

Variable speed drives for asynchronous motors

Frequency inverter ER32

Short programming manual

Retain for future use!



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Important information

NOTICE

Please read these instructions carefully and examine the device in order to familiarize yourself with it prior to installation, operation or maintenance. The specific messages below can appear in the documentation or on the device. They warn of potential dangers or draw your attention to information that can clarify or simplify a procedure.



This symbol on a hazard or warning label indicates a potential risk of electrocution, which can result in bodily harm in the event of non-compliance with the accompanying instructions.



This symbol indicates a safety hazard. It warns of the potential risk of physical injury. You must observe all safety instructions accompanied by this symbol in order to avoid situations that can result in serious physical injury or even death.

ENGLISH

DANGER

DANGER indicates a dangerous situation that **will** result in death, serious physical injury or equipment damage.

WARNING

WARNING indicates a dangerous situation that **can result** in death, serious physical injury or equipment damage.

CAUTION

CAUTION indicates a potentially dangerous situation that **might possibly result** in bodily harm or equipment damage.

IMPORTANT NOTE

Electrical equipment must only be serviced by qualified personnel. ER32 will not accept any responsibility for consequences associated with the use of this document. This document must not be used as a training guide for beginners.

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Before you begin

Read and understand these instructions before performing any procedure on this drive.

ENGLISH

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand this manual before installing or operating the ER32 drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical standards in force concerning protective grounding of all equipment.
- Many parts of this variable speed drive, including the printed circuit boards, operate at the line voltage. **DO NOT TOUCH.** Use only electrically insulated tools.
- **DO NOT** touch unshielded components or terminal strip screw connections with voltage present.
- **DO NOT** short across terminals PA and PC or across the DC bus capacitors.
- Install and close all the covers before applying power or starting and stopping the drive.
- Before servicing the variable speed drive
 - Disconnect all power.
 - Place a "DO NOT TURN ON" label on the variable speed drive disconnect.
 - Lock the disconnect in the open position.
- Disconnect all power including external control power that may be present before servicing the drive. Wait for the charging LED to go off. **WAIT 10 MINUTES** to allow the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure on page 32 to verify that the DC voltage is less than 45 V. The drive LEDs are not accurate indicators of the absence of DC bus voltage.

Failure to follow these instructions will result in death, serious physical injury or equipment damage.

⚠ CAUTION

IMPROPER DRIVE OPERATION

- If the drive is not powered up for a long period, the performance of its electrolytic capacitors will be reduced.
- If it is stopped for a prolonged period, turn the drive on every two years for at least 5 hours to restore the performance of the capacitors, then check its operation. It is recommended that the drive is not connected directly to the line voltage. The voltage should be increased gradually using an adjustable AC source.

Failure to follow this instruction can result in bodily harm and/or equipment damage.

Steps for setting up the drive

- 1 Take delivery of the drive

- Check that the catalog number printed on the label is the same as that on the purchase order.
- Remove the Altivar from its packaging and check that it has not been damaged in transit.

- 2 Check the line voltage

- Check that the line voltage is compatible with the voltage range of the drive.

- 3 Mount the drive (page 31)

- Mount the drive in accordance with the instructions in this document.
- Install any internal and external options.

- 4 Wire the drive (page 33).

- Connect the motor, ensuring that its connections correspond to the voltage.
- Connect the line supply, after making sure that the power is off.
- Connect the control.
- Connect the speed reference.

Steps 1 to 4 must be performed with the power off.

- 5 Power up without run command.

- 6 Configure the AUF menu (page 45).

- Speed variation range
- Motor thermal protection
- Motor frequency if not equal to 50 Hz.
- Motor frequency if not equal to that of the drive.
- If the motor's power rating differs from that of the drive, consult the CD-ROM supplied with the drive.

- 7 Start.

Tip:

- Perform an auto-tuning operation to optimize performance.



Note: Check that the wiring of the drive is compatible with its configuration.

Preliminary recommendations

Handling and storage

To protect the drive prior to installation, handle and store the device in its packaging. Ensure that the ambient conditions are acceptable.

⚠ WARNING

DAMAGED PACKAGING

If the packaging appears damaged, it can be dangerous to open and handle it. Take precautions against all risks when performing this operation.

Failure to follow this instruction can result in death, serious bodily harm or equipment damage.

ENGLISH

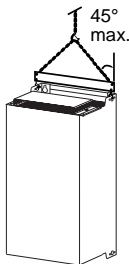
⚠ WARNING

DAMAGED EQUIPMENT

Do not operate or install any drive that appears damaged.

Failure to follow this instruction can result in death, serious bodily harm or equipment damage.

Handling on installation



ER32 drives up to ratings ER32-18.5/4K can be removed from their packaging and installed without a handling device.

A hoist must be used for higher ratings; for this reason they are fitted with handling "lugs". The precautions described below must be observed.

