micompact 330

Controller series for drives in elevator, crane and automated warehousing systems

Operating manual

User manual covering functional features, installation and troubleshooting. With skeleton instructions and description of accessories.

Notes on safety

In these operating instructions you will find three different types of message drawing your attention to important facts.

DANGER! A danger warning describes a procedure or status that may lead to hazardous or even fataly dangerous consequences for the user or elevator passenger.

ATTENTION! This type of message accompanies operations involving risk of damage to the controller, the control system or the drive, with injury to persons possible as the result (e.g. if fire breaks out!).

PLEASE NOTE: Messages of this type contain information about specific work steps. They explain facts, define terms or provide tips on how to simplify procedures or operating sequences.

Please observe the following safety notes:

Although the MICOVERT controller has been developed for your protection with due consideration to all safety measures it is not possible to exclude faults. In the interest of your own safety and that of your colleagues please note the following instructions:

DANGER! When the power supply is connected up, the inside of the controller and its external terminals wil be under high voltage. Touching live components can be fatal! Before you switch on the power supply, make sure that the front panel of the controler is screwed properly in position!Never poke inside the controler through the bottom or top with long objects (pliers, screwdrivers ...) while it is in use!

DANGER! After prolonged use the heat sink of the controller wil warm up to a maximum temperature of 70 °C. Touching it with your bare hands can be painful. This can happen in particular after opening the front panel or by reaching behind the top edge. Alow the unit to cool before getting close to the heat sink!

ATTENTION! Sharp edges and sensitive components! To carry unpacked units, hold them at their side elements. Gripping under the circuit board or metal panel can cause damage to the unit and injury to yourself

ATTENTION! . When the controler is in use, it generates waste heat which must be removed from the control cabinet. If the rate of cooling is too low, the controler's surroundings may overheat. Under the most adverse conditions this can result in ignition. When you plan the cabinet and instal the controller, make sure that the heat removal arrangements are adequate, particularly for operation in the summer months!

MICOMPACT 330 digital controllers

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Alzenau, 01.01.2005

MICOTROL INTERNATIONAL

Overview of chapters

MICOTROL INTERNATIONAL

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Summary of chapter

Although you will certainly want to get involved with our MICOMPACT 330 digital controller straight away, please read through this chapter first. It gives you an overview of the contents of these operating instructions and defines our legal relationship as contractual partners. Yes, now that you have purchased this unit, we are partners.

1.1 A word about these operating instructions

Who are the instructions for?

These operating instructions are written for the elevator engineer who installs and starts up the control system, control cabinet and drive. They are also intended for the control engineer who installs the controller in the control cabinet and makes the necessary connections to the control system.

Only qualified specialists (electricians or persons with electrical engineering training) are allowed to work on the controller.

We recommend a special course of instruction for the smoothest possible handling of the controller. Ask for our seminar materials: Phone +49-60 23-50 56 53.

DANGER! Live components. Risk of a fatal electric shock if the power supply is not disconnected. Observe the previously described precautions and safety notes during instalation and start- up!

What's in the instructions?

- Introduction and fundamentals: Chapter 2 to 4
- Start-up and troubleshooting: Chapter 5 to 6
- Skeleton instructions: Chapter 5.4
- Troubleshooting: Chapter 6
- Options and accessories: Chapter 7

Further documentation

- Skeleton start-up instructions
- Controller parameters and start-up via PC
- Description of faults
- Documentation on MICOBUS, the digital interface to the control system

Special symbols

You have already read how we mark safety messages, haven't you? If not, please do so right now. We don't want you putting yourself or other people in danger just because you haven't realized the hazards involved in using these controllers!

As you read through the operating instructions, you will come across the following symbols:

- A large dot is used in lists of properties and statuses.

☑ A tick in a box indicates that you should check something or read a summary.

☞ A hand points to steps which you must carry out yourself.

👓 Spectacles draw your attention to a specific display, but there is no need for you to set anything.

Revision status

In the left margin of each page you will see the date when the particular page was last revised.

1.2 Product liability and warranty

We guarantee the faultless condition of our product as defined in our advertising, the product documentation we have published, and these operating instructions. Product characteristics over and above this are not promised. In particular we give no guarantee nor do we accept any legal responsibility or liability of any kind for the use of these operating instructions or of the MICOMPACT 330 digital controller, for its efficiency or faultless operation for any other purpose than that defined in chapter 1.3.

Claims for damages are generally excluded, except in the case of proven premeditation, gross negligence by MICOTROL, or the absence of any promised characteristics. In particular we do not accept any liability when the controllers are used with elevator control systems, tacho- generators, power supply systems and drive motors for which the controllers are unsuitable as stated in these operating instructions or which fail to conform with the customary state of technology by virtue of their individual concepts.

We also disclaim responsibility for any damage to elevator facilities and building facilities that are owed to malfunction of the product or faults in the operating instructions.

We are not responsible for violation of the patents and other rights of third parties.

We shall not be liable for any damage resulting from improper handling as defined in these operating instructions. We expressly exclude liability for lost profit and especially for consequential damage due to the non-observance of safety regulations and warnings and/or resulting from accessories not supplied by MICOTROL.

MICOTROL products may not be sold in the United States of America and other countries governed by U.S. American law.

MICOTROL products are designed for a long service life. They conform with the current state of science and technology and were individually tested in all their promised functions prior to shipment. MICOTROL is continuously engaged in product and market analysis in the interest of further development and constant improvement. If any malfunctions or breakdowns arise in spite of all the preventive measures, you should notify the customer service department in Alzenau. We assure you that suitable action to rectify the damage will be taken without delay.

Terms of warranty

We guarantee the product's proper working order as defined in these operating instructions for a period of 24 months after shipment as per the delivery note. Repairs will only be carried out free of charge if the operating instructions are shown to have been observed during storage, transportation, installation, start-up and operation.

Interventions in a unit by the customer or third parties are only allowed after special consultation with MICOTROL. If this condition is not observed, MICOTROL will accept no responsibility for any damage to the unit, injury to persons or consequential damage; in this case the warranty shall expire.

MICOTROL also disclaims all responsibility for unit faults resulting from damaged or functionally defective equipment in the controller's environment or following the use of accessories which were not supplied by MICOTROL.

The General Terms of Business of MICOTROL International GmbH shall apply.

1.3 Area of application and normal use

Area of application

Controllers of the MICOMPACT 330 series and their accessories are designed for the electronic speed variation, control and positioning of so-called variable three-phase asynchronous motors. Areas of application are

- Passenger elevators
- Material and load elevators
- Lifting gear in automated warehousing systems
- Travelling gear in automated warehousing systems

These are the only applications; the controllers are not intended for any other purposes. In particular the units are unsuitable for high-dynamic drives with precision positioning. The upper conveying speed limit lies at 2 m/s.

Combination with a control system

MICOMPACT 330 controllers can receive control signals from a special elevator control system and send back status messages. Controller parameters are set via keyboard and LCD; alternatively it is possible to make the settings with a suitable PC and matching MICOTROL software.

Further connections (for details see chapter 4, Interfaces)

For normal operation you must connect up a suitable tacho-generator. The controller and motor must be supplied with three-phase alternating current. The motor plus sensor for monitoring the motor's temperature must be connected to the controller. As an optional feature it is possible to measure the cabin load with a special sensor and to specify an external set-point value.

No provision is made for any other control and connection options.

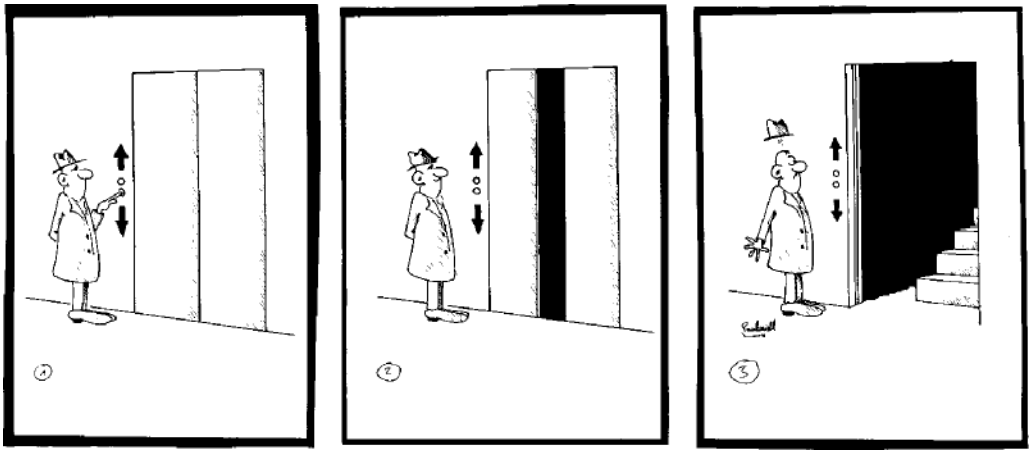
1.4 Installation and operating personnel

Prior to installation and/or start-up you must acquaint yourself with all the controller's details. We shall help you as much as possible with these operating instructions.

Each person involved in the installation, start-up, assembly or disassembly, adjustment and maintenance of the controller must have read and understood these operating instructions in full, particularly those passages concerning safety.

Only qualified specialists (electricians or persons with electrical engineering training, according to IEC 364 and VDE 0105 Part I) are allowed to work on the controller. Only authorized and trained specialists are allowed to install and service the controllers.

MICOTROL shall not be liable for any injury or damage if this condition is not observed..



2 Description of the unit

Summary of chapter

This chapter introduces you to the fundamentals of MICOMPACT 330 digital controllers and their use in comfort elevators. Read the chapter if you want to learn more about the technology of MICOTROL elevator controllers and their integration in the control system.

2.1 Use and definitions

Area of use (see also chapter 1)

The MICOMPACT 330 digital series of controllers consists of variable-speed phase control units for elevator drives with exceptionally high comfort. The controllers are designed to control two-speed asynchronous elevator motors in conjunction with a digital tacho-generator (pulse generator) and a higher-level control system.

Definitions

Conveying systems: Passenger elevators, material and load elevators, crane facilities, high-bay stores. The controllers can be used on lifting and travelling gear.

PLEASE NOTE: These operating instructions refer generaly to instalation of the controllers in elevators, which is comparable to the function of a lifting gear in storage systems. Attention wil be drawn to any special differences.

Three -phase asynchronous motors: Variable squirrel-cage motors for which the motor torque characteristic is designed for the use of electronic speed controllers with voltage dosing (like MICOMPACT 330) (see chapter 4.1 and Figure 4.1).

Radio interference suppression: Neither radio interference level K nor N are reached in the basic version!

PLEASE NOTE: We wish to point out that the operator of the overal system is responsible for observing the postal regulations in force in his area.

If interference level N is required, we recommend base module FN330 as an option (see chapter 7.2).

2.2 Functions and features

The main features and functions of the unit are listed below:

- Use of the maximum possible motor speed: Low energy losses under braking load and higher speed (synchronous speed) under pulling load. Notable saving in energy under full load and constant travel. Plus a reduction in noise under braking load and at maximum speed.
- Automatic determination of braking distance.
- Power range: 16 to 200 A in standard increments.
- Mains connection: 50 or 60 Hz, available for various mains voltages.
- Power section: Principle of phase control with thyristors.
- Control section: Fully digitalized, hence high and lasting control accuracy.
- Controller set-up: Performed with four keys via menu structure; all status signals via LCD.
- PC control system (option) : All controller settings can also be made via an IBM-compatible PC instead of with the four operator keys and the LCD; the PC is connected to the controller via a serial interface. Password-based locking plus on-line display of the travel curve (setpoint and actual value curve).
- MICOBUS control system (option): Connection of the controller to the control system is usually based on control voltages and separate control lines. With MICOBUS, on the other hand, the digital connection to the control system runs via an RS 232 or RS 485 interface with all input and output functions.
- Five different operating speeds.
- Serial interface for connecting up a PC as standard.
- Five output relays with floating contacts; one of them is freely assignable by the user for signalling functions.
- Monitoring and safety functions: Motor temperature monitoring, tacho-monitoring, heat sink temperature monitoring.
- Reduction of braking noise by means of a three-phase bridge (option).
- Speed monitoring: Output relay V<0.3 m/s.

2.3 Basic concept

The MICOMPACT 330 digital series

The speed of the 4- or 6-pole three-phase motors normally used in elevator systems is varied by way of voltage (or phase) control and evaluation of an actual speed signal (tacho-generator signal). The low-speed motor coil - also found in nonvariable elevator drives and isolated from the high-speed coil - is fed with direct current and used in addition as an eddy-current brake.

The control concept is based on an elevator's ideal travel curve, with due consideration to passenger sensations. Ramp-up is time-related; ramp-down is dependent on the distance travelled. Halting is controlled up to drive speed ZERO, which means that the mechanical brake has a retention and safety function only and is subjected to no wear. Driving and braking are controlled in accordance with a specified speed program which is derived from the ideal travel curve for the human sense of acceleration.

Execution of the complete control layout in digital technology with two microcontrollers enables a maximum of support from the controller's operating software when putting the system into operation for the first time. Unlike analog controllers, there is no need for a variety of set-up procedures; the controller calculates the parameters itself and saves them permanently in an internal memory.

Speed control in thyristor technology

In keeping with the high requirements on safety and reliability, the service-proven and perfected thyristor control concept (based on comparatively simple and lowprice semiconductor components) is used to control the motor. The advantage of using thyristor components lies in their availability up into the highest power ranges beyond 500 A, in their insensitivity to double to quadruple overloading, and in their insensitivity in the event of unit and motor faults.

With the phase control principle it is possible moreover to reduce radio interference and system perturbations by simple means: The harmonics analysis produces defined harmonic waves of 250, 350 and 450 Hz with a low amplitude. If a radio interference suppression module is used (optional feature for the 330 series), it is possible to achieve a radio interference level of N, which corresponds to a level of interference emission acceptable e.g. in residential areas, hospitals and office environments.

Motor torque is dosed in all three phases by voltage reduction using antiparallel thyristors. Braking torque is generated by controlled direct current in the brake coil. Through selective overlapping of speed torque and braking torque it is possible to achieve with high stability the dynamic drive combinations required for elevator systems.

Rectification of the braking current can take place via a Graetz bridge or - to reduce ripple - via a fully controlled three-phase bridge, which results in a notable reduction of noise created in the motor. Unit control-factor setting of the controller helps to reduce noise further still in addition to optimizing the conveyor capacity.

2.4 Schematic sequence of an elevator travel

This section gives a step-by-step description of a typical passenger elevator travel using a MICOMPACT 330 controller (see Figure 2.1).

Sequence on an inspection travel

On an inspection travel or a travel with return control, the contactors and the electromechanical brake are switched off simultaneously with the setpoint command. This entails interrupting the controller's deceleration ramp, which the controller identifies as a malfunction. To prevent the controller from issuing a fault message, the enable command must be switched off immediately (delay <3 ms) when the inspection travel is switched off.

Sequence on a normal travel

Start-up

At start-up the control system sends the controller

- the command for release,
- the command for positioning speed V1,
- the command for the required end speed V2, V3, Vi or just Vn (V1 switched off), and
- the command for the direction of travel.

The controller

- excites the motor's brake coil (with a preselectable start-up braking torque),
- restrains the motor parallel to the mechanical brake, and
- switches the main and direction contactors as well as the TRAVEL relay (mechanical brake) .

The controller's internal tacho-signal evaluator adjusts to the set direction.

