larger, filter time 2 for the shaft error input value which becomes effective below the *Shaft Filter Switch Level [S7-18]*.	0.00 ... 50.00 s	0.00 s
S7-18	ShftFilSwitchLvl	Sets the level below which *Shaft Filter Time 2 [S7-17]* is applied. This functions helps to rule-out swings of the lift car when running into level position.	0.00 ... 10.00 Hz	2.00 Hz
S7-30	Shaft Pos Trim	Trims the final shaft position by some mm by adding this value to the actual lift car position feedback.	-10 to 10 mm (-0.39 .. 0.39 in) *1	0 mm (0.00 in) *1
S7-31	Min. Prol. Jump	Distance prolongations are only accepted when they exceed *S7-31* value. **Note:** This parameter is not used in CAN-Lift.	0 to 50 mm (0.00 .. 2.00 in) *1	30 mm (1.18 in) *1
S7-32	ShD Auto-Tuning	Enables Sheave Diameter Auto-Tuning. After every profile positioning drive, *o1-20* is adapted stepwise minimizing *U4-53*/*U4-54*. The parameter is automatically reset after 6 travels. To insure proper tuning, always drive the longest distance occurring in the lift installation.	0 - 1	0
S7-33	BrakDistFactor	Increases the current braking distance and 'I7' telegram reply for the braking distance. This forces a lift controller to perform distance prolongation earlier (safety margin). **Note:** This parameter is not used in CAN-Lift.	0.0 - 20.0%	0.0%
S7-34	RescPRMSetActive	Enables evacuation speed *d1-25* to be used as limiting V4 DCP speed. **0 : Disabled** **1 : Enabled** Although *V4 [d1-01]* might be commanded by the controller, *d1-25* is used as the limiting DCP speed. In that case, *V4* is displayed in the FREF menu. **Note:** This parameter is not used in CAN-Lift.	0 - 1	0
S7-40	DCPInt I/F Enabl	Selects the controller distance change method. **0 : Prolongation (for MPK400c, bp30x)** **1 : Shortening (for LiSA20, SLC4-20)** If *S7-40 = 0*, also set *S7-44 = 0*.	0 - 1	H5-13 = 4: 1 H5-13 ≠ 4: 0
S7-41	I/F LowMarginMin	Defines the interface's lower margin minimum value.	20 to *S7-42* mm (0.79 .. *S7-42* in) *1	120 mm (4.724 in) *1
S7-42	I/F LowMarginMax	Defines the interface's lower margin maximum value.	*S7-41* to 500 mm (*S7-41* .. 19.69 in) *1	150 mm (5.91 in) *1
S7-43	Interface Offset	Defines the Interface Offset. It includes the interface low margin + the I/F jump height.	30 to 900 mm (1.18 .. 35.43 in) *1	400 mm (15.75 in) *1
S7-44	BrakDistOffset	Defines the total Braking Distance Offset. The offset is added to the true Braking Distance. The value with offset is communicated to the lift controller (to allow enough margin for distance shortening controllers). It is also added to 'I7' telegram reply.	0 to 1000 mm (0 .. 39.37 in) *1	500 mm (19.69 in) *1
S7-50	Mfctr Code ZA En	Switches the drive manufacturer code within 'I0' command to 'ZA' instead of 'YE' which is necessary for controllers not (yet) supporting Yaskawa drives. **0 : YE** **1 : ZA** Power needs to be cycled to activate the changed string	0 - 1	0

*1 Values not in parentheses apply when *o1-12 = 0*. Values in parentheses apply when *o1-12 = 1*.

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■ Added Standard Parameter Scroll Items

Parameter	Operator Display	Description	Value Range	Default Value
b1-01	Ref Source 1	Speed Reference Selection 1 **0 : Operator Keypad** **1 : Terminals** **2 : Memobus/Modbus Communications** **3 : Option Card** **6 : DCP/CANopen-Lift**	0 - 3, 6	H5-13 = 1: 0 H5-13 ≠ 1: 6
b1-02	Run Source 1	Up / Down Command Selection **0 : Operator Keypad** **1 : Control Circuit Terminal** **2 : Memobus/Modbus Communications** **3 : Option Card** **6 : DCP/CANopen-Lift**	0 - 3, 6	H5-13 = 1: 1 H5-13 ≠ 1: 6

■ Modified Standard Parameters

Only modified parameters are listed in this table. If parameter *H5-13 = 3 or 4 or 5*, the following changes apply:

Parameter	Operator Display	Description	Value Range	Default Value
A1-02	Control Method	Control Method Selection Selects the control method the drive uses to operate the motor. **Note:** If *H5-13 = 4 or 5* (in profile Position Mode), the control method must be changed to *3* or *7*.	If H5-13 ≠ 4: 0 to 7 If H5-13 = 4 **2*: 3 or 7	0
b6-01 to b6-04	Dwell Function	Dwell Function Parameters	H5-13 ≥ 4: [not available] **2 *3*	
b7-01 to b7-02	Droop Control	Droop Control Parameters	H5-13 ≥ 4: [not available] **2 *3*	
C1-01	Accel Time 1	Acceleration Time 1 Sets the ramp to accelerate from 0 to maximum speed	0.00 - 600.00 s	3.00 s
C1-02	Decel Time 1	Deceleration Time 1 Sets the ramp to from maximum speed to 0	0.00 - 600.00 s	3.00 s
C1-03 to C1-08	Accel Time 2 ... 4 Decel Time 2 ... 4	Acceleration Time 2 to 4 Deceleration Time 2 to 4	H5-13 ≥ 4: [not available] **2 *3*	
C1-11	Acc/Dec SW Freq	Accel/Decel Switching Speed Sets the speed to switch between accel/decel ramp settings **Note:** If *H5-13 ≥ 4*: Parameter fixed to 0.0%	0.0 - 100.0%	0.0%
C2-03	Jerk@Decel Start	Jerk at Deceleration End Sets the jerk used at the end of deceleration	If H5-13 < 4: 0.00 - 10.00 s If H5-13 ≥ 4: 0.01 - 10.00 s **2 *3*	0.50 s
C2-04	Jerk@Decel End	Jerk at Deceleration End Sets the jerk used at the end of deceleration	0.00 - 10.00 s	H5-13 < 4: 0.50 s H5-13 ≥ 4: 2.00 s **2 *3*
C2-05	Jerk @ Leveling	Jerk at Leveling Sets the jerk used when the speed reference is lower than the leveling speed setting	H5-13 ≥ 4: [not available] **2 *3*	
C3-01	Slip Comp Gain	Slip Compensation Gain	H5-13 ≥ 4: [not available] **2 *3*	
C3-05	Output V Lim Sel	Output Voltage Limit Operation Selection	H5-13 ≥ 4: [not available] **2 *3*	
d1-01 to d1-07, d1-23, d1-24, d1-26	Refer to Added Standard Parameter Dependencies (Defaults) (62). Parameters *d1-xx* are not used or modified for *H5-13 = 5* **3*.			
d1-18	Spd Ref Sel Mode	Speed Reference Selection Mode	[not available]	
d2-01	Ref Upper Limit	Frequency Reference Upper Limit	[not available]	
o1-12	Length Unit Sel	Length Unit Selection **0 : mm** **1 : inch** **Note:** Parameter *o1-12* does not change on initialization.	0, 1	0
o1-20	Traction Sheave Diameter	Sets the traction sheave diameter. **Note:** If *H5-13 ≥ 4* parameter *o1-12* has one additional decimal place.	H5-13 < 4: 80 - 2000 mm (3.15 - 78.74 in) **1* H5-13 ≥ 4: 80.0 - 1660.0 mm (3.150 - 65.354 in) **1 *2 *3*	H5-13 < 4: 400 mm (15.75 in) **1* H5-13 < 4: 400.0 mm (15.748 in) **1 *2 *3*
o2-01	LO/RE Key	Determines if the digital operator LOCAL/REMOTE key is functional. **0 : Disabled** **1 : Enabled**	H5-13 = 5: not available **3*	
S1-01	ZeroSpeed@Stop	Zero Speed Level at Stop	H5-13 < 4: 0.000% to 9.999% H5-13 ≥ 4: 0.001% to 9.999% **2 *3*	0.200%
S1-05	DC Brk Time Stop	DC Braking Time at Stop Determines how long the drive should perform DC Injection at stop. In CLV and CLV/PM, *S1-05* determines how long Position Lock should be performed. A setting of 0.00 disables *S1-05*. When *H5-13 ≥ 4* is selected, the minimum time is *S1-07 + 0.1 s*. **2 *3*	0.10 - 10.00 s	0.60 s
S3-20	Dwell 2 Speed Reference	Sets the speed reference for the Dwell 2 function.	H5-13 ≥ 4: [not available] **2 *3*	
S3-21	Dwell 2 End Speed	The Dwell 2 function will end when the drive reaches this speed.	H5-13 ≥ 4: [not available] **2 *3*	

Parameter	Operator Display	Description	Value Range	Default Value
S4-01 to S4-04, S4-06 to S4-15	Rescue Operation	Rescue Operation Parameters	H5-13 ≥ 4: [not available] *2 *3	
S5-01 to S5-13	Short Floor Operation	Short Floor Operation Selection	H5-13 ≥ 4: [not available] *2 *3	

*1 Values not in parentheses apply when *o1-12 = 0*. Values in parentheses apply when *o1-12 = 1*.
*2 Applicable when *H5-13 = 4 [DCP4]*.
*3 Applicable when *H5-13 = 5 [CANopen-Lift]* (Profile Position Mode).

■ Modified Standard Monitors

Only modified parameters are listed in this table. If parameter H5-13 = 3 or 4 or 5, the following changes apply:

Monitor	Operator Display	Description	Analog Output Scaling	Unit
U4-18	Reference Source	Displays the source for the speed reference as XY-nn. **X: Indicates which reference is used** **1 : Reference 1 (b1-01)** **Y-nn: Indicates the reference source** **0-01 : Digital Operator** **1-01 : Analog (Terminal A1)** **1-02 : Analog (Terminal A2)** **3-01 : MEMOBUS/Modbus communications** **4-01 : Communication Option Card** **5-00 : CANopen-Lift** **6-00 : DCP**	-	Hex
U4-21	Run Cmd Source	Displays the source for the Up/Down command as XY-nn. **X: Indicates which Up/Down command source is used** **1 : Reference 1 (b1-02)** **Y: Input power supply data** **0 : Digital Operator** **1 : External Terminals** **3 : MEMOBUS/Modbus communications** **4 : Communication Option Card** **5 : CANopen-Lift** **6 : DCP** **nn: Up/Down command limit status data** **00 : No limit status** **01 : Up/Down command was left on when stopped in PRG mode** **02 : Up/Down command was left on when switching from LOCAL to REMOTE operation** **03 : Waiting for soft charge bypass contactor after power up (Uv or Uv1 flashes after 10 s)** **04 : Waiting for "Up/Down Command Prohibited" time period to end** **05 : Emergency Stop (multi-function input, operator)** **07 : During baseblock while coast to stop with timer** **08 : Speed reference is below minimal reference during baseblock** **09 : Wairing for Enter command**	-	Hex
U4-42 to U4-44		Direct Landing	H5-13 ≥ 4: [not available]	

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■ Added Standard Monitors

Monitor	Operator Display	Description	Analog Output Scaling (H4-xx selection)	Unit
U4-50	Rem Distance	Remaining Distance Shows the remaining distance until the commanded distance is reached (value originating from lift controller, contains distance prolongations)	10 V: 65.535 m (2580.12 in) *1	0.001 m (0.01 in) *1
U4-51	Braking Distance	Braking Distance Shows the braking distance for a currently driven speed (matches the remaining distance at the time of deceleration)	10 V: 65.535 m (2580.1 in) *1	0.001 m (0.1 in) *1
U4-52	Int Dist Cmd	Internal Distance Command Shows the total commanded distance including prolongations (calculated from remaining distance)	10 V: 100.00 m (3937.0 in) *1	0.01 m (0.1 in) *1
U4-55	Shft Ctrl Input	Shaft Controller Input Shows the difference between remaining distance based on shaft PG and motor PG	-	0.001 m (0.01 in) *1
U4-56	Shft Ctrl Output	Shaft Controller Output Shows the shaft controller output correction value per scan, added to the absolute position value based on motor PG	-	0.001 m (0.01 in) *1

Monitor	Operator Display	Description	Analog Output Scaling (H4-xx selection)	Unit
U4-57	Shft Ctrl O/PSum	Shaft Controller Output Sum Shows the accumulated control effort of the shaft controller (positive and negative values cancel out)	-	0.001 m (0.01 in) *1
U4-58	Absolute RemDist	Absolute Remaining Distance Shows the absolute initial distance when starting a travel, for controllers using Distance Shortening.	-	0.001 m (0.01 in) *1
U4-71	DecelDist V0	Shows the deceleration distance occurring when decelerating from *d1-26* speed. **Note:** Monitor is not available for CANopen-Lift.	-	0.001 m (0.1 in) *1
U4-72	DecelDist VN	Shows the deceleration distance occurring when decelerating from *d1-23* speed. **Note:** Monitor is not available for CANopen-Lift.	-	0.001 m (0.1 in) *1
U4-73	DecelDist V1	Shows the deceleration distance occurring when decelerating from *d1-04* speed. **Note:** Monitor is not available for CANopen-Lift.	-	0.001 m (0.1 in) *1
U4-74	DecelDist V2	Shows the deceleration distance occurring when decelerating from *d1-03* speed. **Note:** Monitor is not available for CANopen-Lift.	-	0.001 m (0.1 in) *1
U4-75	DecelDist V3	Shows the deceleration distance occurring when decelerating from *d1-02* speed. **Note:** Monitor is not available for CANopen-Lift.	-	0.001 m (0.1 in) *1
U4-76	DecelDist V4	Shows the deceleration distance occurring when decelerating from *d1-01* speed. **Note:** Monitor is not available for CANopen-Lift.	-	0.001 m (0.1 in) *1
U4-77	DecelDist V5	Shows the deceleration distance occurring when decelerating from *d1-07* speed. **Note:** Monitor is not available for CANopen-Lift.	-	0.001 m (0.1 in) *1
U4-78	DecelDist V6	Shows the deceleration distance occurring when decelerating from *d1-06* speed. **Note:** Monitor is not available for CANopen-Lift.	-	0.001 m (0.1 in) *1
U4-79	DecelDist V7	Shows the deceleration distance occurring when decelerating from *d1-05* speed. **Note:** Monitor is not available for CANopen-Lift.	-	0.001 m (0.1 in) *1
U4-82	Command Byte	First byte of DCP frame (Controller to Drive) **B0 : Drive Controller Enable** **B1 : Travel Command** **B2 : Stop Switch** **B3 : Travel command transfer in data bytes** **B4 : Travel Direction** **B5 : Speed Change** **B6 : Remaining Distance** **B7 : Error in last reply message**	-	-
U4-83	Status Byte	First byte of DCP frame (Drive to Controller) **S0 : Drive Controller Ready** **S1 : Travel active** **S2 : Alarm active** **S3 : Fault active** **S4 : Motor speed below 0.3 m/s** **S5 : Distance accepted** **S6 : Brake open** **S7 : Error in last reply message**	-	-
U4-84	Peak Brak Dist	Peak Braking Distance Shows the maximum braking distance occurring for profiles with linear acceleration part. *U4-84* shows the maximum value taking all *d1-xx* speeds into account. If there is no speed high enough to produce a linear acceleration portion (*C2-01* and *C2-02* are fully driven), the monitor will show a *0* value. The value must be transferred/set in Strack SLC4-20 controller parameter DCPVzAbst.	-	0.001 m (0.01 in) *1

Monitor	Operator Display	Description	Analog Output Scaling (H4-xx selection)	Unit
U4-85	I0 Cmd Rcv Ctr	I0 Command Reception Counter Counts the valid 'I0' commands received by the drive. The counter will roll after 65535 counts.	-	0 - 65535
U4-86	I1 Cmd Rcv Ctr	I1 Command Reception Counter Counts the valid 'I1' commands received by the drive. The counter will roll after 65535 counts.	-	0 - 65535
U4-87	I1 DIR DI PTR PT	I1 Command Request and Reply Shows Data Information Type Request (DIR) from controller, Data Information Type (DI) acknowledged by drive, Protocol Type Request (PTR) from controller, and acknowledged Protocol Type (PT) U4-87 = 00000 PT PTR DI DIR	-	-
U4-88	I6 Cmd Rcv Ctr	I6 Command Reception Counter Counts the valid 'I6' commands received by the drive. The counter will roll after 65535 counts.	-	0 - 65535
U4-89	I7 Cmd Rcv Ctr	I7 Command Reception Counter Counts the valid 'I7' commands received by the drive. The counter will roll after 65535 counts.	-	0 - 65535
U4-90	I7 Rx Data V4	I7 Reception Data when V4 Commanded Shows the distance command transferred in an 'I7' message (controller to drive) with V4 speed selection.	-	0.001 m (0.01 in) *1
U4-91	I7 Rx Data V3	I7 Reception Data when V3 Commanded Shows the distance command transferred in an 'I7' message (controller to drive) with V3 speed selection.	-	0.001 m (0.01 in) *1
U4-92	I7 Tx Data Sg	I7 Transmit Data Sg Shows the total distance to be traveled according to the transferred distance command.	-	0.001 m (0.01 in) *1
U4-93	I7 Tx Data Sv	I7 Transmit Data Sv Shows the deceleration distance according to the transferred distance command.	-	0.001 m (0.01 in) *1
U4-94	I9 Cmd Rcv Ctr	I9 Command Reception Counter Counts the valid 'I9' commands received by the drive. The counter will roll after 65535 counts.	-	0 - 65535
U4-95	I7 Profile Type	Shows the 'I7' communicated profile type as it was determined by the drive according to the last query by the controller.	-	-

*1 Values not in parentheses apply when *o1-12 = 0*. Values in parentheses apply when *o1-12 = 1*.

