# 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 fatally 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! 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.*




*DANGER! When the power supply is connected up, the inside of the controller and its external terminals will 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 controller is screwed properly in position!Never poke inside the controller 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 will 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. Allow the unit to cool before getting close to the heat sink!*




*DANGER! Risk of crushing and damage to controller if it is not stood up firmly. Only stand the controller on flat surfaces with adequate load carrying capacity before installation! Do not stand the controller upright otherwise it can fall over.*




*ATTENTION! Fatally dangerous high voltage even after switching off the mains power supply. Different components inside the controller are under high voltage for about three minutes after disconnection from the mains power supply. Only open the cover after these three minutes have elapsed. Never operate the controller with the cover open.*



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

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MICOVERT 340 controllers

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The state of technology at the time of the joint dispatch of product and operating instructions by MICOTROL-SADOWSKI GmbH shall be decisive, unless otherwise stated. Technical data are subject to change without prior notice, in which case all previous operating instructions become invalid.

The General Terms of Business of MICOTROL-SADOWSKI GmbH shall apply.

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Alzenau, 23.04.1997



# Overview of chapters


General information about these operating instructions, our ***terms of business***, our ***warranty*** and the normal ***use*** of the controllers **1**

Introduction to the ***concept*** behind the controllers, their ***functional features***, and the ***schematic sequence of an elevator run*** **2**

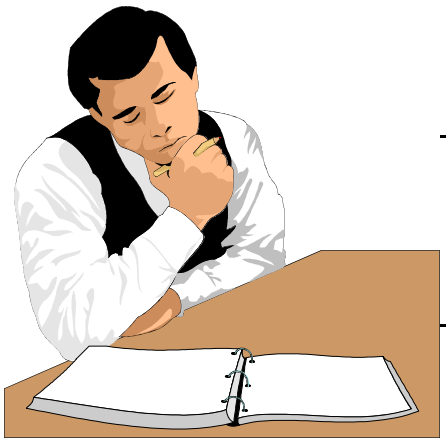
Description of the unit s design: ***Selecting the right controller, operating conditions, preparations for installation*** **3**

All you need to know about ***connections*** to the ***motor, control system and tacho-generator*** **4**

The main section for Installation and start-up. Explanation of ***menu structure*** and the different setting parameters **5**

***Installation and start-up***, setting the controller, ***skeleton instructions*** **6**

An aspect that can t be omitted: ***Troubleshooting***, improving ***comfort characteristics*** **7**

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# 1 We are partners.

## 1.1 A word about these operating instructions

## 1.2 Product liability and warranty

## 1.3 Area of application and normal use

## 1.4 Installation and operating personnel

*Summary of chapter*

Although you will certainly want to get involved with our MICOVERT 340 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.

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# 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 literature: 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 installation and start- up!*

*What's in the instructions?*

- Introduction and fundamentals: Chapter 1 to 4
- Start-up: Chapter 5 to 6
- Troubleshooting: Chapter 7

*Further documentation*

- 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. If you want to see which version of the operating instructions you have, look up the last line on the second page. The date of the last revision follows after "Alzenau, ..".

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## 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 MICOVERT 340 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 improve-

ment. 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.

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## 1.3 Area of application and normal use

### *Area of application*

Controllers of the MICOVERT 340 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 is 4m/s.

### *Combination with a control system*

MICOVERT 340 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.

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

# 1.4 Installation and operating personnel

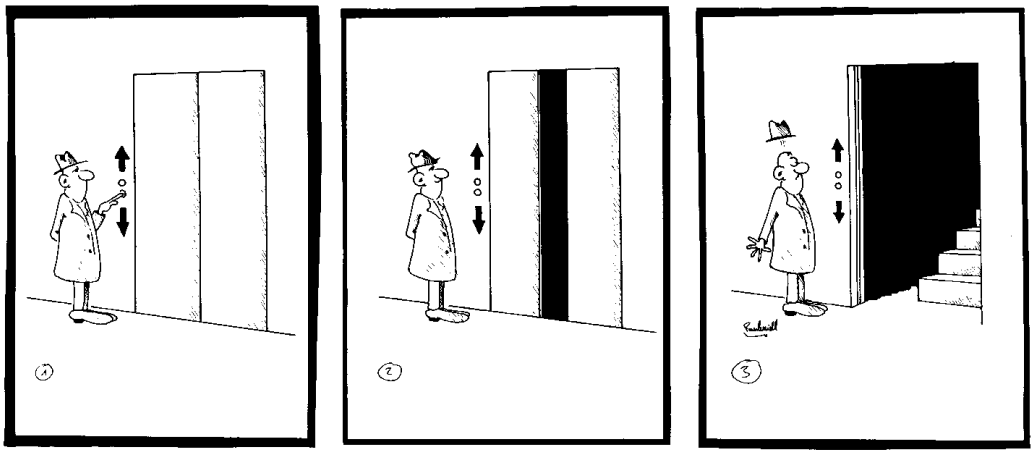


Prior to installation and/or start-up you must acquaint yourself with all the controller's details. We shall help you as much as possible with these operating instructions.

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 in accordance with IEC 364 und DIN EN 60204-1) 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..



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# 2 Description of the unit

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## 2 Description of the unit

## 2.1 Use and definition

## 2.2 Functions and features

## 2.3 Basic concept

## 2.4 Schematic sequence of an elevator run



*Summary of chapter*

This chapter introduces you to the fundamentals of MICOVERT 340 controllers and their use in comfort elevators. Read the chapter if you want to earn 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 1.3)*

The MICOVERT 340 series of controllers consists of variable speed phase control units for elevator drives with exceptionally high running comfort. The controllers are designed to control variable 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 generally to installation of the controllers in elevators, which is comparable to the function of a lifting gear in storage systems. Attention will 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) or similar standard motors of all types designed and built for speed control through frequency converters.

Radio interference suppression: radio interference level N is reached in the basic version when all installation instructions are followed thoroughly!

---

*PLEASE NOTE: We wish to point out that the operator of the overall system is responsible for observing the postal regulations in force in his area as well as the interpretation and observance of accident prevention regulations and fulfilling all pertinent standards and directives.*

---

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## 2.2 Functions and features

The main features and functions of the unit:

- The MICOVERT 340 series: efficient vector-controlled transistor pulse-controlled A.C. converter with high running comfort and best stopping precision. For supplying power to single speed standard asynchronous machines or special elevator motors.
- Range of nominal current: 12 A to 94 A
- Mains connection: 50 or 60 Hz, available for various mains voltages.
- Power pack: IGBT module for cycle frequences up to 16 kHz, very low noise development. Earth fault and short-circuit proof.
- Radio-suppression: built-in filter
- Control section: fully digitalized, hence high and lasting control accuracy. Switch over parameter set for a second drive (warehouse technology).
- Controller set-up: performed with four keys via menu structure; all status signals via illuminated LCD.
- PC control system (option): all controller settings can also be made via an IBM-compatible PC instead of through 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 running 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.
- Automatic determination of braking path.
- Six different operating speeds.
- Six 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, short circuiting and earthing connection monitoring.
- Direct running-in subject to appropriately accurate well information.
- Tacholess operation up to speeds of 1.0 m/s.
- Four quadrant operation: directional protection system not necessary.

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## 2.3 Basic concept

*The MICOVERT 340 series, power circuit*

The speed of the three-phase motor is varied by way of the indirect voltage converter and controlled through the evaluation of an actual speed signal (tacho-generator signal).

To be considered as motors are either the controllable special motors usually used in elevator technology or standard variable speed motors. The main supply for the power circuit (IGBT module) is a three-phase supply through the radio-suppression filter and a non-controlled mains rectifier in the intermediate circuit. Only the active power is taken from the mains network. The mains power supply for the electronics and recharging the intermediate circuit is through a three-phase supply on the controller board.

The required torque for the motor is gained through pulse width modulation from the constant intermediate voltage. The sinusoidal current and the frequency are varied according to the required torque. Frequency and voltage are reduced for the braking operation and the motor feeds generator energy back to the intermediate circuit and the brake resistor.

*Trigger and control section*

The control concept is based on an elevator's ideal run 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 only has a retention and safety function and is subjected to no wear. Driving and braking are controlled in accordance with a specified speed program which is derived from the ideal run curve for the passengers feeling for acceleration.

Execution of the complete control layout in digital technology with two microcontrollers enables maximum support from the controller's operating software when putting the system into operation for the first time. The controller calculates the essential elevator and operating parameters itself and saves them permanently in an internal memory.

### *Radio suppression*

A radio suppression level N is achieved as standard equal to an interference emission level admissible, for example, on housing estates, hospitals and around office areas.

---

*PLEASE NOTE: Radio suppression level N may only be achieved when all installation requirements as listed in chapter 3.4 are met! This is valid also for peripheral components and other electrical components close to the inverter!*

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## 2.4 Schematic sequence of an elevator run

This section gives a step-by-step description of a typical passenger elevator run using a MICOVERT 340 controller (see Fig. 2-1).

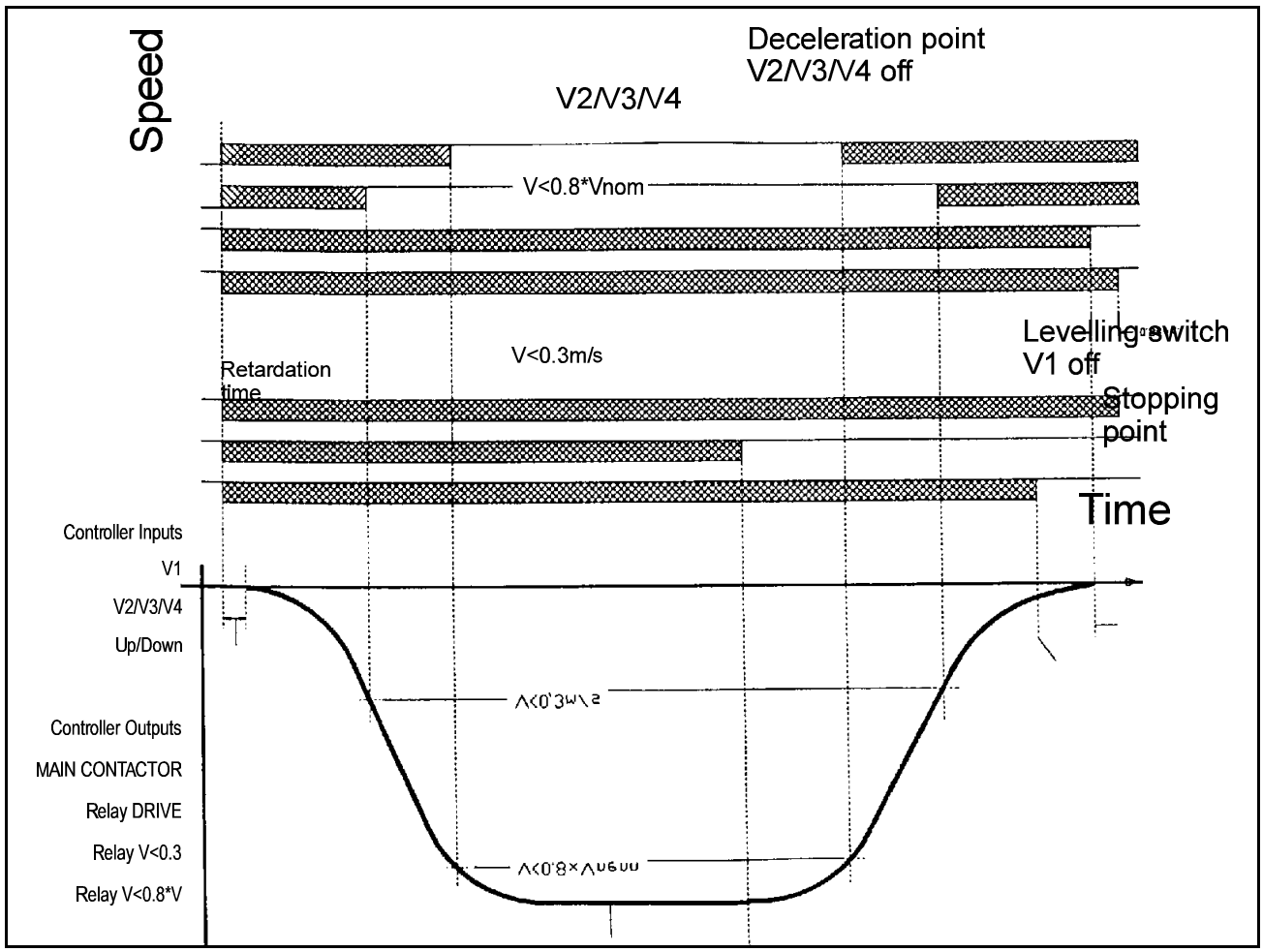



Fig. 2-1
Curve of a typical elevator run, showing the control signals and switching points

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The significance of the different speeds and the inputs and outputs are described in greater detail in Chapter 4 of this operating manual.