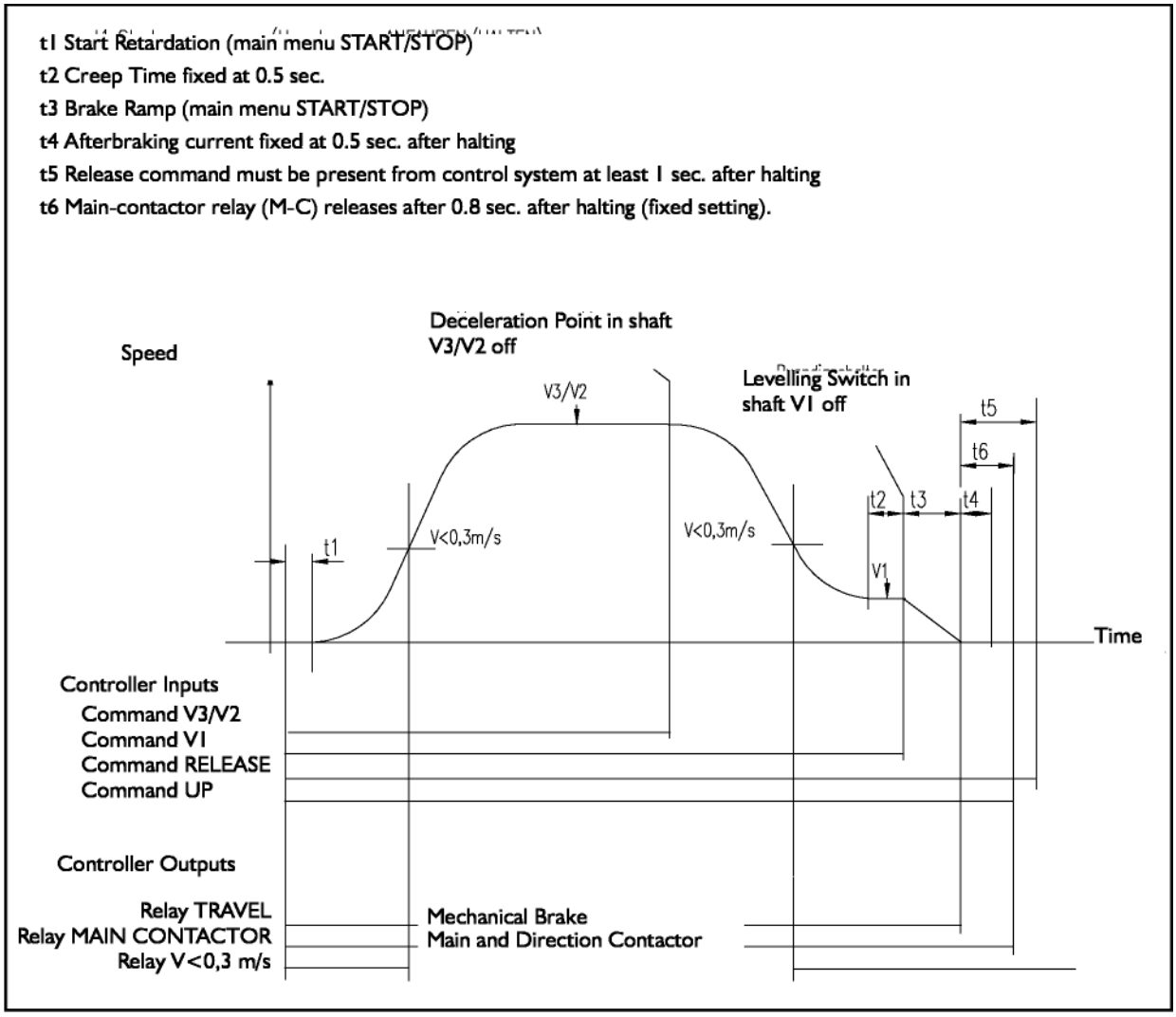


Figure 2.1
Curve of a typical elevator travel, showing the control signals and switching points

After expiry of the adjustable start-up retardation time T0, which makes allowance for the inertia of the electromechanical brake and delays within the higher-level control system, the controller goes into start-up status: The torque is increased

continuously until the motor begins to move. This torque is blended with a start torque M0, which prevents the motor from reversing under pulling load. This breakaway torque can be adjusted in magnitude.

The start torque is removed automatically as soon as the tacho-signal indicates the correct direction of rotation. It is only now that the controller can tell from the first two tacho-signal pulses that the cabin is moving and, above all, the direction in which the load is pulling. Driving and/or braking current is dosed accordingly and as per the direction specified by the control system.

Acceleration

Normally the cabin is set in motion quickly and without jerking. Acceleration is increased according to the program and is reduced prior to transition into end speed. The form of this transition can be adjusted by jerk-acceleration (round-off factor) .

Deceleration

The control system switches off the fast speed command V2 or V3 at the deceleration point. From the calibration travel conducted when putting the system into operation, the distance calculator in the controller knows the distance left to the levelling switch. It also knows the required maximum deceleration or, in mathematical terms, the slope of the speed ramp. From this data it continuously calculates by way of integration the last moment by which the deceleration phase has to be introduced in order to arrive reliably in level stop position. It is not until this moment is reached that the elevator slows down to positioning speed V1 with the travel curve determined by the distance calculator.

Separate setting of the round-off factor (jerk-deceleration), which the distance calculator considers when adapting the speed to the distance left, is possible to prevent unpleasantly high deceleration values occurring during the transition from the end speed into the deceleration phase.

Direct run-in is pointless and would only be possible if exact position data was available from the shaft. This condition is not met, however, by the data normally available today and the given tolerances of shaft switches, speed generators and control systems. Thanks to the shaft data known to the controller from the calibration travel and the distance prediction feature, the rest of the creep distance is reduced to a minimum compared with other methods; as a rule it should not last longer than 0.4 s.

Upon reaching run-in speed V1, the residual distance is covered at 10 to 15 cm/s. Run-in speed V1 is set so that the elevator comes to a halt over the length of the levelling flag. A run-in speed of 8 to 14 cm/s is recommended if the levelling flag is variable. With a creep distance of 5 cm, the creep time then takes around 0.4 s. When the level signal is issued, V1 is switched off and the drive is brought to a halt by deceleration control with an adjustable brake ramp.

The length of the creep travel depends mainly on the accuracy of the shaft switches and the control system's response time.

Stopping

When the TRAVEL relay drops out, this is the signal for the control system that the elevator is at a standstill. The control system then actuates the mechanical brake. The controller remains switched to braking voltage (after-braking) for another 0.5 s in order to restrain the drive until the mechanical brake engages. Maximum braking voltage is adjustable and can be adapted to the individual elevator.

For the electric stop function to work, the motor needs electricity. The main contactor must remain switched on for at least 1 s, therefore, after the level signal is issued. If the main contactor was switched together with the direction contactors when the standstill signal is issued, this would result in severe contact wear due to switching of the high after-braking current. Until the mechanical brake engages, there is also a risk that the drive could begin to move again after stopping. The controller controls the delay time up to the moment when the main contactor drops out; the main contactor is connected directly to the MAIN CONTACTOR output relay.

Sequence on a POINTED-CURVE travel

A pointed-curve travel is a travel curve in which the specified end speed is not yet reached at the deceleration point (by shaft switch). In this case the controller calculates the point in time (point on the path) at which the braking phase must actually be introduced in order to reach the destination floor at run-in speed (see Figure 5.5).

Applications are floor-to-floor travels at high end speed and offset floors. The shortest possible travel time is then achieved because the elevator continues to accelerate after passing the shaft switch.

3 Unit design

Summary of chapter

This chapter contains important data concerning the controller family. It explains how to select the right MICOMPACT controller for the job, describes the preparations necessary to install the unit, and lists the operating conditions.

3.1 Selecting the right controller

To order a controller you must first establish the following key data according to the unit's intended use:

- ☞ Mains voltage.
- ☞ Nominal controller current: The nominal controller current must be greater than or the same as the nominal motor current.
- ☞ Control voltages: The control voltage depends on the elevator control system used and must be agreed with the builder of the control system.
- ☞ Tacho-generator: Preferably a digital tacho-generator. Key data: Up to 300 pulses/revolution, push-pull, operating voltage 10 to 30 VDC. An analog tachogenerator is also possible as an alternative (specify when ordering!).
- ☞ Radio interference suppression: It will depend on the actual tender invitation whether a controller with integral radio interference suppression is required or not. If it is, this must be specified in the order. Retrofitting at a later date is possible, however.
- ☞ Brake rectification: When ordering you must know whether the unit can be equipped with a standard Graetz bridge or whether the quieter three-phase bridge has to be installed. The reduction of motor noise during braking is worth the higher outlay for a three-phase bridge, particularly on comfort elevators.

3.2 Power classes and type codes

The MICOMPACT 330 series consists of the units 330/A (analog tacho input) and 330/D (digital tacho input). As variants for brake rectification it is also possible to choose between a Graetz bridge (330 Gb) and a three-phase bridge (330 Db).

PLEASE NOTE: When ordering you must specify the tacho input and type of brake rectification required. Retrofitting at a later date is not possible.

- Both types are available in the following sizes: Nominal current 16, 25, 40, 60, 80, 100, 140, 170 or 200 amperes (see Figure 3.11). Higher power classes on

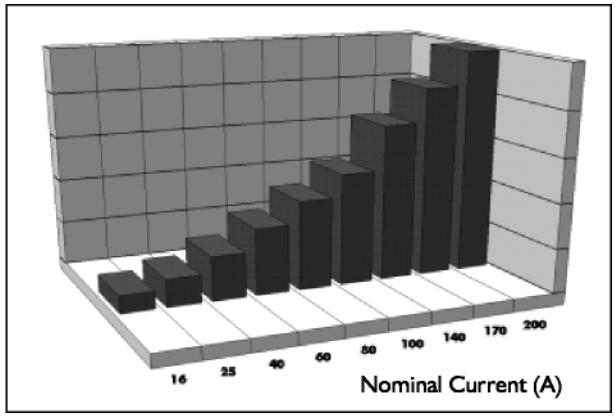


Figure 3. 1
Graded power classes of the MICOMPACT 330 series

request. The quoted nominal currents correlate directly with the specified nominal motor currents in the selection of drive motors. Allowance is made for the fact that both the motor and the controller must be able to withstand start-up currents of at most 3.5 times the nominal current for a limited length of time customary in elevator and storage systems.

- Mains voltages of 400 V three-phase current or as required, mains frequency 50/60 Hz
- Control voltages as required, as direct or alternating voltages
- Braking current rectification as Graetz bridge (code Gb) or as a fully-controlled three-phase bridge (code Db)

Example of an order code:

Series
D=Digital tacho, A=Analog tacho

Gb=Graetz bridge (2 phase), Db=Three-phase bridge

3 3 0/ D/G b-400/60/48V D C

Control voltage
Nominal controller current Mains voltage

3.3 Operating conditions

The controller complies with the DIN and VDE standards relevant for and applicable to units of this type.

This chapter considers the design of units for operation in elevators and other conveying systems.

Electric power and constant load

- The start-up current may equal 3.5 times the nominal current for a maximum period of 2 s.
- Nominal current tolerance is +5%.
- A maximum of 240 travels per hour are permitted for elevator and automated warehousing applications at an ambient temperature of less than 45°C. The controller switches off automatically if a limit temperature is exceeded by the motor and/or controller.
- The braking current may reach the value of the nominal current during a travel. Three times the value of the nominal current is permitted for a maximum period of 0.5 s during after-braking for electric restraint of the load.

Operating temperature

The units are designed in accordance with DIN/VDE 0558 for an ambient temperature (in this case: control cabinet temperature) of 45°C. If higher temperatures are specified, it may be possible from case to case to use a controller from a higher nominal power class. This alternative must always be clarified in advance with MICOTROL!

ATTENTION! When the controller is in operation, it emits waste heat via the heat sink. The permissible control cabinet temperatures may be exceeded as the result. When calculating the size of the control cabinet's exhaust air system and cooler, you must make alowance for the controler's heat output (see Figure 3.2!)

Nominal power (A)	Heat loss (W)
16	55
25	95
40	140
60	220
80	290
100	360
140	500
170	620
200	730

Figure 3.2
Table of maximum heat loss values as a function of nominal controller power

3.4 Packaging and disposal

3.4.1 Transport

The controller is packed in the factory to meet the requirements of the particular form of transportation, the forwarding route and the place of delivery. Prior to installation and assembly, you must examine the units for any signs of transit damage. In the event of damage, contact the forwarding agent immediately.

DANGER! Sharp edges and sensitive components! To carry unpacked units, hold them at their side elements. Gripping under the circuit board or metal panel can cause damage to the unit and injury to yourself.

3.4.2 Packaging

The controllers are delivered in boxes with corrugated cardboard bolsters. One complete packed unit weighs between 12 and 30 kg, depending on the power class of the controller and its accessories.

All packaging materials, including those used for the accessories, are environmentally compatible. You can dispose of them in accordance with the pertinent disposal regulations in force in your area.

Cardboard and paper packing tape can be recycled in the RESY disposal and recycling system. Any packing films, straps and foamed films that may be used are made of polyethylene (PE); the padding elements are made of CFC-free, foamed polystyrene (PS). These packing materials consist of pure hydrocarbons and can therefore be recycled.

In special cases we use steel tightening straps and non-chemically treated wood crates.

3.4.3 Disposal

MICOTROLInternational GmbH will take back old units free of charge provided they are delivered carriage paid to the MICOTROL factory in Alzenau.

The waste treatment and disposal regulations in force in your region must be observed if you dispose of a unit yourself or replace any components. MICOTROL shall accept no liability for any parts and components that are not disposed of correctly!

The following details are useful for disposal purposes:

- The controller's heat sink and side sections are made of aluminium, usually without lacquering and treatment.
- The front panel consists of printed aluminium sheet.
- The regulations concerning the disposal of electronic parts and components apply for the disposal of the main printed board, the LCD unit and the ignition protective circuit board.
- The power semiconductors used (thyristor and diode modules) contain no beryllium; disposal as electronic scrap is therefore possible.

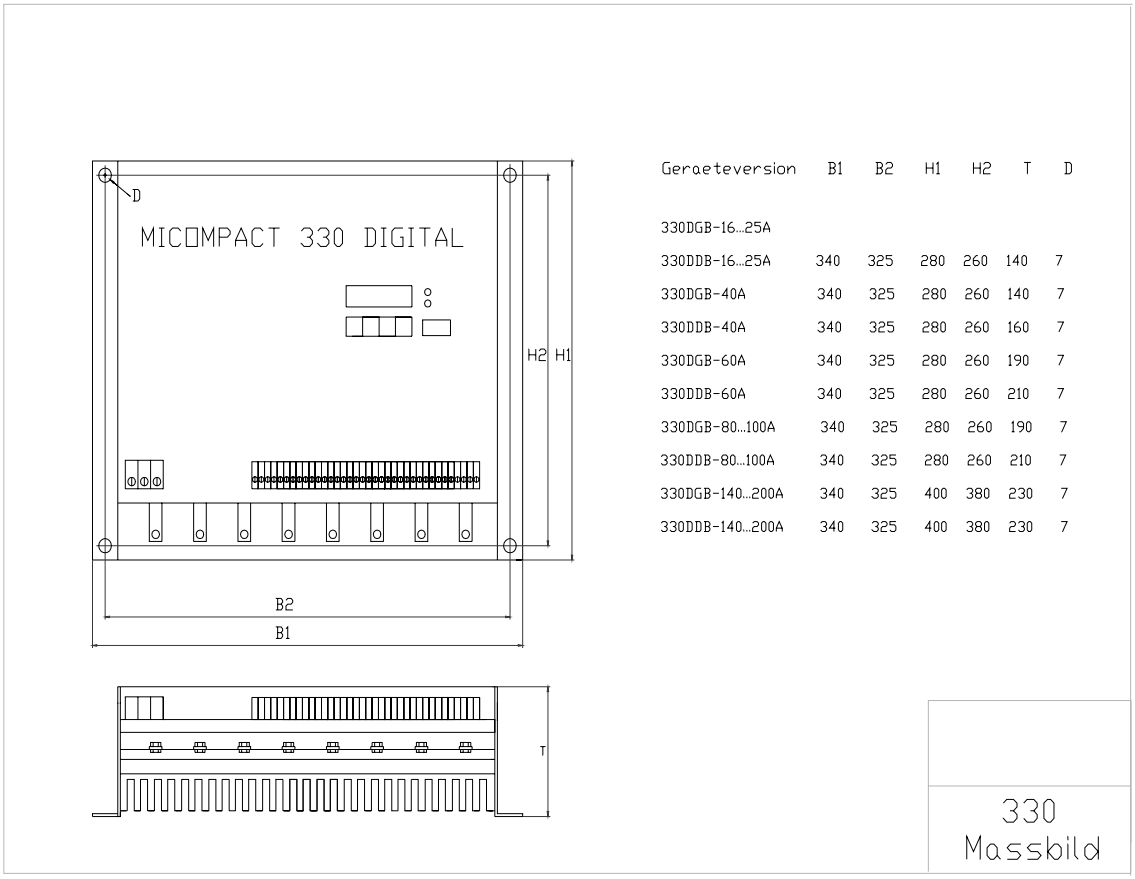
3.5 Installation notes

DANGER! When the controler is in operation, certain parts of the unit are bound to be under hazardous high voltage. Appropriate precautions must be taken when instaling the unit in the control cabinet. In particular this means providing covers for live parts.