Precautions

⚠ CAUTION

INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the drive, ensure that the line voltage is compatible with the line voltage range shown on the drive nameplate. Before turning on and configuring the drive, ensure that the line voltage is compatible with the line voltage range of the drive. The drive may be damaged if the line voltage is not compatible.

Failure to follow this instruction can result in bodily harm and/or equipment damage.

⚠ DANGER

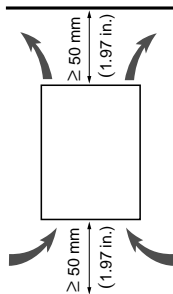
UNINTENDED EQUIPMENT OPERATION

Before turning on or on exiting the configuration menus, check that the inputs assigned to the run command are deactivated (at state 0) since they can cause the motor to start immediately.

Failure to follow these instructions will result in death, serious physical injury or equipment damage.

Mounting

Mounting and temperature conditions



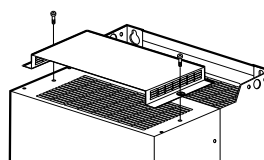
Install the unit vertically, at $\pm 10^\circ$.
Do not place it close to heating elements.
Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

Free space in front of unit: 10 mm (0.4 in.) minimum

When IP20 protection is adequate, it is recommended that the protective cover on the top of the drive is removed as shown below.

Removing the protective cover

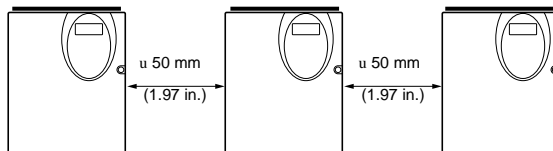
Example ER32-22.0/4K



3 types of mounting are possible

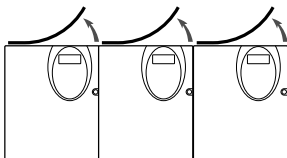
Type A mounting:

Free space ≥ 50 mm (1.97 in.) on each side, with protective cover fitted



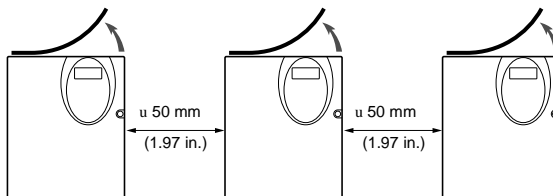
Type B mounting:

Drives mounted side by side, with the protective cover removed (the degree of protection becomes IP20)



Type C mounting:

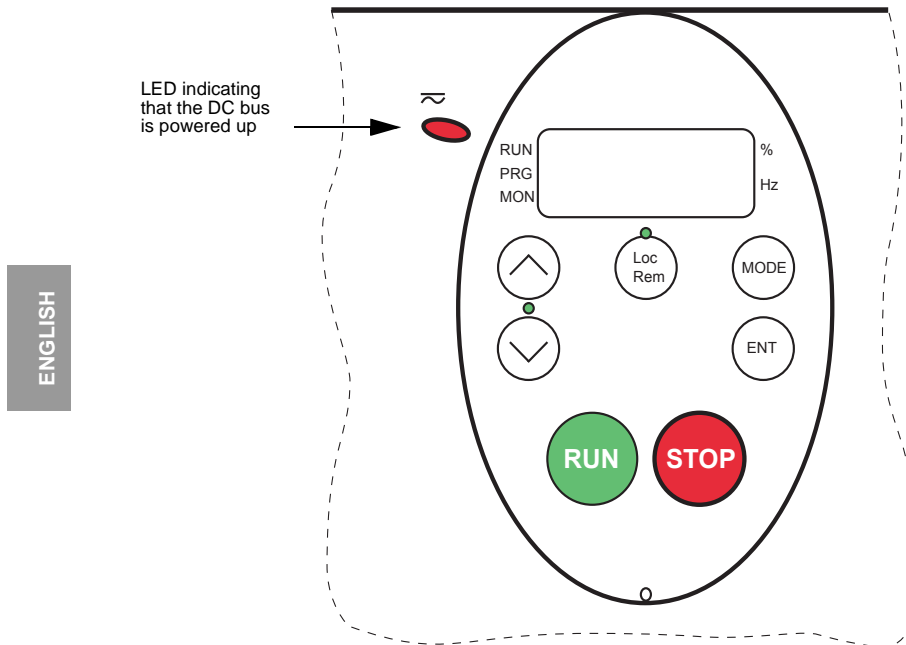
Free space ≥ 50 mm (1.97 in.) on each side, with protective cover removed (the degree of protection becomes IP20)



These types of mounting are possible without derating up to 40°C at the factory-set switching frequency. For other ambient temperatures and switching frequencies, derating may be required (please consult our catalog).

Position of the capacitor charging LED

Before working on the drive, turn it off, wait until the capacitor charging LED has gone out, then measure the DC bus voltage.



