BASE-LINE

Variable speed drives for asynchonous motors

Frequency inverter ER12

Simplified manual

03/2009

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Important information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

⚠ WARNING

Warning indicates a potentially hazardous situation, which, if not avoided, **can result** in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result** in property damage.

PLEASE NOTE

The word "drive" as used in this manual refers to the controller portion of the adjustable speed drive as defined by NEC.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by BLEMO for any consequences arising out of the use of this material.

Before you begin

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand this manual before installing or operating the ER12 drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical code requirements with respect to grounding of all equipment.
- Many parts of this 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.
- Before servicing the drive:
  - Disconnect all power, including external control power that may be present.
  - Place a “DO NOT TURN ON” label on all power disconnects.
  - Lock all power disconnects in the open position.
  - WAIT 15 MINUTES to allow the DC bus capacitors to discharge. Then follow the “Bus Voltage Measurement Procedure” in the user manual to verify that the DC voltage is less than 42 V. The drive LEDs are not indicators of the absence of DC bus voltage.
- Install and close all covers before applying power or starting and stopping the drive.

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

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- **Read and understand this manual before installing or operating the ER12 drive.**
- **Any changes made to the parameter settings must be performed by qualified personnel.**

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

⚠ WARNING

DAMAGED DRIVE EQUIPMENT

Do not operate or install any drive or drive accessory that appears damaged.

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

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may includ+e communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link. [a]

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

For additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control”
and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems.”

Steps for setting up (also refer to Quick Start)

1. Receive and inspect the drive

- Check that the catalog number printed on the label is the same as that on the purchase order.
- Remove the ER12 from its packaging and check that it has not been damaged in transit.

2. Check the line voltage

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

3. Mount the drive (see page 5)

- Mount the drive in accordance with the instructions in this document.
- Install any options required.

Steps **2** to **4** must be performed with the **power off**.

4. Wire the drive (see page 8)

- 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 part.

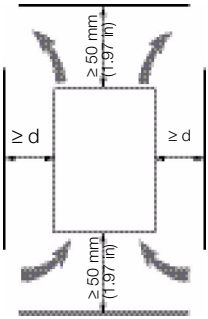
5. Configure the drive (see user manual)

- Apply input power to the drive but do not give a run command.
- Set the motor parameters (in Conf mode) only if the factory configuration of the drive is not suitable.

6. Start

Mounting

Mounting and temperature conditions



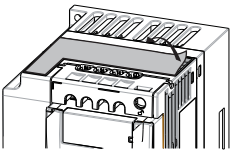
Install the unit vertically, at ± 10°.
Do not place it close to heating elements.
Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

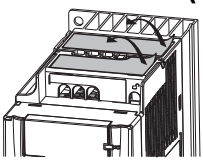
Free space in front of unit: 10 mm (0.39 in.) minimum.

When IP20 protection is adequate, we recommend that the vent cover(s) on the top of the drive be removed, as shown below.

We recommend to install the drive on a dissipative surface.

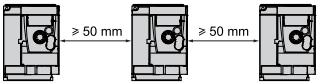
Removing the vent cover(s)





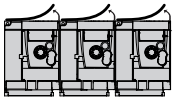
Mounting types

Type A mounting



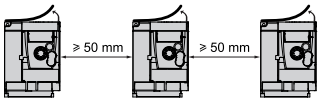
Free space ≥ 50 mm (≥ 1.97 in.) on each side, with vent cover(s) fitted.

Type B mounting



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

Type C mounting



Free space ≥ 50 mm (≥ 1.97 in.) on each side, with vent cover(s) removed.

With these types of mounting, the drive can be used up to an ambient temperature of 50°C (122°F), with a switching frequency of 4 kHz. Fanless references need derating, consult the user manual.
For other temperature and other switching frequencies, consult the user manual available on www.blemo.com.

Wiring recommendations

Keep the power cables separate from control circuits with low-level signals (detectors, PLCs, measuring apparatus, video, telephone). Always cross control and power cables at 90° if possible.

Power and circuit protection

Follow wire size recommendations according to local codes and standards.
Before wiring power terminals, connect the ground terminal to the grounding screws located below the output terminals (see subheading «Access to the terminals if you use stripped wire cables», indicator B page 12).

The drive must be grounded in accordance with the applicable safety standards. ER12 drives have an internal EMC filter, and as such the leakage current is over 3.5 mA.
Where local and national codes require upstream protection by means of a residual current device, use a type A device for single-phase drives and a type B device for three-phase drives as defined in the IEC Standard 60755. Choose a suitable model integrating:

- High frequency current filtering
- A time delay that helps to prevent 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

Control

For control and speed reference circuits, we recommend using shielded twisted cables with a pitch of between 25 and 50 mm (0.98 and 1.97 in.), connecting the shield to ground as outlined on page 6.

Length of motor cables

For motor cable lengths longer than 50 m (164 ft) for shielded cables and longer than 100 m (328 ft) for unshielded cables, please use motor chokes.

Equipment Grounding

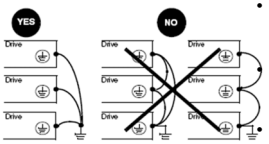
Ground the drive according to local and national code requirements. A minimum wire size of 10 mm∑ (6 AWG) may be required to meet standards limiting leakage current.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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



- Ensure that the resistance of the ground is one ohm or less.

When grounding several drives, you must connect each one directly, as shown in the figure to the left.

- Do not loop the ground cables or connect them in series.

⚠ WARNING

RISK OF DRIVE DESTRUCTION

- The 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 drive.
- If replacing another drive, verify that all wiring connections to the drive comply with wiring instructions in this manual.

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

⚠ WARNING

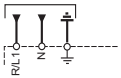
INADEQUATE OVERCURRENT PROTECTION

- Overcurrent protective devices must be properly coordinated.
- The Canadian Electrical Code and the National Electrical Code require branch circuit protection. Use the fuses recommended in the user manual.
- Do not connect the drive to a power feeder whose short-circuit capacity exceeds the drive short-circuit current rating indicated within the in user manual.

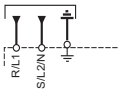
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Wiring diagram for factory settings

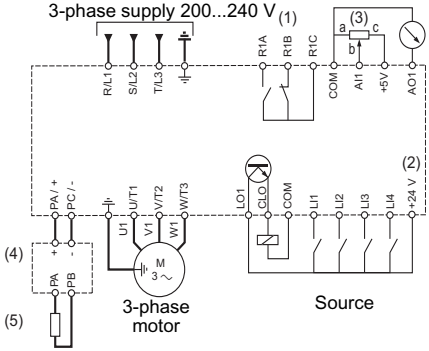
ER12 Single-phase supply 100...120 V



ER12 Single-phase supply 200...240 V



ER12 3-phase supply 200...240 V



(1) R1 relay contacts, for remote indication of the drive status.
(2) Internal + 24 VDC. If an external source is used (+ 30 VDC maximum), connect the 0 V of the source to the COM terminal, and do not use the + 24 VDC terminal on the drive.
(3) Reference potentiometer (maximum 10 kΩ).
(4) Optional braking module
(5) Optional braking resistor.