- ☑ You must mount the top metal cover before switching on the mains supply. All adjustment procedures are possible with the unit closed!
- ☑ You must observe the pertinent regulations and guidelines of your power supply company. You must also follow the installation guidelines prescribed for the site of installation by the plant operator as well as the pertinent accident prevention regulations.
- ☑ Environmental conditions must be according to DIN IEC 721. Not to be used under tropical climate conditions!
- ☑ Only qualified specialists (electricians or persons with electrical engineering training according to IEC 364 and VDE 0105 Part I) are allowed to carry out the installation work.
- ☑ Shock protection precautions must be taken before carrying out adjusting and servicing jobs with the mains supply switched on (VDE 0680).
- ☑ Only a special version of the unit (option: closed case cover) meets VBG4 requirements on ready-to-use condition.
- ☑ You must observe the pertinent VDE and DIN standards, especially VDE 0105 and DIN 57105, during installation and when performing the installation work.
- ☑ Electrical connections for the motor, control system and controller must be made in accordance with the corresponding terminal diagrams and with due consideration to the pertinent VDE regulations and the guidelines of your local electric power supply company.

Instalation in the control cabinet

Controllers of the MICOTROL 330 series are designed for vertical installation in cabinets or machine frames. They must be fitted with their terminal strips and connecting bars to the bottom. See Figure 3.3. for dimensions.



Geraeteversion	B1	B2	H1	H2	T	D
330DGB-16...25A						
330DDB-16...25A	340	325	280	260	140	7
330DGB-40A	340	325	280	260	140	7
330DDB-40A	340	325	280	260	160	7
330DGB-60A	340	325	280	260	190	7
330DDB-60A	340	325	280	260	210	7
330DGB-80...100A	340	325	280	260	190	7
330DDB-80...100A	340	325	280	260	210	7
330DGB-140...200A	340	325	400	380	230	7
330DDB-140...200A	340	325	400	380	230	7

Figure 3.3
Dimension drawing for all units of the MICOMPACT330 series. All dimensions in mm.
Fixing holes are always 7 mm in diamer

☑ Make sure that the cooling air can enter and exit unimpeded. To do so, allow a space of at least 100 mm above and underneath the unit. See chapter 3.3 for permissible operating temperatures.

Shielding and radio interference suppression

☑ It is necessary as a general rule to use shielded leads for analog and digital tacho-generators and for other transducers (cabin load measurement, external setpoint infeed).

PLEASE NOTE: Suitable shielding not only enables you to meet the required radio interference level. It also guards the system and above all the digital electronics from parasitic influences.

☑ The cable shield must be connected in each case to the external generator or unit (to PE) and (!) to the separate shielding terminal provided for each controller connection.

☑ Suitable R-C combinations must also be used for radio interference suppression of all contactors.

☑ Control and tacho leads must be laid separately to the load lines.

Fusing

Ultra-quick-acting fuses (semiconductor fuses) must be provided on the input side as short-circuit protection for the thyristors (normal l.v.h.b.c. fuses are unsuitable). A maximum of double the nominal current is permissible as nominal fuse current (if necessary, round down to the next value).

3.6 Safety features

The concept on which the controller is based ensures that excitation of the MAINS, MAIN CONTACTOR (M-C) and TRAVEL relays is interrupted immediately, even if the elevator has not stopped, should any faults arise in the controller (unlike type MICOMPACT 320!). This ensures that the mechanical brake can engage and the direction contactors can drop out in the event of any faults.

- If any faults arise in the control system or the enable signal is lost, the thyristors will be switched off-circuit immediately and the mechanical brake deactivated through loss of the RELEASE signal. Independently of this, the system ensures that the power supply to the thyristor ignition stages is switched off no later than 0.5 s after the TRAVEL relay drops out, causing both motor coils to be switched off-circuit.
- If the tacho-generator fails, the controller will cause the cabin to halt.
- If the heat sink temperature is too high (threshold I), the MAIN CONTACTOR
  relay (M-C) will switch off the controller when the next stop position is reached.
- If threshold II is exceeded or if the permissible motor temperature is exceeded (PTC thermistor evaluation), the drive will be halted immediately.

PLEASE NOTE: The thyristor controler is not a safety device as defined by the elevator regulations. The above described monitoring functions of the controller do not release the elevator builder from his duty to observe the statutory safety regulations. The elevator control system is the first level integrated in the safety chain.

3.7 Mechanical construction

General construction

MICOMPACT controllers are characterized by their compact, space-saving design. All control and display elements can be reached from the top or - when installed - from the front.

The printed boards are copper-clad on two sides. Thus in spite of the high component density, the spacing between printed conductors is ample. Contacts, relays and printed conductors satisfy in shipped condition the requirements of insulation class C, pollution severity 3, as regards creepage, air and isolating distances. Printed boards are coated and receive an additional coat of protective lacquer.

Temperature ranges

The units may be operated with nominal power in an ambient temperature range of 0 to +45°C. Limit temperatures of -10 to +70°C may arise during storage and transportation.

Key modules

Controllers of the 330 series consist of the following main modules:

Power section

The basis is formed by an aluminium profile structure with an integrated heat sink for the power semiconductors (thyristor and diode modules). This power section is made up of electrically insulated thyristor modules (see Figure 3.4a), which means that the heat sinks are insulated. Side sections, connection covers and the front panel (shielding sheet made of printed steel), which covers the entire top of the unit, guard against accidental contact when working close to the unit.

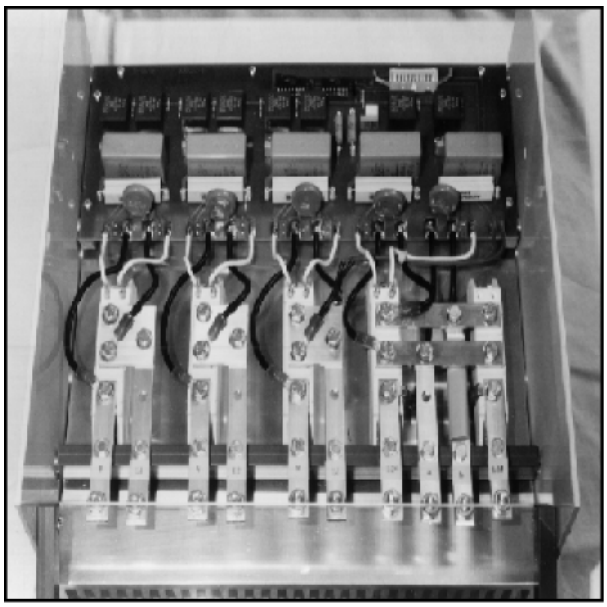


Figure 3.4a
Top view of the power section (front panel swung up, printed board swung down) with power semiconductors (Graetz bridge), control board (at top of picture), and connecting bars pointing to the front

Protective circuit section

A special printed board with power-adapted ignition transformers and suppressor circuit against overvoltage is located under the main printed board directly above the power semiconductors.

Control section

- The universal printed board for all power classes and special models with power supply, interface connections, setpoint generation, control section, safety logic, etc. (see Figure 3.4). The control board is mounted on a frame that also supports the front panel (touch guard).
- For putting into operation and for all status displays the top side has an illuminated two-line LCD with four keys. All adjustments and status displays are made here (see Figure 3.5), so there is usually no need to access the actual printed board. It holds no operating and display elements; local repairs by the customer are in any case impossible due to the complex digital electronics.

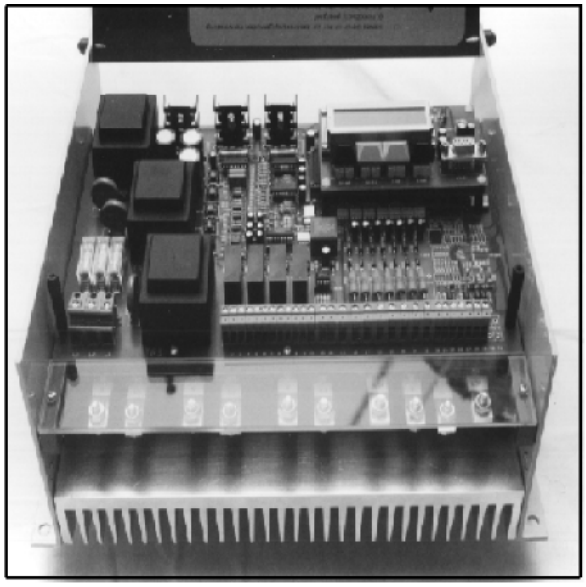


Figure 3.4b
Top view of the main printed board with the front panel swung up: The terminals are at the front edge of the board, the power supply unit with fuses on the left, the output relays further right, and the display chip with the four keys and LCD at the back right

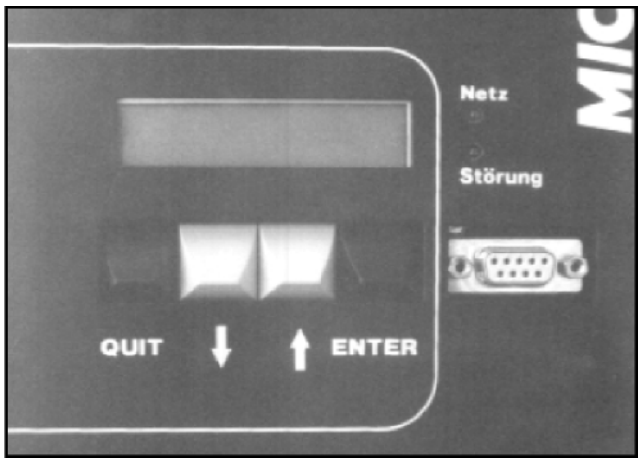


Figure 3.5
Front panel with control and display elements: The LCD, to the right of it the two LEDs, the four keys underneath the display, and to the right the serial interface for connection to a PC.

Internal construction, dismantling

☑ Removing the front panel: Loosen the top two screws at the edge of the side sections (see Figure 3.6.) and the two screws in the cover. You can now take off the metal cover.

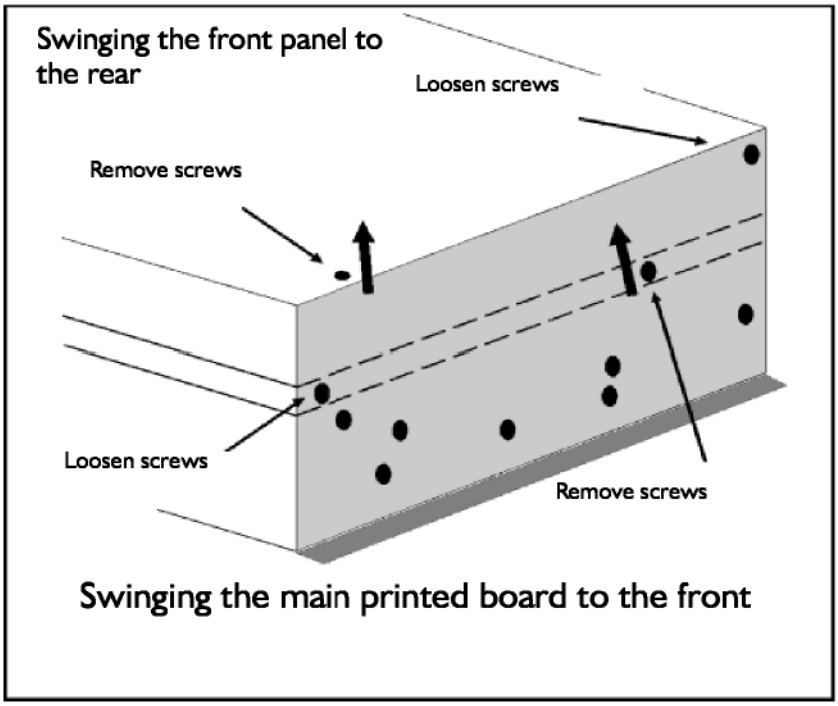


Figure 3.6
View of the right-hand side of the controller showing the position of the fixing screws: Two screws on each side hold the front panel and the printed board.

☑ Swinging down the main board: The board unit is held by a total of four hexagonal socket-head screws, which can easily be reached from the outside of the structural profiles. After removing the two top screws (in installed position), the board unit can be swung down as far as a stop. After loosening the bottom screws at the side, the board unit can be swung down into position for servicing purposes (see Figure 3.7). The power semiconductor modules and the protective circuit section are accessible without having to release or disconnect any external terminals.

Figure 3.7
Swinging up the front panel, swinging down the printed board (in the picture you can see the rear aluminium shielding plate; the released ribbon connector for the power section is visible at the bottom).

☑ Before swinging down the board unit, carefully remove the ribbon cable connector from the power section (see Figure 3.8) !

☑ Replacing the controller board: This is simplified by the plug-on cable connector (see Figure 3.8), which represents the only connection to the power section. When you replace the controller board, check for correct mains voltage, control voltage and tacho input configuration (code 330/D or 330/A) !

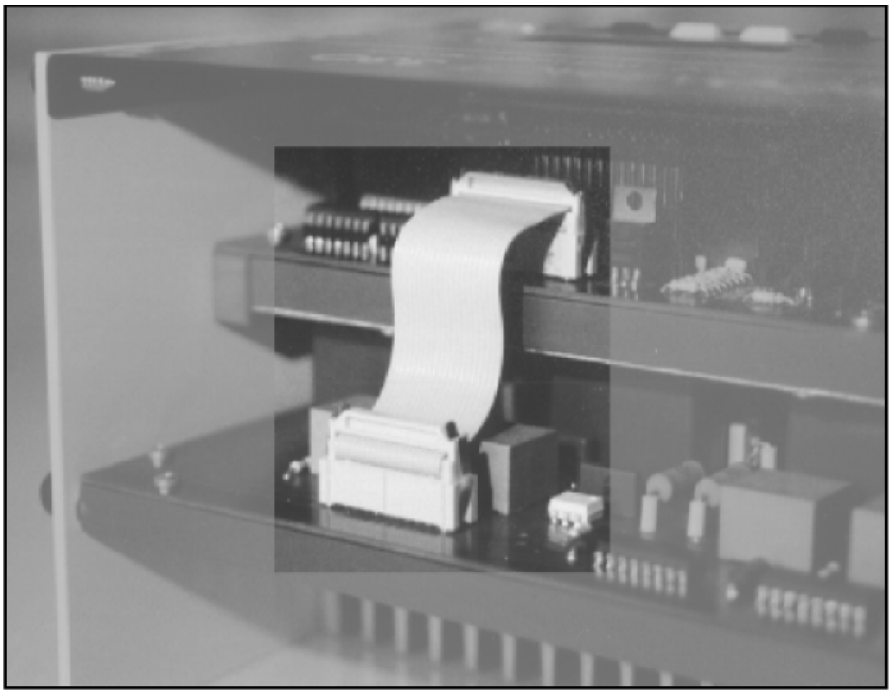


Figure 3.8
View from the rear: Unlatch the bottom ribbon cable plug before swinging up the main printed board and pull up and off.