ENGLISH

Procedure for measuring the DC bus voltage

⚠ DANGER

HAZARDOUS VOLTAGE

Read and understand the instructions on page 28 before performing this procedure.

Failure to follow this instruction will result in death, serious physical injury or equipment damage.

The DC bus voltage can exceed 1000 V DC. Use a properly rated voltage sensing device when performing this procedure. To measure the DC bus voltage:

- 1 Disconnect the drive power supply.
- 2 WAIT 10 MINUTES to allow the DC bus capacitors to discharge.
- 3 Measure the voltage of the DC bus between the PA/+ and PC/- terminals to check whether the voltage is less than 45 V c.
- 4 If the DC bus capacitors have not discharged completely, contact your local ER32 representative (do not repair or operate the drive).

Wiring recommendations

Power

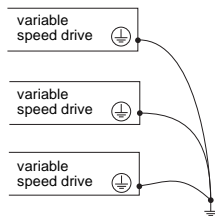
The drive must be connected to the protective ground. To comply with current regulations concerning high leakage currents (above 3.5 mA), use at least a 10 mm² (AWG 6) protective conductor or 2 protective conductors with the same cross-section as the power section AC supply conductors.

⚠ DANGER

HAZARDOUS VOLTAGE

Ground equipment using the provided ground connecting point as shown in the figure below. The drive panel must be properly grounded before power is applied.

Failure to follow these instructions will result in death or serious injury.



- Check whether the resistance of the protective ground is one ohm or less.
- If several drives need to be connected to protective ground, each one must be connected directly as indicated opposite.

ENGLISH

⚠ WARNING

IMPROPER WIRING PRACTICES

- The ER32 drive will be damaged if input line voltage is applied to the output terminals (U/T1,V/T2,W/T3).
- Check the power connections before energizing the ER32 drive.
- If replacing another drive, verify that all wiring connections to the ER32 drive comply with all wiring instructions in this manual.

Failure to follow these instructions can result in death or serious injury.

When upstream protection by means of a "residual current device" is required by the installation standards, a type A device should be used for single phase drives and type B for 3-phase drives. Choose a suitable model integrating:

- HF current filtering
- A time delay which prevents tripping caused by the load from stray capacitance on power-up. The time delay is not possible for 30 mA devices. In this case, choose devices with immunity against nuisance tripping, for example "residual current devices" with reinforced immunity from the s.i range.

If the installation includes several drives, provide one "residual current device" per drive.

⚠ WARNING

INADEQUATE OVERCURRENT PROTECTION

- Overcurrent protective devices must be properly coordinated.
- The Canadian Electricity Code and the National Electrical Code require branch circuit protection. Use the fuses recommended on the drive nameplate to achieve published short-circuit current ratings.
- Do not connect the drive to a power feeder whose short-circuit capacity exceeds the drive short-circuit current rating listed on the drive nameplate.

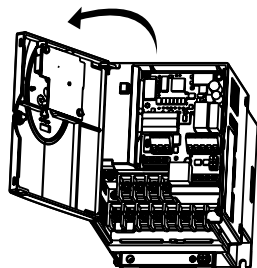
Failure to follow these instructions can result in death or serious injury.

Power terminals

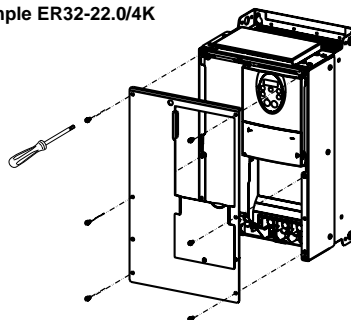
Access to terminals

Open the cover as described below

Example ER32-1.5/4K




Example ER32-22.0/4K



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Functions of power terminals

Terminals	Function
Ground	Protective ground connection terminal
R/L1 - S/L2 - T/L3	Power section line supply
U/T1 - V/T2 - W/T3	Outputs to the motor
PO	Do not use
PA/+	DC bus + polarity
PB	Do not use
PC/-	DC bus - polarity

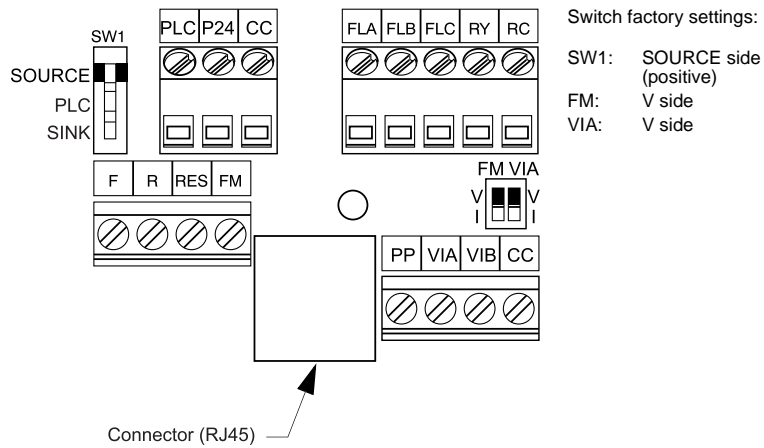
 The PO, PA/+, PB, and PC/- terminals can only be used to measure the voltage on the DC bus.

