

## Operating Manual

### Frequency Inverter FU 3 AE - 04

Digital frequency inverter for stepless speed control  
of 3-phase a.c. motors up to 1.1 kW



Operating Manual

Frequency inverter  
FU3AE-04

Document

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-Errors and omissions excepted, subject to alterations-

## 1. Preface and general

### 1.1 Manufacturer

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### 1.2 Extend of delivery

Frequency inverter for insertion in card rack . The frequency inverter has been tested for correct functioning and continuous operation.

#### 1.2.1 Brief description

- ◆ Digital frequency inverter for the operation of 3-phase a.c. motors
- ◆ digital tachometer feedback (optional)
- ◆ Wide range voltage input
- ◆ Temperature monitoring of output stage
- ◆ Phase current monitoring of the motor winding
- ◆ Over- and under voltage monitoring of intermediate circuit
- ◆ Levelling of intermediate circuit fluctuations
- ◆ Act./Nom. monitoring of speed in controller mode
- ◆ 19" rack mount with 3 RU (rack units) standard European boards 100 x 160 mm
- ◆ Integrated switching power supply

#### Advantages:

- ◆ Compact and space-saving type as 3RU / 19" insert
- ◆ Operation with industry standard motors (min. Inductivity 2mH)
- ◆ Sinusoidal excitation of the motor ensures that the latter runs true run even at low speeds
- ◆ Potential-free electronics
- ◆ Overload-proof protection
- ◆ Change direction of rotation by electronic system

### 1.2.2 Disclaimer

#### Liability

The information, data and instructions contained in this operating manual were up-to-date as of the date of publication. No claims may be made in respect of inverters delivered previously on the basis of statements, illustrations/photos or descriptions contained in this operating manual.

The process-specific instructions and circuit extracts contained in this manual are recommendations. Their applicability to the task in hand must first be verified. The firm ANTEK – Antriebstechnik GmbH assumes no liability for the suitability of the processes described and the suggested circuits contained herein.

No liability will be assumed for damages or malfunctions caused by:

- ◆ disregarding this operating manual
- ◆ unauthorized modifications made to the inverter
- ◆ operator errors
- ◆ improper working on and with the inverter
- ◆ Operation of the inverter in mountings or connections, other than those described in this manual.

#### Warranty

Warranty claims are to be made to the manufacturer as soon as a fault / defect is discovered. The warranty will be voided by:

- ◆ improper use of the inverter
- ◆ improper working on and with the inverter
- ◆ arbitrary modifications to the inverter

### 1.2.3 Definitions

#### Qualified Personnel

Qualified personnel are persons who, due to their training, experience and instructions, as well as their knowledge of relevant standards and directives, safety-regulations, company policies, and entitled by those responsible for the safety of the system, are justified to carry out necessary tasks and recognize and avoid possible dangers.  
(Definition for qualified employees per IEC 364)

#### Operator

An operator is any natural person or legal entity who operates the inverter, or in whose name the frequency inverter is operated.

## 2. Safety

### 2.1 Operating Manual

This operating manual contains safety instructions for correct operation on and of the frequency inverter, they are to be followed.

In addition to the general safety instructions contained in this chapter, the instructions contained in the manual text must also be followed.

No claim is made that the safety instructions are complete. Please contact the manufacturer in the event of questions or problems.

This manual must be available to all persons who work on or with the frequency inverter and must remain in good, readable condition.

### 2.2 Symbols

In these instructions important explanations are highlighted with the following symbols:



Caution: this explanation indicates hazards which, under certain circumstances, may lead to personal injury or material damage.



Attention required / Check: please pay special attention to the points described.



Information: provides you with further information relating to the product.

### 2.3 General Safety Information

The frequency inverter was state-of-the-art at the time of delivery and is considered principally safe to operate. The frequency inverter may present certain dangers to personnel, the frequency inverter or other assets of the operator when:



- ◆ non-qualified personnel work on or with the frequency inverter,
- ◆ Operation of the inverter in other mountings or connections, other than described in this manual.
- ◆ the frequency inverter is improperly used.

Then exists danger for:

- ◆ Persons
- ◆ The frequency inverter
- ◆ Other real value of the operator

The installations in which the frequency inverter is incorporated must be designed so that they fulfil their functions when set up correctly and when used in accordance with the instructions in fault-free operation and do not cause any danger to persons. This also applies to the interaction of the frequency inverter with the installation as a whole. In the case of applica-

tions in installations with technical safety requirements and with regard to installation, the relevant laws and regulations must be complied with (e.g. EN 57100, EN 60204).

Take additional measures to limit consequences of error functions which can prove to be dangerous for people:



- ◆ other independent devices which safeguard against possible malfunction of the frequency inverter.
- ◆ electrical and non-electrical safety devices (locking or mechanical stops )
- ◆ measures covering the system

Take appropriate measures to see that in case of malfunctioning of frequency inverter there is no material damage.