4 Interfaces

Summary of chapter

This chapter contains complete details about the controller's connections. The information is important for installation and start-up preparations (see chapter 5).

4.1 Mains and motor connections

Variable drive motors

MICOTROL controllers can only be used with a variable three-phase asynchronous motor. Motors of this type are characterized by a high level of torque in the lower speed range, by optimum control characteristics in voltage control mode, by a good level of efficiency and by stable operating points in electronic control mode.

Heat dissipation: A torque characteristic different to that of a standard motor (see Figure 4.1) can only be used with voltage controllers at the expense of slip losses. The resulting heat must be dissipated by separate ventilation of the motor. The fan wheel normally used with a motor is hardly effective particularly at low speeds.

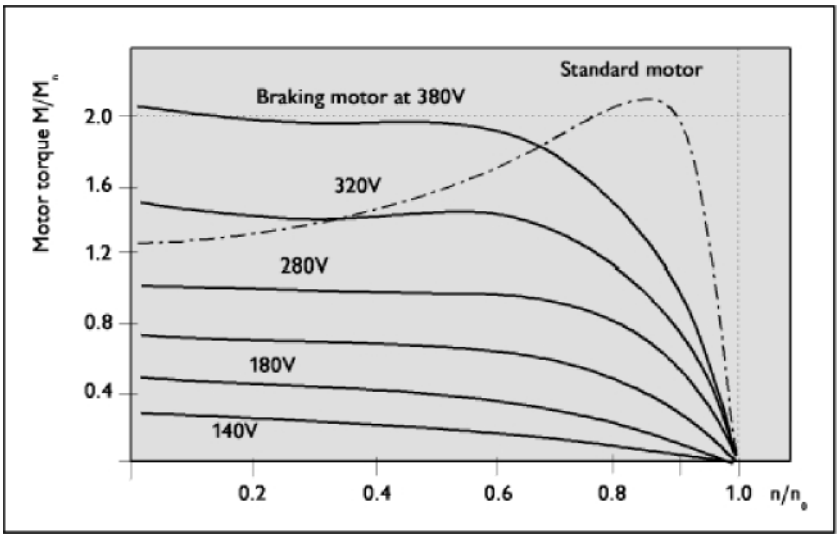


Figure 4. 1
Typical torque curves of a special variable motor for elevator systems (Braking motor) compared with a standard motor

Number of poles: For applications in elevator systems and in automated warehousing, the drive used with the MICOMPACT 330 must be a pole-changing asynchronous elevator motor with two separate coils, preferably in 4/16- or 6/24-pole execution. In the case of a 30-pole brake coil, you must check whether the braking torque is sufficient. For reasons of economy we recommend a highresistance 16-pole coil.

Brake coil: Braking is performed by means of direct current excitation in the lowspeed coil in accordance with the eddy current braking principle. A pole number ratio of 1:4, such as is customary in non-variable drives for presentation of the creep and final travel speed, is suitable for combination with a controller regardless of the speed required for any particular case.

Centrifugal masses: The controller has to control the complete drive train and must also compensate short-term deviations from the set value. It is advisable, therefore, to dispense with additional centrifugal masses. The reduction of centrifugal masses results in a considerable saving in energy and at the same signifies a notable decrease in thermal loading for the motor. The same also applies for the conversion of old systems where the existing centrifugal mass should be replaced (as far as this is allowed by the statutory regulations) by a lightweight handwheel made of aluminium or plastic.

It is important for the motor to be of low-noise design.

All established makes of standard pole-changing elevator motors are suitable.

Mains and motor connections

Installation notes: The direction contactors are located between the controller (U, V, W) and the high-speed motor coil. The motor can be delta or star connected.

- The braking circuit can be fed separately via connecting bars laid to the outside. It is then possible, for example, to integrate external interference suppressors. Normally - and ex works - the two conductor bars are jumpered.
- Outputs a, b are connected directly to the low-speed brake coil. As far as possible the brake coils must be series-connected, with one of the coils connected in opposition (see also Terminal diagram).
- In DRIVE mode the motor is fed with three-phase current from 0 to 100% of the mains voltage. In BRAKE mode the low-speed brake coil is supplied with direct voltage from 0 to 80% of the mains voltage. The controller monitors the mains voltage for undervoltage and phase failure; the temperature of its heat sink and the motor temperature are also monitored via thermocouples or PTC thermistors.

- The mains input to the controller board is connected up in front of the main contactor so that the safety circuit is closed before the start of a travel. The mains input to the power section is connected up behind the main contactor. Both mains connections must be cophasal.

Details of the connections can be found in the circuit diagrams (see Figure 4.2).

4.2 Tacho-generator connection

A motor tacho-generator is required to scan the actual speed and to calculate the distance of the TRAVEL. The standard 330 series is suitable for the use of digital tacho-generators which transmit pulses to the controller via built-in light barriers or proximity initiators and a gear wheel.

The higher the number of pulses from the digital speed scan, the better the control characteristic at low speed, especially in the start-up phase.

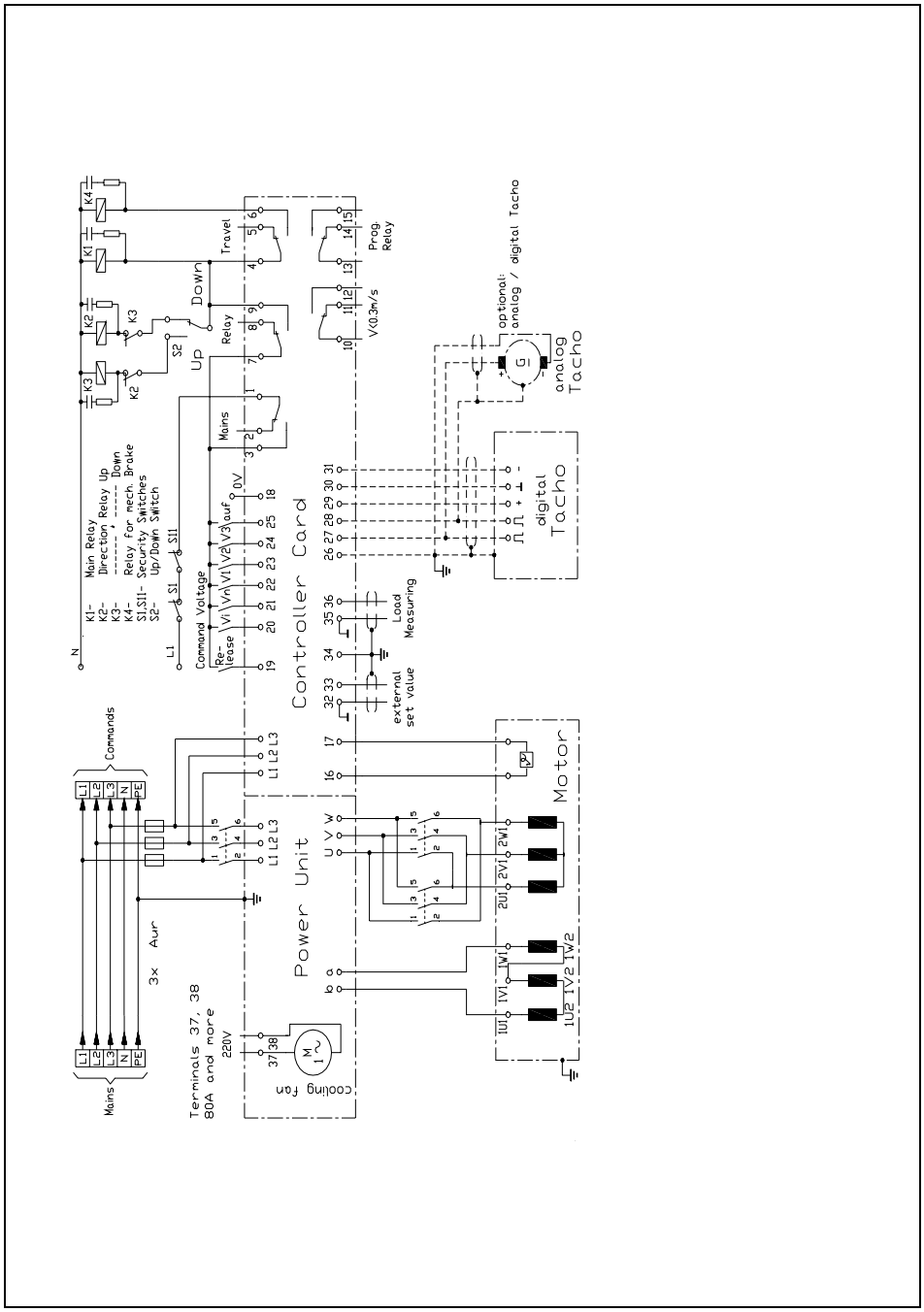
Suitable digital tacho-generators have two built-in pulse generators which supply 90°-offset pulses with perfect flanks.

The tacho-generator must be connected directly to the motor shaft in order to prevent vibrations and blurred signals. Belt drives are less suitable. The operating voltage for the tacho-generator electronics is supplied by the controller.

The controllers are suitable for digital tacho-generators (standard version, code 330D) or, as an option, for analog tacho-generators (collector tacho-generator, code 330A).

Digital tacho -generator:

- Operating voltage: 10 to 30 VDC (+Ub at terminal 29, -Ub at terminal 31) or + 15/0/-15 VDC or 10 to 24 VDC (+UB at terminal 29, -UB at terminal 30). Current consumption: 100 mA maximum.
- Pulse number: 48 to 300 pulses/revolution, two channels offset 90°, tolerance +/-30°



4.2 Details of connection

- Output: Any, preferably push/pull
- The cable shield must be connected to PE on the output side.

PLEASE NOTE: The digital tacho -generator used must be in perfect working order and under no circumstances must it transmit any pulses when at standstil!

Colector tacho -generator:

- Output voltage: Either 40 or 60 VDC/1000 min^{-1}

4.3 Interfaces to the control system

In the current controller version, communication signals between the controller and the control system are transmitted by conventional means via control voltages (24-220 V, AC or DC). A separate line or separate controller connection via terminal strips must be provided for each signal (see terminal diagram Figure 4.3). In a special version of the 330 controllers, the entire communication with the control system takes place via a serial interface (MICOBUS). With this arrangement it is also possible to transmit differentiated status messages to the control system or telecontrol networks.

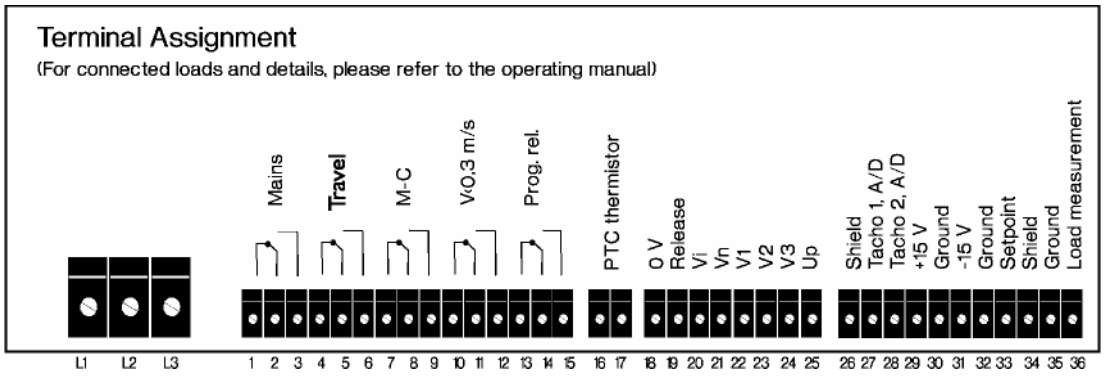


Figure 4.3
Terminal diagram (also printed on the bottom of the front panel!)

4.3.1 Inputs in the controller

Travel commands: RELEASE, VN, Vi, V1, V2, V3, UP. The command voltage can lie between 24 and 250 VAC or VDC; 0 V is without voltage.

PLEASE NOTE: You must specify the command voltage when ordering the controller. Subsequent conversion is possible, however, by resoldering six resistors.

The inputs in detail:

- RELEASE: The controller is activated with a travel command and the release command. The release command must not be switched off again before at least one second after the cabin comes to a standstill! On an inspection travel the RELEASE signal must be switched off immediately together with the travel command, otherwise the controller will emit a fault message! PLEASE NOTE: On an inspection travel the contactors and the mechanical brake are switched off simultaneously by the control system with the set value command. When this happens, the controller's deceleration ramp is interrupted and the controller identifies this as a malfunction. To prevent a fault message, the RELEASE command must be switched off as well within less than 3 ms of switching off the inspection travel.
- Adjustment speed VN: This input finds application on elevators with high elongation of the ropes, should the levelling no longer be exact after the cabin is unloaded. This function requires an additional levelling flag that is shorter than that for V1 switch-off.
- Inspection travel Vi: A separately adjustable speed for inspection travels on the cabin roof and for returning the elevator to its starting position. Is switched on and off with the release command from the control system.
- Run-in speed V1: After the controller has decelerated to V1, V1 is switched off upon reaching the levelling switch. The controller reduces the speed to ZERO over the length of the levelling flag. V1 must be set to a level that allows the elevator to stop in level position.
- Interim speed V2: Is only used when all the deceleration distances (= distance between the deceleration switch and the levelling switch) in the shaft are not equal. Commands V2+V1+RELEASE are selected for a shorter deceleration distance. After a V2 calibration travel, V2 is set high enough for the display to show "ATTENTION BRAKING DISTANCE V2".
- Final speed V3: Is usually set as high as possible. With the optimum setting V3 =100%, the motor reaches its synchronous speed under pulling load (EMPTY UP) . Under braking load (EMPTY DOWN) the motor reaches its maximum speed at approximately 90 to 95% of synchronous speed.
- UP command for an upwards travel: UP command OFF is interpreted as a down travel. Is switched parallel to the UP contactor. Like RELEASE, UP must remain switched on for at least 0.5 s after the cabin comes to a standstill.

4.3.2 Outputs from the controller

Five relays with floating contacts are available as outputs. Each contact has a rating of between 24 VDC and 250 VAC at 3 A.

Contacts, relays and printed conductors satisfy in shipped condition the requirements of insulation class C, pollution severity 3, as regards creepage, air and isolating distances.

The outputs in detail:

- MAINS relay: Drops out with the following faults: Mains failure (one phase missing or 15 % undervoltage), motor temperature too high, controller temperature too high, tacho-generator malfunction, difference between set value and actual value, wrong direction, wrong phase sequence.
- TRAVEL relay: Is activated with issue of the command RELEASE + Vx. Drops out upon reaching ZERO speed. ZERO speed is defined and can be set to between 0 and 1% of the synchronous speed. The TRAVEL relay switches the mechanical brake.
- M-C (MAIN CONTACTOR) relay: Is activated with issue of the command RELEASE + Vx. Drops out after around 0.5 s of reaching ZERO speed. M-C relay controls the main and direction contactor.
- V<03 relay: Drops out when the speed of the cabin exceeds 0.3 m/s and is activated when the speed is lower. The speed threshold is adjustable. The relay can be used for locking during run-in with an open door.
- P-relay: A user-programmable relay with the following possible functions: V<Vx (adjustable speed threshold), OVERLOAD (controller overrides in drive or brake mode), motor temperature too high or controller temperature too high.

