MAKING MODERN LIVING POSSIBLE

Quick Guide
VLT® Lift Drive LD 302

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THE REAL DRIVE

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1 Inhalt

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1 Introduction

This manual is a guideline for using Danfoss frequency converter series, Lift Drive LD 302, Automation Drive FC 302 regarding design, installation, wiring and parameterization. Fundamental knowledge about elevators and frequency converters are essential. Fundamental knowledge is not a part of the manual. For elevators and the use of frequency converter, the national and local regulations and safety requirements must be complied. Regarding handling and use of frequency converters it is recommended additional to read and understand the available literature for Automation Drive FC 300 and Lift Drive LD 302 to be able to work with the system safely and professionally, particularly observe the hints and cautionary remarks.

Qualified Personnel

Only qualified personnel should carry out Installation, commissioning and maintenance of the frequency converter. Qualified personnel are trained personnel who are authorized to fit, install, commission, ground and label equipment, systems, and circuits in accordance with the standards for safety technology and who are familiar with the safety concepts of automation engineering. Additionally, the personnel must be familiar with all the instructions and safety measures described in supplemental publications and manuals are available from Danfoss. They must have suitable safety equipment and be trained in first aid.

Additional Resources

Other resources are available to understand advanced frequency converter functions and programming.

Supplemental publications and manuals are available from Danfoss:

Operating Instructions VLT® Automation Drive
Design Guide, VLT® Automation Drive
Programming Guide VLT® Automation Drive
Operating Instructions VLT® Lift Drive LD 302
See for listings:
http://www.danfoss.com/BusinessAreas/DrivesSolutions/Documentations/VLT+Technical+Documentation.htm

Symbols used in this document

The following symbols are used in this manual.

⚠WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION

Indicates a situation that may result in equipment or property-damage-only accidents.

NOTE

Indicates highlighted information that should be regarded with attention to avoid mistakes or operate equipment at less than optimal performance.

2 Safety

WARNING

High voltage

Frequency converters are connected to hazardous mains voltages. Extreme care should be taken to protect against shock. Only trained personnel familiar with electronic equipment should install, start, or maintain this equipment.

Unintended start

When the frequency converter is connected to the AC mains, the motor may be started by means of an external switch, a serial bus command, an input reference signal, or a cleared fault condition. Use appropriate cautions to guard against an unintended start.

Discharge time

Frequency converters contain DC-link capacitors that can remain charged even when the frequency converter is not powered. To avoid electrical hazards, disconnect AC mains, any permanent magnet type motors, and any remote DC link power supplies, including battery backups, UPS and DC-link connections to other frequency converters. Wait for the capacitors to fully discharge before performing any service or repair work. The amount of wait time is listed in the *Discharge Time* table. Failure to wait the specified time after power has been removed before doing service or repair could result in death or serious injury.

Discharge Time table	
Power range [kW]	Minimum waiting time [min]
0.37–7.5	4
11–90	15
High voltage may be present even when the warning LED indicator lights are off.	

Mechanical Holding Brake

A mechanical holding brake mounted directly on the motor shaft normally performs static braking. In some applications, the static holding torque is working as static holding of the motor shaft (usually synchronous permanent motors). A holding brake is either controlled by a PLC or directly by a digital output from the frequency converter (relay or solid state).

NOTE

When the holding brake is included in a safety chain:
The frequency converter cannot provide a safe control of a mechanical brake.
A redundancy circuitry for the brake control must be included in the total installation.

Crane, Lifts and Hoists

The controlling of external brakes must always have a redundant system. The frequency converter can in no circumstances be the primary safety circuit. Comply with relevant standards. It is recommended to disable protection mode in hoisting applications.

Motor-generated Over-voltage

The voltage in the intermediate circuit is increased when the motor acts as a generator.

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Back-EMF from PM motor operation

If coasted at high rpm the PM motor back-EMF may potentially exceed the maximum voltage tolerance of the frequency converter and cause damage. If it is possible that the motor may overspeed then it is recommended to equip a brake resistor.

Safe Stop

After installation and before first operation, perform a commissioning test of an installation or application, using Safe Stop. Perform the test again after each modification of the installation or application involving the Safe Stop.

NOTE

A passed commissioning test is mandatory after first installation and after each change to the safety installation. The Safe Stop function can be used for asynchronous, synchronous and permanent magnet motors. Two faults can occur in the power semiconductor of the frequency converter. When using synchronous or permanent magnet motors a residual rotation can result from the faults. The rotation can be calculated to Angle = 360/(Number of Poles). The application using synchronous or permanent magnet motors must take this residual rotation into consideration and ensure that it does not pose a safety risk. This situation is not relevant for asynchronous motors.

3 Installation

Installation Site Check List

- The frequency converter relies on the ambient air for cooling. Observe the limitations on ambient air temperature for optimal operation.
- Ensure that the installation location has sufficient support strength to mount the frequency converter.
- Keep the manual, drawings, and diagrams accessible for detailed installation and operation instructions. It is important that the manual is available for equipment operators.
- Locate equipment as near to the motor as possible. Keep motor cables as short as possible.
- Check the motor characteristics for actual tolerances.
- Ensure that the ingress protection rating of the frequency converter is suitable for the installation environment. IP55 (NEMA 12) or IP66 (NEMA 4) enclosures may be necessary.

⚠CAUTION

Ingress protection

IP54, IP55 and IP66 ratings can only be guaranteed if the unit is properly closed.

- Ensure that all cable glands and unused holes for glands are properly sealed
- Ensure that the unit cover is properly closed.

⚠CAUTION

Device damage through contamination. Do not leave the frequency converter uncovered. For "spark-free" installations according to European Agreement concerning International Carriage of Dangerous Goods by Inland Waterways (ADN_2011 ###), refer to VLT® Automation Drive FC 300 Design Guide.

Frequency Converter and motor pre-installation check list

- Compare the model number of unit on the nameplate to what was ordered to verify the proper equipment.
- Ensure each of the following are rated for same voltage:
  Mains (power), Frequency converter and Motor
- Ensure that the frequency converter output current rating is equal to or greater than motor full load current for peak motor performance. Motor size and frequency converter power must match for proper overload protection. If frequency converter rating is less than motor, full motor output cannot be achieved.

Mechanical Installation Cooling

- To provide cooling airflow, mount the unit to a solid flat surface or to the optional back plate.
- Top and bottom clearance for air cooling must be provided. Generally, 100-225 mm (4-10 in) is required.
  See specification for clearance requirements.
- Improper mounting can result in overheating and reduced performance.
- Derating for temperatures starting between 40 °C (104 °F) and 50 °C (122 °F) and elevation 1000 m (3300 ft) above sea level must be considered. See the equipment Design Guide for detailed information.

Lifting

- Check the weight of the unit to determine a safe lifting method.
- Ensure that the lifting device is suitable for the task.
- If necessary, plan for a hoist, crane, or forklift with the appropriate rating to move the unit.
- For lifting, use hoist rings on the unit, when provided.

Mounting

- Mount the unit vertically.
- The frequency converter allows side by side Installation.
- Ensure that the strength of the mounting location will support the unit weight.
- Mount the unit to a solid flat surface or to the optional back plate to provide cooling airflow.
- Improper mounting can result in overheating and reduced performance.
- Use the slotted mounting holes on the unit for wall mounting, when provided.

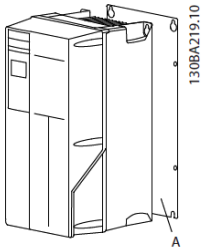

Illustration: Proper Mounting with Back Plate

Item A is a back plate properly installed for required airflow to cool the unit.

NOTE

Back plate is needed when mounted on railings.

Tightening Torques

Connection Tightening Torques for proper tightening must be complied with specification.

Electrical Installation Requirements

WARNING

EQUIPMENT HAZARD!

Rotating shafts and electrical equipment can be hazardous. All electrical work must conform to national and local electrical codes. It is strongly recommended that installation, start up, and maintenance be performed only by trained and qualified personnel. Failure to follow these guidelines could result in death or serious injury.

CAUTION

Wiring isolation

Run input power, motor wiring and control wiring in three separate metallic conduits or use separated shielded cable for high frequency noise isolation. Failure to isolate power, motor and control wiring could result in less than optimum frequency converter and associated equipment performance.

- For your safety, comply with the following requirements. Electronic controls equipment is connected to hazardous mains voltage. Extreme care should be taken to protect against electrical hazards when applying power to the unit.
- Run motor cables from multiple frequency converters separately. Induced voltage from output motor cables run together can charge equipment capacitors even with the equipment turned off and locked out. Overload and Equipment Protection.
- An electronically activated function within the frequency converter provides overload protection for the motor. The overload calculates the level of increase to activate timing for the trip (controller output stop) function. The higher the current draw, the quicker the trip response. The overload provides Class 20 motor protection. See *Warnings and Alarms* for details on the trip function.
- Because the motor wiring carries high frequency current, it is important that wiring for mains, motor power, and control are run separately. Use metallic conduit or separated shielded wire. Failure to isolate power, motor, and control wiring could result in less than optimum equipment performance.
- All frequency converters must be provided with short-circuit and over-current protection. Input fusing is required to provide this protection, see *Illustration*. If not factory supplied, fuses must be provided by the installer as part of installation.

Refer the maximum fuse ratings in Fuse Specifications.

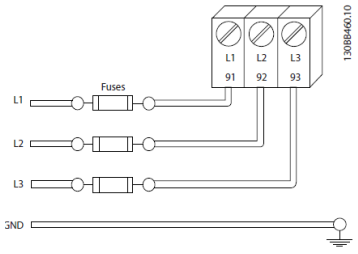

Illustration: Frequency Converter Fuses

Wire Type and Ratings

- All wiring must comply with local and national regulations regarding cross-section and ambient temperature requirements.
- Danfoss recommends that all power connections be made with a minimum 75 °C rated copper wire.
- Refer the *Power-dependent Specifications* for recommended wire sizes.

Earth (Grounding) Requirements

WARNING

GROUNDING HAZARD!

For operator safety, it is important to ground the frequency converter properly in accordance with national and local electrical codes as well as instructions contained within these instructions. Ground currents are higher than 3,5 mA. Failure to ground the frequency converter properly could result in death or serious injury.

NOTE

It is the responsibility of the user or certified electrical installer to ensure correct grounding (earthing) of the equipment in accordance with national and local electrical codes and standards.

- Follow all local and national electrical codes to ground electrical equipment properly.
- Proper protective grounding for equipment with ground currents higher than 3,5 mA must be established, see *Leakage Current (>3,5 mA).*
- A dedicated ground wire is required for input power, motor power and control wiring.
- Use the clamps provided with on the equipment for proper ground connections.
- Do not ground one frequency converter to another in a "daisy chain" fashion.
- Keep the ground wire connections as short as possible.
- Use of high-strand wire to reduce electrical noise is recommended.
- Follow motor manufacturer wiring requirements.

Leakage Current

Follow national and local codes regarding protective earthing of equipment with a leakage current > 3.5 mA. Frequency converter technology implies high frequency switching at high power. This will generate a leakage current in the earth connection. A fault current in the frequency converter at the output power terminals might contain a DC component which can charge the filter capacitors and cause a transient earth current. The earth leakage current depends on various system configurations including RFI filtering, screened motor cables, and frequency converter power. EN/IEC61800-5-1 (Power Drive System Product Standard) requires special care if the leakage current exceeds 3.5 mA. Earth grounding must be reinforced in one of the following ways:

- Earth ground wire of at least 10 mm².
- Two separate earth ground wires both complying with the dimensioning rules.

See EN 60364-5-54 § 543.7 for further information.

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Using RCDs

Where residual current devices (RCDs), also known as earth leakage circuit breakers (ELCBs), are used, comply with the following:
Use RCDs of type B only which are capable of detecting AC and DC currents.
Use RCDs with an inrush delay to prevent faults due to transient earth currents.
Dimension RCDs according to the system configuration and environmental considerations.

Grounding Using Shielded Cable

Earthing (grounding) clamps are provided for motor wiring.

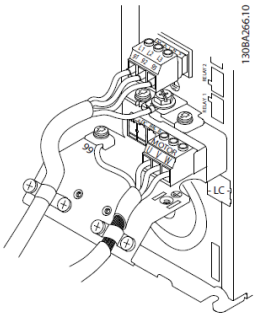


Illustration: Grounding with Shielded Cable

Motor connection

WARNING

INDUCED VOLTAGE!

Run output motor cables from multiple frequency converters separately. Induced voltage from output motor cables run together can charge equipment capacitors even with the equipment turned off and locked out. Failure to run output motor cables separately could result in death or serious injury.

- For maximum wire sizes see Power-dependent specification.
- Comply with local and national electrical codes for cable sizes.
- Motor wiring knockouts or access panels are provided at the base of IP21 and higher (NEMA1/12) units.
- Do not install power factor correction capacitors between the frequency converter and the motor.
- Connect the 3-phase motor wiring to terminals 96 (U), 97 (V), and 98 (W).
- Ground the cable in accordance with grounding instructions provided.
- Torque terminals in accordance with the information provided.
- Follow motor manufacturer wiring requirements.

The following *Illustration* represents mains input, motor, and earth grounding for basic frequency converters. Actual configurations vary with unit types and optional equipment.

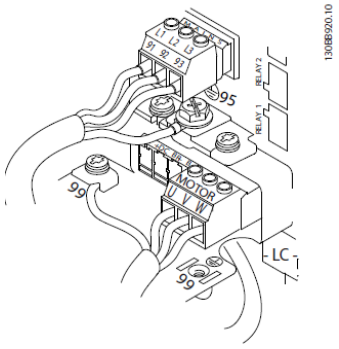


Illustration: Example of Motor, Mains and Earth Wiring

Back-EMF from PM motor

WARNING

PM motors produce voltage when the rotor shaft is turned. The generated voltage is fed back into the connected frequency converter. When the voltage level is high enough, the motor can generate enough energy to power up the frequency converter, even when it is disconnected from mains. To avoid PM motor produced voltage when the rotor shaft is turned and for maintenance work on frequency converter and PM motor it is recommended to take care the following safety precautions.

- Disconnect PM motor from frequency converter.
- Short circuit of the motor winding.
- Block motor shaft against movement.

WARNING

Frequency Converter powered on, at Disconnected Mains if PM motor shaft turns.

Brake Resistor

WARNING

The user is responsible for the compliance of the specification for installation and operation of a braking resistor on the drive.

To handle higher demands by generatoric braking a brake resistor is necessary. Using a brake resistor ensures that the energy is absorbed in the brake resistor and not in the frequency converter. For more detailed information concerning brake resistor usage, selection, installation, wiring, cabling see the Brake Resistor Design Guide.

WARNING

Monitoring the brake power is not a safety function; a thermal switch is required for that purpose. The brake resistor circuit is not earth leakage protected. Do not touch the brake resistor as it can get very hot while/after braking. The brake resistor must be placed in a secure environment to avoid fire risk.

Environment

Equipment containing electrical components may not be disposed of together with domestic waste. It must be separately collected with electrical and electronic waste according to local and currently valid legislation.

Schematic drawing, examples

Schematic Lift Drive LD302

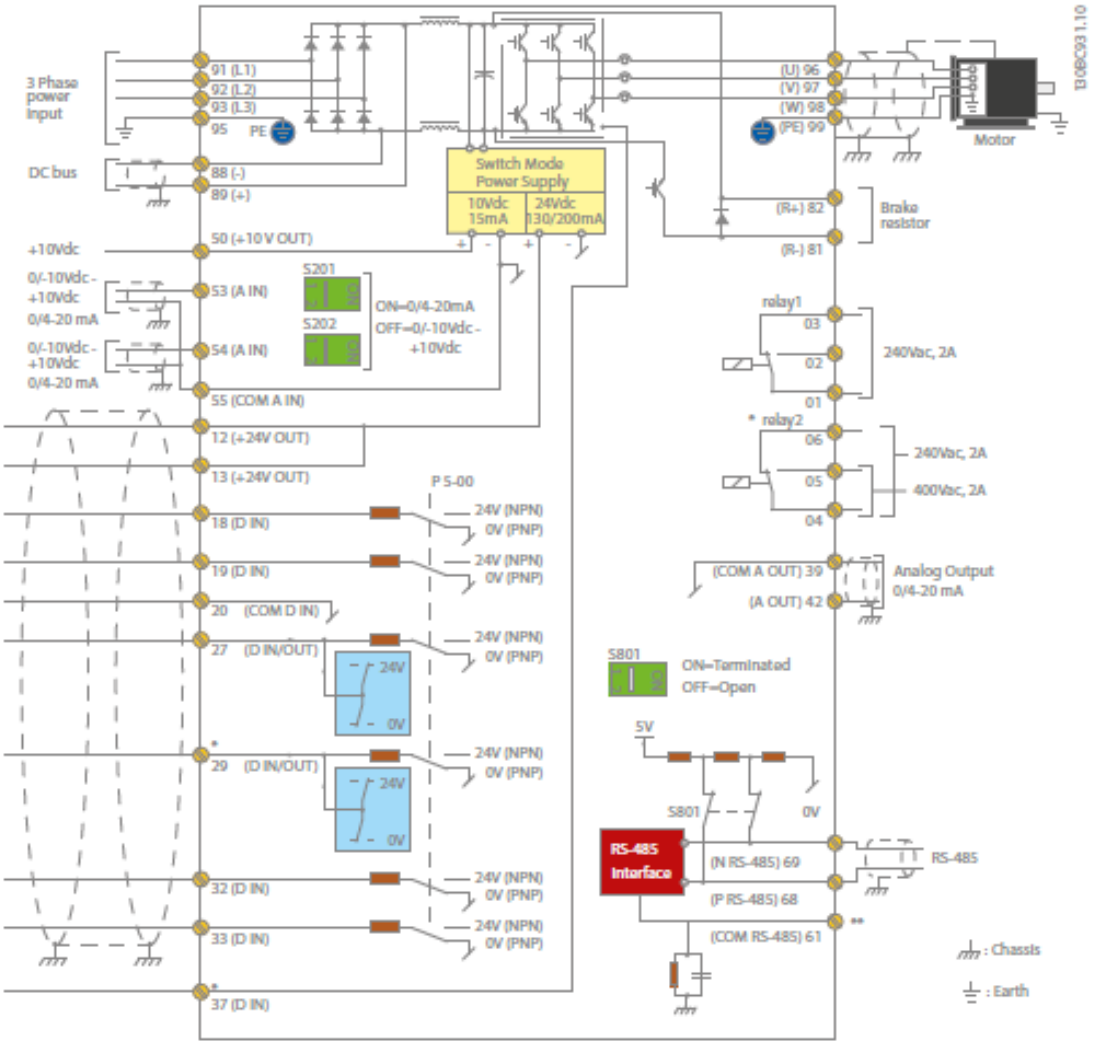
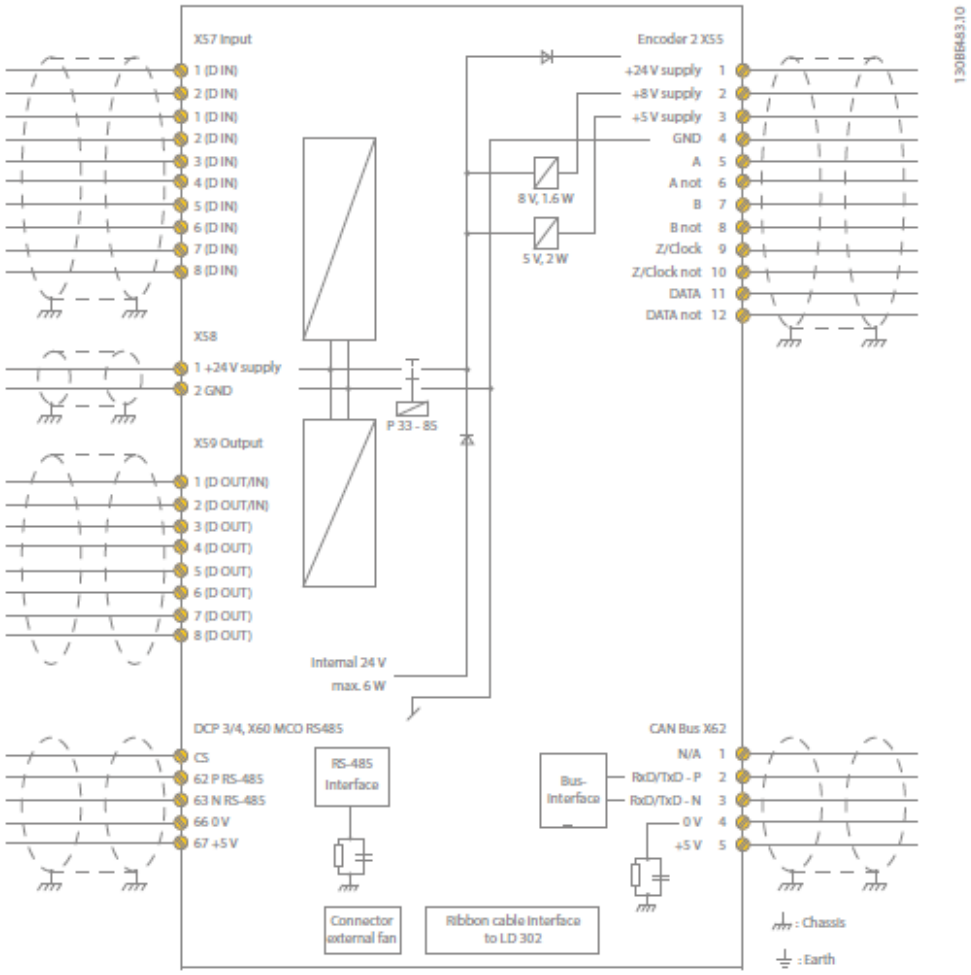


Diagram showing all electrical terminals without options. A = analog, D = digital

For instructions on Safe Stop installation please refer to the section Safe Stop Installation in the VLT®AutomationDrive FC 302 Design Guide.

Schematic Lift Controller MCO 361

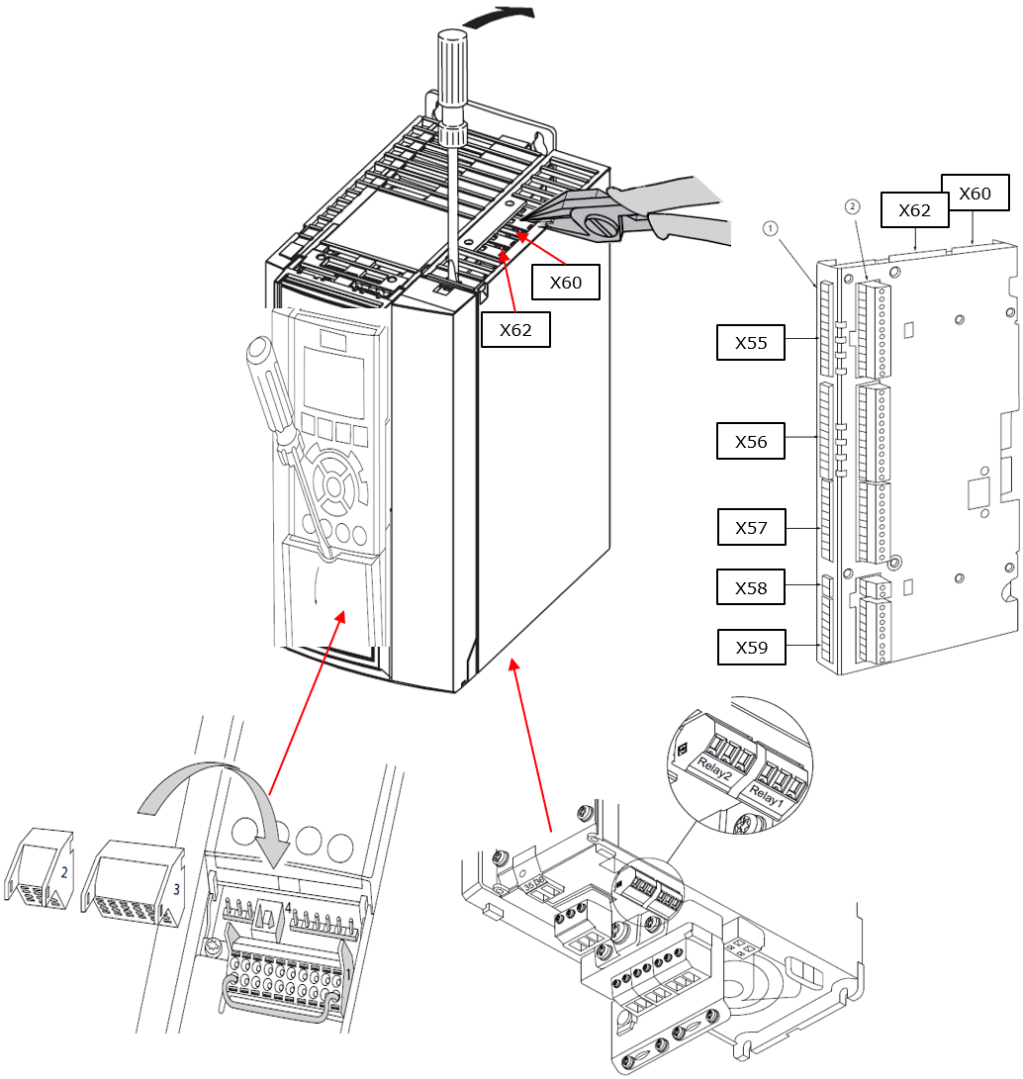


The numbers represent the terminals on the drive.
VLT Lift Drive standard interfaces:

- RS485
- USB
- DCP 3/4
- CANopen DSP 417

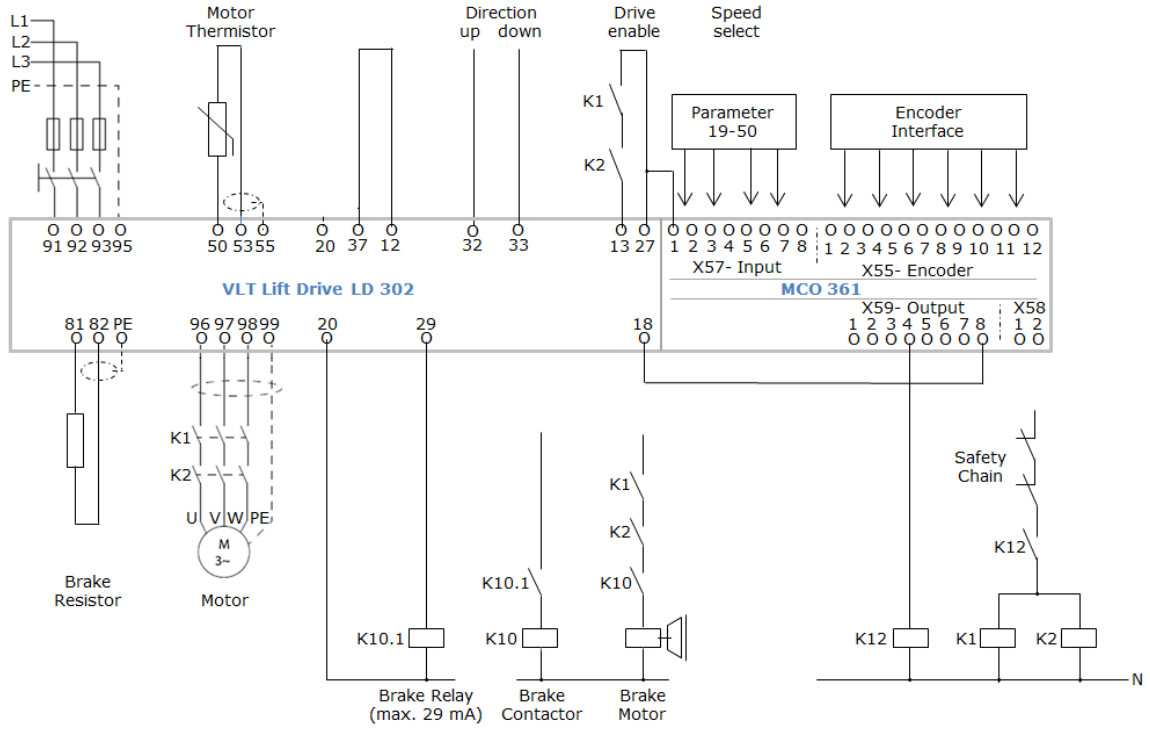
Location Terminals

The USB socket connector and the terminal strips for the control terminals 18 - 69 are located below the front cover of the LCP. The terminal strips X55, X56, X57, X58 and X59 are located on the right behind the front cover. The front covers can e.g. be removed with a screwdriver
The terminal strips X60 and X62 are on the top right of the housing. The connections X60 and X62 are exposed by breaking out the provided windows.
The connectors for supply, motor, braking resistor and for the relays are located on the bottom of the housing.