When work is being carried out on live equipment, the relevant accident prevention regulations must be obeyed.

For reasons of safety and of maintaining documented system data and functions, repairs to the unit or its components are to be carried out only by the manufacturer.



No liability is accepted for inappropriate, incorrect manual or automatic setting of the parameters for the drive.

### 2.4 Operator Responsibilities

Responsibilities of the operator or safety officer:

- ◆ to ensure adherence to all relevant directives, instructions and laws,
- ◆ to ensure that only qualified personnel operate on or with the frequency inverter,
- ◆ to ensure that the operating manual is available to all personnel.
- ◆ to ensure that unqualified personnel do not work with the frequency inverter.
- ◆ The operator is responsible for ensuring that the motor, the inverter and ancillary equipment are installed and connected in accordance with the technical rules applicable in the country in which installation is taking place and with other regulations which are applicable regionally. In this context, special consideration must be given to cable dimensioning, screening, earthing, disconnection, isolation and overcurrent protection.

### 2.5 Personnel

Only qualified personnel may work on or with the inverter.



## 2.6 Instructions on unpacking, mounting and installation



Check for any transport damage after unpacking the control unit and before the initial start-up.

Check that all plug-in and screwed connections are secure.

Minimum requirements for installation site:

- ◆ The room should be as dust-free as possible (fit filters to control cabinets which have floor fans).
- ◆ The allowed ambient temperature and the relative air humidity must not be exceeded (if required provide separate cooling).
- ◆ The inverter causes power loss and heats up the environment. Ensure a sufficient distance from heat-sensitive equipment.
- ◆ In the event of contaminated cooling air (dust, fluff, aggressive gases and grease), which might adversely affect the functioning of the frequency inverter, adequate countermeasures must be taken, e.g. separate air feed, installation of filters, regular cleaning, etc.
- ◆ The units are designed for mounting in suitable card racks .
- ◆ The unit must be mounted vertically.
- ◆ Ensure unimpeded access of cooling air and egress of discharged air. Clearances for incoming and outgoing air must be complied with.
- ◆ If the frequency inverter is continuously exposed to oscillation or vibration, vibration absorbers may be required.

## 2.7 Electrical Installation

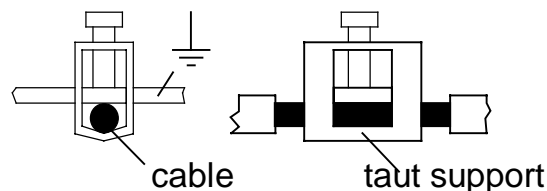


- ◆ The regulator contains components sensitive to electrostatics. Before installation and service work in the terminal clamp area, the staff must free itself of electrostatic electricity. The discharging can be achieved by touching a grounded metal surface beforehand.
- ◆ To protect the power supply cables, the recommended cable protection fuse is required
- ◆ The motor should be equipped with a temperature sensor . Evaluation can be performed by the FU3AE-04 or a suitable analyser.
- ◆ Control wiring and power cables must always be spatially separated from each other.
- ◆ Set-value inputs must be shielded.
- ◆ Conductor diameters for power supply and motor wiring must be at least 1,5 mm<sup>2</sup>!
- ◆ Observe the current local safety regulations.

## 2.8 Information on EMC

In order to warranty electromagnetic compatibility (EMC) in your switch cabinets in an electrically raw environment, the following EMC rules are to be observed during construction and set-up:

- ◆ All metallic parts of the switch cabinet are to be connected flatly and in a well-conducting manner (not lacquer on lacquer!). If necessary, use contact or scraper wafers. The cabinet door is to be connected with as short a circuit as possible via the metal powder tapes (upper, middle, lower).
- ◆ Signal lines and power cables are to be laid separated from each other in order to avoid coupling intervals. Minimum distance: 20 cm:
- ◆ Signal lines should be led to the cabinet from only one level, if possible. Unshielded lines from the same electrical circuit (outgoing and return circuit) are to be transposed, if possible.
- ◆ Contactors, relays and magnetic valves in the switch cabinet, if necessary in the adjacent cabinets, are to be wired with suppressor combinations, e.g. with RC elements, varistors or diodes.
- ◆ The braiding from signal lines are to be laid two-way (source and target), large-area and well-conducting to a ground<sup>1</sup>. In case of poor potential equalization between shielded connections, an additional balancing network of at least 10 mm<sup>2</sup> must be laid parallel to the braiding to reduce the current.
- ◆ Wiring is not to be laid freely in the cabinet, but should rather lead as tightly as possible to the cabinet frame or to installation plates. This also applies to reserve cables. At least one end of them must be grounded, but preferably both (additional shield effect).
- ◆ Unnecessary wire lengths are to be avoided. Coupling capacities and coupling inductance's are thereby kept small.
- ◆ The braiding from leads, such as resolver or incremental tachometer cables, must be laid to the frame grounding. Approximately 2 cm of the insulation is to be removed in the area where the cable is to be led into the frame in order to expose the braided cable. The braided cable may not be damaged while removing the insulation. The cable is to be led at the position where the insulation has been removed by grounded terminals or taut supports.