■ Added Standard Parameter Dependencies

The baud rate for DCP operation is specified as 38,400 baud. When DCP operation is selected by *H5-13*, the baud rate of the Memobus port, accessible via terminals R+, R-, S+, S-, is automatically set to 38,400 baud. The values of the following parameters are changed automatically according to the settings of *H5-13*.

Dependent Parameter	H5-13 = x				
	0 [DCP Com Channel]	1 [Memobus/Modbus]	3 [DCP3]	4 [DCP4]	5 [CANopen-Lift]
b1-01 (sequence)	6 [DCP]	0 [Operator Keypad]	6 [DCP]	6 [DCP]	6 [DCP]
b1-01 (reference)	6 [DCP]	1 [Control Circuit Terminal]	6 [DCP]	6 [DCP]	6 [DCP]
F6-35	0 [Node ID]	0 [Node ID]	0 [Node ID]	0 [Node ID]	2 [Node ID]
F6-36	6 [500 kBaud]	6 [500 kBaud]	6 [500 kBaud]	6 [500 kBaud]	5 [250 kBaud]
H3-02	0 [Frequency Bias]	0 [Frequency Bias]	1F [not used]	1F [not used]	1F [not used]
H5-02	5 [38400 Baud]	3 [9600 Baud]	5 [38400 Baud]	5 [38400 Baud]	3 [9600 Baud]
H5-11	1 [Enter Cmd not necessary]	0 [Enter Command necessary]	1 [Enter Cmd not necessary]	1 [Enter Cmd not necessary]	1 [Enter Cmd not necessary]
S4-01	3 [Advanced]	0 [Disabled]	3 [Advanced]	3 [Advanced]	0 [Disabled]

Note:

1. Parameter values are set to default when *H5-13* is changed.
2. Do a power cycle after you switched *H5-13 ≠ 1* or after you switched back to *H5-13 = 1* to let the new *H5-02* setting take effect.
3. When *H5-13 = 4*, *S4-01* is not shown.

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■ Added Standard Parameter Dependencies (Defaults)

H5-13 = x	0	1	3	4	5	3, 4	0, 1, 5
Parameter	Default Value					Parameter Texts	
C1-01	3.00 s	1.50 s	3.00 s			-	-
C1-02	3.00 s	1.50 s	3.00 s			-	-
d1-01	0.00 %		100.00 %		0.00 %	V4 Speed	Reference 1
d1-02	0.00 %		64.00 %		0.00 %	V3 Speed	Reference 2
d1-03	0.00 %		40.00 %		0.00 %	V2 Speed	Reference 3
d1-04	0.00 %					V1 Speed	Reference 4
d1-05	0.00 %					V7 Speed	Reference 5
d1-06	0.00 %					V6 Speed	Reference 6
d1-07	0.00 %					V5 Speed	Reference 7
d1-23	0.00 %		1.00 %		0.00 %	VN Speed	Releveling Speed
d1-24	50.00 %		25.00 %		50.00 %	VI Speed	Inspect Oper Spd
d1-26	8.00 %		4.00 %		8.00 %	V0 Speed	Leveling Speed

■ Changes of Standard Digital Input Multi-Functions (DIMF)

DIMF Availability by H5-13 Setting

H1-xx Setting (Hex)	Function Name	H5-13 = 0, 1	H5-13 = 3 [DCP3]	H5-13 = 4, 5 [DCP4, CANopen-Lift]
3 ... 5	Multi-Step Speed Reference 1~3	Available	Not available	Not available
6	JOG Reference Selection			
7	Accel/Decel time selection		Available	
16	Motor 2 Selection		Not available	
1A	Accel/Decel Time Selection 2		Available	
50	Nominal Speed		Not available	
51	Intermediate Speed			
52	Releveling Speed			
53	Leveling Speed			
54	Inspection Operation			
57	High Speed Limit (Up)			
58	High Speed Limit (Down)			
5C	Floor Sensor		Available	

When *H5-13 ≥ 3*, values and defaults of the parameters *H1-03 to H1-07* are set to *0xF [not used]*.

■ Changes of Standard Digital Output Multi-Functions (DOMF)

DOMF Availability by H5-13 Setting

H2-xx Setting (Hex)	Function Name	H5-13 = 0, 1	H5-13 = 3, 4, 5
1C (11C)	Motor 2 Selection	Available	Not available

DOMF Availability by S4-01 Setting

H2-xx Setting (Hex)	Function Name	S4-01 < 3	S4-01 = 3
55 (155)	Light Load Direction Detection Status	Available	Not available

Note:
S4-01 is not shown when *H5-13 = 4*. In this case, the value for *H5-13* is set to *3* internally.

Added DOMF

H2-xx Setting (Hex)	Operator Display	Description	Available in Control Method
70 (170)	In Position	The lift car has reached the commanded target position within *S7-01* bandwidth for a minimum continuous time of *S7-02*	CLV, PMCLV

■ Changes of Standard Analog Input Multi-Functions (AIMF)

AIMF Availability by H5-13 Setting

H3-xx Setting (Hex)	Function Name	H5-13 = 0, 1	H5-13 = 3, 4, 5
0	Speed Reference Bias	Available	Not available
2	Auxiliary Speed Reference 1		
3	Auxiliary Speed Reference 2		

When *H5-13 ≥ 3*, value and default of parameter *H3-02* are set to *0x1F [not used]*.
When *H5-13 ≥ 3*, default of parameter *H3-10* is set to *0x1F [not used]*.

■ Added Faults and Modified Errors

Added DCP Faults

Fault	Fault Code (Hex)	Fault Display	Description	Cause	Countermeasure
DCE1	61	DCP CRC Error	Drive Control Position Cyclic Redundancy Check Error A CRC8 check failed 10 times consecutively during RUN.	EMC, bad serial link	Shield serial link. Check serial RS-485 connection (Termination Resistance switched by S2).
DCE2	62	DCP Init Error	Drive Control Position Initialization Error A Run command was given although no valid initialization command ('I','1') was received.	EMC, bad serial link	Check if lift controller sends valid initialization command.
DOE1	63	DCP OPE	Drive Control Position Operation Error A Run command was given although the inverter was in Alarm state.	Alarm	Remove alarm condition. Lift controller must not give Run during Alarm state.

Modified oPE Errors

Error	Description	Cause	Countermeasure
oPE18	DCP3, DCP4, CANopen Lift: If b1-01 is set to 6 "DCP" and b1-02 is set ≠ 6 or vice versa, oPE18 is shown.	b1-01 = 6 AND b1-02 ≠ 6 b1-02 ≠ 6 AND b1-02 = 6	Set b1-01 = 6 AND b1-02 = 6

Modifications of FREF Menu Texts

Menu Text	Display		Displayed when	Description
	Active Speed (Command by Lift Controller	Message Text		
ME-01	V0	FreqRef(DCP-V0)	b1-01 = 6	DCP sequence is activated (also used for CANopen Lift) VN: Releveling speed VI: Inspection speed VF: Fast Start speed (0Hz)
	V1	FreqRef(DCP-V1)		
	V2	FreqRef(DCP-V2)		
	V3	FreqRef(DCP-V3)		
	V4	FreqRef(DCP-V4)		
	V5	FreqRef(DCP-V5)		
	V6	FreqRef(DCP-V6)		
	V7	FreqRef(DCP-V7)		
	VN	FreqRef(DCP-VN)		
	VI	FreqRef(DCP-VI)		
	VF	FreqRef(DCP-VF)		
	undefined	FreqRef(DCP)		
ME-01	FreqRef(CANLift)		H5-13 = 5	CANopen Lift uses DCP sequence internally. Differentiation is done by H5-13.

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◆ Positioning

■ Velocity Profile Input Control

Taking *Ramping Times [C1-01, C1-02]* and *Jerk Settings [C2-01 to C2-04]* of the drive into account, a suitable velocity profile is determined which matches the remaining distance and which does not exceed the limiting DCP speed. The limiting DCP speed is transferred by the lift controller to the drive before the travel starts.

Besides the velocity profile input control, a shaft controller aligns the traveled distance based on motor PG with the lift car position based on shaft PG. In order to reduce the control effort for the shaft controller, *o1-20*, *o1-21*, and *o1-22* settings must be accurate. It is especially recommended to set *o1-20* as exact as possible (rope-center to rope-center value).

As mentioned before, an optimal setting of *o1-20* greatly improves positioning performance. A coarse tuning at the beginning of commissioning is usually done by comparing the lift speeds shown by lift and drive controller. In this case, the lift car is typically moved in inspection speed. When the lift controller shows higher speeds than the drive, *o1-20* setting needs to be lowered; when it shows slower speeds, increase *o1-20*.

■ Shaft Controller Tuning

The shaft controller compares the remaining distance to travel with the remaining distance based on motor PG. In some cases, especially with high pulse count PGs, it is necessary to reduce the *Shaft Controller Output Gain [S7-13]*.

◆ Adjustment Procedures

General Tuning Requirements for Profile Position Mode

1. Select Drive control method (CLV or PM CLV; requires pulse counter (PG) feedback).
2. Perform Auto-tuning.
3. Set *H5-13 = 4* (profile positioning is performed with setting 4).
4. When you use a lift controller from Böhnke & Partner or from Kollmorgen, set *S7-40 = 0*. If you use a lift controller from any other manufacturer, set *S7-40 = 1*.
5. Tune complete ASR, i.e. *C5-01/C5-03/C5-13, C5-02/C5-04/C5-14*.
   It is very important to have a fast ASR response time in order to obtain good leveling results. This is mainly achieved when *C5-02/C5-04/C5-14* have low values (< 100ms). Higher *C5-01/C5-03/C5-13* values (ASR gains) are also recommended.
6. Set *o1-20*, *o1-21*, *o1-22* values, especially *o1-20*, as precise as possible (set the sheave diameter from rope-center to rope-center if possible).
7. Compare speeds of lift controller and drive controller using inspection speed.
   These values should be similar with a tolerance of about 3%. If deviations are bigger, adjust *o1-20*.
   Recommendation: Switch drive controller units to m/s (*o1-03 = 4*).
8. Perform a DCP4 positioning travel one floor up or down.

■ Shaft Controller Tuning

The shaft controller compares the remaining distance to travel with the remaining distance based on motor PG. Usually, you do not need to tune this function. But in case of high PG-PPR values, the shaft controller output gain *[S7-13]* should be reduced.

■ Optional: Zero-Servo Tuning

The last bit of the distance (1 to 3 mm) during a positioning operation can be performed by the Zero-Servo controller. Its properties are governed by *S3-xx* parameter group. With higher gain settings (*S3-03 [Stop Position Lock Gain]*), the remaining leveling error is driven by a quick movement which can be undesired.

The remaining distance after deceleration by ASR controller (end of *C2-04* time) is fed into the Zero-Servo function at that threshold. The maximum speed during that correction can be limited by *S3-05*. With slower speeds, the correction takes longer but possibly yields a higher riding comfort and is less discernible. A compromise has to be found. To avoid any roll-back at stop, set *S3-05 = 0*.

7 CANopen Lift

Yaskawa CANopen Lift implementation refers to CiA-417: Profile for Lift Control Systems. Supported operation modes are Profile Velocity mode and Profile Position mode. The Yaskawa CANopen Lift fieldbus option card SI-L3 is required.

To enable CANopen Lift functionality, set parameter *H5-13 = 5*, *b1-01* and *b1-02 = 6*, and perform a power-cycle. Some parameters will be changed automatically. Refer to *Added Standard Parameter Dependencies (Defaults) on page 62*.

Parameter groups are commonly used in CANopen Lift and in DCP mode. Therefore the following descriptions refer to DCP parameter and monitor tables.

◆ Characteristics of CANopen Lift Interface

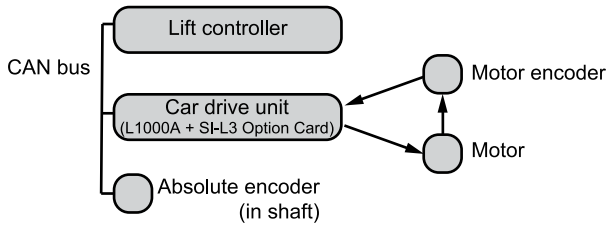

Figure 7.1 Connection Using CANopen Lift

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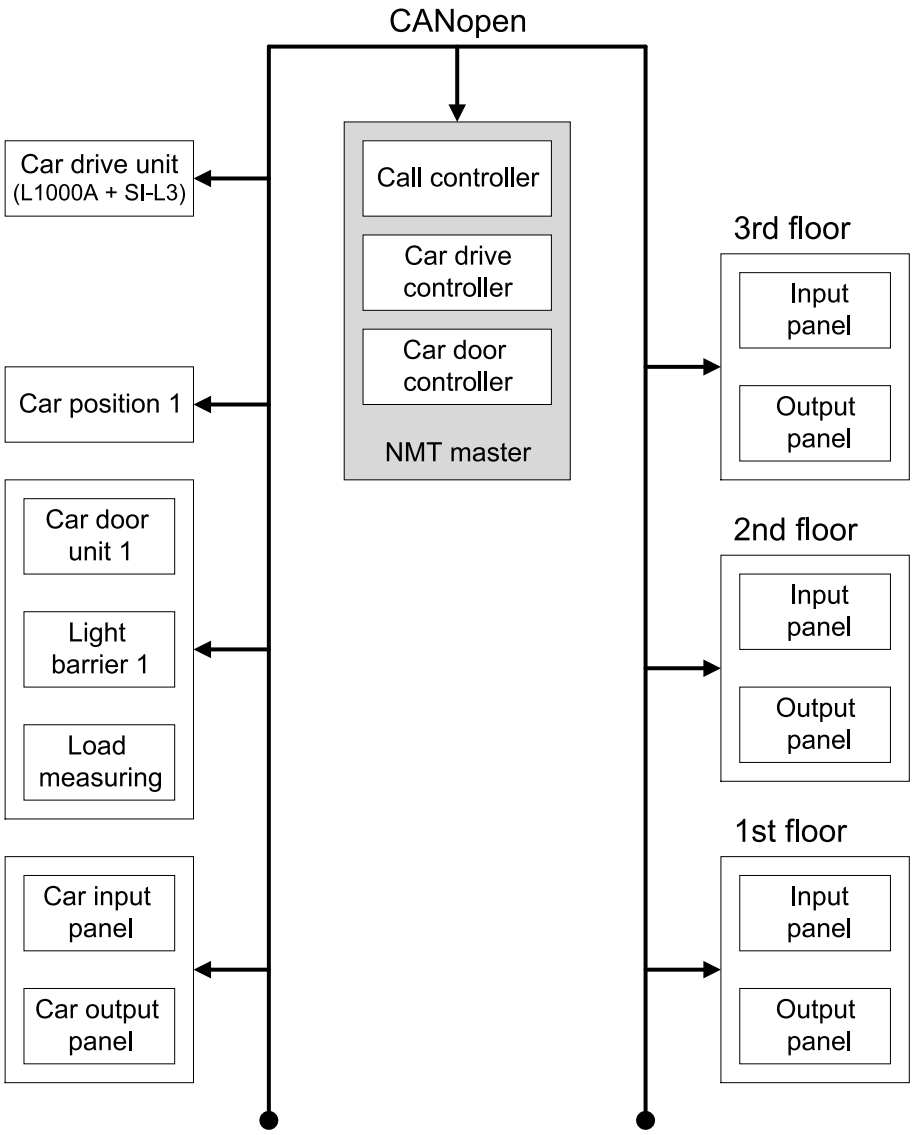

Figure 7.2 Example For a Single Network Architecture For a Single-shaft Lift Control System

The L1000A together with the SI-L3 option card is a car drive unit and moves the car upwards and downwards. It receives the motion commands from the car drive controller. It is based on the CANopen profile for drives and motion control (see IEC61800-7-201 and IEC61800-7-301). There are some additional objects required for lift applications that are not specified in IEC61800-7-201. If there is no absolute encoder supported, the target velocity (Refer to *6430 (Hex): Target Velocity on page 72*) is provided to the car drive unit using the Profile Velocity Mode. If there is an absolute encoder available, the target position (Refer to *6420 (Hex): Target Position on page 72*) is provided to the car drive unit using the Profile Position Mode. The operation mode is selected by the modes of operation (Refer to *6403 (Hex): Modes of Operation on page 71*).