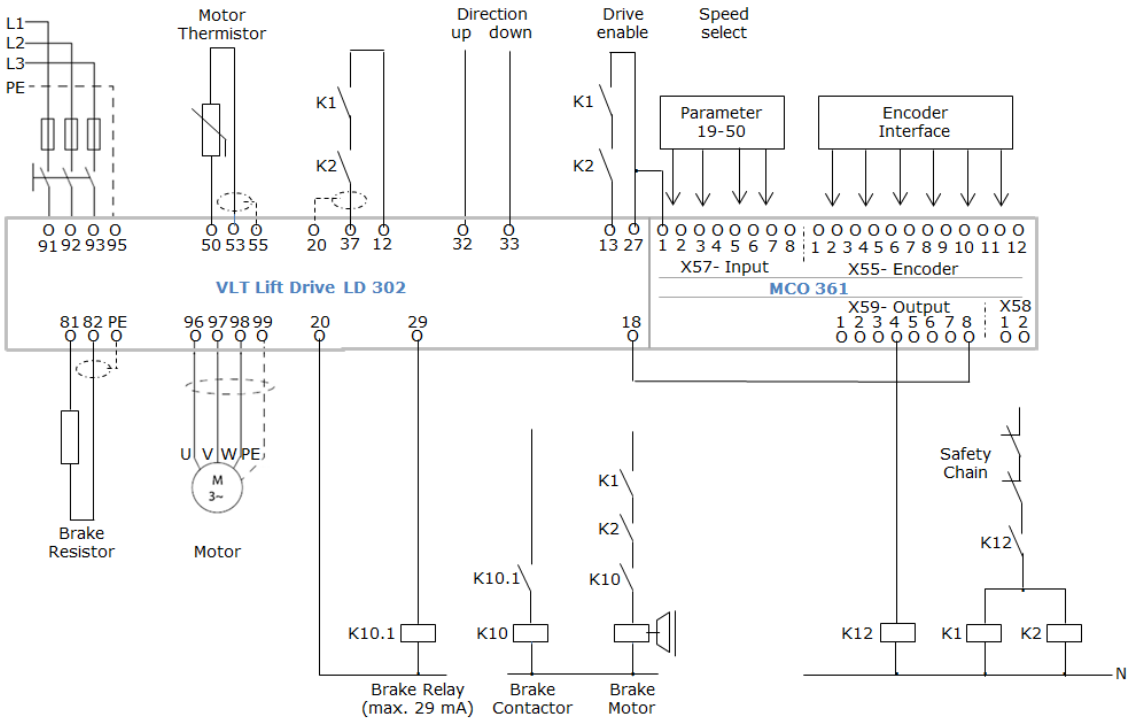


Examples

Operation with Motor Contactors K1 and K2

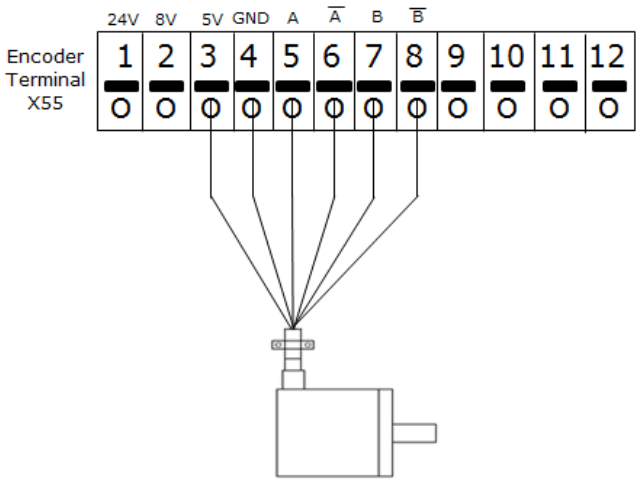


Operation without Motor Contactors

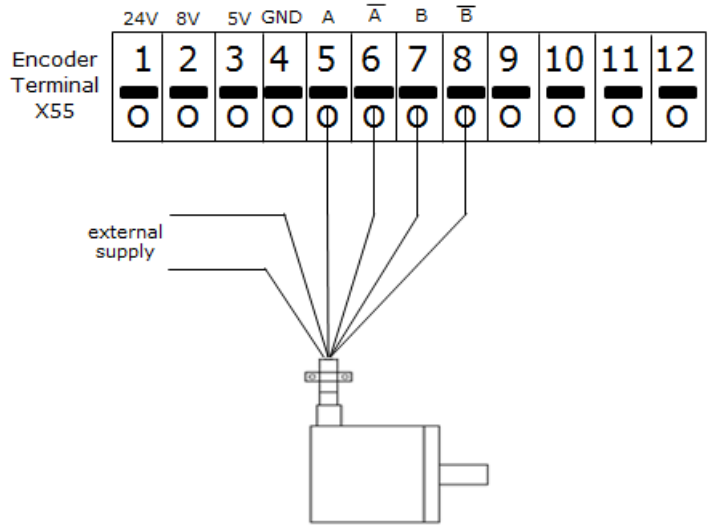


Encoder Connections on Terminal X55, Examples

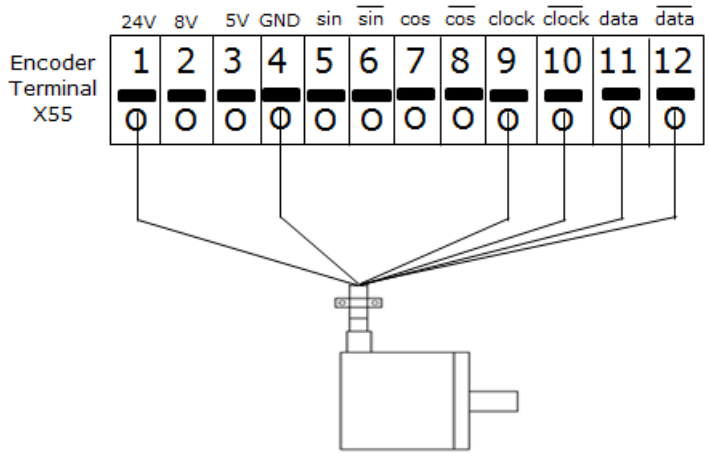
Incremental TTL Encoder, 5V, Supplied by MCO 361



Incremental TTL Encoder, 5V, external Power supply



Absolute Encoder, 24V, single turn SSI/Endat, Supplied by MCO 361



4 Programming

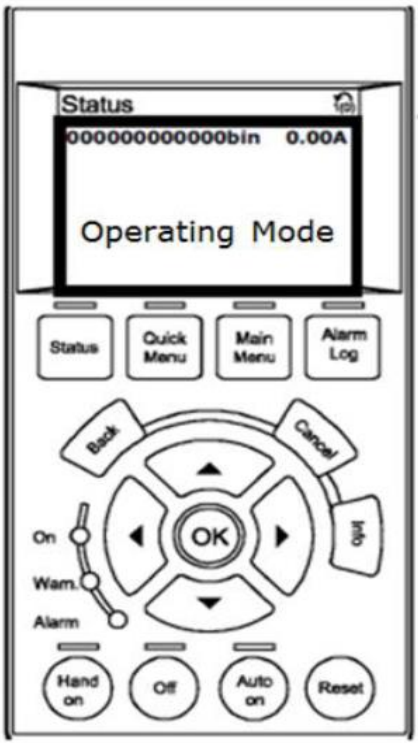
Local Control Panel

The local control panel (LCP) is the combined display and keypad on the front of the unit and has several user functions.

- Start, stop, and control speed in local control
- Display operational data, status, warnings and cautions
- Programming frequency converter functions
- Manually Reset the frequency converter after a fault

LCP Layout, functional groups

The graphical LCP is divided into four functional groups A, B, C and D



Display area.

Display menu keys for changing the display to display status options, programming, or error message history.

Navigation keys for programming functions, moving the display cursor, and speed control in local operation. Also included are the status indicator lights.

Operation mode keys and reset.

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Display functional group A

After power-up the frequency converter, the LCP displays "Operation Mode".
The LCP displays the input status terminal X.57 (0 bin=0 V/DC, 1 bin=24 V/DC) and the actual motor current in Ampere.

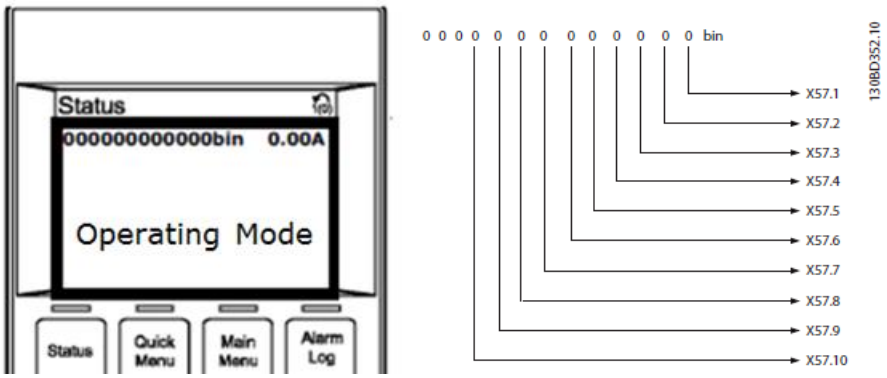


Illustration: LCP Display, Input Status Terminal X.57, and Motor Current

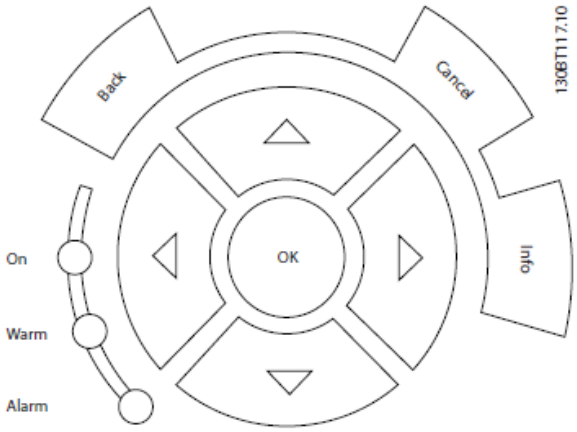
Display functional group B, LCP Menu keys

Menu keys are used for menu access and parameter set-up, toggling through status display modes during normal operation, and viewing fault log data.

LCP- Key	Function
Status	Press to display operational information. Displays the Lift application status message. Displays the status of the digital input signals of X57. The symbol in the upper right corner of the LCP display shows the motor rotation direction and the active set-up.
Quick Menu	Allows access to programming parameters for initial set-up instructions and many detailed application instructions. Select *"Q1 My Personal Menu"* to set-up the Lift application parameters.
Main Menu	Allows access to all programming parameters. Press twice to access top-level index. Press once to return to the last location accessed. Press and hold to enter a parameter number for direct access to a parameter.
Alarm Log	Displays a list of current warnings, the last 5 alarms, and the maintenance log. For details select the alarm number using the navigation keys and press [OK].

Display functional group C, Navigation Keys

Navigation keys are used for programming functions and moving the display cursor. The navigation keys also provide speed control in local (hand) operation. Three frequency converter status indicator lights for On, Warning and Alarm are also located in this area.

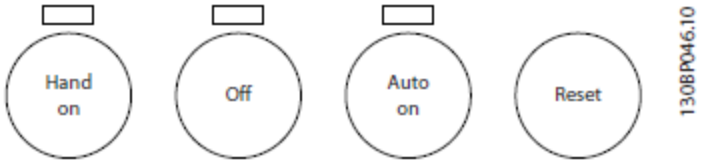


LCP- Key	Function
Back	Reverts to the previous step or list in the menu structure.
Cancel	Cancels the last change or command as long as the display mode has not changed.
Info	Press for a definition of the function being displayed.
Navigation Keys	Use the four navigation keys to move between items in the menu.
OK	Use to access parameter groups or to enable an option.

Indicator lamp	Indicator	Function
Green	ON	The ON indicator lamp activates when the frequency converter receives power from mains voltage, a DC bus terminal, or a 24 V external supply.
Yellow	WARN	In case of warning conditions, the yellow WARN indicator lamp becomes on and a text appears in the display area to identify the reason.
Red	ALARM	A fault condition causes the red alarm indicator lamp to flash and an alarm text is displayed.

Display functional group D, Operation Keys

Operation keys are located at the bottom of the LCP.



Key	Function
Hand On	Starts the frequency converter in local control. Use the navigation keys to control the frequency converter speed. An external stop signal by control input or serial communication overrides the local hand on.
Off	Stops the motor but does not remove power to the frequency converter.
Auto On	Puts the system in remote operational mode. Responds to an external start command by control terminals or serial communication. Speed reference is from an external source.
Reset	Resets the frequency converter manually after a fault has been cleared.

Back Up and Copying Parameter Settings

Programming data is stored internally in the frequency converter.
Data can be uploaded into the LCP memory as a storage back-up
Once stored in the LCP, the data can be downloaded back into the frequency converter.
Data can also be downloaded into other frequency converters by connecting the LCP into those units and downloading the stored settings. (This procedure is a quick way to program multiple units with the same settings.)
Initialization of the frequency converter to restore factory default settings does not change stored data in the LCP memory.

!! Back up and copy only possible if P19-88 = 0, fast-boot function is not active.

Restoring Default Settings

Initialization restores the unit to factory default settings. All made parameter settings changed from factory settings, e.g. motor data, and monitoring records, will be lost. Uploading data to the LCP provides a backup before initialization.

Restoring the frequency converter parameter settings back to default values is done by initialization of the frequency converter.

Manual Initialization

1. Disconnect power to the Lift Drive and wait for the display to turn off.
2. On LCP, Press and hold the LCP buttons, **[Status]**+ **[Main Menu]** + **[OK]** at the same time and apply power to the unit.
3. Release the LCP keys after 5 s.

Factory default parameter settings are restored during start-up.
After powering-up the Lift Drive wait until the Lift application is loaded, and continue parameter setup, after the LCP displays "Operation Mode".

Main Menu

In the Main Menu, the Parameters are organized in various parameter groups.
The graphical local control panel (LCP) displays the parameter groups after pressing the "Main Menu" Button on the LCP.
For easy selection of correct setup and optimized operation for the complete Lift application, the Lift Drive LD302 contains within the Main Menu additional the Parameter group 19-**. Parameter group 19-** contains all necessary Parameter to setup the complete Lift application.

Within the Parameter group 19-** it is possible to setup parameter for:
- electrical Lift Components. E.g. Lift Motor, Encoder, mechanical Brake, …
- mechanical Lift components. E.g. Ratio, Suspension, Traction, …
- requirement concerning Lift dynamic and comfort. E.g. Lift speed, motion profile, …

Parameter groups overview
The following table contains all the Main Menu Parameter groups.
Outside of the 19-** Parameter group are only limited Parameter groups and Parameter are available to setup additional or special functions which are not supported within the Parameter group 19-**.
The different colors indicate the parameter groups for possible access outside the 19-** Parameter group.

	Parameter setup for Lift application
	Read only
	Optional parameters
	Do not touch!

No.	Parameter groups Menu name	Parameter group Description
0-**	Operation/Display	Setup LCP display, operation and handling.
1-**	Load and Motor	Setup Motor data, Motor Thermal Protection.
2-**	Brakes	Please do not change settings here!
3-**	Reference/Ramps	Please do not change settings here!
4-**	Limits/Warnings	Please do not change settings here!
5-**	Digital In/Out	Please do not change settings here!
6-**	Analog In/Out	Please do not change settings here!
7-**	Controllers	Please do not change settings here!
8-**	Comm. and Options	Please do not change settings here!
13-**	Smart Logic	Please do not change settings here!
14-**	Special Functions	Setup special Functions e.g. switching Frequency, EMV-Filter, reset Function, Fan control, Mains Failure.
15-**	Drive Information	Read only, Drive information e.g. Drive Type, Software Version, operation hours.
16-**	Data Readouts	Read only, Drive status information, parameter for troubleshooting.
18-**	Data Readouts 2	Read only, display parameter for troubleshooting.
19-**	**Application Parameter**	**Lift Application Parameter settings for the complete Lift setup. E.g. setup for, Lift Motor with or without Encoder, mechanical Ratio, Suspension, Traction, Brake control, Floor level, Lift speed**
30-**	Special Features	Please do not change settings here!
32-**	MCO Basic Settings	Setup Encoder, PID Controller
33-**	MCO Adv. Settings	Setup MCO- Terminal X60, CAN node, DCP3 / DCP4
34-**	MCO Data Readouts	MCO Display parameters for troubleshooting

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Parameter overview

Motor Construction			
ID	Parameter Name	Factory setting	Unit
1-10	Motor Construction	Asynchron	

ASM- Motor Data			
ID	Parameter Name	Factory setting	Unit
1-20	Motor Power [kW]	depends on drive	kW
1-22	Motor Voltage	depends on drive	V
1-23	Motor Frequency	depends on drive	Hz
1-24	Motor Current	depends on drive	A
1-25	Motor Nominal Speed	depends on drive	Rpm
19-02	Motor cos phi	69	

PM- Motor Data			
ID	Parameter Name	Factory setting	Unit
1-24	Motor Current	depends on drive	A
1-25	Motor Nominal Speed	depends on drive	Rpm
1-26	Motor Cont. Rated Torque	depends on drive	Nm
1-30	Stator Resistance (Rs)	depends on drive	Ohm
1-37	d-axis Inductance (Ld)	depends on drive	mH
1-39	Motor Poles	depends on drive	
1-40	Back EMF at 1000 Rpm	depends on drive	V

19-* Lift Application Parameter			
ID	Parameter Name	Factory setting ASM / PM- Motor	Unit
19-01	Motor number	0	
19-02	Cos Phi	69	
19-03	Encoder Autotun	0	
19-04	Car direction	0	
19-05	Encoder direction	1	
19-06	Encoder monitor	1	
19-07	Encoder resol	2/3	
19-08	Abs. encoder type	0	
19-09	Abs. encoder offs	0	
19-10	Traction sheave	650/320	mm
19-11	Ratio	36.85/1.0	
19-12	Suspension	1/2	
19-13	Brake lift delay	300/0	ms
19-14	Brake delay	600	ms
19-15	Brake close delay	600	ms
19-16	Max. Torque	0.00	%
19-17	Source start torque	0	
19-19	Run in Dist.	60.0	mm
19-20	Max. speed	1.000	m/s

19-21	V4, Nominal speed	1.000	m/s
19-22	V0, Leveling speed	0.100	m/s
19-23	Vi, Inspection speed	0.300	m/s
19-24	V3, Intermediate speed 1	0.800	m/s
19-25	V2, Intermediate speed 2	0.300	m/s
19-26	Vn, Releveling speed	0.010	m/s
19-27	Floor level dist	5.0	mm
19-28	V1, Intermediate speed 3	0.200	m/s
19-30	Acceleration	0.700	m/s²
19-31	Deceleration	1.000	m/s²
19-32	Start Jerk	0.600	m/s³
19-33	Accel. Jerk	0.600	m/s³
19-34	Decel. Jerk	1.000	m/s³
19-35	Run in Jerk	0.400	m/s³
19-38	Comfort	0	
19-40	KP - gain at start	100/50	
19-41	KP - gain at operat.	100/50	
19-42	I time at start	200.0/12.0	ms
19-43	I time operation	200.0	ms
19-44	Filtertime start	10.0/1.0	ms
19-45	Filtertime opera	10.0	ms
19-46	Pos. gain start	0.0000/0.1000	
19-47	Pos. error start	100	mm
19-48	Pos. error max	1000	mm
19-50	Run - in mode	0	
19-52	evac. limit VVC+	3.52	A
19-53	Control V1	0.800	m/s
19-54	Control V2	0.300	m/s
19-55	L - start acc	0.020	m/s²
19-56	L- start speed	0.050	m/s
19-57	L-start time	200	ms
19-58	Delay after Stop	100	ms
19-59	Torque down time	200	ms
19-60	Test - run mode	0	
19-61	X55 >>->> X56	0	
19-62	Open Loop	0	
19-63	Motor adaptation	0	
19-64	Store param.	0	
19-65	Monitoring functions	0	
19-66	Dig_Serial	0	
19-67	Function Relay 1	1	
19-68	Time Delay Coast	5	ms
19-69	Sync Position	0	
19-70	Monit. Drive + motor	0	
19-71	Setup counter	0	
19-72	DCP4 corr. factor	1.000	
19-73	DCP CMD	0	
19-74	DCP STAT	0	
19-79	Error behaviour	0	
19-80	Log No	1	

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19-81	Error code	0	
19-82	Error time	0	h
19-83	Function Error log	0	
19-84	Function X59.1-7	0	
19-85	User Par 1985	0	
19-86	Special Functions	0	
19-87	Brake monitor delay	2.000	s
19-88	Fast Boot Mode	0	
19-89	User Par 1989	0	
19-90	SW- Version	Version No.	
19-92	Status	Status No.	
19-93	Dir change cnt 1	-1	
19-94	Dir change cnt 2	0	
19-96	User Par 1996	1000	
19-97	Brake slip	0.08	
19-98	Abs enc position	0	
19-99	Distance during dec.	0	mm

Additional Parameters			
ID	Parameter Name	Factory setting	Unit
1-53	Model Shift frequency	depends on drive	Hz
4-16	Torque limit Motor Mode	depends on drive	%
4-17	Torque Limit Generator Mode	depends on drive	%
4-18	Current Limit	depends on drive	%
14-01	Switching frequency	depends on drive	kHz
14-50	RFI Filter	[1] On	
32-00	Incremental Signal Type	[1] RS-422 (5V TTL)	
32-01	Incremental Resolution	1024	
32-60	Proportional factor	30	

16-* Data Readouts			
	Parameter Name	Factory setting	Unit
16-1* Motor Status			
16-10	Power [kW]	0	kW
16-12	Motor Voltage	0	V
16-13	Frequency	0	Hz
16-14	Motor Current	0	A
16-16	Torque [Nm]	0	Nm
16-17	Speed [RPM]	0	RPM
16-18	Motor Thermal	0	%
16-3* Drive Status			
16-30	DC Link Voltage	0	V
16-34	Heatsink Temp.	0	°C
16-35	Inverter Thermal	0	%
16-39	Control Card Temp. [°C]	0	°C

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16-* Inputs and Outputs			
16-60	Digital Input*	0000000000	bin
16-62	Analog Input 53	0.000	
16-64	Analog Input 54	0.000	
16-66	Digital Output [bin]	0000	bin
16-71	Relay Output [bin]	0000000000	bin
34-40	Digital Input [bin]	000000000000	bin
Process Data			
34-50	Actual Position	0	1mm/100
34-56	Track Error	0	1mm/100
34-59	Actual Velocity	0	1mm/100s

* Getting the status of the input terminals of the control card:

P16-60 [bin]	0	0	0	0	0	0	0	0	0	0
Input terminal	-	-	-	37	18	19	27	29	32	33

5 Commissioning

Guideline for simple and fast setup

Recommended steps for the initial commissioning:

1. Wiring according to the examples in chapter 8.1 to adapt the drive to your control system.
2. Setting up language, motor and mechanical data using the quick menu.
3. Setting up control mode, communication, and special functions according to your needs and depending on the examples in chapter 8.1.
4. Cycle Power (Power off, wait until drive is completely off, switch power on again and wait until drive is ready)
5. Perform AMA (if required)
6. Testrun (Inspection speed), check of basic operation, directions (chapter 6.1.1)
7. Activation of required monitoring functions
8. Optimization (chapter 6.2)
9. Wiring Examples with Parameter setup

Commissioning using Quick Menu

For simple and fast setup of the Lift application, the Lift Drive LD 302 offers an additional Quick Menu for parameter setup, step by step. All relevant parameter to get the Elevator up and running are listed in the quick menu. For later optimization further settings can be found in group 19 in the main menu. For commissioning the Lift Drive LD 302, we strongly recommend the Quick Menu!