### *Sequence on an inspection run*

At start-up the control system sends the controller

- the travel direction signal UP or DOWN .
- The command for positioning speed V1 and
- if necessary the command for the run-in speed V1.

The controller supplies the following signals to the control system via potentialless relay contacts:

- switch on the main contactor (CONTACTOR relay),
- clear the mechanical brake (DRIVE relay).

The controller controls the motor torque dependent on the load. The drive accelerates to the desired value of the stipulated inspection or normal run speed.

When the inspection speed is stopped the main contactor and the mechanical brake are switched off by the control system (brake is applied).

---

*PLEASE NOTE: the UP or DOWN command must likewise be switched off at the same point of time as the main contactor is switched off. Only then is the controller output blocked. Otherwise the controller signals a fault: INTERIM CIRCUIT UNDERVOLTAGE !*

---

### *Sequence on a normal run*

#### *Start*

At start-up the control system sends the controller

- the command for the direction of run UP or DOWN ,
- the command for the required end speed V2, V3, V4,
- the command for the run-in speed V1.

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The controller applies the following signals to the control system through the relay contacts:

- Switch on main contactor (CONTACTOR relay)
- Release mechanical brake (DRIVE relay)

The controller regulates the torque of the motor dependent on load. The drive accelerates to the desired value of the stipulated constant speed.

### *Acceleration*

Normally the cabin is set in motion quickly and without jolting. Acceleration is increased according to the run's program and is reduced prior to transition into end speed. The transition form can be set through the jolt-acceleration (round-off factor).

### *Deceleration*

The control system switches off the fast run command V2, V3 or V4 at the deceleration point. From the calibration run conducted when putting the system into operation, the distance calculator in the controller knows the distance left to the levelling switch. From this data it continuously calculates by way of integration the last moment at 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 run-in speed V1 with the run curve determined by the distance calculator.

Upon reaching the levelling flag (about 4 to 10 cm before the stop) the control system cuts out the run-in speed V1 and the drive decelerates down to the ZERO speed, stops the motor electrically and allows the run relay to brake at which point the brake is applied.

The contactor relay breaks with a delay of 0.5 sec. During this time the motor is still held electrically until the mechanical brake has been safely applied (see Fig. 2-1, interfaces).

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For the electric stop function, the motor also needs current. Therefore the main contactor must remain switched on after the level signal has been given. If the main contactor is switched off when the standstill signal is given the drive could start up again after stopping until the mechanical brake has been applied. The controller controls the delay time up to the moment when the main contactor drops out; the main contactor is connected directly to the CONTACTOR output relay.

### *Sequence on a POINTED-CURVE run*

A pointed-curve run is a travel curve in which the specified end speed is not yet reached at the deceleration point (by well 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 Fig. 2-2).

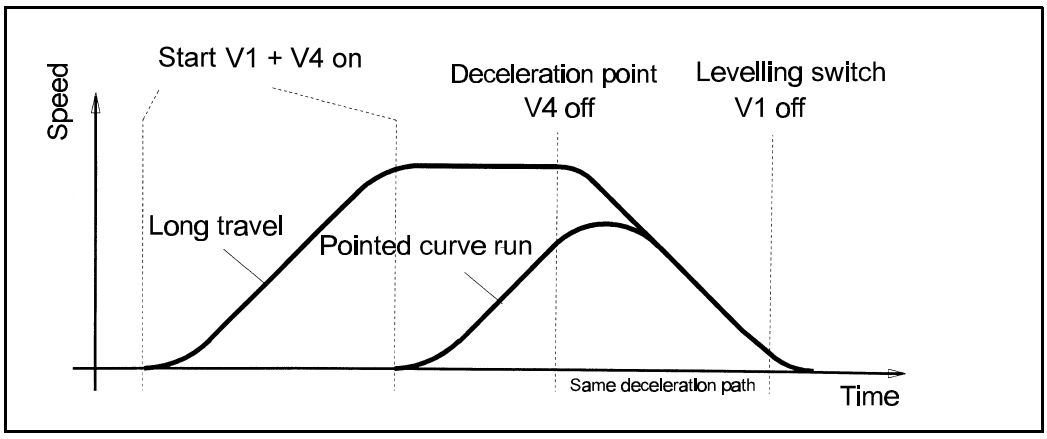



Fig. 2-2
Travel sequence on a pointed-curve run, see text

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

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# 3 Unit design


## 3.1 Selecting the controller

## 3.2 Power classes and type codes

## 3.3 Operating conditions

## 3.4 Installation notes

## 3.5 Safety features

## 3.6 Mechanical construction

## 3.7 Packaging and disposal


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*Summary of chapter*

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

## 3.1 Selecting the right controller

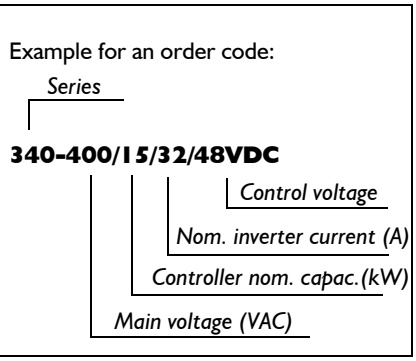
To order a controller you must first establish the following key data according to its intended use:

- ☞ Mains voltage.
- ☞ Nominal motor current.
- ☞ 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.
- ☞ Digital tacho-generator: preferably a digital tacho-generator. Key data: up to 300 pulses/revolution, push-pull, operating voltage 10 to 30 VDC. Load max. 100 mA.
- ☞ Brake resistor: see Chapter 4.6, accessories.

## 3.2 Power classes and type codes

- The controllers are available in the sizes given below (see Fig. 3-1). Higher power classes on request.
- Mains voltages of 400 V three-phase current or as required, mains frequency 50/60 Hz.
- Control voltages as required, as direct or alternating voltage

Example for an order code:




## 3.3 Operating conditions

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

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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 reach the given limit level (see Fig. 3-1 on page 4) for a maximum period of 10 sec.
- Nominal current tolerance is +5%.
- The mains power supply tolerance is +10/-20%.
- Maximum 240 runs per hour are permitted for elevator and automated warehousing applications at an ambient temperature of less than 45°C. The controller switches off automatically should a limit temperature be exceeded by the motor and/or controller.

## *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 to use a controller in a higher nominal power class from case to case. This alternative must always be clarified in advance with MICOTROL!

## *Further controller data*

- Cycle frequency: fixed to 16 kHz
- Radio suppression: as standard to EN 55011, EN 55022, VDE 0875 B. All installation instructions have to be followed (see chapter 3.4)!
- Housing type of enclosure: IP 21.



*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 allowances for the controller's heat output. A freqeuncy controller dissipates about three times the heat loss of a thyristor controller!*

| Motor nominal rating (kW) | Motor nominal current (A) | Current limit max. 10 s (A) | Mains fuse | Heat loss (W) |
|---|---|---|---|---|
| 5,5 | 12 | 18 | 20 | 270 |
| 7,5 | 16 | 24 | 25 | 370 |
| 11 | 23 | 35 | 36 | 550 |
| 15 | 32 | 48 | 50 | 750 |
| 18,5 | 39 | 56 | 63 | 870 |
| 22 | 45 | 65 | 80 | 920 |
| 30 | 62 | 93 | 100 | 1300 |
| 37 | 76 | 110 | 125 | 1800 |
| 45 | 94 | 135 | 150 | 2200 |

Fig. 3-1
Table on performance data and maximum heat development on nominal rating of controller

## 3.4 Installation

### 3.4.1 Basic Notes and Safety Precautions




*DANGER! When the controller is in operation, certain parts of the unit are bound to be under hazardous high voltage. Appropriate precautions must be taken when installing the unit in the control cabinet. This means providing separate covers for live parts in particular. IMPORTANT: even after the controller system has been sitched off some components within the system remain under high voltage for about three minutes.*

☑ You must fit the top metal cover before switching on the mains supply. All adjustments are possible with the unit closed!

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- ☑ You must observe the pertinent regulations and guidelines of your power supply company. You must also follow the installation guidelines stipulated for the site by the plant operator as well as the applicable accident prevention regulations.
- ☑ Only qualified specialists (electricians or persons with electrical engineering training) 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).
- ☑ The unit meets VBG4 requirements in ready-to-use condition.
- ☑ You must observe the pertinent VDE and DIN standards, especially VDE 0105 and DIN 57105, during installation and when working on the plant.
- ☑ Electrical connections for the motor, control system and controller must be made in accordance with the appropriate terminal diagrams and with due consideration to the pertinent VDE regulations and the guidelines of your local electric power supply company.



### 3.4.2 Installation in the Control Cabinet

- ☞ Controllers of the MICOTROL 340 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 Fig. 3-2 for dimensions.
- ☞ Make sure that the cooling air intake and discharge are not restricted in any way. To ensure this allow a gap of at least 100 mm above and underneath the unit. Permissible ambient temperature within the cabinet 45°C. See also Chapter 3.3.
- ☞ Note the controller heat loss capacity, see Fig. 3-1 on page 4! The switch cabinet must be designed and built to ensure effective heat dissipation.
- ☞ We recommend the use of separately driven fans in the switch cabinet for ventilation purposes. Such fans should be supplied with filters to avoid contamination of the controller.

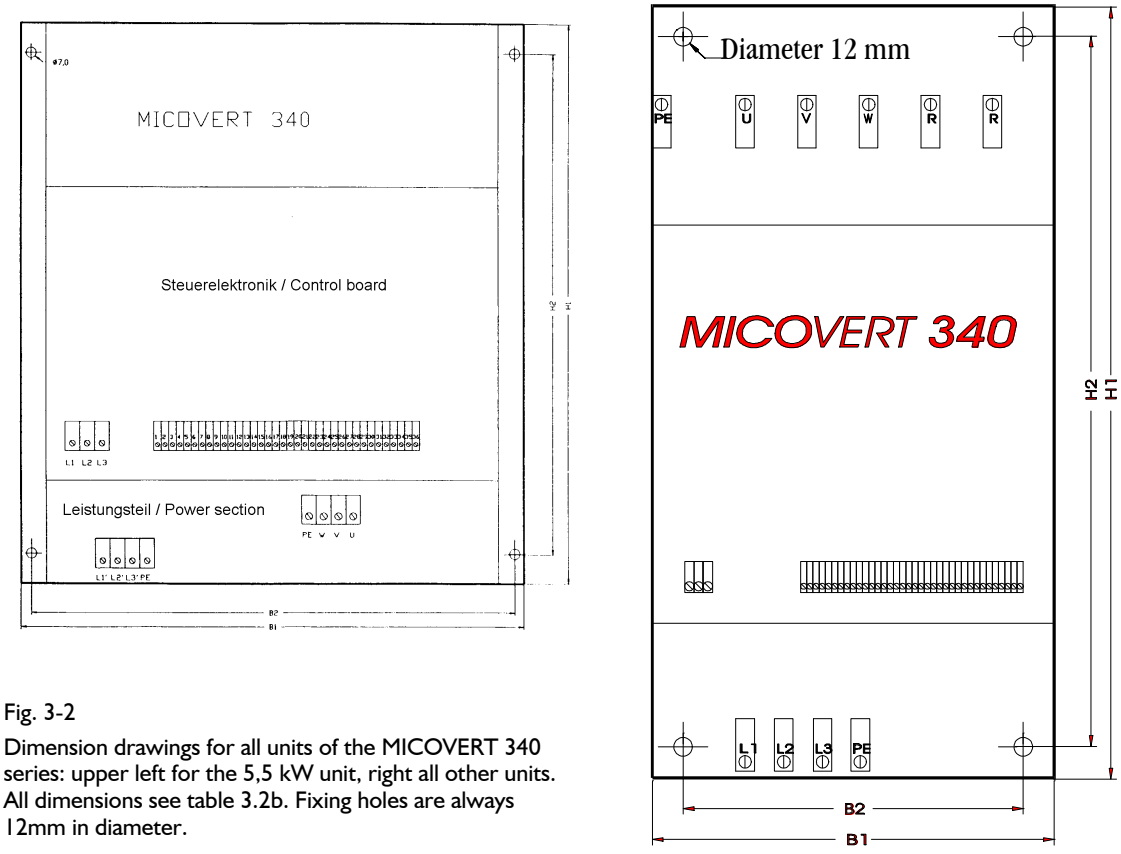



Fig. 3-2
Dimension drawings for all units of the MICOVERT 340 series: upper left for the 5,5 kW unit, right all other units. All dimensions see table 3.2b. Fixing holes are always 12mm in diameter.

