F6 ELEVATOR DRIVE

DEVELOPER'S SUPPLEMENT | **CANopen ELEVATOR** © CiA

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Preliminary Version

1 Preface

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This manual describes the installation and function of device series: F6 ELEVATOR DRIVE.

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1.1 Key Symbols

Symbols and markings referenced in this document can be found below.

Informative message, prerequisite or recommend procedure.

Symbol	Definition
	Refer to instruction manual
▶	Action step
●	Enumerations/unordered list
➡	Cross-reference
Link	Internal or external hyperlink
	Smartphone QR code

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2 Introduction

Reliable and safe operation of elevator systems requires interoperability between many interconnected devices. Throughout all phases of the lifetime of the elevator system if any device malfunctions or fails to operate as intended the entire system is in jeopardy of a shutdown. This is especially true for modern elevator systems which are equipped with many networked electronic devices. Interoperability of each networked device becomes a challenge when devices exchange information using different communication protocols.

With this challenge in mind a technical group named “CANopen Special Interest Group Elevator” within CAN in Automation was formed to define a standard communication protocol to be used by all networked devices in the elevator control system. Such devices may be variable frequency drives, car controllers, door controllers, input panels, display units, etc. The application profile CiA 417 Elevator control was defined as the open standardized protocol for communication for devices in a CANopen elevator system. CiA 417 is based upon the communication profile CANopen, which is commonly utilized in many industrial applications. The goal of creating a standard communication protocol is to create a vendor neutral elevator system using plug and play components. This allows users the freedom to combine products from different producers without the worry of incompatibility issues. The benefits of creating a plug and play system include reduced cost and time in designing, installing, and maintaining the elevator system.

The product family F6 Elevator Drive with CANopen Elevator (CiA 417) application has been developed for use in elevator applications. The CANopen elevator application was built upon an already proven elevator program which includes a wide range of specially designed features to reduce installation times and provide high performance ride quality without sacrificing safety.

2.1 CANopen Elevator: Standard Open Protocol

CiA 417 defines a standard communication protocol to be used by all devices on the communication bus for elevator systems. Each device will communicate using the same set of rules when transmitting information. This means that the transmission of information to all devices on the bus will follow a common format and meaning. In addition, all information is transmitted and received using the same communication mechanism. CiA 417 defines all parameters, commands, and services used by the elevator system. This includes parameter units, communication rates, cable connectors. Using this common “language” each device on the bus will understand all commands or status messages that are sent.

The KEB Elevator Application supports CAN communication based on the CiA DS402 protocol with the elevator application layer as defined by DS417.

The elevator application layer defines all the interface between all typical devices found in a modern elevator control system. This document will describe this CAN interface as implemented in the CANopen Elevator Application.

It is highly recommended that control developers purchase a copy of the 417 specification from CAN in Automation (CiA).

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2.1.1 Contact Information

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3 Functional Description

3.1 RxPDO - Process Data Inputs

The process data for the receive PDOs are described by two sets of parameters, the RM and RS parameters.

The RS parameters configure the PDO aspects such as timing and COB-ID.

Parameter tem	Description	RS00 Defaults
COB-ID	This determines the COB-ID that a RxPDO will look for. This is fixed for all RS parameters.	0x182
Tx Type	This is fixed for all RS parameters	255
Inhibit Time	RPDOs do not use inhibit time and this value should always be 0.	0
Reserved	-	-
Event Time	Not supported	-

Table 3.1 *RS parameter description*

The RM parameters determine the mapping for the associated RS parameter. For example, RM00 determines the mapping for RS00 and RM02 determines the mapping for RS02.

The maximum length of a PDO is 8 bytes and can support up to 4 parameters. The size of the parameters can vary, but the total data length for all parameters must not be greater than 8 bytes.

Each of the Data sub-indexes are defined as follows:

- The upper 16 bits are the parameter address.
- The mid-lower 8 bits are the sub-index.
- The lower 8 bits are the data size. With the data size 0x10 is a word, 0x08 is a byte, and 0x20 is a long word. Where word = 16 bits, byte = 8 bits, and long word = 32 bits.

RM00 default values

Subindex	Default Value	Parameter
1	64820108h	CA114[1] - Load Signaling
2	64800110h	CA112[1] - Load Value

RM01 default values

Subindex	Default Value	Parameter
1	64000010h	CA01 - Control Word
2	64030008h	CA03 - Modes of Operation
3	00050008h	Reserved
4	64300020h	CA48 - Target Velocity

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RM02 default values

Subindex	Default Value	Parameter
1	64200020h	CA32 - Target Position
2	64230020h	CA35 - Profile Velocity

RM04 default values

Subindex	Default Value	Parameter
1	63830120h	PO00[1] - Position Value

RS00 default values

Subindex	Default Value	Parameter
1	COB-id	182h
2	Tx type	255
3	Inhibit time	0 µs
4	Reserved	0
5	Event Timer	0 ms

RS01 default values

Subindex	Default Value	Parameter
1	COB-id	188h
2	Tx type	255
3	Inhibit time	0 µs
4	Reserved	0
5	Event Timer	0 ms

RS02 default values

Subindex	Default Value	Parameter
1	COB-id	180h
2	Tx type	255
3	Inhibit time	0 µs
4	Reserved	0
5	Event Timer	0 ms

RS04 default values

Subindex	Default Value	Parameter
1	COB-id	18Ch
2	Tx type	255
3	Inhibit time	0 µs
4	Reserved	0
5	Event Timer	0 ms

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3.2 TxPDO - Process Data Outputs

The process data for the receive PDO's are described by two sets of parameters, the TM and TR parameters.

The TR parameters configure the PDO aspects such as timing and COB-ID.

Parameter Item	Description	RS00 Defaults
COB-ID	This determines the COB-ID that a TxPDO will look for. This is fixed for all TR parameters.	0x182
Tx Type	This is fixed for all TR parameters.	255
Inhibit Time	This determines how long between each message to ignore changes in the PDO. TPDOs do not use Inhibit Time. Value should always be zero.	0
Reserved	-	-
Event Time	If Tx Type is 255, this is the time in milliseconds between successive TxPDO transmit. If set to zero, this TxPDO will only transmit if the value changes.	0

Table 3.2 *TR parameter description*

The TM parameters determine the mapping for the associated TR parameter. For example, TM00 determines the mapping for TR00 and TM02 determines the mapping for TR02.

The maximum length of a PDO is 8 bytes and can support up to 4 parameters. The size of the parameters can vary, but the total data length for all parameters must not be greater than 8 bytes.

Each of the Data sub-indexes are defined as follows:

- The upper 16 bits are the parameter address.
- The mid-lower 8 bits are the sub-index.
- The lower 8 bits are the data size. With the data size, 0x10 is a word, 0x08 is a byte, and 0x20 is a long word. Where word = 16 bits, byte = 8 bits, and long word = 32 bits.

TM01 default values

Subindex	Default Value	Parameter
1	64010010h	CA02 - Status word
2	64040008h	CA03 - Modes of operation
3	67EE0008h	Reserved
4	64330020h	CA51 - Actual velocity

TM02 default values

Subindex	Default Value	Parameter
1	64060020h	CA06 - Control effort

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TR00 default values

Subindex	Default Value	Parameter
1	COB-id	183h
2	Tx type	255
3	Inhibit time	0 µs
4	Reserved	0
5	Event timer	0 ms

TR02 default values

Subindex	Default Value	Parameter
1	COB-id	181h
2	Tx type	255
3	Inhibit time	0 µs
4	Reserved	0
5	Event timer	0 ms

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4 CAN Bus Parameter Descriptions

4.1 CAN KEB Parameters (CN)

CN00 CAN Node ID
CAN Addr: 2000h

Sets the CAN node ID.
Default value is 2 per DS417 specification.

CN01 CAN Baud Rate
CAN Addr: 2001h

Sets the CAN Baud Rate.