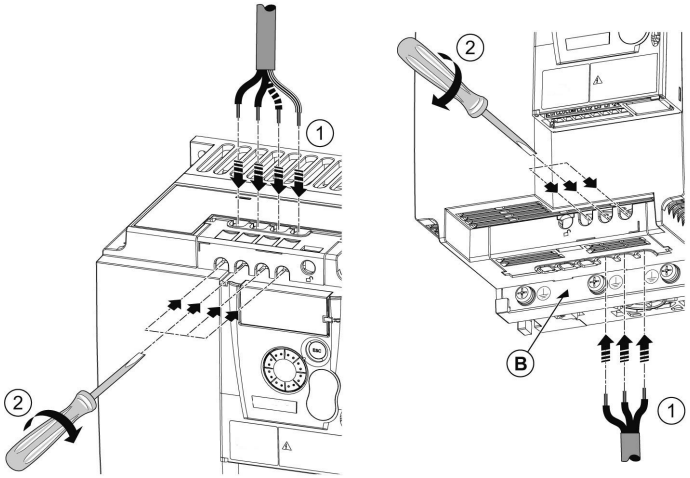
Note:
- Use transient voltage surge suppressors for all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid valves, etc).
- The ground terminal (green screw) is located at the opposite location it was on the ER11, (see wiring trap label).

Power terminals

Line supply is at the top of the drive, the motor power supply is at the bottom of the drive. The power terminals can be accessed without opening the wiring trap if you use stripped wire cables.

Access to the power terminals

Access to the terminals if you use stripped wire cables



B) Grounding screws located below the output terminals.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Replace the wiring trap before applying power.

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

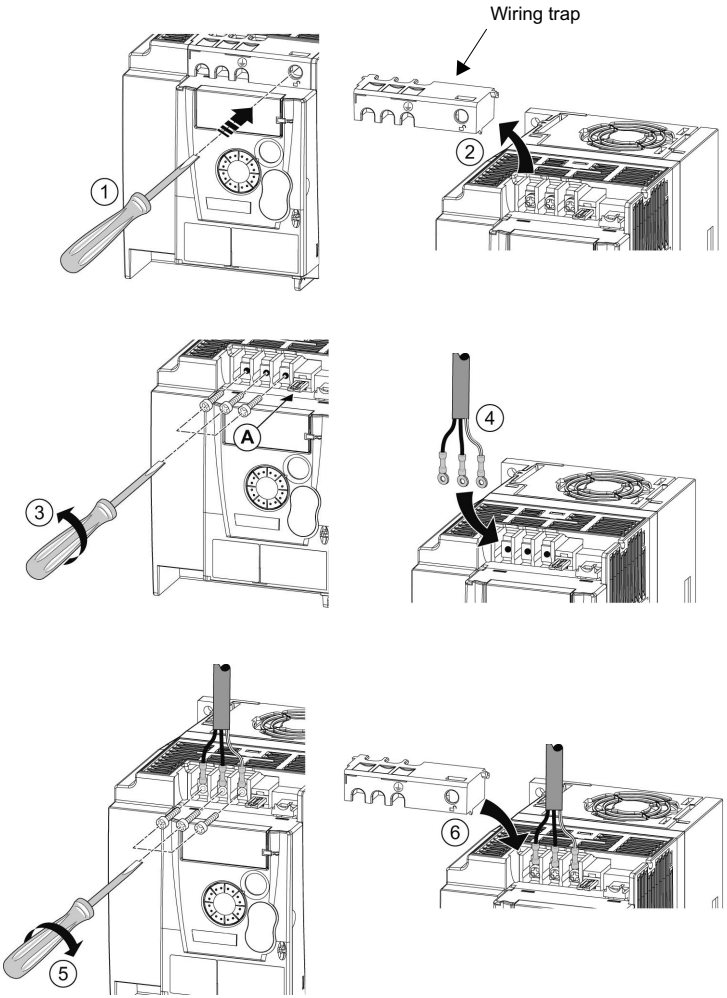
⚠ CAUTION

RISK OF BODILY INJURY

Use pliers to remove the break-away tabs of the wiring trap.

Failure to follow these instructions can result in injury.

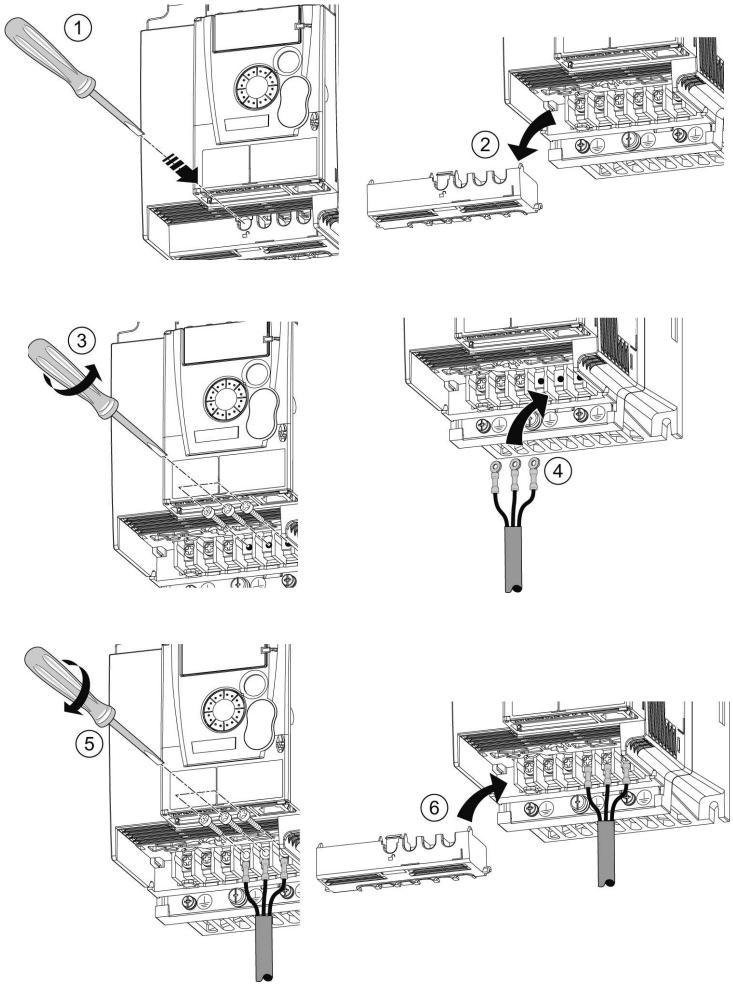
Access to the line supply terminals to connect ring terminals



A) IT jumper on ER12

Power terminals

Access to the motor power terminals if you use ring terminals

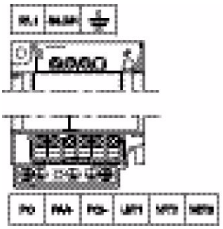


Characteristics and functions of power terminals

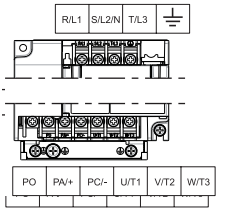
Terminals	Function	ER12
⏚	Ground terminal	All ratings
R/L1 - S/L2/N	Power supply	1-phase 100…120 V
R/L1 - S/L2/N		1-phase 200…240 V
R/L1 - S/L2 - T/L3		3-phase 200…240 V
PA/+	+ output (dc) to the braking module dc Bus (divisible part on wiring trap)	All ratings
PC/-	- output (dc) to the braking module dc Bus (divisible part on wiring trap)	All ratings
PO	Not used	
U/T1 - V/T2 - W/T3	Outputs to the motor	All ratings