### 3.4.3 Radio Interference Suppression

Without any radio interference suppression filters at the input, the required level of radio shielding can not be achieved with any frequency inverter available on the market.

It is necessary to follow these installation instructions:

☞ The controller must not be operated through residual-current-operated circuit breakers (FI-type).

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| Motor nominal rating (kW) | B1 | B2 | H1 | H2 | T |
|---|---|---|---|---|---|
| 5,5 | 340 | 326 | 380 | 340 | 180 |
| 7,5 | 310 | 250 | 540 | 520 | 230 |
| 11 | 310 | 250 | 540 | 520 | 230 |
| 15 | 310 | 250 | 540 | 520 | 230 |
| 18,5 | 310 | 250 | 575 | 555 | 230 |
| 22 | 310 | 250 | 575 | 555 | 230 |
| 30 | 310 | 250 | 880 | 860 | 230 |
| 37 | 310 | 250 | 880 | 860 | 230 |
| 45 | 310 | 250 | 1000 | 980 | 230 |

Fig. 3-3
Dimensions, all in [mm]

- ☞ The cross section of the PE-connection cable must correspond with the power connections but have cross section of at least 10 $mm^2$. ATTENTION: high current because of the input filter!
- ☞ The shielding of the motor supply cable and brake resistance cable must be on both sides. Shielding has to be of copper, not of steel leads! From the motor housing directly on the motor side and on the controller side over a large area to the cable clip available for this purpose.
- ☞ As a general rule shielded leads for analog and digital tacho-generators.
- ☞ The tacho-shielding must be connected to both sides: on the motor side directly to the housing (PE), on the controller side to terminal 31 (capacitor for PE). Leads not in use to be connected on both sides to the protective conductor (PE).
- ☞ Suitable R-C combinations must also be used for radio interference suppression of all contactors. This is valid for all relays, also without the cabinet.
- ☞ Control and tacho leads must be laid separately to the load lines.
- ☞ Cable routing has to be conducted as to be as close as possible to the reference potential.

☞ All metallic components within the cabinet habe to be interconnected in good contact.

☞ If more than one inverter are installed within the same network radio suppression problems will be experienced most certainly. This has to be taken care of already during the design phase.

*PLEASE NOTE: Suitable shielding not only enables you to keep the required radio interference level. It also protects the system and more especially the digital electronics against parasitic interference.*

### 3.4.4 Fusing

Fuses are suitable as short-circuit protection for the power module (see Fig. 3-1 on page 4)

## 3.5 Safety features

The concept on which the controller is based ensures that excitation of the MAINS, CONTACTOR and RUN relays is interrupted immediately, even if the elevator has not stopped, should any faults arise in the controller. This ensures that the mechanical brake can be applied in the event of any faults.

- If any faults occur in the control system or the enable signal is lost, the output stages will be switched off circuit immediately and the mechanical brake deactivated through loss of the RUN signal. Independently of this, the system ensures that the power supply to the power circuit is switched off no later than 0.5 s after the RUN relay drops out, causing the motor windings to be deenergized.
- If the tacho-generator fails, or the deviation between set-value and actual value for speed exceeds 10%, the controller will bring the cabin to a halt.
- If the heat sink temperature is too high the circuit breaker will switch off the controller when the next stop position is reached.

- If the admissible motor temperature is exceeded (PTC thermistor evaluation), the drive will be brought to an immediate standstill.

*PLEASE NOTE: The controller 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 responsibilities to observe the statutory safety regulations. The elevator control system is the first level integrated in the safety chain.*

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## 3.6 Mechanical construction



### *General construction*

MICOMPACT controllers are outstanding for their compact, space-saving design. All control and display elements are accessible 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, with regards to creepage, air and isolating distances. Printed conductors are coated and given an additional coat of protective lacquer.

### *Temperature ranges*

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

### *Key modules*

Controllers of the 340 series comprise the following main modules:

### *Power section*

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

### *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. 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, so there is usually no need to access the actual printed board (see Fig. 3-4). It holds no operating and display elements; local repairs by the customer are in any case impossible due to the complex digital electronics.

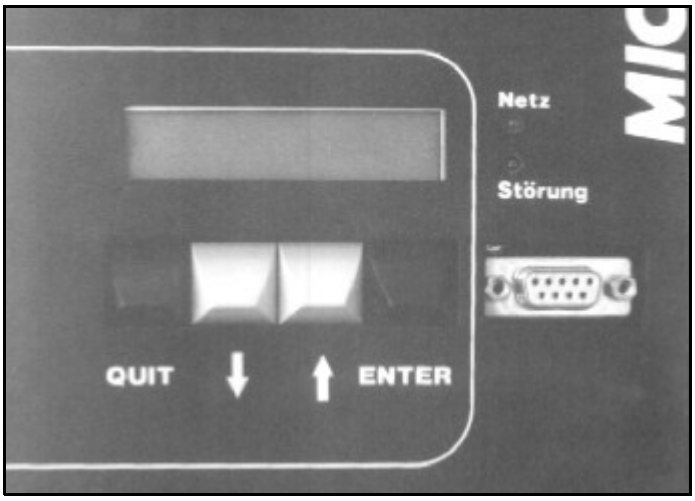



Fig. 3-4
Front panel with control and display elements: The LCD, to the right of it the two LEDs, the four keys underneath the display, and to the right the serial interface for connection to a PC.

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# 3.7 Packaging and disposal

## 3.7.1 Transport

The controller is packed in the factory to meet the requirements for 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 by their side elements. Gripping under the circuit board or metal panel can cause damage to the unit and injury to yourself.*

## 3.7.2 Packaging

The controllers are delivered in boxes with corrugated cardboard bolsters. One complete packed unit weighs between 25 and 60 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 fastening straps and non-chemically treated wood crates.

### 3.7.3 Disposal

MICOTROL-SADOWSKI will take back old units free of charge provided they are delivered carriage paid to the MICOTROL factory in Alzenau, Germany.

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 or surface treatment.
- The front panel is made 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 contain no beryllium; disposal as electronic scrap is therefore possible.

# 4 Interfaces


## 4.1 Mains and motor connections

## 4.2 Tacho-generator connection

## 4.3 Interfaces to the control system

## 4.4 Motor PTC thermistor

## 4.5 Fault memory

## 4.6 Brake resistor

## 4.7 Shaft information

## 4.8 Serial interface


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*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 and 6).

# 4.1 Mains and motor connections

## *Suitable drive motors*

The controllers can be driven with two types of motor:

- Single speed standard motor or similar standard motor without separate ventilation.
- So-called variable three-phase asynchronous motors as are used as special motor with the controller in non-controlled elevators or with thyristor controllers.



*ATTENTION! Increased voltage peaks occur at the motor with longer motor connection cables (more than 10 m in length) which can reduce the service life of the windings. Only use motors for rate-of-rise-of-current values greater than 2 kV/æs or convert the output throttles on the controller.*

*Centrifugal masses:* The controller has to control the complete drive train and must also compensate short-term setpoint fluctuations. 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 that the motor is of low-noise design.

## *Mains and motor connections*

Installation notes:

- The controller monitors the mains voltage for undervoltage, phase failure and heat sink temperature and motor temperature via thermocouples or thermistors, respectively.

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- 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 run. The mains input to the power section is connected up behind the main contactor. Both mains connections must be cophasal.



*ATTENTION! Complete destruction, if main contactor is activated before the inverter electronic board is switched to the mains! First the inverter has to be connected to the main voltage (terminals l1, L2, L3), after that the main contactor may be activated.*

Details of the connections can be found in the circuit diagrams (see Fig. 4-1 on page 4).

## 4.2 Tacho-generator connection

A motor tacho-generator is required to scan the actual speed and calculate the distance of the run. The standard 340 series controller is suitable for use with digital tacho-generators (incremental encoders).

*PLEASE NOTE: The higher the number of pulses from the digital speed scan is, 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 to prevent vibrations and blurred signals. Belt drives are less suitable. The operating voltage for the tacho-generator electronics is supplied by the controller. Digital tacho-generator:

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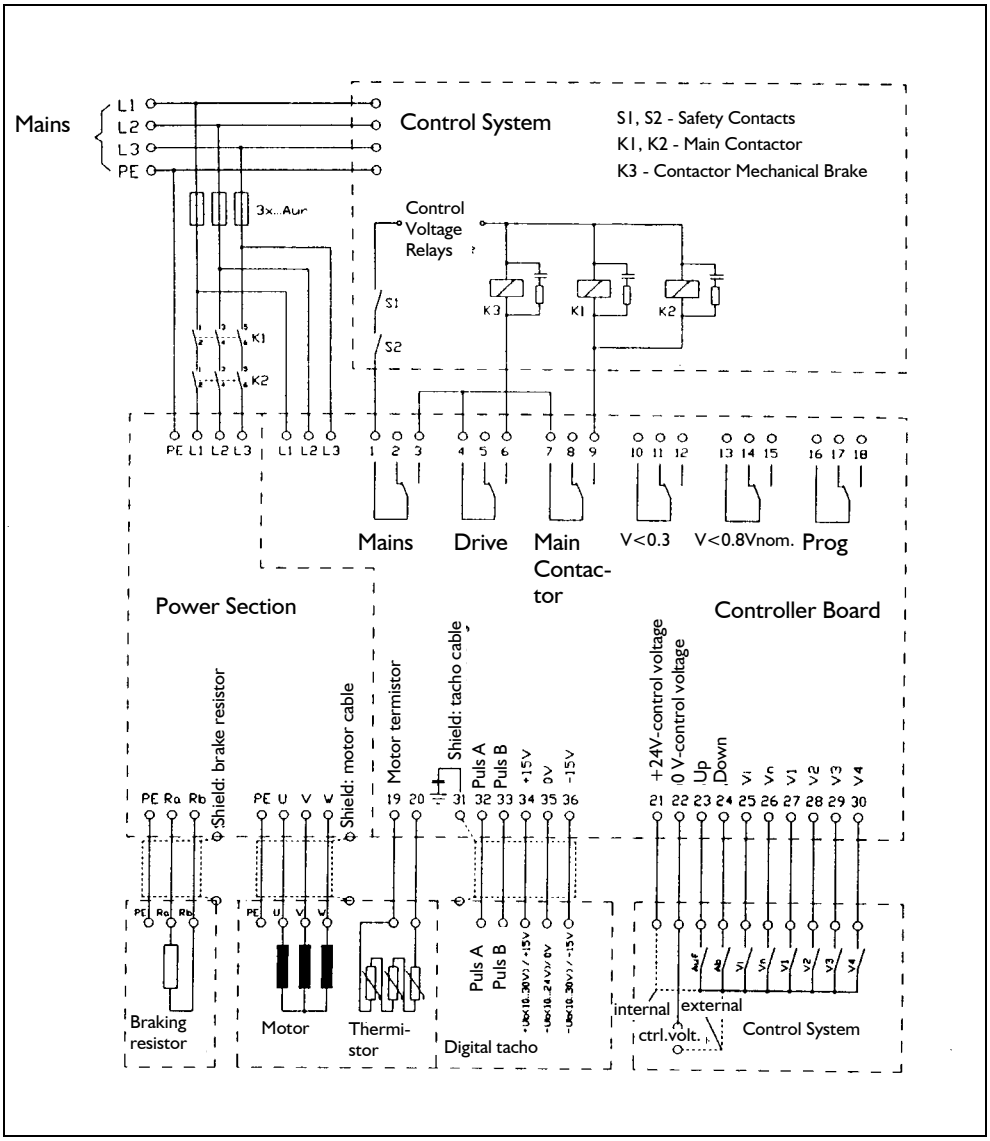



Fig. 4-1
Circuit diagram

- Operating voltage: 10 to 30 VDC (+Ub at terminal 34, -Ub at terminal 36) or +15/0/-15 VDC or 10 to 24 VDC (+Ub at terminal 34, -Ub at terminal 36, 0 at terminal 35). Current consumption: 100 mA maximum.
- Pulse number: 1024 through 4096 pulses/revolution, two channels offset 90°, tolerance +/-30°

- Output: push/pull
- The cable shield must be connected to PE on the output side and to terminal 31 on the controller (capacitor to PE).