Value	Baud Rate
0	10k bps
1	20k bps
2	50k bps
3	100k bps
4	125k bps
5	250k bps (default)
6	500k bps

CAN Input Functions (CN03-CN05)

CN03 CAN Input Function 1
CAN Addr: 2003h

CN04 CAN Input Function 2
CAN Addr: 2004h

CN05 CAN Input Function 3
CAN Addr: 2005h

These parameters define the special function inputs that are mapped to the manufacturer-specific CAN Controlword bits. Special functions can be assigned to Control Word manufacturer's specific bits 11, 12 and 13 through CN03, CN04 and CN05. Special functions must be activated before the Control Word, Enable Voltage and Enable Operation bits are given. Otherwise, the special function will be ignored.

Bit	Function
0	Switch ON
1	Enable voltage
2	Quick stop
3	Enable operation
4	New setpoint
5	Change setpoint now
6	Absolute or relative
7	Fault reset
8	Halt
9	Change or setpoint

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Bit	Function
10	Reserved
11	Manufacturer-specific: CAN input function 1
12	Manufacturer-specific: CAN input function 2
13	Manufacturer-specific: CAN input function 3
14	Recall active
15	Inspection active

Programmable Input Functions for CN03-CN05:	Description of Functionality	NUM
No Function	No function is assigned to input	0
UPS Operation	The undervoltage limit is reduced and single phase detection is turned off to allow for supply from 230V UPS battery power source; the LS10 Battery Operation Speed is selected. Additionally, carrier frequency is dropped to 2kHz to reduce switching losses at very low output frequencies.	1
Reduced Torque	The torque limit is set according to the LC31 Reduced Maximum Torque.	2
Emergency Profile	Emergency Profile rate settings are loaded, according to parameters LS40-45.	4
Emergency Generator Speed	LS09 Emergency Power Speed is selected and all speeds are limited to this value.	8
Fault Reset	Input to reset drive fault errors	16
External Fault	Input triggers specific 'External Fault' error. The source of the input may be from the controller, linked from a drive output, etc.	17
Brake Release Confirmation	Indicates the drive has received brake open confirmation from brake microswitch. Prevents brake drag. Drive fault if no confirmation received. ➡ Refer to *LI20 Brake Switch Function* for reset options.	18
Main Contactor Check	Indicates the Motor Contactor auxiliary has closed/opened. Qualifies enable. Drive will not output current until this confirmation has been received; fault if not. Premature open will result in drive disable.	19
Earthquake Speed	Earthquake speed selected, LS08. All speeds limited to 150 fpm max.	20
Emergency Slowdown (ESD)	Alternate slowdown selected, according to LS48, 49; (e.g. quick stop).	21
Position Selection	Activates Positioning run (currently not supported)	22
Position Deviation Reset	Corrects position deviation at leveling zone marker, according to distance set in LP05.	23
Teach Value	Learns floor value (not yet implemented)	24
Up Direction	Ignored in Cia417 control system.	25
Down Direction	Ignored in Cia417 control system.	26
Speed Selection	Ignored in Cia417 control system.	27

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ETS (Emergency Terminal Slowdown)	Emergency Terminal Slowdown	28
NTS1 (Normal Terminal Slowdown)	Normal Terminal Slowdown 1	29
NTS2 (Normal Terminal Slowdown)	Normal Terminal Slowdown 2	30
NTS3 (Normal Terminal Slowdown)	Normal Terminal Slowdown 3	31
Inspection Speed	➡ Refer to *F6 Reference manual* for more information.	32
Regen Fault (AFE Fault)	Input triggers Regen Fault error. This is an active low input function that is triggered by the Ready Digital Output (X2A.20) on the R6 Regen.	33
Default: No Function (0)		

Table 4.1 *CN03-CN05 Programmable input functions*

CAN Output Functions (CN06-CN08)

CN06 CAN Output Function 1
CAN Addr: 2006h

CN07 CAN Output Function 2
CAN Addr: 2007h

CN08 CAN Output Function 3
CAN Addr: 2008h

These parameters define the outputs, O1, O2, RLY, or OSW that are mapped to the manufacturer-specific CAN Statusword bits. Special functions can be assigned to the Control Word manufacturer's specific bits 8, 14 and 15 through CN06, CN07 and CN08. Special functions must be activated before the Control Word, Enable Voltage and Enable Operation bits are given. Otherwise, the special function will be ignored.

Bit	Function
0	Ready to switch ON
1	Switched ON
2	Operation enabled
3	Fault
4	Voltage enabled
5	Quick stop
6	Switched on disabled
7	Warning
8	Manufacturer specific: CAN output function 1
9	Remote
10	Target reached
11	Internal limit active
12	Setpoint Acknowledged Bit
13	Maximum slippage
14	Manufacturer specific: CAN output function 2
15	Manufacturer specific: CAN output function 3

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Each parameter can be assigned to one of the following outputs:

- Output O1
- Output O2
- Output RLY
- Output OSW

When these outputs are set 'active' within the drive parameter RU20,
the CAN Statusword changes to reflect this 'activation.'

For more information on each output function, ➡ refer to the standard elevator instruction manual 00F5LUB-K331.

The default setting is “0 no function”.

Value	Description
0	No Function
1	O1 - Digital output 1
2	O2 - Digital output 2
3	RLY1 - Relay output 1

CN14 NMT State
CAN Addr: 200Eh

The network management state the elevator application is currently in. The elevator application will not allow any runs to be performed if it is not in the operational state.

Value	Description
0	Boot Up
4	Stopped
5	Operational
127	Pre-operational

CN23 VT MPDO Setting (not yet implemented)
CAN Addr: 2017h

The virtual terminal MPDO configuration settings. ➡ Refer to section *3.2 TxPDO - Process data outputs* for details.

CN40 Position Reached Window
CAN Addr: 2028h

An absolute distance from the target position the car must be in before the Status Word bit Target Reached will be output.

CN60 Error Info & Emergency Text
CAN Addr: 2028h

Subindex 1 is unused. Subindex 2 contains the error number as seen in DG02, but ASCII-encoded.

Subindex	Description	Units
1	Display error info	-
2	Emergency text string	-

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4.2 CAN CiA417 Parameters (CA)

CA00 CAN Control Word
CAN Addr: 6400h

An absolute distance from the target position the car must be in before the Status Word bit Target Reached will be output.

Velocity Mode Control Word (16-bit)

The control word consists of bits which control the operation of the drive. This definition of the bits is consistent with DS417 standard.

Bit	Function
0	Switch ON
1	Enable voltage
2	Quick stop
3	Enable operation
4	Reserved
5	Reserved
6	Reserved
7	Fault reset
8	Halt
9	Reserved
10	Reserved
11	Manufacturer specific: CAN Input function 1
12	Manufacturer specific: CAN input function 2
13	Manufacturer specific: CAN input function 3
14	Recall active
15	Inspection active

Bit 0 - Switch ON
When the drive is standalone (no AFE or regen unit), this bit has no immediate function. This bit is required to properly start a run. ➡ Refer to *Figure 7.1 CAN state machine.*

Bit 1 - Enable voltage
When the drive is standalone (no AFE or regen unit), this bit has no immediate function. This bit is required to properly start a run. ➡ Refer to *Figure 7.1 CAN state machine*.

When the drive is not used standalone, this bit can be used to trigger an output which can then be used to close a contactor, thereby powering up the drive. This output can also be used to provide the pre-charge signal to a regen or AFE unit.

Bit 2 - Quick stop
Triggers an emergency slowdown utilizing the emergency slow down ramp. Quick stop is an active low.

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Bit 3 - Enable operation
Enable operation allows the drive to begin following the speed command.

Bits 4-6
These bits are reserved according to the DS417 specification.

Bit 7 - Fault reset
Used to reset drive faults.

Bit 8 - Halt (not yet implemented)
Triggers a deceleration to zero speed using the normal decel profile.

Bits 9-10
These bits are reserved according to the DS417 specification.

Bits 11-13 Manufacturer specific
These bits are defined by the CAN input functions 1 through 3 in parameters *CN03*, *CN04* and *CN05* respectively.