Arrangement of power terminals

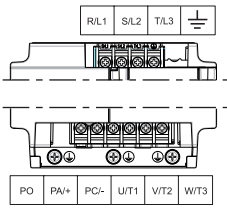
Size 1



Size 2



Size 3

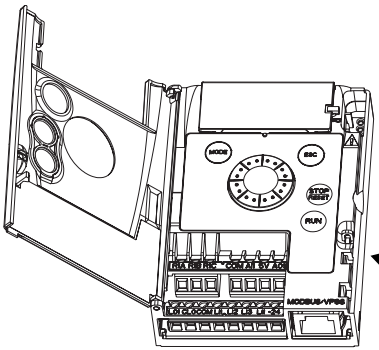


ER12	Applicable wire size (1) mm² (AWG)	Recommended wire size (2) mm² (AWG)	Tightening torque (3) N·m (lb.in)
Size 1 0.18KU 0.37KU 0.18K 0.37K 0.55K 0.75K 0.18/3K 0.37/3K 0.75/3K	**2** to 3.5 (**14** to 12)	2 (14)	0.8 to 1 (7.1 to 8.9)
Size 2C 0.75KU 1.5K 2.2K	**3.5** to 5.5 (**12** to 10)	5.5 (10)	1.2 to 1.4 (10.6 to 12.4)
Size 2F 1.5/3K 2.2/3K	**2** to 5.5 (**14** to 10)	2 (14) for U15M3 3.5 (12) for U22M3	
Size 3 3.0/3K 4.0/3K	5.5 (10)	5.5 (10)	

(1) The value in bold corresponds to the minimum wire gauge to guarantee secureness.
(2) 75°C (167 °F) copper cable (minimum wire size for rated use).
(3) Recommended to maximum value.

Control terminals

Access to the control terminals

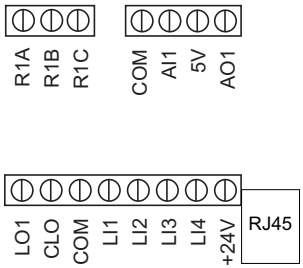


To access the control terminals, open the cover.

Note: For information regarding HMI button functions, see "HMI description" on page 23.

It is possible to lock the cover with a lead seal.

Arrangement of the control terminals



Nota: To connect cables, use a slotted screwdriver 0,6x3,5.

R1A	Normally open (NO) contact of the relay
R1B	Normally close (NC) contact of the relay
R1C	Common pin of the relay
COM	Common of analog and logic I/Os
AI1	Analog input
5 V	+5V supply provided by the drive
AO1	Analog output
LO1	Logic output (collector)
CLO	Common of the logic output (emitter)
LI1	Logic input
LI2	Logic input
LI3	Logic input
LI4	Logic input
+24V	+24 V supply provided by the drive
RJ45	Connection for software, Modbus network or remote display.

ER12 Control terminals	Applicable wire size (1) mm^2 (AWG)	Tightening torque (2) N·m (lb.in)
R1A, R1B, R1C	**0.75** to 1.5 (**18** to 16)	0.5 to 0.6 (4.4 to 5.3)
Other terminals	**0.14** to 1.5 (**26** to 16)	

(1) The value in bold corresponds to the minimum wire guage to guarantee secureness.
(2) Recommended to maximum value.

Characteristics and functions of the control terminals

Terminal	Function	Electrical characteristics
R1A	NO contact of the relay	Minimum switching capacity: • 5 mA for 24 VDC Max. switching capacity: • 2 A for 250 VAC and for 30 VDC on inductive load (cos φ = 0.4 and L/R = 7 ms) • 3 A for 250 VAC and 4 A for 30 VDC on resistive load (cos φ = 1 and L/R = 0) • response time: 30 ms max.
R1B	NC contact of the relay	
R1C	Common pin of the relay	
COM	Common of analog and logic I/Os	
AI1	Voltage or current analog input	• resolution: 10 bits • precision: ± 1 % at 25˚C (77˚F) • linearity: ± 0.3% (of full scale) • sampling time: 20 ms ± 1 ms Analog voltage input 0 to +5 V or 0 to +10 V (maximum voltage 30 V) impedance: 30 kΩ Analog current input x to y mA, impedance: 250 Ω
5V	Power supply for potentiometer	• precision: ± 5% • maximum current: 10 mA
AO1	Voltage or current analog output	• resolution: 8 bits • precision: ± 1 % at 25˚C (77˚F) • linearity: ± 0.3 % (of full scale) • refresh time: 4 ms (maximum 7 ms) Analog voltage output: 0 to +10 V (maximum voltage +1%) • minimum output impedance: 470 Ω Analog current output: x to 20 mA • maximum output impedance: 800 Ω
LO1	Logic output (collector)	• voltage: 24 V (maximum 30 V) • impedance: 1 kΩ, maximum 10 mA (100 mA in open collector) • linearity: ± 1% • refresh time: 20 ms ± 1 ms
CLO	Common of the logic output (emitter)	
LI1 LI2 LI3 LI4	Logic inputs	Programmable logic inputs • +24 V power supply (maximum 30 V) • impedance: 3.5 kΩ • state: 0 if < 5 V, state 1 if > 11 V in positive logic • state: 1 if < 10 V, state 0 if > 16 V or switched off (not connected) in negative logic • sampling time: < 20 ms ± 1 ms.
+24V	+ 24 V supply provided by the drive	+ 24 V -15% +20% protected against short-circuits and overloads. Maximum customer current available 100 mA

Electromagnetic compatibility (EMC)

IMPORTANT: The high frequency equipotential ground connection between the drive, motor, and cable shielding does not eliminate the need to connect the ground (PE) conductors (green-yellow) to the appropriate terminals on each unit. See Wiring recommendations page 9.

Principle of precautions

- Grounds between the drive, motor, and cable shielding must have high frequency equipotentiality.
- When using shielded cable for the motor, use a 4-conductor cable so that one wire will be the ground connection between the motor and the drive. Size of the ground conductor must be selected in compliance with local and national codes. The shield can then be grounded at both ends. Metal ducting or conduit can be used for part or all of the shielding length, provided there is no break in continuity.
- When using shielded cable for Dynamic Brake (DB) resistors, use a 3-conductor cable so that one wire will be the ground connection between the DB resistor assembly and the drive. The size of the ground conductor must be selected in compliance with local and national codes. The shield can then be grounded at both ends. Metal ducting or conduit can be used for part or all of the shielding length, provided there is no break in continuity.
- When using shielded cable for control signals, if the cable is connecting equipment that is close together and the grounds are bonded together, then both ends of the shield can be grounded. If the cable is connected to equipment that may have a different ground potential, then ground the shield at one end only to prevent large currents from flowing in the shield. The shield on the ungrounded end may be tied to ground with a capacitor (for example: 10 nF, 100 V or higher) in order to provide a path for the higher frequency noise. Keep the control circuits away from the power circuits. For control and speed reference circuits, we recommend using shielded twisted cables with a pitch of between 25 and 50 mm (0.98 and 1.97 in.)
- Ensure maximum separation between the power supply cable (line supply) and the motor cable.
- The motor cables must be at least 0.5 m (20 in.) long.
- Do not use surge arresters or power factor correction capacitors on the variable speed drive output.
- For installation of the optional EMC plate and instructions for meeting IEC 61800-3 standard, refer to the section entitled “Installing the EMC plates” and the instructions provided with the EMC plates.