*PLEASE NOTE: The digital tacho-generator used must be in perfect working order and under no circumstances must it transmit any pulses when at standstill! The use of tachos other than those defined above need approval from MICOTROL.*

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# 4.3 Interfaces to the control system

## 4.3.1 Inputs in the controller

### *Control voltage*

The control voltage of 20 VDC is available on terminal 21. Input current approx. 10 mA. Other control voltages (12 to 250 V) are to be expressely stated when ordering.

---

*PLEASE NOTE: You must specify the command voltage when ordering the controller. Subsequent conversion is possible but six resistors will have to be resoldered.*

---

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 Fig. 4-2, terminal diagram).

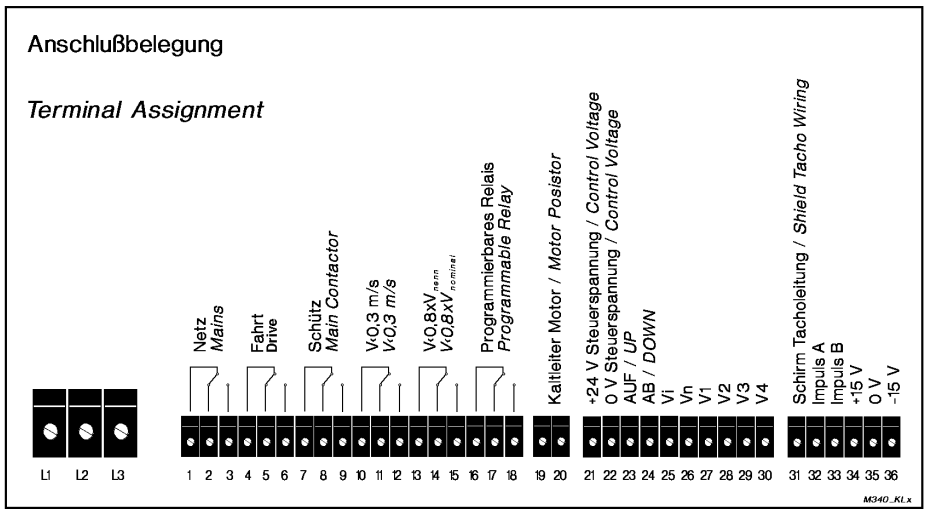



Fig. 4-2
Terminal diagram (also printed on the bottom of the front panel!)

*PLEASE NOTE: In the case of a special version of the controller, Type 340, the complete communication with the control system is through a serial interface. This enables also differentiated status signals to be transmitted to the control system or a telecontrol network.*

## *Drive commands*

For an overview of the different input commands see Fig. 4-3.

| Speed commands | Designation | Setting range (related to synchronous speed) | Terminal on controller |
|---|---|---|---|
| Vn | Readjusting speed | 0.5 to 10% | 26 |
| Vi | Inspection speed | 1 to 130% | 25 |
| V1 | Run-in speed | 1 to 20% | 27 |
| V2 | First speed | 25 to 130% | 28 |
| V3 | Second speed | 25 to 130% | 29 |
| V4 | Third speed | 25 to 130% | 30 |
| AUF | Direction preselection/Release | - | 23 |
| AB | Direction preselection/Release | - | 24 |

Fig. 4-3
Input commands

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*The inputs in detail:*

- The 0 V connection is potential-free.
- 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 has been unloaded. Example: goods elevators with 2:1 suspension and higher run height. The function requires an additional levelling flag that is shorter than that for V1 switch-off. Only connect VN and direction command.
- Inspection speed Vi: a separately adjustable speed for inspection runs on the cabin roof and for returning the elevator to its starting position. Is switched on and off with the enable command from the control system.
- Run-in speed V1: is switched on upon start and switched off again when 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 with unaltered brake ramp. When overrunning: reduce V1. When stopping too early: increase V1.
- The three different speeds V2, V3 and V4 are used if the deceleration paths (deceleration switch to levelling switch) are different in the well. If the deceleration paths in the well are different then only one of the three speeds is used.
- Direction UP or DOWN: the controller is activated by a run command and the direction command. The direction command must only be switched off again more than 0.5 seconds after the cabin has come to a standstill. The direction command must be switched off immediately with the run command on an inspection run; otherwise the controller will signal a fault! If UP or DOWN is switched off the controller will be immediately blocked and the drive stopped.

---

*PLEASE NOTE: The contactors and the mechanical brakes are switched off by the control system simultaneously with the desired value command on an inspection run. The deceleration ramp of the controller is interrupted when the controller recognizes this as a fault. To prevent a fault signal being given the direction command must be switched off within a period of less than 3 ms when switching off the inspection run.*

---

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## 4.3.2 Outputs from the controller

Six relays with floating changeover contacts are available as outputs. Each contact has a rating of between 24 VDC and 250 VAC at 3 A (see Fig. 4-4).

| Output relay | Designation | Terminals |
|---|---|---|
| MAINS | Centralised fault signal relay | 1,2,3 |
| DRIVE | Blocking the mechanical brake, TRAVEL-Signal | 4,5,6 |
| MAIN CONTACTOR | Interlocking main contactor | 7,8,9 |
| V<0,3 m/s | Interlocking for run-in with open doors | 10,11,12 |
| V<0,8 | Interlocking a speed threshold, for example 80 % of synchronous speed | 13,14,15 |
| PROG | Freely programmable relay for one of the following fuctions:<br>- Motor temperature<br>- Heat sink temperature<br>- Overload, controller end stage<br>- Speed theshold or 110 % of synchronous speed | 16,17,18 |

Fig. 4-4
Output relays

*PLEASE NOTE: Contacts, relays and printed conductors satisfy in shipped condition the requirements of insulation class C, pollution severity 3, with regards to creepage, air and isolating distances.*

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*The outputs in detail:*

- MAINS relay: centralised fault signal relay. The contact (terminals 1-3) makes after the mains voltage has been connected up to the terminals L1, L2, L3 on the electronic card. The contact 1-2 makes in the case of faults (see Fig. 4-5).

| Faults | Display |
|---|---|
| Fuse or phase failure on power network | MAINS FAULT |
| Low voltage on power network >20% | MAINS FAULT |
| Tacho wiring failure, tacho coupling fracture, blocked drive | TACHO FAILURE |
| Controller overload, deviation from actual/set value more or equal than 10 % | DIFFERENCE SET VALUETRAVEL |
| Motor temperature too high | MOTORTEMP. |
| Controller temperature too high | CONTROLLER TEMP. |
| Under or overvoltage, intermediate circuit | INTERMED.CIRCUIT VOLT. |
| Start-up in wrong direction | WRONG DIRECTION |
| Short circuit or earth connection | IGBT OVERCURRENT |

Fig. 4-5
Causes for MAINS fault signal relay response

- TRAVEL relay: is activated when the command DIRECTION PRESELECTION + Vx (terminal 4-6) is given. It drops out when ZERO speed is reached or the direction command drops out (terminal 4-5). The RUN relay switches the mechanical brake (see Fig. 2-1).
- CONTACTOR relay: main contactor interlocking. The relay is activated run speed Vx + direction command signal is given (terminals 7-9). The main contactors are switched on. The contactor relay is switched off with 0.5 s delay upon reaching the zero speed (terminal 7-8), see Fig. 2-1.
- V<03 relay: drops out when the speed of the cabin exceeds 0.3 m/s (terminals 10-11) and is activated when the speed drops below this value (terminals 10-12). The speed threshold is variable. The relay can be used for interlocking

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during run-in with open doors. Note for setting: %-value = 30/run speed in m/s. Example: run speed = 3 m/s, this gives a value of 10% for the threshold V<0.3. Or: speed = 0.9 m/s gives V<0.3 which is equal to 33.3%

- V<0.8 relay: signals a speed threshold. If the speed increases above the threshold then the relay is deactivated (terminals 13-14). If the speed drops below the threshold the terminals 13-15 are made. This output is used in the case of shortened well heads where speed control is necessary after the uppermost and bottommost deceleration point. Example: 50 cm after the uppermmost deceleration point the speed must be <80% of nominal speed. If this is not the case an emergency halt is initiated with deactivated relay.
- PROG relay (Terminals 16-17-18): a freely programmable relay by the user 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 Motor thermistor

The thermistor monitoring system is designed for three thermosensors switched in a row to DIN 44082 (terminals 19, 20 on controller). They are triggered at a resistant value of 2.7 kOhm. The controller is locked and the mains relay drops out (terminal 1-2).

The system is automatically reset after the motor has cooled down. If motor temperature monitoring is taken over by a separate monitoring unit then the terminals 19, 20 must be bridged.

## 4.5 Fault memory

If the controller identifies a fault, the MAINS, TRAVEL and CONTACTOR relays will drop out immediately and a fault message will appear in the display.

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

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

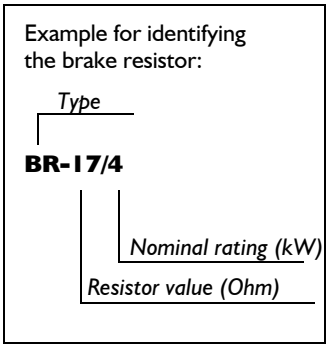
## 4.6 Brake resistor

Energy is fed back into the controller intermediate circuit by the motor upon braking. As a result the intermediate circuit voltage increases and the energy is cycled to a brake resistor when exceeding a voltage value of 740 V (cycle frequency 16 kHz).

### 4.6.1 Choice of brake resistor

Suitable brake resistors can be obtained from MICOTROL or be self-selected taking the following table (see Fig. 4-6) as a basis.

Please state type according to key alongside when ordering! Further values and performances on request.




Brake resistors supplied by Micotrol have IP 20 types of enclosures.

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| Motor nominal rating (kW) | Resistor value (Ohm) | Resistor capacity (kW) | Wiring ($mm^2$) |
|---|---|---|---|
| 5,5 | resistor built-in | - | - |
| 7,5 | 68 | 1 | 3*1,5 |
| 11 | 33 | 2 | 3*2,5 |
| 15 | 22 | 3 | 3*2,5 |
| 18,5 | 15 | 4 | 3*4,0 |
| 22 | 12 | 5 | 3*4,0 |
| 30 | 10 | 6,5 | 3*6,0 |
| 37 | 8,5 | 8 | 3*6,0 |
| 45 | 8,5 | 8 | 3*10,0 |

Fig. 4-6
Choosing the appropriate braking resistor for gear box efficiency of lower than 75%

Cooling is by natural convection and no fan is necessary as a general rule.

*PLEASE NOTE: in the case of transmission systems working with a degree of efficiency greater than 75% it is essential to refer back to Micotrol because a different dimensioning may possibly be necessary.*

*Dimensioning example*

☑ R (resistor value) = 650 V/motor nominal current (A)

Please refer to us when doing own dimensioning.

## 4.6.2 Installation instructions

The brake resistor is to be installed outside locked switch cabinets to ensure reliable heat dissipation. For dimensions see Fig. 4-7 and the pertinent measurement diagram further on in this manual.

| Type (BR-...) | B1 | B2 | H1 | H2 | T | Cable ($mm^2$) |
|---|---|---|---|---|---|---|
| .../1 | 226 | 196 | 480 | 450 | 115 | 3*1,5 |
| .../2 | 226 | 196 | 480 | 450 | 115 | 3*2,5 |
| .../3 | 380 | 350 | 480 | 450 | 115 | 3*2,5 |
| .../4 | 380 | 350 | 480 | 450 | 115 | 3*4,0 |
| .../5 | 533 | 503 | 480 | 450 | 115 | 3*4,0 |
| .../6 | 533 | 503 | 480 | 450 | 115 | 3*6,0 |
| .../7 | 686 | 656 | 480 | 450 | 115 | 3*6,0 |
| .../8 | 686 | 656 | 480 | 450 | 115 | 3*10,0 |

Fig. 4-7
Dimensions and cable cross sections for brake resistor, all measurements in mm! Two core cables to be used respectively for connection - resistor plus PE. Use shielded cable.

- ☞ Fit brake resistor vertically with connection terminals to the bottom or horizontally:
- ☞ Ensure that the ambient temperature is below 50°C all the year round.
- ☞ Cable: use shielded cable and connect up shield to provided cable clamp, see Fig. 4-7 for cable cross section.
- ☞ After making connection fasten the gitter cover securely with six screws.