<sup>1</sup>Generally all metallic conducting parts which can be connected to a protective conductor, such as cabinet frames, motor frames, foundation grounding, etc. are designated as a ground.

## 2.9 Operation of the frequency inverter

Operate the frequency inverter only if it is in perfect condition. The permissible conditions of use and output limits must be complied with.



Retrofitting, modifications or conversions of the frequency inverter are **forbidden**. In all such cases, the manufacturer must be consulted.

The frequency inverter is an item of equipment for use in industrial installations. During operation, these items of equipment have dangerous, live components. Consequently, during operation all covers must be fitted to the drive controller, in order to ensure full protection from contact with it.

The modules include electro statically sensitive CMOS und MOS components. Caution must be exercised in respect of electrostatic charges.

## 2.10 Important instructions on protective earthing

Because of the loss currents of the essential mains filter (>3.5 mA) via the protective earthing conductor (PE), according to DIN VDE 0160 the cross-sectional area of the lead-in wire of the protective earth wire to the switch cabinet must be at least 10 mm<sup>2</sup> Cu, or a second protective earth conductor must be laid electrically in parallel.



In the case of higher installed loads, the minimum cross-sectional area of the protective earth conductor must be in a corresponding relation to the cross-section of the outer conductors (see DIN 57100 Part 540).

The loss currents of the filter may be as high as 100 mA. Operation with FI earth leakage circuit breakers is therefore not possible.

## 2.11 Important instructions on routing of wires



Control lines and power cables must always be routed separately with a gap between them. Tacho inputs, set point and analogue control inputs must be laid using shielded cables.

### 3. Technical data

#### 3.1 Reference data FU3AE-04

for use with UL and CSA type approval regulations (according to UL 508)

| Type  | FU3AE-04 |  |
|---|----------|--|
| Input voltage range $U_{\text{mains}}$ :                              | VAC      | 3x 380 VAC -10% ... 480 VAC +6%;<br>45 ... 66 Hz |
| Nominal input current $I_N$ :   | AAC      | 3x 3   |
| Peak input current:   | AAC      | 3x 5   |
| Connect load  | kVA      | 2,1  |
| Fuse protection extern:   | A        | 3x 10 Z characteristic<br>(e.g. ABB S283-Z10)    |
| 24 VDC supply external:   | VDC      | 24 $\pm$ 20%                                     |
| 24 VDC supply external:   | ADC      | approx. 0,4 (1A internal fuse)                   |
| Nominal output voltage $U_a$  |          | 0 ... $U_e$                                      |
| Nominal output current $i_a$ :  | AAC      | 3x 3   |
| Peak output current:  | AAC      | 3x 5   |
| Output frequency $f_{\text{out}}$ :                                   | Hz       | 0 ... 160  |
| Nominal output power S:   | kVA      | 2.1  |
| min. output inductance L:   | mH       | 2  |
| Regulating range with pulse generator<br>(number of gradations > 100) |          | 1:100  |
| Output stage clock frequency:   | kHz      | 4, 8, or 16 resp.                                |
| Technical specifications refer to 400 VAC mains input voltage         |          |  |

#### Note:

There is no fuse in the unit for the mains supply. It is essential to provide automatic circuit-breakers with 3x 10 A Z characteristic, since the unit is not protected otherwise.

|                      |  |
|----------------------|--|
| Installation:        | in suitable module racks, cooling fins vertical  |
| Ambient temperature: | 5 ... 40 °C  |
| Atmospheric humidity | max. 90%, non-condensing!  |
| Cooling:             | Forced cooling 60 m <sup>3</sup> /h  |
| Connection:          | High-current terminal strip E-L12 Type H11<br>Edge connector GDS-AC32 Type C<br>SUB-D 9-pole (Edge socket connector) |
| Protection class:    | IP 00  |
| Dimensions:          | 19" slide-in 3 RU x 19 TE, depth approx. 190 mm  |