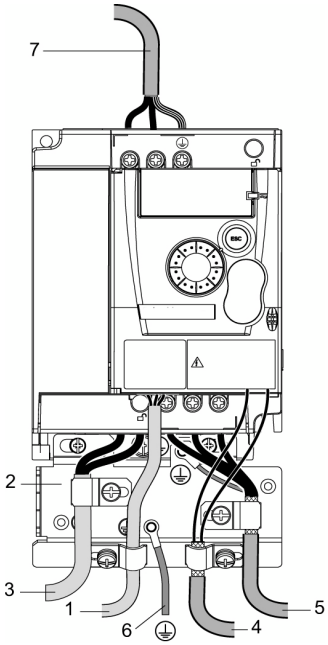
⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Do not expose cable shielding except where connected to ground at the metal cable glands and underneath the grounding clamps.
- Ensure that there is no risk of the shielding coming into contact with live components

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

Installation diagram (example)



1 Non-shielded wires for the output of the status relay contacts.

2 Sheet steel grounded casing not supplied with the drive (see user manual), to be fitted as indicated on the diagram.

3 PA & PC terminals, to the braking module DC Bus

4 Shielded cable for connecting the control/ signalling wiring.
For applications requiring several conductors, use small cross-sections (0.5 mm^2, 20 AWG). The shielding must be connected to ground at both ends. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

5 Shielded cable for motor connection with shielding connected to ground at both ends. This shielding must be continuous, and if there are any intermediate terminals, these must be in an EMC shielded metal box. The motor cable PE grounding conductor (green-yellow) must be connected to the grounded casing.

6 Grounding conductor, cross-section 10 mm^2 (6 AWG) according to IEC 61800-5-1 standard.

7 Power input (non shielded cable)

Attach and ground the shielding of control and motor cables as close as possible to the drive:

- expose the shielding
- use cable clamps of an appropriate size on the parts from which the shielding has been exposed, to attach them to the casing.
  The shielding must be clamped tightly enough to the metal plate to ensure correct contact.
- types of clamp: stainless steel (delivered with the optional EMC plate).

EMC conditions for ER12

C1 EMC category is reached if length of shielded cable is 5 meter (16.4 ft) maximum and Switching frequency SFr is 4, 8 or 12 kHz.
C2 EMC category is reached if length of shielded cable is 10 meter (32.8 ft) maximum and Switching frequency SFr is 4, 8 or 12 kHz and if length of shielded cable is 5 meter (16.4 ft) maximum for all other values of Switching frequency SFr.

Internal EMC filter on ER12

All ER12 drives have an built-in EMC filter. As a result they exhibit leakage current to ground. If the leakage current creates compatibility problems with your installation (residual current device or other), then you can reduce the leakage current by opening the IT jumper (see chapter Access to the line supply terminals to connect ring terminals, indicator A page 13). In this configuration EMC compliance is not guaranteed.

CAUTION
DRIVE LIFETIME REDUCTION On ER12 ratings, if the filters are disconnected, the drive's switching frequency must not exceed 4 kHz. Refer to Switching Frequency parameter SFr (see user manual for adjustment). **Failure to follow these instructions can result in equipment damage.**

Check list

Read carefully the safety information in the user manual, and the simplified manual. Before starting up the drive, please check the following points regarding mechanical and electrical installations, then use and run the drive.
For complete documentation, refer to www.blemo.com.

1. Mechanical installation

- For drive mounting types and recommendations on the ambient temperature, please see the Mounting instructions on page 8 of the simplified manual and in the user manual.
- Mount the drive vertically as specified, see Mounting instructions on page 8 of the simplified manual or in the user manual.
- The use of the drive must be in agreement with the environments defined by the standard 60721-3-3.
- Mount the options required for your application, see catalogue.

2. Electrical installation

- Connect the drive to the ground, see Equipment Grounding on page 9 of the simplified manual and in the user manual.
- Ensure that the input power voltage corresponds to the drive nominal voltage and connect the line supply as shown on the drawing Wiring diagram for factory settings on page 11 of the simplified manual and in the user manual.
- Ensure that appropriate input power fuses and circuit breaker are installed according to the catalogue.
- Wire the control terminals as required, see Control terminals on page 13 of the simplified manual and in the user manual. Separate the power cable and the control cable according to EMC compatibility rules.
- The range ER12 integrates EMC filter. The leakage current can be reduced using the IT jumper as explained in the paragraph Internal EMC filter on ER12 on page 20 of the simplified manual and in the user manual.
- Ensure that motor connections correspond to the voltage (star, delta).

3. Use and run the drive

- Start the drive and you will see Standard motor frequency **bFr** at the first power on. Check that the frequency defined by the frequency **bFr** (the factory setting is 50 Hz) is in accordance with the frequency of the motor, see the paragraph First power-up on page 23 of the simplified manual and in the user manual.
- For the following power on, you will see **rdY** on the HMI.
- MyMenu (upper part of CONF mode) permits you to set the drive for most applications (see page 29).
- At any time, Factory / recall customer parameter set **FCS** function permits you to reset the drive with factory settings (see page 31).

Factory Configuration

Drive factory setting

The ER12 is factory-set for the most common operating conditions (motor rating according to drive rating):

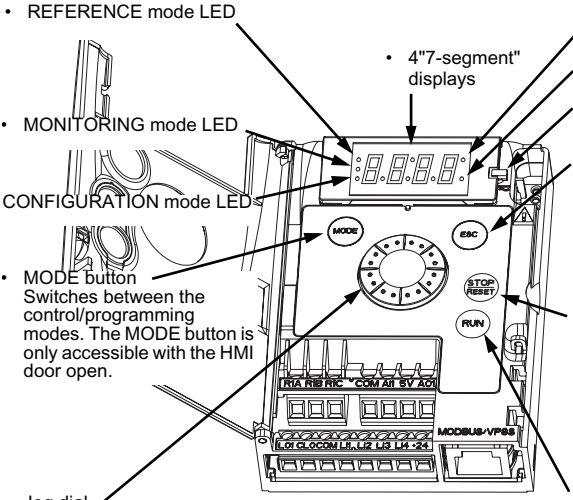
- Display: drive ready (**rdY**) motor stopped or motor frequency reference while running.
- Standard motor frequency **bFr**: 50 Hz (see page 29).
- Rated motor voltage **UnS**: 230 V.
- Acceleration time **ACC** and Deceleration time **dEC**: 3 seconds
- Low speed **LSP**: 0 Hz
- High speed **HSP**: 50 Hz
- Motor control type **Ctt**: **Std** (U/F standard law)
- IR compensation (law U/F) **UFr**: 100%
- Motor thermal current **Ith**: equal to nominal motor current (value determined by the drive rating)
- Automatic DC injection current **SdC1**: 0.7 x nominal motor current, for 0.5 seconds.
- Decel Ramp Adaptation assignement **brA**: YES (Automatic adaptation of the deceleration ramp in the event of overvoltage on braking).
- No automatic restarting after a detected fault is cleared
- Switching frequency **SFr**: 4 kHz
- Logic inputs:
  - LI1: forward (2-wire transitional control), start drive
  - LI2, LI3, LI4: no assignment
- Logic output: LO1: no assignment
- Analog input: AI1 (0 to + 5 V) speed reference
- Relay R1: Default setting is fault. R1A opens and R1B closes when a fault is detected or no line voltage is present.
- Analog output AO1: no assignment

If the above values are compatible with the application, the drive can be used without changing the settings.