*DANGER! High voltage dangerous to life on the brake resistor connections and on the brake resistor itself. Before switching on the mains power network fasten the cover gitter over the brake resistor with six screws.*

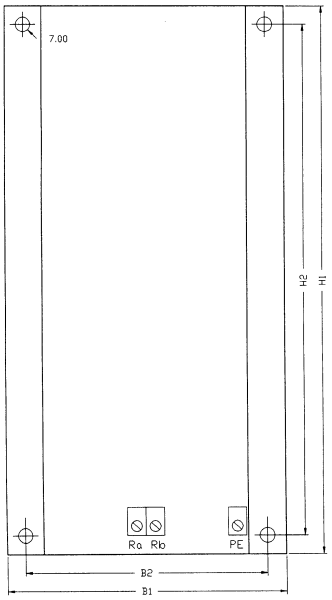



Fig. 4-8
dimensions of the brake resistors according to the table above

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## 4.7 Shaft information

As a general rule two specifications are required from the well for each floor:

- ☞ Deceleration switch (see Fig. 4-9): cuts out the selected run speed without delay. Levelling signal must follow approx. 4-10 cm before the floor.
- ☞ Levelling switch (4 to 10 cm before stopping point) cuts out the run speed V1 without delay.

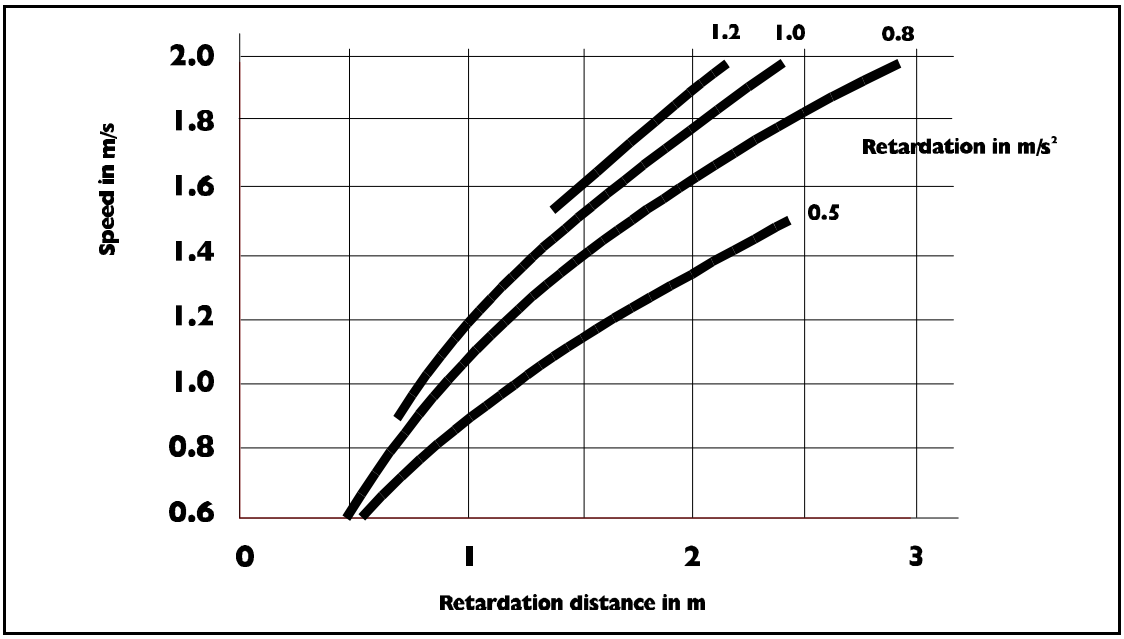



Fig. 4-9
Estimating the retardation distance. Exact values depend on the specific elevator and its design.

*PLEASE NOTE: All switches must be adjusted as accurately as possible to avoid different run-in times. The deceleration switch must be set with an accuracy of +/- 5 mm; the levelling switch with an accuracy of min. +/- 2 mm.*

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## 4.8 Serial interfaces

Two different fields of application can be covered by the two different serial interfaces in the control system:

- Use of a serial interface for the direct connection with the elevator control syste (MICOBUS).
- Controller setting, display of run curve and filing the controller parameters via a laptop PC.

### 4.8.1 MICOBUS (Option)

All input and output procedures can be realized through a serial interface (RS 232 or RS 485) (MICOBUS). As a result the controller can be connected up directly to the control system without the usual control cables.

The transmission report must be matched with the control system. Further information can be attained from this by telephone (Germany 06023 5056- 0)!

*PLEASE NOTE: This option is not to be mistaken for the PC control system as described below with its appropriate software to a PC.*

### 4.8.2 Control system setting via PC

All control system settings can be made on-line through a PC and be stored on data carriers for call-up. All control system status signals can be shown on the monitor and the actual and desired value run curves can be presented graphically. A standard RS-232 interface is used for this purpose.

The necessary PC software is optional and must be ordered separately.

The nine-pin jack is used as interface on the front of the controller to set the control system completely through a PC instead of the LCD display and to be able to carry out a large number of additional functions. The electrical data of the connection to the PC corresponds to the standard interface, Type RS-232 with metallic isolation.

Both software and a user handbook are supplied.

An interface cable for connecting the RS-232 interface of the usual commercial PC and the jack on the front plate of the controller can be supplied as optional extra.

Operation and configuration between controller and PC are described in detail in a separate operating manual.

# 5 Menus and Parameters

## 5.1 Preparations

## 5.2 Basic operating

## 5.3 Description of the operating menus

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

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# 5.1 Preparations

Before putting into operation for the first time you must

☑ Make or check all connections and links to the motor, control system and tacho-generator (see Fig. 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). There are no adjustments to make 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 given 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!

☞ see Fig. 4-9 to set the well switch distance as a function of the speed




*DANGER! A controller that is not yet properly adjusted can cause dangerous JERKing of the cabin! Above all, during the adjustment work there is a risk 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 provide 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 incorporates all the facilities 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 unforeseen problems occur in the system as a whole.

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## 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.

### 5.2.1 Display, keyboard, menus

The operator panel consists of a two-line LCD with two LEDs to the right and four keys underneath (see Fig. 3-4).

Operations are based on a variety of entry masks . The successive masks are called menus . You can move from one menu to another and make changes to the values listed in a menu. Menus are classified as main menus and sub-menus (for example TRAVEL SPEED. Main menus correspond to chapter headings which have various sub-chapters (for example TRAVEL SPEED VX).

### 5.2.2 Summary of key functions

Key functions are identical for all menus, i.e.:

☑ The arrow keys UP and DOWN:
- Selection of main menu
- Selection of sub-menu
- Alteration of set values (parameters) as figures or ON/OFF

☑ Use the right-hand key, ENTER:
- To move from the main menu into a sub-menu
- To enter the edit mode inside a sub-menu
- To take over a changed setting value (parameters) in the memory

☑ Use the left-hand key, QUIT:
- To move from edit mode into a sub-menu
- To return from a sub-menu to the main menu

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

*PLEASE NOTE: After you have altered a setting value (parameter) you must press ENTER to permanently store the new value. After doing this the arrow in front of the set value which marks the editing mode disappears. If ENTER is not pressed the original values (set at the factory) will be used after the electronic card has been disconnected from the mains power supply the next time.*

### 5.2.3 Switching on the controller

☍ After you have switched on the controller (e.g. connected it to the mains power supply), the LCD will show the message [MICOTROL selftest] for several seconds.

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

☍ The display now shows [MICOTROL MICOVERT 340 xx kW].

☞ Now press any of the four keys underneath the display to enter the main menu [TRAVEL COMMANDS].

*PLEASE NOTE: If no key is pressed within an hour, the initial MICOVERT message will reappear and the display light goes off until the next time a key is pressed.*

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## 5.2.4 Menu structure

*Main menus*

There are nine main menus. Using the UP arrow key and the DOWN arrow key you can move from menu one to nine and back again (see Fig. 5-1).

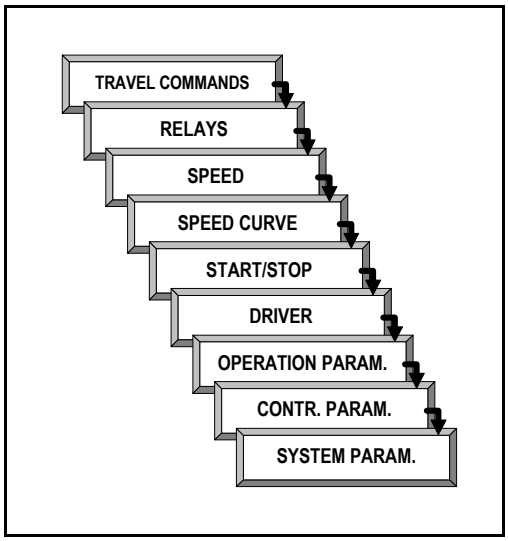



Fig. 5-1
The sequence of the nine main menus

*Sub-menus*

- see Fig. 5-2 how to move from the main menu into the sub-menu to be able to make alterations to the set values.
- see Fig. 5-3 on page 6 for the procedure to be taken to make amendments and store them in the memory.

*PLEASE NOTE: To make any adjustments the elevator must be at a standstill.*

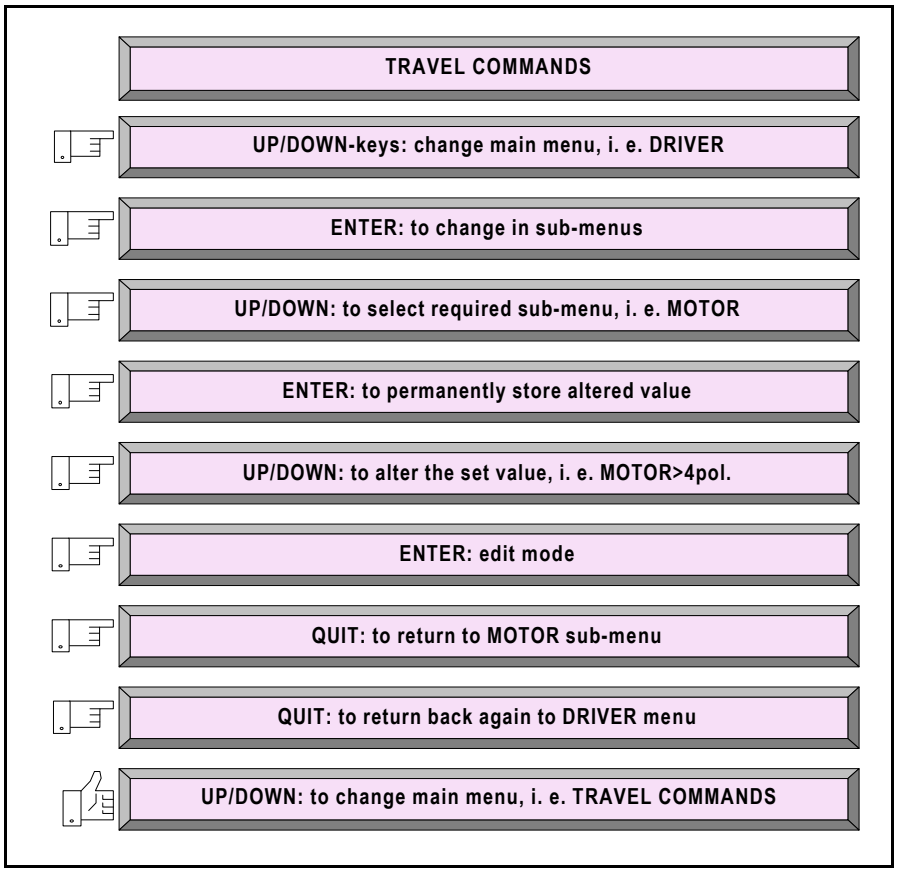



Fig. 5-2
The change between the main menus and making alterations to the set values

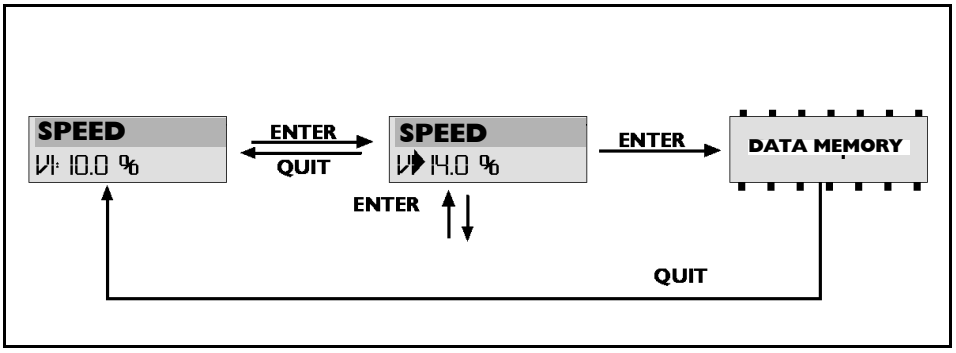



Fig. 5-3
Altering data in the sub-menus: move from display into the edit modus with ENTER change the values with the arrow keys and press ENTER to save permanently.