Bit 14 - Recall active (not yet implemented)
Indicates if an Emergency Recall Operation is active.

Bit 15 - Inspection active
Indicates the current run is an inspection run. Inspection runs must always occur in velocity mode. The controller must change modes of operation, CA03 to 3.

This bit must be set before bits 1 and 3 are set.

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CA00 CAN Control Word
CAN Addr: 6400h

Position Mode Control Word (16-bit)

The control word consists of bits which control the operation of the drive. This definition of the bits is consistent with DS417 standard.

Bit	Function
0	Switch ON
1	Enable voltage
2	Quick stop
3	Enable operation
4	New Setpoint
5	Change setpoint now
6	Absolute or relative
7	Fault reset
8	Halt
9	Change on Setpoint
10	Reserved
11	Manufacturer specific: CAN Input function 1
12	Manufacturer specific: CAN input function 2
13	Manufacturer specific: CAN input function 3
14	Recall active
15	Inspection active

Bit 0 - Switch ON
When the drive is standalone (no AFE or regen unit), this bit has no immediate function. This bit is required though to properly start a run. ➡ Refer to *Figure 7.1 CAN state machine*.

Bit 1 - Enable voltage
When the drive is standalone (no AFE or regen unit), this bit has no immediate function. This bit is required though to properly start a run. ➡ Refer to *Figure 7.1 CAN state machine*.

When the drive is not used standalone, this bit can be used to trigger an output which can then be used to close a contactor, thereby powering up the drive. This output can also be used to provide the pre-charge signal to a regen or AFE unit.

Bit 2 - Quick stop
Triggers an emergency slowdown utilizing the emergency slow down ramp. Quick stop is an active low.

Bit 3 - Enable operation
Enable operation allows the drive to begin following the speed command.

Bit 4 - New Setpoint
Requests that the current position set value be accepted as a new target position.

Bit 5 - Change setpoint now
Causes the new target position to become the active target in the position controller.

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Bit 7 - Fault reset
Used to reset drive faults.

Bit 8 - Halt (currently not supported)
Triggers a deceleration to zero speed using the normal decel profile.

Bit 9 - Change on Setpoint (currently not supported)
When this bit is active, it causes a write to bit 4 to act as a write to bit 5 also.

Bit 10
This bit is reserved according to the DS417 specification.

Bits 11-13 – Manufacturer-specific
These bits are defined by the CAN input functions 1 through 3 in parameters *CN03*, *CN04* and *CN05* respectively.

Bit 14 - Recall active (currently not supported)
Indicates if an Emergency Recall Operation is active.

Bit 15 - Inspection active
Indicates the current run is an inspection run. Inspection runs must always occur in velocity mode. The controller must change modes of operation, CA03 to 3.

This bit must be set before bits 1 and 3 are set.

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CA01 CAN Status Word
CAN Addr: 6401h

Velocity Mode Status Word (16-bit)

The status word consists of bits which indicate the operation of the drive. This definition of the bits is consistent with DS417 standard.

Bit	Function
0	Ready to switch ON
1	Switched ON
2	Operation enabled
3	Fault
4	Voltage enabled
5	Quick stop
6	Switched on Disabled
7	Warning
8	Manufacturer specific: CAN Input function 1
9	Remote
10	Target reached
11	Internal limit active
12	Zero speed
13	Maximum slippage
14	Manufacturer specific: CAN input function 2
15	Manufacturer specific: CAN input function 3

Bit 0 - Ready to switch ON
Indicates the drive software is booted and ready to be switched on.

Bit 1 - Switched on
Confirms that the drive is switched on, holding zero speed, or in the process of ending a run by stopping or setting the brake.

Bit 2 - Operation enabled
Confirms that operation is enabled, and the drive is now running.

Bit 3 – Fault
Indicates the drive has shut down with a fault condition.

Bit 4 - Voltage enabled
Confirms voltage to the motor has been enabled. (The F6 is always under high voltage unless an AFE of some sort is used).

Bit 5 - Quick stop
Indicates a quick stop has been activated. Quick stop is active low.

Bit 6 - Switched on Disabled
Indicates that the drive is in its pre-run state.

Bit 7 - Warning (currently not supported)
Indicates a drive warning, such as motor or drive overheat.

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Bit 8 - Manufacturer specific
This bit is defined by CAN output function 1 in parameter *CN06*. Through this parameter, the bit can be linked to any one of the hardware output functions.

Bit 9 - Remote (currently not supported)
A value of ‘0’ indicates that the control word has not been processed; a value of ‘1’ means that the control word has been processed.

Bit 10 - Target reached
The current speed as measured by the drive matches the command speed sent from the controller.

Bit 11 - Internal limit active (currently not supported)
Indicates the drive is operating at the torque, current or voltage limit.

Bit 12 - Zero speed
Indicates the motor speed is zero.

Bit 13 - Maximum slippage (currently not supported)
This bit indicates that the drive had a following error where the motor speed fell behind the command speed.

Bits 14-15 - Manufacturer specific
This bit is defined by CAN output function 1 and CAN output function 2 in parameters *CN07* and *CN08*. Through these parameters, the bit can be linked to any one of the hardware output functions.

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CA01 CAN Status Word
CAN Addr: 6401h

Position Mode Status Word (16-bit)

The status word consists of bits which indicate the operation of the drive. This definition of the bits is consistent with DS417 standard.

Bit	Function
0	Ready to switch ON
1	Switched ON
2	Operation enabled
3	Fault
4	Voltage enabled
5	Quick stop
6	Switched on Disabled
7	Warning
8	Manufacturer specific: CAN Input function 1
9	Remote
10	Target Reached
11	Internal limit active
12	Setpoint Acknowledged Bit
13	Maximum slippage
14	Manufacturer specific: CAN input function 2
15	Manufacturer specific: CAN input function 3

Bit 0 - Ready to switch ON
Indicates the drive software is booted and ready to be switched on.

Bit 1 - Switched on
Confirms that the drive is switched on.

Bit 2 - Operation enabled
Confirms that operation is enabled.

Bit 3 - Fault
Indicates the drive has shut down with a fault condition.

Bit 4 - Voltage enabled
Confirms voltage to the motor has been enabled.

Bit 5 - Quick stop
Indicates a quick stop has been activated. Quick stop is active low.

Bit 6 - Switched on Disabled
Indicates that the drive is in its pre-run state.

Bit 7 - Warning
Indicates a drive warning, such as motor or drive overheat.

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Bit 8 - Manufacturer specific
This bit is defined by CAN output function 1 in parameter *CN06*. Through this parameter, the bit can be linked to any one of the hardware output functions.

Bit 9 – Remote
A value of ‘0’ indicates that the control word has not been processed; a value of ‘1’ means that the control word has been processed.

Bit 10 - Target reached
The drive has reached the last setpoint position that was accepted.

Bit 11 - Internal limit active (currently not supported)
Indicates the drive is operating at the torque, current or voltage limit.

Bit 12 - Set point acknowledged
The drive must set this bit active if it can reach the required setpoint otherwise this bit is left low.

Bit 13 - Following error (currently not supported)
This bit is set if the motor speed deviates from the commanded speed.

Bits 14-15 - Manufacturer specific
This bit is defined by CAN output function 1 and CAN output function 2 in parameters *CN07* and *CN08*. Through these parameters, the bit can be linked to any one of the hardware output functions.

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CA03 Modes of Operation
CAN Addr: 6403h

This Parameter determines the control mode of the drive (velocity or position).
Writing a value of '1' will change the drive to Position Control Mode.
Writing a value of '3' will change the drive to Velocity Control Mode.
All other values are ignored. Mapped to RxPDO01.

CA04 Modes of Operation Display
CAN Addr: 6404h

Indicates the active control mode of the drive: '1' is position mode; '3' is velocity mode; any other value is a non-CAN mode. Mapped to TxPDO00.

CA06 Control Effort
CAN Addr: 6406h

This parameter is only used in position mode. It is used to indicate the current slowdown point of the position controller; the unit is raw position counts. Mapped to TxPDO02.