Standards and regulations: DIN 57110b

EN 60204

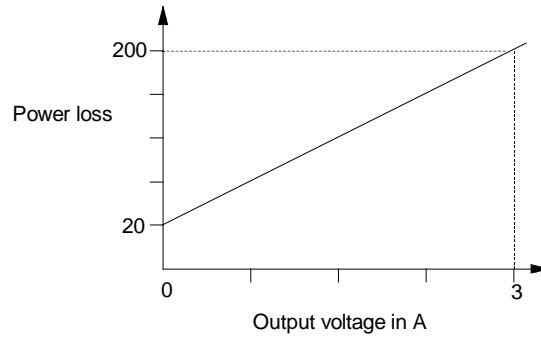
EN 55011b only with mains filter A395

UL approval File E181898

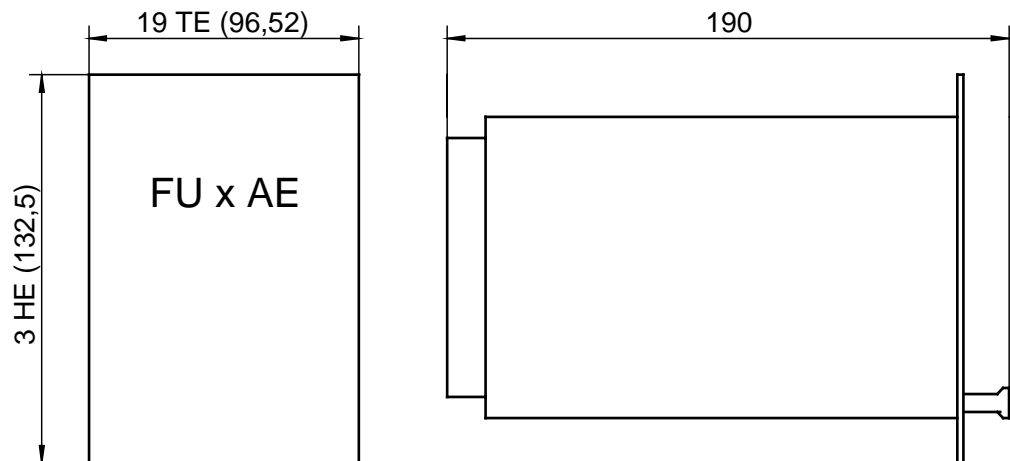




|                         |  |
|-------------------------|--|
| Digital control inputs: | Controller enable, Reset fault   |
| Signal outputs:         | Floating signal outputs for act./nom. monitoring, ready signal<br>Load capacity: 35 VDC; 0.2 A |
| Nominal value input:    | 0 ... 10VDC  |
| Actual value feedback:  | 2-wire pulse generator   |
| Power loss diagram:     |  |

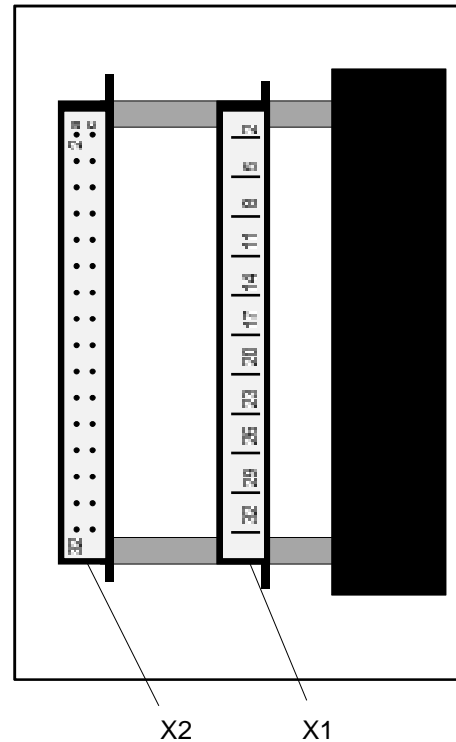


### 3.2 Dimensions



## 4. Description of connection

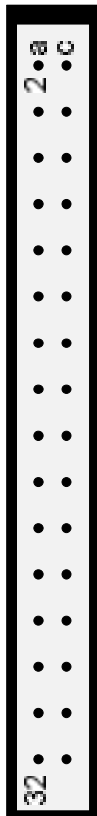
(back view of unit)



### 4.1 Power plug X1

|    |                     |   |
|----|---------------------|---|
| 2  | <b>X1-2 +24 VDC</b> | Supply voltage for internal controlling equipment of the controller 24 VDC $\pm 20\%$   |
| 5  | <b>X1-5 GND</b>     |   |
| 8  | <b>X1-8..PE</b>     |   |
| 11 | <b>X1-11 L1</b>     | Supply voltage connection   |
| 14 | <b>X1-14 L2</b>     |   |
| 17 | <b>X1-17 L3</b>     |   |
| 20 | <b>X1-20 UZK+</b>   | Intermediate circuit voltage to connect a feed-back module or to couple several units with common intermediate circuits                       |
| 23 | <b>X1-23 UZK -</b>  |   |
| 26 | <b>X1-26 U</b>      | Motor connection<br><b>Warning!</b> The motor cable always must be shielded. Shielding has to be laid two-way (source and target) to a ground |
| 29 | <b>X1-29 V</b>      |   |
| 32 | <b>X1-32 W</b>      |   |

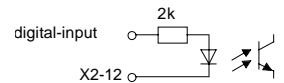
## 4.2 Control plug X2



### Control inputs

**X2-2a,c RF-L**  
**X2-4a,c RF-R**  
**X2-6a,c N1**  
**X2-8a,c N2**  
**X2-10a,c Reset-Fault**  
**X2-12a,c Ref. 2a,c-10a,c**

Enable left  
 Enable right  
 Permanent rotation speed N1  
 Permanent rotation speed N2  
 Reset-fault message



Potential reference of the inputs X2-2a, X2-4a and X2-10a.