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## 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

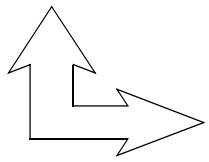
factory with standard values taken from practice, enabling it to be used straight away, it is still essential for you to go through the various steps since

specific values will certainly need to be adjusted (e.g. the motor pole number).

For an overview see Fig. 5-4 on page 8 for 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

TRAVEL COMMANDS
0-V3 UP 31



In the second line on the left .the actual operating status is shown at each moment during an elevator run:

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

[V3] . . . . . Constant running at V3

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

[V1...] . . . . . Constant running V1

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

*PLEASE NOTE: The given final speed can be V4 or V2.*

Shown on the right side of the second line is the command stipulated by the control system, for example UP 31 (i. e. UP, V3, V1).

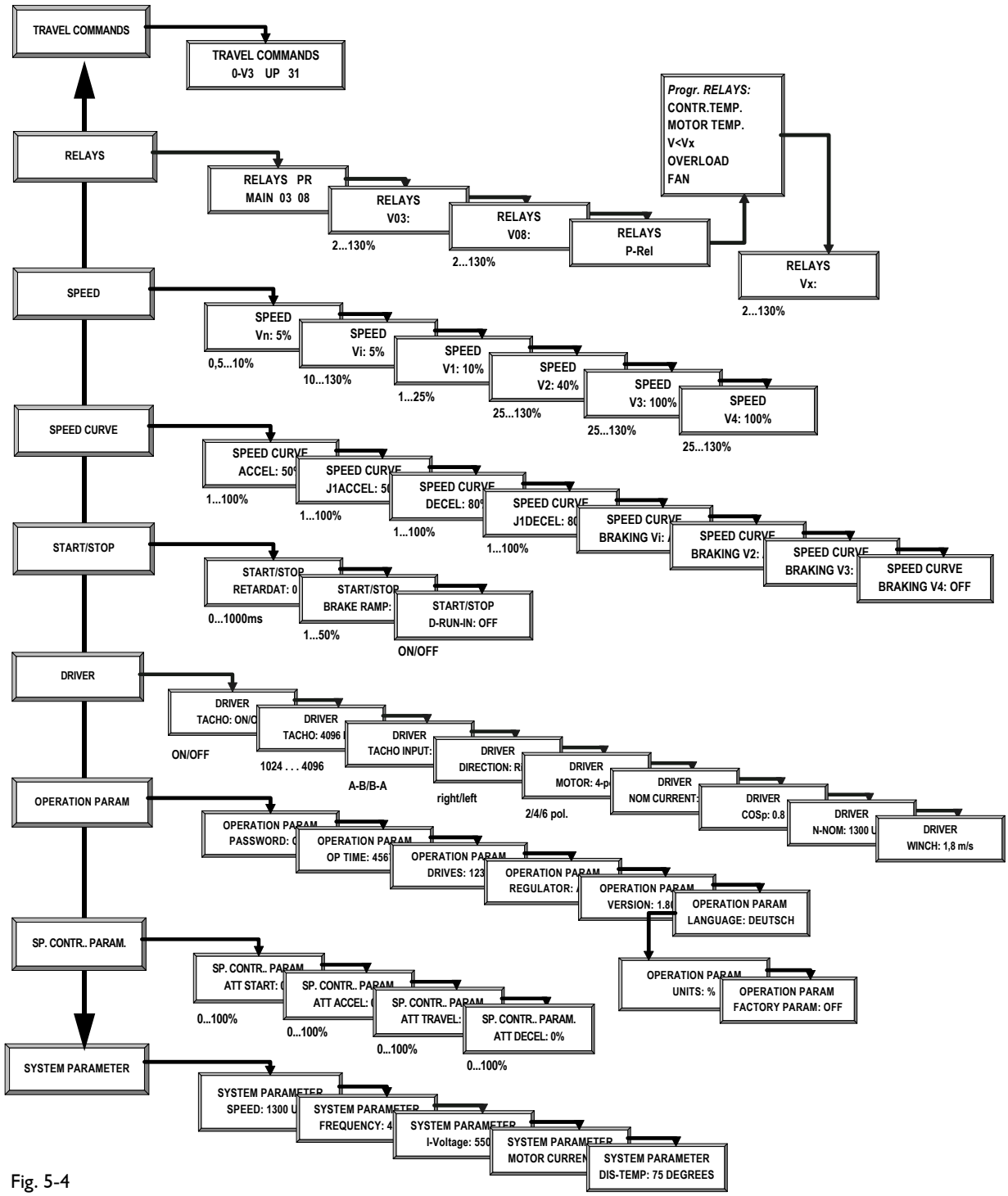



Fig. 5-4
complete menu overview

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## 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

[FAN] . . . . . after-running of cooling fan after stand-still: approx. 2 min.

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

- Mains irregularity (overvoltage or fuse failure)
- Motor temperature too high
- Heat sink temperature too high
- Tacho-generator malfunction
- Difference between setpoint 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).

[V<08] . . . . . Speed threshold V<0.8*Vnom closes when value falls below the adjustable threshold. Default value: 15%. The setting range: 2 to 130% of the synchronous speed.

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[CONTACTOR] . . . . 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. 0.4 s after standstill (time delay for the after-braking current).

[TRAVEL] . . . . . Relay for locking the mechanical brake. Switches on without delay with the command Vx + RELEASE. Switches off when speed is ZERO.

### 5.3.3 SPEED menu

The MICOVERT controller has a total of six different speeds (see Fig. 5-5).

[Vn] . . . . . Adjustment speed, variable from 0.5 to 10%; is set so that the elevator stops in level position after adjustment (only command Vn). Is used in the case of considerable rope elongation after which 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 130%. Set as required for inspection runs on the cabin roof and for returning the elevator to its starting position.

[V1] . . . . . Run-in speed, variable from 1 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 6.3.3 for details of how to set the stopping accuracy via V1.

[V2] . . . . . Interim speed, variable from 25 to 130%. Is only used when there are unequal braking distances in the well, 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; caution: BRAKING PATH V2.

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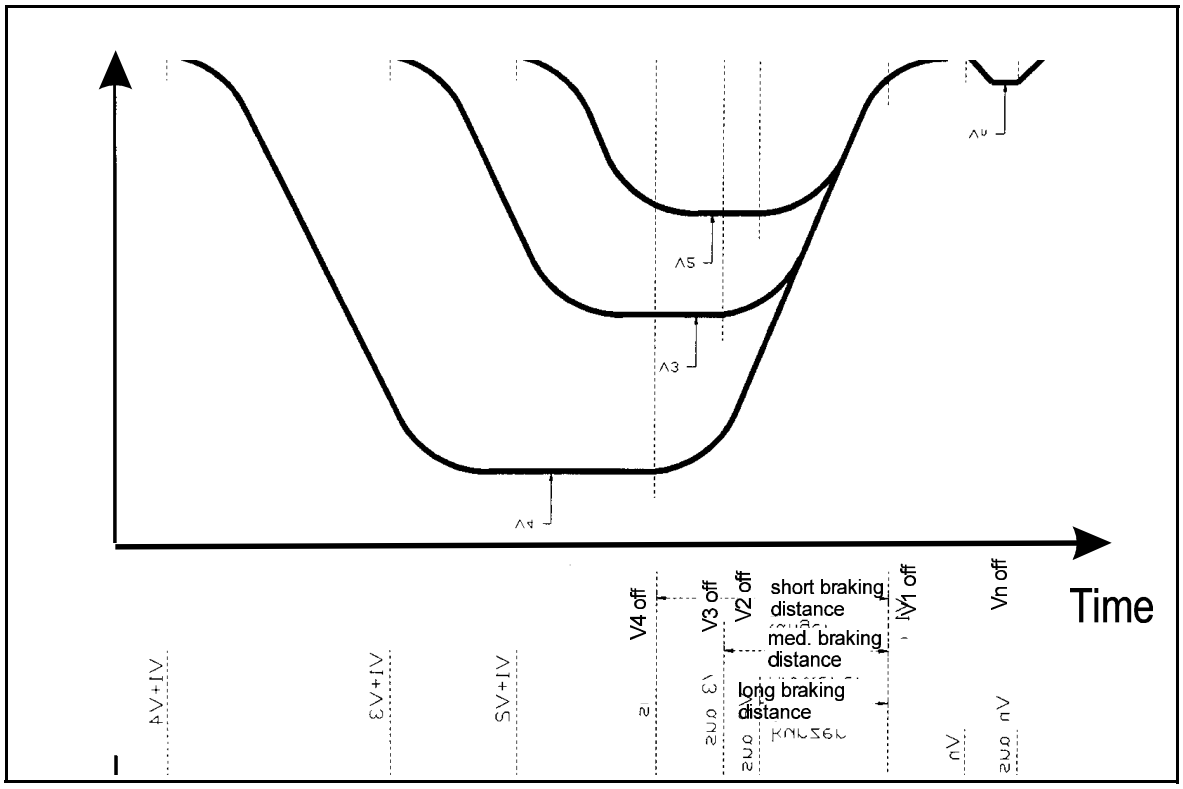



Fig. 5-5
Using different speed commands

[V3] . . . . . Final speed, variable from 25 to 130%. After calibration it is advisable to set as high as possible; caution: BRAKING PATH V3.

[V4] . . . . . Alternative final speed, variable from 25 to 130% is related to the final speed of the motor. For example: 1,350 r.p.m. at V4 = 90% gives a speed of: Vnom/Vsynchr*100*V4%. If necessary increase V4 to such an extent until OVERLOAD CONTROL appears in the display.

### 5.3.4 SPEED CURVE menu

[ACCEL.] . . . . . Ramp from 0 to Vmax, variable from 1 to 100% where 1% equals approx. 6 s and 100% approx. 1 s. Is set according to sensations inside the cabin during a run. Recommendation: 50%.

[JERK-ACCEL.] . . . . Transition from 0 to acceleration phase and transition from acceleration phase to Vmax. 15% corresponds to a soft run out and 100% to a hard run out (see Fig. 5-6). Is set according to sensations inside the cabin during a run. Recommendation: 50%.

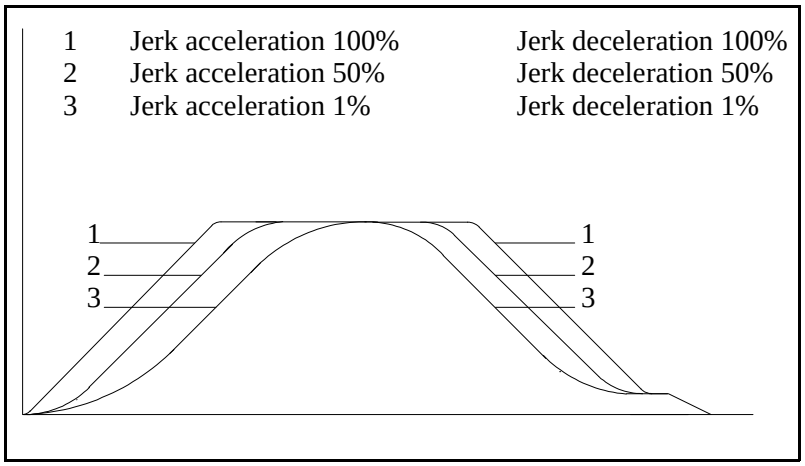



Fig. 5-6
Settings for jerk-acceleration and jerk-deceleration

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

[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 run.

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[BRAKING DISTANCE V2>MEAS] Scanning of braking distance for short stops (shorter distance from the floor switch to the levelling switch than on a long run). 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 run is repeated, the elevator will pass the deceleration point (floor switch) and continue running up to the calculated deceleration point. The duration of the run-in speed V1 is thus minimized to around 0.3 s, see Fig. 5-7 for explanation.