CA31 Position Conversion
CAN Addr: 641Fh

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

This object needs to be configured by the drive controller or by the user to enable a correct operation.

Sub-index 01h shall contain the number of position units.

Sub-index 02h shall contain the equivalent length value in multiples of mm of the total number of position units as given in sub-index 01h.

CA32 Target Position
CAN Addr: 6420h

The target position. Mapped by default to RxPDO2

CA33 Position Range Limit
CAN Addr: 6421h

Defines the absolute minimum and maximum position values (raw counts). Use sub-index 01h for the minimum and sub-index 02h for the maximum.

CA34 Software Position Limit
CAN Addr: 6422h

Defines a software limit for the minimum and maximum position values. Use sub-index 01h for the minimum and sub-index 02h for the maximum.

CA35 Profile Velocity
CAN Addr: 6423h

The target velocity in mm/s used in position mode. Mapped to PxPDO02.

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CA48 Target Velocity
CAN Addr: 6430h

The target velocity in mm/sec. Only valid in velocity mode. Mapped to RxPDO4.

CA51 Actual Velocity
CAN Addr: 6433h

Current motor encoder speed converted to mm/sec. Mapped to TxPDO04.

CA53 Velocity Window
CAN Addr: 6435h

Sub-index 2 adjusts how long the velocity must remain in the range specified by sub-index 1 before activating Target Reached in the status word.

CA54 Velocity Threshold (not yet implemented)
CAN Addr: 6436h

Sub-index 2 adjusts how long the velocity must remain above or below the value specified by sub-index 1 before activating Zero Speed in the status word.

CA55 Maximum Slippage
CAN Addr: 6437h

Sets the max slippage value in percent.

CA101 Car loads and weights (not yet implemented)
CAN Addr: 6465h

Used to adjust the rated car weights and loads. The values are entered via the subindexes as listed below.

Subindex	Description	Units
1	Rated car load	kg
2	Car weight	kg
3	Counterweight	kg

CA112 Load Value (This object is not fully implemented)
CAN Addr: 6480h

Sub-index 1 contains the load value in units specified by sub-index 2. Currently the only supported units are kg. Mapped to RxPDO00.

Subindex	Description	Units
1	Absolute Load Value	kg
2	SI Unit	-
3	Negative Load Value	kg

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CA114 Load Signaling (not yet implemented)
CAN Addr: 6482h

Sub-index 1 contains general load status information. Each bit in the Load Signal has a different meaning. Sub-index 2 is used to determine if a specific bit in the Load Signal should be processed. If set to '1', the bit is processed. If set to '0', the bit is ignored. Mapped to RxPDO00.

Subindex	Description	Units
1	Load Signal	-
2	Load Signal Interrupt	-

Load Signal Bit Descriptions

Bit	Function
7	Reserved
6	Reserved
5	Rope Difference
4	Slack Rope
3	Overlaod
2	Full Load
1	Norm Load
0	Zero Load

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4.3 CAN Mandatory Parameters (CG)

CG00 Device Type
CAN Addr: 1000h

Identifies the CAN device type. Value is fixed at 090001A1h as defined by the DS417 specification.

CG01 Error Register
CAN Addr: 1001h

Error messages are given via the emergency object. The message has the following format:

1. First is the class: 0x00 for no error and 0x10 for an error.
2. Next is based on the table below.
3. The last byte is the DG02 status.

Error Register	Description	Dg02 Values
0x00	No Error	None
0x01	Generic Error	None
0x02	Current Error	4, 56, 97
0x04	Voltage Error	1,2,3,5,12,150
0x08	Temperature Error	6, 7, 8, 9, 11, 36, 87, 88, 89, 91, 92, 213
0x10	Communication Error	18, 93, 103, 149
0x20	Profile Specific Error	None
0x40	Reserved	None
0x80	Manufacturer Specific Error	All Others

CG02 Status register
CAN Addr: 1002h

Outputs the DG02 value.

CG06 Communication Cycle Period (currently not supported)
CAN Addr: 1006h

Used to establish synchronous communication between the controller and the drive. Gives the time in mSec between CAN synchronization pulses.

CG08 Manufacturer Device Name
CAN Addr: 1008h

Displays the name of the CAN device. Displays KEB in ASCII.

CG10 CAN Software Version
CAN Addr: 100Ah

Displays the current software version of the elevator application.

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CG12 Guard Time
CAN Addr: 100Ch

The guard time when node guarding in mSec. Not recommended. Heartbeat monitoring is preferred.

CG13 Life Time Factor
CAN Addr: 100Dh

Used together with the guard time, the amount of time you guard for.

CG20 Emergency CobID
CAN Addr: 1014h

The emergency consumer object ID. This is the ID used to send error messages to all nodes. The COB id is defined as CG20 + NODE_ID.

CG22 Consumer Heartbeat Time
CAN Addr: 1016h

The consumer heartbeat (controller heartbeat consumed by the drive) is broken down into four parts as defined below. Only support heartbeat consuming from call controller.

The default heartbeat time is 1.5 seconds.

Sub-Index	Description	Value
1	Call Controller (NMT master)	000105DCh
2 (not supported)	Position unit 1	000405DCh
3 (not supported)	Position unit 2	000505DCh
4 (not supported)	Load measuring unit	000D05DCh

CG23 Producer Heartbeat Time
CAN Addr: 1017h

The heartbeat time of the producer (produced by the drive) in mSec.

CG24 Identify Object
CAN Addr: 1018h

The identity object is broken down into four parts as defined below.

Sub-Index	Description	Value
1	Vendor ID	00000014h
2	Product code	1C8H
3	Revision	Date code
4 (not supported)	Serial number	Serial number of the unit

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4.4 CAN Optional Parameters (CB)

CB00 Supported VD Objects (currently not supported)
CAN Addr: 6000h

Indicates the supported VD (virtual devices) objects.

CB50 Power Saving Mode Display (currently not supported)
CAN Addr: 6032h

Defines the power saving mode of the display. Defaulted at 255.

CB72 MPDO Transmit Timer (currently not supported)
CAN Addr: 6048h

Defines the MPDO transmit timer for the VD power measuring unit. The value is in mSec and is entered using sub-index 1.

CB80 Parameter Setting Capability (currently not supported)
CAN Addr: 6050h

Determines whether parameters have different sets. The elevator application does not, so always zero.

CB82 Parameter Setting Display (currently not supported)
CAN Addr: 6052h

If CB80 is non-zero, then this indicates which set is currently selected for adjustment.

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4.5 CAN-Bus Position Value Parameters (PO)

PO00 Position Value
CAN Addr: 6403h

This parameter contains the position value which is given by the CAN bus position encoder. The value can be found at sub-index 1.

PO07 Car Speed Value
CAN Addr: 6410h

This parameter contains the car speed value which is given by the CAN bus encoder. The value can be found at sub-index 1.

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5 Filtering the Speed Command (currently not supported)

LX11 - Reference Splitting, can be used for interpolation of the CAN speed profile and is typically set at twice the cyclic update time, in milliseconds (ms). This will cause the drive to generate a new speed command value every millisecond despite the fact the new values are being given at a much slower rate.

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6 Virtual Terminal (not yet implemented)

The virtual terminal provides a means of remote access to the elevator application's display and keypad. The resulting functionality allows the CAN master to retrieve the display information from the elevator application to display it on its own native display. Likewise, the keypad on the elevator application can be mapped to the push buttons on the CAN master. Thereby, the parameters of the drive can be displayed and edited through the CAN master. Note that this is not an object-oriented interface but a simulated physical interface, i.e. one press of the UP button on the CAN master equals one press of the UP button on the elevator application. In this way, the user navigates through the parameter lists and displays the parameters one by one.

The virtual terminal feature of the LCD CAN elevator application was designed for a 2x16 character display. Currently this feature is not expandable to larger displays or dot matrix displays.

All parameters that are available to edit on the keypad are available to edit on the virtual terminal.