At the graphical local control panel (LCP), Press **[QUICK MENU]** and choose **[Q1]**- My Personal Menu and **[OK].**
Within the Quick Menu, [Q1]- My Personal Menu, start with the first Parameter, 0-01 Language and continue step by step the following parameter.

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Setting Language

No.	Name	Parameter Description
0-01	Language	Select the Language [0] English [1] German [X] …….

Setting up motor data

Motor data can be entered on two different ways.

1. Motor numbers (See appendix "Drive Motor Database") contains motor construction-, electrical and encoder data. After entering a motor number, all relevant parameter will be set and optimized for the given motor. Not further information regarding the motor and encoder are required.

2. Setting up the motor by name plate information. After setting the data, an automatic motor adaptation (AMA) will optimize the control of the motor.

Setting up motor data by motor number

No.	Name	Parameter Description
19-01	Motor number	Select the ASM or PM motor type stored in LD 302 motor type database (see Apendix "Drive Motor Database"). By selecting a certain motor type, all required motor data are set automatically within the LD 302. See Lift manual appendix, Drive Motor Database, motor-table for motor type and associated motor number. 1. Enter motor type number. 2. Save the selected motor type. 3. Press **[OK] and [Cancel]** to save the settings. If selecting [0], enter the following parameter for ASM or PM motors.

Update Quick Menu

To update the Quick Menu, press on the graphical local control panel (LCP) again the LCP button **[Quick Menu]**. After press **[Q1]**- My Personal Menu and then continue the commissioning with the next parameter.
The update procedure of the Quick Menu is necessary to refresh the Quick Menu with the right parameters depends on Motor number, Motor type and motor construction.

Setting up the motor by name plate information

Setup Motor Construction

No.	Name	Parameter Description
1-10	Motor Construction	[0] Asynchronous [1] PM,non salient PM

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Update Quick Menu

To update the Quick Menu, press on the graphical local control panel (LCP) again the LCP button **[Quick Menu]**. After press **[Q1]**- My Personal Menu and then continue the commissioning with the next parameter. The update procedure of the Quick Menu is necessary to refresh the Quick Menu with the right parameters depends on Motor, Motor type and motor construction.
Depends on the used motor type, continue the motor data setup with the following parameter setup description for asynchronous motor or PM motor.

Setup motor data for asynchronous motor

After selecting the Motor construction "asynchronous" and update the Quick Menu, continue within the Quick Menu, [Q1**]**- My Personal Menu, to setup the following motor parameters for the asynchronous motor.

No.	Name	Parameter Description Enter the nominal motor data according to the motor nameplate.
1-20	Motor Power [KW]	Enter the nominal motor power
1-22	Motor Voltage [V]	Enter the nominal motor voltage
1-23	Motor Frequency [Hz]	Enter the nominal motor frequency
1-24	Motor Current [A]	Enter the nominal motor current
1-25	Motor Speed [rpm]	Enter the nominal motor speed
19-02	Motor cos phi	Set the motor cos phi value, multiplied by 100. The input of the cos phi value causes automatically a new calculation of the advanced motor data, 1-30 Stator Resistance (Rs) to 1-35 Main Reactance (Xh).

Setup motor data for PM motor

After selecting the Motor construction "PM Motor" and Update the Quick Menu, continue within the Quick Menu, [Q1**]**- My Personal Menu, to setup the following motor parameters for the Lift PM motor.

No	Name	Parameter Description Enter the nominal motor data according to the motor nameplate.
1-24	Motor Current [A]	Enter the nominal motor current
1-25	Motor Speed [Rpm]	Enter the nominal motor speed
1-26	Motor Torque [Nm]	Enter the nominal motor Torque
1-30	Stator Resistance [Ohm]	Set the line to common stator resistance value.
1-37	d-axis Inductance Ld [mH]	Enter line to common direct axis inductance of the PM motor. Obtain the value from the permanent magnet motor datasheet. If only line-line data are available, divide the line-line value by 2 to achieve the line common (starpoint) value. Alternatively measure the value with an inductance meter, this also takes the inductance of the cable into account. Divide the measured value by 2 and enter the result.

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1-39	Motor Poles	Enter the number of motor poles.
1-40	Back EMF at 1000rpm [V]	If Back-EMF is only available at motor nominal speed, it can be calculated as follows: Example: Back- EMF 320V at 1800rpm. Back- EMF=(320V/1800)*1000=178V

Setting up incremental encoder data

For Lift application with motor feedback it is necessary to setup the encoder data.

No.	Name	Parameter Description
32-00	Incremental Signal Type	[0] None (for induction motors open-loop) [1] RS-422 (5V TTL) [2] Sinusoidal 1Vpp
32-01	Incremental Resolution	Pulses per revolution

Setting up Mechanical data

No.	Name	Parameter Description
19-10	Traction sheave [mm]	Enter the value for Diameter of traction sheave or enter [-1] to calculate the value. The calculation is based on parameter value settings for P1-25 motor nominal speed, P19-11 ratio, P19-12 suspension and P19-21 nominal cabin speed.
19-11	Gear Ratio	Enter the value of the Gear ratio or enter [-1] to calculate the value. The calculation is based on parameter value settings for P1-25 motor nominal speed, P19-10 traction sheave, P19-12 suspension and P19-21 nominal cabin speed.
19-12	Suspension	Number of suspensions
19-20	V max	Maximum (nominal speed)
19-21	V4	Nominal speed

Predefined Comfort Settings

To get a quick setting of acceleration and jerks it is possible to use different preselection's of comfort.

No.	Name	Parameter Description
19-38	Comfort	[0] no preselection active [1] gentle [2] dynamic [3] normal

Setting up control source

No.	Name	Parameter Description
19-66	Dig_Serial	[0] Drive control by digital terminals [1] Serial bus control DCP3 [2] serial bus control DCP4 [3] CanOpen DSP417 Power cycle drive after change of control type

Setting up control type

No.	Name	Parameter Description
19-50	Run-in mode	Set mode due to desired control type as described

Setting up special functions

No.	Name	Parameter Description
P19-86	Special Function	[00] none [x1] **S**imple **C**ontrol [x2] Dir=V0 [x3] SC + DF [x4] **S**oft-**S**top at **D**irection=0 [x5] SSD + SC [x6] SSD + DF [x7] SSD + SC + DF [1x] **S**hort **F**loor function [2x] **D**eceleration with **S**peed **C**ompensation [3x] SF + DSC

Setting up in- and outputs

19-67	Function Relay 1	[0] Functionality set with parameter P5-40. [1] VLT-Ready [2] Short circuit relay [3] Motor Contactors (as X59.4) [4] Ready signal (as X59.5)

6 Functional descriptions

Automatic motor adaptation, AMA

Automatic motor adaptation (AMA) is an automated procedure used to measure the electrical characteristics of the connected motor and provides an accurate electronic motor model. It allows the drive to run the motor with optimal performance and efficiency. AMA is performed at standstill or during elevator operation. At standstill the measurement will be done under closed brakes and is load independent. The AMA routine supports asynchronous- and PM Gearless motors.

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NOTE: AMA cannot be used with a sine-wave filter connected.

AMA is required after manual input of motor nameplate data. The basic measurement will be done at standstill (P19-63=1). After this measurement the motor is ready for operation.
However, if this measurement fails on induction motors, 19-63=3 estimates data for the given motor.
Further optimization (P1963=4) is optional and can be used for late fine tuning.

Motor adaption description

No.	Name	Parameter Description
19-63	Motor adaption for asynchronous motor and PM motor	[0] not active / AMA completed [1] AMA at standstill [2] reserved for future use [3] calculation of motor data [4] optimization during normal operation

AMA at standstill

1. Set the Parameter P19-63 = [1] and confirm with **[OK]**
2. Activate Inspection Mode.
3. The motor is energized and the AMA measurement starts without opening the mechanical brake.
4. The AMA procedure is finished when the LCP status display changes from "P19-63 [1]" → back to the status display "P19-63 [0]"
5. Disable Inspection Mode

AMA during operation

1. Set the Parameter P19-63 = [4] and confirm with **[OK]**
2. The elevator should run now at least three times with nominal speed in normal operation.
3. The AMA procedure is finished when the LCP status display changes from "P19-63 [4]" →back to the status display "P19-63 [0]"

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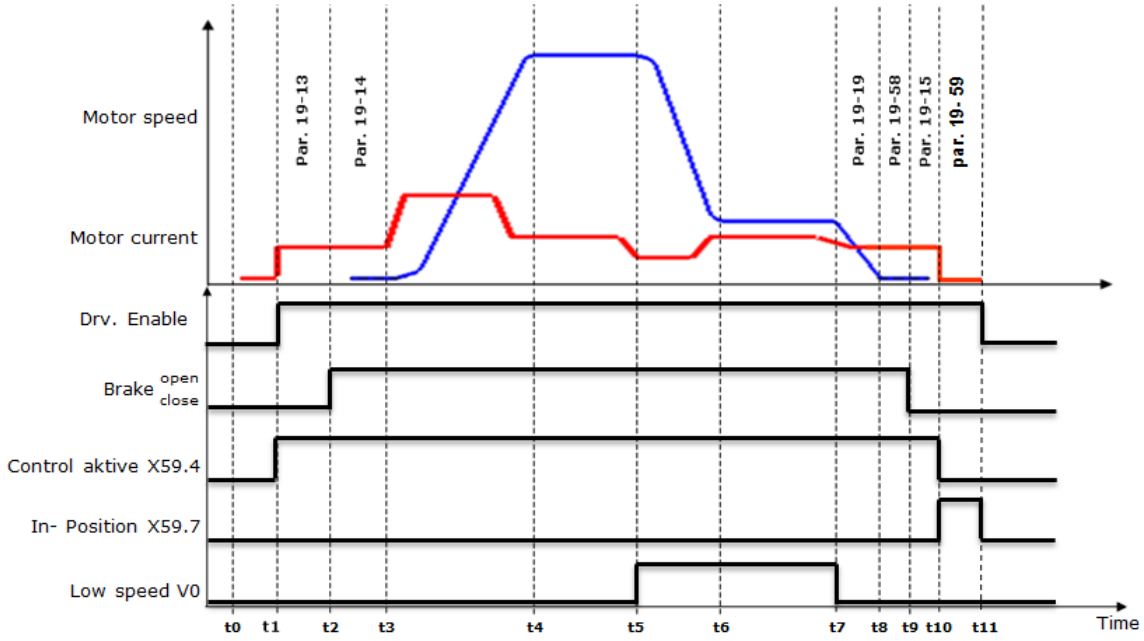
Mechanical Brake Control



Time	Description
t0	In- Position
t1	Motor control on
t2	Delay and open brake
t3	Brake is open, speed reference active
t4	Max. speed
t5	Deceleration command
t6	Low speed V0
t7	Stop command
t8	Positioning
t9	Brake close
t10	Motor off
t11	In- Position
Parameter	Description
19-13	Brake Lift delay
19-14	Brake delay
19-19	Run in distance
19-58	Delay after Stop
19-15	Brake close delay
19-59	Torque down time

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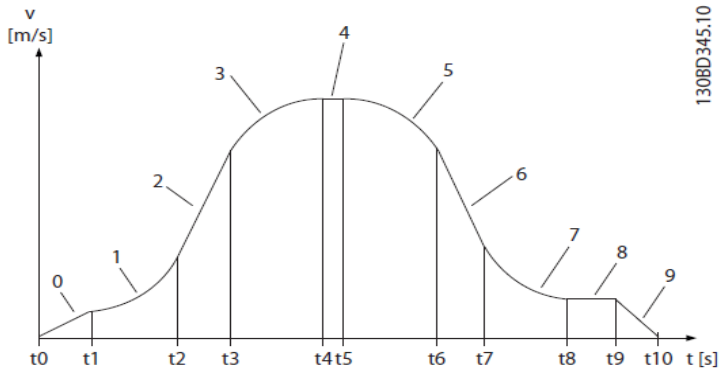
Speeds, Acceleration, Jerks

Speeds

No.	Name	Parameter Description
19-20	max. speed [m/s]	Set the max. speed in m/s for the Lift. Depending on the nominal motor speed and the settings in parameters 19-10 to 19-12, the maximum speed is limited to 125% of the rated motor speed.
19-21	V4 [m/s]	Nominal speed
19-22	V0 [m/s]	Leveling speed
19-23	Vi [m/s]	Inspection speed
19-24	V3 [m/s]	Intermediate speed 1
19-25	V2 [m/s]	Intermediate speed 2
19-26	Vn [m/s]	Releveling speed
19-28	V1 [m/s]	Intermediate speed 3

Overview of the motion profile

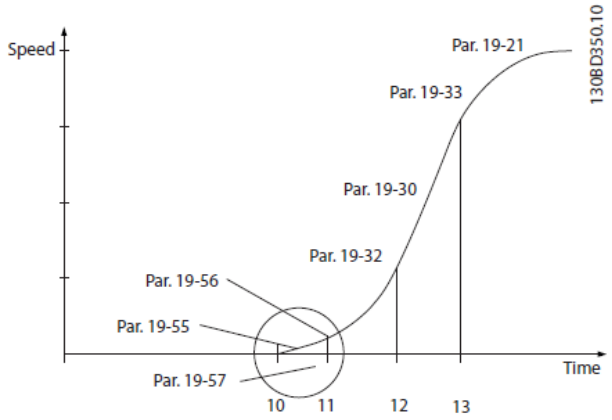
The profile of the elevator operation can be separated into 10 single parts of movement which can be adjusted individually.



Parameter	Identifier	Name	Description
19-19	9	Run in distance [mm]	Distance of last proximity switch to ground level
19-21	4	V4 [m/s]	Nominal speed
19-22	8	V0 [m/s]	Run in speed
19-30	2	Acceleration [mm/s²]	
19-31	6	Deceleration [mm/s²]	
19-32	1	Start Jerk [mm/s³]	when jerk values are too low, programmed acceleration values may not be reached
19-33	3	Accel. Jerk [mm/s³]	
19-34	5	Decel. Jerk [mm/s³]	
19-35	7	Run in Jerk [mm/s³]	
19-55	0	L-start acc [mm/s²]	Linear start function can be deactivated when L-start time is set to 0
19-56		L-start speed [mm/s]	
19-57		L-start time [ms]	

Linearstart

Linearstart is useful for comfortable start of the elevator in difficult mechanical environment. E.g. L- Type car frame or glide shoes.



Parameter	Description	Unit
19-57	L- start time [ms]	[ms]
19-55	L- start Acceleration	[m/s²]
19-56	L- start Speed	[m/s]
19-32	Start Jerk	[m/s³]
19-30	Acceleration	[mm/s²]
19-33	Acceleration Jerk	[m/s³*]
19-21	Nominal Speed, V4	[m/s]

Predefined Comfort Settings

To get a quick setting of acceleration and jerks it is possible to use different preselection's of comfort.

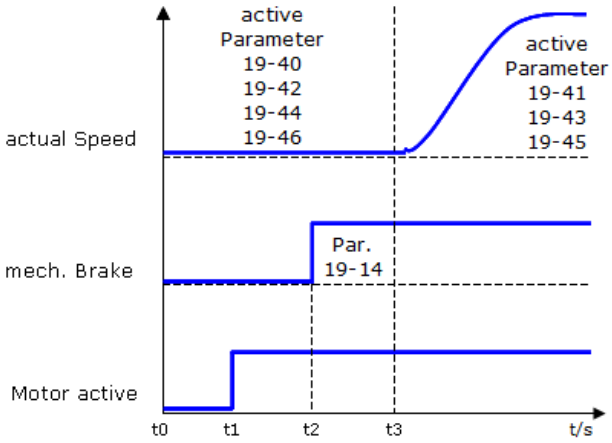
No.	Name	Parameter Description
19-38	Comfort	[0] no preselection active [1] gentle [2] dynamic [3] normal

Deceleration distance

In Lift installations it is useful to know the actual deceleration distance before starting operation. For this purpose, it is possible to calculate the distance for each speed. Those calculated values can be used for the optimization of the control system. The value is based on the deceleration distance of the chosen speed down to v0 including 100 mm run in speed and including run in distance (P19-19).

No.	Name	Parameter Description
19-99	Distance during deceleration	Shows the calculated deceleration distance of the last travel [-1] calculates deceleration distance V1 (P19-28) [-2] calculates deceleration distance V2 (P19-25) [-3] calculates deceleration distance V3 (P19-24) [-4] calculates deceleration distance V4 (P19-21)

Speed PID controller



Speed controller settings at start

No.	Name	Parameter Description	PM-motor recommended values	Asynchronous- motor recommended values
19-40	KP-Gain at start	Proportional part of the speed controller. Decrease the value when motor makes noise.	50	100.0
19-42	I-time at start [ms]	Integral part of the speed controller	12	200.0
19-44	Filter time at start [ms]	Filter time of the speed controller, can be used to filter out vibrations from the system or disturbances of the encoder-signal	1	4.0-10.0
19-46	Pos. gain start	Position controller gain during start	0.2 - 0.5	0

Speed controller settings during operation

No.	Name	Parameter Description	PM-motor recommended values	Asynchronous- motor recommended values
19-41	KP-Gain at operation	Proportional part of the speed controller. Decrease the value when motor makes noise.	30 -70	100.0
19-43	I-time operation [ms]	Integral part of the speed controller	200.0	200.0
19-45	Filter time operation [ms]	Filter time of the speed controller, can be used to filter out vibrations from the system or disturbances of the encoder-signal	4.0-10.0	4.0-10.0

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Control sources P19-66

No.	Name	Parameter Description
19-66	Dig_Serial	[0] Drive control by digital terminals [1] Serial bus control DCP3 [2] serial bus control DCP4 [3] Can Open DSP417 Power cycle drive after change of control type

Operation with serial bus DCP3 and DCP4

The drive supports the serial Lift protocol DCP3 and DCP4. Due to this protocol all necessary signals and information will be transferred by the serial bus. As a matter to the fact the wiring of the input control signals for direction and speed can be reduced.

Connections

Terminal block	Terminal number	MCO
X60	CS	Chip Select
	62	RXD/TXD P
	63	RXD/TXD N
	66	0V
	67	5V

Data readouts

No.	Name	Parameter Description
19-73	BUS CMD	Display parameter for DCP command byte and selected speed from Lift controller. Use Lift drive setup tool for logging.
1974	BUS STAT	Display parameter for DCP status byte and extended status to Lift controller. Use Lift drive setup tool for logging.

DCP4 settings

In DCP4 the motor encoder shall be aligned to the shaft encoder. For this reason, the Lift controller transmits the actual shaft encoder position to the drive after each movement. The distance deviation is displayed in P19-69 Sync Position. To align motor encoder with shaft encoder the deviation in P19-69 shall be entered manually in P19-72 Position corr. factor.

No.	Name	Parameter Description
19-69	Sync Position	Position deviation actualized after each movement of the drive. If value is out of range 0.950-1.050 (5%) a failure will be generated. Check parameters of mechanical settings in drive and Lift controller. Displayed value shall be entered in P19-72.

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19-72	Position corr. factor	Value adapts the mechanic settings of the Lift drive to the shaft encoder. Only when P19-72 is aligned with 19-69 an optimum approach at floor level is possible.

Operation with Can Open DSP417

The drive supports Can Open DSP417.
Supported Features:

- Heartbeat guarding of lift controller
- Profile velocity mode
- Profile position mode (Can Open shaft encoder necessary)
- EMCY-telegram
- Virtual position encoder 3 (for slip measurement)
- Virtual terminal (for remote parametrization and diagnosis)
- Pre-torque at start (with Can Open load measuring device) in preparation

Connections

Terminal block	Terminal number	MCO Can Bus
X62	1	N/A
	2	CAN- L
	3	DRAIN
	4	CAN- H
	5	N/A

NOTE: If the drive is the last node in the network an external termination according to CAN Open specification is required. (120 Ohm between CAN-H and CAN-L)

Speed setting

All speed references set directly by the Lift controller via CAN-Bus.
P19-20 Max. speed used for speed limitation
P19-22 V0 used together with P19-19 Run in distance to define the run-in ramp.
All other speed parameters not used in CAN-Open DSP417.

No.	Name	Parameter Description
19-66	Dig_Serial	[3] Can Open DSP417
33-90	CAN node ID	2 (Default)
33-91	CAN baud rate	[21] 250 Kbps (Default)

NOTE: Power cycle the drive after change of control type.

Data readouts

No.	Name	Parameter Description
19-73	BUS CMD	Display parameter for DSP command byte
1974	BUS STAT	Display parameter for DSP status byte

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Position mode

In position mode, the motor encoder shall be aligned to the shaft encoder. For this reason, the Lift controller transmits the actual shaft encoder position to the drive after each movement. The distance deviation is displayed in P19-69 Sync Position. To align motor encoder with shaft encoder the deviation in P19-69 shall be entered manually in P19-72 position corr. factor.

No.	Name	Parameter Description
19-69	Sync Position	Position deviation actualized after each movement of the drive. If value is out of range 0.950-1.050 (5%) a failure will be generated. Check parameters of mechanical settings in drive and Lift controller. Displayed value shall be entered in P19-72.
19-72	Position corr. factor	Value adapts the mechanic settings of the Lift drive to the shaft encoder. Only when P19-72 is aligned with 19-69 an optimum approach at floor level is possible.

Operation with absolute encoder (SSI/EnDat/BISS-C)

For running PM-motors with frequency converters it is necessary to know the exact rotor position. Usually the rotor position is determined with the help of an additional single turn absolute encoder which is mounted on the rotor shaft. The Danfoss Lift drive doesn´t need an absolute encoder for the operation of pm motors. It detects the rotor position by creating a test signal before the first start of the motor. However, it is possible to use a single turn absolute encoder for the rotor position detection as well. It is recommended to switch to absolute encoder type after the normal commissioning is finished.

Note: Operation with Absolute encoder can only work if Encoder direction P19-05=0!

No.	Name	Parameter Description
19-08	Abs. encoder type	[0] no absolute encoder active [1] SSI encoder [2] EnDat encoder [3] BISS-C
19-09	Abs. encoder offs	In new motors the absolute encoder is mounted by factory, so the offset is 0. If encoder was dismounted or changed, the exact position to the rotor shaft has to be determined. [-2] detection of encoder offset Activate inspection mode. Offset will be determined after stop [-1] absolute encoder value will be displayed in P19-98. No movement of the drive possible [0-8192] Encoder Offset
19-98	Abs. enc. position	Shows the value of the absolute encoder. Value is updated after power up

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Operation with UPS, Evacuation mode

In operation with UPS, it is necessary to know the direction of the load. With the knowledge of the load direction it is possible to use smaller UPS devices.

Load direction

The determined load direction can be a function of a digital output selected in P19-84. For PLC's without possibility to use the given load direction, the drive can choose the light load direction independently. Therefore P19-86 shall be set to 2X or 3X.

No.	Name	Parameter Description
19-85	Load direction	[-1] Load direction down (full cabin) [1] Load direction up (empty cabin)

At empty cabin the load direction P19-85 shall be 1. If not, set P19-84 to 2, inverse.

Cabin load	load direction	P19.85	Output X59.1
Empty	Up	1	0
Full	Down	-1	1

The cabin load is measured directly after the mechanical Brake is opened. So, it is important for the proper functionality to set the value P19-14 brake delay long enough.

UPS Mode

Input X57.8 can be used to connect the feedback contact of an ups device. In ups mode the speed is reduced to P19-22 run in speed no matter what speed is selected by the speed inputs.

Operation VVC+ open loop for induction motors

The drive can operate asynchronous motors without encoder in open loop mode.

Function	Parameter-number	Parameter name	Value recommended values	Remark
Basic Setting	P32-00	Incremental Signal Type	[0] None	No encoder is needed
Release Brake	P19-13	Brake Lift delay	300-1000ms	Motor magnetizing time before releasing the brake.
	P19-14	Brake delay	0-500ms	Delay of speed reference until the brake is totally opened.
Start	19-55	L-start acc	100mm/s² - 200mm/s²	To avoid a rollback of the cabin it can be necessary to use the linear start function to accelerate the drive quickly to the
	19-56	L-start speed	0.050m/s - 0.100m/s	
	19-57	L-start time	200ms-1000ms	

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				minimum speed.
Close Brake	P2-21	Activate brake speed	0-300 rpm	Speed level of engaging the brake.
	P19-15	Brake close delay	300-100ms	Additional magnetizing time to hold the load until the brake is fully closed.

Extended Settings

No.	Name	Parameter Description
P19-86	Special Function	[00] none [x1] **S**imple **C**ontrol [x2] Dir=V0 [x3] SC + DF [x4] **S**oft-**S**top at **D**irection=0 [x5] SSD + SC [x6] SSD + DF [x7] SSD + SC + DF [1x] **S**hort **F**loor function [2x] UPS operation in light load direction [3x] SF + UPS operation in light load direction

Simple Control

With simple control operation can be started by enabling the direction signals at T32/33. The enable signals will be wired as normal however the normally opened relays contact in the path of the motor contactors k1 and k2 will now be controlled by the contactor function of the drive. This can be digital output X59.4 or relays 1 (P19-67 Function Relay 1 [3] contactors). That means, with the setting of a direction signal and a speed signal the relays contact of K12 will be switched, which leads to the switching of the motor contactors and the enable signal to T27 and X57.1.