4.4 Error memory

If the controller identifies a fault, the MAINS, TRAVEL and M-C (MAIN CONTACTOR) relays will drop out immediately and a fault message will appear in the display.

If all the travel commands are switched off by the control system, the MAINS relay will be re-activated and a new travel can begin.

If, in the event of a malfunction, one or more travel commands remain on after the fault message is issued by the MAINS relay, the fault message will be saved until the travel commands are switched off.

5 Putting into operation

Summary of chapter

This chapter describes how to start up the controller for the first time after installation. It covers the necessary preparations, describes the basic steps for programming the controller and provides detailed setting instructions. The chapter closes with skeleton instructions as a summary for the experienced user.

The commissioning engineer learns how to adjust the motor, elevator control system and drive controller so that each works exactly with the other.

5.1 Preparations

PLEASE NOTE: In the margin of the folowing sections you wil come across various symbols informing you about the content, importance and purposes of the particular paragraph. Read chapter 1.1 again if you are no longer sure what the symbols mean!

Before putting into the operation you must

☑ Make or check all connections and links to the motor, control system and tacho-generator (see Figure 4.2).

☞ Swing the printed board and its cover (lacquer-coated front metal panel) inside the unit and screw in position after completing the installation and wiring work (see chapter 3.5). Do not make any more adjustments underneath the front panel!

☞ Set all the shaft switches with a tolerance of no more than +/-5mm for the deceleration switch (fast/slow changeover switch or V3 to V1) and of no less than +/-2 mm for the levelling switch. The level signal must be issued approximately 4 - 10 cm before reaching floor level. It is important for the switch distances to be identical for each floor. The controller is unable to compensate differences from one floor to another!

☞ Figure 5.6 at the end of chapter 5 will help you to set the shaft switch distance as a function of running speed.

DANGER! A controler that is not yet properly adjusted can cause dangerous jerking of the cabin! During the adjustment work there is a risk in particular of the elevator setting off in the wrong direction, and under unfavourable conditions it might even crash at top speed against the top buffer. This could cause serious injury to any persons inside the cabin! Make sure that no one can use the elevator before and during commissioning and before the elevator passes the official inspection test! If necessary, set up barriers and warning signs on each floor. At all events you must switch off the external door controller in the elevator control system!

Tools and instruments

The controller contains all the aids needed to put the elevator into operation without additional assistance from the machine room. No tools are required. A clip-on ammeter, a phase-sequence indicator, a tachometer, a multimeter and possibly a storage oscilloscope may prove useful if the system as a whole is affected by unforeseen problems.

5.2 Basics of working with the menus

The adjustments are made one step at a time via the controller's operator panel. The basic options and structure of the operating menus are described in the following sections. You will find it useful to work through the following examples and explanations at the controller.

The operator panel consists of a two-line LCD, with two LEDs to the right and four keys underneath (see Figure 3.5).

5.2.1 Switching on the controller

After you switch on the controller (connect it with the mains voltage), the LCD will show the message [MICOTROL selftest] for several seconds.

PLEASE NOTE: Display messages are printed in these operating instructions in square brackets.

When the selftest is completed, the display shows [MICOTROL MICOMPACT 330]. Now press any of the four keys underneath the display to enter the main menu [TRAVEL COMMANDS] . If no key is pressed within an hour, the initial MICOMPACT message will reappear and the display light goes off until the next time a key is pressed.

5.2.2 Menu structure

The following sections describe the basic operations of the keyboard and the display. You are strongly advised to read this information as you will then find it easier to adjust the controller.

Operations are based on a variety of "entry masks". The successive menus are called "menus". You can move from one menu to another, you can select a menu and you make changes to the values listed in a menu. Menus are classified as main menus and sub-menus. Main menus correspond to chapter headings which have various sub-chapters.

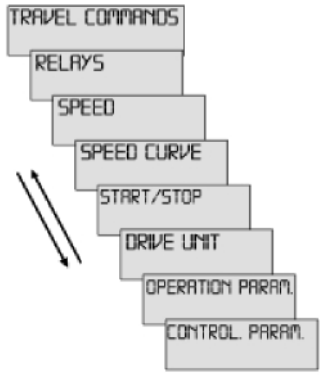


Figure 5.1
Order of the eight main menus

Main menus

There are eight main menus. Using the UP arrow key and the DOWN arrow key you can move from menu one to eight and back again (see Figure 5.1). A concrete example will be used to illustrate the menu structure.

Main menus will always be presented on the left-hand side of the page, with their corresponding sub-menus to the right.

Sub-menus

To enter a sub-menu, always press the ENTER key. To return to the main menu from a sub-menu, always press the QUIT key. For our example in Figure 5.2, we have chosen the main menu [SPEED].

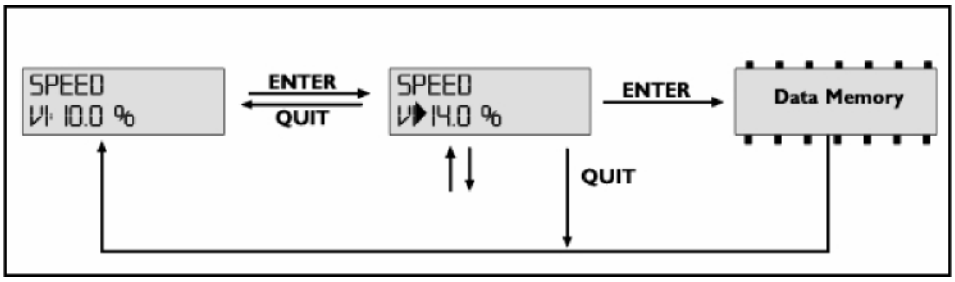


Figure 5.2
Changing data in the sub-menus: press ENTER to move from the display into the edit mode, change values with the arrow keys, press ENTER to save permanently

- In the first display line of a sub-menu you will always see the name of its corresponding main menu. You will always know, therefore, in which menu area you are currently working.
- In the second line on the left you will see the entry parameter followed by an arrow and further right the currently set numeric value (or selection option, e.g. [on]).

To move between the sub-menus of a particular main menu, use the two arrow keys. In our example there are five sub-menus, one for each speed.

Our example is concerned with adjusting the speeds Vn, Vi, V1, V2 and V3. The first sub-menu is for Vn.

Changing the set values

When you are in a sub-menu, you can change the value that is entered there. The settings entered in the factory have proven successful under general conditions. In our example we want to reset speed V1.

- ☞ Move into the sub-menu [SPEED V1]. The current value for V1 will be displayed (see Figure 5.2).
- ☞ Press ENTER. The displayed value is cleared for editing and the colon changes into a triangle. Using the arrow keys you can now raise or lower the value in small steps.
- ☞ Keep the arrow keys pressed: After a second the speed of editing increases, enabling you to make larger jumps within a few seconds.
- ☞ Having reached the value you want, you have two options: press QUIT and the new value will be adopted by the computer but the old value will be re-loaded again when the controller is switched off. If the setting is wrong, you can restore the original status. Press ENTER and the value will not only be adopted as the current new value, but it will also be saved permanently in a memory to be made available again even after the system is switched off. This new value can always be overwritten, of course, at any time by editing and saving with ENTER.

PLEASE NOTE: To make any adjustments, the elevator must be at a standstil.

5.2.3 Summary of key functions

Key functions are the same for all menus, i.e.:

- ☑ Arrow keys: Use the arrow keys to move through the main menus or through the sub-menus. Use them also in entry mode to raise or lower the set values or to choose between various selection options [off, on] .
- ☑ The right-hand key, ENTER: Use this key to move from the main menu into a sub-menu. Use it also to enter the edit mode inside a sub-menu and to save changed settings in the memory.
- ☑ The left-hand key, QUIT: Use this key to return from a sub-menu to the main menu. Use it also to return to the menu display after changing set values, after which the changed value remains valid until the controller is switched off.

The functions of the keys are marked in the menu structure diagram, which is also printed on the front panel for convenient reference.

5.3 Description of the various operating menus

The following sections describe all the adjustment steps needed to put the controller and the drive into operation. Although the controller is set in the factory with standard values taken from practice, enabling it to be used straight away, it is still essential for you to carry out the various steps since certain values will certainly need to be adjusted (e.g. the motor pole number).

The order in which the adjustments are made is important. You are advised to follow the order set out below, which was chosen for reasons of logic.

Figure 5.3 provides an overview of all the main menus and sub-menus. With the title picture on the display, press any key to enter the main menu [TRAVEL COMMANDS]. From here you can move into the other main menus with the arrow keys.

5.3.1 TRAVEL COMMANDS menu

This main menu is a pure display menu. Settings cannot be made, only read. The run commands in force at each moment of an elevator run are displayed.

[0 -V3] .....Acceleration from 0 to final speed V3

[V3] .....Constant travel at V3

[V3 -V1] .....Deceleration from final speed V3 to run-in speed V1

[V1...] .....run-in speed V1

[V1-0] .....Final deceleration from run-in speed V1 to 0

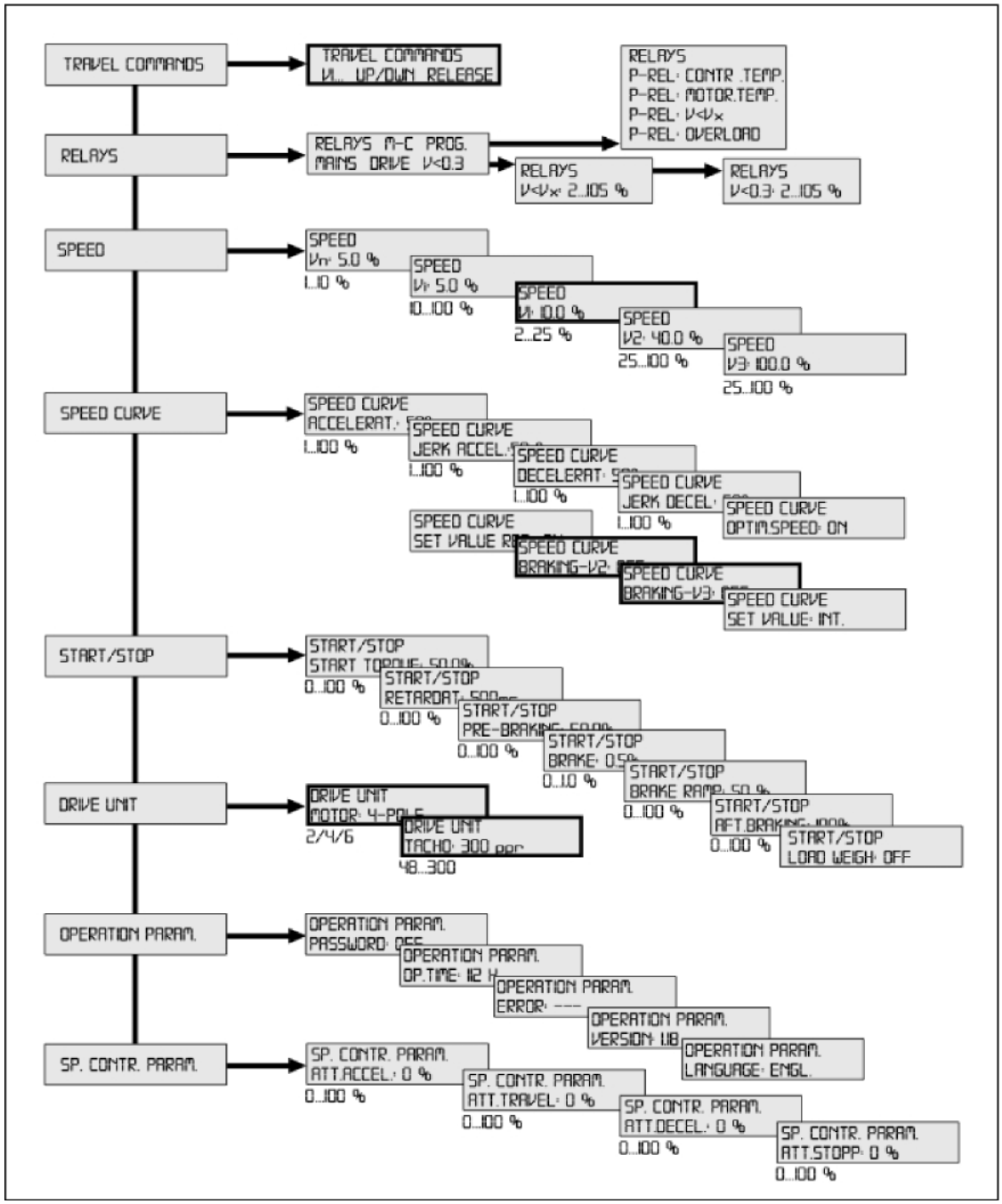


Figure 5.3
Overview of all main menus and sub-menus (here: Software version 1.18)

5.3.2 RELAYS menu

[P_REL] ..... Freely programmable relay; one of the following functions can be assigned to the relay:

[V<Vx] ..... .Speed threshold (adjustable from 0 to 105%); relay drops out when Vx is exceeded

[OVERLOAD] .... Controller overrides in drive or brake mode; relay drops out

[MOTOR TEMP] .....Motor becomes too hot; relay drops out

[CONTROLLER TEMP] . .... The controller's heat sink becomes too hot; relay drops out

[MAINS] ..... Fault signalling relay; this non-programmable relay drops out in the event of

Wrong phase sequence

Mains malfunction (overvoltage or fuse failure)

Motor temperature too high

Heat sink temperature too high

Tacho-generator malfunction
Difference between set value and actual

value exceeds 2 s Wrong direction for longer

than 2 s

[V<03] ..... Speed threshold V<0.3 m/s. for locking during run-in with open door. Closes when value falls below the adjustable threshold. Default value: 15%. The setting is derived from: % =(30/running speed m/s)

[M-C] ..... Relay for main contactor. Switches the main and direction contactor on without delay with the commands Vx + RELEASE. Switches the main and direction contactor off approx. 0.5 s after standstill (time bridge for the after-braking current) .

[TRAVEL] ..... .Relay for locking the mechanical brake. Switches on without delay with the command Vx + RELEASE. Switches off if the value falls below the "brake" threshold (adjustable between 0.1 and 1 % in the main menu "START/STOP") .

5.3.3 SPEED menu

[Vn] Adjustment speed, variable from 1 to 10%; is set so that the elevator stops in level position after adjustment (only command Vn) . Is used with large rope elongation when the cabin is no longer level after unloading. Requires an additional level flag that is shorter than that of V1.

[Vi] Inspection speed, variable from 10 to 100%. Set as required for inspection travels on the cabin roof and for returning the elevator to its starting position.

ATTENTION! Prolonged operation with Vi can cause the motor to overheat and may even result in the windings burning. For this reason you should use the inspection speed for short periods only.

[V1] Run-in speed, variable from 2 to 25%. Set so that the elevator stops level. If it stops too soon, V1 must be increased; if the cabin moves too far, V1 must be decreased. See chapter 5.6 for details of how to set the stopping accuracy via V1.

[V2] Interim speed, variable from 25 to 100%. Is only used when there are unequal braking distances in the shaft, i.e. when the distances from the floor switch (=deceleration point) to the levelling switch vary. After calibration of the V2 braking distance it is advisable to set V2 as high as possible.