The inputs X2-2a to X2-10a are separated by optoelectronic couplers from the residual electronic. A voltage between 12 ... 30 VDC sub-tend Pin X2-12a activate the respective inputs.

**X2-14a,c th<sub>Mot</sub>**

Motor thermal sensor . Parameters can be assigned for switching threshold and behaviour.

**X2-16a,c n-Set-point**

This input must be protected from interference Input of the rotation speed set point 0 ... 10 VDC

R<sub>i</sub> = 10 kΩ reference GND (X2-22a,c)

**Warning!** This connection always must be shielded.

**X2-18a,c Tacho**

Connection for pulse generator (2-wire-technique, Ref.: X2-22a,c)

**Warning!** This connection always must be shielded.

### Auxiliary voltage

**X2-20a +15 VDC**

**X2-22a GND**

**X2-24a -15 VDC**

These connections have a direct voltage of ± 15 VDC for external components (e.g. pulse generator) .

Current carrying capacity: ± 25 mA

### Outputs

potential free outputs Current carrying capacity: 60 VDC; 0,2 A

**X2-26a Act./Nom.-1**

**X2-28a Act./Nom.-2**

Signal connection for Act./Nom. monitoring .

ok = Relay contact closed

Error = Relay contact open

Connection for "ready" signal .

**X2-30a ready 1**

**X2-32a ready 2**

ok = Relay contact closed

Fault = Relay contact open

### 4.2.1 Fixed set points

By means of the input signals for fixed speed N1 and fixed speed N2, it is possible to select 3 fixed speeds or analogue set point specification by binary coding.

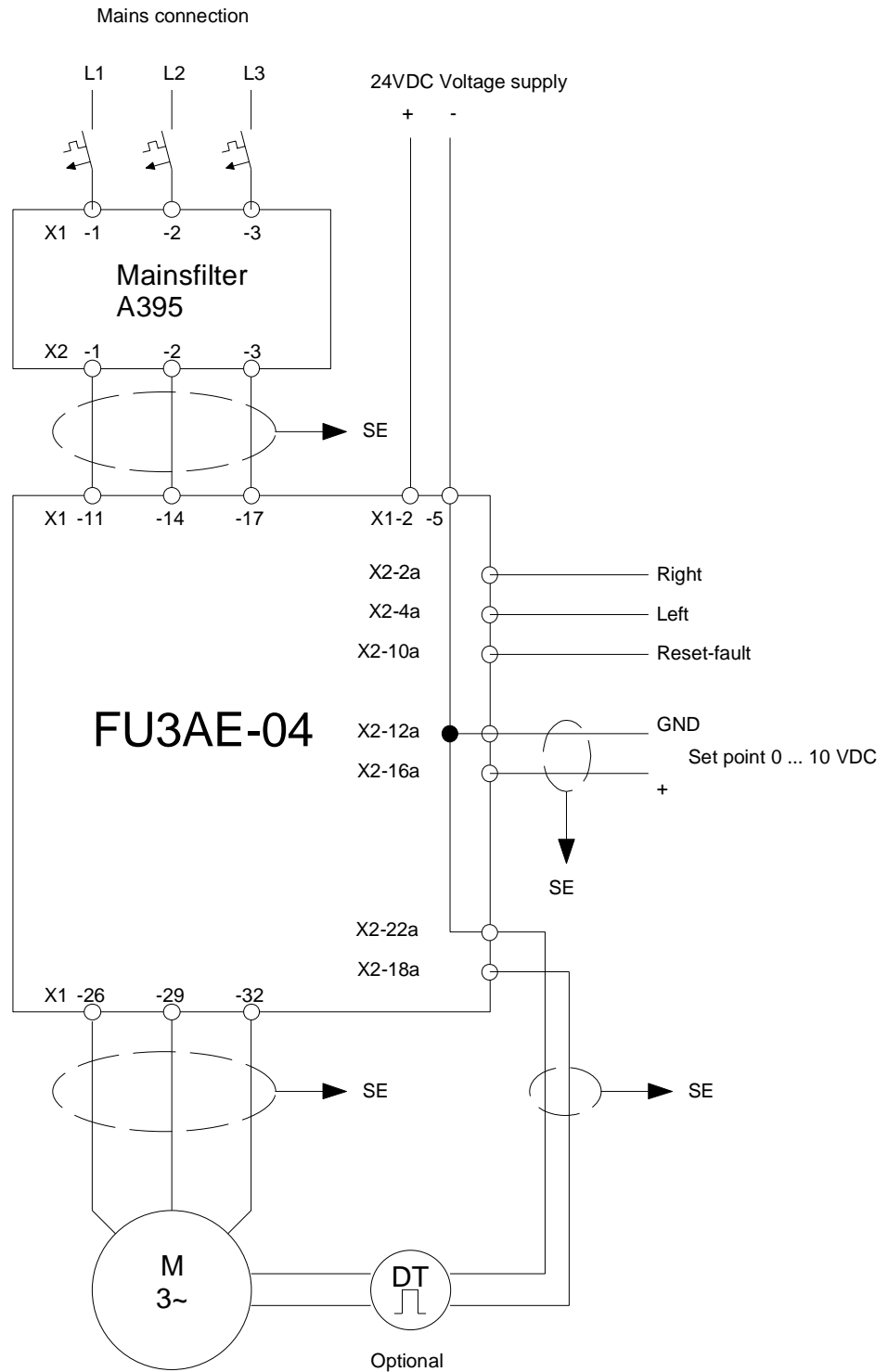
| <b>Logic diagram:</b> | <b>Fixed speed N1</b> | <b>Fixed speed N2</b> |
|-----------------------|-----------------------|-----------------------|
| Analogue set point    | LOW                   | LOW                   |
| Fixed set point n1    | HIGH                  | LOW                   |
| Fixed set point n2    | LOW                   | HIGH                  |
| Fixed set point n3    | HIGH                  | HIGH                  |