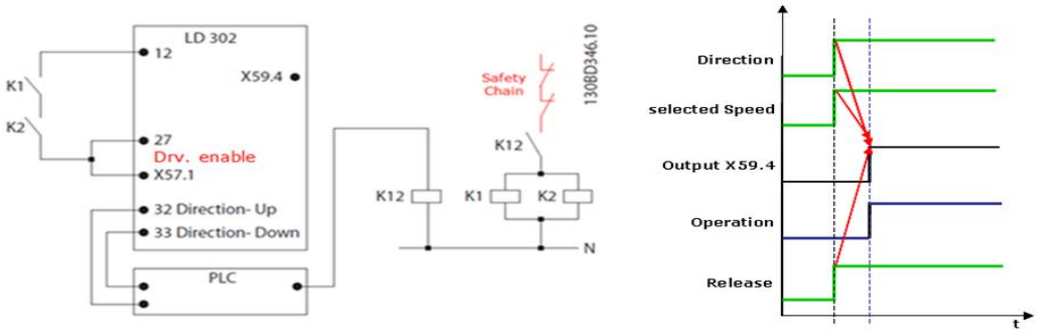


Illustration: Parameter 19-86 Enable Simple Control=[0]

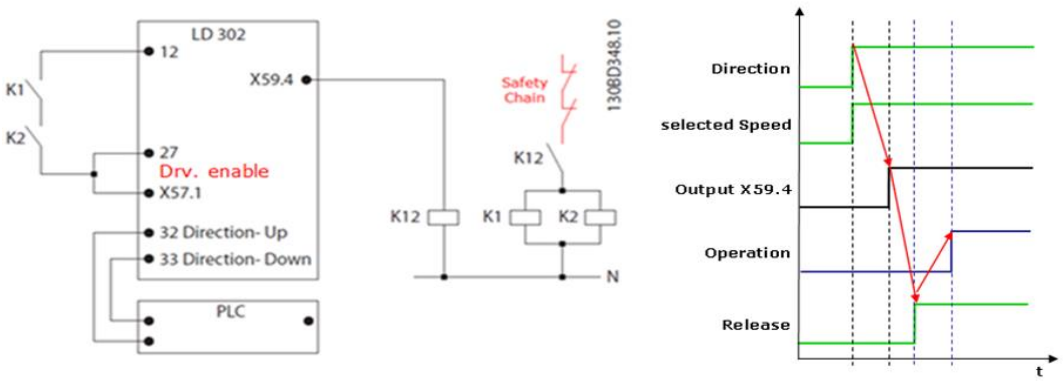


Illustration: Parameter 19-86 Enable Simple Control=[1]

Dir=V0

This function uses the directions signals up and down for V0. The run-in speed V0 is always active when a direction signal is active. The priority is on the fast speed input. When fast speed is disabled slow speed is active.

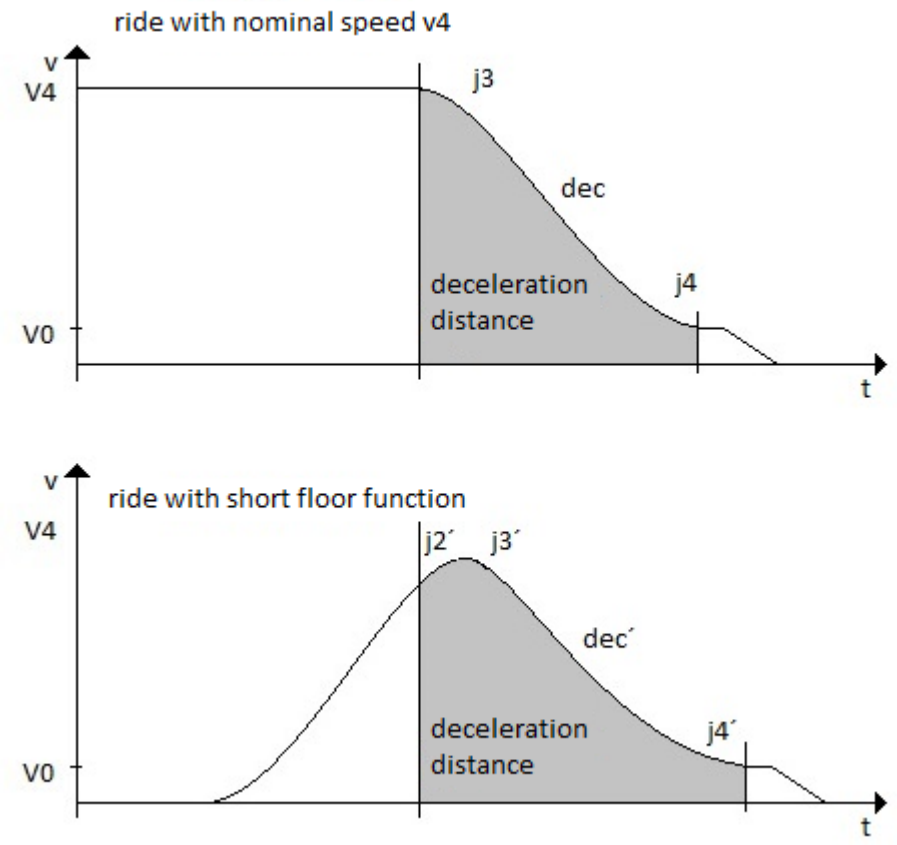
This function can be used with all control modes where V0 run in speed has the lowest priority. That is P19-50 = 1 or 8.

Softstop at dir=0

When disabling the direction signals during movement a soft stop will be executed. The mechanical brakes will be closed at standstill. The function can be used in combination with inspection boxes which use the direction signal to stop the drive.

Short floor function

The Lift drive executes the short floor function if the selected speed cannot be reached due to short floor distances. The jerks j2, j3 and j4 and the deceleration will be recalculated and adapted to the deceleration distance of the nominal speed v4. As a result the approach at v0 is independent of the time when run in speed v0 is selected. A overshoot will be prevented as well as long slow speed duration. The short floor function is only available for nominal speed v4.



UPS operation in light load direction

If this function is activated, the drive will operate the elevator in light load direction, independent on the given direction control signals, in case of activated UPS input.

Terminal X59.1 – X59.7

No.	Name	Parameter Description
19-84	Function X59.1-7	Functions of output X59.1 – X59.7 Parameter 19-84 displays a seven-digit value. Each digit represents the outputs X57.1-7. The first digit (right digit) represent output X59.1, the last digit (left digit) represent output X59.7. A Parameter value 0,1,2,3 or 4 defines for each digit the output function. Digit value = 0, set the output function to: - default output function. Digit value = 1, set the output function to: - Light load direction Digit value = 2, set the output function to: - Light load direction inverse Digit value = 3, set the output function to: - Warning direction change counter

		Digit value = 4, set the output function to: - Fault Braking IGBT / short circuit Brake resistor Default output function, Par. 19-84 = 0000000: - X59.1, Over Speed - X59.2, Control Speed 1 - X59.3, Control Speed 2 - X59.4, Output contactor - X59.5, Ready Signal - X59.6, Over Temperature - X59.7, Position reached
19-85	Load direction	[-1] Load direction down (full cabin) [1] Load direction up (empty cabin)

Monitoring functionalities

No.	Name	Parameter Description
19-65	Monitoring	[000] no monitoring active [xx1] monitoring brake feedback [no] [xx2] monitoring brake feedback [nc] [x1x] monitoring governor [no] [x2x] monitoring governor [nc] [1xx] monitoring contactors [no] [2xx] monitoring STO [no] [3xx] monitoring contactors + STO

Monitoring of brake feedback due to DIN EN 81-20

The application controller MCO361 is able to monitor the feedback contacts of the mechanic brake. The monitoring can be done with normally open contacts (NO) or with normally closed contacts (NC). In case of a failure the next start of the drive will be inhibited (Drive locked) unless a reset is made. Movements with a duration shorter than the delay time in parameter 19-87 or with an irregular termination will not be monitored. However, a new start is only possible after brakes have been closed.
The interlock stays active even in the case of a loss of power supply, unless a reset is done by setting P19-64 to the value -1 or by pressing the LCP-keys [Back] + [Reset] simultaneously.
A fault will be recognized:

- If state of brake feedback is not closed when receiving a start signal
- If state of brake feedback is not opened before closing the brake.
- If state of brake feedback is not closed after closing the brake and the delay time (P19-87) has passed

States and reactions	Output status for mechanical brake	State of feedback contacts at input X57.9 and X57.10	State delay time P19-87	Reaction of Lift drive
Before opening mechanical brake	0	Applied	x	x
	0	Not applied	x	Brake failure 1
Before closing mechanical brake	1	Released	x	x
	1	Not released	1	Brake failure 2

After closing mechanical brake	0	Applied	x	x
	0	Not applied	1	Brake failure 3

0 = Not active; 1 = Active; X = Not used

NOTE:
As a protection against manipulation the functionality of brake monitoring can only be deactivated by setting the drive to factory settings. However, a change of contact types is possible.
NOTE:
The monitoring due to DIN EN 81-20 is only available if in parameter 19-90 the identifier A3 is displayed. e.g. S_A3_B_X.XXT/RXXX.

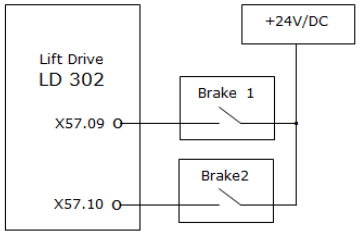


Illustration: Schematic drawing Brake Monitor with N.O. contacts, P 19-65 = [x1]

Test instruction for the installation:

During commissioning of the elevator and after every change of wiring and at every first or recurring check the proper functionality of the brake monitoring shall be rechecked.
At standstill one of the two brakes shall be released manually and a start signal shall be given. After receiving the start signal the message text "Brake failure 1" shall be displayed. The start shall be inhibited, and the drive shall be locked. The manually released brake can now be applied again. The fault can be reset by setting the value of P19-64 to -1 or pressing the LCP-keys [Back] + [Reset] simultaneously.
The procedure shall be repeated with the second brake. Reaction of the drive shall be as described before. If the reaction of the drive is not as described a fault or manipulation is suspected. The wiring shall be checked or changed if necessary.
After fault correction the complete test shall be repeated.
If the manual actuation of the brakes is not possible it is necessary to simulate the state "brake released" at the relevant signal input with a bridge to 24 VDC or an interruption of the signal.

Monitoring of the governor feedback contact

P19-65 x1x [no]/ x2x [nc]
The feedback contact of the speed governor device can be monitored by the Lift drive. For this purpose, the digital input 19 on the control card can be used. The function cannot be combined with the standby function of the drive which uses the same digital input.
The function locks the drive if one of the following situations is detected.

- Start signal received and no change of signal level from low to high was detected before.
- Signal level of feedback contact changed from high to low during movement

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The interlock stays active even in the case of a loss of power supply, unless a reset is done by setting P19-64 to the value -1 or by pressing the LCP-keys [Back] + [Reset] simultaneously.
The monitoring can be implemented with normally open [no] contacts as well as with normally closed [nc] contacts.

Functional description:

• At each start it will be checked if the governor contact has been switched from low to high level before. If that is not the case it will be assumed that faulty wiring or defect contactors or short circuit to 24V could be the reason. The Lift drive creates an alarm and an interlock because this is seen as a dangerous malfunction.
  ○ Following failure will be created:
  - 249 Governor Fault

• During the operation the signal level of the governor contact is monitored as well. If signal level should drop to low an alarm will be created and the drive locked. This is seen as well as dangerous malfunction of the monitoring device.
  ○ Following failure will be created:
  - 249 Governor Fault
 	
After the detection of a dangerous malfunction of the governor contacts the Lift drive stays out of order (locked).
The interlock stays active even in the case of a loss of power supply, unless a reset is done by setting P19-64 to the value -1 or by pressing the LCP-keys [Back] + [Reset] simultaneously.

Monitoring of motor contactors

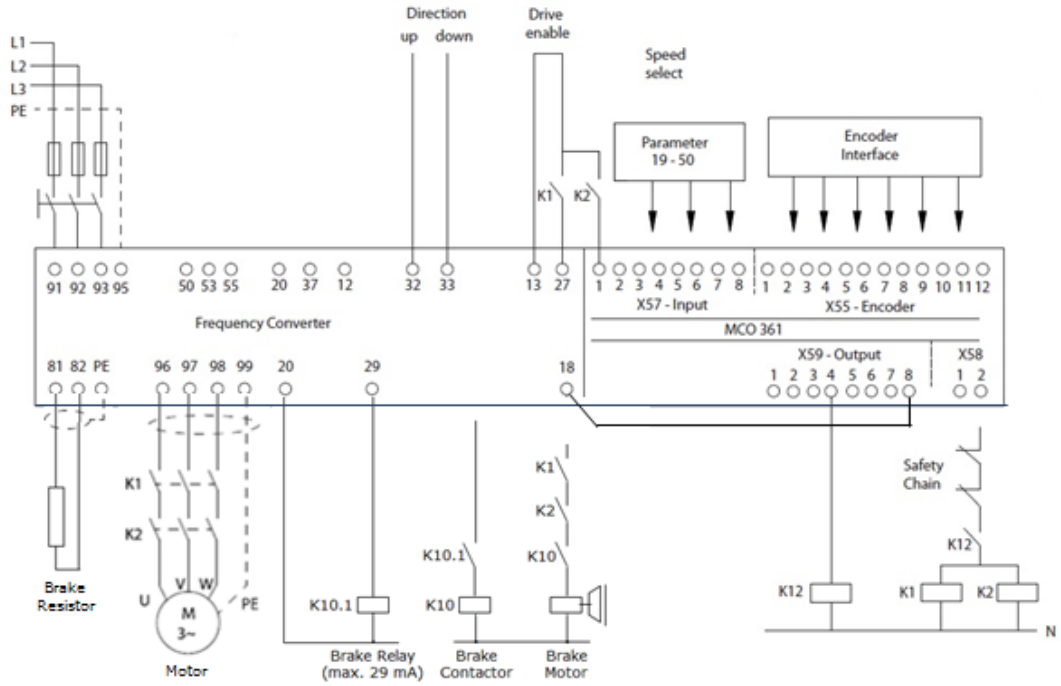
P19-65 1xx / 3xx
Due to separate wiring the digital input signals X57.1 and terminal 27 on the control card can be used for the monitoring of the motor contactors. The monitoring shall be done with normally opened [no] contacts.
The function prevents the start of the drive if one of the following situations has been detected.

- Start signal received and no change of signal level from low to high on feedback contacts was detected before
- After the receiving a start signal and the output of signal contactors on X59.4 the signal level of the feedback contacts refuses to switch to high level within a time of 10 seconds.

After the detection of a dangerous malfunction of the motor contactors the Lift drive stays out of order (locked).
The interlock stays active even in the case of a loss of power supply, unless a reset is done by setting P19-64 to the value -1 or by pressing the LCP-keys [Back] + [Reset] simultaneously.

To implement the monitoring of the motor contactors the corresponding wiring shall be

done. The feedback contacts of the motor contactors K1 and K2 shall be connected to terminal 27 and X57.1 as shown below.
After the detection of a dangerous malfunction of the motor contactors, the Lift drive will be locked.
The interlock stays active even in the case of a loss of power supply, unless a reset is done by setting P19-64 to the value -1 or by pressing the LCP-keys [Back] + [Reset] simultaneously.



Functional description:

- At each start it will be checked if the motor contactors have been switched off before. If that is not the case it will be assumed that faulty wiring or defect contactors or short circuit to 24V could be the reason. The Lift drive creates an alarm and an interlock because this is seen as a dangerous malfunction.
    - Depending on the cause one of the following failures will be created:
      - 253 CO1_T27 on
      - 254 CO2_X57/1 on
- If after the receiving of a start signal and the output of the signal contactors on X59.4 the signal level of the feedback contacts refuses to switch to high level within a time of 10 seconds it leads to an alarm and the start will be cancelled. The drive will not be locked because this is seen as a not critical fault which leads to a save state.
    - Depending on the cause one of the following failures will be created:
      - 251 CO1_T27 off
      - 252 CO2_X57/1 off

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Monitoring of STO

P19-65 2xx / 3xx
With this function the STO (Safe Torque Of) can be monitored. This ensures the detection of wrong connections during installation at every start. This function is only relevant at operation without motor contactors.
In case a failure is detected, alarm number 259 (STO T37 on) will be created and the drive is locked.
The interlock stays active even in the case of a loss of power supply, unless a reset is done by setting P19-64 to the value -1 or by pressing the LCP-keys [Back] + [Reset] simultaneously.

Standby function

The function can decrease the power consumption of the drive when no operation is needed. All digital outputs and all relays will be switched of. If the control card temperature exceeds 56 °C degrees, the fan will be started with a reduced speed of 50%.
Standby function can be activated with input terminal 19 or by DCP telegram. If digital inputs are used to control the drive the standby function cannot be combined with the governor monitoring function.

Test run mode

19-60	Test run mode	[1] Gear ratio test function. The drive moves one revolution of the traction sheave. Can be used to check mechanic settings. [2] Fang Release function. Applies torque shocks to release cabin from mechanic fang device.

Gear ratio test function

Parameter 19-60 = 1. After start in inspection mode the drive will be started with slow speed. After one revolution of the traction sheave the motor will be stopped. Adjust the gear ration new if the traction shave does not exactly turn one revolution.

Safety gear release function

Parameter 19-60 =2. After start in inspection mode the mechanic brake will be opened, and periodic torque shocks will be applied to the motor to release the mechanic fang. This function is only allowed for start direction Up. The function will be disabled automatically after the cabin has moved 100mm or after stopping the drive by control signal.

Alarm log

Alarm log of the drive

The Alarm log of the drive can be reached by pressing [Alarm Log]. The alarm log shows a list of the last 5 alarms of the drive. To get additional information, select the alarm with the arrow keys and press [OK].
To get the exact information about the occurrence of the alarm, the alarm time can be compared with the operating hours of the drive in P15-00.
Example:
P15-50 = 345 h, alarm log time: 1217075s = 338 h 4min 35 s
The alarm occurred 7h 55min 25 s ago.

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Alarm log of the Lift controller

No.	Name	Parameter Description
19-80	Log No	Error log of the Lift-controller MCO361. Select the last errors of the Lift application by entering values from 1-10.
19-81	Error code	Error code of the selected log-number in [19-80
19-82	Error time	Error time of the selected log-number in [19-80]
19-83	Function Error log	[0] Default: logging of errors [1] Reset error log [2] logging of errors and warnings

7 Operation

Startup

After setting up the drive as described in chapter "Initial commissioning", the drive is ready to start operation. However, depending on the mechanical system further adaptations can be necessary. Please follow in case of unexpected behavior the instructions below.

Test

As first step after programming the drive it is highly recommended to test the basic operation in inspection mode with reduced speed. In case of unintended behavior please follow the instructions in the next sup- chapters.

Car direction

In case Motor runs controlled, but in wrong direction, the reference can be adjusted to the mechanical system:

No.	Name	Parameter Description
19-04	Car direction	[0] normal direction [1] direction inverted

Uncontrolled movement (With absolute encoder)

In case of used absolute encoder, the motor shall be connected U-V-W to the drive terminal U-V-W in the right order. If this is double checked, a wrong encoder offset can lead to an uncontrolled movement. Please make sure that P19-05 is set to 0.
The encoder offset can be measured with P19-09.

No.	Name	Parameter Description
19-09	Abs. encoder offs	In new motors the absolute encoder is mounted by factory, so the offset is 0. If encoder was dismounted or changed, the exact position to the rotor shaft shall be determined. [-2] detection of encoder offset Activate inspection mode. Offset will be determined after stop [-1] absolute encoder value will be displayed in P19-98. No movement of the drive possible [0-8192] Encoder Offset

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19-98	Abs. enc. position	Shows the value of the absolute encoder. Value is updated after power up

Start-error or Track-error or accelerates unexpected or does not move

Encoder function

Check the upper two LEDs at terminal block X55 where the encoder is connected. The LEDs show the status of channel A and B of the incremental encoder. If there is a broken wire or a short circuit the LEDs will be switched off.

Illustration: Terminal X55, LED´s

Encoder Auto tuning P19-03

The drive can detect the encoder direction. P19-03 shall be set to 1 and inspection mode shall be activated. The drive will start the motor in open loop and check the direction of encoder speed.
P19-05 will be adjusted to the measured direction.

No.	Name	Parameter Description
19-03	Encoder Autotuning	[0] Not active [1] Active
19-05	Encoder direction	[0] normal direction [1] direction inverted

Encoder pulses

Use Parameter 34-50 "Actual Position" to read out the actual position value.
Depends on the motor direction, the actual position value must increase for positive motor direction and decrease for negative motor direction. If the encoder pulses, for the position information, are counted not correctly, check the encoder wiring and the mechanical coupling from motor and encoder.

Noise or vibrations during acceleration or deceleration (low frequency)

Reduce P19-41 "KP – gain at operation", until the motor makes no noise or vibrations. (Minimum 20). Motors without any load can only be run with the minimum value of 20 in P19-41.

No.	Name	Parameter Description
19-41	KP-Gain at operation	Proportional part of the speed controller. Decrease the value when motor generates noise or vibration.

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Noise during operation

If the resonance frequency of the mechanical system matches to the harmonics in the output frequency of the drive, vibrations will occur. P 19-45 can damp this behavior. Usually lower values solve the vibrations. Recommended values are 1 to 8 ms.

No.	Name	Parameter Description
19-41	KP-Gain at operation	Proportional part of the speed controller. Decrease the value when motor generates noise or vibration.
No.	Name	Parameter Description
19-45	Filter time operation [ms]	Filter time of the speed controller, can be used to filter out vibrations from the system or disturbances of the encoder-signal

Optimization

Start Behavior

Press **[Main Menu],** select group 19-** Application Parameters and press **[OK].**

In case of jerks at start, P 19-14 can be increased to ensure that the mechanical brake is fully opened before the reference is given out.
P19-14 can be used as well to optimize the rollback at start. The start controller settings in Parameter P19-40, P19-42, P19-44 and P19-46 are active during the delay in P19-14. See chapter 5.3.4 Speed PID controller.
In case of rollback at start make sure that the value of P19-14 is high enough that the start controller can eliminate rollback.
Increased values of P19-40 and reduced values in P19-42 help to reduce rollback.
P19-46 is an additional fast zero-position controller to eliminate remaining rollback.
In case of instable control during start, P19-40 shall be decreased and P19-42 increased.

No.	Name	Parameter Description	PM-motor recommended values	Asynchronous- motor recommended values
19-13	Brake Lift delay [ms]	Delay time for motor magnetization. (open loop). Value is determined automatically from motor data	0	300-800
19-14	Brake delay [ms]	Time delay until brake is fully applied. Also defines the active time of the start speed controller	300-2500	300-2500
19-40	KP-Gain at start	Proportional value of the start-speed controller	20-100	50-100
19-42	I-time at start [ms]	Integral part of the start-speed controller	12-50	200
19-44	Filter time at start [ms]	Filter time of the encoder signals	1.0	10.0
19-46	Pos. gain start	Value needed for Gearless motor	0.2-0.5	0.0-0.4

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Controller behavior during operation

In case of overshoot at the end of acceleration or deceleration, a decreased I time P19-42 can optimize this behavior.

Parameters for Stop behavior

The smoothness of approaching the floor depends in general on the distance (P19-19) and the creeping speed (P19-22). Our recommendation is to keep the default values to ensure a comfortable approach.
However, lower distances for positioning or higher speeds leads to higher jerks.
In case of rollback after stop, the timing of the PLC and the brake close delay P19-15 needs to be double checked.
P19-58 ensures standstill of the motor after reaching the floor, before closing of mechanical brake.
P19-59 influences the mechanical noise of the brake when the motor is switched off.

No.	Name	Parameter Description
19-19	Run in distance [mm]	Deceleration distance from P19-22 run in speed to stop at floor level.
19-22	V0 [m/s]	Run in speed v0
19-15	Brake close delay [ms]	time delay for closing the brake after switching the output signal for the mechanical brake to low level. The time delay ensures that the motor remains magnetized long enough to hold the load until the brake is closed.
19-58	Delay after stop [ms]	Time delay for applying the mechanical brake after position is reached
19-59	Torque down time [ms]	Time for decreasing the torque when mechanical brake is closed.

8 Troubleshooting

High Motor current on asynchronous motors

1. Check nominal motor data.
2. Perform the motor adaption. P 19-63 = [1] (See chapter "Automatic motor adaptation, AMA").

High motor current on PM motors

1. Check nominal motor data.
2. Perform the motor adaption. P 19-63 = [1] (See chapter "Automatic motor adaptation, AMA").
3. Check rotor offset (See chapter "Operation with absolute encoder")
4. Disable absolute encoder for test purpose (See chapter "Operation with absolute encoder")

Motor noise or drive noise at motoric operation

1. Check input phases voltage and balance

Motor noise, encoder failures, unstable operation

1. Check shielding of motor and encoder cables (See chapter installation)

Earth fault alarm at start

1. Check for mismatch between mains and motor connection.

Sporadic A38 during operation

1. Doublecheck shielding of control signal cables, e.g. motor thermistor. Use PLC or external device for monitoring of motor thermistor. Check for EMC interference suppressor.