To edit a parameter, a group must first be selected. The UP and DOWN virtual terminal key commands are used to select the desired group. The ENTER or RIGHT virtual terminal key commands are used to select the desired group. *Figure 6.1* below displays how groups are shown on the virtual terminal screen.

Figure 6.1 *Normal parameter*

Once a group is selected the parameters from the respective group will be available for modification. Parameters will appear on the virtual terminal in one of two ways.

- Parameters without a subindex will appear as shown in *Figure 6.2* below.
- Parameters with a subindex will appear as shown in *Figure 6.3* below.

Figure 6.2 *Normal parameter*

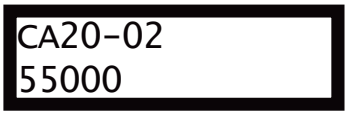

Figure 6.3 *Parameter with subindex*

The ENTER or RIGHT virtual terminal key commands are used to select the desired parameter to edit. A cursor will appear on screen when the virtual terminal is in edit mode. *Figure 6.4* below shows the virtual terminal screen for the LM01 parameter that is in edit mode. Changing the value is done by use of the virtual terminal key commands, UP, DOWN, LEFT and RIGHT.

- UP command: Increments the number underlined by the cursor.
- DOWN command: Decrements the number underline by the cursor.
- LEFT command: Removes the rightmost number, moves cursor one place to the left.

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- RIGHT command: Adds a ‘0’ to the end of the number, moves cursor one place to the right.

Figure 6.4 *Editing a parameter (note the cursor)*

Storing the desired value is done by using the virtual terminal ENTER key command. If an attempt to edit a parameter is made but the message “Parameter RO” is displayed, this means that the parameter is READ-ONLY and cannot be edited as seen in *Figure 6.5* below.

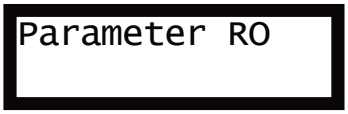

Figure 6.5 *Read-only message*

If an attempt to edit a parameter is made but the message “Password LOW” is displayed, see *Figure 6.6* below. This indicates that the parameter is available to edit, but the current value of OS01 does not allow for edit access to this parameter.

Figure 6.6 *Password error message*

Command	Function
UP Key	Same as UP via keypad
DOWN Key	Same as DOWN via keypad
LEFT Key	Same as ENTER via keypad
RIGHT Key	Same as ESCAPE via keypad
ENTER Key	Same as ENTER via keypad
END Key	Same as ESCAPE via keypad

Table 6.1 *Summary of virtual terminal commands*

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R\C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	G	G	N	N	-	S	S	X	X	X	X	X	X	X	X	X
2	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V

Table 6.2 *Layout of 2x16 character display*

G = Group characters
N = Parameter number
S = Subindex
X = Don’t care
V = Integer Value

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7 Application Information

7.1 Parameter Setup

CAN parameters must be configured correctly!

Basic Setup Parameters

- US02 = 0 (m/sec)
- US04 = 7 (CiA417)

CAN Parameters

- CN00 - CAN node id, default: 2.
- CN01 - CAN baud rate, default: 250k.
- CG22[1] - Call Controller consumer heartbeat

The Call Controller should set this parameter upon boot up. Set CG22[1] to '0' to have the Drive Unit not listen for the call controller's heartbeat (NOT RECOMMENDED).

Bits 31-24	23-16	15-0
(reserved 0x000)	Node-id of call controller	Heartbeat time in ms

CAN Functionality Parameter Groups

- **CG** - CiA301 configuration parameters. Mostly device information and communication configuration parameters.
- **RM** - RPDO mapping parameters (read-only)
- **RS** - RPDO communication configuration parameters
- **TM** - TPDO mapping parameters (read-only)
- **TR** - TPDO communication configuration parameters
- **CA** - CiA417 application parameters
- **CN** - Baud Rate, Node id, manufacturer's specific parameters
- **PO** - CAN encoder raw position value

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7.2 Modes of Operation

Ensure Modes of Operation display is not ‘0’ and matches Modes of Operation.

Modes of Operation is the control mode the controller is requesting and is sent over process data. The Drive Unit receives the Modes of Operation via RPDO #259.

Modes of Operation Display is the control mode the Drive Unit is currently in. If this value is ‘0’ or does not match Modes of Operation, there is a problem. The Drive Unit sends Modes of Operation Display via TPDO #260.

Name	CiA Index	KEB ID	PDO (if applicable)
Modes of Operation	0x6403	CA03	RPDO #259
Modes of Operation Display	0x6404	CA04	TPDO #260

7.3 Control Word

The Control Word is sent from the elevator controller and dictates the Drive Unit’s actions. The Control Word is received by the Drive Unit via RPDO #259. This is an unsigned 16-bit value where each bit represents various requests the controller can make. For a basic setup, the most important bits on the control word are the following:

- Inspection Active (Bit 15)
- Enable Operation (Bit 3)
- Quick Stop (Bit 2)
- Enable Voltage (Bit 1)
- Switch On (Bit 0)

Table 7.1 and *Table 7.2* below show the Control Word bits. Take notice that there are some differences in the Control Word depending on Modes of Operation (velocity or position).

Bit 15	14	13	12	11	10	9	8
Inspection Active	Recall Active	Manu. Specific	Manu. Specific	Manu. Specific	Reserved	Reserved	Halt
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Fault Reset	Reserved	Reserved	Reserved	Enable Operation	Quick Stop	Enable Voltage	Switch On

Table 7.1 *Control word velocity*

Bit 15	14	13	12	11	10	9	8
Inspection Active	Recall Active	Manu. Specific	Manu. Specific	Manu. Specific	Reserved	Change on Setpoint	Halt
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Fault Reset	Abs/rel	Change Set Immed.	New Setpoint	Enable Operation	Quick Stop	Enable Voltage	Switch On

Table 7.2 *Control word position*

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7.4 Status Word

The Status Word is how the Drive Unit represents the current state it is in. The Status Word is sent from the Drive Unit via TPDO #260. This is an unsigned 16-bit value where each bit represents a status of the Drive Unit. For a basic setup the most important bits are the following.

- Switch On Disabled (Bit 6)
- Quick Stop (Bit 5)
- Voltage Enabled (Bit 4)
- Operation Enabled (Bit 2)
- Switched On (Bit 1)
- Ready to Switch On (Bit 0)

Table 7.3 and *Table 7.4* below shows the full contents of the Status Word. Similar to the Control Word, the Status Word differs depending on Modes of Operation.

Bit 15	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Manu. Specific	Manu. Specific	Max Slippage	Speed = 0	Internal Limit Active	Target Reached	Remote	Manu. Specific
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Warning	Switch on Disabled	Quick Stop	Voltage Enabled	Fault	Operation Enabled	Switched On	Ready to Switch On

Table 7.3 *Status word velocity*

Bit 15	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Manu. Specific	Manu. Specific	Max Slippage	Set Point Ack.	Internal Limit Active	Target Reached	Remote	Manu. Specific
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Warning	Switch On Disabled	Quick Stop	Voltage Enabled	Fault	Operation Enabled	Switched On	Ready to Switch On

Table 7.4 *Status word position*

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7.5 Starting a Run: General Description

To start a run, interaction needs to take place between the Control Word and the Status Word. There is a sequence that needs to be followed to properly start a run. This table shows a state-machine of the interaction between the Control Word and Status Word. *Table 7.5* shows a general timing table of the Control/Status Word interaction. It should be noted the time value in Table 7.5 is 'generic' and does not represent an actual time. Also, Table 7.5 is treating the upper bits that are not shown of the Control/Status Words as "don't care" values.

This section is not a complete specification on the steps required to start a run. This section displays a general requirement for the Control Word and Status Word interaction.

Time	Status Word	Control Word	Comment
0	0x60	0x0	Idle
1	0x60	0x6	Initiate run, controller sends 0x6 and waits for status word to update.
2	0x31	0x6	Status word updates to 0x31.
3	0x31	0x7	Controller sends 0x7 and waits for status word to update.
4	0x33	0x7	Status word updates to 0x33.
5	0x33	0xF	Controller sends 0xF and waits for status word to update.
6	0x37	0xF	Speed output to motor.