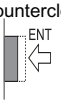
Programming

HMI description

Functions of the display and keys



- REFERENCE mode LED
- MONITORING mode LED
- CONFIGURATION mode LED
- MODE button
  Switches between the control/programming modes. The MODE button is only accessible with the HMI door open.
- Jog dial
  - Acts as a potentiometer in local mode.
  - For navigation when turned clockwise or counterclockwise
  - and selection / validation when pushed.
    This action is represented by this symbol



- 4"7-segment" displays
- Value LED (2)
- Unit LED (1)
- Charge LED
- ESC button: Exits a menu or parameter, or aborts the displayed value to return to the previous value in the memory.
- STOP button: stops the motor (could be hidden by door if function disabled).

  See instructions for "RUN/STOP" cover removal.
- RUN button: Start running if the function is configured (could be hidden by door if function disabled).

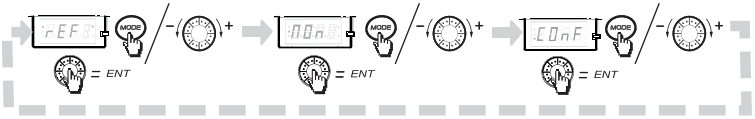
(1) If illuminated, indicates that a unit is displayed, ex **AMP** displayed for "Amps"
(2) If illuminated, indicates that a value is displayed, ex **0.5** displayed for "0.5"

First power-up

At first power-up you are prompted to set Standard motor frequency **bFr** page 29. Next time power is applied **rdY** appears. Operating mode selection is then possible using the MODE or ENTER key as detailed below.

Menus structure

Menus and parameters are classified in three branches (modes): Reference **rEF** page 24, Monitoring **MOn** page 25 and Configuration **COnF** page 28, described below. Switching between these modes is possible at any time using the MODE key or Jog Dial. First MODE key depression moves from current position to the top of the branch. Second depression switches to next mode.



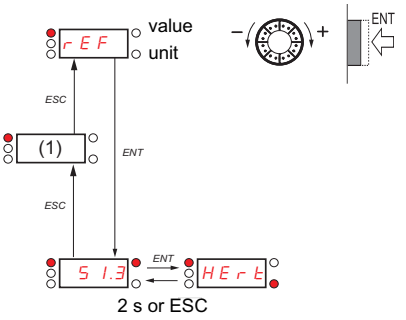
Reference Mode rEF

Use the reference mode to monitor and, if local control is enabled (Reference channel 1 **Fr1** = **AIU1**) adjust the actual reference value by rotating the jog dial.
When local control is enabled, the jog dial of the HMI acts as a potentiometer to change the reference value up and down within the limits preset by other parameters (LSP and HSP). There is no need to press the ENT key to confirm the change of the reference.
If local command mode is disabled, using Command channel 1 **Cd1**, only reference values and units are displayed. The value will be "read only" and cannot be modified by the jog dial (the reference is no longer given by the jog dial but from an AI or other source).
Actual reference displayed depends on choice made by Reference channel 1 **Fr1**.

Organization tree

(1) Depending on reference channel active.
Possible values:
LFr
AIU1
FrH
rPI
rPC

displayed parameter value and unit of the diagram is given as examples



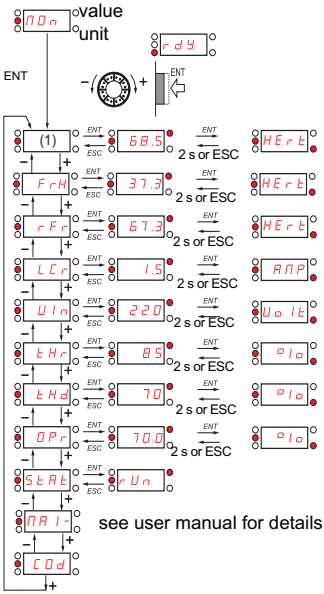
Code	Name/Description	Adjustment range	Factory setting
LFr (1)	**External reference value** This parameter allows to modify the frequency reference with the jog dial.	0 Hz to HSP	-
AIU1	**Analog input virtual** This parameter allows to modify the frequency reference with analog input.	0 to 100 %	-
FrH	**Speed reference** This parameter is in read-only mode.	0 Hz to HSP	-
rPI (1)	**Internal PID reference** This parameter allows to modify the PID internal reference with the jog dial.	0 to 100 %	-
rPC	**PID reference value** This parameter is in read-only mode.	0 to 100 %	-

(1) It is not necessary to press ENT key to validate the modification of the reference.

Monitoring mode MOn

This mode allows monitoring of application values. It is also possible to select the desired parameter to be monitored. When the drive is running, the value of the parameter selected is displayed. While the value of the desired new monitoring parameter is being displayed, press a second time on the jog dial button to display the units.
The default value which is displayed is the motor Output frequency **rFr** page 26.
Changing the default value is achieved by pressing the jog dial more than 2 sec.

Organization tree



displayed parameter values and units of the diagram are given as examples

(1) Depending on reference channel active.
Possible values:
LFr
AIU1

see user manual for details on Maintenance **MAI-** menu

Code	Name	Unit
LFr	**External reference value** Displays the speed reference coming from the remote keypad.	Hz
AIU1	**Analog input virtual** Displays the speed reference coming from the jog dial.	%
FrH	**Speed reference** This parameter is in read-only mode.	Hz
rFr	**Output frequency** This parameter provides the estimated motor speed given in Hz (range -400 Hz to 400 Hz. In Standard law **Std**, the Output frequency **rFr** is equal to the estimated motor stator frequency. In Performance law **PErF**, the Output frequency **rFr** is equal to the estimated motor rotor frequency.	Hz
LCr	**Motor current** Estimation of the effective motor current (output of the drive) with an accuracy of 5%. During DC injection, the current displayed is the maximum value of current injected in the motor.	A
ULn	**Main voltage** Line voltage from the point of view of the DC bus, motor running or stopped.	V
tHr	**Motor thermal state** Display of the motor thermal state. Above 118%, the drive trips in Motor overload **OLF** page 39.	%
tHd	**Drive thermal state** Display of the drive thermal state. Above 118%, the drive trips in Drive overheat **OHF** page 39.	%
Opr	**Output power** The parameter shows the ratio between "estimated motor power (on the shaft) versus Drive rating." Range: 0 to 100% of drive rated power.	%

Code	Name
StAt rdY rUn ACC dEC dCb CLI nSt Obr CtL tUn FSt nLP	**Product status** This parameter displays the state of the drive and motor. • Drive ready • Drive running, the last digit on the right of the code indicate also direction and speed. • Acceleration, the last digit on the right of the code indicate also direction and speed. • Deceleration, the last digit on the right of the code indicate also direction and speed. • DC injection braking in progress • Current limit, displayed code is blinking. • Freewheel stop control • Auto-adapted deceleration • Controlled stop on mains phase loss • Auto-tuning in progress • Fast stop • No line power. When control power is present and there is no power on the main input and no run command present.
MAI-	**Maintenance menu**
	See user manual for details on Maintenance **MAI-** menu.
COd	**HMI Password** Possible state value: OFF: factory setting ON: code activated The protection enables only access to **rEF** (see page 24) and **MOn** (see page 25 modes, except using Software.