In case of velocity controlled drives, the Profile Velocity Mode is used. The objects for the velocity profile are stored in the drive unit and may be configured by the lift controller. Due to safety reasons, configuration is not possible in Operation Enable state of the car drive unit. The car drive unit state machine is controlled by the control word (Refer to *6400 (Hex): Control Word on page 70*) and depends on the internal status of the drive unit. Drive-specific functions such as motor relays are operated locally in the drive unit or in the lift controller. *Target velocity ≠ 0* determines motion while Operation Enabled status is active. The sign of target velocity indicates direction; positive values indicate upward motion of the car. The drive unit indicates reaching the target velocity in the 10th bit of the status word (Refer to *6401 (Hex): Status Word on page 70*).

In case of position controlled drives the Profile Position Mode should be used. To configure the ramps and S curves the same parameters as for velocity mode are used. After setting a new position, the drive unit calculates the curve and starts motion. During motion the drive controller may change target position. If the control effort allows stopping at the new target position, this is indicated in bit 12 of the status word. If the drive cannot stop at

the new target position, the drive unit moves to the previous target position. Travel completion is indicated in bit 10 of the status word.

◆ Added and Modified Parameters, Monitors, Dependencies, Functions, and Faults

■ Added Standard Parameters

Parameter	Operator Display	Content	Value Range	Default Value
F6-95	Min level diff	Minimum level difference. Sets the upper limit for the traveling distance which is drive-internally commanded per step even if the controller issues bigger distances in one step.	0 ... 10000 mm (0.00 ... 393.70 in) *1	500 mm (19.69 in) *1

Usually, there is no need to change this parameter.

*1 Values not in parentheses apply when *o1-12 = 0*. Values in parentheses apply when *o1-12 = 1*.

■ Added Standard Parameter Scroll Items

Refer to *Added Standard Parameter Scroll Items on page 57*.

■ Modified Standard Parameters

Refer to *Modified Standard Parameters on page 57*.

■ Added Standard Monitors

Refer to *Added Standard Monitors on page 59*.

■ Modified Standard Monitors

Refer to *Modified Standard Monitors on page 59*.

■ Added Standard Parameter Dependencies (Defaults)

Refer to *Added Standard Parameter Dependencies (Defaults) on page 62*.

■ Changes of Standard Input and Output Multi-Functions

Refer to *Changes of Standard Digital Input Multi-Functions (DIMF) on page 62*, *Changes of Standard Digital Output Multi-Functions (DOMF) on page 62*, *Changes of Standard Analog Input Multi-Functions (AIMF) on page 63*.

■ Added Faults and Modified Errors

Added CANopen Lift Faults

Fault	Fault Code (Hex)	Fault Display	Description	Cause
CLoE	68	CLoE	CANopen Lift Operation Error	• Speed limit (obj. 6423h) is set to 0 during position mode travel. • A position mode travel is commanded while a non closed-loop control mode is active. • Mode of operation change requested while in one of the states "ready to switch on", "switched on", or "operation enabled". • Position mode: the position data is invalid during the travel. • "Drive Ready" status disabled while in one of the states "ready to switch on", "switched on", or "operation enabled" (exception: no fault if control word bits 14 ("rcl") or 15 ("insp") are set) • "External Baseblock" command set or "Safe Torque Off" input terminals opened while in one of the states "switched on" or "operation enabled" (exception: no fault if control word bits 14 ("rcl") or 15 ("insp") are set) • Fast Start operation time-out • Status transition time-out • Control command time-out

Modified OPE Errors

Refer to *Added Faults and Modified Errors on page 63*.

Modifications of FREF Menu Texts

Refer to *Added Faults and Modified Errors on page 63*.

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◆ Object Dictionary

Table 7.1 Explanation of Data Types

Data Type	Explanation
UNS8	Unsigned 8 bit value
UNS16	Unsigned 16 bit value
UNS32	Unsigned 32 bit value
SINT8	Signed 8 bit value

Data Type	Explanation
SINT16	Signed 16 bit value
SINT32	Signed 32 bit value
String	Character String

■ Supported General Communication Objects

1000 (Hex): Device Type

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
1000	0	Device Type	RO	UNS32	0900 01A1

This object describes the type of device and its functionality.

Bit 0 - 15 : Device Profile Number (01A1 (Hex))

Bit 16 - 23 : Reserved

Bit 24 - 31 : Virtual Device Code (09 (Hex))

1001 (Hex): Error Register

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
1001	0	Error Register	RO	UNS8	0

This register shows the fault status of the device. If any errors occurs in the device, bit 0 (generic error) is set to one.

Bit 0 : Generic error

Bit 1 : Current

Bit 2 : Voltage

Bit 3 : Temperature

Bit 4 : Communication error (overrun, error state)

Bit 5 : Device profile specific

Bit 6 : Reserved (0)

Bit 7 : Manufacturer-specific

1003 (Hex): Pre-defined Error Field

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
1003	0	Number of errors	RW	0, 1	0
1003	1	Standard error field	RO	UNS32	0

This register provides the latest error that occurred in the drive and has been signalized via the Emergency object. Subindex 0 contains the number of errors.

The number of valid logged errors in sub index is 01 (Hex). Writing a 0 to subindex 0 resets the error field.

Note:

You can find a list of error codes in the *YASKAWA AC Drive Option CANopen Technical Manual Type SI-S3* (Document number SIEPC73060085).

1008 (Hex): Manufacturer Device Name

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
1008	0	Manufacturer Device Name	RO	String	SI-L3

This object displays the name of the connected option card.

1009 (Hex): Manufacturer Hardware Version

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
1009	0	Manufacturer Hardware Version	RO	String	1.10

Note:
1: Major hardware version
10: Minor hardware revision assigned during production

This object contains the option card hardware version.

100A (Hex): Manufacturer Software Version

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
100A	0	Manufacturer Software Version	RO	String	3201

This object contains the manufacturer software version.

Example: Software version number 3201

- 32: Bus type “CANopen Lift”
- 0: Major revision
- 1: Minor revision

1016 (Hex): Consumer Heartbeat Times

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
1016	0	Number of Supported Virtual Devices	RO	01 - 7F	2
1016	1	Consumer Heartbeat Times 1	RW	UNS32	0001 0BB8
1016	2	Consumer Heartbeat Times 2	RW	UNS32	0004 0BB8

Consumes the heartbeat from all CANopen devices in multiples of 1 ms.

Note:
The value ”0004 0BB8” means a *heartbeat time of 3000 ms* for *Node-ID 4*.

Bit 0 - 15 : Heartbeat Time
Bit 16 - 23 : Node-ID
Bit 24 - 31 : Reserved (0)

1017 (Hex): Producer Heartbeat Times

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
1017	0	Producer Heartbeat Times	RW	UNS16	03E8

Produces the heartbeat. The heartbeat time is given in multiples of 1 ms. Default value is 1 s (1000 ms = 03E8 (Hex)).

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1018 (Hex): Identity Objects

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
1018	0	Number of Entries	RO	0 - 4	1
1018	1	Vendor ID	RO	UNS32	0100 00E7

This object contains general information about the drive.

■ Supported General Application Objects

6008 (Hex): Specification Version

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6008	0	Specification Version	RO	UNS16	2222

This object contains the profile specification version, binary coded decimal code is used.

600A (Hex): Virtual Terminal Interface

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
600A	0	Number of Entries	RO	2	1
600A	1	Virtual Terminal Input	RW	UNS32	0
600A	2	Virtual Terminal Output	RO	UNS32	0

This object consists of four characters to transmit the sub-objects in MPDOs. The object can store characters, e.g. from a keypad, and can provide characters, e.g. for a display.

■ Supported Car Drive Objects

6383 (Hex): Position Value

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6383	0	Number of Entries	RO	0 - 4	1
6383	1	Position Unit 1	RW	UNS32	FFFF FFFF

This objects contains the position values measured by the car position units (shaft encoder increments).

6400 (Hex): Control Word

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6400	0	Control Word	RW	UNS16	0

This object indicates the received command controlling the drive.

Bit 0 : Switch on
Bit 1 : Enable voltage
Bit 2 : Quick stop
Bit 3 : Enable operation
Bit 4 : New set-point (only in profile Position Mode)
Bit 5 : Change set immediately (only in profile Position Mode, setting not required)
Bit 6 : Abs / rel (keep zero, relative position mode is not supported)
Bit 7 : Fault reset (Reset on rising edge)
Bit 8 : Halt (not used)
Bit 9 : Change on set-point (not used)
Bit 10 - 13 : Reserved (0)
Bit 14 : Emergency recall operation mode
Bit 15 : Car top inspection mode

6401 (Hex): Status Word

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6401	0	Status Word	RO	UNS16	0

This object provides the status of the drive.

Bit 0 : Ready to switch on
Bit 1 : Switched on
Bit 2 : Operation enabled
Bit 3 : Fault
Bit 4 : Voltage enabled

If bit 4 (voltage enabled) of the status word is 1, this indicates that high voltage is applied.

Bit 5 : Quick stop

If bit 5 (quick stop) of the status word is 0, this indicates that the drive is reacting on a quick stop request.

Bit 6 : Switch on disabled
Bit 7 : Warning

If bit 7 (warning) of the status word is 1, this indicate the presence of a warning condition. Warning is not an error or fault. The status is not being changed.

Bit 8 : Reserved

Bit 9 : Remote

If bit 9 (remote) of the status word is 1, this indicates that the control word is processed. If bit 9 is 0 (local), this indicates that the control word is not processed.

Bit 10 : Target reached

If bit 10 (target reached) of the status word is 1, this indicates that the set-point has been reached. This means: In profile Velocity Mode, the set speed reference is reached.

In profile Position Mode, the travel is completed.

In profile Position Mode, the bit is also set at travel completion if the set-point is not reached.

Bit 11 : Internal limit active

If bit 11 (internal limit active) of the status word is 1, this indicates that an internal limit is active.

Possible reasons: invalid speed command, invalid position set-point, invalid position, position mode travel completed (bit 10 set) but position set-point not reached.

Bit 12 : Set-point acknowledge (profile Position Mode) / Speed (profile Velocity Mode)

Profile Position Mode: Set-point acknowledge.

Profile Velocity Mode: Zero Speed.

Bit 13 : Following error (profile Position Mode) / Max. slippage error (profile Velocity Mode)

Profile Position Mode: Excessive deviation between remaining distance calculation and shaft encoder data.

Profile Velocity Mode: Speed Deviation (*dEv*) alarm active.

Bit 14 - 15 : Not used

6403 (Hex): Modes of Operation

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6403	0	Modes of Operation	RW	01, 03	01

This object shows the value of the requested operation mode. The actual operation mode of the drive is reflected in the object modes of operation display.

If...	then...
Object 6403 (Hex) = 01 (Hex)	Profile Position Mode
Object 6403 (Hex) = 03 (Hex)	Profile Velocity Mode

If the controller requests profile Position Mode while this is not possible, 6404 (Hex) will remain in profile Velocity Mode.

6404 (Hex): Modes of Operation Display

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6404	0	Modes of Operation Display	RO	01, 03	01

This object provides the actual operation mode.

If...	then...
Object 6404 (Hex) = 01 (Hex)	Profile Position Mode
Object 6404 (Hex) = 03 (Hex)	Profile Velocity Mode

6406 (Hex): Control Effort

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6406	0	Control Effort	RO	SINT32	0

This object contains the position where to start braking, as absolute value.

641F (Hex): Position Conversion

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
641F	0	Number of Entries	RO	2	2
641F	1	Number of Position Units	RW	UNS32	0
641F	2	Total Length in Millimeter	RW	UNS32	0

This object contains the conversion coefficients to convert the target position from the drive controller and the position value from the position device into millimeters (mm).

Note:

To enable correct operation, this object must be configured by the drive controller.

6420 (Hex): Target Position

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6420	0	Target Position	RW	SINT32	0

This object indicates the commanded position that the drive should move to in profile position mode. The value of this object must be set in terms of shaft encoder increments.

Note:

When you want to command a new position setpoint, you must use the control word bit 4 “New setpoint”.

6421 (Hex): Position Range Limit

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6421	0	Number of Entries	RO	UNS8	2
6421	1	Min Position Range Limit	RW	SINT32	0
6421	2	Max Position Range Limit	RW	SINT32	0

This object indicates the configured maximum and minimum position range limits. This object limits the numerical range of the input value. A position command which exceeds these limits is ignored. The "setpoint acknowledge" bit in the status word is not set. The values are given in terms of shaft encoder increments. Make sure the values meet the condition *Min Position Range Limit* < *Max Position Range Limit*.

6423 (Hex): Profile Velocity

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6423	0	Profile Velocity	RW	UNS32	0

This object sets an upper limit for the speed which is used in Profile Position Mode. The maximum speed in a Profile Position Mode travel may fall below the set value but may not exceed it. The value is given in multiples of 1 mm/s.

Note:

The speed is limited to the value defined with parameter *E1-04*.

6430 (Hex): Target Velocity

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6430	0	Target Velocity	RW	SINT32	0

This object indicates the configured target velocity, and is used in Profile Velocity mode. The value is given in multiples of 1 mm/s.

Note:

The speed is limited to the value defined with parameter *E1-04*.

6433 (Hex): Velocity Actual Value

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
6433	0	Velocity Actual Value	RO	SINT32	0

In Closed Loop control methods, this object provides the actual velocity value derived either from the velocity sensor or the position sensor. In *Open Loop Vector [A1-02 = 2]* or *V/f [A1-02 = 0]* control methods, it is based on drive internal calculations. The value is given in multiples of 1 mm/s.

67FE (Hex): Byte Dummy

Index (Hex)	Sub	Content	Access	Range	Initial Value (Hex)
67FE	0	Byte Dummy	RO	UNS8	FF

This object is used to fill one byte into a TPDO.

■ Receive PDOs

PDO Number	Receive PDO Parameter		Receive PDO Mappings	
	COB-ID (Hex)	Index (Hex)	Mapped Object (Hex)	Index (Hex)
259	182	1502	Sub-index 01: 6400 Sub-index 02: 6403 Sub-index 03: 0005 Sub-index 04: 6430	1702
261	180	1504	Sub-index 01: 6420 Sub-index 02: 6423	1704
263	18C	1506	Sub-index 01: 6383 sub1	1706

■ Transmit PDOs

PDO Number	Transmit PDO Parameter		Transmit PDO Mappings	
	COB-ID (Hex)	Index (Hex)	Mapped Object (Hex)	Index (Hex)
260	183	1903	Sub-index 01: 6401 Sub-index 02: 6404 Sub-index 03: 67FE Sub-index 04: 6433	1B03
262	181	1905	Sub-index 01: 6406	1B05

8 Ripple Compensation

◆ Overview

Only available for PM CLV control method.

This function is intended for use when compensating n*f torque ripple on the motor shaft.

■ Special Functions

Function	Description
Calculation of car inertia	The total car inertia (J) is calculated as follows: [System Inertia] = ([S8-08] + [S8-09] + [S8-10] + [S8-11] + [S8-12]/2) * ([o1-20] / 4000)^2 J = [S8-04] + [S8-06] + [S8-07] + [System Inertia]

■ Function Description

Set the *Kt value [S8-02]* from motor data sheet or motor name plate.

Unit of Kt is *Nominal Torque [Nm] / Nominal Current [A]*.