For assignment of parameters for fixed set points, see section: 6.2.2





### 4.3 Connections



All "PE" must be earth on both sides (look on EMC-rules)!

## 5. Commissioning

### 5.1 Switch-on sequence

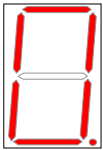


- Switch on control voltage (24VDC)
- (first time) Assign parameters to suit the respective conditions
- Switch on main voltage
- Specify controller enable and set point

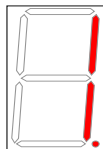
### 5.2 Display



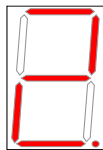
The 7-segment display displays the instantaneous status of the unit. (The status of the unit can also be ascertained using the “UniDesk“ operating software).



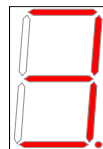
0- not ready: no fault , but main voltage is not present. In this condition, the inverter waits for the voltage to be supplied. If controller enable is applicable, when the main voltage is switched on the drive is started immediately. The ready signal contact is closed in order to exclude a ring interlock with the higher-level control system.



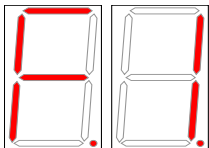
1- Ready: no fault. The drive can be started immediately.



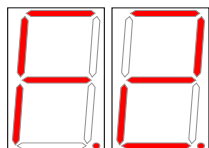
2- Clockwise rotation: no fault. The inverter generates a clockwise rotating field.



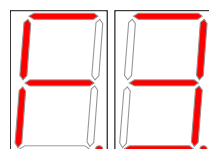
3- Anti-clockwise rotation: no fault . The inverter generates an anti- clockwise rotating field.



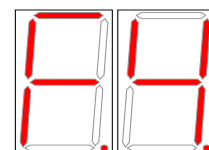
F1- Undervoltage mains: the intermediate circuit voltage has dropped below a critical value. (This fault is triggered only during controller enable) Drive switched off. Check power supply.



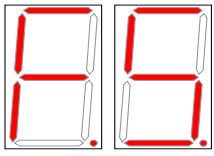
F2- Overvoltage : the intermediate circuit voltage has exceeded a critical value. Drive switched off. Check power supply, check motor braking energy.



F3- Overtemperature of the heat sink: the inverter’s heat sink has become too hot. Drive switched off. Ensure that the inverter is adequately cooled.

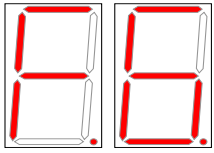


F4- Overcurrent: Either the set peak current has been briefly exceeded or the continuous current has been exceeded for some time. Drive switched off. Check the load on the motor.



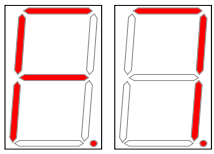
F5- Output stage: a fault has occurred in the power stage of the inverter. Drive switched off.

If this fault occurs repeatedly, please inform the manufacturer.

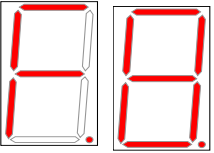


F6- Processor. A fault has occurred in the inverter's microprocessor. Drive switched off.

If this fault occurs repeatedly, please inform the manufacturer.

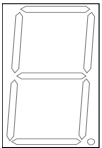


F7- Overtemperature motor: motor has become too hot. Drive switched off. Check the load on the motor, ensure motor is cooled, check parameters.



F8- Undervoltage 24V: control voltage has failed briefly or is too low. Drive switched off.

Check power supply (control voltage). It is essential to ascertain the cause of this fault and remedy it, since safe operation of the frequency inverter may be compromised.



F9- Display off: control voltage has failed or is too low. Unit is non-operational.