Characteristics of power terminals

ER32-	Maximum wire size			Tightening torque Nm (lb.in)
	mm ²	AWG	kcmils	
0.75/4K to 5.5/4K	6	10		1.3 (11.5)
7.5/4K to 11.0/4K	16	6		2.5 (22)
15.0/4K to 18.5/4K	25	3		4.5 (40)
22.0/4K to 45.0/4K	50	1/0		24 (212)
55.0/4K to 75.0/4K	150		300	41 (360)

Control terminals

The control card is the same for all power ratings.



Maximum wire size: 2.5 mm²/AWG 14
Tightening torque: 0.6 Nm (5.3 lb.in)

⚠ WARNING

RISK OF IMPROPER OPERATION

The logic input type selector switch is factory-set to the source position. Please consult the ER32 drive Installation Manual before making any changes to the position of the switch.

Failure to follow these instructions can result in death or serious injury.

Control terminals

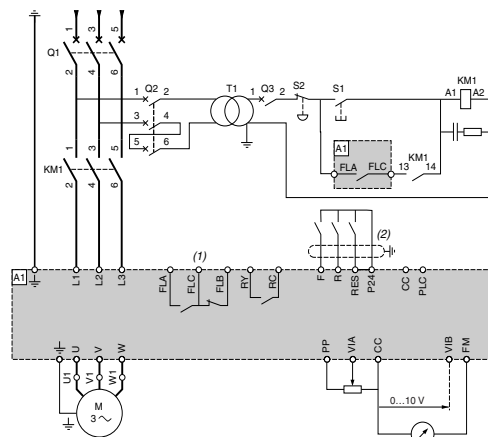
Electrical characteristics

ENGLISH

Terminals	Function	Characteristics
PLC	External power supply input	+24 V input for possible external power supply for logic inputs Max. permissible voltage 50 V
P24	Internal supply available	Short-circuit and overload protection: • 1 x DC 24 V supply (min. 21 V, max. 27 V), maximum current 50 mA.
DC	Common	0 V common (2 terminals)
FLA, FLB, FLC	Configurable relay outputs	1 x relay logic output, 1 x "N/C" contact and 1 x "N/O" contact with common point Minimum switching capacity: 3 mA for DC 24 V Maximum switching capacity: • On resistive load ($\cos \varphi = 1$): 1 A for AC 250 V or DC 30 V • On inductive load ($\cos \varphi = 0.4$ and $L/R = 7$ ms): 0.5 A for AC 250 V or DC 30 V Max. response time: 7 ms \pm 0.5 ms Electrical service life: 100,000 operations
RY, RC		1 x relay logic output, 1 x "N/O" contact Minimum switching capacity: 3 mA for DC 24 V Maximum switching capacity: • On resistive load ($\cos \varphi = 1$): 1 A for AC 250 V or DC 30 V • On inductive load ($\cos \varphi = 0.4$ and $L/R = 7$ ms): 0.5 A for AC 250 V or DC 30 V Max. response time: 7 ms \pm 0.5 ms Electrical service life: 100,000 operations
F R RES	Logic inputs	3 x programmable logic inputs, DC 24 V, compatible with level 1 PLC, IEC 65A-68 standard Impedance: 3.5 k Ω Maximum voltage: 30 V Max. sampling time: 2 ms \pm 0.5 ms Multiple assignment makes it possible to configure several functions on one input Positive logic (Source): State 0 if $y \leq 5$ V or logic input not wired, state 1 if $u \geq 11$ V Negative logic (Sink): State 0 if $u \geq 16$ V or logic input not wired, state 1 if $y \leq 10$ V
FM	Analog output	1 x switch-configurable voltage or current analog output: • Voltage analog output DC 0...10 V, minimum load impedance 470 Ω • Current analog output X-Y mA by programming X and Y from 0 to 20 mA, maximum load impedance 500 Ω Max. sampling time: 2 ms \pm 0.5 ms Resolution: 10 bits Accuracy: $\pm 1\%$ for a temperature variation of 60°C Linearity: $\pm 0.2\%$
PP	Internal supply available	Short-circuit and overload protection: • 1 x DC 10.5 V $\pm 5\%$ supply for the reference potentiometer (1 to 10 k Ω), maximum current 10 mA
VIA	Analog inputs	Switch-configurable voltage or current analog input: • Voltage analog input DC 0...10 V, impedance 30 k Ω (max. safe voltage 24 V) • Analog current input X-Y mA by programming X and Y from 0 to 20 mA, with impedance 242 Ω Max. sampling time: 2 ms \pm 0.5 ms Resolution: 11 bits Accuracy: $\pm 0.6\%$ for a temperature variation of 60°C Linearity: $\pm 0.15\%$ of the maximum value This analog input is also configurable as a logic input;
VIB		Voltage analog input, configurable as an analog input or as a PTC probe input. Voltage analog input: • DC 0...10 V, impedance 30 k Ω (max. safe voltage 24 V) • Max. sampling time: 2 ms \pm 0.5 ms • Resolution: 11 bits • Accuracy: $\pm 0.6\%$ for a temperature variation of 60°C • Linearity: $\pm 0.15\%$ of the maximum value PTC probe input: • 6 probes max. mounted in series • Nominal value < 1.5 k Ω • Trip resistance 3 k Ω , reset value 1.8 k Ω • Short-circuit protection < 50 Ω