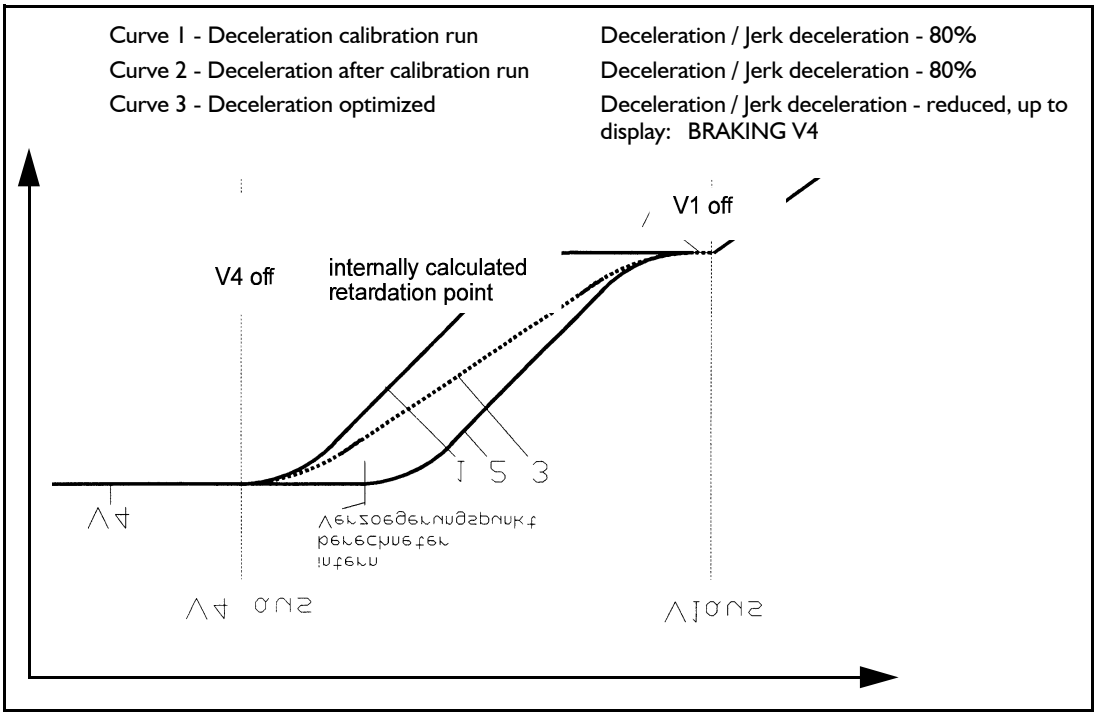



Fig. 5-7
Sequence of braking distance calibration, see text!

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

[BRAKING DISTANCE V4>MEAS] Braking distance scanning for long stops with speed V4. 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 run-in speed V1 must be adjusted via deceleration and JERK-deceleration (see above)*

---

### 5.3.5 START/STOP menu

[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 been reliably released.

[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 100 %, recommended value: 20%. The braking ramp can also be used to adjust the halting accuracy (see chapter 6.3.3).

[DIRECT RUN-IN] . Direct run-in was still not possible at the time of going to press.

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## 5.3.6 DRIVE menu



*ATTENTION! The controller has not been adapted to the specific elevator system when being set at the factory. Running the elevator before following adjustments have been made can lead to it being damaged. You must enter the following adjustment values before running the cabin for the first time.*

[TACHO] . . . . . Enter the number of pulses of the digital tacho-generator per revolution. Possible entries: 1024 through 4096 pulses/revolution.

[TACHO INPUT] . . . In case of message DIRECTION WRONG , change from [A-B] to [B-A]. This function is corresponding to the exchange of the tacho input leads A and B.

[ROTATION FIELD]. If motor runs into wrong direction (e. g. down with signal UP ), use this function to change the direction of the rotation field. This corresponds to the exchange of the leads U and V.

[MOTOR] . . . . . Enter the pole number of the motor: 2, 4 or 6. See rating plate for the correct number of poles.

[NOM CURRENT] . . See the motor rating plate for the correct nominal current for the motor.

[COSφ] . . . . . See the motor rating plate for the COSφ value.

[N-NOMINAL] . . . . . See the motor rating plate for the nominal speed value. If the plate gives a value of 1.000 or 1.500, call the motor supplier, because the data given are for the synchronous speed instead of the nominal speed.

[WINCH] . . . . . If units m/s are chosen instead of % , you must type the speed of the elevator.

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### 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 for one hour after the last key has been pressed.



*ATTENTION! Loss of the password will prevent all further access to the controller! Note your personal password well. The system can only be unlocked in the MICOTROL factory.*

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

[TRAVEL] . . . . . Run counter

[CONTROLLER ALTERNATIVE] Switchable set of parameters for a second drive which can be connected alternatively to the same controller.

1 ..... Setting values for drive 1

2 ..... Setting values for drive 2

OFF ..... Only one set of setting values normally for just one drive (preentered at factory)

[FAULT] . . . . . Menu point not yet used (7/95)

[VERSION] . . . . . Display version number of the software. These operating instructions were drawn up on the basis of version 1.07.

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

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[UNITS] . . . . . All entered values in the display and input can be switched between [%] and [m/s]. The acceleration/deceleration are given in $m/s^2$ and JERK acceleration/deceleration in $m/s^3$.

[FACTORY PARAMETER] Factory setting.

OFF ..... All parameters remain unaltered just as you have entered them.

LOAD ..... After pressing the ENTER key all set values are reset to the factory standard settings. The motor and tacho data is also reset at the same time. Never start your elevator without reentering the motor data.

### 5.3.8 CONTROLLER PARAMETERS menu

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

[ATT.TRAVEL] . . . . . Adjustment range from 0 to 100%. If vibrations occur during constant running, this value can be increased. Recommendation: 0%.

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

### 5.3.9 SYSTEM PARAMETER menu

This main menu is purely a display menu. No settings can be made. It only provides a read-off.

[SPEED] . . . . . Shows the actual speed of the motor in r.p.m.

[FREQUENCY] . . . . Shows the actual output frequency of the controller.

[MOTOR CURRENT] Shows the actual motor current

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[INT CIRC VOLTAGE] Shows the actual intermediate circuit voltage of the controller.

Motor at standstill ..... approx. 500 V
Motor in operation ..... approx. 600 V
Motor braked..... approx. 700 V

[K-TEMP] . . . . . Shows the heat sink temperature of the controller. Should be under 80°C in normal operation.

# 6 Putting into operation


## 6.1 Preparations

## 6.2 Entry of main data

## 6.3 Commissioning, normal run

## 6.4 Inspection run

## 6.5 Setting V2 and V3

## 6.6 Direct run-in


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*Summary of chapter*

This chapter describes putting the controller into operation for the first time, preparations and conditions and checking the connections. After the converter has been set the inspection and normal run follows as well as the direct run-in tests.

# 6.1 Preparations

## 6.1.1 Summary of installation construction

*Installing 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 (see Fig. 3-1)! Provide adequate ventilation!

*Connecting up the controller*

Connect up the controller in accordance with the terminal diagram, see Fig. 4-2. To do so, remove the metal cover by loosening the front screws. Important details:

☞ Fuses: Use only l.v.h.b.c. fuses. The nominal fuse 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) for conformance.

☞ Meaning of the various speed signals see Fig. 2-1 (run diagram)

☞ Release signal: The release signal (=UP or DOWN) must be given with each run command and must not be switched off again until about 1 second after standstill is reached! EXCEPTION: On an inspection run the RELEASE signal must be switched off immediately.



*ATTENTION! Complete destruction, if main contactor is activated before the inverter electronic board is switched to the mains! First the inverter has to be connected to the main voltage (terminals l1, L2, L3), after that the main contactor may be activated.*

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☞ MAIN CONTACTOR and direction contactor are actuated directly by the controller via the CONTACTOR output relay; delayed after the end of a run. Never switch on main contactor together with main switch.

☑ TRAVEL relay: If the controller has the relay drop out after the end of a run, the electromagnetic brake must be applied immediately by the control system.

☞ ERROR relay: Fault signal for mains failure, fuse failure, under voltage, temperature too high, tacho broken.

☞ Motor contactor: If no PTC thermistor is provided then the terminals 19/20 must be bridged.

## 6.1.2 Checking the installation

You must carry out the following test steps before start-up:

☑ Make all connections to the motor, control system and tacho or check same, respectively (see Fig. 4-2).

☑ The shielding of the motor supply cable and brake resistance cable must be on both sides. Shielding has to be of copper, not of steel leads! From the motor housing directly on the motor side and on the controller side over a large area to the cable clip available for this purpose.

☑ As a general rule shielded leads for analog and digital tacho-generators.

☑ The tacho-shielding must be connected to both sides: on the motor side directly to the housing (PE), on the controller side to terminal 31 (capacitor for PE). Leads not in use to be connected on both sides to the protective conductor (PE).

☑ Check the controller connections: compare the following data with the values given on the controller rating plate:

- Mains voltage
- Motor capacity/motor nominal current
- Control voltage

☑ Check the brake resistor: check type, rating and resistance value.

☞ After installation and wiring drop back the printed wiring board and the printed wiring card cover (varnished sheet metal front cover) into the controller and fastened with screws. No more adjustments are to be made behind the front panel.

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*DANGER! High voltages dangerous to life! Through the buffering of the intermediate circuit capacitors some components are still under high voltage for at least 3 minutes and inside the controller even after the mains power supply has been switched off. The front cover must be dropped back and fastened by screws during and after starting up the controller and when it is in operation.*

☞ Set all shaft switches with an accuracy of max +/- 5 mm for the deceleration switch (switchover switch from fast/slow or V3 to V1, respectively) with an accuracy of min. +/- 2 mm for the levelling switches. The levelling signal must be given approx. 4 - 10 cm before reaching the floor level. It is essential that the switch distances are identical for each floor. The controller cannot compensate differences from floor to floor.

*PLEASE NOTE: To set the distance for the shaft switch dependent on the travel speed see Fig. 4-9.*

☑ Check whether the motor/drive unit with tacho and mechanical brake and the brake resistor are installed and wired correctly (shielding!).

☑ You must be fully conversant with the operation and use of the controller keyboard and display. Have you any questions? Please read Chapter 5!




*DANGER! Dangerous jolting of the cabin can occur if the converter has not been set. It must be ensured that the elevator cannot be used by persons before and during start and until it has been accepted by the appropriate authorities. If necessary barriers and warning signs must be provided on each floor. Moreover, under all circumstances the external door control system must be switched off through the elevator control system.*

### *Tools and instruments*

The controller incorporates all the facilities needed to put the elevator into operation without additional assistance from the machine room. No tools are required. A clip-on ammeter, a tachometer, a multimeter and possibly a storage oscilloscope may prove useful if unforeseen problems occur in the system as a whole.

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## 6.2 Entry of main data

### 6.2.1 Switching on the controller

✍ After the controller has been switched on (i.e. connection has been made to the mains power supply) the LC display will show [MICOTROL self test] for about 4 seconds.

✍ After which the following message will appear [MICOTROL MICOVERT 340 XX kW]

### 6.2.2 Determination of the entry units

☞ Scroll to the main menu OPERATING PARAMETERS with keys UP/DOWN.

☞ Determine the entry unit according to personal taste in [%] (100% = synchronous speed) or in [m/s].

### 6.2.3 Entering the motor parameters

*PLEASE NOTE: The drive and the controller can be damaged through false initial settings! You must proceed and go through the following setting steps before the first run.*

☞ Go to DRIVER in the main menu.

☞ Read the pulse count from the tacho rating plate or from the tacho specification and enter this in the TACHO PULSE sub menu.

☞ Read off the motor nominal current (A) from the motor rating plate and enter in the nominal current sub-menu.

☞ Read the COS φ from the motor rating plate and enter in the COS φ sub-menu.

☞ Read the motor nominal speed from the motor rating plate and enter in the N-NOMINAL sub-menu.

The following entries are only valid if you have selected [m/s] as unit:

☞ Enter drive run speed (m/s) in GEARBOX sub-menu.

### 6.2.4 Entry of inspection speed

☞ Enter the required value Vi as a percentage of the synchronous speed or as value in m/s in the main menu SPEED.

### 6.2.5 Inspection run

☑ Check the relationship between control system and controller: now start a run with Vi. At the same time you must give the command UP or DOWN.

☑ Check the direction of travel!

---

*PLEASE NOTE: The main contactors are switched off when switching off the inspection run command Vi. The preselected direction (enable) UP or DOWN must also be switched off immediately at the same time.*

---

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## 6.3 Normal run start-up

Check whether the parameters have been correctly stored in the main menu DRIVE.

### 6.3.1 Test run with VI

☞ Check the relation between the control system and the controller: start a run up or down! The drive must run at a speed V1 for at least 2 seconds (check in display!)

### 6.3.2 Calibration run

The following measuring run serves to determine the braking path and is to be carried out at the final speed V4.

---

*PLEASE NOTE: Should the message "controller overload" appear in the display at the final speed V4 you must reduce the speed V4 in the main menu until the message no longer appears. V4 is to be set between 85 and 95% depending upon motor nominal speed.*

---

☞ If the message controller overloaded appears during acceleration reduce the value for ACCELERATION/JERK DECELERATION.