Table 7.5 *Starting a run timing*

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7.6 Stopping a Run: General Description

Stopping a run is sequencing the Control Word in reverse of starting a run. Rather than 0->6->7-F to stop a run, the Controller would give F->7- >6->0. *Table 7.6* shows a general timing table for the Control/Status Word handshaking that occurs while properly stopping a run. It should be noted the time value in Table 7.6 is “generic” and does not represent an actual time. Also, Table 7.6 is treating the upper bits that are not shown of the Control/Status Words as “don’t care” values.

This section is not a complete specification on the steps required to stop a run. This section displays a general requirement for the Control Word and Status Word interaction.

Time	Status Word	Control Word	Comment
0	0x37	0xF	Running
1	0x37	0x7	Initiate stop, controller sends 0x7 and waits for status word to update.
2	0x33	0x7	Status word updates to 0x33.
3	0x33	0x6	Controller sends 0x6 and waits for status word to update.
4	0x31	0x6	Status word updates to 0x31.
5	0x31	0x0	Controller sends 0x0 and waits for status word to update.
6	0x60	0x0	Idle

Table 7.6 *Stopping a run timing*

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7.7 Performing a Run: Full Description

To officially start a run, a few other specifics need to occur beyond what is described in the General Description. These specifics will differ slightly depending on Modes of Operation.

7.7.1 Velocity Mode

Performing a velocity run requires the controller to give the Drive Unit a target velocity. The controller can give a new target velocity at any time and the Drive Unit will respond. In velocity mode, the controller should be monitoring the current position to know when to start slowing the car down to reach the desired position (floor).

The controller gives the desired speed through the Target Velocity object. The Target Velocity is a signed 32-bit value with units of mm/s. The polarity of the Target Velocity represents direction of travel.

The other factors to take note of are the Status Word bits Speed = 0 and Target Reached. The Drive Unit will set the Speed = 0 bit when the actual speed of the car is 0. The Drive Unit will set the Target Reached bit when the actual speed is within a configurable threshold of the Target Velocity.

To begin a run, give a non-zero Target Velocity and then cycle through the Control Word as described in the *Starting a run: General description* section. A new Target Velocity can be given at any time during the run and the Drive Unit will respond. When the controller wants to terminate the run, it should give a Target Velocity Value of '0' and wait for the Drive Unit to set the Speed = 0 bit of the Status Word. Once the Speed = 0 bit is set, the controller will know the car has stopped moving and can cycle through the stop procedure as described in the General Description section.

Inspection runs are only available in Velocity Mode. The travel speed is still given via the Target Velocity object. Setting the Inspection bit in the Control Word will limit the travel speed to 762 mm/s.

Table 7.7 shows a timing table of the steps required to perform a Velocity run. It should be noted that the times used are "generic" and do not represent actual timing in a real system. The variable 'x' is used as it is unknown how long a run will be in constant speed. *Table 7.8* provides common CiA417 objects used by velocity mode.

Time	Action	Comment
0	Nothing	Idle
1	Set Target Velocity	Give the desired run speed
2 to 8	Start Run Steps	Transition through the steps shown in *Table 7.5*.
9 to x	Constant Speed	May adjust Target Velocity as needed.
x + 1	Set Target Velocity to 0	Begin stopping procedure.
x + 2	Status Word Speed = 0 bit becomes True.	Car is now at zero speed.
x + 3 to x + 9	Stop Run Steps	Transition through the steps in *Table 7.6*.
x + 10	Nothing	Idle

Table 7.7 *Velocity mode timing*

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Name	CiA Index	KEB ID	PDO (if applicable)
Control Word	0x37	0xF	Running
Status Word	0x37	0x7	Initiate stop, controller sends 0x7 and waits for status word to update.
Target Velocity	0x33	0x7	Status word updates to 0x33.

Table 7.8 *Common CiA417 objects used by velocity mode*

7.7.2 Position Mode

For position mode to work correctly you must ensure the CAN encoder is synchronized with the motor encoder.

Performing a position run requires the controller to give the Drive Unit a destination position as well as a maximum velocity. The controller can give a new position at any time, but should be monitoring the Control Effort to know the closest position the Drive Unit can reach at the current velocity with current ramps. Note that the Target Position and Control Effort values are raw encoder counts.

The controller gives the position run max speed through the Profile Velocity object. The Profile Velocity is an unsigned 32-bit value with the units of mm/s. The Profile Velocity is the maximum move speed and may not be reached. Changing this value while a run is occurring will have no effect.

7.7.3 New Position Handshaking

The controller requests a new target position in the Target Position object and then sets Control Words bit 4 + bit 5 (new set point + change set point immediately) to high. If the Drive Unit can reach the requested target position, it will set Status Word bit 12 (set point acknowledge) to high. Once the controller sees Status Word bit 12 go high, it will immediately set Control Words bit 4 + bit 5 to low. Once the Drive Unit sees the Control Word bit 4 go low, it will immediately set Status Word bit 12 to low.

Table 7.9 shows a timing table of the handshaking between the Control Word and Status word when a new target position is requested. Note that the times used are “generic” times and do not represent actual timing in a real system.

Time	Status Word Setpoint Knowledge	Control Word New Setpoint	Comment
0	Low	Low	Idle or constant speed.
1	Low	Low	Controller gives new target position.
2	Low	High	Controller sets new setpoint bit.
3	High	High	Drive unit sets position acknowledge bit.
4	High	Low	Controller clears new setpoint bit.
5	Low	Low	Drive Unit clears position acknowledge bit.

Table 7.9 *New position handshaking timing table*

To begin a position run, the controller will need to set the Profile Velocity object, update the Target Position object, and then perform the new position handshaking as described above. The controller can then cycle through the control word as described in section

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Starting a run: General description, and the car will begin traveling towards the target position. Once the target position has been reached, the Drive Unit will set Status Word bit 10 (target reached) high to tell the controller the position move has been completed. The car will be stopped at this point and the controller can safely transition through the stopping sequence as described in the General Description section.

The controller may wish to step through target positions (floors) rather than give the final destination at the beginning of the run. Using the Control Effort that the Drive Unit is broadcasting and monitoring in the current position, the controller can give the next target position at the appropriate time. The new position handshaking process as described above will need to be completed each time a new position is requested. If the new target position is unable to be reached, the Drive Unit will stop at the last acknowledged target position.

Inspection runs are not available in Position Mode. If an inspection run is required, ➡ refer to section *Velocity mode*.

Table 7.10 shows a timing table of the steps required to perform a position run. Note that the times used are “generic” times and do not represent actual timing in a real system. The variable ‘x’ is used as it is unknown how long a run will be in constant speed**.**

Time	Action	Comment
0	Nothing	Idle
1	Set Profile Velocity	Give the maximum run speed.
2	Set Target Position	Give the target position.
3	New Position Handshake	➡ Refer to *Table 7.9*.
4 to 10	Start Run Steps	➡ Follow procedure shown in *Table 7.5*.
11 to x	Constant Speed	May set new target position as needed.
x + 1	Status Word Target Reached bit becomes True	Car is at target position and at 0 speed.
x + 2 to x +9	Stop Run Steps	➡ Follow procedure in *Table 7.6*.
x + 10	Nothing	Idle

Table 7.10 *Position run timing table*

Name	CiA Index	KEB ID	PDO (if applicable)
Control Word	0x6400	CA00	RPDO #259
Status Word	0x6401	CA01	TPDO #260
Target Position	0x6420	CA32	RPDO #261
Profile Velocity	0x6423	CA35	RPDO #261
Control Effort	0x6406	CA06	TPDO #262

Table 7.11 *Common CiA417 objects used by position mode*

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7.7.4 CAN Encoder Synchronization

The CAN Encoder must be synchronized with the motor encoder for position mode to function correctly. Synchronization should be as simple as writing to the Position Conversion object. This object is used to relate the number of CAN encoder ticks per linear distance the car travels. The Position Conversion object has two components: Number of Position Units and Total Length.