Configuration mode ConF

The Configuration mode includes 3 parts :

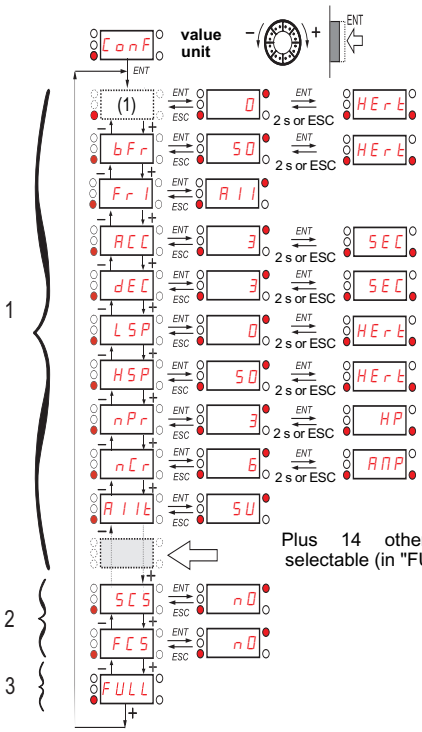
1 My menu includes 11 factory set parameters (among them 9 visible by default). Up to 25 parameters are available for user customization using software.

2 store/recall parameter set: these 2 functions allow to store and recall customer settings.

3 FULL: This menu permits to access to all other parameters. It includes 6 sub-menus:

- Input Output menu **I-O-**,
- Motor control menu **drC-**,
- Control menu **Ctl-**,
- Function menu **FUn-**,
- Fault detection management menu **FLt-**,
- Communication menu **COM-**.

Organization tree



displayed parameter values of the diagram are given as examples

(1) Depending on reference channel active.
Possible values:
LFr
AIU1

Configuration Mode - MyMenu section

Code	Name/Description	Adjustment range	Factory setting
LFr	**External reference value**	0 Hz to HSP	-
	This parameter allows to modify the frequency reference with the jog dial. Visible if reference channel active is remote display (Reference channel 1 Fr1 is set to LCC).		
AIU1	**Analog input virtual**	0 to 100 %	-
	This parameter allows to modify the frequency reference with the analog input AI1. Visible if reference channel active is integrated display (Reference channel 1 Fr1 is set to AIU1) or if local forcing is activated (Forced local assignment FLO is different to nO).		
bFr	**Standard motor frequency**		50 Hz
50 60	• 50 Hz • 60 Hz Corresponds to the nominal speed of the motor nameplate.		
Fr1	**Reference channel 1**		AI1
AI1 LCC Mdb AIUI	This parameter allows selection of the reference channel. • Analog input AI1 • Remote display • Modbus • Integrated display with Jog dial		
ACC	**Acceleration time**	0.0 s to 999.9 s	3.0 s
	Acceleration time between 0 Hz and the Rated motor frequency FrS. Make sure that this value is compatible with the inertia being driven.		
dEC	**Deceleration time**	0.0 s to 999.9 s	3.0 s
	Time to decelerate from the Rated motor Rated motor frequency FrS to 0 Hz. Make sure that this value is compatible with the inertia being driven.		

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
LSP	**Low speed**	0 Hz to HSP	0 Hz
	Motor frequency at minimum reference. Allows to set a lower limit of the motor speed range.		
HSP	**High speed**	LSP to tFr Hz	50 Hz
	Motor frequency at maximum reference. Allows to set an upper limit of the motor speed range. Check that this setting is appropriate for the motor and the application.		
nPr	**Rated Motor Power**	According to drive rating	According to drive rating
	Rated motor power given on the nameplate. Visible only if Motor parameter choice **MPC** is set to **nPr**. Performance is optimized within 1 rating different (maximum). For more information regarding adjustment range, see user manual.		
nCr	**Rated motor current**	0.20 to 1.5 In (1)	According to drive rating
	Rated motor current given on the nameplate. Changing value of **nCr** modifies Motor thermal current**Ith** (see user manual).		
A11t	**AI1t type**		5U
	Drive hardware accept voltage and current AI. this parameter allows to select the desired mode 5U • Voltage: 0 to 5 vdc (internal power supply only) 10U • Voltage: 0 to 10 vdc 0A • Current: x to y mA. Range determined by AI1 current scaling parameter of 0% **CrL1** and AI1 current scaling parameter of 100% **CrH1** settings. Default setting are 0 to 20 mA (see user manual).		

(1) In = rated drive current

Parameter that can be modified during operation or when stopped.

How to control the drive locally

In factory setting "RUN", "STOP" and jog dial are inactive. To control the drive locally, adjust the following parameter:

- Reference channel 1 **Fr1** = **AIU1** (Integrated display with jog dial). See page 29.

Configuration Mode - Store/recall parameters

Code	Name/Description	Adjustment range	Factory setting
SCS	**Store customer parameter set**		nO
nO Str1 2 s	This function creates a back up of the present configuration : • Function inactive • Saves the current configuration in the drive memory. SCS automatically switches to nO as soon as save has been performed. When a drive leaves the factory the current configuration and the backup configuration are both initialized with the factory configuration.		
FCS	**Factory / recall customer parameter set**		nO
nO rEC1 InI InI1 2 s	This function permits to restore a configuration. • Function inactive. FCS automatically changes to nO as soon as one of the following action has been performed. • The current configuration becomes identical to the backup configuration previously saved by SCS. FCS automatically changes to nO as soon as this action has been performed. rEC1 is only visible if the backup has been carried out. If this value appears, Ini1 is not visible. • The current configuration becomes identical to the factory setting. If this value appears, Ini1 is not visible. • The current configuration becomes identical to the backup configuration previously defined by software. If this value appears, Ini and reC1 are not visible.		

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

Check that the modification of the current configuration is compatible with the wiring diagram used.

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

2 s To change the assignment of this parameter press the “ENT” key for 2 s.