## 6. Service information

### 6.1 Summary of parameters

| No.                           | Parameter       | Explanation  |
|-------------------------------|-----------------|--|
| <b>Measurement parameters</b> |                 |  |
| 2                             | Software code   | Information  |
| 3                             | Hardware status | Information  |
| 4                             | Operating hours | Operating time of the unit   |
| 6                             | Status          | Unit status, see also section 5.2  |
| 7                             | Set point       | The currently active set point as % of the nominal frequency                                       |
| 8                             | UZK             | Intermediate circuit voltage   |
| 9                             | I-Phase         | Phase current  |
| 10                            | f-out           | Output frequency   |
| 11                            | U-out           | Output voltage   |
| 12                            | Controller      | Controller's effect on inverter's characteristic curve in % (active only in speed controller mode) |
| 13                            | n-act.          | Actual frequency of the motor as % of the nominal frequency  |

| <b>Adjustable parameters</b> |                      |   |
|------------------------------|----------------------|---|
| 30                           | Mode                 | Static: operation strictly according to the parameterised characteristic curve<br>Speed: controller mode, in which the characteristic curve is displaced within the framework of the limit of influence. Pulse generator feedback is necessary in order to do this. |
| 32                           | U-0                  | Boost – Output voltage at 0Hz output frequency  |
| 33                           | U-50                 | Steepness of the inverter's characteristic curve: output voltage at 50Hz output frequency   |
| 35                           | Offset               | Set point shift to adjust to set point source   |
| 36                           | Mult. N-Set          | Set point multiplier to adapt to set point source   |
| 37                           | N-1                  | Fixed speed N1  |
| 38                           | N-2                  | Fixed speed N2  |
| 39                           | N-3                  | Fixed speed N3  |
| 40                           | tH                   | Run-up ramp   |
| 41                           | tR                   | Run-down ramp   |
| 42                           | n-nom                | Nominal motor speed (for speed controller mode)   |
| 43                           | Poles                | Number of motor poles   |
| 44                           | Number of gradations | For pulse generator feedback: number of gradations per revolution   |
| 45                           | t-n-act              | Speed actual value filter: eliminates speed jitter in speed controller mode   |
| 46                           | KPn                  | Proportional component of the speed controller  |
| 47                           | Kin                  | Integral component of the speed controller  |
| 48                           | Influence            | Limit of influence of the speed controller on the inverter's characteristic curve   |
| 49                           | Nom.-act. threshold  | Maximum deviation between nominal and actual speed before Nom.-Act. OK signal contact opens (active only in speed controller mode)  |
| 50                           | t-Nom.-Act.          | Delay before the Nom.-Act. OK signal contact opens (active only in speed controller mode)   |
| 51                           | I-Max                | Maximum permissible motor phase current   |
| 52                           | I-Cont.              | Maximum permissible continuous motor phase current  |
| 53                           | t-I-Act.             | Actual value filter for current. Eliminates current pulses during current measurement   |
| 54                           | t-I-red              | Delay within which exceeding of I-Cont is permissible.  |

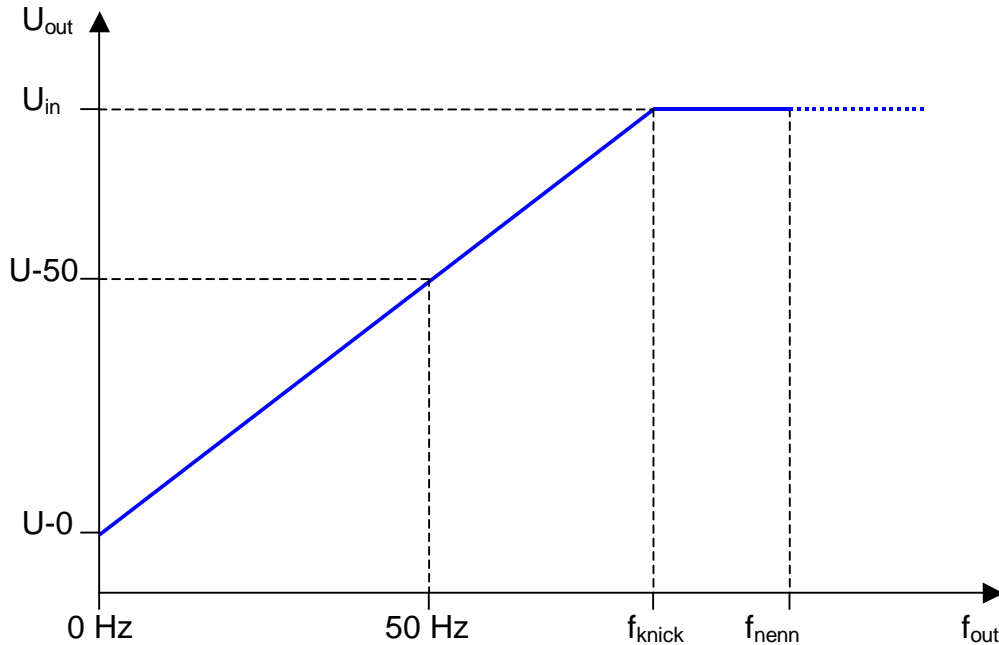


## 6.2 Configuration und useful information on parameters

All parameters may be changed only when the controller is not enabled!