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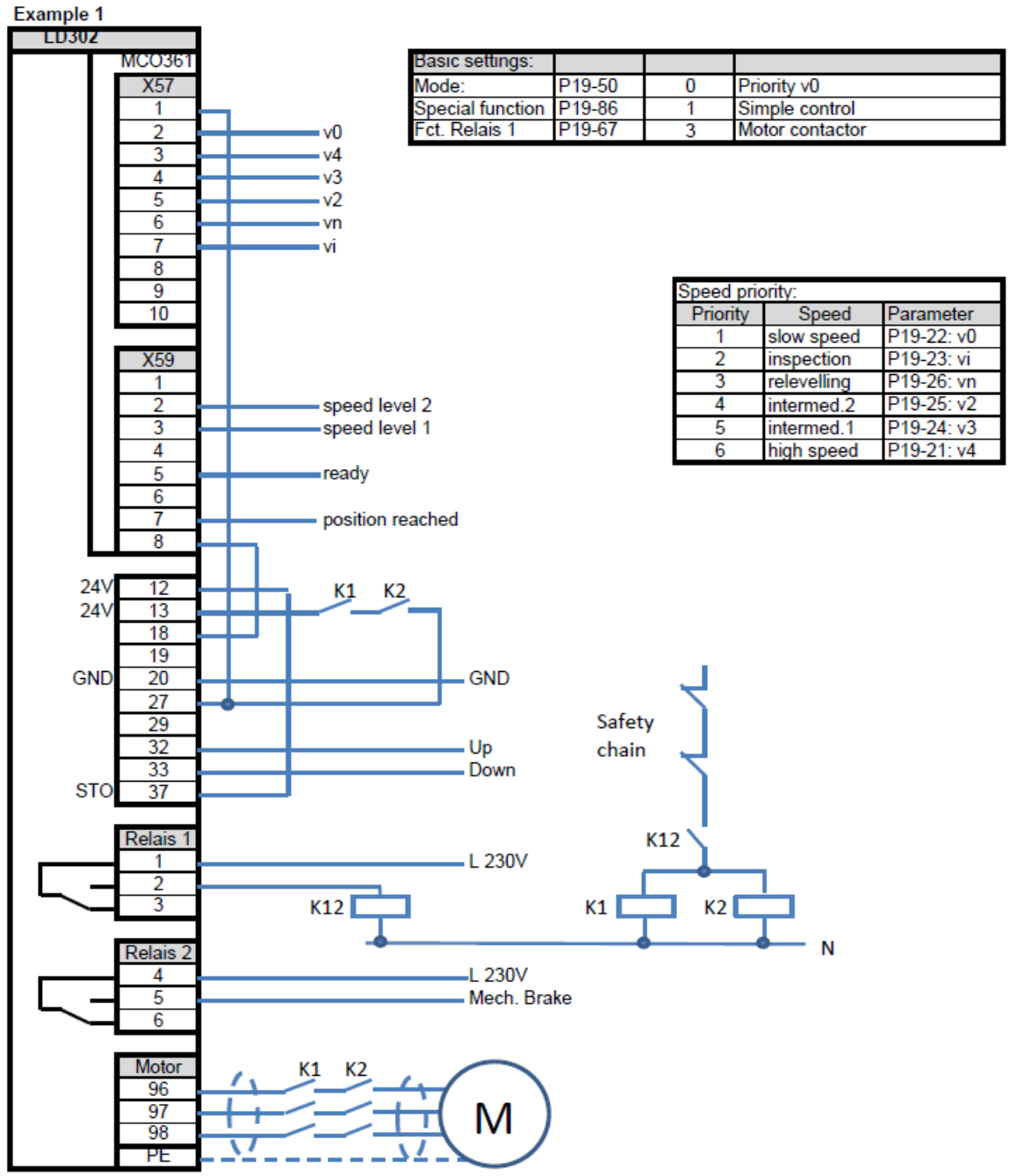
9 Appendix

Wiring Examples with Parameter setup

Mode 0, digital, low speed priority

Example 1: Mode 0, Digital speed selection, low speed priority, direction priority up	
Configuration:	Motor contactors controlled by drive
Speeds: 6	Priority: slow speed, inspection, relevelling, intermed.2, intermed.1, high speed
Start Signal:	Start with direction signal

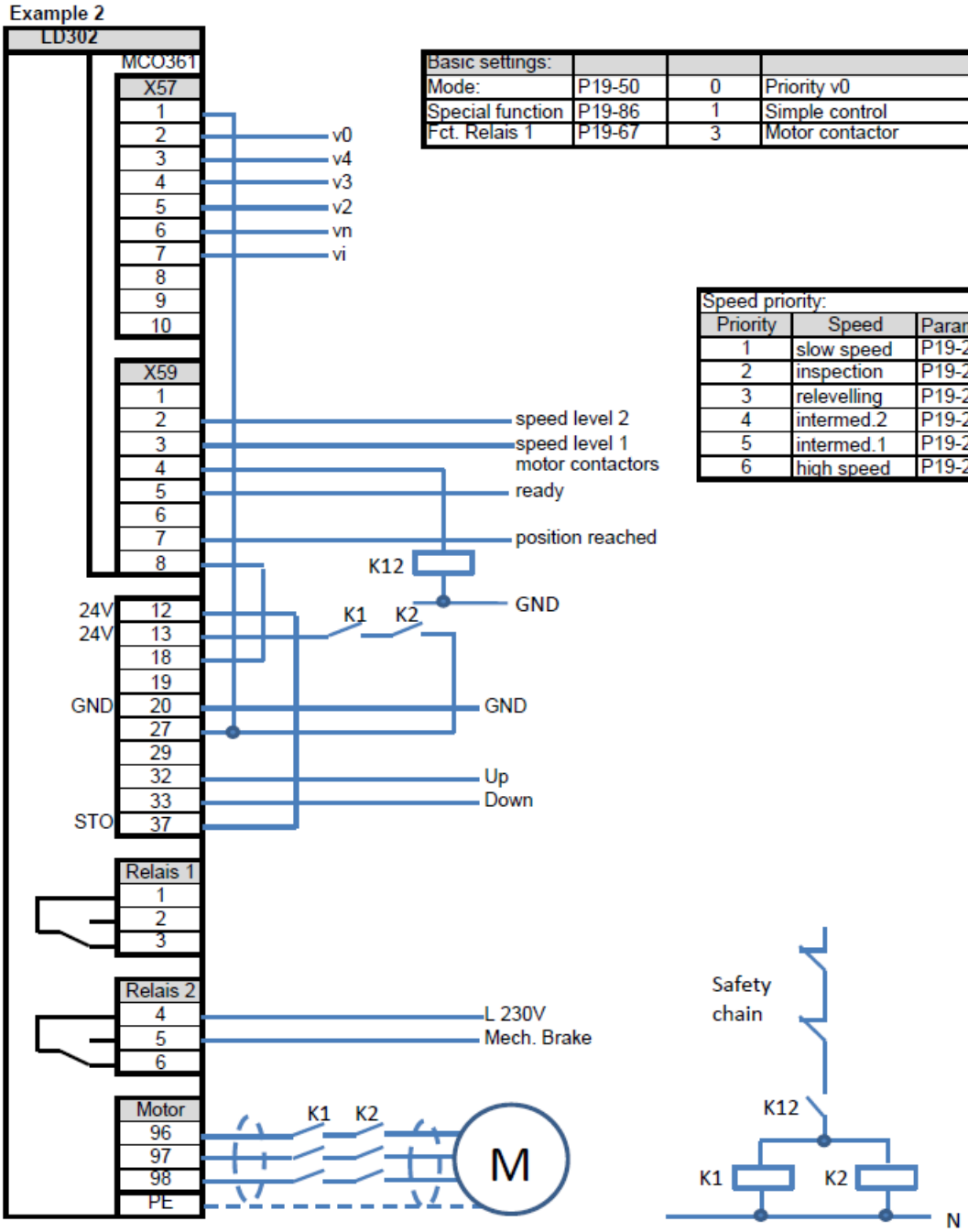


Basic settings:			
Mode:	P19-50	0	Priority v0
Special function	P19-86	1	Simple control
Fct. Relais 1	P19-67	3	Motor contactor

Speed priority:		
Priority	Speed	Parameter
1	slow speed	P19-22: v0
2	inspection	P19-23: vi
3	relevelling	P19-26: vn
4	intermed.2	P19-25: v2
5	intermed.1	P19-24: v3
6	high speed	P19-21: v4

Mode 0, digital, low speed priority

Example 2: Mode 0, Digital speed selection, low speed priority, direction priority up	
Configuration:	Motor contactors controlled by drive, Output X59.4
Speeds: 6	Priority: slow speed, inspection, relevelling, intermed.2, intermed 1, high speed
Start Signal:	Start with direction signal

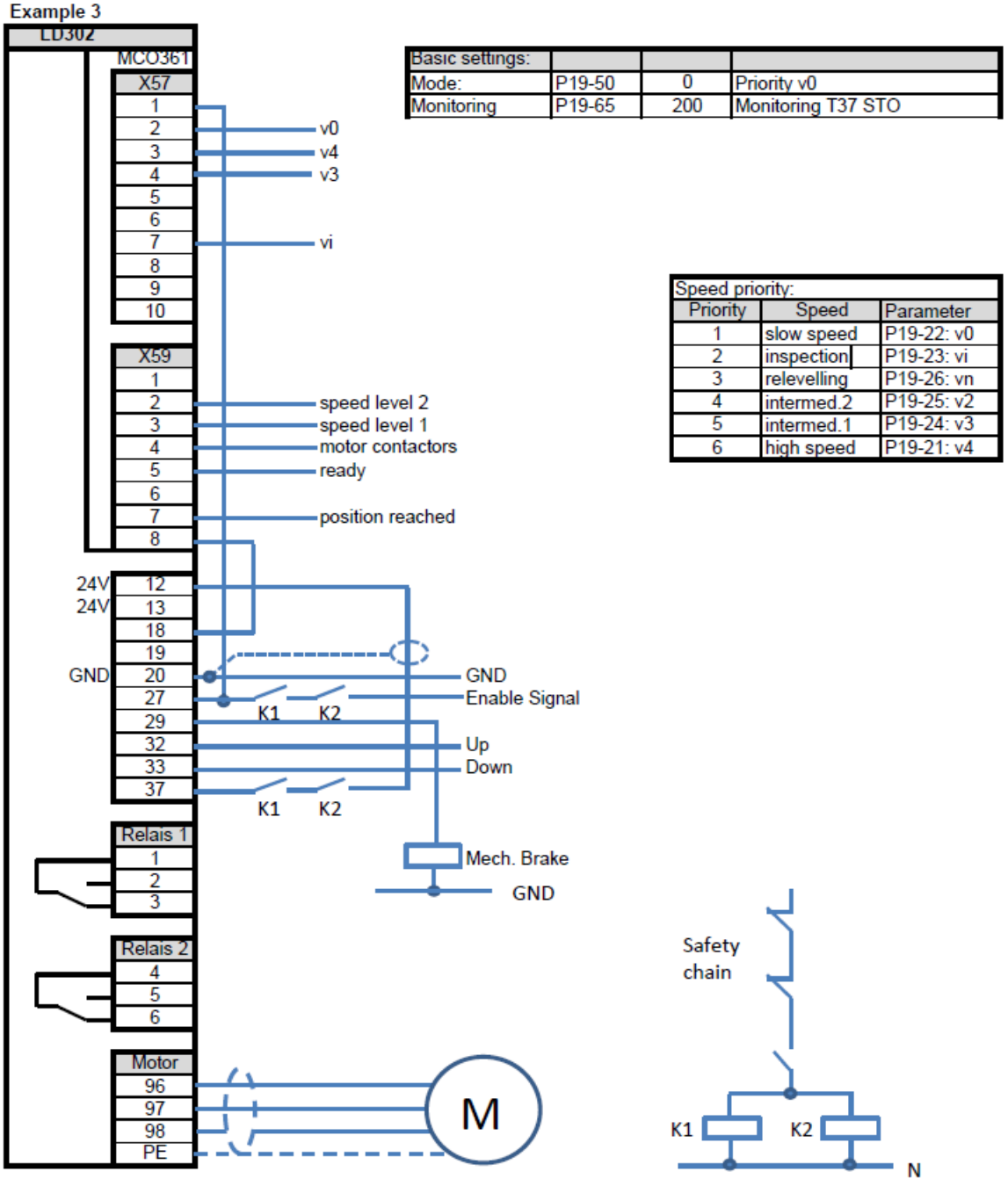


Basic settings:			
Mode:	P19-50	0	Priority v0
Special function	P19-86	1	Simple control
Fct. Relais 1	P19-67	3	Motor contactor

Speed priority:		
Priority	Speed	Parameter
1	slow speed	P19-22: v0
2	inspection	P19-23: vi
3	relevelling	P19-26: vn
4	intermed.2	P19-25: v2
5	intermed.1	P19-24: v3
6	high speed	P19-21: v4

Mode 0, 24V control signals to lift controller used

Example 3: Mode 0, only 24V control signals to lift controller used	
Configuration:	Without motor contactors, only 24V control signals to lift controller used
Speeds: 6	Priority: slow speed, inspection, relevelling, intermed.2, intermed 1, high speed
Start Signal:	Start with enable signal from lift controller, safety relays controlled by lift controller

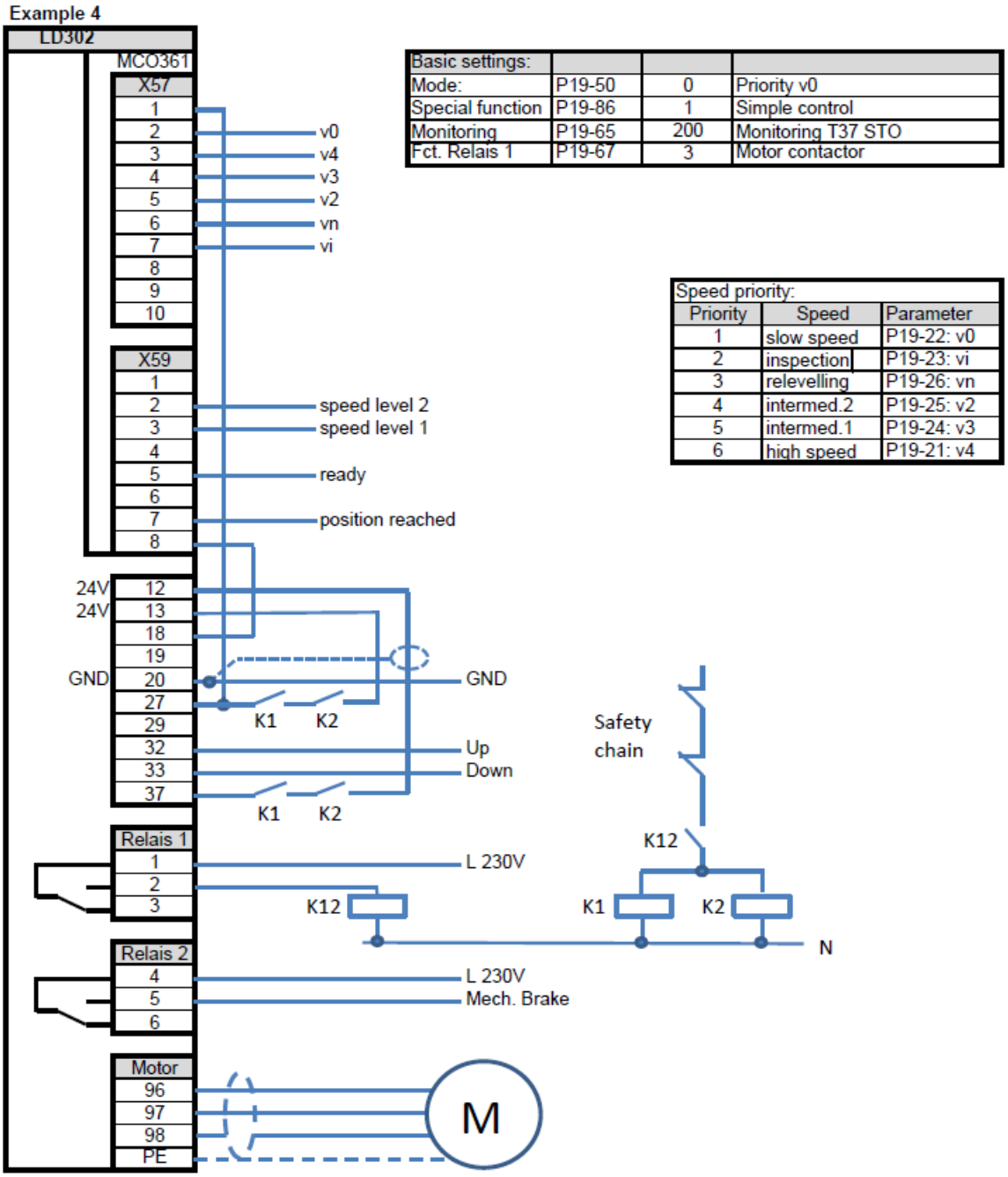


Basic settings:			
Mode:	P19-50	0	Priority v0
Monitoring	P19-65	200	Monitoring T37 STO

Speed priority:		
Priority	Speed	Parameter
1	slow speed	P19-22: v0
2	inspection	P19-23: vi
3	relevelling	P19-26: vn
4	intermed.2	P19-25: v2
5	intermed.1	P19-24: v3
6	high speed	P19-21: v4

Mode 0, digital, low speed priority

Example 4: Mode 0, Digital speed selection, low speed priority, direction priority up	
Configuration:	Without motor contactors
Speeds: 6	Priority: slow speed, inspection, relevelling, intermed.2, intermed.1, high speed
Start Signal:	Start with direction signal

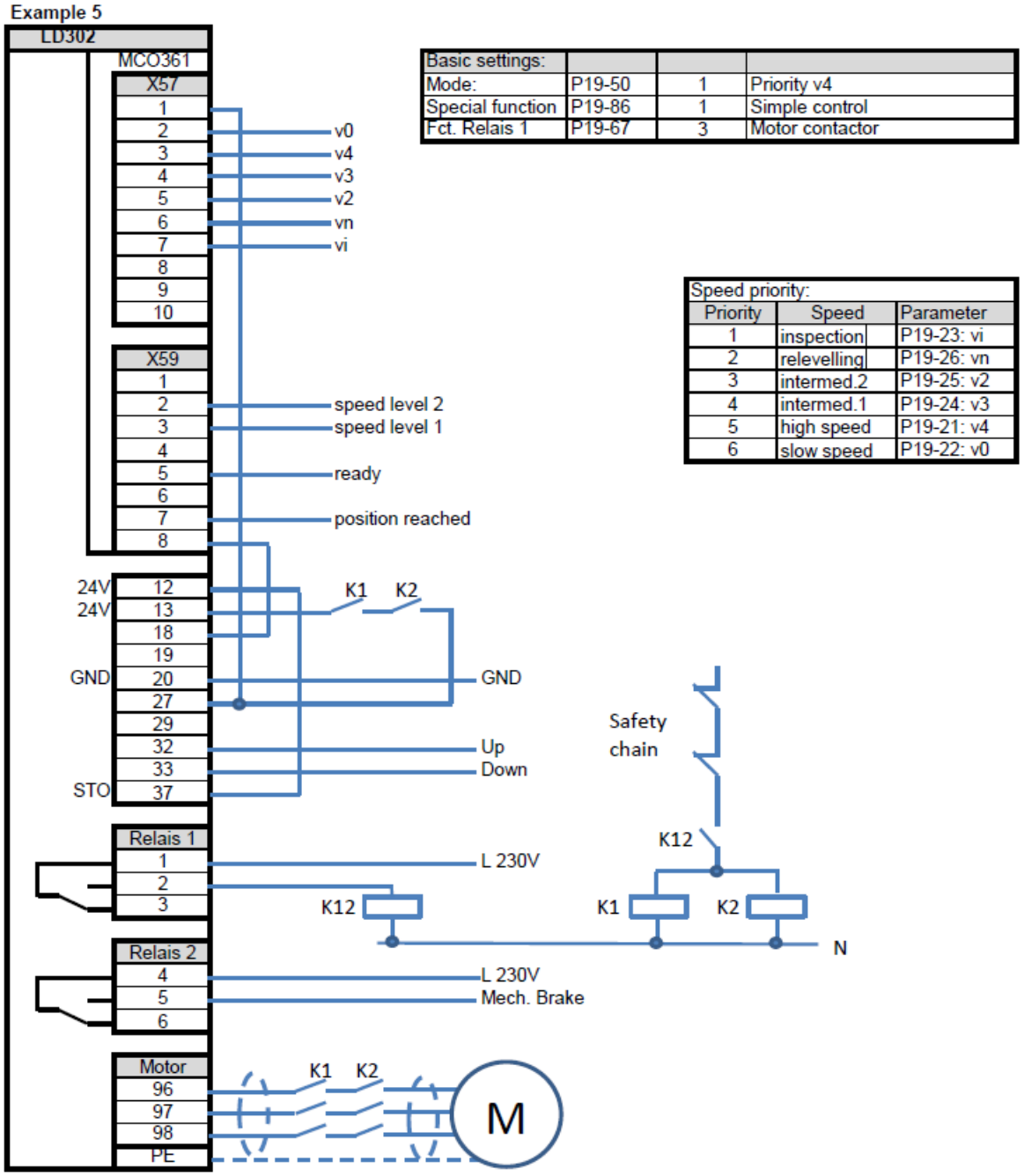


Basic settings:			
Mode:	P19-50	0	Priority v0
Special function	P19-86	1	Simple control
Monitoring	P19-65	200	Monitoring T37 STO
Fct. Relais 1	P19-67	3	Motor contactor

Speed priority:		
Priority	Speed	Parameter
1	slow speed	P19-22: v0
2	inspection	P19-23: vi
3	relevelling	P19-26: vn
4	intermed.2	P19-25: v2
5	intermed.1	P19-24: v3
6	high speed	P19-21: v4

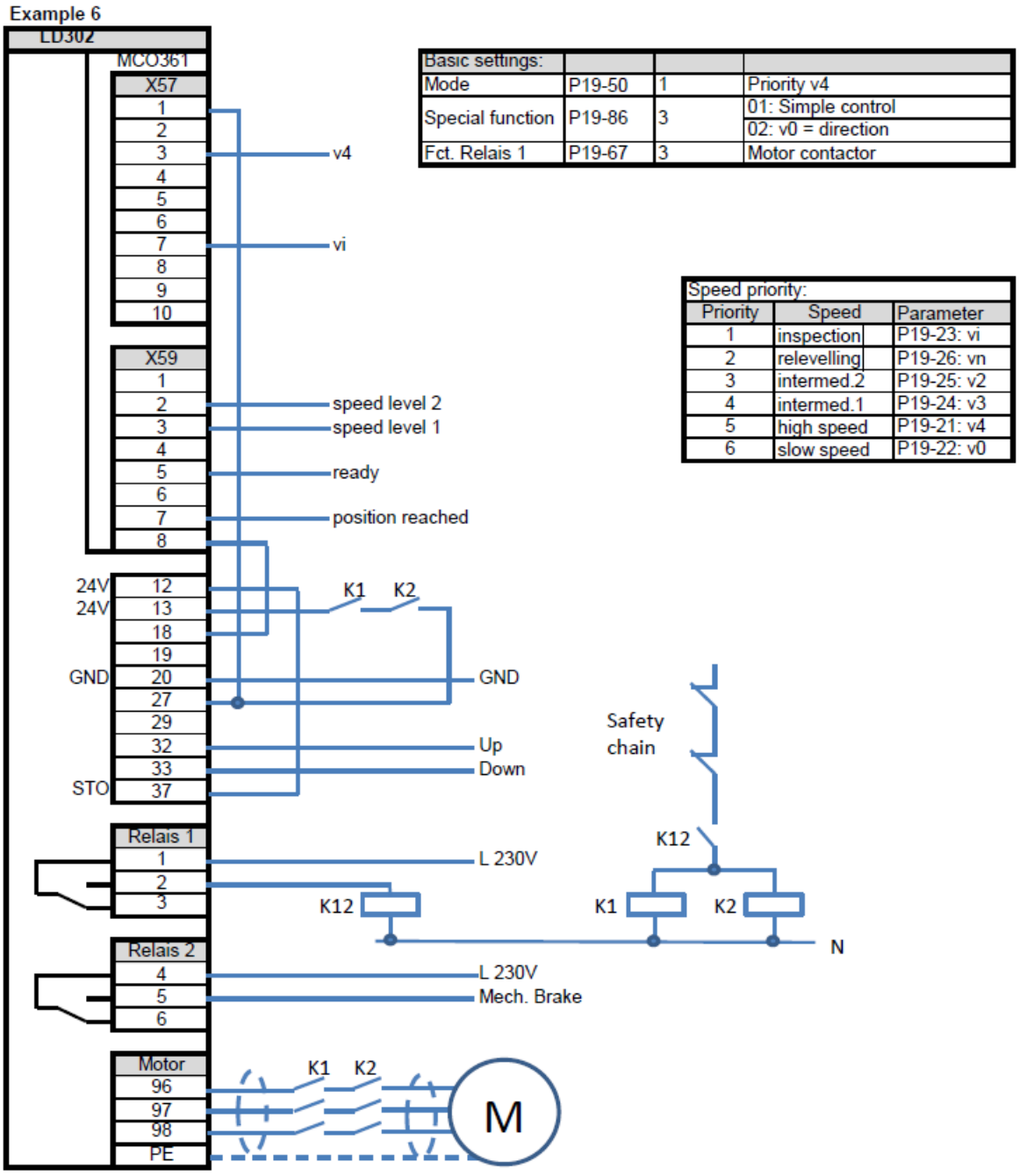
Mode 1, digital, high speed priority

Example 5: Mode 1, Digital speed selection, high speed priority, direction priority up-	
Configuration:	Motor contactors controlled by drive
Speeds: 6	Priority: slow speed, inspection, relevelling, intermed.2, intermed.1, high speed
Start Signal:	Start with direction signal



Mode 1, slow speed direction

Example 6: Mode 1, slow speed with direction signal	
Configuration:	Motor contactors controlled by drive
Speeds: 3	Priority: slow speed, inspection, high speed
Start Signal:	Start with direction signal