[V3] Final speed, variable from 25 to 100%. Should be set to 100%; this gives the synchronous speed under pulling load and the nominal speed under braking load. Different speeds are evaluated by the controller so that the elevator stops punctually in both cases with the same creep travel (see below for menu point Set value reduction) . "SET VALUE RED." to be switched on if V3 > 90%!

5.3.4 SPEED CURVE menu

[ACCELERAT.] .. .Ramp from 0 to Vmax, variable from 1 to 100 % where 1% corresponds to roughly 6 s and 100% to roughly 1 s. Is set according to sensations inside the cabin during a travel. Recommendation: 50%.

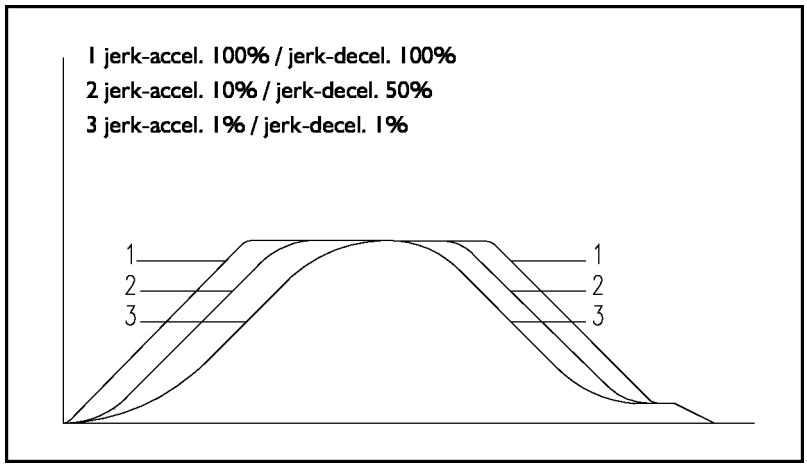


Figure 5.4
Settings for jerk-acceleration and jerk-deceleration

[JERK ACCEL.] . . . . Transition from 0 to acceleration phase and transition from acceleration phase to Vmax. 15 % corresponds to a soft round-off and 100% to a hard round-off (see Figure 5.4). Is set according to sensations inside the cabin during a run. Recommendation: 50%.

[DECELERAT.] . . . . Ramp from Vmax to V1, where 15 % corresponds to roughly 4 s and 100% to roughly 1 s. First set to 80%, then after calibration of the V3 braking distance adjust according to sensations during a travel.

[JERK DECEL.] . . . . Transition from Vmax to the deceleration phase and from the deceleration phase to V1. First set to 80%, then after calibration of the V3 braking distance adjust according to sensations during a travel.

[OPTIM.SPEED]

ON ..... .If the elevator passes the deceleration point in the shaft and has still not reached its end speed, the drive will continue to accelerate up to the deceleration point calculated by the controller and will then round off into the deceleration phase (see Figure 5.5).

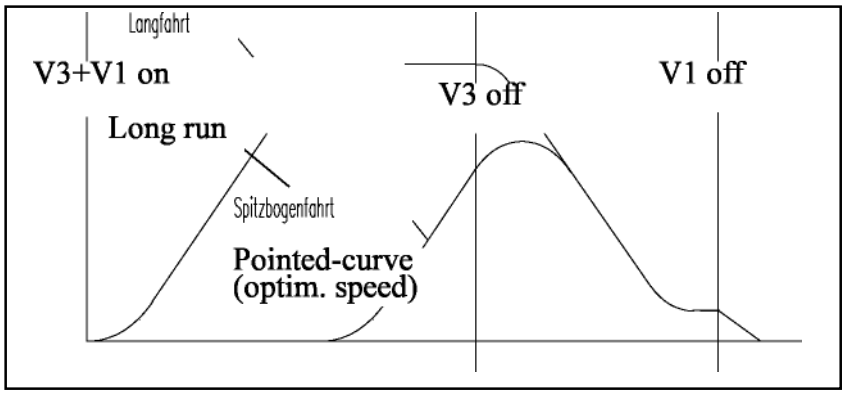


Figure 5.5
Characteristic of a pointed-curve travel, see text

OFF If the drive is to decelerate at the deceleration point in the shaft even if the end speed has not been reached yet. Finds application on travelling gear in manual operation. The function must be switched on for normal elevator operations.

[SET VALUE RED.]

ON If the end speed V3 is set to 100%, the motor will only reach nominal speed under braking load. The controller will then reduce the set value from 100% to the maximum actual value in order to ensure proper control (see above, Speed V3) .

OFF Switch off if you do not require a V3 speed of 100 %. In this case the controller must know as soon as it overrides during driving. The V3 speed must then be reduced until the controller no longer overrides. N.B.: The setting is then identical with LED CONTROLLER OVERRIDES in the MICOMPACT 320.

[BRAKING V2] . . . . Scanning of braking distance for short stops (shorter distance from the floor switch to the levelling switch than on a long travel) . Is driven at V2 speed. The controller decelerates immediately upon reaching the floor switch and creeps for a relatively long time to the levelling switch. The controller calculates the optimum deceleration on the basis of the braking distance from the floor switch to the levelling switch. If the V2 travel is repeated, the elevator will pass the deceleration point (floor switch) and continue travelling up to the calculated deceleration point. The duration of the run-in speed V1 is thus minimized to around 0.3 s. See Figure 5.5a for explanation.

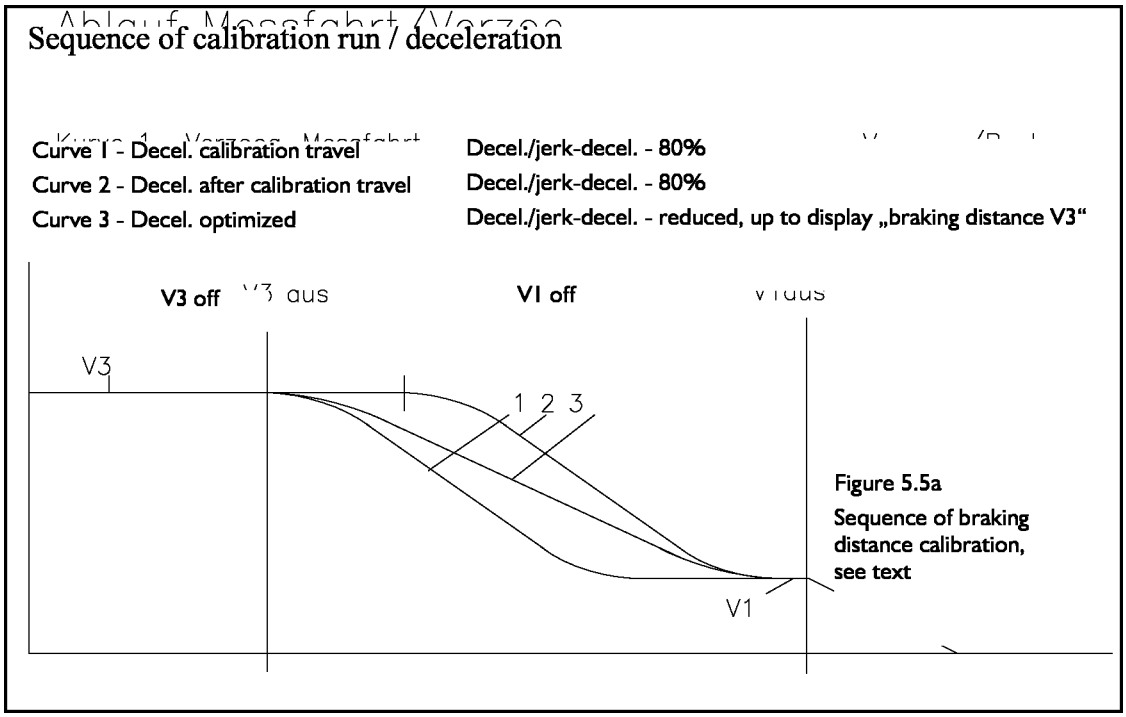


Figure 5.5a
Sequence of braking distance calibration, see text

[BRAKING V3] . . . . Braking distance scanning for long stops with speed V3. The same applies here as in the preceding section.

PLEASE NOTE: If the two previous points are unwanted, V2 and V3 must be set to OFF in the BRAKING DISTANCE display. In this case the duration of the runin speed V1 must be adjusted via deceleration and jerk-deceleration (see above). We wish to point out that the duration of the run-in speed should be chosen as short as possible in order to prevent unnecessary heat losses in the motor.

[SET VALUE]

INTERNAL .....Set value is calculated internally in the controller.

EXTERNAL Set value can be fed externally to terminals 32, 33. This function is available by special request only. Please specify when ordering!

ATTENTION! In this function the set value generator is not isolated. Risk of damage to the controller! Terminal 32 is the controler's zero-volt line.

5.3.5 START/STOP menu

[START TORQUE] . . If the pulling load pulls the drive briefly in the opposite direction during a start, the starting torque can be increased until the motor no longer reverses. The most critical point is EMPTY DOWN from the very top stop.

[RETARDAT.] Starting delay, variable from 0 to 1000 ms. If the motor works against the mechanical brake due to the contactor and control system delay times, the controller start can be delayed until the mechanical brake has reliably opened.

[PRE-BRAKING] . . . If the drive is pulled away so quickly under puling load that a jerk can be felt in the cabin, you must increase the pre-braking value. During a start the motor is then fed with direct voltage, which cushions the jerking. The most critical point in this connection is EMPTY UP to the very top stop.

[BRAKE] ..... .If the speed threshold 0...1 % is underranged during a stop, the TRAVEL relay will drop out and the controller will brake electrically for around 0.5 s. The TRAVEL relay will switch off the contactor for the mechanical brake. Recommended value: 0.5 %.

[AFT.BRAKING] . . . . Afterbraking voltage adjustable (0...100% =0...300VDC). Function is active for 0.5sec., when motor reaches a speed value of ZERO, so that the motor will be hold tight, if the mechanical brake falls in to late. Recommended values: 2*braking coils serial: 40%; 3*braking coils serial: 70%

[BRAKE RAMP] . . . . End deceleration from V1 to zero. Ramp over levelling flag. If you feel a small jerk during the end deceleration, reduce the value. Variable from 1 to 50%, recommended value: 20%. the braking ramp can also be used to adjust the halting accuracy (see chapter 5.6).

5.3.6 DRIVE UNIT menu

[MOTOR] .....Enter the pole number of the motor: 2, 4 or 6.

[TACHO] ..... .Enter the number of pulses of the digital tacho-generator per revolution. Range: 48 to 300 pulses/revolution.

[TOLERANCE] Only for the analog tacho-generator version MICOMPACT 330A! Adjustment of the collector tacho tolerance. You will need a rev counter! See chapter 7.3.3!

5.3.7 OPERATION PARAMETERS menu

[PASSWORD]

OFF All parameters and controller settings are always accessible.

ON > 0000. Enter any four-digit number. Access to all settings will be blocked one hour after the last key is pressed.

ATTENTION! Loss of the password will prevent all further access to the controller! Note your individual password shaft. Unlocking is only possible in the MICOTROL factory.

[OP. TIME] ..... Operating hours counter

[ERROR] Menu point not yet used (12/94)

[VERSION] Display of the software version number. These operating instructions were drawn up on the basis of version 1.18 dated 28.04.1994.

[LANGUAGE] You can choose between the following language versions for the menu displays: German, English, Italian, Swedish. Other languages are possible (option).

5.3.8 SP. CONTROLLER PARAMETERS menu

[ATT. ACCEL.] Adjusting range from 0 to 100%. If vibrations arise during acceleration, this value can be increased. Recommendation: 0%.

[ATT. TRAVEL] . . . . Adjusting range from 0 to 100%. If vibrations arise during constant travelling, this value can be increased. Recommendation: 0%.

[ATT. DECEL.] . . . . Adjusting range from 0 to 100%. If rope vibrations arise during deceleration (usually during run-in) due to undamped bearings, this value can be increased. Recommendation: 10%

[ATT. STOP] Adjusting range from 0 to 100%. If vibrations arise during the end deceleration, this value can be increased.

5.3.9 Check run

To complete the controller adjustment, travels are conducted with various loads to check whether comfort and performance score optimum marks.

Special attention must be paid to the elevator's acceleration and deceleration characteristics as measured by the passenger's sensations. If a short deceleration path is specified for fast elevators, the transition from deceleration to run-in speed may be experienced as unpleasant. In this case it is advisable to adjust the deceleration and jerk-deceleration (round-off).

If the message "OVERLOAD BRAKING" appears in any situation during a travel, the jerk-deceleration or deceleration must be reduced; if necessary, set the shaft switches further away from the stopping position!

See also chapter 6 for the diagnosis and rectification of adjustment errors!

PLEASE NOTE: Once you change the position of the shaft switches it is imperative to carry out a new calibration travel to release the controler to note the new shaft data!

5.4 Skeleton instructions

These skeleton instructions provide a summarized overview of how to start up the controller. They are intended as a source of help for the experienced commissioning engineer or control system builder. To install the controller it is essential to know the complete instructions.

5.4.1 Installation Instaling the controller

- ☞ Shielded cables must be used for the tacho-generator lines and for any other encoders. Connect the cable shield of the external encoder to PE and to the corresponding separate shielding terminal on the controller's terminal strip.
- ☞ The ambient temperature in the control cabinet must not exceed 45°C.
- ☞ Remember to remove the waste heat from the controller! Figure 3.2 ists the heat output of the various types of controller in table form. Provide adequate ventilation!
- ☞ Set the deceleration switch with a precision of +/-5 mm; set the levelling switch to at least +/-2 mm. The levelling signal must be issued approximately 4 - 10 cm ahead of the floor. Figure 5.6 shows the necessary distance of the switches.

Connecting up the units

Connect up the controller in accordance with the terminal diagram in Figure 4.2. To do so, remove the metal cover by loosening the front screws.

Important details:

- ☞ Fusing: Use only ultra-quick-acting fuses. The fusing current must be no higher than double the nominal controller current.
- ☑ Check the mains voltage and nominal current (controller rating plate and the motor rating plate!)
- ☑ Speed default: Check that the control voltages in the control system and controller (rating plate) are in conformance.
- ☞ Meaning of the various speed signals in Figure 2.1 (travel diagram)

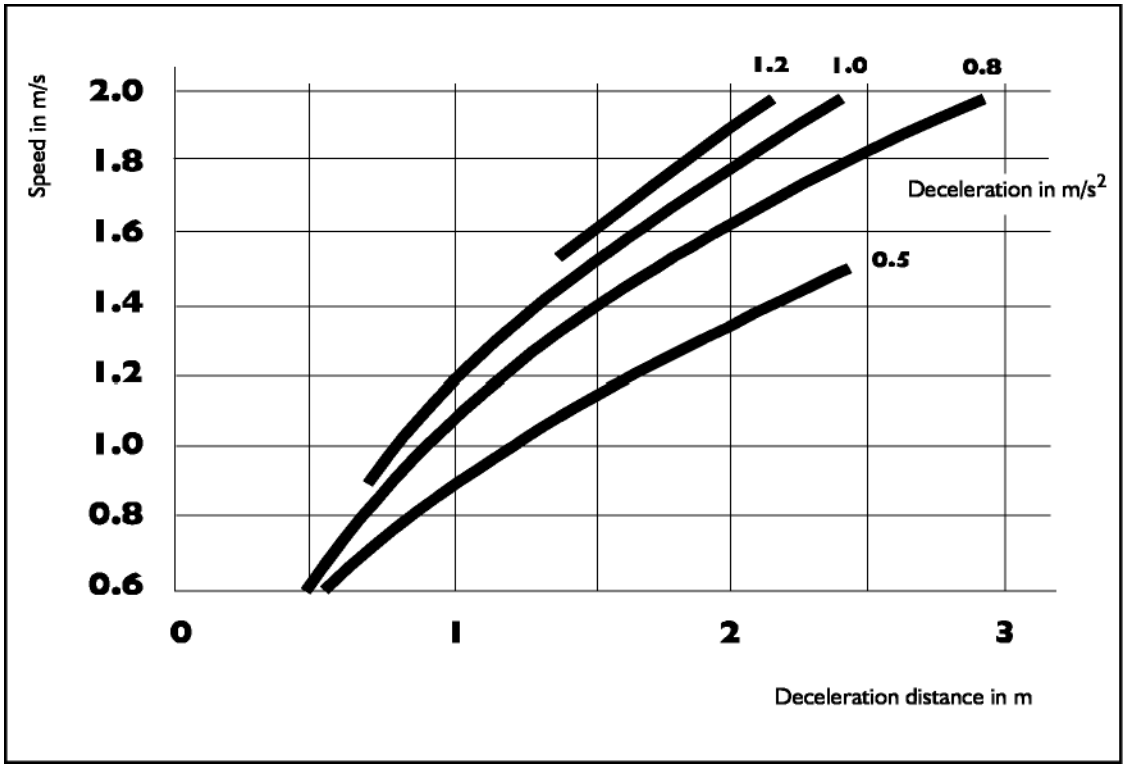


Diagram 5.6
Estimate of the deceleration distance. Exact values depend on the elevator and its design.