Connection diagrams

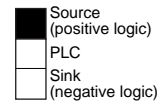
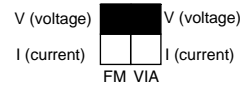
3-phase power supply



Switches (factory settings)

Voltage/current selection for analog I/O (FM and VIA)

Selection of logic type



Note: All terminals are located at the bottom of the drive. Install interference suppressors on all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.

Components that can be used in association with the Altivar: Consult our catalog

Factory-set terminal functions

FLA-FLB-FLC relay	De-energized in the event of a fault or when the power supply is disconnected
RY-RC relay	Energized when the speed is greater than or equal to low speed (LL)
F	Forward (2-wire control)
R	Preset speed
RES	Clear fault (reset)
VIA	Speed reference 0-10 V
VIB	Not assigned
FM	Output frequency

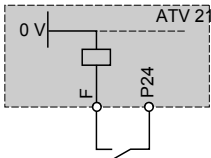
ENGLISH

Connection diagrams

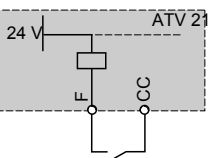
Examples of recommended circuit diagrams

Logic inputs according to the position of the logic type switch

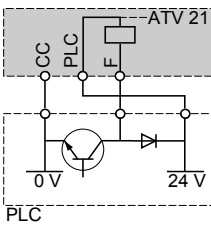
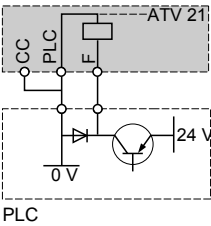
"Source" position



"Sink" position

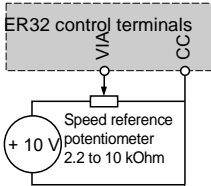


"PLC" position with PLC transistor outputs

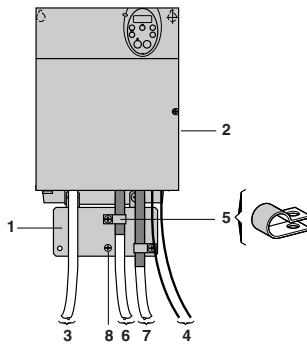


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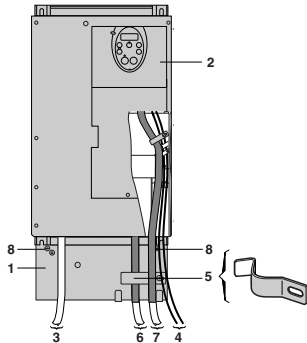
Voltage analog inputs
+ 10 V external



Connection diagrams



Er32-0.75/4K to -18.5/4K



ER32-22.0/4K to -75.0/4K

Connections to meet the requirements of EMC standards

Principle

- b Grounds between the drive, motor and cable shielding must have "high-frequency" equipotentiality.
- b Use shielded cables with shielding connected to ground throughout 360° at both ends for the motor cable and the control-command cables. Conduit or metal ducting can be used for part of the shielding length provided that there is no break in the continuity of the ground connection.
- b Ensure maximum separation between the power supply cable (line supply) and the motor cable.