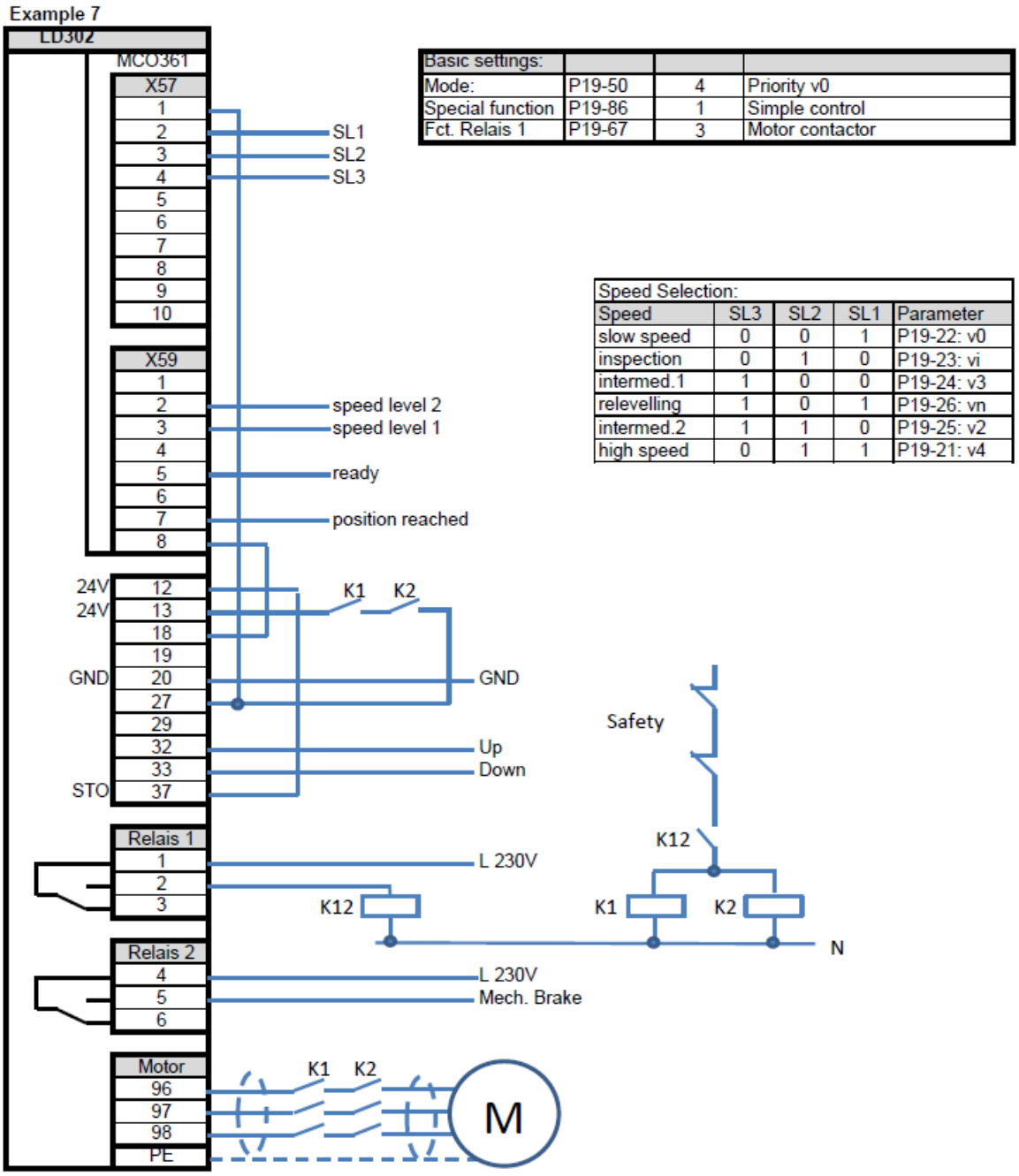


Basic settings:			
Mode	P19-50	1	Priority v4
Special function	P19-86	3	01: Simple control 02: v0 = direction
Fct. Relais 1	P19-67	3	Motor contactor

Speed priority:		
Priority	Speed	Parameter
1	inspection	P19-23: vi
2	relevelling	P19-26: vn
3	intermed.2	P19-25: v2
4	intermed.1	P19-24: v3
5	high speed	P19-21: v4
6	slow speed	P19-22: v0

Mode 4, binary 1

Example 7: Mode 4, Binary speed selection 1, direction priority up	
Configuration:	Motor contactors controlled by drive
Speeds: 6	Slow speed, inspection, relevelling, intermed.3, intermed.2, intermed 1, high speed
Start Signal:	Start with direction signal

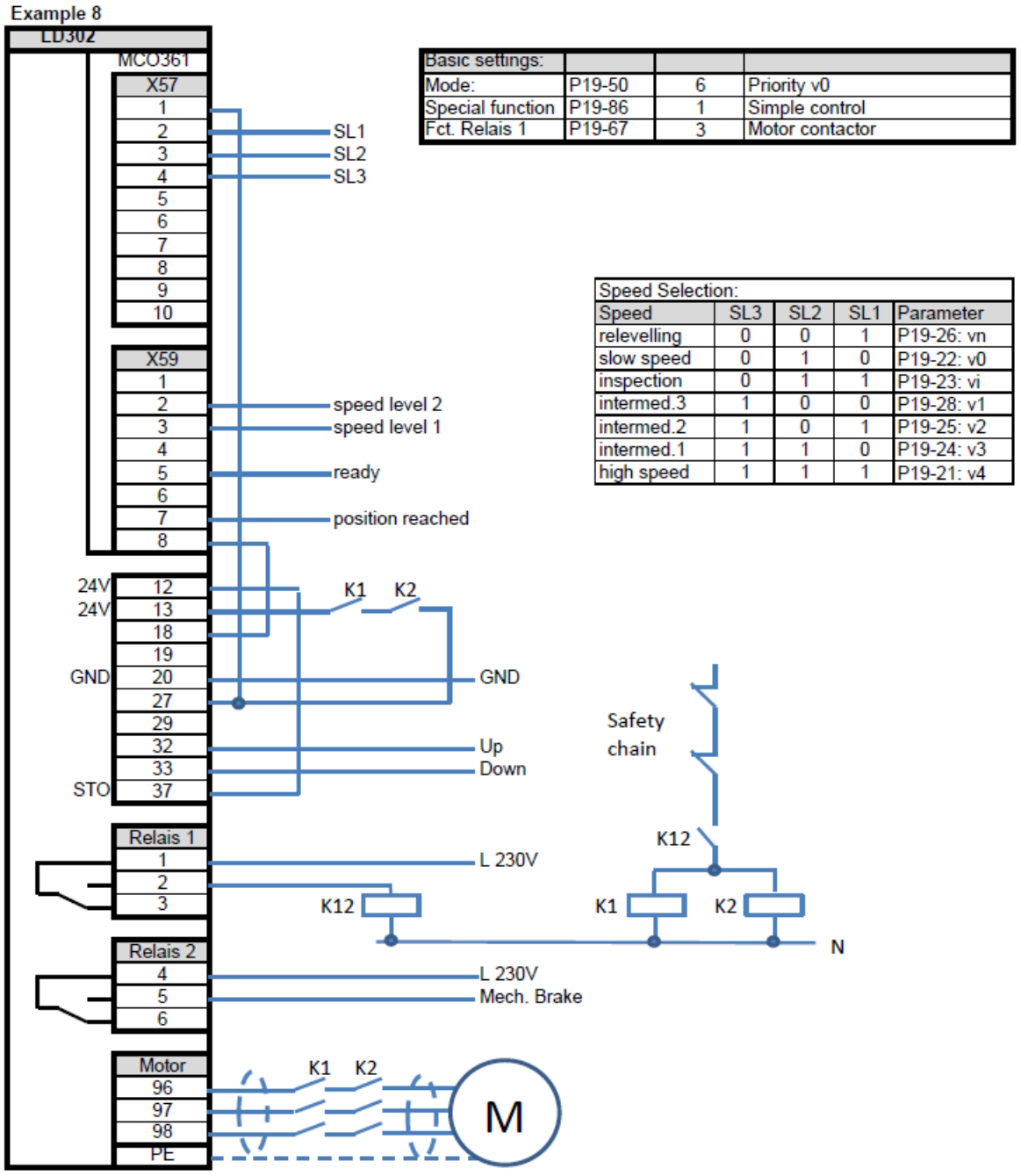


Basic settings:			
Mode:	P19-50	4	Priority v0
Special function	P19-86	1	Simple control
Fct. Relais 1	P19-67	3	Motor contactor

Speed Selection:				
Speed	SL3	SL2	SL1	Parameter
slow speed	0	0	1	P19-22: v0
inspection	0	1	0	P19-23: vi
intermed.1	1	0	0	P19-24: v3
relevelling	1	0	1	P19-26: vn
intermed.2	1	1	0	P19-25: v2
high speed	0	1	1	P19-21: v4

Mode 6, binary 2

Example 8: Mode 6, Binary speed selection 2, direction priority up	
Configuration:	Motor contactors controlled by drive
Speeds: 7	Slow speed, inspection, relevelling, intermed.3, intermed.2, intermed.1, high speed
Start Signal:	Start with direction signal

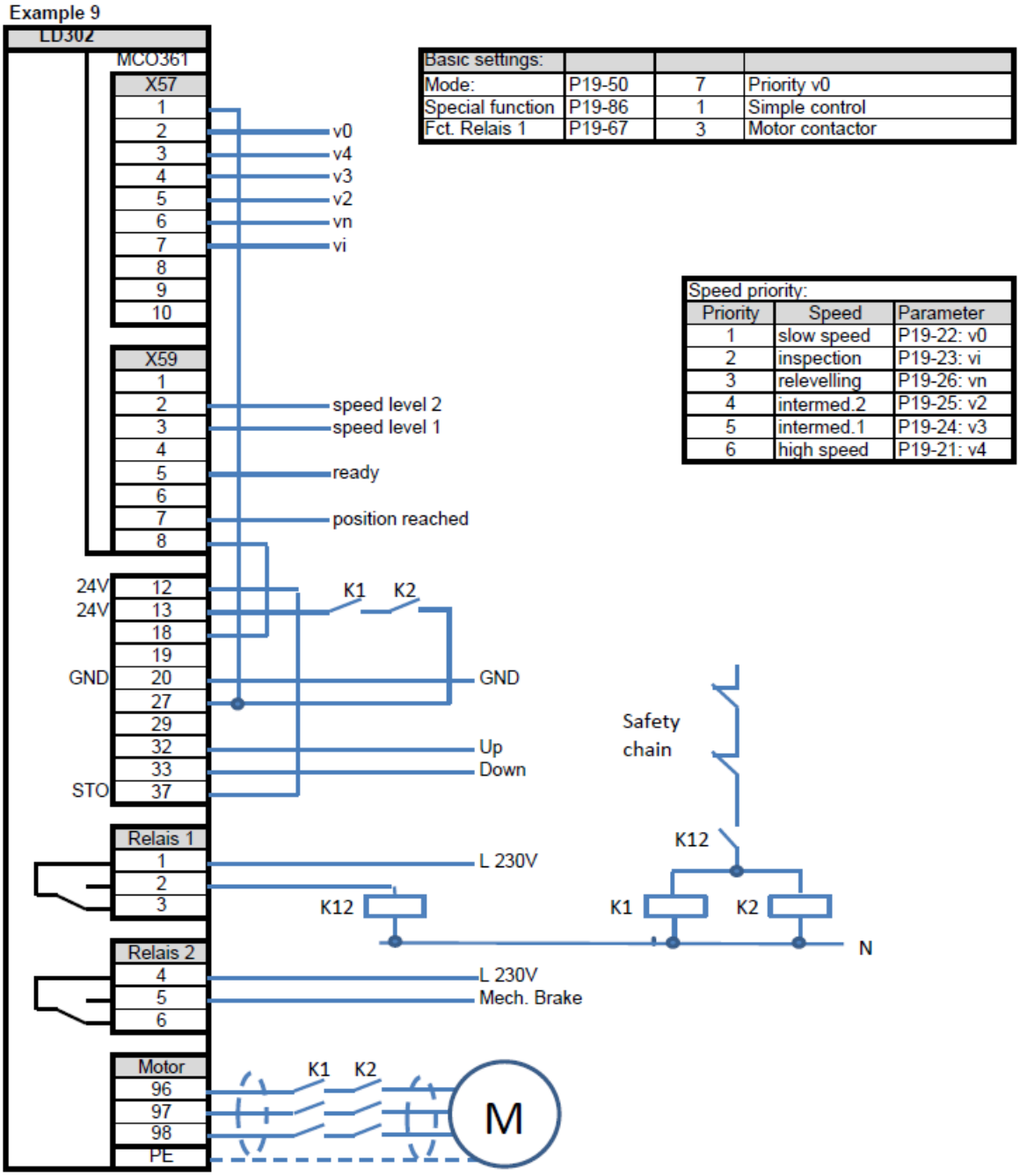


Basic settings:			
Mode:	P19-50	6	Priority v0
Special function	P19-86	1	Simple control
Fct. Relais 1	P19-67	3	Motor contactor

Speed Selection:				
Speed	SL3	SL2	SL1	Parameter
relevelling	0	0	1	P19-26: vn
slow speed	0	1	0	P19-22: v0
inspection	0	1	1	P19-23: vi
intermed.3	1	0	0	P19-28: v1
intermed.2	1	0	1	P19-25: v2
intermed.1	1	1	0	P19-24: v3
high speed	1	1	1	P19-21: v4

Mode 7, digital, low speed priority, direction priority down

Example 9: Mode 7, Digital speed selection, low speed priority, direction priority down	
Configuration:	Motor contactors controlled by drive
Speeds: 6	Priority: slow speed, inspection, relevelling, intermed.2, intermed.1, high speed
Start Signal:	Start with direction signal

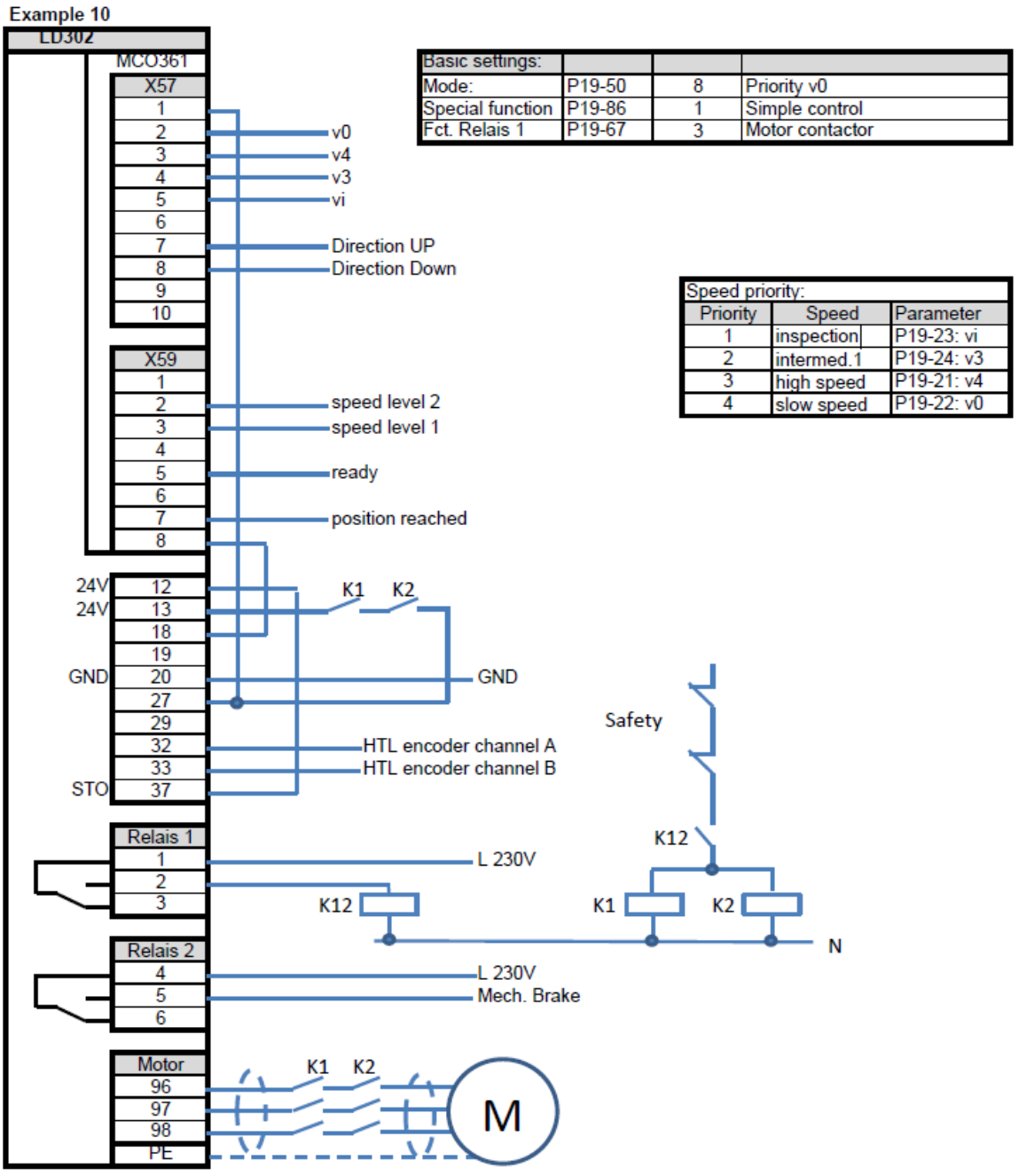


Basic settings:			
Mode:	P19-50	7	Priority v0
Special function	P19-86	1	Simple control
Fct. Relais 1	P19-67	3	Motor contactor

Speed priority:		
Priority	Speed	Parameter
1	slow speed	P19-22: v0
2	inspection	P19-23: vi
3	relevelling	P19-26: vn
4	intermed.2	P19-25: v2
5	intermed.1	P19-24: v3
6	high speed	P19-21: v4

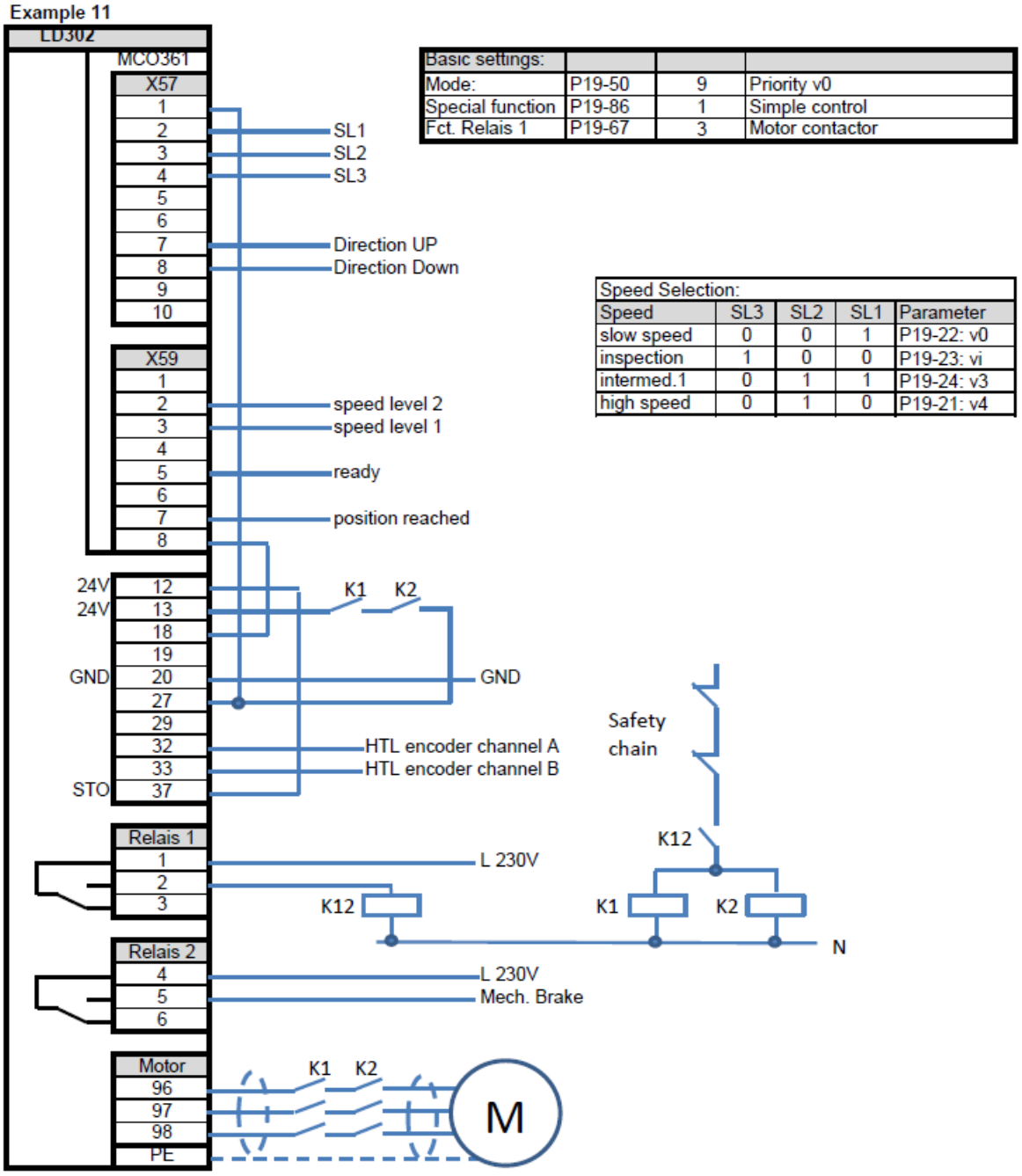
Mode 8, HTL-encoder, digital 1, direction priority up

Example 10: Mode 8, HTL-encoder, digital speed selection 1, direction priority up	
Configuration:	Motor contactors controlled by drive
Speeds: 4	Slow speed, inspection, intermed 1, high speed
Start Signal:	Start with direction signal



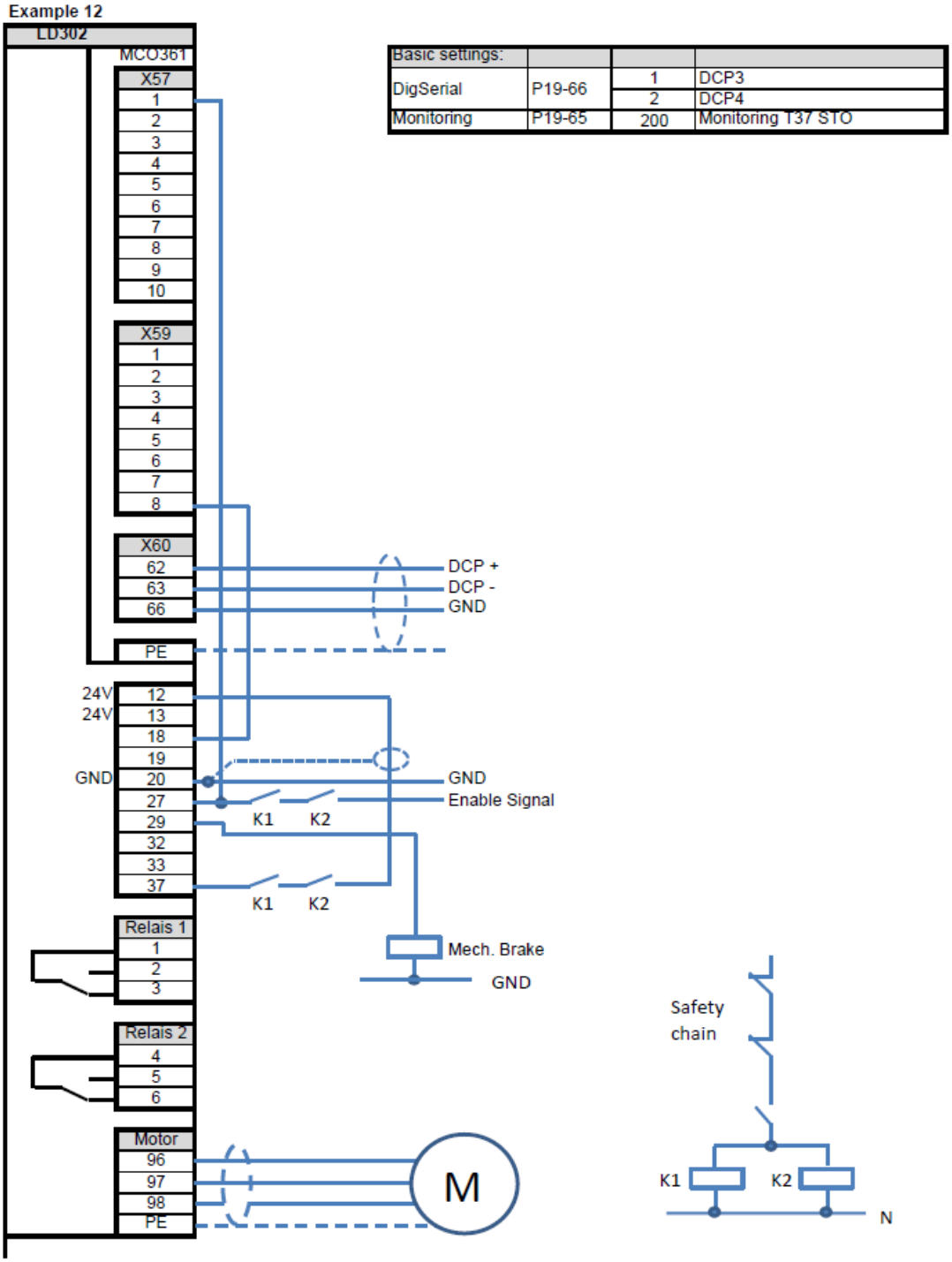
9.1.1.1.1.1 Mode 9, HTL-encoder, binary

Example 11: Mode 9, HTL-encoder, Binary speed selection, direction priority up	
Configuration:	Motor contactors controlled by drive
Speeds: 4	Slow speed, inspection, intermed 1, high speed
Start Signal:	Start with direction signal