### 6.2.1 Characteristic curve

The frequency inverter's characteristic curve must be adapted to the connected motor:



The diagram shows the relationship between output frequency ( $f_{out}$ ) and output voltage ( $U_{out}$ ). The position and steepness of the characteristic curve is determined by the two parameters  $U-0$  (voltage when  $f_{out}=0\text{Hz}$ , also termed Boost) and  $U-50$  (voltage when  $f_{out}=50\text{Hz}$ , can as a rule be taken from the motor rating plate).

Setting  $U-0$  high results in improved start-up behaviour, but also causes the motor to heat up more.



This characteristic curve is continued in linear fashion until it is limited by the available input voltage ( $U_{in}$ ). At this point, the kink frequency occurs ( $f_{kink}$ ).

Above the kink, the motor's nominal moment is no longer available (because of physical limitations).

### 6.2.2 Set point adaptation, fixed set points and ramps

Set point adaptation is possible by means of the parameters 'Offset' and 'Mult. N-Nom.'. The 'Offset' parameter offsets the set point (e.g. for zero balancing); the 'Mult N-Act.' represents the evaluation factor for the set point.



It must be noted that the physical range of the set point voltage remains restricted to  $0...10\text{V}$ .

Fixed set points are programmed by parameters 'N1', 'N2' and 'N3'. See also section 0.

The run-up and run-down ramps are specified in the parameters 'tH' and 'tR'. They define the time (in seconds) for acceleration from 0 to 'f-Nom' and vice versa.

### 6.2.3 Controller mode



For controller mode operation feedback with the pulse generator is required. The control characteristics can be influenced by the parameters  $KP_n$  (proportional component) and  $KI_n$  (integral component).

If the feedback jitters, i.e. indicates speed fluctuations which are not present, these can be smoothed by means of the speed actual value filter. The parameter 't-n-Act.' specifies the time constant for this filter.

The speed controller's control variable affects the inverter's characteristic curve, but excessive displacements of the characteristic curve must be avoided; otherwise the motor may exceed its breakdown torque. The limit is imposed by means of the 'Influence' parameter. The two parameters 'Threshold Nom.-Act.' and 't-Nom.-Act' relate to the 'Nom.-Act. OK' signal contact. The maximum permissible speed deviation from the set point is specified by 'Threshold Nom.-Act.'; 't-Nom.-Act.' defines how long an excessively high speed deviation is tolerated (e.g. during start-up). In the static mode, the signal output is permanently closed.

#### 6.2.4 Limitations

The continuous and peak current limit are specified in the parameters 'I-Cont' and 'I-max'. The integration time by which 'I-cont' may be exceeded, is defined in 't-I-red'. In addition, the time constant of the actual value filter for current can be set in 't-I-Act.'.

## 7. Finding and eliminating faults

### 7.1 Resetting faults

- ◆ Control voltages ON/OFF
- ◆ Pos. edge on control input “Reset fault“

### 7.2 Possible causes of faults

A number of possible causes of faults are listed in the table below.

| Fault  | Possible cause                        | Remedy  |
|--|---------------------------------------|---|
| Display off  | 24V control voltage absent or too low | Check voltage   |
| Display indicates 0  | Main voltage absent                   | Check voltage   |
| Display indicates fault code   | See section 5.2                       | See section 5.2   |
| Motor not running, even though display indicates 2 (clockwise) or 3 (anti-clockwise) | Set point too low                     | Specify set point   |
|  | Wiring fault                          | Check wiring (esp. motor phases)  |
|  | U-0 too low (at low speeds)           | Correct U-0   |
| Drive controller oscillates (speed controller mode)                                  | Controller set incorrectly            | Optimise KPn, Kin and t-n-Act. if necessary   |
| Motor runs out of true   | EMC                                   | Link reference earth of analogue and digital inputs respectively                                |
|  |                                       | Screening of analogue and digital inputs, large-area earthing of sensor signals and motor cable |

If you return the unit for testing or repair, please provide the following information:

- ◆ type of fault
- ◆ accompanying circumstances
- ◆ suspected cause of the fault
- ◆ unusual preceding events

## 8. Operating software

### 8.1 UniDesk

In order to be able to parameterise and monitor the frequency inverter FU3AE-04, ANTEK UniDesk monitor software is required.

System requirements:

- ◆ Windows 9x, ME, 2000, XP
- ◆ 32MB RAM
- ◆ 10MB free hard disk space
- ◆ Processor: 486 or faster

### 8.2 Serial interface

Communication from UniDesk and the controller takes place across a standard RS232 cable (DTE – DCE, not crossed) with 9-pole Sub-D connectors.



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