Number of Position Units is the number of CAN encoder ticks that will be output per Total Length the car travels. The Total Length's units are millimeters (mm).

Example:

If the car moves 681mm and the CAN encoder outputs 2048 ticks:

- Number of Position Units = 2048
- Total Length = 681

The controller should write the Position Conversion object upon boot up. When this object is written, a calculation is done based on the LN, LE, and LP parameters to scale the CAN encoder with the motor encoder. Any time the LN, LE, or LP parameters are changed, the Position Conversion object should be written to again to force the scale calculation. *Table 7.12* provides the position conversion object.

Name	CiA Index:subindex	KEB ID	PDO (if applicable)
Number of Position Units	0x6511:1	CA31[1]	NA
Total Length	0x6511:2	CA31[2]	NA

Table 7.12 *Position conversion object*

7.7.5 Tuning

Tuning is only available in Velocity Mode. This means the controller should set Modes of Operation to velocity before attempting any tuning.

Motor, SPI and pole learn tune modes require that the Control Word inspection bit be high before the tune mode starts and remain high until the tune mode completes.

Performing a tune mode is done by performing a velocity run as described above.

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7.8 CAN State Machine

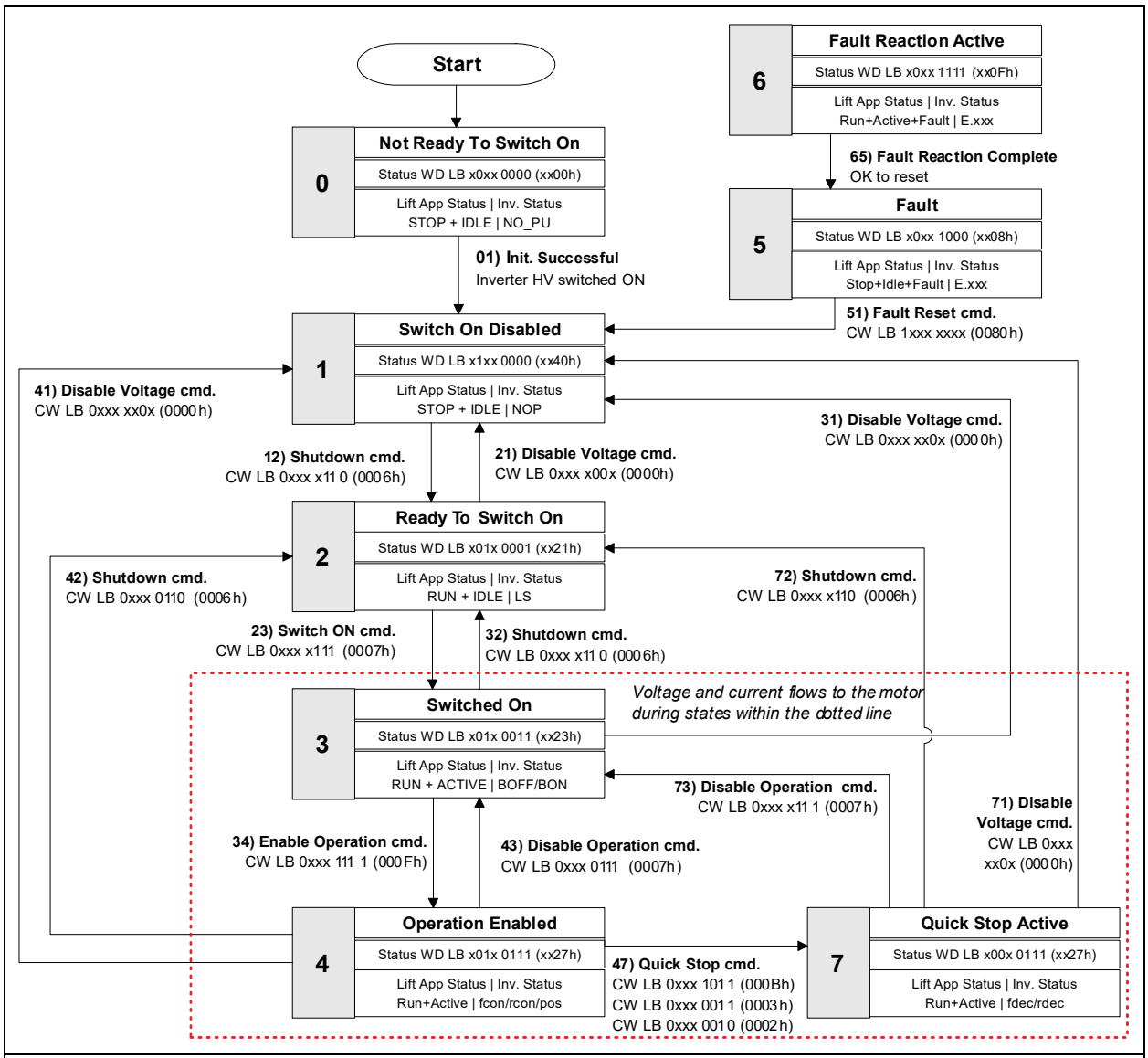

Figure 7.1 *CAN state machine*

7.9 CAN Load Weighing Pre-torque (not yet implemented)

When using external pre-torque with CAN communication, it is necessary to set LC01= 6: CAN pre-torque CiA417. The CiA417 specification requires that the load value be sent over in the SI units being used. There are several steps that need to be taken in the drive to convert this load value into a useful pre-torque percentage.

To begin:

1. Set the correct value in LN04 - Load.
2. Have the car hold zero speed with no load in the car.
3. Monitor DG05 - Actual Torque while it is holding empty car and enter the value into LC35 - No Load Torque.
4. Put full load into the car and have it hold zero speed.
5. Monitor the torque in DG05 again and enter the value into LC36 - Full Load Torque.
6. If LM07 - Motor Torque has been entered correctly, the drive can now use the incoming load value to correctly calculate the percentage of pre-torque needed for the measured load.

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8 Hardware Connection

8.1 CAN Hardware Connection

The CAN interface consists of three pluggable poles on terminals 23, 24, and 25 of the double-row control terminal strip X2A with spring-cage connection.

Assignment of the CAN connections is described below.

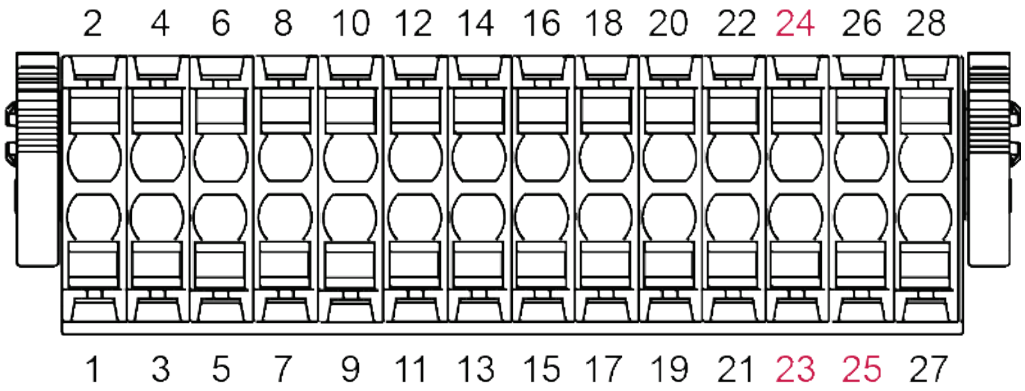

Figure 8.1 *CAN X2A hardware connections*

	X2A			X2A
Hardware	CAN		**Hardware**	CAN
Use	Bus Communications		**Use**	Bus Communications
Terminal	**Signal**		**Terminal**	**Signal**
1	N/A		15	N/A
2	N/A		16	N/A
3	N/A		17	N/A
4	N/A		18	N/A
5	N/A		19	N/A
6	N/A		20	N/A
7	N/A		21	N/A
8	N/A		22	N/A
9	N/A		23	CAN_L
10	N/A		24	CAN_H
11	N/A		25	CAN_GND
12	N/A		26	N/A
13	N/A		27	N/A
14	N/A		28	N/A