Bus controlled /DCP3/DCP4

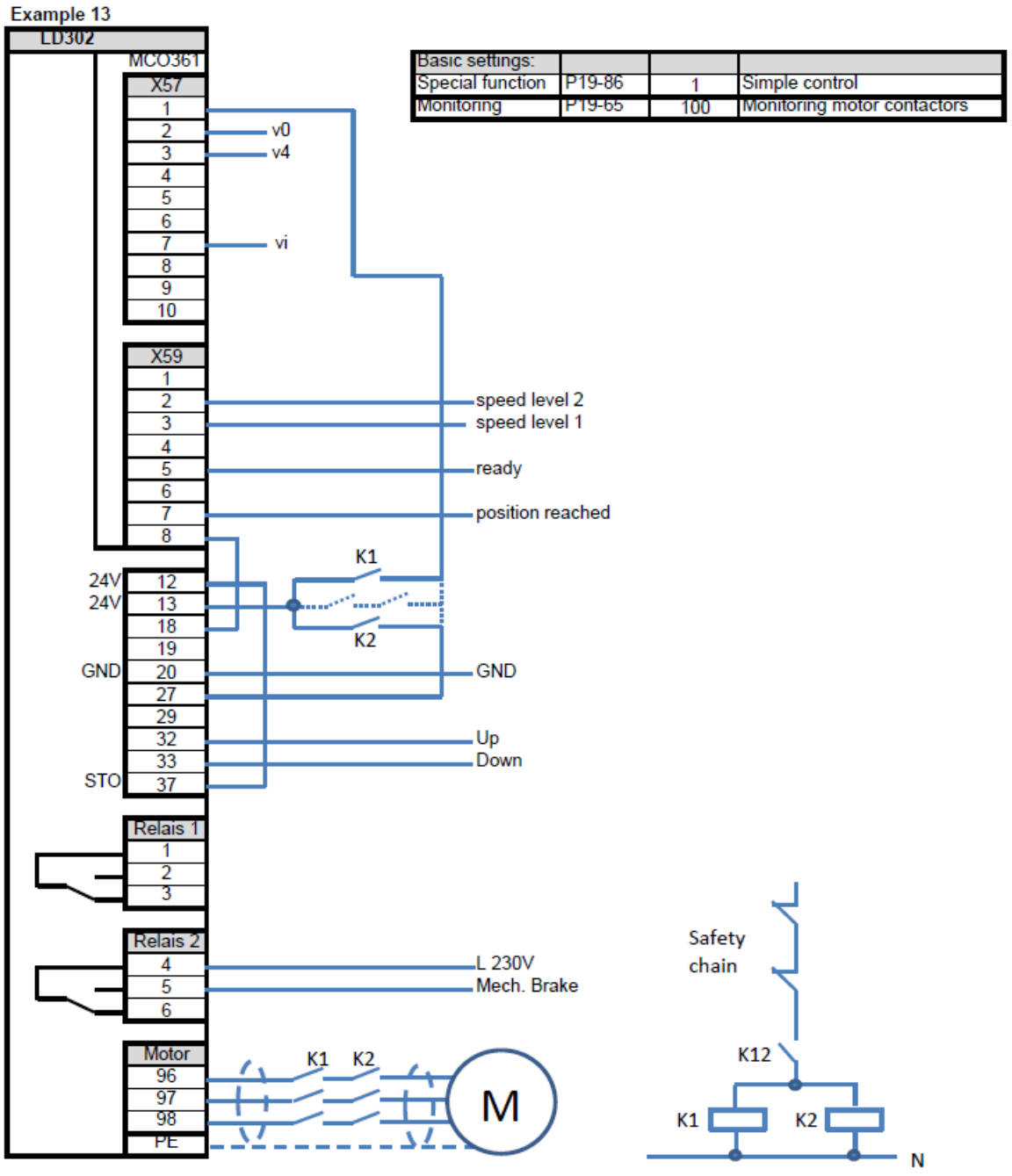
Example 12: Bus controlled /DCP3/DCP4	
Configuration:	Without motor contactors
Start Signal:	Bus controlled, Hardware enable signal from lift controller



Basic settings:			
DigSerial	P19-66	1	DCP3
		2	DCP4
Monitoring	P19-65	200	Monitoring T37 STO

Monitoring of motor contactors

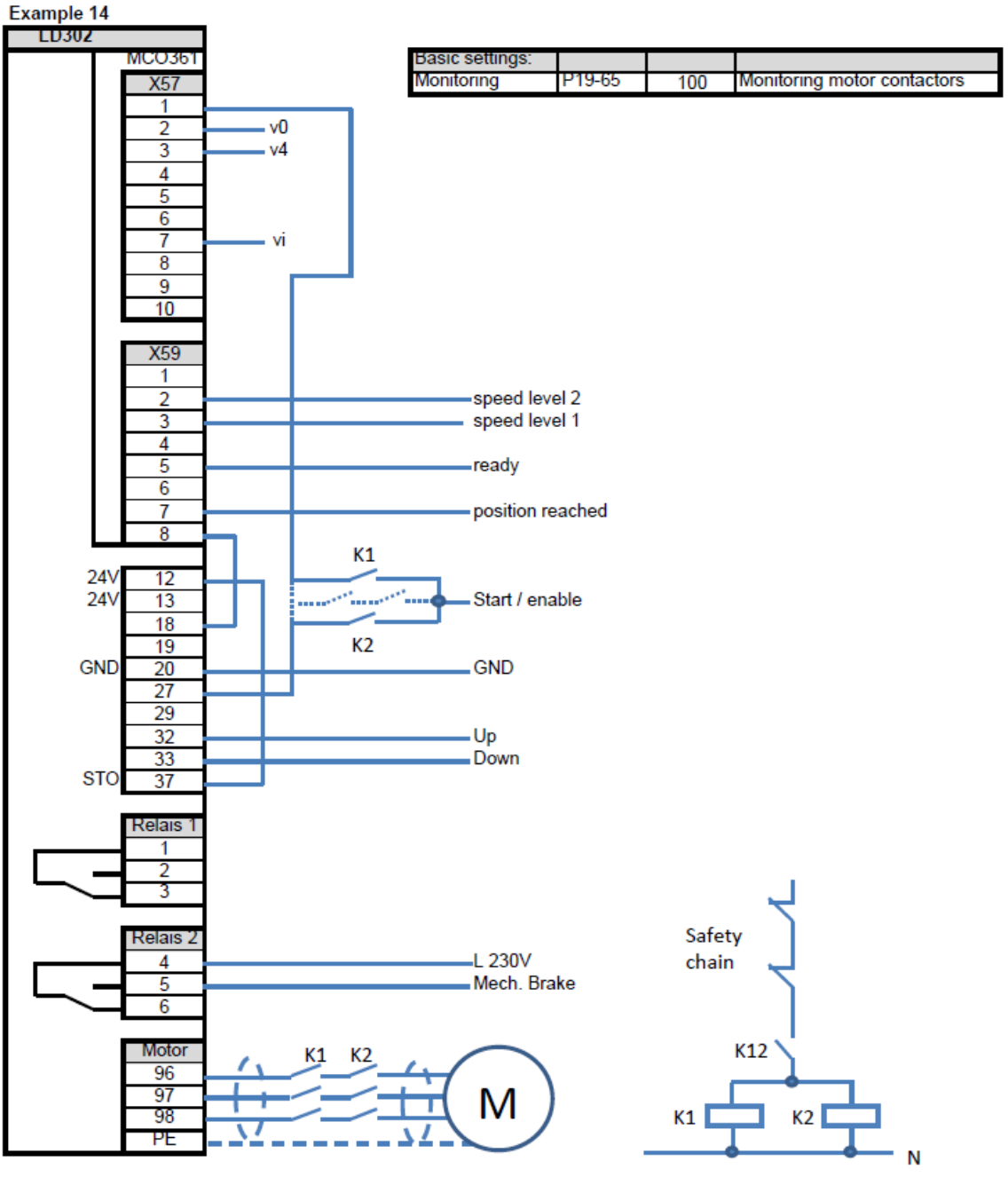
Example 13: Monitoring of motor contactors	
Configuration:	Start with direction signal



Basic settings:			
Special function	P19-86	1	Simple control
Monitoring	P19-65	100	Monitoring motor contactors

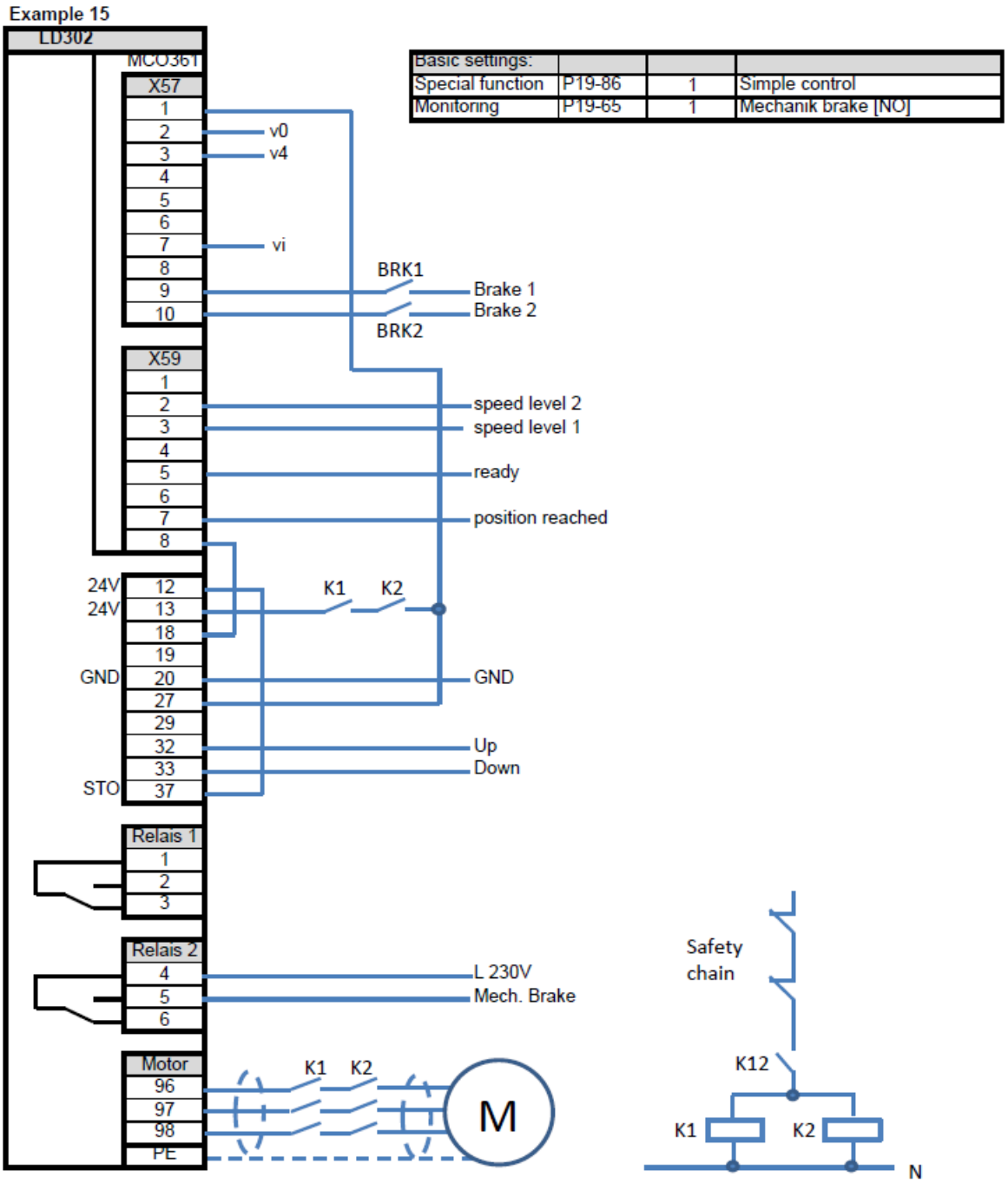
Monitoring of motor contactors

Example 14: Monitoring of motor contactors	
Configuration:	Start with enable signal



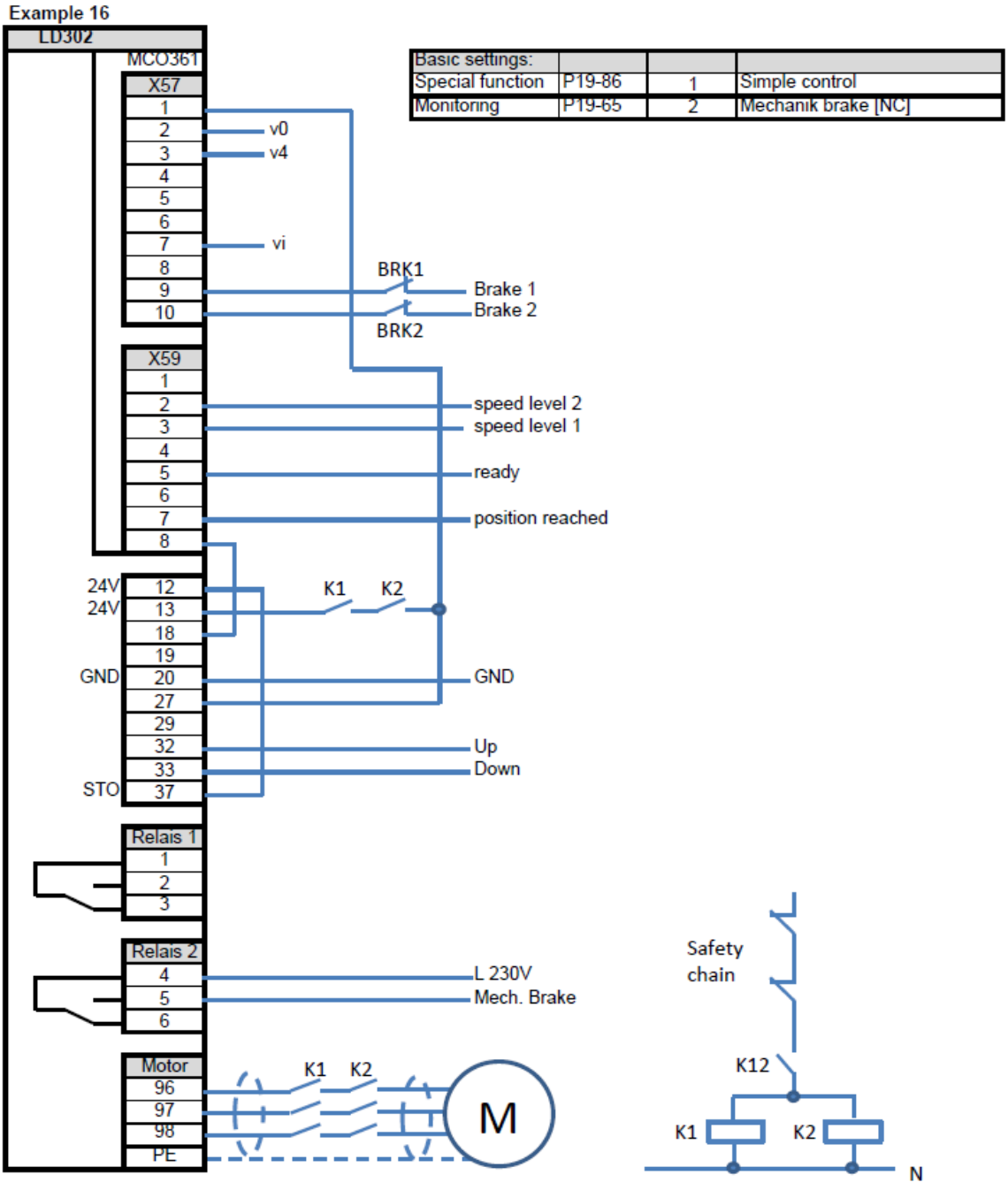
Monitoring brake feedback 1, normal open contacts

Example 15: Monitoring of brake feedback 1, normal open contacts	
Configuration:	Start with direction signal



Monitoring brake feedback 2, normal closed contacts

Example 16: Monitoring of brake feedback 2, normal closed contacts	
Configuration:	Start with direction signal



Basic settings:			
Special function	P19-86	1	Simple control
Monitoring	P19-65	2	Mechanik brake [NC]

Start and Stop Sequences

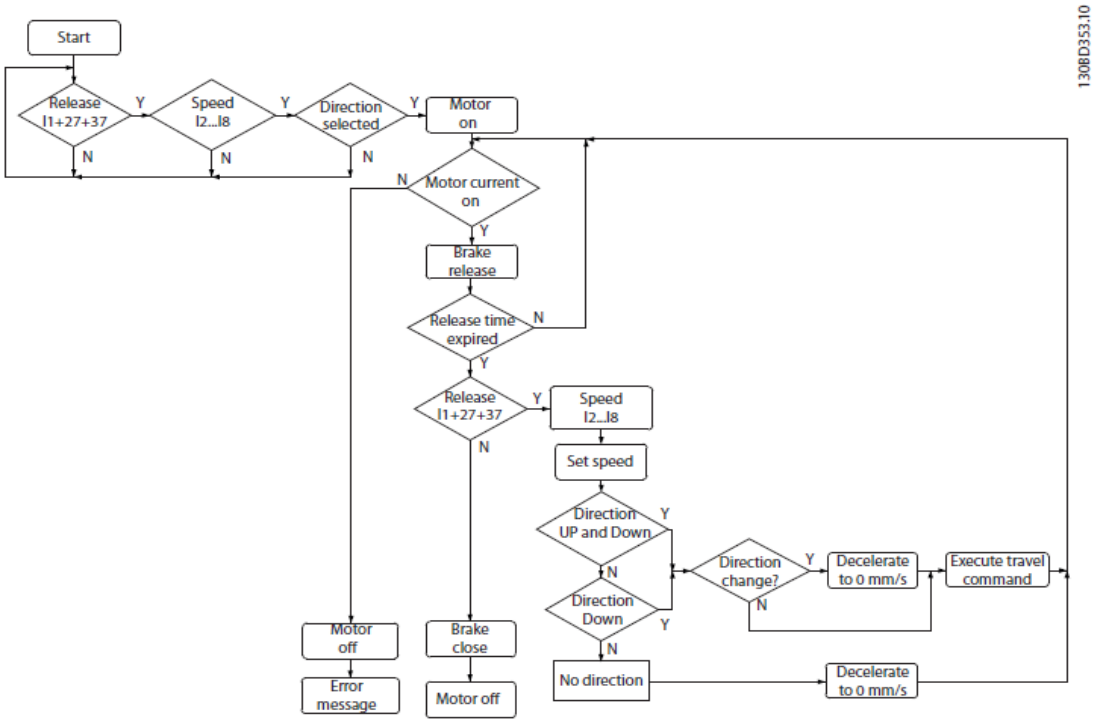


Illustration 4.1 Lift Control Start Sequence in operating mode

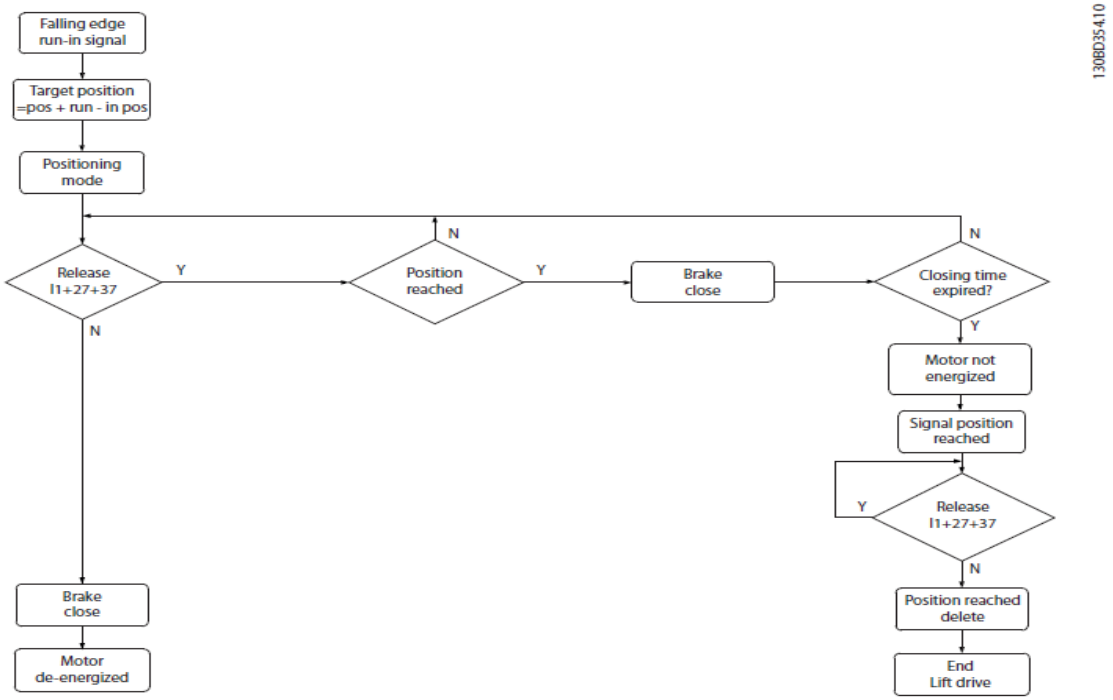


Illustration 4.2 Lift Control Stop Sequence in operating mode

Drive Motor Database

Select t a ASM or PM motor type and enter the Motor number in Parameter 19-01. The motor number is the number after the letter M of the motor type code. Example: For the motor type M**16**-VAF160M/4B-21, enter the motor number 16 in Parameter 19-01. Parameter 19-01=16.

ASM Motor- Type							
	Parameter- No., Description and Motor- Data						
	1-20	1-22	1-23	1-24	1-25	1-30	1-31
VAF= OMS Motor	Motor Power [W]	Motor Voltage [V]	Motor Frequency [Hz]	Motor Current [A]	Motor nominal Speed [RPM]	Stator Resistance (Rs) [Ohm]	Rotor Resistance (Rr) [Ohm]
M1-VAF112M/4A-11H	420	400	60	840	1725	12610	8810
M2-VAF112L/4L-11LH	550	400	60	1100	1725	9740	7080
M4-VAF132M/4D-21LH	1100	400	60	2200	1730	3950	3310
M5-VAF160M/4B-21H	1500	400	70	2800	2065	2210	1160
M6-VAF160L/4F-21H	2000	400	70	3600	2070	1440	830
M7-VAF112L/4L-11LH	380	400	40	810	1120	20610	14980
M9-VAF132M/4D-11H	750	400	40	1530	1130	8770	7250
M10-VAF112L/4C-11SH	750	400	60	1450	1730	8190	4850
M11-VAF160L/4F-21LH	1700	400	60	3100	1765	2060	1200
M12-VAF160L/4F-21LH	1200	400	40	2200	1170	4260	2500
M13-VAF132M/4D-11LH	1500	400	87	2900	2550	1950	1640
M14-VAF132M/4D-21LH	1100	400	60	2200	1730	3950	3310
M15-VAF112L/4C-11SH	870	400	70	1700	2030	5730	3370
M16-VAF160M/4B-21	1860	400	87	3400	2580	1420	740
M18-VAF160M/4E-21H	1500	400	60	2700	1760	2490	1350
M20-VAF160L/4D-21LH	1450	400	40	2650	1170	3360	2080
M21-VAF160L/4D-21LH	2050	400	60	3700	1765	1610	960
M22-VAFU132M/4D-21LH	550	400	50	1100	1450	6090	5240
M23-VAFU132M/4D-21LH	750	400	50	1450	1440	6090	5240
M24-VAF132M/4C-21H	900	400	60	1800	1740	5110	4080
M25-VAFU132S/4B-21H	770	350	70	1660	2040	4550	3650
M27-VAF160L/4D-21LH	3000	400	87	5600	2580	700	430
M28-VAFU132M/4D-21LH	500	400	33	1000	930	13390	11340
M29-VAFU132S/4E-11SH	750	400	60	1450	1745	5480	4390
M30-VAF160C/4D-21H	1300	380	50	2570	1465	2610	149
M31-VAF180L/4D-21LH	2630	400	50	4800	1475	940	560
M32-VAF200L/4E-21LH	3600	400	60	6500	1775	610	380
M33-VAF160L/4C-21H	1700	380	50	3400	1470	1740	1000
M34-VAF160L/4F-21H	1400	380	50	2700	1465	2360	1340
M35-VAF180L/4B-21H	2050	400	50	3800	1475	1510	780

Classified as Business

PM Motor- Type							
	Parameter- No., Description and Motor- Data						
	1-24	1-25	1-26	1-30	1-37	1-39	1-40
ZA=Ziehl ABEGG Motor	Motor Current [A]	Motor nominal Speed [RPM]	Motor Cont. Rated Torque [Nm]	Stator Resistance (Rs) [Ohm]	Induktion d-Achse (Ld) [mH]	Motor Poles	Back EMF at 1000 RPM [V]
M37-Te-Stand	1600	150	4430	13800	72	24	1810
M38-GLAT	2250	180	3300	6000	43	40	1105
M39-ZA-160.20-3,3kW-240rpm	830	240	1300	33600	167	20	908
M40-ZA-160.20-5,2kW-384rpm	1220	384	1300	15800	76	20	626
M41-ZA-160.30-2,8kW-192rpm	1050	192	1950	29800	167	20	1126
M42-ZA-160.30-3,5kW-240rpm	1300	240	1950	20700	116	20	937
M43-ZA-160.30-4,4kW-300rpm	1600	300	1950	13900	78	20	796
M44-ZA-160.30-5,6kW-384rpm	1950	384	1950	9100	51	20	626
M45-ZA-160.40A-5,2kW-192rpm	1400	192	2600	22100	133	20	1162
M46-ZA-160.40A-6,5kW-240rpm	1650	240	2600	15600	93	20	973
M47-ZA-160.40A-8,2kW-300rpm	2000	300	2600	10500	64	20	807
M48-ZA-160.40A-10,5kW-384rpm	2500	384	2600	6700	40	20	640
M49-ZA-200.15C-20-2,5kW-96rpm	900	96	2500	62200	371	20	1766
M50-ZA-200.15C-20-4,4kW-168rpm	1350	168	2500	27600	164	20	1267
M51-ZA-200.15C-20-4,3kW-186rpm	1150	186	2200	27000	168	20	1060
M52-ZA-200.15C-20-5kW-192rpm	1500	192	2500	22900	133	20	1063
M53-ZA-200.15C-20-6,8kW-258rpm	1900	258	2500	13700	81	20	818
M54-ZA-200.15C-20-7,9kW-300rpm	2050	300	2500	11300	66	20	744
M55-ZA-200.20C-20-3,3kW-96rpm	1100	96	3300	46600	308	20	1874
M56-ZA-200.20C-20-4,1kW-120rpm	1280	120	3300	34600	227	20	1629
M57-ZA-200.20C-20-5,8kW-168rpm	1650	168	3300	20800	137	20	1256
M58-ZA-200.20C-20-6,6kW-192rpm	1900	192	3300	15800	105	20	1099
M59-ZA-200.20C-20-8,9kW-258rpm	2500	258	3300	9200	61	20	831
M60-ZA-200.20C-20-10,4kW-300rpm	2850	300	3300	7100	47	20	732
M61-ZA-200.30C-20-4,8kW-96rpm	1450	96	4750	30900	234	20	2054
M62-ZA-200.30C-20-6kW-120rpm	1700	120	4750	22500	17	20	1730
M63-ZA-200.30C-20-6,7kW-168rpm	1700	168	3800	15800	122	20	1318
M64-ZA-200.30C-20-8,4kW-168rpm	2200	168	4750	13500	101	20	1328
M65-ZA-200.30C-20-9,6kW-192rpm	2450	192	4750	10500	79	20	1180
M66-ZA-200.30C-20-12,8kW-258rpm	3100	258	4750	6700	51	20	945
M67-ZA-200.30C-20-14,1kW-300rpm	3500	300	4500	4610	35	20	784
M68-ZA-200.40C-20-6kW-96rpm	1750	96	6000	22100	184	20	2108
M69-ZA-200.40C-20-7,5kW-120pm	2100	120	6000	16300	134	20	1788
M70-ZA-200.40C-20-10,6kW-168rpm	2700	168	6000	9400	79	20	1359
M71-ZA-200.40C-20-12,1kW-192rpm	3200	192	6000	6700	56	20	1153