■ Example

Elevator					
Parameter		Symbol	Value	Unit	Value from:
S8-08	Weight Cage	m_{Car}	1050	kg	Lift builder
S8-09	Weight Counter Weight	m_{Cwt}	1550	kg	Lift builder
S8-10	Weight Rope	m_{Rope}	70	kg	Lift builder

Elevator					
Parameter		**Symbol**	**Value**	**Unit**	**Value from:**
S8-11	Weight Pulley	m_{Pulley}	20	kg	Lift builder
S8-12	Maximum Load Weight	m_{Load}	0	kg	Lift builder

Motor: MSYP160					
Parameter		**Symbol**	**Value**	**Unit**	**Value from:**
S8-04	Motor Inertia	J_{Mot}	1.110	kgm^2	Motor manufacturer
S8-06	Pulley Inertia	J_{Pulley}	0.375	kgm^2	Lift builder
S8-07	Sheave Inertia	J_{Ts}	0.500	kgm^2	Motor manufacturer
	Roping Ratio		2:1	-	Motor manufacturer
	Rated Speed		1	m/s	Motor manufacturer
o1-20	Sheave Diameter		Ø 240	mm	Motor manufacturer

$J = (1050 + 1550 + 70 + 20 + 0/2)\ kg * ((240 / 4000)\ mm)^2 + 1.110\ kgm^2 + 0.375\ kgm^2 + 0.500\ kgm^2$
$J = 11.669\ kgm^2$

◆ Added Parameters for Ripple Compensation

Only available for PM CLV control method.

Table 8.1 Added Parameters

Parameter	MEMOBUS Address (Hex.)	Operator Display *[Parameter Name]*	Description	Range [Default]
S8-01	620	Ripple Compens. *[Activate Ripple Compensation]*	**0 : Disable** **1 : Enable**	0, 1 [0]
S8-02	621	Kt value	Set the Kt value (Torque parameter) in Nm/A. Unit of Kt is Nominal Torque [Nm] / Nominal Current [A].	0.00 - 200.00 [1.00]
S8-03	622	Tripple gain	Set the T_{ripple} gain	0.00 - 20.00 [0.30]
S8-04	623	Set mtr inertia *[Jm (motor inertia)]*	Set the motor inertia in kgm^2	0.000 - 60.000 [0.000]
S8-06	625	Set pull inertia *[Jm (motor inertia)]*	Set the pulley inertia in kgm^2	0.000 - 60.000 [0.000]
S8-07	626	Set shv inertia *[JST (sheave inertia)]*	Set the sheave inertia in kgm^2	0.000 - 60.000 [0.000]
S8-08	627	Weight Cage	Set the weight of the cage in kg	0 - 60,000 [0]
S8-09	628	Weight Cweight *[Weight counter weight]*	Set the weight of the counter weight in kg	0 - 60,000 [0]
S8-10	629	Weight Rope	Set the weight of the rope in kg	0 - 60,000 [0]
S8-11	62A	Weight Pulley	Set the weight of the pulley in kg	0 - 60,000 [0]
S8-12	62B	Max Load Weight *[Maximum Load Weight]*	Set the maximum load weight in kg	0 - 60,000 [0]

◆ Added Monitors for Ripple Compensation

Only available for PM CLV control method.

Table 8.2 Added Monitors

Monitor	MEMOBUS Address (Hex.)	Operator Display *[Parameter Name]*	Description	Analog Output Scaling
U4-60	862	RippleMon [%/Tn]	Estimated ripple [100%/Tn] in 0.1%.	10 V: 100% Nominal Torque *1
U4-61	863	Ripple Mon [N]	Estimated ripple [0.1 Nm] in 0.1 Nm.	-

*1 Nominal torque is based on E1-06, E5-02, and E5-04.

9 Replacement Instructions for Smart Controller Drives

The following describes how to replace the drive in Schindler Smart controllers with a YASKAWA L1000A AC drives for Lift. This solution has been developed to replace drives used in Smart MRL 001 / 002 controllers.

◆ Requirements

The L1000A can almost directly replace existing drives. The only additional component needed is an external relay to control the brake.

YASKAWA recommends a relay from the 46.52 series made by Finder. When other relays are used it should be selected so that the excitation current of the coil does not exceed the specifications of the output M2 on the L1000A drive. Generally the relay should be selected so that the excitation current is as low as possible.

Figure 9.1 Finder Relay

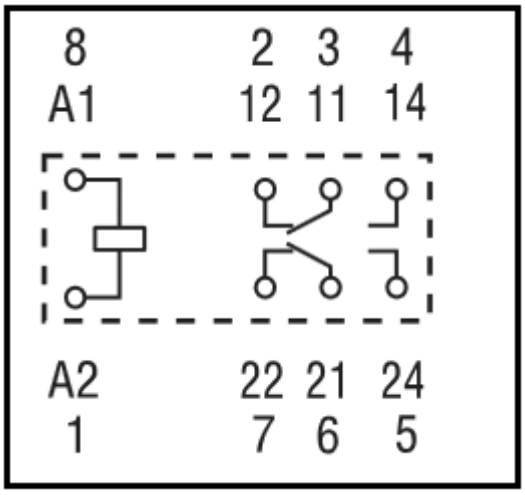

Figure 9.2 Circuit of the Relay

Table 9.1 DC Coil Data

Nominal Voltage	Coil Code	Operating Range		Resistance	Rated Coild Consumption
U_N [V]		U_{min} [V]	U_{max} [V]	R [Ω]	I at U_N [mA]
24	9.024	17.5	26.4	1,200	20

◆ Wiring of the L1000A AC Drive for Lift

The following figure shows the wiring between the controller (connector XFCL) and the drive terminals.

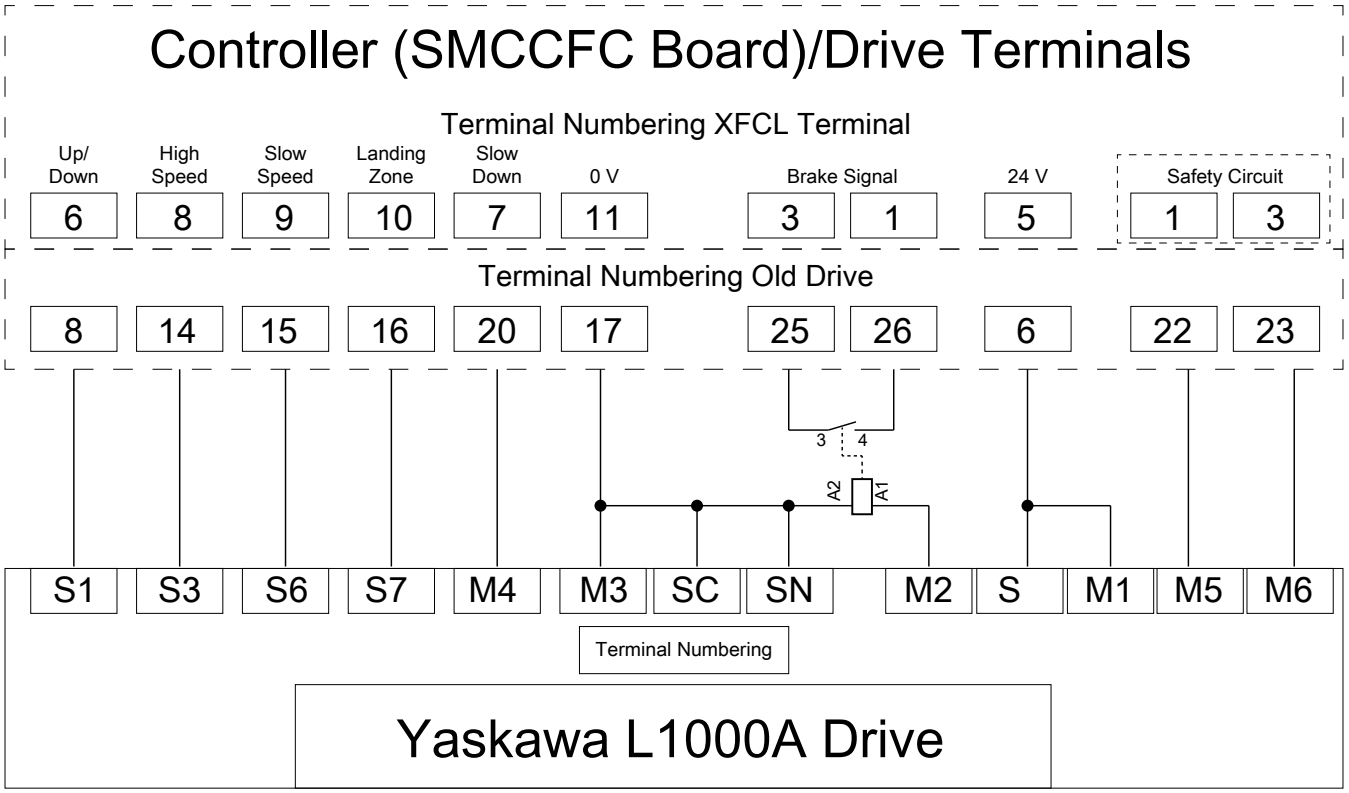

Figure 9.3 Wiring Between Controller and Drive Terminals

The following table summarizes the terminal connections in the old and new configurations.

Table 9.2 Terminal Connections

Controller SMCCFC Terminal	Vacon Drive Terminal	YASKAWA L1000A Terminal	Brake Relay	Function
-		M2	A1	Connection for Brake Relay
1	26	-	4	
3	25	-	3	
5	6	SP, M1	-	-
6	8	S1	-	Direction / Run
7	20	M4	-	-
8	14	S3	-	Nominal / Fast Speed
9	15	S6	-	Inspection / Leveling
10	16	S7	-	Landing Zone
11	17	SC, SN, M3 A2 (Relay Coil)	-	Connection for Brake Relay
1	22	M5	-	Safety Circuit
3	23	M6	-	

◆ Start Up

After wiring, power on the drive and follow these steps

1. Enter the programming mode of the L1000A.
2. Set parameter *d1-18 = 4 [Smart Replacement]*.
   This operation sets I/Os to operate with the Smart controller.
3. Set drive parameters.
   With this step, you enter motor data to the drive.

Table 9.3 Motor Nameplate (Example)

U = Δ / Y 400 ΔV	f = 33 Hz	cos φ 0,85
P = 6.7 kW	I = 13.5 A	RPM = 950 min^{-1}
		Starting Torque = TA/TN 2.75
S5 240, F/h 50 % ED		Inertia = I mot 0,32 kgm^2
IEC34 - 1	Protection degree = IP21	Insulation = KI F

Table 9.4 Recommended Parameters (Example)

Parameter No.	Parameter Name	Setting Value
E1-04	Maximum Output Frequency	33 Hz *1
E1-05	Maximum Voltage	400 V *1
E1-06	Base Frequency	33 Hz *1
E1-09	Minimum Output Frequency	0.1 Hz *1
E2-01	Motor Rated Current	13.5 A *1
E2-02	Motor Rated Slip	1.30 Hz *1
E2-03	Motor No Load Current	6 A *1
E2-11	Motor Rated Power	6.7 kW *1
S1-07	Brake Close Delay Time	0.3 s
S1-10	Run Command Delay Time	0.4 s
S6-02	Starting Current Error (SE2) Detection Delay Time	500 ms
S6-03	SE2 Detect Current Level	35 %
S6-04	Output Current Error (SE3) Detection Delay Time	500 ms

*1 According to the (Example) Motor Nameplate.

4. Enter the Auto-Tuning menu.
5. Set parameter *T1-01 = 2 [Stationary Auto-Tuning for Line-to-Line Resistance]*.
6. Enter the nameplate data in the Auto-Tuning menu.
   - T2-02 = Motor Power (kW)
   - T2-04 = Motor Current (Amps)
7. After entering the data listed on the motor nameplate, press the UP-button until the following message is displayed: “0.00 Hz/0.00 A Tuning Ready? Press RUN key”.

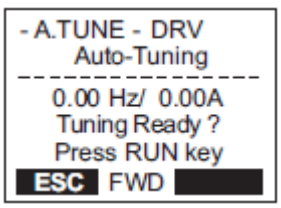

Figure 9.4 Tuning ready?

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8. Make sure the motor contactors SR-D and SH-1 or SR-U and SH-1 are closed before starting the Auto-Tuning procedure.

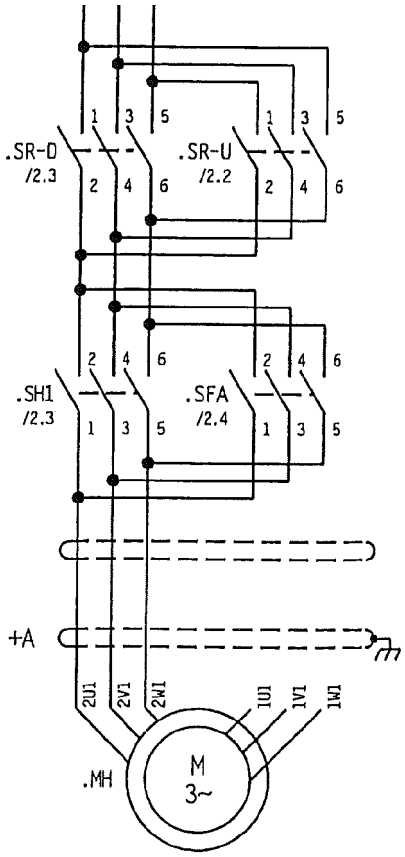

Figure 9.5 Motor Contactors

9. Press the RUN-button to start the Auto-Tuning procedure. The message “Tune Proceeding” is displayed.

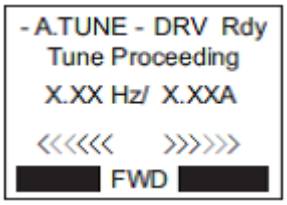

Figure 9.6 Auto-Tuning Proceeding

The drive begins by injecting current into the motor for about 1 minute.
The tuning process is completed, as soon as the drive displays the message “End Tuning Successful”.

10. Open the motor contactors.

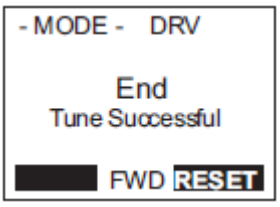

Figure 9.7 Tune Successful

Now the system is ready to run in normal operation.

11. Fine tune acceleration and jerk using the following parameters.

Parameter Value	Description
C1-xx	Acceleration
C2-xx	Jerk

The system will start with the learning run. This sequence is done by the controller without intervention from the user.

10 Input Phase Loss Detection

The drive offers two different methods to detect a possible Input Phase Loss.

- Standard Input Phase Loss Detection
- dv/dt Method Input Phase Loss Detection

◆ Standard Input Phase Loss Detection

The drive evaluates the DC Bus voltage to detect Input Phase Loss. In intervals of 1 second, the drive determines the minimum and maximum DC Bus voltage. If the difference between minimum and maximum continuously exceeds a threshold value for 10 seconds, the drives considers an Input Phase Loss.

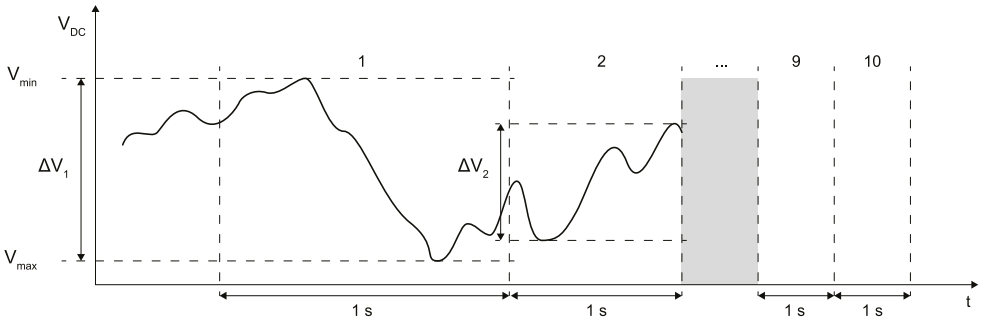

Figure 10.1 Standard Input Phase Loss with *L8-42 = 10* (Example)

■ Related Parameters

Use the following parameters to use and adjust Standard Input Phase Loss Detection. Parameters are available when *A1-01 = 2 [Access Level Selection = Advanced Access]*.

Parameter	Operator Display	Description	Value Range	Default Value
L8-06	Inp Ph Loss Lvl	Input Phase Loss Detection Level Defines the difference between the maximum and minimum values of the DC Bus ripple for detecting input phase loss. Default value for *L8-06* depends on drive model.	0.0 ... 50.0 %	Between 14 and 28 %.
L8-42	In Phase Loss T	Input Phase Loss Detection Time Sets the time for detecting input phase loss. *PF* fault is activated if the DC bus voltage ripple exceeds the value defined with *L8-06* for the time in seconds defined with *L8-42*.	0 ... 255 s	2 s

◆ dv/dt Method Input Phase Loss Detection

The dv/dt Method Input Phase Loss Detection can detect input phase loss immediately at start and before opening the brake. The drive evaluates the voltage deviation (ΔV/Δt), this means the drive evaluates the voltage change within a fixed small time frame (e.g. with a sampling time *Δt = 5 ms*). When the ΔV/Δt value exceeds a set negative threshold for a certain number of times, the drive detects an Input Phase Loss. The drive also detects negative values for ΔV/Δt to detect unusual voltage drops.