- ☞ RELEASE signal: The release signal must be issued with each travel command and must not be switched off again until about 1 second after standstill is reached! EXCEPTION: On an inspection travel the RELEASE signal must be switched off immediately.
- ☞ Main contactor and direction contactor are actuated directly by the controller via the M-C output relay; delayed after the end of a travel.
- ☑ TRAVEL relay: If the controller has the relay drop out after the end of a travel, the electromagnetic brake must be engaged immediately by the control system.
- ☞ MAINS relay: Fault message for mains failure, fuse failure, undervoltage, temperature too high, tacho broken.

- ☞ Three possibilities for connecting up the digital tacho-generator: -15.0, + 15 V (terminals 30, 29, 31), + 10 to +30 V (terminals 31 and 29) or 0 to +24 V (terminals 31 and 30) .
- ☞ Load measurement (-10/+ 10 VDC) and external set value (0-10 VDC) : these inputs are not of isolated design!
- ☞ Motor protection: If there are no PTC thermistors, terminals 16/17 must be jumpered.
- ☞ Fan: Units from 80A upwards have cooling fans which must be connected up separately to 230 VAC (terminals on the heat sink).

5.4.2 Starting up

All the controller settings are made with the four jog keys and the above lying LCD. As an option it is also possible to set up the controller from a PC using MICOMPACT PC software.

Key functions:

- Arrow keys: Move through main menus or through sub-menus. Increase or decrease numerical values in entry mode. Switch between selection statuses, e.g. ON/OFF.
- ENTER: Move from the main menu into a sub-menu (move to the right in Figure 5.2). Select entry mode in sub-menus. Adopt entry values.

PLEASE NOTE: If you do not press ENTER after selecting a value, the original value will be re-adopted after the next time the controller is switched off.

- QUIT: Move from sub-menus to the main menu (move to the left in Figure 5.2) . Exit entry fields, with retention of any new numerical value until the next time the controller is switched off.

Step sequence

For the standard controller set-up, proceed as described below. For fine tuning or in the event of any trouble, read chapter 6.

☞ Switch on the controller. Wait for the self-test routine. Press any key.

☞ Move through the main menus until you reach the DRIVE UNIT menu. Set the MOTOR POLE number and tacho resolution (for a digital tacho-generator) or TOLERANCE (for an analog tacho-generator).

☞ Start an UP or DOWN travel. Check the interplay between the control system and the controller.

☞ Watch the display on the controller.

☞ Carry out a calibration travel for automatic determination of the braking distance. To do so, set BRAKING V3 and then BRAKING V2 (if V2 exists) in the SPEED CURVE main menu to [meas + ENTER] and carry out a travel.

☞ SPEED main menu: Set V1 so that the cabin halts in level position. Move the levelling flags if necessary. If the elevator stops too soon: increase V1. If it stops too late: decrease V1.

☞ Check the creep times V1 on all floors, UP and DOWN: The following data must be indicated on the display in succession during the run: 0 -V3 / V3 / V3 -V1 / V1 / V1-0.

PLEASE NOTE: V1 must be indicated on a l floors for 0.3...1 sec. If this is not the case, the deceleration switches on the floors in question must be moved, or a new calibration run must be carried out on these floors.

☞ SPEED CURVE main menu: To begin with, leave the factory settings as they are. After the first travel you can adapt the round-offs (jerk-acceleration and jerk-deceleration) and the acceleration and deceleration slope to the floor distances and passenger sensations.

☞ Deceleration/jerk-deceleration can be reduced until the RED LED lights up and the display shows: BRAKING V2/V3. Now increase the value again until the two signals disappear.

☑ OPTIM. SPEED mode and SET VALUE REDUCTION generally remain switched on, and external SET VALUE switched off (factory setting).

☞ If the machine reverses during a start: Increase the starting torque in the main menu START/STOP.

☞ If the drive starts up against the engaged brake, you must correct the setting for the RETARDATION (increase the value in [ms]).

- ☞ If the drive pulls too quickly in the right direction, you must increase the value for the pre-braking (menu: START/STOP).
- ☞ Now carry out an inspection travel in the cabin.
- ☞ START/STOP main menu: To begin with, leave the factory settings for the braking point and pre-braking. Correct if necessary after the test travel. Switch on load measurement if necessary and if sensor is available and connected up.
- ☞ CONTROLLER PARAMETERS main menu: If deceleration is accompanied by notable vibrations, increase ATT. DECELERATION.
- ☞ SP. OPERATION PARAMETERS main menu: To begin with, leave the password as it is (factory setting [OFF]); it can be specified and activated later.

ATTENTION! Prolonged operation with Vi (or any other speeds below 90-100%) can cause the motor to overheat and may even result in the windings burning. For this reason you should use the inspection speed for short periods only.

5.5 Adjustment of stopping precision

The precision with which the elevator stops can be influenced by adjusting the runin speed V1 (see chapter 5.3.3) and/or the braking ramp (see chapter 5.3.5). Diagrams 5.7a and 5.7b show the relationships.

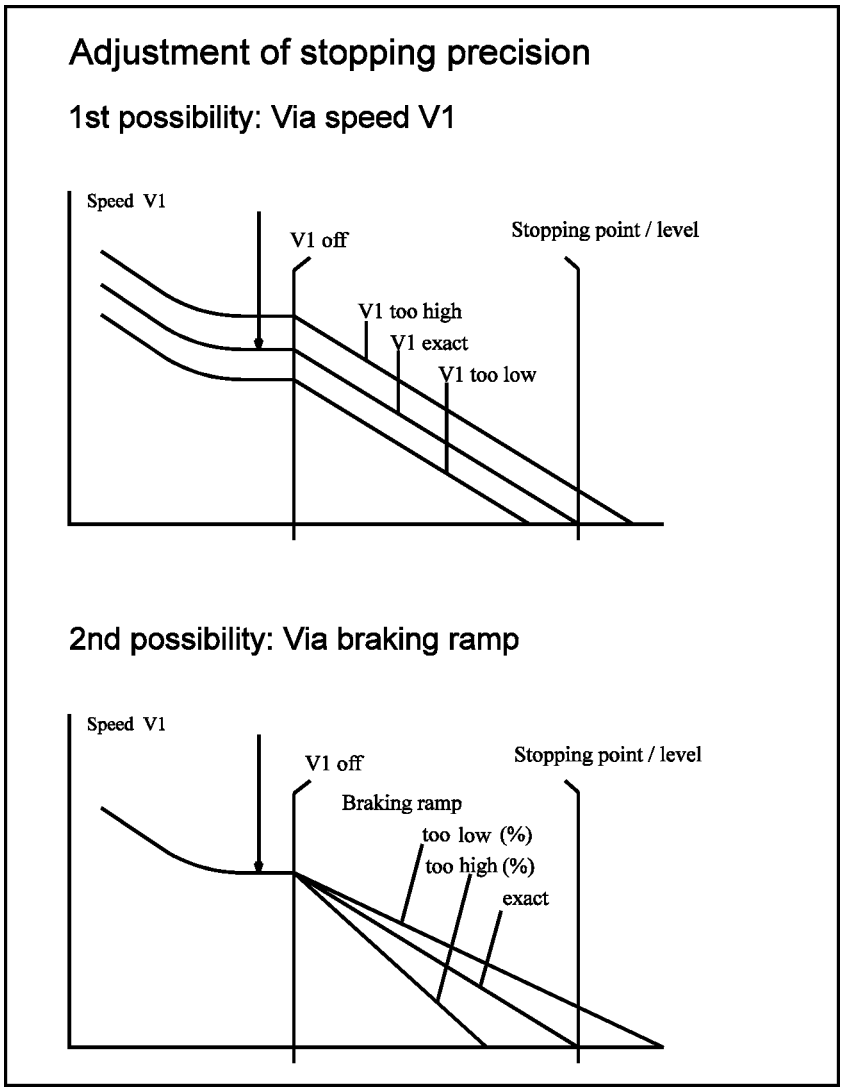


Figure 5.7a/b Adjustment of stopping precision via runin speed V1 or the braking ramp

6 Description of errors

6.1 Error diagnosis

6.2 Replacement of EPROMS

6.3 Servicing and spare parts

Summary of chapter

This chapter looks at a variety of errors that can arise when putting the controller into operation. It also describes how to use new EPROM versions with current programs. To round off, you will learn a little about maintenance, servicing and spare parts.

6.1 Error diagnosis

6.1.1 LED indicators

To the right of the display (see Figure 3.5) you will find one green and one red LED, which are used to indicate important messages supplementary to information on the display.

GREEN LED ..... .This LED is always on as long as there are no serious errors in the controller or the controller's periphery.

RED LED ..... .The red LED lights up steadily with each error message until a key is pressed by way of acknowledgement, until a new run begins and until the error is rectified. The red LED lights up briefly with WRONG DIRECTION or OVERLOAD BRAKING.

6.1.2 Display messages

This chapter describes the system messages that may appear on the controller's LCD.

Help is available with irregular controller behaviour and any problems in connection with critical elevators.

Errors are indicated by plain-text error messages in the first display line. The message will not disappear until the cause of the error is rectified, until the wrong setting has been changed, or until a new start is made.

!ERROR! Phase sequence

☑ Mains supply L1, L2, L3 in wrong phase sequence

!ERROR! Undervoltage

☑ Undervoltage: The mains voltage lies more than 15 % below the nominal voltage.

☑ Wrong mains voltage; check the mains voltage against the data on the rating plate.

☑ One phase is missing.

!ERROR! Mot. temperature

☑ Wrong PTC thermistor installed in the motor.

☑ Motor PTC thermistor is not connected correctly to the controller, terminals 16, 17.

☑ If the motor PTC thermistor is checked by a separate monitor, the terminals 16, 17 must be jumpered.

☑ Motor really is too hot!

!ERROR! Wrong direction

☞ Pulse cables swapped at terminals 27, 28.

☞ The UP command is missing. It must be activated by the control system via the UP contactor.

☑ Check the digital tacho-generator and its connecting cable.

☑ Check the mechanical link between the tacho-generator and the motor shaft.

!ATTENTION! Wrong direction

(The message appears for a maximum of 2 seconds and is then followed by the message !ERROR! Wrong direction.)

☞ Motor reverses during a start. Increase the starting torque (START/STOP menu) until the motor starts up in the right direction.

☞ N.B.: You can ignore a short flash of the red LED to the right of the display if the start-up characteristic feels O.K. in the cabin. The red LED lights up for as long as the motor turns in the wrong direction, but the error message is retained for a further two seconds.

!ERROR! Tacho failure

Possibility A: Motor does not start up.

☑ Main or direction contactor does not pick up.

☑ Mechanical brake does not disengage.

- ☑ Line between controller and motor is broken
- ☑ Star point missing from motor winding.

Possibility B: Motor starts up but is switched off by the controller after two seconds.

- ☑ No tacho pulses at the input.
- ☑ Check tacho-generator! Digital or analog tacho-generator? Rating plate: 330A for analog tacho, 330D for digital tacho input.
- ☑ Check tacho-generator connections!
- ☑ Signal from the digital tacho-generator must be bigger than/equal to +5V and smaller than/equal to 0V from terminal 30 to terminals 27, 28.
- ☑ Check the tacho-generator coupling!

!ATTENTION! Overload braking

- ☞ Too little braking torque. Connect brake coils in series (one winding in phase opposition!), see connection diagram. Connect brake coils in delta for 230V mains supply!
- ☞ Reduce deceleration (SPEED CURVE menu) !
- ☑ Braking distance too short: The braking distance should correspond to around 1.5 times the running speed.

!ERROR! Variance

Possibility A: Message while starting or during a travel

- ☑ Compare the pulse number setting (DRIVE UNIT menu) with the tacho pulses and correct if necessary.
- ☑ Compare the motor pole number setting (DRIVE UNIT menu) with the motor's pole number and correct if necessary.
- ☑ Phase sequence of power section terminals L1, L2, L3 and printed board terminals L1, L2, L3 must be identical.
- ☑ Check tacho-generator and tacho coupling!

Possibility B: Message during deceleration. N.B.: This message is preceded by !ATTENTION! OVERLOAD BRAKING.

- ☑ Connection from controller bar A/B to the motor is missing.
- ☑ See above for error description: OVERLOAD BRAKING

Possibility C: Message while stopping

☑ Main or direction contactor or the mechanical brake are switched off too soon. The mechanical brake must not engage until standstill is reached! The main and direction contactor must stay picked up for around 0.5 seconds after standstill is reached.

☑ See connection diagram for interlock.

!ERROR! Dissipator

☑ The controller's power section overheats. The ambient temperature in the control cabinet must not exceed 45°C! Compare the nominal current of the controller with that of the motor: The nominal current of the motor must not exceed that of the controller.

6.1.3 Unexpected travel characteristics Drive starts up with a jerk

Possibility A: On an empty Up travel

☞ Motor must not start up against an engaged brake! If necessary, extend the starting delay (START/STOP menu).

☞ Increase the pre-braking (START/STOP menu).

Possibility B: On an empty Down travel

☞ If the motor reverses, increase the starting torque (START/STOP menu). Increase the starting torque just enough to stop the motor from reversing.

Possibility C

☑ In the case of 2:1 suspension with rollers on the side of the cabin, make sure that the cabin guide system is working properly as otherwise the cabin will be pulled initially on just one side.

☑ The use of guide rolls is advisable for perfect starting at speeds higher than 1.6 m/sec.

Cabin/drive vibrates while running in

☞ Increase ATT. DECEL. (CONTROLLER PARAMETERS menu) until you can no longer feel any vibrations in the cabin.

Jerk while stopping.

Possibility A: When passing the levelling switch

- ☑ Reduce the BRAKE RAMP (START/STOP menu), e.g. from 20 to 7%. You must then adjust the stopping precision, however, with V1 (SPEED menu).

Possibility B: When at standstill

- ☑ Main or direction contactor drops out too soon (see description of ERROR VARIANCE, 2nd possibility).
- ☑ Mechanical brake engages too soon. Reduce BRAKE (START/STOP menu) from 0.5% to around 0.2%.
- ☑ The RELEASE command is switched off too soon. RELEASE must be retained for at least 0.5 seconds after standstill is reached.

Noises during braking

- ☞ Under certain circumstances replace the two-phase rectifier (Graetz bridge, type 330DGb) with a three-phase rectifier (three-phase bridge, type 330DDb). N.B.: It is not possible to retrofit the three-phase rectifier. The complete controller has to be replaced.