Installation diagram for ER32-.../4K drives

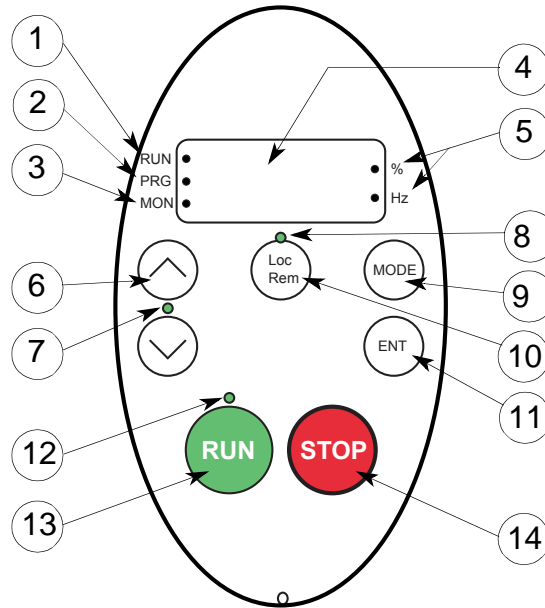
- 1 Steel plate to be mounted on the drive (grounded casing)
- 2 UL Type 1/IP 21 ER32 drive
- 3 Unshielded power supply wires or cable
- 4 Unshielded wires for the output of the fault relay contacts
- 5 Attach and ground the shielding of cables 6 and 7 as close as possible to the drive:
 - Strip the shielding.
 - Attach the cable to the metal plate 1 by tightening the clamp on the stripped part of the shielding.
 The shielding must be clamped tightly enough to the metal plate to ensure good contact.
- 6 Shielded cable for connecting the motor
- 7 Shielded cable for connecting the control-command wiring. For applications requiring several conductors, use cables with a small cross-section (0.5 mm²). For cables 6 and 7, the shielding must be grounded at both ends. The shielding must be continuous and intermediate terminals must be placed in EMC shielded metal boxes.
- 8 Grounding screw. Use this screw for the motor cable on drives with lower power ratings, as the screw on the heatsink is inaccessible.

Note: The HF equipotential ground connection between the drive, motor and cable shielding does not remove the need to connect the PE conductors (green-yellow) to the appropriate terminals on each unit.
If using an additional EMC input filter, it should be mounted beneath the drive and connected directly to the line supply via an unshielded cable. Link 3 on the drive is then established via the filter output cable.

Integrated display terminal

Description of integrated display terminal

The LEDs and keys on the integrated display terminal are illustrated below:



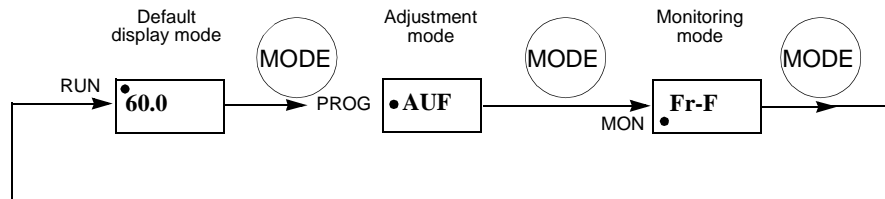
ENGLISH

	LED/Key	Characteristics
1	Display RUN LED	Lights up when the run command is active Flashes when there is a speed reference
2	Display PRG LED	Lights up in programming mode (AUF... GrU)
3	Display MON LED	Lights up in monitoring mode
4	Display unit	4 digits, 7 segments
5	Display unit LED	Numerical value displayed in hertz or percent
6	Navigation arrows	Depending on the mode: Navigate in menus Change a value Change the speed reference when the LED is lit (10)
7	Arrow LED	Lights up when the arrows are affecting the speed reference
8	Loc/Rem LED	Command and reference switching between terminals/com ↔ display terminal
9	Mode	Mode selection: <ul style="list-style-type: none"> • Default display mode • Adjustment mode • Monitoring mode Can also be used to go back to the previous menu
10	Loc/Rem key	Command and reference switching between terminals/com ↔ display terminal
11	ENT	Validation
12	RUN LED	Lights up when the ER32 is in local run command mode
13	RUN	Local run command
14	STOP	Stop/reset in the event of a fault

Programming

Access to different modes

Use of the "MODE" key
 For more detailed information, consult the CD-ROM supplied with the drive.

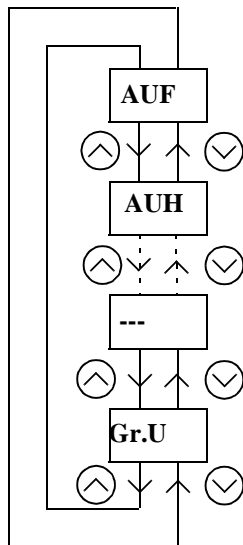


Default display mode	<ul style="list-style-type: none"> • Active when the drive is switched on • Continuous display of a drive variable (current, speed, etc.), alarms and faults.
Adjustment mode	<ul style="list-style-type: none"> • Can be used to modify the drive parameters
Monitoring mode	<ul style="list-style-type: none"> • Can be used to control set frequencies, output current or voltage and information from the terminals

Note:

Access to menus

Example in adjustment mode:



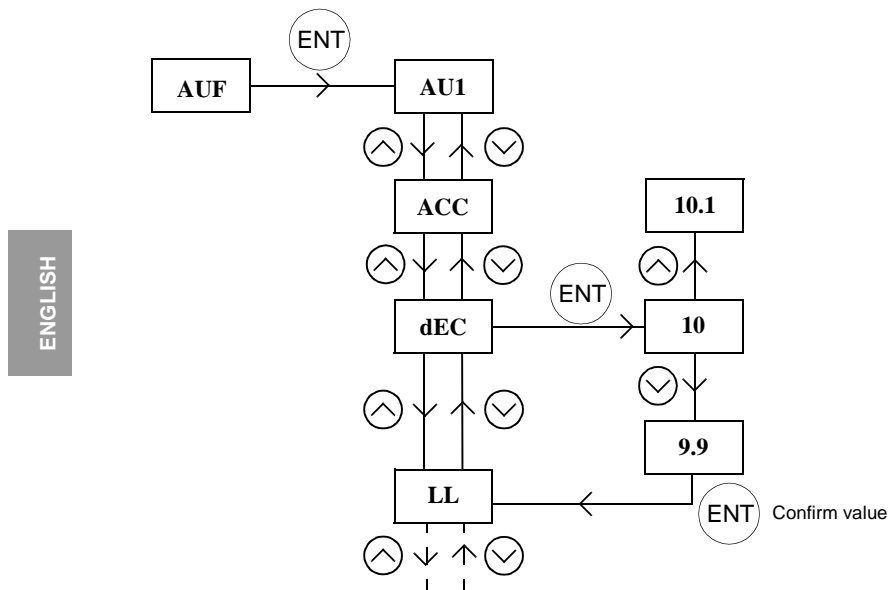
Note: Press the "MODE" key to go back up to the next level; here, for example: Go back to Fr-F.

ENGLISH

Programming

Access to parameters

Example: Quick menu



Note: Press the "MODE" key to go back to the previous menu.

Examples:

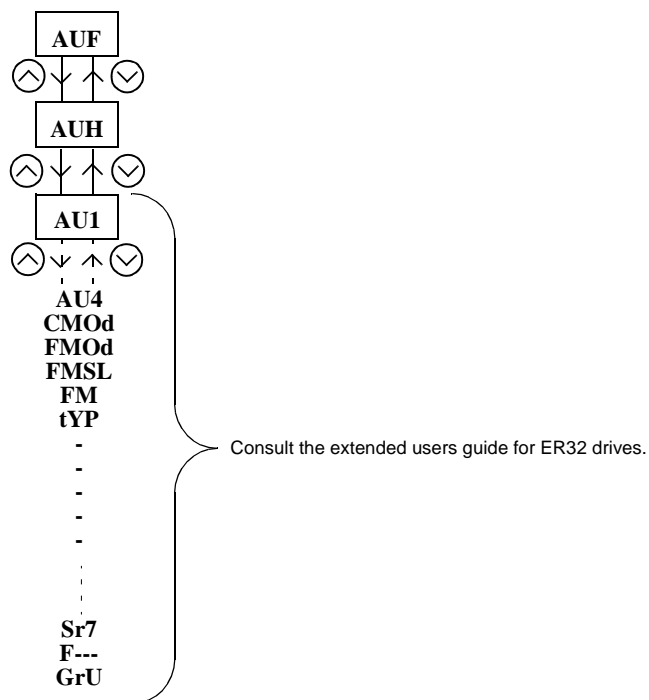
- From 9.9 to dEC
- From dEC to AUF

Adjustment mode

Description of menus

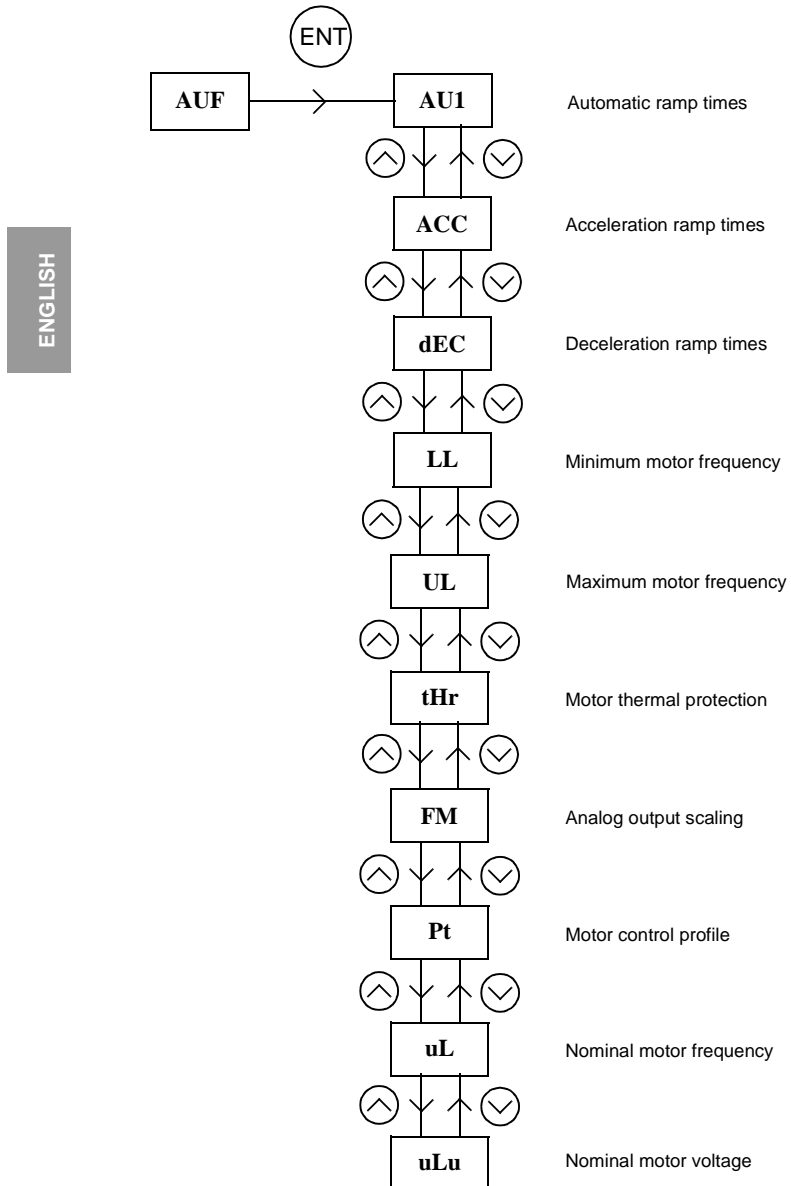
The diagram below shows the various menus that can be accessed from the AUF quick menu:

- AUF menu: Fast startup menu providing access to the parameters of current applications and sufficient in the majority of cases
- AUH menu: Provides access to the last 5 parameters modified, in reverse chronological order (the last parameter modified appears first).



Adjustment mode

The diagram below shows the various parameters that can be accessed from the AUF quick menu.



Adjustment mode

AUF menu

The table below shows the various parameters that can be accessed from the AUF menu.

Code	Description	Adjustment ranges	Factory settings
AU1	Automatic ramp times.	0 : Deactivated 1 : Automatic acceleration and deceleration times 2 : Automatic acceleration time only	1
ACC	Acceleration time, in seconds	0.0 to 3200	10.0
dEC	Deceleration time, in seconds	0.0 to 3200	10.0
LL	Frequency lower limit (minimum motor frequency), in Hz.	0.0 to UL	0.0
UL	Frequency upper limit (maximum motor frequency), in Hz.	0.5 to 200.0	50.0
tHr	Motor electronic thermal protection level, as a % of the nominal output current indicated on the drive nameplate	10 to 100	100
FM	Measurement adjustment (analog output scaling)	-	-
Pt	Selection of V/F control mode (motor control profile)	0: V/F profile constant torque 1: V/F profile variable torque 2: Automatic torque "boost" 3: Flux vector control 4: Energy saving 6: Permanent magnet synchronous motor	1
uL	Base frequency (nominal motor frequency), in Hz	25 to 500.0	50.0
uLu	Voltage at base frequency (nominal motor voltage), in V	50 to 660 (ER32-.../4K	400



With the exception of ACC and dEC, the parameters cannot be modified while the drive is running.

Monitoring mode

Display of information relating to faults

Display of fault code

If the drive trips, an error code will be displayed indicating the cause. As trips are recorded, information about each can be displayed at any time in status control mode.

The table below lists the various error codes and their description.

Error code	Description
nErr	No error
OC1-0C1P	Overcurrent during acceleration
OC2-0C2P	Overvoltage during deceleration
OC3-0C3P	Overcurrent during operation at constant speed
OCL	Motor overcurrent during startup
OCA	Drive overcurrent during startup
EPH1	An input phase error has occurred or the capacitor on the main circuit has discharged.
EPH0	Output phase error
OP1	Overvoltage during acceleration
OP2	Overvoltage during deceleration
OP3	Overvoltage during operation at constant speed
OL1	Drive trip due to overload
OL2	Motor trip due to overload
OLr	Dynamic braking records a trip due to overload
OH	Trip due to overheating or failure of thermal sensor
E	Emergency stop
EEP1	Failure of EEPROM 1 (write error)
EEP2	Failure of EEPROM 2 (initialization error) or power failure during parameterization of tYp
EEP3	Failure of EEPROM 3 (read error)
Err2	Drive RAM failure
Err3	Drive ROM failure
Err4	CPU 1 trip due to error
Err5	Communication error
Err7	Current detector error
Err8	Option card error

Monitoring mode

Error code	Description
UC	Trip due to insufficient current
UP1	Undervoltage trip
0t	Excessive torque trip
EF2	Grounding error
Etn1	Automatic adjustment error
EtYP	Drive type error
OH2	External thermal input
E-18	VIA cable break
E-19	Communication error between CPUs
E-20	V/F control error
E-21	CPU 2 error
SOUt	Loss of synchronism during operation (for PM motors only)

Note: Earlier trip records (trip record logs or trips that occurred in the past) can be retrieved.