Set the ΔV/Δt threshold with *L8-70*. This setting is independent from speed and load.

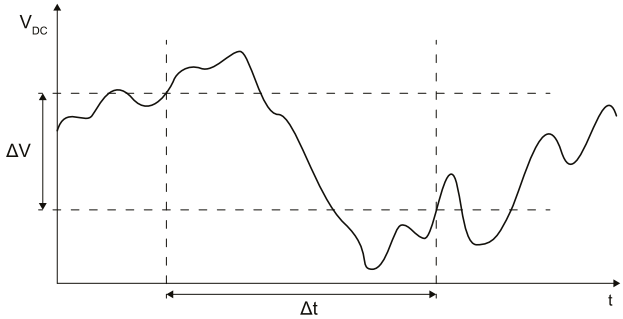

Figure 10.2 DC Bus Voltage ΔV/Δt Calculation (Example)

◆ Power-On dv/dt Threshold Tuning

When you set *L8-79 ≥ 100%*, the drive determines the value for *L8-70 [dv/dt Threshold]* during the first start after power-on. The drive will save the value after the travel has ended. During this first start, the dv/dt method Input Phase Loss Detection is disabled.

When you change *L8-79 [dv/dt Tuning Factor]* and confirm with Enter, the drive will determine the new value for *L8-70* during the next travel. The drive will save the value after the travel has ended.

The maximum dv/dt value during *S1-06 [Brake Release Delay Time]* is determined and saved. The drive calculates the new dv/dt value as *S1-06 × L8-79*. This value is only stored when it differs ±50 V/s from the existing setting of *L8-70*. When you set *L8-79 = 99%*, this tuning function is disabled, and L8-70 will not be modified.

◆ Input Phase Loss Detection Method Selection

Use *L8-05 [Inp Ph Loss Det]* to activate the Input Phase Loss Detection function.

Parameter (Hex.)	Operator Display	Description	Value Range	Default Value
L8-05 (04B1)	Inp Ph Loss Det	Input Phase Loss Detection Method Enables or disables the input phase loss detection. **0 : Disabled** Lift controller decides the direction with S1/S2 **2 : Enabled during operation** **6 : Standard + dv/dt** dv/dt @Start and Standard detection during RUN	0, 2, 6	2

◆ Further Modifications

■ Output Phase Loss Detection (OPLD)

OPLD During RUN :

The output phase loss detection function is modified to ensure that no false detections occur during RUN when the lift car is balanced.

OPLD at Start :

Parameter *L8-81* sets the injection current for PM motors in % dependent on the selected motor rated current. The threshold value for the phase loss detection is calculated and set to half of $|IU| = |IV|$ value. If one of the phase currents falls below this threshold for more than 100 ms, *LF* fault is triggered.

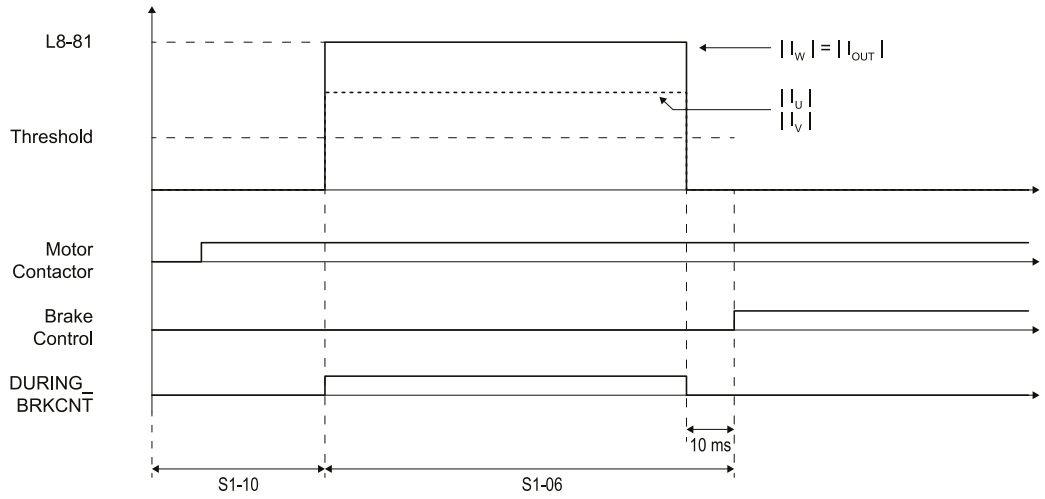

Figure 10.3 Output Phase Loss Detection Parameters and Timing During Injection

◆ Related Parameters and Monitors

■ Added Parameters

Parameter (Hex.)	Operator Display	Description	Value Range	Default Value
L8-05 (04B1)	Inp Ph Loss Det	Input Phase Loss Detection Method Enables or disables the input phase loss detection. **0 : Disabled** Lift controller decides the direction with S1/S2 **2 : Enabled during operation** **6 : Standard + dv/dt** dv/dt @Start and Standard detection during RUN	0, 2, 6	2
L8-65 (067B)	PF Min Current	PF Detection Minimum Current Level PF detection minimum current level; % of drive rated current. Used for both, standard method and dv/dt method (only during run, not evaluated for dv/dt detection method at start)	0.0 ... 100.0 %	10.0 %
L8-70 (066F)	Pf dv/dt Level	PF Detection Level Sets the DC bus dv/dt threshold value.	0 ... 10,000 V/s	2,500 V/s
L8-79 (067E)	dv/dt TuneFactor	dV/dt tuning factor Factor applied to the dv/dt value(s) which have been determined during tuning. The result is stored to the parameter(s) if tuning was completed successfully.	100 ... 200 %	105 %
L8-81 (067F)	OutPhLs PMInjCur	Output Phase Loss PM Injection Current Injection current for PM motor to detect output phase loss before the brake opens.	0 ... 50.0 %	5 %

■ Added Monitors

Monitor (Hex.)	Operator Display	Description	Analog Output Scaling (H4-xx selection)	Unit
U4-62 (085B)	PF dVdt ErrCount	PF detection error counter Shows a percentage value less than 100%. If the value is different to zero, there have been dv/dt threshold exceeding events. Upon reaching 100%, PF fault is triggered and the counter is reset to 0%. **Note:** Only applies for dv/dt Input Phase Loss detection method.	-	ms
U4-64 (0859)	PF Max dVdtValue	PF detection maximum dV/dt value Shows the maximum dv/dt value from the previous (or the current, while running) travel. The value is reset at start and only updated while the drive is running. When powering on (no previous travel), zero is shown. The value is shown as absolute maximum dv/dt value (the internal value is negative). The unit of this value is V/s but not shown in the operator. **Note:** Only applies for dv/dt Input Phase Loss detection method.	-	ms
U4-65 (085A)	PF dVdtValue	PF detection actual dV/dt value Shows the current dv/dt value with sign. The value unit is V/s but not shown in the operator. **Note:** Only applies for dv/dt Input Phase Loss detection method.	-	-

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11 Direct Landing 2

◆ Overview

When you activate Direct Landing, the drive decelerates within a fixed distance to the floor level while it does a positioning operation. You can define the distance to the floor, and also the frequency reference when Direct Landing is activated.

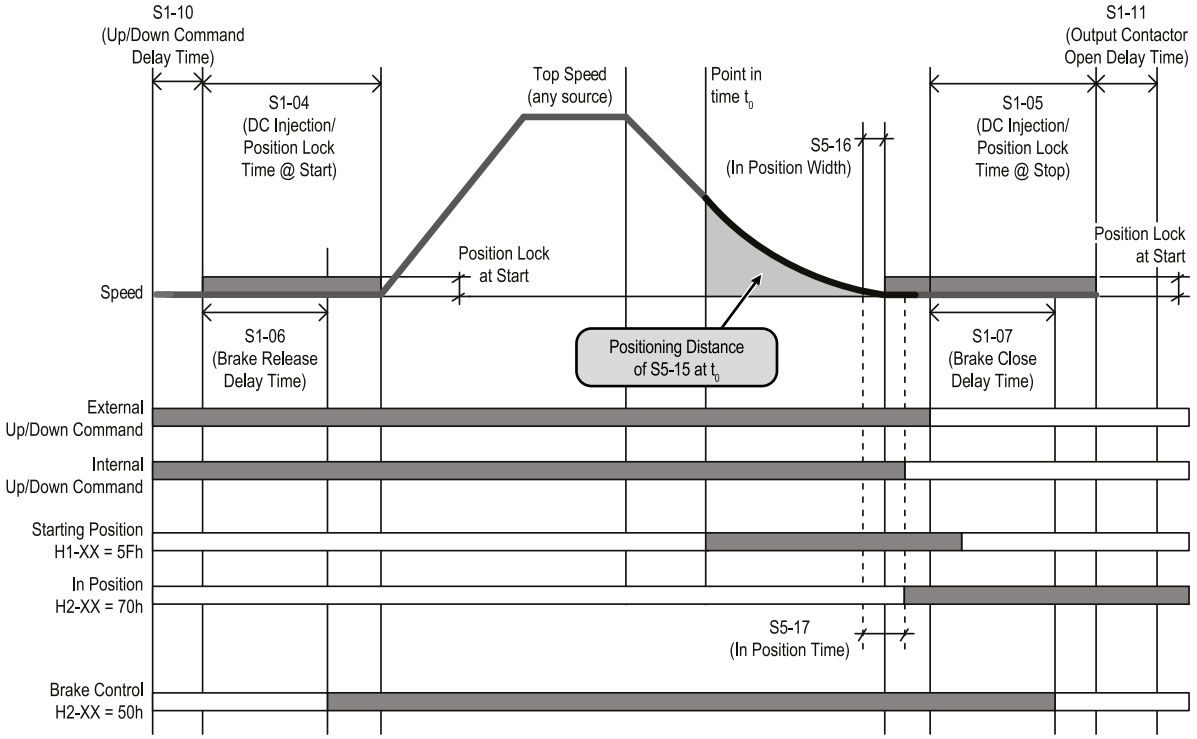


Figure 11.1 Direct Landing Positioning Sequence

■ C5-13 & C5-14 ASR Set Activation

When you activate the Direct Landing input Function via digital input *5Fh [Start Positioning]*, ASR set C5-13/ C5-14 becomes active (motor speed < *C5-07*).

■ Profile Selection for Direct Landing

Depending on the remaining *S5-15 [Positioning Distance]* at the time when digital input *5Fh [Start Positioning]* is activated, there are two profiles. One of them is selected automatically.

Profile 1 :

The time set in *C1-02* is adapted while *C2-04* is fully executed. This leads to a linear deceleration. This profile is selected when:

$$S_{TOT} > \frac{1}{2} C2\text{-}04 \times \left(\frac{v_6^2}{V_{TOP}} + \frac{1}{12} V_{TOP} \right)$$

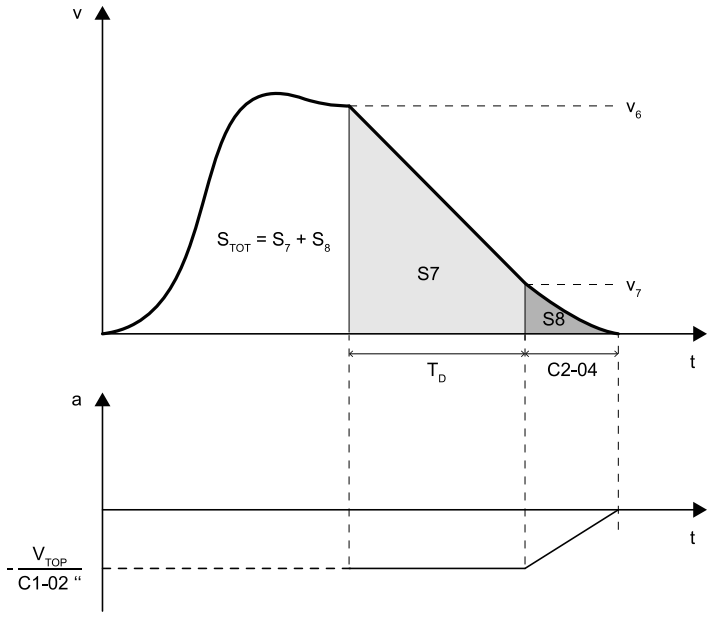


Figure 11.2 Profile 1: With Linear Deceleration

Profile 2 :

In this profile, *C1-02* and *C2-04* are adapted to match the position target. This profile is selected when:

$$S_{TOT} \leq \frac{1}{2} C2\text{-}04 \times \left(\frac{v_6^2}{V_{TOP}} + \frac{1}{12} V_{TOP} \right)$$

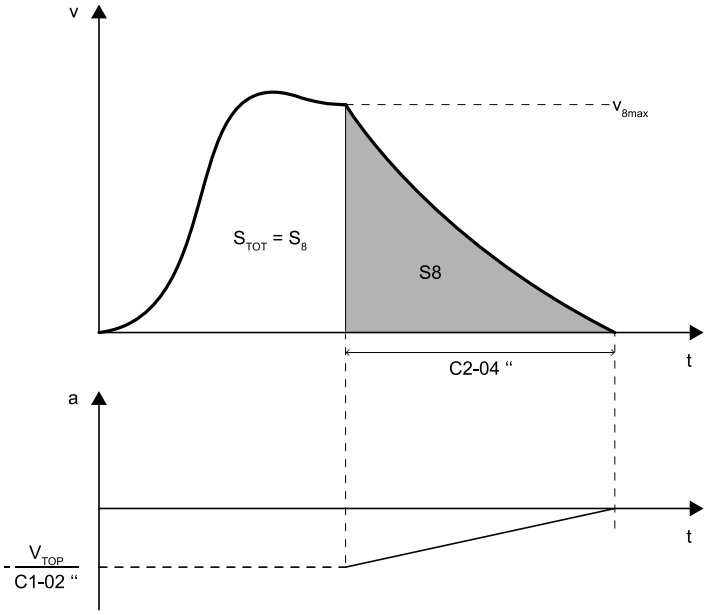


Figure 11.3 Profile 2: Without Linear Deceleration

◆ Related Parameters and Monitors

■ Added Parameters

Parameter (Hex.)	Operator Display	Description	Value Range	Default Value
S5-15 (06E1)	DL2 Pos Distance	Direct Landing 2 Positioning Distance After *5Fh* activation, the distance in *S5-15* is travelled until the drive stops. The external RUN command is switched off internally. For correct distances, set *o1-20, o1-21, and o1-22* correctly. **Note:** This parameter can be changed during RUN before the positioning command is given (DIMF *5Fh* activation) to account for intermediate calls.	0 ... 5000 mm (0.00 ... 196.85 in) *1*	100 mm (3.94 in) *1*
S5-16 (06E2)	DL2 In Pos Width	Direct Landing 2 In-Position Width If *U4-45 ≤ S5-16 [Remaining Distance ≤ DL2 In Pos Width]* for the time *S5-17 [DL2 In Pos Time]*, the drive sets the digital output *70h [In-Position]*.	0 ... 10 mm (0.00 ... 0.39 in) *1*	3 mm (0.12 in) *1*
S5-17 (06E3)	DL2 In Pos Time	Direct Landing 2 In-Position Time If *U4-45 ≤ S5-16 [Remaining Distance ≤ DL2 In Pos Width]* for the time *S5-17 [DL2 In Pos Time]*, the drive sets the digital output *70h [In-Position]*.	0.00 ... 5.00 s	0.60 s

*1 Values not in parentheses apply when *o1-12 = 0*. Values in parentheses apply when *o1-12 = 1*.

■ Added Standard Parameter Scroll Items

Parameter (Hex.)	Operator Display	Description	Value Range	Default Value
S5-10 (02C0)	Stop Method Sel	Stopping Method Selection Selects the stopping method: **0 : Speed Control** **1 : Direct Landing** **2 : Leveling Distance Control** **3 : Direct Landing 2**	0 ... 3	1

EN

■ Added Monitors

Monitor (Hex.)	Operator Display	Description	Analog Output Scaling (H4-xx selection)	Unit
U4-45 (084F)	DL2 Rem Distance	Direct Landing 2 Remaining Distance Shows the remaining distance after *5Fh* was activated. After the distance *S5-15* has been travelled, *U4-45* is set to *0*.	10 V: 5000 m (196.85 in) *1	0.001 m (0.01 in) *1

*1 Values not in parentheses apply when *o1-12 = 0*. Values in parentheses apply when *o1-12 = 1*.

■ Changes of Standard Digital Input Multi-Functions (DIMF)

H1-xx Setting (Hex)	Function Name	Description
5F	Direct Landing 2 Start	**S5-10 = 3 [Direct Landing 2 Start] :** When Digital Input *5Fh* is activated, the drive decelerates to stop within *S5-15* distance. The origin of the reference driven at the time of *5Fh* activation is arbitrary. The driven profile depends on the distance in *S5-15*.