6.1.4 Controller errors

If it proves impossible to rectify any controller errors and malfunctions by changing the parameters and data entries, there will usually be no chance of repairing the controller successfully in-situ. You can replace power semiconductors (only ever in a measured set) after consulting with our factory in Alzenau; the same applies for a complete printed board.

Repairs to the main printed board are not possible, however, because they require special instrumentation which is only available in our testing laboratory.

PLEASE NOTE: We draw express attention to the fact that repairs to the main board should only be carried out by our service technicians because otherwise there is a risk of destroying expensive digital components.

The front panel should not be removed again from the printed board once the terminal connections have been made. Underneath the panel are touch-sensitive digital components that will be destroyed especially if subjected to static charging. There are no control and indicator elements under the metal cover to warrant gaining access.

6.2 Replacement of EPROMS

In certain special cases it may be necessary to replace the programmable memory components (EPROMS) in consultation with MICOTROL. This might be necessary with special cases of application where use is made of modified software.

In these cases, proceed as follows:

- ☞ Disconnect the controller from the mains.
- ☞ Remove the front panel as described in chapter 3.5.
- ☞ Loosen the four screws holding the indicator chip above the main printed board at top right, see also Figure 3.4.
- ☞ Carefully pull the indicator chip straight up and off the main printed board. The bottom of the indicator chip is plugged into sockets!
- ☑ The position of the programmable memory components (EPROMS) is shown in Figure 6.1 as IC8 and IC13.

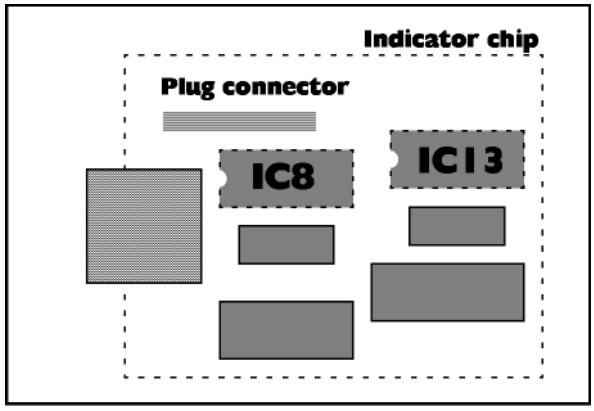


Figure 6. 1
Replacing EPROMS IC 8 and IC 13. Layout of the digital components underneath the display chip.

- ☞ Only IC8 is replaced as a rule. To do so, carefully pull it up and out of the socket, preferably using the clamp-type tool designed specially for the purpose. First note which way the notch on the top of the component is pointing.
- ☞ Insert the replacement IC in the correct direction (notch). Work carefully so that all the legs slide into the socket without buckling.
- ☞ Insert the indicator chip so that the pins on its bottom side fit in the corresponding plug connector.
- ☞ Screw the indicator chip firmly in place, swing the front panel shut and screw tight.

6.3 Servicing and spare parts

Servicing

Controllers of the MICOMPACT series require no maintenance. The electronic components used display long-term stability and are subject to no wear. Servicing is confined, therefore, to checking the terminals regularly for tightness and examining the relay contacts on the output relays for signs of arc erosion.

To prevent leakage current and flashover you should remove any dust which may collect on the chips, heat sinks and thyristors. Pay special attention to the heat sink fins and the external fans where present.

Replacement parts

No repairs may be carried out to the main board and none of its components replaced without risk of destroying the sensitive digital components. All work on the main board should be carried out at the factory in Alzenau.

Replacement parts for defective components should be obtained only from MICOTROL. We guarantee that the components are suitable for the purposes and have been tested.

PLEASE NOTE: When replacing thyristors, use only complete sets from MICOTROL! Never replace single thyristors!

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7 Accessories

Summary of the chapter

The following chapter contains information about useful extensions to controllers of the MICOMPACT 330 digital series. The three-phase bridge, the analog tacho input and the external setpoint source are extension features that cannot be retrofitted but must be ordered as special versions.

7.1 Optional fully controlled three-phase bridge

The brake rectifier is available as two different versions:

- Three-phase bridge (330D-Db) : All three phases are controlled and rectified. This results in less braking noise. The connections a/b are situated at bottom right.
- Graetz bridge (330D-Gb): Only two phases L2 and L3, are controlled and rectified. Unpleasant motor resonance may arise during braking under certain circumstances. The connections a/b are situated at bottom left.

No special measures need to be observed during installation and operation.

7.2 Radio interference suppression module

The following description of module 330FN includes a description of the device, a list of items delivered, installation instructions and a troubleshooting guide.

7.2.1 Description of the device

Module 330FN is an auxiliary component for controllers of the MICOMPACT 330 series. Together with a controller from this family, the device reduces radio interference to level N.

The module is available in four different basic versions and to match digital and analog tacho versions: 330FN-16/40 is suitable for controller output nominal currents of up to 40 A, and 330FN-60/90 for up to 90A. Each version is also available for a Graetz bridge and for the fully controlled three-phase bridge.

PLEASE NOTE: When ordering, state whether the module is to be supplied with a Graetz bridge (330FNGb) or with a three -phase bridge (330FNDb).

Higher output currents are available on special request. The standard nominal voltage is 400 V; higher voltage on request. In each power class there is one version for the Graetz bridge and one for the three-phase bridge. When ordering, please state which module you require.

The module contains a network of inductances and capacitances. It is looped into the controller's power circuit so that it is subordinate to the controller. The standing area of the overall unit does not change from that of controller on its own. The only change is to the installation depth, which increases by 80 mm. The module's fixing holes correspond to those of the controller.
Module 330FN can either be connected up to the controller in the factory or retrofitted in-situ. Module 330FN is designed solely for use with controllers of type MICOMPACT 320 and 330, not for controller types 301/302/402/403.

7.2.2 List of items delivered

Delivery of the 330FN auxiliary module includes the following items:

- One module (base dimensions identical with those of a 330 controller, height 80 mm) for installation underneath a type 330 controller.
- Five connecting cables for linking up to the controller.
- Four connecting screws and nuts for fastening to the controller.

7.2.3 Installation Mechanical work

Where necessary, the controller must be removed from the control cabinet. The controller must be mounted on module 330FN with the four fastening screws as shown in Figure 7.1 so that the connection bars are all on the same side.

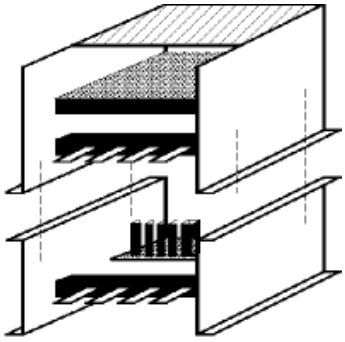


Figure 7.1

The FN-module is fixed underneath the
controller. All connection bars show into the same direction.

In the case of controllers with external ventilation (cooling fans), a thin aluminium plate must be installed as an air baffle between the module and the controller in order to guarantee the correct flow of cooling air and to maintain the permissible operating temperatures. This baffle plate can be order as an accessory if necessary.

The unit, which is now 80 mm deeper on account of the module base, can then be installed in the control cabinet.

Electrical connections.

The five connecting cables must be laid from the module and the controller bars and screwed in place as shown in Figure 7.2.

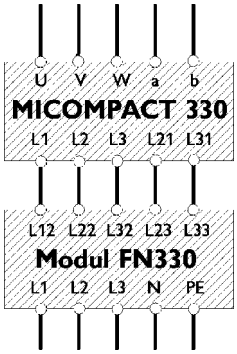


Figure 7.2
Joining up the connection bars of the FN module and the controller: The mains connection and N/PE are connected directly with the module, not with the controller. The motor connection is taken straight from the controller.

PLEASE NOTE: The mains connection and N/PE are not joined up to the controller but to the 330FN base module! Only the motor connection (bars U, V, W, a, b) is taken straight from the controller.

Putting into operation

After checking that the connections are the right ones and making the printed board connections on the controller, there is no further action to be taken apart from the usual procedures for putting the controller into operation.

Malfunctions

If there is an earth-leakage circuit-breaker (e.l.c.b.), it may be triggered under unfavourable circumstances. This has been known to happen only very rarely.

In such a case it is advisable not to join together the N-conductor of the higher-level control system and the N-conductor connected to the 330FN module ahead of the e.l.c.b. but to lay both conductors separately up to the e.l.c.b. This measure has proven successful particularly when there are long cables between the e.l.c.b. and the control system or controller (see Figure 7.3).

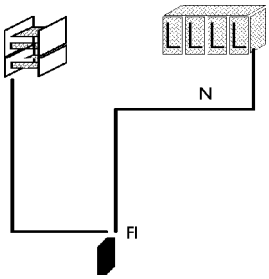


Figure 7.3
If the earth-leakage circuit-breaker (e. l. c. b.) responds incorrectly, the N-conductors should be laid separately up to the e. l. c. b.

The 330FN module requires no maintenance. In the case of controllers with cooling fans it is essential to install the baffle plate between the controller and the module in order to ensure the permissible operating temperature!

When the time comes to scrap the module and controller, be sure to observe you local regulations governing the disposal and recycling of aluminium, printed board material and electronic components, particularly ferrite cores, cooper cables, capacitors and PVC.

7.3 Optional analog tacho input

The analog tacho-generator must be connected up to terminals 27 and 28 in place of the digital tacho-generator (see Figure 4.2). The type of tacho-generator must be selected in the corresponding menu point (see chapter 5).

This chapter applies only to MICOMPACT 330A controllers that are equipped with the ANALOG TACHO option. It contains information on how to install analog tachogenerators on the MICOMPACT 330A.

The analog tacho input cannot be retrofitted! Allow for this fact when ordering (order: 330A for analog tacho input, 330D for digital tacho input)! On the other hand, a MICOMPACT 330A with analog tacho input cannot be changed over to a digital tacho-generator.

7.3.1 Suitable tacho-generators and connecting them up

It is fundamentally possible to connect up all makes of tacho-generator that supply an output voltage of 60 V or 40 V per 1000 motor revolutions. The combination of tacho-generator type and motor pole number is set once only (see below). Shielded cables must be used for the tacho lines.

The tacho-generator is connected up to terminals 26 (shielding) / 27(+) / 28 (-) as shown in the connection diagram.

PLEASE NOTE: Terminals 29/30/31 are not available in the analog version!

[ERROR] ..... If the controller switches off after the first start and issues the fault message ERROR WRONG DIRECTION, the tacho terminals 27 and 28 have been swapped!

7.3.2 Adjusting the tacho-generator

To carry out the following adjustments, you must remove the printed controller cover panel (loosen screws on cover, loosen screws at back and side).

DANGER! LETHAL DANGER FROM HIGH VOLTAGE! SWITCH OFF MAINS FIRST. DO NOT PUT BACK INTO OPERATION UNTIL YOU HAVE REFITTED THE FRONT COVER!

In the bottom right corner of the main printed board (see Figure 7.4) you will find

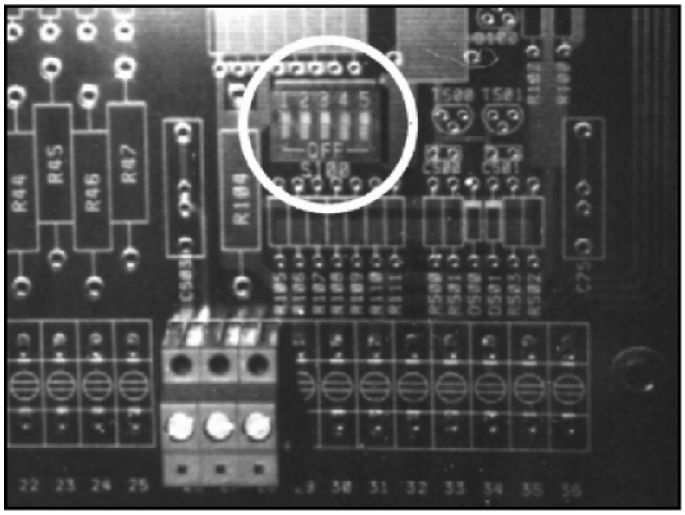


Figure 7.4
DIP switch for adjusting the analog tacho-generator on the main board

a coding switch for setting the mains frequency, the setpoint tacho voltage and the motor pole number.

The coding switch contains five slide switches that can be moved with a small screwdriver. Down position means OFF.

Setting the mains frequency

- Mains frequency 50 Hz: Switch 1 up (ON)
- Mains frequency 60 Hz: Switch 1 down (OFF)

Setting the motor pole number and the tacho -generator's standard voltage

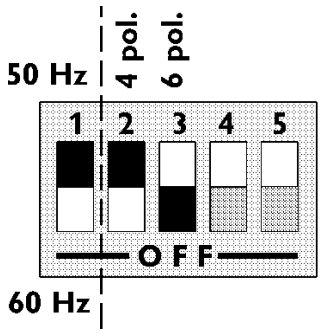
TACHO 60 V / 1000 rpm

- Motor 4-pole: Switch 2 up (ON)
- Motor 6-pole: Switch 3 up (ON)

TACHO 40 V / 1000 rpm

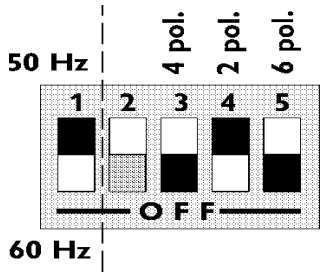
- Motor 2-pole: Switch 4 up (ON)
- Motor 4-pole: Switch 3 up (ON)
- Motor 6-pole: Switch 5 up (ON)

PLEASE NOTE: Push up only those switches that are actualy needed! A l the other switches must be OFF!



Example in Figure 7.5:

The controller is set for a tacho-generator with 60 V/1000 and a four-pole motor.



Example in Figure 7. 6:

The controller is set for a tacho-generator with 40 V/1000 and a two-pole motor.

7.3.3 Tacho-generator calibration

An analog tacho-generator must always be calibrated (not every analog tacho-generator supplies its nominal voltage at exactly 1,000 rpm).

- ☞ Carry out a long travel at a defined speed (e.g. V2 = 50%),
- ☞ move into the DRIVE UNIT main menu,
- ☞ change the % value under sub-point TOLERANCE until e.g. with a four-pole motor you measure a speed of 750 rpm at a setpoint of 50%.

7.4 Optional controller set-up via PC

With a PC you can make all the controller adjustments on-line, can save the settings on a data carrier for subsequent retrieval, can display all the controller status messages on the monitor, and can present the actual and setpoint run curves in graphic form.

The nine-pole socket on the front side of the controller allows you to set up the controller completely by PC instead of with the LCD as well as to perform numerous additional functions.

The electrical data of the link to the PC complies with the standard RS-232 interface with isolation.

Software and a user manual are included with the delivery.

An interface cable for linking the RS 232 interface of a standard PC to the socket on the front panel of the controller can be supplied as an optional item.

A separate operating manual describes the controller/PC operations and interactions.

7.5 Cabin load weigh

To enable the controller to adapt better to the load conditions, it is possible to connect up a load sensor such as is installed in many elevators with DC drive. Its output voltage must rise linearly with the cabin load from -10 to + 10 V; 0 V means load equalization. Connection is made via terminals 35 and 36, which are only assembled on request (state when ordering!).

Use of the load sensor is specified in a menu (see chapter 5.3.5).

DANGER! There is no electrical isolation in this operating mode!

7.6 External set value source

For special applications in automated warehousing a menu point can be used to switch off the set value calculator (see chapter 5.3.4), which normally determines the run curve. Instead it is possible to feed in an independent and externally generated set value as 0 - 10 V direct voltage (terminals 32/33 are assembled on request). The speed is controlled proportional to this voltage range.

DANGER! There is no electrical isolation in this opera