Configuration Mode - Full menu (FULL)

Macro-configuration

Input / output or parameter	Start / Stop	PID regulation	Speed
AI1	Ref. channel 1	PID feedback	No
AIU1	No	Reference channel 1	
AO1	No		
LO1	No		
R1	No drive detected fault		
LI1 (2 wire)	Forward		
LI2 (2 wire)	No		Reverse
LI3 (2 wire)	No	Auto/Manu	2 preset speeds
LI4 (2 wire)	No		4 preset speeds
LI1 (3 wire)	Stop		
LI2 (3 wire)	Forward		
LI3 (3 wire)	No		Reverse
LI4 (3 wire)	No	Auto / Manu	2 preset speeds
Fr1 (Reference channel 1)		**AIUI**	**AIUI**
Ctt (Motor control type)		**PUMP**	
rIn (Reverse inhibition)		**YES**	
SFS (PID start speed)		**10.0**	
AI1t (AI1t type)		**0A**	
LFLI (4-20 mA loss behaviour)		**YES**	
SP2 (Preset speed 2)			**10.0**
SP3 (Preset speed 3)			**25.0**
SP4 (Preset speed 4)			**50.0**
MPC (Motor parameter choice)			**COS**
AdC (Automatic DC injection)			**YES**

Code	Name/Description	Adjustment range	Factory setting
CFG	**Macro-configuration**		Start/stop

2 s

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

Check that the selected macro configuration is compatible with the wiring diagram used.

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

Macro configuration provides a shortcut to configure a set of parameters suited to a specific field of application.
3 macro configurations are available:

StS
- Start/stop. Only forward is assigned

PId
- PID regulation. Activate PID function, dedicate AI1 for feedback and AIU1 for reference.

SPd
- Speed. Allocate LI to preset speed (same allocation as ER11)

provides a means of speeding up the configuration of functions for a specific field of application.
Selecting a macro configuration assigns the parameters in this macro configuration.
Each macro configuration can still be modified in the other menus.

2 s

To change the assignment of this parameter press the “ENT” key for 2 s.

Migration ER11 - ER12

The ER12 is compatible with ER11 (latest version), nevertheless some difference can exist between both drives.
Both models (ER11 and ER12) are available in heatsink or base plate models.

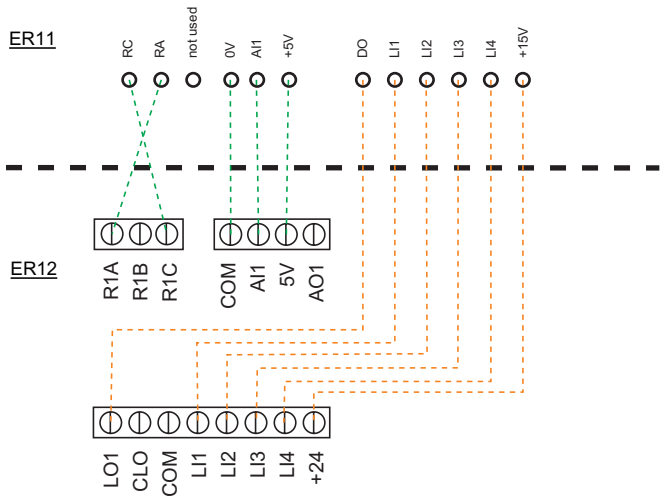
Terminals

Power

- Before wiring power terminals, connect the ground terminal of the grounding screws located below the output terminals to the protective ground (see indicator B page 12).
- The power connections are available without removing the power terminal cover. Nevertheless, if necessary, it is possible to remove them using an adapted tool (IP20 protection requirement). Cover to be removed in case of using ring terminals (pressure stress is 14 N for size 1 and 20 N for sizes 2 and 3).
- Pay attention to the input ground terminal located **on right of the connector** (was on left on ER11). The ground connection is clearly indicated on input power terminal cover and the screw colour is green.

Control

Important: The control terminals are arranged and marked differently:



On ER11 «DO» is an analog output that can be configured as logic output. On ER12, depending on your configuration, DO can be linked to LO1 or AO1.

The ER11 integrates an internal supply voltage of 15V, ER12 now integrates an internal supply of 24V.

For information regarding mounting holes and dimensions, refer to user manual.

Settings

The information below explains the differences between the ER11 and ER12 to assist with replacement. These information are convenient to assist for the management of drive embedded HMI (RUN, STOP keypad and potentiometer).

- Replacing an ER11-…K

The embedded HMI of ER11 is not managing speed, as ER12 doesn't (factory setting), there is no modification to get equivalence.
LI2 to LI4 and AO1 are not assigned on ER12.

- Replacing an ER11-…KU

Main change is on the bFr and HSP settings. It is now 50 Hz as factory setting on ER12.
EMC filters are now integrated in ER12-...K
LI2 to LI4 and AO1 are not assigned on ER12.

- Replacing an ER11-…KA

EMC filters are now integrated in ER12**.**
LI2 to LI4 and AO1 are not assigned on ER12.
The active command channel is on terminals for ER12 (was front keypad on ER11-…KA).

To make embedded HMI active, it is necessary to set Reference channel 1 **Fr1** = **AIU1** (located in **COnF** menu). See page 29.

ER12 factory setting characteristics: see page 22.

More complete information is given in user manual (see www.blemo.com)

Diagnostic and Troubleshooting

Drive does not start, no error code displayed

- If the display does not light up, check the power supply to the drive (ground and input phases connection, see page 12).
- The assignment of the "Fast stop" or "Freewheel" functions will prevent the drive starting if the corresponding logic inputs are not powered up. The ER12 then displays **nSt** in freewheel stop and **FSt** in fast stop. This is normal since these functions are active at zero so that the drive will be stopped if there is a wire break. Assignment of LI to be checked in **COnF/FULL/FUn-/Stt-** menu (see user manual).
- Make sure that the run command input(s) is activated in accordance with the selected control mode (Type of control **tCC** and 2 wire type of control **tCt** parameters in **COnF/ FULL/ I-O-**menu).
- If the reference channel or command channel is assigned to a Modbus, when the power supply is connected, the drive displays "**nSt**" freewheel and remain in stop mode until the communication bus sends a command.
- In factory setting "RUN" and "STOP" button are inactive. Adjust Reference channel 1 **Fr1** page 29 and Command channel 1 **Cd1** parameters to control the drive locally (**COnF/ FULL/CtL-**menu). See chapter How to control the drive locally page 30.

Fault detection codes which cannot be reset automatically

The cause of the fault must be removed before resetting by cycling power to the drive.

SOF and tnF faults can also be reset remotely by means of a logic input (Detected fault reset assignment **rSF** parameter in **COnF/FULL/FLt-**menu).

InFb, SOF and tnF codes can be inhibited and cleared remotely by means of a logic input (Detected fault inhibition assignment **InH** parameter).

Code	Name	Possible causes	Remedy
CrF1	Precharge	• Charging relay not operating properly or charging resistor damaged	• Turn the drive off and then back on again • Check the connections • Check the stability of the main supply • Contact local BLEMO representative.
InFI	Unknown drive rating	• The power card is different from the card stored	• Contact local BLEMO representative.
InF2	Unknown or incompatible power board	• The power card is incompatible with the control card	• Contact local BLEMO representative.
InF3	Internal serial link	• Communication fault between the internal cards	• Contact local BLEMO representative.