M72-ZA-200.40C-20-16,2kW-258rpm	3900	258	6000	4480	38	20	945
M73-ZA-200.40C-20-18,8kW-300rpm	4400	300	6000	3520	30	20	830
M74-ZA-225.30-20-3,2kW-60rpm	1100	60	5000	28600	289	20	2855
M75-ZA-225.30-20-5kW-96rpm	1550	96	5000	14300	147	20	1964
M76-ZA-225.30-20-6,3kW-120rpm	1750	120	5000	12000	119	20	1716
M77-ZA-225.30-20-8,2kW-156rpm	2300	156	5000	6600	66	20	1320
M78-ZA-225.30-20-10kW-192rpm	2500	192	5000	5400	55	20	1216
M79-ZA-225.40-20-4,5kW-60rpm	1600	60	7100	28600	289	20	2855
M80-ZA-225.40-20-7kW-96rpm	2250	96	7100	14300	147	20	1964
M81-ZA-225.40-20-8kW-108rpm	2250	108	7100	14300	149	20	1954
M82-ZA-225.40-20-9kW-120rpm	2500	120	7100	12000	90	20	1644
M83-ZA-225.40-20-11,3kW-156rpm	3350	156	7100	6600	66	20	1320
M84-ZA-225.40-20-12,5kW-168rpm	3350	168	7100	6600	66	20	1318
M85-ZA-225.40-20-13kW-192rpm	3300	192	6500	5390	55	20	1216
M86-ZA-225.60B-20-7kW-60rpm	2300	60	11200	19200	220	20	2999
M87-ZA-225.60B-20-11kW-96rpm	3500	96	11200	8600	98	20	1982
M88-ZA-225.60B-20-12,5kW-108rpm	3500	108	11200	8600	98	20	1986
M89-ZA-225.60B-20-14kW-120rpm	4200	120	11200	5630	67	20	1629
M90-ZA-225.60B-20-18kW-156rpm	5350	156	11200	3700	43	20	1309
M91-ZA-225.60B-20-20kW-168rpm	5350	168	11200	3700	43	20	1308
M92-ZA-225.60B-20-20kW-192rpm	5350	192	10000	2900	33	20	1144
M93-ZA-225.60B-20-25kW-240rpm	6500	240	10000	2140	24	20	973
M94-ZA-225.60B-20-31,5kW-336rpm	7000	336	9000	1470	17	20	819
M95-ZA-250.60B-20-10kW-60rpm	3000	60	16000	13600	209	20	3258
M96-ZA-250.60B-20-16kW-96rpm	4300	96	16000	6450	99	20	2235
M97-ZA-250.60B-20-20kW-120rpm	5250	120	16000	4310	66	20	1831
M98-ZA-250.60B-20-26kW-156rpm	6800	156	16000	2630	40	20	1419
M99-ZA-250.60B-20-32kW-192rpm	8000	192	16000	1930	29	20	1216
M100-ZA-250.60B-20-38kW-240rpm	9200	240	15000	1320	20	20	1009
M101-ZA-250.60B-20-37kW-252rpm	8500	252	14000	1320	20	20	1009
M102-ZA-250.60B-20-42kW-336rpm	9400	336	12000	860	13	20	819
M103-ZA-250.80C-20-19kW-84rpm	5800	84	21000	5330	84	20	2286
M104-ZA-250.80C-20-25kW-114rpm	7000	114	21000	3250	51	20	1776
M105-ZA-250.80C-20-30kW-138rpm	8000	138	21000	2390	37	20	1529
M106-ZA-250.80C-20-27kW-156rpm	6400	156	16500	2390	37	20	1519
M107-ZA-250.80C-20-33kW-192rpm	8100	192	16500	1640	24	20	1270
M108-ZA-250.80C-20-42kW-240rpm	10200	240	16500	1060	17	20	1009
M109-ZA-250.80C-20-54kW-312rpm	13700	312	16500	600	9	20	771
M110-ZA-250.100C-20-22kW-78rpm	6200	78	26500	5030	83	20	2551
M111-ZA-250.100C-20-30kW-108rpm	8200	108	26500	2850	47	20	1906
M112-ZA-250.100C-20-37kW-132rpm	9800	132	26500	1960	32	20	1586

M113-ZA-250.100C-20-33kW-150rpm	7700	150	21000	1960	33	20	1592
M114-ZA-250.100C-20-42kW-192rpm	9800	192	21000	1270	21	20	1270
M115-ZA-250.100C-20-58kW-264rpm	13900	264	21000	710	12	20	963
M116-ZA-250.100C-20-69kW-312rpm	16700	312	21000	500	8	20	793

Messages

Lift application message	Description
Act. Inspection mode!	Activate inspection mode for operation
AMA active	AMA, Automatic Motor Adaption active
Auto on!!	VLT not in automatic mode
Counter expired!!!	Direction change counter expired
Counter low	Direction change counter low / Call Service
Operating Mode	Lift Drive ready for operation
Set Parameter	internal parameter calculation and adjustment
MCO Track Error	monitor Tracking error
MCO Encoder Error	Encoder- fault, - short circuit, - wire breakage
No motor data!!	motor data not assigned
Overspeed	Shutdown due overspeed
Overtemp Heatsink	Overtemperature on heatsink
Overtemp Motor	Overtemperature on motor
Abs. encoder-test	Drive is in absolute encoder test-mode
Encoder Error SSI	SSI-encoder fault
Encoder Error ENDAT	EnDat encoder fault
Please wait	Wait until drive is ready

Warnings and Alarms

Warnings and Alarms in P 19-81

Warnings and Alarms			
P19-81			
No.	Warnings/Alarms of control card	Error type	Description
4	Mains phase loss	TRIP	A phase is missing on the supply side, or the mains voltage imbalance is too high. This message also appears for a fault in the input rectifier on the frequency converter. Options are programmed at 14-12 Function at Mains Imbalance. Troubleshooting Check the supply voltage and supply currents to the frequency converter.
7	DC overvoltage	TRIP	If the intermediate circuit voltage exceeds the limit, the frequency converter trips after a time.

			Troubleshooting Connect a brake resistor Extend the ramp time Change the ramp type Activate the functions in 2-10 Brake Function Increase 14-26 Trip Delay at Inverter Fault If the alarm/warning occurs during a power sag, use kinetic back-up (14-10 Mains Failure)
8	DC under voltage	TRIP	If the intermediate circuit voltage (DC link) drops below the under-voltage limit, the frequency converter checks if a 24 V DC back-up supply is connected. If no 24 V DC backup supply is connected, the frequency converter trips after a fixed time delay. The time delay varies with unit size. Troubleshooting Check that the supply voltage matches the frequency converter voltage. Perform input voltage test. Perform soft charge circuit test.
9	Inverter overload	TRIP	The frequency converter is about to cut out because of an overload (too high current for too long). The counter for electronic, thermal inverter protection issues a warning at 98% and trips at 100%, while giving an alarm. The frequency converter cannot be reset until the counter is below 90%. The fault is that the frequency converter has run with more than 100% overload for too long. Troubleshooting Compare the output current shown on the LCP with the frequency converter rated current. Compare the output current shown on the LCP with measured motor current. Display the Thermal Drive Load on the LCP and monitor the value. When running above the frequency converter continuous current rating, the counter increases. When running below the frequency converter continuous current rating, the counter decreases.
12	Torque limit	TRIP	The torque has exceeded the value in 4-16 Torque Limit Motor Mode or the value in 4-17 Torque Limit Generator Mode. 14-25 Trip Delay at Torque Limit can change this warning from a warning-only condition to a warning followed by an alarm. Troubleshooting If the motor torque limit is exceeded during ramp up, extend the ramp up time. If the generator torque limit is exceeded during ramp down, extend the ramp down time. If torque limit occurs while running, possibly increase the torque limit. Make sure that the system can operate safely at a higher torque.

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			Check the application for excessive current draw on the motor.
13	Overcurrent	TRIP	The inverter peak current limit (approximately 200% of the rated current) is exceeded. The warning lasts about 1.5 s, then the frequency converter trips and issues an alarm. Shock loading or quick acceleration with high inertia loads can cause this fault. It can also appear after kinetic backup, if the acceleration during ramp up is quick. If extended mechanical brake control is selected, trip can be reset externally. Troubleshooting Remove power and check if the motor shaft can be turned. Check that the motor size matches the frequency converter. Check parameters 1-20 to 1-25 for correct motor data.
14	Earth fault	TRIP	There is current from the output phases to earth, either in the cable between the frequency converter and the motor or in the motor itself. Troubleshooting Remove power to the frequency converter and repair the earth fault. Check for earth faults in the motor by measuring the resistance to earth of the motor leads and the motor with a megohmmeter. Perform current sensor test.
16	Short circuit	TRIP	There is short-circuiting in the motor or motor wiring. Remove power to the frequency converter and repair the short circuit.
17	Control word timeout	TRIP	There is no communication to the frequency converter. The warning is only active when parameter 8-04 Control Word Timeout Function is NOT set to [0] Off. If parameter 8-04 Control Word Timeout Function is set to [5] Stop and Trip, a warning appears and the frequency converter ramps down until it stops, and then it displays an alarm. Troubleshooting • Check the connections on the serial communication cable. • Increase parameter 8-03 Control Word Timeout Time. • Check the operation of the communication equipment. • Verify a proper installation based on EMC requirements.
25	Brake resistor short circuit	TRIP	The brake resistor is monitored during operation. If a short circuit occurs, the brake function is

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			disabled and the warning appears. The frequency converter is still operational, but without the brake function. Troubleshooting • Remove the power to the frequency converter and replace the brake resistor (see parameter 2-15 Brake Check).
26	Brake resistor power limit	TRIP	The power transmitted to the brake resistor is calculated as a mean value over the last 120 s of run time. The calculation is based on the intermediate circuit voltage and the brake resistance value set in 2-16 AC brake Max. Current. The warning is active when the dissipated braking is higher than 90% of the brake resistance power. If [2] Trip is selected in 2-13 Brake Power Monitoring, the frequency converter trips when the dissipated braking power reaches 100%. WARNING If the brake transistor is short-circuited there is a risk of substantial power being transmitted to the brake resistor.
27	Brake chopper fault	TRIP	The brake transistor is monitored during operation and if a short circuit occurs, the brake function is disabled and a warning is issued. The frequency converter is still operational but, since the brake transistor has short circuited, substantial power is transmitted to the brake resistor, even if it is inactive. Remove power to the frequency converter and remove the brake resistor. This alarm/warning could also occur, if the brake resistor overheats. Terminals 104 and 106 are available as brake resistors Klixon inputs, see section Brake Resistor Temperature Switch in the Design Guide.
30	Motor phase U missing	TRIP	Motor phase U between the frequency converter and the motor is missing. Remove power from the frequency converter and check motor phase U.
31	Motor phase V missing	TRIP	Motor phase V between the frequency converter and the motor is missing. Remove power from the frequency converter and check motor phase V.
32	Motor phase W missing	TRIP	Motor phase W between the frequency converter and the motor is missing. Remove power from the frequency converter and check motor phase W.
33	Inrush fault	TRIP	Too many power-ups have occurred within a short time period. Let the unit cool to operating temperature. WARNING/ALARM 36, Mains failure This warning/alarm is only active if the supply

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			voltage to the frequency converter is lost and 14-10 Mains Failure is NOT set to [0] No Function. Check the fuses to the frequency converter and mains supply to the unit.
47	24V supply low	TRIP	The 24 V DC is measured on the control card. The external 24 V DC back-up power supply may be overloaded, otherwise contact the Danfoss supplier.
48	1,8V supply low	TRIP	The 1.8 V DC supply used on the control card is outside of allowable limits. The power supply is measured on the control card. Check for a defective control card. If an option card is present, check for an overvoltage condition.
63	Mechanic brake low	TRIP	The actual motor current has not exceeded the release brake current within the start delay time window.
67	Option module has changed	TRIP	One or more options have either been added or removed since the last power-down. Check that the configuration change is intentional and reset the unit. ALARM 68, Safe Stop activated Safe Torque Off has been activated. To resume normal operation, apply 24 V DC to terminal 37, then send a reset signal (via Bus, Digital I/O, or by pressing [Reset].
	Alarms of motion control card	Error type	Description
108	Track error	TRIP	tracking limit P19-48 exceeded
150	No external 24 Volt		External 24 V supply is missing, There is no external 24V mains for digital Input available (or the Voltage is to low?). Activate external mains in Parameter 33-85.
154	Digital Output overloaded		digital output on X59 overloaded
188	CAN-BUS Fault	TRIP	CAN communication timeout
192	Encoder error	TRIP	Short cut or wire break of encoder signals on X55
	Alarms of lift application	Error type	Description
207	Over speed	TRIP	Overspeed
208	Start error	TRIP	tracking distance limit P19-47 at start exceeded
216	Brake failure	TRIP	Drive signal for releasing the brake is missing or motor current too low
217	Brake failure 1	TRIP LOCK	Brake feedback signal not applied before releasing the brake
218	Brake failure 2	TRIP LOCK	Brake feedback signal not released before closing the brake
219	Brake failure 3	TRIP LOCK	Brake feedback signal not applied after closing the brake
220	Brake IGBT	TRIP	Brake IGBT defect or short circuit at the brake resistor
221	Serial bus fault	MESSAGE	Bus fault

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225	DCP4 position deviation	TRIP	Position deviation between distance at motor feedback and cabin (absolute encoder) exceeded. Check parametrization of Lift drive / Lift controller
226	Fan Fault	TRIP	Fault of drive internal fan.
230	Directions signal mismatch	TRIP	Direction signals for positive and negative direction at start
236	Overtemperature motor	TRIP	Overtemperature of motor
237	Overtemperature drive	TRIP	Overtemperature of drive
238	V=0 Stop	MESSAGE	Quick- Stop
239	Timeout STO T37	TRIP	Signal on T37 is missing >10 seconds after start signal
240	Timeout Quick- Start	TRIP	Speed signal is missing >5 seconds after quick start
241	Positioning not completed	MESSAGE	Time for positioning to floor level of 2 seconds exceeded
242	Direction change counter low	MESSAGE	Warning limit of direction change counter exceeded
243	Direction change counter expired	TRIP	Direction change counter exceeded, speed reduced to v0 and vi
246	Encoder error SSI	TRIP	Encoder error SSI-absolute encoder
247	Encoder error EnDat	TRIP	Encoder error EnDat absolute encoder
248	Missing Speed/Dir	MESSAGE	Speed or direction signal missing longer than 2 seconds during movement
249	Governor failure	TRIP LOCK	Monitoring of feedback contact of speed governor
250	Encoder error BISS	TRIP	Encoder error BISS absolute encoder
251	CO1 T27 off	TRIP	Contactor monitoring signal timeout at start. Signal on T27 is missing >10 seconds after start signal
252	CO2 X57.1 off/ Contactor monitoring signal timeout at start	TRIP	Signal on X57.1 is missing >10 seconds after start signal
253	CO1 T27 on/ Contactor monitoring signal not switched to LOW state after travel	TRIP LOCK	Signal on T27 not changed to LOW before start
254	CO2 X57.1 on/ Contactor monitoring signal not switched to LOW state after travel	TRIP LOCK	Signal on X57.1 not changed to LOW before start
255	CO1T27 Stop	MESSAGE	Movement interrupted with T27
256	CO2X57.1	MESSAGE	Stop Movement interrupted with X57.1
257	STOT37 Stop	MESSAGE	Movement interrupted with T37
258	Bus Stop	MESSAGE	Movement interrupted with Bus-signal
259	T37 on	TRIP LOCK	STO Signal on T37 not changed to LOW before start
305	VLT-Alarm of control card. See alarm log of control card	TRIP	VLT-Alarm of control card. See alarm log of control card

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Further Warnings and Alarms

WARNING 1, 10 Volts low
The control card voltage is below 10 V from terminal 50. Remove some of the load from terminal 50, as the 10 V supply is overloaded. Max. 15 mA or minimum 590 Ω. A short circuit in a connected potentiometer or improper wiring of the potentiometer can cause this condition.

Troubleshooting
Remove the wiring from terminal 50. If the warning clears, the problem is with the wiring. If the warning does not clear, replace the control card.

WARNING/ALARM 2, Live zero error
This warning or alarm only appears if programmed in *6-01 Live Zero Timeout Function*. The signal on one of the analog inputs is less than 50% of the minimum value programmed for that input. Broken wiring or faulty device sending the signal can cause this condition.

Troubleshooting
Check connections on all the analog input terminals. Control card terminals 53 and 54 for signals, terminal 55 common. MCB 101 terminals 11 and 12 for signals, terminal 10 common. MCB 109 terminals 1, 3, 5 for signals, terminals 2, 4, 6 common). Check that the frequency converter programming and switch settings match the analog signal type. Perform Input Terminal Signal Test.

WARNING/ALARM 3, No motor
No motor has been connected to the output of the frequency converter.

WARNING 5, DC link voltage high
The intermediate circuit voltage (DC) is higher than the high-voltage warning limit. The limit is dependent on the frequency converter voltage rating. The unit is still active.

WARNING 6, DC link voltage low
The intermediate circuit voltage (DC) is lower than the low voltage warning limit. The limit is dependent on the frequency converter voltage rating. The unit is still active.

WARNING/ALARM 10, Motor overload temperature
According to the electronic thermal protection (ETR), the motor is too hot. Select whether the frequency converter issues a warning or an alarm when the counter reaches 100% in *1-90 Motor Thermal Protection*. The fault occurs when the motor runs with more than 100% overload for too long.

Troubleshooting
Check for motor overheating. Check if the motor is mechanically overloaded. Check that the motor current set in *1-24 Motor Current* is correct. Ensure that Motor data in parameters 1-20 to 1-25 are set correctly. If an external fan is in use, check in *1-91 Motor,* External Fan that it is selected. Running AMA in 1-29 Automatic Motor Adaptation *(AMA)* tunes the frequency converter to the motor more accurately and reduces thermal loading.

WARNING/ALARM 11, Motor thermistor over temp
The thermistor might be disconnected. Select whether the frequency converter issues a

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warning or an alarm in *1-90 Motor Thermal Protection*.

Troubleshooting
Check for motor overheating. Check if the motor is mechanically overloaded. Check that the thermistor is connected correctly between either terminal 53 or 54 (analog voltage input) and terminal 50 (+10 V supply). Also check that the terminal switch for 53 or 54 is set for voltage. Check that *1-93 Thermistor Source* selects terminal 53 or 54. When using digital inputs 18 or 19, check that the thermistor is connected correctly between either terminal 18 or 19 (digital input PNP only) and terminal 50. If a KTY Sensor is used, check for correct connection between terminals 54 and 55. If using a thermal switch or thermistor, check that the programming if *1-93 Thermistor Resource* matches sensor wiring. If using a KTY Sensor, check the programming of 1-95 KTY Sensor Type, 1-96 KTY Thermistor Resource and 1-97 KTY Threshold level match sensor wiring.

ALARM 15, Hardware mismatch
A fitted option is not operational with the present control board hardware or software.
Record the value of the following parameters and contact your Danfoss supplier:
15-40 FC Type
15-41 Power Section
15-42 Voltage
15-43 Software Version
15-45 Actual Typecode String
15-49 SW ID Control Card
15-50 SW ID Power Card
15-60 Option Mounted
15-61 Option SW Version (for each option slot)

WARNING/ALARM 22, Hoist mechanical brake
Report value shows what kind it is.
0 = The torque ref. was not reached before time-out.
1 = There was no brake feedback before time-out.

WARNING 23, Internal fan fault
The fan warning function is an extra protective function that checks if the fan is running/mounted. The fan warning can be disabled in *14-53 Fan Monitor ([0] Disabled)*.

Troubleshooting
Check fan resistance. Check soft charge fuses.

WARNING 24, External fan fault
The fan warning function is an extra protective function that checks if the fan is running/mounted. The fan warning can be disabled in *14-53 Fan Monitor ([0] Disabled)*.

Troubleshooting
Check fan resistance. Check soft charge fuses. WARNING 25, Brake resistor short circuit
The brake resistor is monitored during operation. If a short circuit occurs, the brake function is disabled and the warning appears. The frequency converter is still operational but without the brake function. Remove power to the frequency converter and replace the brake resistor (see *2-15 Brake Check*).

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WARNING/ALARM 28, Brake check failed
The brake resistor is not connected or not working.
Check *2-15 Brake Check*. ALARM 29, Heatsink temp. The maximum temperature of the heatsink has been exceeded. The temperature fault resets when the temperature falls below a defined heatsink temperature. The trip and reset points are different based on the frequency converter power size.

Troubleshooting
Check for the following conditions.

- Ambient temperature too high.
- Motor cable too long.
- Incorrect airflow clearance above and below the frequency converter.
- Blocked airflow around the frequency converter.
- Damaged heatsink fan.
- Dirty heatsink.

For the D, E, and F enclosures, this alarm is based on the temperature measured by the heat sink sensor mounted inside the IGBT modules. For the F enclosures, the thermal sensor in the rectifier module can also cause this alarm.

Troubleshooting

- Check fan resistance.
- Check soft charge fuses.
- IGBT thermal sensor.

ALARM 38, Internal fault
When an internal fault occurs, a code number is displayed.

Troubleshooting

- Cycle power
- Check that the option is properly installed
- Check for loose or missing wiring

It may be necessary to contact your Danfoss supplier or service department.
Note the code number for further troubleshooting directions.

ALARM 39, Heatsink sensor
No feedback from the heatsink temperature sensor. The signal from the IGBT thermal sensor is not available on the power card. The problem could be on the power card, on the gate drive card, or the ribbon cable between the power card and gate drive card.

WARNING 40, Overload of digital output terminal 27
Check the load connected to terminal 27 or remove short circuit connection. Check 5-00 Digital I/O Mode and 5-01 Terminal 27 Mode.

WARNING 41, Overload of digital output terminal 29
Check the load connected to terminal 29 or remove short circuit connection. Check 5-00 Digital I/O Mode and 5-02 Terminal 29 Mode.

WARNING 49, Speed limit
When the speed is not within the specified range in *4-11 Motor Speed Low Limit [RPM]* and *4-13 Motor Speed High Limit [RPM]*, the frequency converter shows a warning. When

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the speed is below the specified limit in *1-86 Trip Speed Low [RPM]* (except when starting or stopping), the frequency converter trips.

ALARM 50, AMA calibration failed
Contact your Danfoss supplier or Danfoss Service Department.

ALARM 51, AMA check Unom and Inom
The settings for motor voltage, motor current and motor power are wrong. Check the settings in parameters 1-20 to 1-25.

ALARM 52, AMA low Inom
The motor current is too low. Check the settings. ALARM 53, AMA motor too big
The motor is too big for the AMA to operate.

ALARM 54, AMA motor too small
The motor is too small for the AMA to operate. ALARM 55, AMA parameter out of range
The parameter values of the motor are outside of the acceptable range. AMA cannot run.

ALARM 56, AMA interrupted by user
The user has interrupted the AMA.

ALARM 57, AMA internal fault
Try to restart AMA again a number of times, until the AMA is carried out.
NOTE:
Repeated runs may heat the motor to a level where the resistance Rs and Rr are increased. In most cases, however, this is not critical. ALARM 58, AMA Internal fault
Contact your Danfoss supplier.

WARNING 59, Current limit
The current is higher than the value in *4-18 Current Limit*. Ensure that Motor data in parameters 1-20 to 1-25 are set correctly. Possibly increase the current limit. Be sure that the system can operate safely at a higher limit.

WARNING 62, Output frequency at maximum limit
The output frequency is higher than the value set in *4-19 Max Output Frequency*.
ALARM 64, Voltage Limit The load and speed combination demands a motor voltage higher than the actual DC link voltage.

WARNING/ALARM 65, Control card over temperature
The cut-out temperature of the control card is 80 °C. Troubleshooting

- Check that the ambient operating temperature is within limits
- Check for clogged filters
- Check fan operation
- Check the control card

WARNING 66, Heatsink temperature low
The frequency converter is too cold to operate. This warning is based on the temperature sensor in the IGBT module. Increase the ambient temperature of the unit. Also, a trickle amount of current can be supplied to the frequency converter whenever the motor is stopped by setting *2-00 DC Hold/Preheat Current* at 5% and *1-80 Function at Stop*

Troubleshooting
The heatsink temperature measured as 0° C could indicate that the temperature sensor is

defective, causing the fan speed to increase to the maximum. If the sensor wire between the IGBT and the gate drive card is disconnected, this warning would result. Also, check the IGBT thermal sensor.

ALARM 69, Power card temperature
The temperature sensor on the power card is either too hot or too cold.
Troubleshooting
Check the operation of the door fans. Check that the filters for the door fans are not blocked. Check that the gland plate is properly installed on IP21/IP 54 (NEMA 1/12) frequency converters.

ALARM 70, Illegal FC configuration
The control card and power card are incompatible. To check compatibility, contact your supplier with the type code of the unit from the nameplate and the part numbers of the cards.

WARNING 76, Power unit setup
The required number of power units does not match the detected number of active power units.

WARNING 77, Reduced power mode
This warning indicates that the frequency converter is operating in reduced power mode (i.e. less than the allowed number of inverter sections). This warning is generated on power cycle when the frequency converter is set to run with fewer inverters and remains on.

ALARM 79, Illegal power section configuration
The scaling card is the incorrect part number or not installed. Also, MK102 connector on the power card could not be installed.

ALARM 80, Drive initialized to default value
Parameter settings are initialized to default settings after a manual reset. To clear the alarm, reset the unit.

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