☞ Select the MEASURE setting in the TRAVEL CURVE / BRAKING PATH-V4 menu (ENTER key).

☞ Carry out a run UP or DOWN at V4.

☞ Repeat the two previous steps for the interim speeds V2 and V3 if you need these.

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## 6.3.3 Setting the stopping accuracy

The stopping accuracy can be determined by setting the run-in speed V1 but also through the brake ramp, see Fig. 6-1.

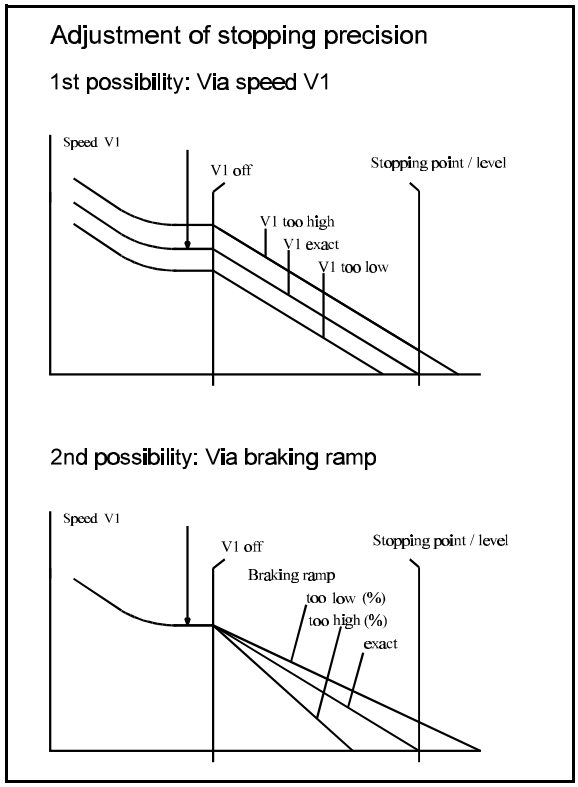



Fig. 6-1
Setting the stopping accuracy through the run-in speed V1 or through the brake ramp

### *1st possibility*

Enter the SPEED V1 in the main menu so that the cabin stops level.

☑ If the cabin stops too soon: increase V1.

☑ If the cabin stops too late: reduce V1.

*PLEASE NOTE: Always run into the same stopping position!*

*2nd possibility*

Enter the BRAKE RAMP in the START/STOP main menu so that the cabin stops level.

☑ If the cabin stops too soon: reduce BRAKE RAMP.
☑ If the cabin stops too late: increase BRAKE RAMP.

---

*PLEASE NOTE: Always run into the same stopping position! If the brake ramp has been set too high it could be that a light jolt is noticeable when passing the levelling switch. In this case the BRAKE RAMP is to be reduced until the jolt is no longer noticeable; then adjust the stopping accuracy by means of the first possibility through V1.*

---

## 6.3.4 Checking the braking path

Now check the braking path at each floor level.

☞ Run into each floor level both UP and DOWN.
✍ When doing this note the display in the RUN COMMAND menu. The following displays must appear one after the other:

0-V4.....Acceleration to final speed
V4.....Constant speed
V4-V1.....Deceleration from V4 to run-in speed V1
V1.....Run-in speed for about 0.3 to 1 second!
V1-0.....Final deceleration to speed 0.

---

*PLEASE NOTE: Should the run-in speed period be different at the various floors then you must correct the deceleration switch.*

---

## 6.3.5 Checking the stopping accuracy

Now check the stopping accuracy on all floors.

☞ Run into all floors both UP and DOWN.

☑ Check the stopping accuracy and if necessary correct the levelling switch should the stopping accuracy vary.

### 6.3.6 Starting behaviour

☑ Check whether the drive starts up with brake on.

☞ Increase the RETARDATION in the START/STOP menu (value in milliseconds) should the drive start up with the brake applied.

## 6.4 Inspection run

Finally to conclude the setting of the controller carry out runs with different loads to check whether optimal comfort and driving capacity are given.

In this respect particular attention is to be paid to the acceleration and deceleration behaviour measured on travel sensations.

*Cabin jerking*

☑ If the deceleration is noticeable in the cabin first reduce the JERK DECELERATION then the DECELERATION in the TRAVEL CURVE main menu until the red LED comes on and BRAKE PATH V4 appears in the display. If the display still shows BRAKE PATH V2, V3, then the speeds V2 or V3, respectively, are to be reduced until the display goes out.

☑ As soon as the message "CONTROLLER OVERLOAD" appears in any run situation the following data must be reduced: maximum speed (if message during fast constant run), acceleration (if message during acceleration) or deceleration (if message during deceleration). If necessary the well switches are to be set at a greater distance away from the stopping point.

See also Chapter 7 for diagnosis and elimination of setting faults!

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*PLEASE NOTE: As soon as the position of the well switch has been altered a new measuring run must be carried out to enable the controller to note the altered well data.*

*Rope vibration*

Should noticeable vibrations occur upon deceleration increase the ATT/DECELERATION.

## 6.5 Setting V2 and V3

Now the speeds V2 and V3 can be set until the red LED just comes on and BRAKE PATH V2 or BRAKE PATH V3, respectively, appear in the display.

Then reduce until both go out.

## 6.6 Direct run-in

(Still not integrated in the system at the time of going to press)

# 7 Description of Faults

## 7.1 Fault diagnosis

## 7.2 Replacement of EPROMS

## 7.3 Servicing and spare parts

*Summary of chapter*

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

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# 7.1 Fault diagnosis

## 7.1.1 LED indicators

To the right of the display (see Fig. 3-4) you will find one green and one red LED, which are used to provide important signals supplementary to information on the display.

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

RED LED . . . . . The red LED is continuously on with each fault message until a key is pressed by way of acknowledgement, until a new run begins and until the fault has been eliminated. The red LED lights up briefly in the case of WRONG DIRECTION or BRAKE OVERLOAD.

## 7.1.2 Display messages

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

Help is available in the case of irregular controller behaviour and for any problems in connection with critical elevators.

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

*!Motor starts into wrong direction!*

Menu DRIVER/ROTATION FIELD: change from RIGHT to LEFT.

*!FAULT! Phase sequence*

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

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### *!FAULT! Mains voltage*

- ☑ Undervoltage: The mains voltage is more than 20% below the nominal voltage.
- ☑ Wrong mains voltage; check the mains voltage against the data on the rating plate.
- ☑ One phase is missing.

### *!FAULT! Motor temperature*

- ☑ Wrong PTC thermistor installed in the motor.
- ☑ Motor PTC thermistor is not connected correctly to the controller, terminals 19, 20.
- ☑ If the motor PTC thermistor is monitored by a separate monitoring facility, the terminals 19, 20 must be bridged.
- ☑ Motor is really too hot!

### *!FAULT! Wrong direction*

- ☞ Pulse cables swapped at terminals 32, 33. Menu DRIVER/TACHO INPUT: change from A-B to B-A.
- ☑ UP and DOWN command swapped.
- ☑ Check the mechanical link between the tacho-generator and the motor shaft.

### *!FAULT! Tacho failure*

Possibility A: Motor does not start up.

- ☑ Main or direction contactor does not make.
- ☑ Mechanical brake is not released.
- ☑ 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
- ☑ Check tacho-generator connections!
- ☑ Signal from the digital tacho-generator must be greater than/equal to +5V and smaller than/equal to 0V.
- ☑ Check the tacho-generator coupling!

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### *!ATTENTION! Controller overload*

Possibility A: during acceleration.

- ☑ SPEED CURVE main menu: Reduce ACCELERATION and JERK ACCELERATION!
- ☑ Mechanical brake not released, drive is blocked. Check mechanical brake.
- ☑ Check parameters in main menu DRIVE!

Possibility B: during constant run with V4.

- ☑ Main menu SPEED: reduce V4.
- ☑ Check parameters in main menu DRIVE!

Possibility C: during deceleration.

- ☑ Main menu SPEED CURVE: reduce DECELERATION and JERK DECELERATION!
- ☑ Check brake resistance! Type? Connections? Capacity?
- ☑ Command V1 is switched off too soon, see Fig. 2-1

### *!FAULT! Set/actual difference*

Possibility A: Message while starting or during a run

- ☑ Compare the pulse number setting (DRIVE menu) with the tacho pulses and correct if necessary.
- ☑ Compare the motor data setting (DRIVE menu) with the motor rating plate and correct if necessary.
- ☑ Check tacho-generator and tacho coupling!

Possibility B: Message during deceleration.

- ☑ Check brake resistor
- ☑ Brake path too short
- ☑ Main menu SPEED CURVE: reduce JERK DECELERATION/DECELERATION.

Possibility C: Message during stop (during the length of the levelling flag)

- ☑ Main contactor or mechanical brake are switched off too soon. The mechanical brake must only be applied when elevator is at standstill! Main contactor must remain made for approx. 0.5 seconds after standstill (see Fig. 2-1).

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*!FAULT! Heat sink temperature*

☑ 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.

*!FAULT! Interim circuit undervoltage*

☑ Interim circuit voltage is too low:

☑ Compare mains voltage with controller rating plate. Voltages must be identical.

☑ Control system provides run command, but main contactor does not make, see Fig. 2-1.

*!FAULT! Interim circuit overvoltage*

☑ Interim circuit voltage is too high:

☑ Compare mains voltage with controller rating plate. Voltages must be identical.

☑ Brake resistor is not connected up or wrongly dimensioned, see Chapter 4.6.1.

*!FAULT! IGBT overcurrent*

☑ Motor blocks, brake is not released.

☑ Motor nominal current must be greater than or the same as the controller nominal current (see motor and controller rating plates).

☑ Drive vibrates: check parameters in main menu DRIVE. Main menu SYSTEM PARAMETERS: increase ATT. ACCELERATION or ATT. TRAVEL.

## 7.1.3 Unexpected running characteristics

*Drive starts up with a jolt*

Possibility A: On an empty up run

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

Possibility B: On an empty down run

☑ 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 otherwise the cabin will be pulled on just one side upon start.

☑ 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.

*Jolting while stopping.*

Possibility A: When passing the levelling switch

☑ Reduce the BRAKING RAMP (SPEED CURVE menu), e.g. from 20 to 7%. You must then adjust the stopping accuracy, however, with V1 (SPEED menu).

Possibility B: When at standstill

☑ Main or direction contactor drops out too soon (see description of FAULT SET/ACTUAL DIFFERENCE, 2nd possibility).

*Mechanical brake engages too soon.*

☑ The RELEASE command (UP or DOWN) is switched off too soon. RELEASE must be retained for at least 0.5 seconds after standstill is reached.

## 7.1.4 Controller faults

If it proves impossible to eliminate any controller faults and irregularities by changing the parameters and data entries as a general rule, there will usually be no chance of repairing the controller successfully in-situ. Repairs to the main printed board are not possible 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. IGBT power semi-conductors are only to be replaced by MICOTROL!*

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.

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## 7.2 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 in 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.

☑ For the position of the programmable memory components (EPROMS) see Fig. 7-1 as IC4, IC5 or IC15..

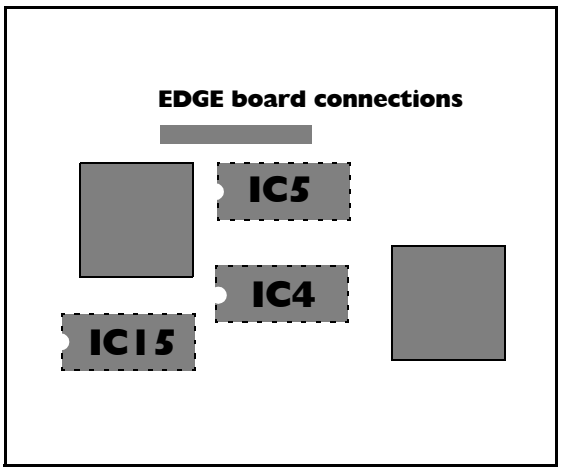



Fig. 7-1
Replacing EPROMS IC4 (Vector Eprom EVEN), IC5 (Vector Eprom ODD) or IC15 (main Eprom). Digital component layout.

☞ MICOTROL will tell you which EPROM is to be replaced. 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.

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## 7.3 Servicing and spare parts

### *Servicing*

The MICOVERT series of controllers 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 to ensure that they are done up tight 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 and heat sinks. 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.

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*PLEASE NOTE: Power semi-conductors are only to be replaced by MICOTROL!*

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