■ Changes of Standard Digital Output Multi-Functions (DOMF)

H2-xx Setting (Hex)	Function Name	Description
70	In-Position	**S5-10 = 3 [Direct Landing 2 Start] :** The lift car has reached the commanded target position within *S5-16* bandwidth for a minimum continuous time of *S5-17*. The output becomes inactive when *5Fh* is activated again.
170	In-Position	Inverted value of setting *70*.

12 Travel Direction Change Counter

Some elevator ropes have a specified limit of bending changes before they must be replaced. You can use the function “Travel Direction Change Counter” (TDCC) to monitor and count the number of bending changes. You must set the value for the specified number of bending changes, then the drive will start counting down with each direction change. When the drive reaches the threshold you defined, the drive will show a warning to inform you. When the drive reaches the value 0, the drive completes the trip and then stops operation. Then you must replace the ropes and reset the counter to enable normal travel operation.

◆ Characteristics

The following example shows how to use the “Travel Direction Change Counter” (TDCC). The example is made up with the following assumptions:

- Parameter *o4-40 = 1* to activate TDCC.
- Terminal S1 is used for Up direction commands.
- Terminal S2 is used for Down direction commands.
- The alarm threshold *o4-41 [TDCC Alarm Level]* is set to *1*.
- The limit of bending changes is set to *4*.
- The direction changes with the first travel.

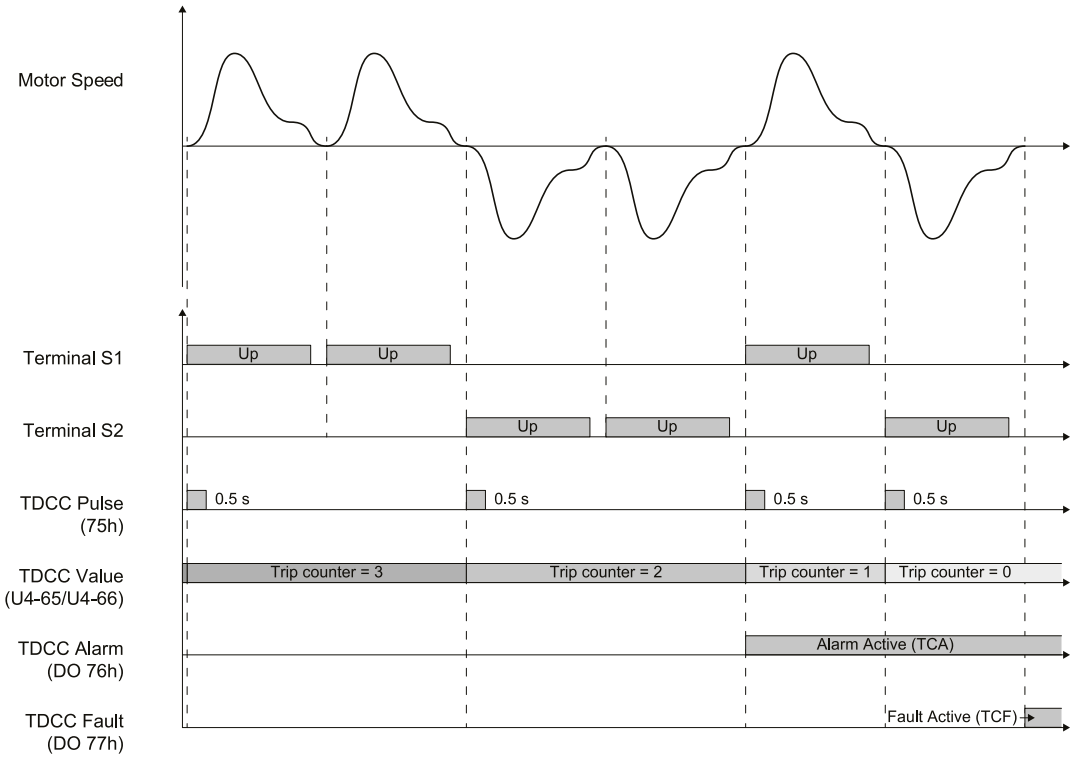


Figure 12.1 Travel Direction Change Counter

When *o4-40 = 1*, the TDCC value is reduced by 1 with each direction change. Subsequent travels in the same direction do not reduce the TDCC value. Inspection mode travels are also counted.

You can use the TDCC function only when you use analog frequency reference with direction given by digital terminal inputs, or when you use CANopen-Lift.

The TDCC value is stored permanently and will not be reset when you power-cycle the drive or on case of power failure.

When the *TDCC value ≤ o4-41 [TDCC Alarm Level]*, a *TDCC alarm* is output on DO function 76h. Lift travel operation will continue normally.

When the *TDCC value = 0*, a *TDCC fault* is output on DO function 77h. Lift travel operation will complete the current operation, and then stop. You can only do inspection travels.

When you want to use TDCC function and do not set a password, a *TDCC setup alarm* occurs.

Note:

When you set *o4-40 = 0*, you deactivate *TDCC alarm* and *TDCC setup alarm*.

When the *TDCC setup alarm* is active, the drive will not show a *TDCC alarm*.

Monitors *Total Dir Chg [U4-67, U4-68]* count all regular travels and inspection travels.

EN

■ Copy Protection

Parameters *o4-40 to o4-43 [TDCC Settings]* cannot be copied with any operator, copy unit or Drive Wizard.

This prevents you from accidentally using wrong data for remaining rope bending changes.

■ Password Loss

In case of a lost password, contact YASKAWA.

◆ Replacing a Drive

When you need to replace a drive, read out the values for *TDCC [U4-65, U4-66]*, *Total TDCC [U4-67, U4-68]*, and *TDCC Alarm Level [o4-41]* and document these values in the facility's maintenance log book.

Enter the last value of the counter and the TDCC Alarm Level from the replaced drive in the new drive with parameters *TDCC Alarm Level [o4-41]* and *TDCC Pres Value [o4-42]*.

Document the new drive's values for *TDCC Alarm Level [o4-41]* and *TDCC Pres Value [o4-42]* in the facility's maintenance log book, together with the information about the replacement.

If the new drive or the TDCC function has not been used before, the monitors will show "0".

Note:
- If o4-40 is active and you have not set a password, a *TCS alarm [TDCC Setup Alarm]* is present.
- During maintenance, log the values for *U4-64 to U4-68* and *o4-41* occasionally.
  If a drive brakes and cannot be powered on anymore, these values cannot be restored. In such a case, a person responsible for elevator safety must decide if ropes need to be replaced or if values can be estimated.

◆ Counter Reset

To reset the Travel Direction Change Counter (TDCC) after you replaced ropes, enter the limit of bending changes to *TDCC Pres Value [o4-42]*. The value entered is in thousands, e.g. when you enter '1' it means 1000 direction changes are allowed.

When you entered the value, the monitors *Rem Dir Chg [U4-65, U4-66]* will be updated, and *04-42* will be reset to *0*.

◆ Related Parameters and Monitors

■ Added Parameters

Parameter	Operator Display	Content	Value Range	Default Value
o4-40	TDCC Enable	Travel Direction Change Counter Enable Enables the TDCC function: **0 : Disabled** **1 : Enabled**	0, 1	0
o4-41	TDCC Alarm Level	Travel Direction Change Counter Alarm Level Sets the Trip Counter Alarm level. The value is set in units of 1 kilo (1000).	0k - 10000k	50k
o4-42	TDCC Pres Value	Travel Direction Change Counter Preset Value Sets the number of allowable direction changes after a rope change. The unit is kilo (1k = 1000). The *direction counter [U4-66/U4-67]* is set to the input value and the parameter is changed back to 0.	0k - 65535k	0k
o4-43	TDCC Pswd Set	Travel Direction Change Counter Password Setting Sets the Travel Direction Change Counter password. The password needs to be entered twice (identically). The active password locks parameters *o4-40 to o4-43* from editing and starts the TDC counting process. The password can only be set when *o4-40* is enabled. When the same password is entered again, the parameters are unlocked again. The password is not displayed. A coded value is shown: **0 : Password not set** **1 : Password set** **2 : Password set and entered (unlocked)** **3 - FFFF : Password** Only values 3 to FFFFh are accepted as password. A set password is not reset by A1-03 initialization (including EEPROM initialization 9990).	0 - FFFF	0

■ Added Monitors

Parameter (Hex.)	Operator Display	Content	Analog Output Scaling	Range/Unit
U4-65 (830)	Rem Dir Chg L	Shows the lower three digits of actual TDCC value. It is reset to 0 after 1000 direction changes.	-	0 - 999
U4-66 (831)	Rem Dir Chg H	Shows the remaining upper digits of actual TDCC value.	-	0k - 65535k
U4-67 (832)	Total Dir Chg L	Shows the lower three digits of total TDCC value. It is reset to 0 after 1000 direction changes.	-	0 - 999
U4-68 (833)	Total Dir Chg H	Shows the remaining upper digits of total TDCC value (1 = 1000 = 1k). The value saturates at 65535k.	-	0k - 65535k
U4-69 (834)	Total TDCC Pres	Shows the number of preset operations (includes reset to 0) of the TDCC. The value saturates at 63. This is intended to uncover possible misuse.	-	0 - 63
U4-70 (835)	Last DirChg Pres	Shows the most recent value, input to *o4-42* for resetting the remaining direction changes counter.	-	0 - 65535k

■ Added Digital Outputs

H2-xx Setting (Hex)	Operator Display	Description
75 (175)	TDCC Pulse Outp	TDCC Pulse Output With every increment of the TDCC, a pulse of 0.5 s pulse width is output.
76 (176)	TDCC AlmLvl Rch	TDCC Alarm Level Reached Indicates that the TDCC alarm level is reached.
77 (177)	TDCC FltLvl Rchd	TDCC Fault Level Reached Indicates that the TDCC has reached 0 value.

■ Added Faults and Alarms

Added Faults

Fault	Fault Code (Hex)	Fault Display	Description	Cause	Countermeasure
TDCC Fault	6B	TCF	TDCC Fault Elevator ropes need to be replaced.	Elevator rope lifetime exceeded (TDCC Counter = 0)	Change ropes. Enter password in *o4-44* and set *o4-40 = 2* to initialize the counter. This resets the counter to the value of *o4-42*.
TDCC EEPROM Memory Data Error	6C	TCE	TDCC EEPROM Memory Data Error Error, while reading the EEPROM section related to TDCC, while powering on.	EEPROM might be broken	Power off and wait for the drive's DC bus to discharge. Power on if the "charge" LED is off. If the problem occurs again, replace the control board or the whole drive.

Added Alarms

Fault	Fault Code (Hex)	Fault Display	Description	Cause	Countermeasure
TDCC Alarm	4D	TCA	TDCC Alarm Elevator ropes need to be replaced soon. Set *o4-40 = 0* to disable the alarm.	The TDCC value fell below the alarm threshold *[TDCC < o4-41]*.	Replace the ropes soon.
TDCC Setup	4E	TCS	TDCC Setup The TDCC function needs to be set up. Set *o4-40 = 0* to disable the alarm. TCS has higher priority than TCA.	*o4-40* is active although no password is set to activate the function.	Set up TDCC function.

13 Fast Stop - Edge Triggered

◆ Related Parameters and Monitors

■ Added Digital Inputs

H1-xx Setting (Hex)	Operator Display	Description
5E (15E)	Fast-Stop 2 N.O.	Emergency Stop 2 (N.O.) Deactivation slope: Decelerates with *Emergency Stop Time [C1-09]* triggered by falling edge. Even if the Emergency Stop command is cleared, the drive will not operate without cycling the Run command.

EN

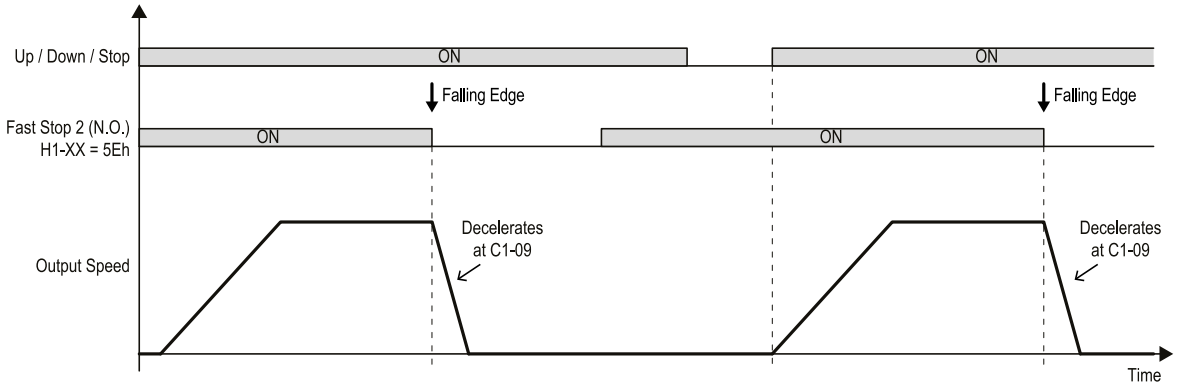


Figure 13.1 Emergency Stop Sequence Fast Stop 2 (N.O.)

14 BiSS

◆ BiSS Option Overview

■ About BiSS Option

The PG-F3 Option allows the user to connect rotary encoders with BiSS-C communication protocol support to the Yaskawa L1000A drives.

The PG-F3 Option is a custom BiSS Master and supports the following functions:

- BiSS bi-directional
- One slave device in peer-to-peer connection
- One data channel per slave
- Read master configuration data from EDS
- EDS profiles: BP1 (version 1) and BP3 (version 1) supported
- EDS common version 1 supported
- Singleturn with max. 32 bit for position data
- Only left data alignment is supported
- Power-on time of BiSS Encoder must be lower than 0.5 seconds
- BiSS Encoder with supply voltage of 5 V DC or 8 V DC supported
- No encoder commands such as “Reset”, “Preset” or similar are used
- BiSS clock frequency for SCD frame transmission between 100 kHz and 300 kHz

Set the drive motor control mode to operate in the Closed Loop Vector Control for PM Motors when using the PG-F3 Option. Refer to the drive Technical Manual for details.

■ Applicable Drives

You can use the option with the following drive models:

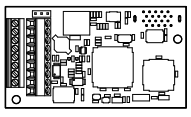
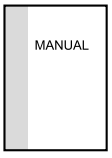
Drive Series	Firmware Version
L1000A	S3404 and later

◆ Receiving

Please perform the following tasks after receiving the Communication Option card:

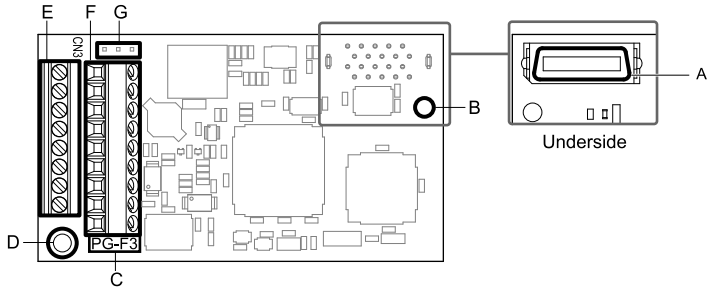
- Inspect the Communication Option card for damage. If the Communication Option card appears damaged upon receipt, contact the shipping company immediately.
- Verify receipt of the correct model by checking the model number on the PCB.
- If you have received the wrong option card model or the Communication Option card does not function properly, contact your supplier.