Table 8.1 *CAN X2A connection assignment*

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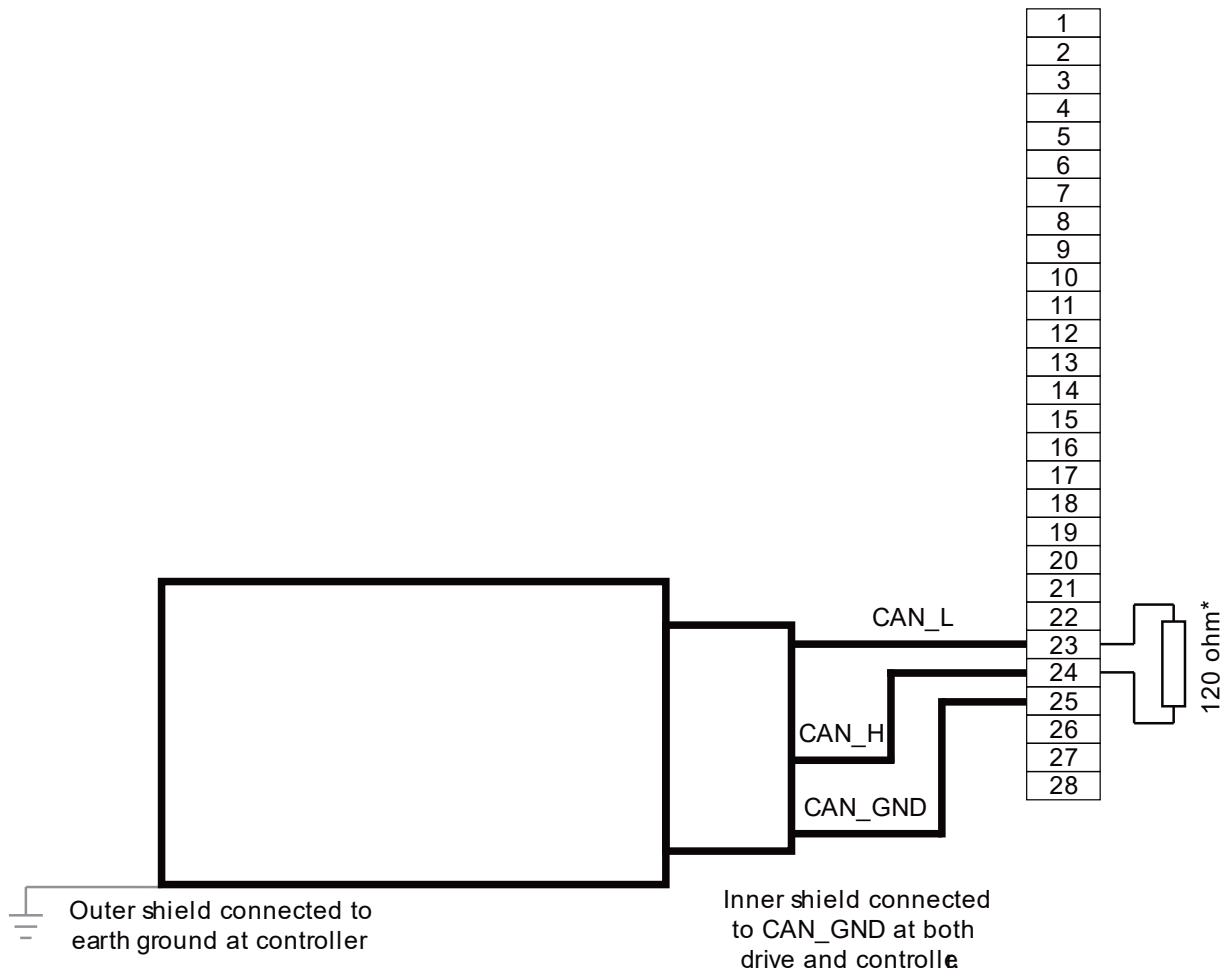

*** Termination resistor must be installed when the KEB Lift Drive is the last node.**

Figure 8.2 *Connection of signals, shields, and optional termination*

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The CAN cable should be selected from a recognized cable provider.

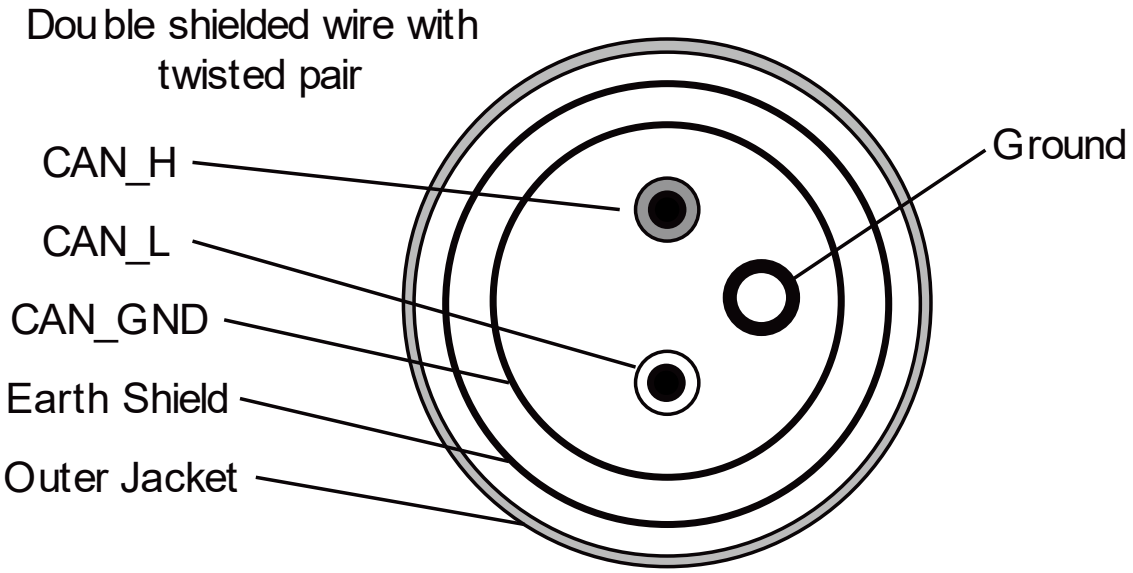

Figure 8.3 *Wire structure*

Manufacturer	Wire Type
U.I. LAPP GmbH Schulze-Delitzsch-Straße 25 70565 Stuttgart Germany Tel.: 0711/7838-01 Fax: 0711/7838-264 *www.lappkabel.de*	e.g. • UNITRONIC ®-BUS CAN UL/CSA (UL/CSA approved) • UNITRONIC ®-BUS-FD P CAN UL/CSA (UL/CSA approved) (different wire gauges available)
ConCab GmbH Äußerer Eichwald 74535 Mainhardt Germany Tel.: 07903/9155-0 Fax: 07903/9155-88 *www.concab.de*	e.g. • BUS-PVC-C (1 x 2 x 0,22 mm²) **Order-no.:** 93 022 016 (UL appr.) • BUS-Schleppflex-PUR-C (1 x 2 x 0,25 mm²) **Order-no.:** 94 025 016 (UL appr.)
SAB Bröckskes GmbH&Co. KG Grefrather Straße 204-212b 41749 Viersen Germany Tel.: 02162/898-0 Fax: 02162/898-101 *www.sab-brockskes.de*	e.g. • SABIX® CB 620 (1 x 2 x 0,25 mm²) **Order-no.:** 56202251 • CB 627 (1 x 2 x 0,25 mm²) **Order-no.:** 06272251 (UL appr.) (bigger wire gauges available)

Table 8.2 *Recommended manufacturers*

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9 Revision History

Version	Date	Description
00	2024-09	Preliminary Release

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Notes

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