Fault detection codes which cannot be reset automatically (continued)

Code	Name	Possible causes	Remedy
InF4	Invalid industrialization zone	• Internal data inconsistent	• Contact local BLEMO representative.
InF9	Current measurement circuit failure	• Current measurement is not correct due to hardware circuit	• Contact local BLEMO representative.
----	Problem with application Firmware	• Bad updated of the application firmware with the Multi-Loader	• Flash again the application firmware of the product
InFb	Internal thermal sensor failure	• The drive temperature sensor is not operating correctly • The drive is in short circuit or open	• Contact local BLEMO representative.
InFE	Internal CPU	• Internal microprocessor fault	• Turn the drive off and then back on again • Contact local BLEMO representative.
OCF	Overcurrent	• Parameters in the Motor control menu **drC-** are not correct • Inertia or load too high • Mechanical locking	• Check the parameters • Check the size of the motor/drive/load • Check the state of the mechanism • Connect line motor chokes • Reduce the Switching frequency **SFr** • Check the ground connection of drive, motor cable and motor insolation.
SCFI	Motor short circuit	• Short-circuit or grounding at the drive output • Ground fault during running status • Commutation of motors during running status • Significant current leakage to ground if several motors are connected in parallel	• Check the cables connecting the drive to the motor, and the motor insulation • Connect motor chokes
SCF3	Ground short circuit		
SCF4	IGBT short circuit	• Internal power component short circuit detected at power on	• Contact local BLEMO representative.

Fault detection codes which cannot be reset automatically (continued)

Code	Name	Possible causes	Remedy
SOF	Overspeed	• Instability • Overspeed link with the inertia of the application	• Check the motor and connected mechanical equipment • Overspeed is 10% more than Maximum frequency **tFr** so adjust this parameter if necessary • Add a braking resistor • Check the size of the motor/drive/load • Check parameters of the speed loop (gain and stability)
tnF	Auto-tuning	• Motor not connected to the drive • One motor phase loss • Special motor • Motor is in rotation (by load for example)	• Check that the motor/ drive are compatible • Check that the motor is present during auto-tuning • If an output contactor is being used, close it during auto-tuning • Check that the motor is completly stopped

Fault detection codes that can be reset with the automatic restart function, after the cause has disappeared

These faults can also be reset by turning on and off or by means of a logic input (Detected fault reset assignment **rSF** parameter).
OHF, OLF, OPF1, OPF2, OSF, SLF1, SLF2, SLF3 and tJF faults can be inhibited and cleared remotely by means of a logic input (Detected fault inhibition management **InH** parameter).

Code	Name	Possible causes	Remedy
LFF1	AI current lost fault	• Detection if: • Analog input AI1 is configured in current • AI1 current scaling parameter of 0% **CrL1** is greater than 3mA • Analog input current is lower than 2 mA	• Check the terminal connection
ObF	Overbraking	• Braking too sudden or driving load too high	• Increase the deceleration time • Install a module unit with a braking resistor if necessary • Check the main supply voltage, to be sure that we are under the maximum acceptable (20% over maximum main supply during run status) • Set automatic adaptation of decel ramp **brA** to YES
OHF	Drive overheat	• Drive temperature too high	• Check the motor load, the drive ventilation and the ambient temperature. Wait for the drive to cool down before restarting. See Mounting and temperature conditions page 8.
OLC	Process overload	• Process overload	• Check the process and the parameters of the drive to be in phase
OLF	Motor overload	• Triggered by excessive motor current	• Check the setting of the motor thermal protection, check the motor load.
OPF1	1 output phase loss	• Loss of one phase at drive output	• Check the connections from the drive to the motor • In case of using downstream contactor, check the right connection, cable and contactor

Fault detection codes that can be reset with the automatic restart function, after the cause has disappeared (continued)

Code	Name	Possible causes	Remedy
OPF2	3 output phase loss	• Motor not connected • Motor power too low, below 6% of the drive nominal current • Output contactor open • Instantaneous instability in the motor current	• Check the connections from the drive to the motor • Test on a low power motor or without a motor:In factory settings mode, motor phase loss detection is active Output phase loss detection **OPL = YES**. To check the drive in a test or maintenance environment, without having to use a motor with the same rating as the drive, deactivate motor phase loss detection Output phase loss detection **OPL = nO** • Check and optimize the following parameters: IR compensation **UFr**, Rated motor voltage **UnS** and Rated motor current **nCr** and perform Auto-tuning **tUn**.
OSF	Main overvoltage	• Line voltage too high: - Only at power on of the drive, supply is 10% over the maximal voltage acceptable - Power with no run order, 20% over maximal main supply • Disturbed mains supply	• Check the line voltage
PHF	Input phase loss	• Drive incorrectly supplied or a fuse blown • Failure of one phase • 3-phase ER12 used on a single-phase line supply • Unbalanced load • This protection only operates with the drive on load	• Check the power connection and the fuses. • Use a 3-phase line supply. • Disable the fault by Input phase loss **IPL = nO**.

Fault detection codes that can be reset with the automatic restart function, after the cause has disappeared (continued)

Code	Name	Possible causes	Remedy
SCF5	Motor short circuit	• Short-circuit at drive output • Short circuit detection at the run order or DC injection order if parameter IGBT test **Strt** = **YES**	• Check the cables connecting the drive to the motor, and the motor's insulation
SLF1	Modbus communication	• Interruption in communication on the Modbus network	• Check the connections of communication bus. • Check the time-out (Modbus time-out **ttO** parameter) • Refer to the Modbus user manual
SLF2	communication	• Loss of communication with software	• Check the connecting cable. • Check the time-out
SLF3	HMI communication	• Loss of communication with the external display terminal	• Check the terminal connection
ULF	Process underload fault	• Process underload • Motor current below the Application underload thereshold **LUL** parameter during a period Application underload time delay **ULt** to protect the application.	• Check the process and the parameters of the drive to be in phase
tJF	IGBT overheat	• Drive overheated • IGBT internal temperature is too high according to ambient temperature and load	• Check the size of the load/motor/drive. • Reduce the Switching frequency **SFr**. • Wait for the drive to cool before restarting

Faults detection codes that will be reset as soon as their causes disappear

The USF fault can be inhibited and cleared remotely by means of a logic input (Detected fault inhibition management **InH** parameter).

Code	Name	Possible causes	Remedy
CFF	Incorrect configuration	• HMI block replaced by a HMI block configured on a drive with a different rating • The current configuration of customer parameters is inconsistent	• Return to factory settings or retrieve the backup configuration, if it is valid. • If default remains after factory setting, Contact local BLEMO representative.
CFI CF12	Invalid configuration	• Invalid configuration The configuration loaded in the drive via the bus or communication network is inconsistent.	• Check the configuration loaded previously. • Load a compatible configuration
USF	Undervoltage	• Line supply too low • Transient voltage dip	• Check the voltage and the parameters of Undervoltage Phase Loss Menu **USb-**

HMI block changed

When a HMI block is replaced by a HMI block configured on a drive with a different rating, the drive locks in Incorrect configuration **CFF** fault mode on power-up. If the card has been deliberately changed, the fault can be cleared by pressing the ENT key twice, which **causes all the factory settings to be restored**.