■ Option Package Content

Item:	Option	Ground Wire	Srews (M3)	Manual
Image				
Quantity	1	1	3	1

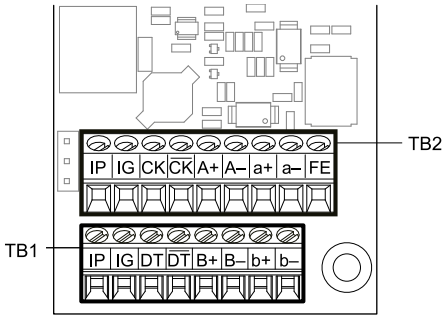
◆ Option Components

■ Option



A - Terminal Block TB1
B - Terminal Block TB2
C - Jumper for PG encoder power supply voltage (CN3)
D - Connector (CN5)
E - Installation hole
F - Model number
G - Ground terminal and installation hole

■ Terminal Blocks TB1 and TB2



◆ Mechanical & Electrical Installation

■ Safety Precautions

⚠ DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

⚠ WARNING *Electrical Shock Hazard. Do not operate equipment when covers are missing. Some figures in this section include drives without covers or safety shields to more clearly show the inside of the drive. Replace covers and shields before operation. Use drives only as specified by the instructions. Failure to obey can cause death or serious injury.*

⚠ WARNING *Electrical Shock Hazard. Do not work on the drive or around the drive while wearing loose clothing or jewelry. Tighten loose clothing and remove all metal objects such as watches or rings. Failure to obey can cause death or serious injury.*

⚠ WARNING *Electrical Shock Hazard. Do not remove covers or touch circuit boards while the drive is energized. Failure to obey can cause death or serious injury.*

⚠ WARNING *Electrical Shock Hazard. Only let authorized persons install, wire, maintain, examine, replace parts, and repair the drive. Failure to obey can cause death or serious injury.*

⚠ WARNING *Electrical Shock Hazard. Do not make changes to the drive body or drive circuitry. Failure to obey can cause death or serious injury and will void warranty. Yaskawa is not responsible for changes to the product made by the user.*

⚠ WARNING *Fire Hazard. Tighten all terminal screws to the correct tightening torque. Connections that are too loose or too tight can cause incorrect operation and damage to the drive. Incorrect connections can also cause death or serious injury from fire.*

⚠ CAUTION *Crush Hazard. Do not hold the drive by the front cover or terminal cover. Tighten the screws correctly before moving the drive. Failure to obey can cause minor to moderate injury.*

NOTICE *Observe correct electrostatic discharge (ESD) procedures when touching the drive. Failure to obey can cause ESD damage to the drive circuitry.*

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NOTICE *Do not lift the drive with the cover removed. Failure to obey can cause damage to the drive board and terminal block.*

NOTICE *Do not use unshielded wire for control wiring. Use shielded, twisted-pair wires and ground the shield to the ground terminal of the drive. Failure to obey can cause electrical interference and unsatisfactory system performance.*

NOTICE *Do not change the drive circuitry. Failure to obey can cause damage to the drive and will void warranty. Yaskawa is not responsible for modifications of the product made by the user.*

NOTICE *Make sure that all connections are correct after you install the drive and connecting peripheral devices. Failure to obey can cause damage to the drive.*

■ Preconditions for Installing the Option Card

Prior to installing the Communication Option Card, wire the AC drive or regenerative unit and connect to the drive terminals. For more information on wiring and connecting the inverter drive or regenerative unit, refer to the manual packaged with the AC drive or regenerative unit.

Verify that the AC drive or regenerative unit runs normally without the option installed.

Tools Required

A Phillips screwdriver PH1(#1) or PH2(#2) is required to install the Communication Option card.

Note:

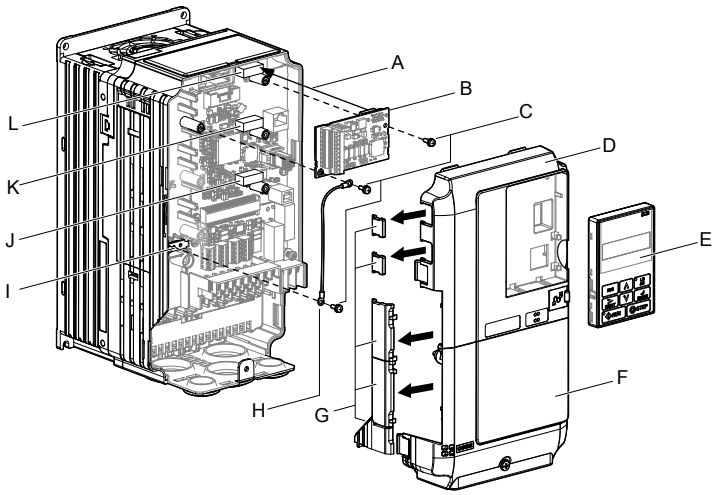
Tools required to prepare communication network cables for wiring are not listed in this manual.

■ Installing the Option on an L1000A

1. Turn off the power. Wait until the CHARGE LED turns off and then remove the cover. Refer to the drive manual for direction on removing the front cover.
2. Plug the option card (B) to the CN5-C connector (L). Fix option card to the drive with a screw, tighten the screw to 0.5 to 0.6 N•m (4.4 to 5.3 in•lb).
   Fieldbus option cards must always be plugged into CN5-C connector.
3. Connect the ground wire (H) to option card and fix with a screw, tighten the screw to 0.5 to 0.6 N•m (4.4 to 5.3 in•lb).
   Select shortest possible cable for ground connection.
4. Connect the ground wire (H) to drive ground terminal (I) and fix with a screw.

Note:

There are only two screw holes on the drive for ground terminals. If three different option cards are connected, two of the ground wires will need to share the same ground terminal.



A - Insertion point for CN5
B - Option card
C - Included screws
D - Front cover
E - Operator
F - Terminal cover
G - Removable tabs for wire routing
H - Ground wire
I - Drive grounding terminal (FE)
J - Connector CN5-A
K - Connector CN5-B
L - Connector CN5-C - for PG option installation

Figure 14.1 Installing the Option Card an L1000A

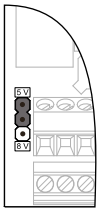
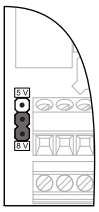
5. Prepare and connect the wire ends.

   Make sure to use the proper tightening torque for each terminal. Take particular precaution to ensure that each wire is properly connected, and wire insulation is not accidentally pinched into electrical terminals.

6. Wire the motor PG encoder to the terminal block on the option.

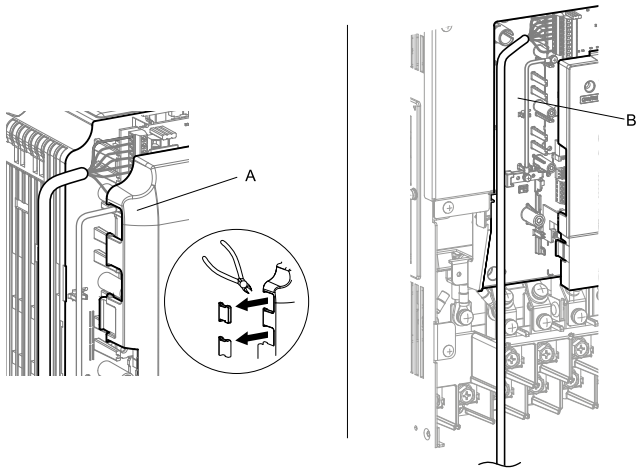
7. Set the voltage for the PG encoder power supply using jumper CN3 located on the option. Position the jumper as shown below to select the voltage level.

   NOTICE *Damage to the equipment. Select the power supply voltage level for the PG encoder connected to the option and motor with jumper CN3. If you select the wrong voltage, the PG encoder may not operate properly or may become damaged.*

Voltage Level	5 V ± 5% (default)	8 V ± 10%
Jumper CN3 Position		

8. Route the option wiring.

   - For drives CIMR-Ax2A0004 to 2A0040, and 4A0002 to 4A0023: The network cable should be routed to the outside through the openings at the left side (G) of the front cover. Make sure no sharp edges remain. The drive will not meet NEMA Type 1 requirements if wiring is exposed outside the enclosure.
   - For drives CIMR-Ax2A0056 to 2A0211, and 4A0031 to 4A0165: Enough space to keep all wiring inside the unit is available.



A - Opening for network cables (CIMR-Ax2A0004 to 2A0040, 4A0002 to 4A0023)

B - Space for wiring (CIMR-Ax2A0056 to 2A0211, 4A0031 to 4A0165)

Figure 14.2 Network Cable Routing

9. Reinstall the front cover back onto the drive as it was before.
10. Reinstall the digital operator as it was before.
11. Switch on the drive power supply.

Prepare and Connect Cable Wiring

⚠ WARNING *Fire hazard. Tighten all terminal screws according to the specified tightening torque. Loose electrical connections can result in death or serious injury by fire due to overheating electrical connections. Tightening screws beyond the specifiec tightening torque may result in erroneous operation, damage the terminal block or cause fire.*

NOTICE *Damage to the equipment. Heat shrink tubing or electrical tape may be required to ensure that cable shielding does not contact other wiring. Insufficient insulation can cause a short circuit and damage the option or drive.*

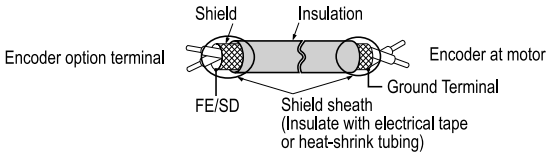


Figure 14.3 Prepare Ends of Shielded Cable

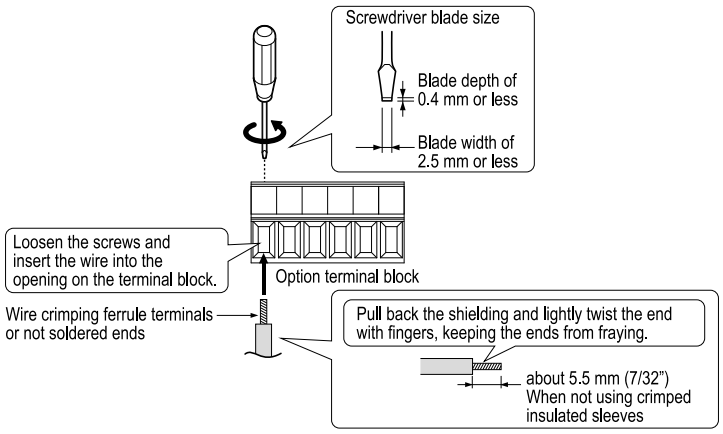
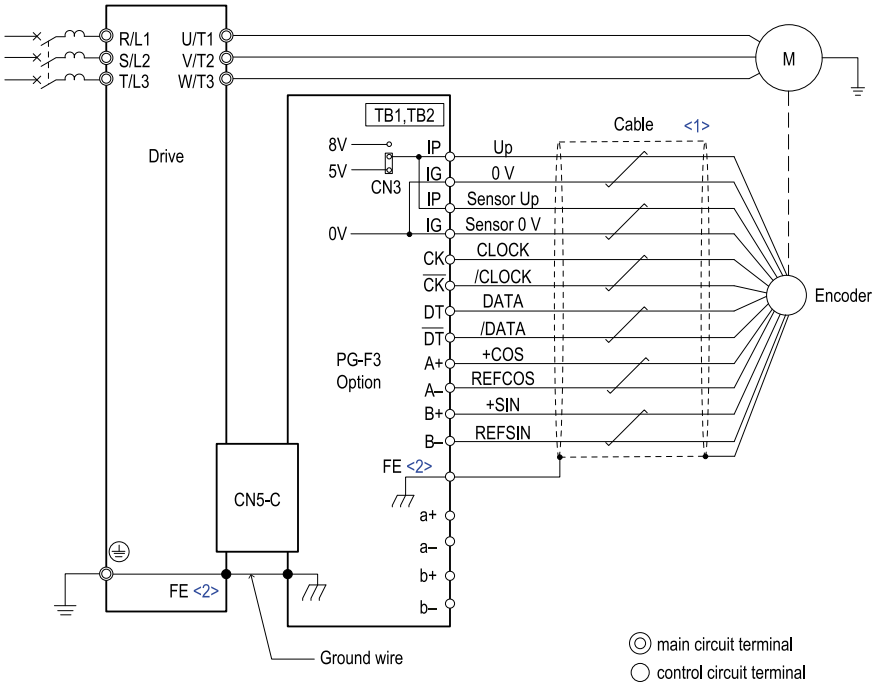


Figure 14.4 Prepare and Connect Cable Wiring

Wire the Encoder

Wire the motor PG encoder to the terminal block on the option using a conductor cable.

The signal “Sensor Up” must be connected to terminal IP on the PG-F3 option for cables longer than 10 m. Additionally, the “Sensor 0 V” must be connected to terminal IG.



<1> Ground the shield on the PG encoder side and the drive side. If noise problems arise in the PG encoder signal, remove the shield ground from one end of the signal line or remove the shield ground connection on both ends.

Figure 14.5 PG-F3 Option and PG-Encoder Connection Diagram

Table 14.1 PG Encoder Cable Specification

Option Terminal	PG Encoder Cable	
	Color *1	PG Encoder Signal *2
IP	Brown/Green	Up
	Blue	Sensor Up
IG	White/Green	0 V
	White	Sensor 0 V
CK	Purple	CLOCK
/CK	Yellow	/CLOCK
DT	Gray	DATA
/DT	Pink	/DATA
A+	Green/Black	A+
A-	Yellow/Black	A-
B+	Blue/Black	B+
B-	Red/Black	B-

*1 Colors depend on the manufacturer. Check the data sheet of the encoder cable for the actual colors.
*2 Signal names depend on the manufacturer. Check the data sheet of the encoder cable for the signal names.

Wire Gauges, Tightening Torques

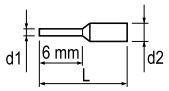
Use the following wire gauges and torques.

Terminal Signal	Screw Size	Tightening Torque Nm (in·lb)	Bare Cable		Crimp Terminals		Wire Type
			Recommended Gauge mm²	Applicable Gauge mm²	Recommended Gauge mm²	Applicable Gauge mm²	
a+, a-, b+, b-, FE	M2	0.22 to 0.25 (1.95 to 2.21)	0.75 (AWG 18)	Stranded wire: 0.25 to 1.0 (AWG 24 to 17) Solid wire: 0.25 to 1.5 (AWG 24 to 16)	0.5 (AWG 20)	0.25 to 0.5 (AWG 24 to 20)	Shielded twisted pair, etc.
IP, IG, DT, /DT, B+, B-, CK, /CK, A+, A-			*1		-	-	-

*1 Use an 8-pin cable. Refer to PG Encoder Cable Specification for details.

Crimp Terminals

Use a Phoenix Contact CRIMPFOX 6 or equivalent and crimp terminals with the following specifications for wiring to ensure proper connections. Properly trim wire ends so loose wire ends do not extend from the crimp terminals.

	Wire Gauge mm²	Phoenix Contact Model	L mm (in.)	d1 mm (in.)	d2 mm (in.)
	0.25 (AWG 24)	AI 0.25 - 6YE	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.34 (AWG 22)	AI 0.34 - 6TQ	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.5 (AWG 20)	AI 0.5 - 6WH	14 (9/16)	1.1 (3/64)	2.5 (3/32)

Example: Connecting the PG-F3 Option Card to Kübler Sendix 5853 or 5873 Encoder

Option Terminal	PG Encoder Cable	
	Color	PG Encoder Signal
IP	Brown	+V
	Red/Blue	+Vsens
IG	White	0 V
	Gray/Pink	+V
CK	Green	C+
/CK	Yellow	C-
DT	Gray	D+

Option Terminal	PG Encoder Cable	
	Color	PG Encoder Signal
/DT	Pink	/D-
A+	Blue	A+
A-	Red	A-
B+	Black	B+
B-	Purple	B-

◆ Related Parameters and Functions

■ Modified Standard Parameters

Only modified parameters are listed in this table.

<table>
<tr><th>Parameter</th><th>Operator Display</th><th>Description</th><th>Value Range</th><th>Default Value</th></tr>
<tr><td>F1-50</td><td>Encoder Select</td><td>Sets up the type of encoder connected to a PG-F3 option card
0 : EnDat 2.1/2.2 01 Serial + Sin/Cos
1 : EnDat 2.1/2.2 22 Serial only
2 : Hiperface
3 : BiSS Serial + Sin/Cos
4 : BiSS Serial only</td><td>0 to 4</td><td>0</td></tr>
<tr><td>F1-52</td><td>Ser Enc Comm Spd</td><td>Selects the speed for serial communication between a PG-F3 option card and serial encoder.
<table>
<tr><th rowspan="2">F1-50 Setting</th><th colspan="4">F1-52 Setting</th></tr>
<tr><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>0</td><td>200 kHz</td><td>200 kHz</td><td>200 kHz</td><td>200 kHz</td></tr>
<tr><td>1</td><td>1 MHz</td><td>500 kHz</td><td>1 MHz</td><td>1 MHz</td></tr>
<tr><td>2</td><td>9600 bps</td><td>19200 bps</td><td>38400 bps</td><td>38400 bps</td></tr>
<tr><td>3</td><td>internal *1</td><td>100 kHz</td><td>200 kHz</td><td>300 kHz</td></tr>
<tr><td>4</td><td>internal *1</td><td>100 kHz</td><td>200 kHz</td><td>300 kHz</td></tr>
</table>
*1 Communication speed selected automatically by BiSS Master (PG-F3 option card) based on BiSS encoder (EDS value).</td><td colspan="2">-</td></tr>
</table>

◆ Troubleshooting

■ Drive-Side Error Codes

This section shows the various fault codes related to the option and pulse generator. Refer to the drive Technical Manual for further details on fault codes.

When an error code occurs on the drive, check the following items first:

- Are the cables connected properly?
- Is the option properly installed to the drive?
- Did a momentary power loss occur?

Code	Name	Causes	Possible Solutions
dEv	Speed Deviation	The load is too heavy.	Decrease the load.
		Acceleration and deceleration times are set too short.	Increase the values set in *C1-01 [Accel Time 1] to C1-08 [Decel Time 4]*.
		The *dEv* detection level settings are incorrect.	Adjust *F1-10 [Speed Dev Level]* and *F1-11 [Speed Dev Delay Time]*.
		The load is locked up.	Examine the machine.
		The holding brake is stopping the motor.	Release the holding brake.
dv3	Inversion Detection	*E5-11 [Enc ZPulse Offset]* is set incorrectly.	Correctly set the value for Δθ to *E5-11* as specified by the values on the motor nameplate.
		There is a new encoder or the motor rotation direction changed.	Do Z Pulse Offset Tuning.
		An external force on the load side rotated the motor.	• Make sure that the motor is rotating in the correct direction. • Find and repair problems on the load side that cause the motor to rotate from the load side.

Code	Name	Causes	Possible Solutions
		Noise interference along the encoder cable.	Correctly ground the shielded wire of the encoder cable.
		The encoder cable is disconnected or incorrectly wired.	Examine for wiring errors or disconnected wires in the encoder cable, and repair problems.
		The setting for *F1-05 [Enc1 Rotat Selection]* is the opposite of the direction of motor rotation.	Correctly connect the motor wiring for each phase (U, V, W).
		The PG option card or the encoder on the motor side is damaged.	Repair the wiring and re-energize the drive, then replace the PG option card or the encoder if the problem continues.
dv4	Inversion Prevention Detection	An external force on the load side moved the motor.	• Make sure that the motor is rotating in the correct direction. • Find and repair problems on the load side that cause the motor to rotate from the load side. • Disable detection of this fault for applications that rotate the motor from the load side in the opposite direction of the speed reference. The drive will not detect this fault if *F1-19 = 0 [Dev4 Mode Selection = Disabled]*.
		E5-11 [Enc ZPulse Offset] is set incorrectly.	Correctly set the value for Δθ to *E5-11* as specified by the values on the motor nameplate.
		There is a new encoder or the motor rotation direction changed.	Do Z Pulse Offset Tuning.
		Noise interference along the encoder cable	Correctly ground the shielded wire of the encoder cable.
		The encoder cable is disconnected or incorrectly wired.	Examine for wiring errors or disconnected wires in the encoder cable, and repair problems.
		The PG option card or the encoder on the motor side is damaged.	Repair the wiring and re-energize the drive, then replace the PG option card or the encoder if the problem continues.
oFA00	Option Not Compatible with Port	The option card connected to connector CN5-A is not compatible.	Connect the option card to the correct connector. **Note:** Encoder option cards are not compatible with connector CN5-A.
oFb00	Option Not Compatible with Port	The option card connected to connector CN5-B is not compatible.	Connect the option card to the correct connector. **Note:** DO-A3, AO-A3, PG-B3, and PG-X3 options can connect to connector CN5-B. Use connector CN5-C when connecting only one encoder option card.
oFC50 to oFC55	Option Card Error Occurred at Option Port CN5-C	A fault occurred in the option card.	Refer to the manual for the PG-RT3 or PG-F3 option card.
oS	Overspeed	There is overshoot.	• Decrease *C5-01 [ASR PGain 1]* and increase *C5-02 [ASR ITime 1]*. • Adjust the pulse train gain with Pulse Train Input Setting Parameters *H6-02 to H6-05* .
		There is an incorrect number of PG pulses set in the drive.	Set *H6-02 []* to the pulse train frequency during 100% reference (maximum motor rotation speed).
		The *oS* detection level is set incorrectly.	Adjust *F1-08 [Overspeed Level]* and *F1-09 [Overspeed Delay Time]*.
PGo	Encoder (PG) Feedback Loss	The encoder cable is disconnected or wired incorrectly.	Examine for wiring errors or disconnected wires in the encoder cable, and repair problems.
		The encoder is not receiving power.	Examine the encoder power supply.
		The holding brake is stopping the motor.	Release the holding brake.
PGoH	Encoder (PG) Hardware Fault	The encoder cable is disconnected.	Connect all encoder cable wires.
oPE02	Parameter Range Setting Error	Parameters settings are not in the applicable setting range.	1. Push  to show *U1-18 [oPE Fault Parameter]*, and find parameters that are not in the applicable setting range. 2. Correct the parameter settings. **Note:** If more than one error occurs at the same time, other *oPExx* errors have priority over *oPE02*.
		Set *E2-01 ≤ E2-03 [Mot Rated Current (FLA) ≤ Mot No-Load Current]*.	Make sure that *E2-01 > E2-03*. **Note:** If it is necessary to set *E2-01 < E2-03*, first lower the value set in *E2-03*, and then set *E2-01*.
oPE06	Control Method Selection Error	*A1-02 = 1, 3, or 7 [= CL-V/f, CLV, CLV/PM]* is set, but there is no encoder option card connected to the drive.	• Connect an encoder option card to the drive. • Set *A1-02* correctly.

■ Preventing Noise Interference

Take the following steps to prevent erroneous operation caused by noise interference:

- Use shielded wire for the PG encoder signal lines.
- Limit the length of all motor output power cables to less than 20 m.

- The signal “Sensor Up” must be connected to terminal IP on the PG-F3 option for cables longer than 10 m. Additionally, the “Sensor 0 V” must be connected to terminal IG.
- Use separate conduit or cable tray dividers to separate option control wiring, main circuit input power wiring, and motor output power cables.
- Ground the shield on the PG encoder side and the drive side. If electrical interference problems arise in the PG encoder signal, verify that the shield is properly grounded and ground one end of the signal line or remove the ground connection on both ends.
- Properly connect the shield in cable to the IG on the option terminal or remove the ground connection on both ends.

◆ Specifications

Item	Specification
Model	PG-F3
Compatible PG Encoder Types	Fritz Kübler GmbH, 8.5873.HK3E.C323 Hohner Automaticos S.L., SMRS64-12104511-13 **Note:** When you want to use other encoders than those listed, contact Yaskawa.
Multi-turn	Not available
PG Encoder Wiring Length	10 m (32 ft.) maximum.
PG Encoder Power Supply	Output voltage: 5 V ± 5%, 8 V ± 10% Maximum Output Current: 330 mA (5 V), 150 mA (8 V)
Compatible Control Methods	Closed Loop Vector for PM motors
Maximum Input Frequency	20 kHz
Pulse Monitor Output	Monitor for A and B phase output Matches RS-422 Level
PG Encoder Disconnect Detection	Software detection
Ambient Temperature	-10 °C to 50 °C (14 °F to 122 °F)
Humidity	max. 95% RH (non-condensing)
Storage Temperature	-20 °C to 60 °C (-4 °F to 140 °F) allowed for short-term transport of the product
Area of Use	Indoor (free of corrosive gas, airborne particles, etc.)
Altitude	max. 1000 m (3280 ft.)

15 Appendix

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TYPE EXAMINATION CERTIFICATE

FOR LIFTCOMPONENTS

Issued by Liftinstituut B.V.

Certificate no.	: NL13-400-1002-184-01	Revision no.: 3
Description of the product	: Brake monitoring as part of the protection against unintended car movement and/or ascending car overspeed means	
Trademark, type	: Yaskawa, CIMR-LCxAxxxxxxx – 910x and CIMR-LCxFxxxxxxx – 91xx	
Name and address of the Manufacturer	: Yaskawa Electric UK LTD 1 Hunt Hill Orchardton Woods Cumbernauld G68 9LF United Kingdom	Yaskawa Electric Corporation 2-13-1-Nishimiyaichi Yukuhashi-City Fukuoka 824-8511 Japan
Name and address of the certificate holder	: Yaskawa Europe GmbH Hauptstr. 185 D-65760 Eschborn Germany	
Certificate issued on the following requirements	: Lifts Directive 2014/33/EU	
Certificate based on the following standard	: EN 81-20:2014 clause 5.6.6.2 and 5.6.7.3	
Test laboratory	: None	
Date and number of the laboratory report	: None	
Date of type examination	: June 13, 2017	
Additional document with this certificate	: Report belonging to the type examination certificate no.: NL13-400-1002-184-01 rev.3	
Additional remarks	: None	
Conclusion	: The lift component meets the requirements referred to in this certificate taking into account any additional remarks mentioned above.	

Amsterdam

Date : 27-06-2017
Valid until : 30-03-2020

ing. J.L. van Vliet
Managing Director

Certification decision by

CERTOSP

· Liftinstituut B.V. · Buikslotermeerplein 381 · P.O. Box 36027 · 1020 MA Amsterdam Netherlands · www.liftinstituut.nl ·
· Registered at the KvK under number 34157363 ·

F23-02-22-v16.0

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Report type-examination

Report belonging to type-examination certificate no.	:	NL13-400-1002-184-01
Date of issue of original certificate	:	June 25, 2012
Concerns	:	Lift component
No. and date of revision	:	3; June 27, 2017
Requirements	:	Lifts Directive 2014/33/EU Standard: EN 81-20:2014 clause 5.6.6.2 and 5.6.7.3
Project no.	:	P170177

1. General specifications

Name and address manufacturer	:	Yaskawa Electric UK LTD 1 Hunt Hill Orchardton Woods Cumbernauld G68 9LF United Kingdom and Yaskawa Electric Corporation 2-13-1-Nishimiyaichi Yukuhashi-City Fukuoka 824-8511 Japan
Description of lift component	:	Brake monitoring as part of the protection against unintended car movement and/or ascending car overspeed means
Type	:	Yaskawa, CIMR-LCxAxxxxxxx – 910x and CIMR-LCxFxxxxxxx – 91xx
Laboratory	:	-
Address of examined lift component	:	-
Data of examination	:	June 2013, June 2017
Examination performed by	:	A. v/d Burg, P.J. Schaareman

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2. Description lift component

The brake monitoring described in this report shall be used in combination with a suitable detection system and a suitable brake to build an unintended car movement protection and/or ascending car overspeed means for lifts.
The monitoring function that is integrated in the frequency inverter becomes effective after parameter S6-17 is set to 1.
Two inputs can be programmed to monitor the correct opening and closing of brakes, it can be done with both normally closed or both normally open contacts.
The activated system will stop the lift when at least one programmed brake monitoring inputs detects one of the following situations:

- When the brake monitoring signal changes status for a time period longer than set with parameter "S6-06" during a trip (Default 500 ms, range 0-60 sec.) (This function is optional).
- When the brake monitoring signal does not change status within a time period set with parameter "S6-05" after the brake is ordered to open during a trip (Default 500 ms, range 0-10 sec.).
- When the brake monitoring signal does not change status within a time period set with parameter "S6-05" after the brake is ordered to close after a trip (Default 500 ms, range 0-10 sec.).

After detection of brake malfunction, the lift remains out of service, also after switching off- and on the supply power or using the "reset" button.
Resetting of the system is only possible by setting the parameter "S6-18 = 1".

Technical data of the inputs:

Voltage	: +24 VDC
Switching level low/high	: typ. 11,85 VDC
Input current at 24 V	: typ. 12,6 mA

3. Examinations and tests

The examination covered a check whether compliance with the Lift Directive 2014/33/EU is met, based on the harmonized product standard EN 81-20:2014. Issues not covered by or not complying these Standards are directly related to the above mentioned essential requirements based on the risk assessment, where applicable with the aid of harmonized A-and B-standards.

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The examination included:

- Examination of the technical file (See annex 2):
- Examination of the representative model in order to establish conformity with the technical file.

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4. Results

After the final examination the product and the technical file were found in accordance with the requirements.

5. Conditions

On the type-examination certificate the following conditions apply:

- Before taking the lift into service and after each change in the software of the Yaskawa, CIMR-LCxAxxxxxxx – 910x or CIMR-LCxFxxxxxxx – 91xx the proper functioning of the brake monitoring must be checked. The checking shall be done by disconnecting and short circuiting the brake monitoring switches one by one. Each time after a command is given, the manipulation shall be detected by the system and a reset shall be necessary to bring the lift back into operation.

6. Conclusions

Based upon the results of the type-examination Liftinstituut B.V. issues a type-examination certificate.

The type-examination certificate is only valid for products which are in conformity with the same specifications as the type certified product. The type-examination certificate is issued based on the requirements that are valid at the date of issue. In case of changes of the product specifications, changes in the requirements or changes in the state of the art the certificate holder shall request Liftinstituut B.V. to reconsider the validity of the type-examination certificate.

Prepared by:

P.J. Schaareman
Product Specialist Certification
Liftinstituut B.V.

Certification decision by:

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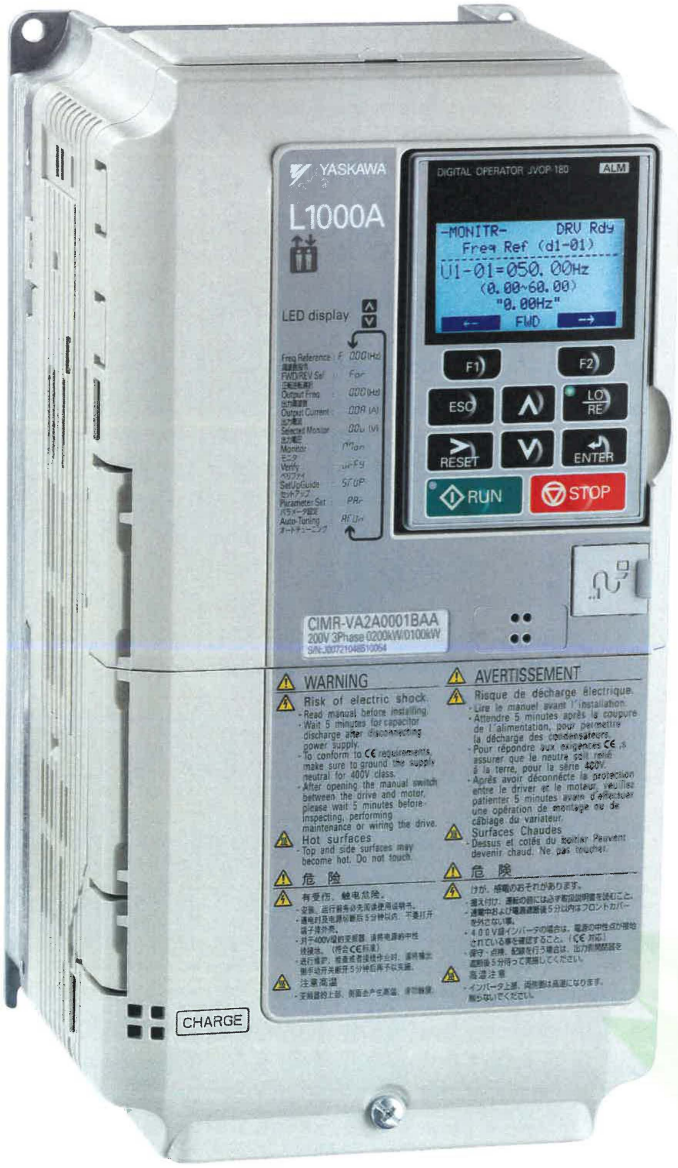
Annexes

Annex 1 : Impression Yaskawa frequency inverter



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Annex 2: Documents of the Technical File which were subject of the examination

Title	Date
Software Functional Specification.docx	13-03-2013
Software Functional Specification.docx rev.1	09-04-2013
Brake Status Monitor Operation Manual	13-06-2013

Annex 3: Reviewed deviations from the standards

EN xx-x par.	Requirement	Accepted design
x.x.x	-	-

Annex 4 Revision overview

Rev.:	Date	Summary of revision
-	25-06-2013	Original
1	10-09-2013	Product name changed
2	30-03-2015	Addition of CIMR-LCxFxxxxxxx – 91xx
3	27-06-2017	Addition of brake monitoring application for ascending car overspeed means and update to new Lifts Directive 2014/33/EU

Index

Revision History

Date of Publication	Revision Number	Section	Revised Content
June 2022	G	15	Added BiSS chapter
		All	Revised and corrected whole document
March 2018	F	2, Appendix	Revised Certificate and Norm
August 2017	E	All	Revised document structure Added DI-A3 Option Multi-functional Support, 6F Ripple Compensation, Advanced Light Load Search, Output Phase Loss Protection
February 2016	D	4	Added Replacement instructions Revised document structure
April 2015	C	1, Appendix	Revised Standards and Scope Revised Certificate
May 2014	B	All	Revised document structure Added DCP3 interface
October 2013	A	-	First Edition

AC Drive L1000A

Technical Manual Addendum

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In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.
Specifications are subject to change without notice for ongoing product modifications and improvements.

Original Instructions

YASKAWA EUROPE GmbH

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Revision: G <6>-0
June 2022
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