

COMBIVERT

INSTRUCTIONS FOR USE | **GENERAL SAFETY INSTRUCTIONS**

Translation of the original instructions
Document 20157737 EN 02



Preface

The described hard- and software are developments of the KEB Automation KG. The enclosed documents correspond to conditions valid at printing. Misprint, mistakes and technical changes reserved.

Signal words and symbols

Certain operations can cause hazards during the installation, operation or thereafter. There are safety informations in the documentation in front of these operations. Security signs are located on the device or machine. A warning contains signal words which are explained in the following table:

DANGER	Dangerous situation, which will cause death or serious injury in case of non-observance of this safety instruction.
WARNING	Dangerous situation, which may cause death or serious injury in case of non-observance of this safety instruction.
CAUTION	Dangerous situation, which may cause minor injury in case of non-observance of this safety instruction.
NOTICE	Situation, which can cause damage to property in case of non-observance.

RESTRICTION

Is used when certain conditions must meet the validity of statements or the result is limited to a certain validity range.

	Is used when the result will be better, more economic or trouble-free by following these procedures.
--	--

More symbols

- ▶ This arrow starts an action step.
- / - Enumerations are marked with dots or indents.
- => Cross reference to another chapter or another page.



Note to further documentation.
www.keb.de/nc/search



Laws and guidelines

KEB Automation KG confirms with the EC declaration of conformity and the CE mark on the type plate, that our device complies with the essential safety requirements.

The EC declaration of conformity can be downloaded on demand via our website. Further information is provided in chapter "Certification".

Warranty and liability

The warranty and liability on design, material or workmanship for the acquired device is given in the general sales conditions.



Here you will find our general sales conditions.
<https://www.keb.de/terms-and-conditions>



Further agreements or specifications require a written confirmation.

Support

Through multiple applications not every imaginable case has been taken into account. If you require further information or if problems occur which are not treated detailed in the documentation, you can request the necessary information via the local KEB Automation KG agency.

The use of our units in the target products is outside of our control and therefore lies exclusively in the area of responsibility of the customer.

The information contained in the technical documentation, as well as any user-specific advice in spoken and written and through tests, are made to best of our knowledge and information about the application. However, they are regarded as being only informal and changes are expressly reserved, in particular due to technical changes. This also applies to any violation of industrial property rights of a third-party. Selection of our units in view of their suitability for the intended use must be done generally by the user.

Tests can only be done within the intended end use of the product (application) by the customer. They must be repeated, even if only parts of hardware, software or the unit adjustment are modified.

Copyright

The customer may use the instruction manual as well as further documents or parts from it for internal purposes. Copyrights are with KEB Automation KG and remain valid in its entirety.

This KEB product or parts thereof may contain third-party software, including free and/or open source software. If applicable, the license terms of this software are contained in the instructions for use. The instructions for use are already available to you, can be downloaded free of charge from the KEB website or can be requested from the respective KEB contact person.

Other wordmarks or/and logos are trademarks (™) or registered trademarks (®) of their respective owners.

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1 Basic Safety Instructions

The COMBIVERT is designed and constructed in accordance with state-of-the-art technology and the recognised safety rules and regulations. However, the use of such devices may cause functional hazards for life and limb of the user or third parties, or damages to the system and other material property.

The following safety instructions have been created by the manufacturer for the area of electric drive technology. They can be supplemented by local, country- or application-specific safety instructions. This list is not exhaustive. This list is not exhaustive. Non-observance of the safety instructions by the customer, user or other third party leads to the loss of all resulting claims against the manufacturer.

NOTICE



Hazards and risks through ignorance.

- ▶ Read the instructions for use!
- ▶ Observe the safety and warning instructions !
- ▶ If anything is unclear, please contact KEB !

1.1 Target group

This instruction manual is determined exclusively for electrical personnel. Electrical personnel for the purpose of this instruction manual must have the following qualifications:

- Knowledge and understanding of the safety instructions.
- Skills for installation and assembly.
- Start-up and operation of the product.
- Understanding of the function in the used machine.
- Detection of hazards and risks of the electrical drive technology.
- Knowledge of DIN IEC 60364-5-54.
- Knowledge of national safety regulations (e.g. DGUV Vorschrift 3).

1.2 Specified application

The COMBIVERT serves exclusively for the control and regulation of three-phase motors. It is intended for the installation into electrical systems or machines.

Technical data and information for connection conditions shall be taken from the type plate and from the instruction manual and must be strictly observed.

The used semiconductors and components of the KEB Automation KG are developed and dimensioned for the use in industrial products.

The COMBIVERT meets the requirements of the Low-Voltage Directive. The harmonized standards of the series EN 61800 for drive converters were used.

The COMBIVERT is a product of limited availability in accordance with EN 61800-3. This product may cause radio interference in residential areas. In this case the operator may need to take corresponding measures.

The machine directive, Low Voltage Directive, EMC directive, RED and other guidelines and regulations must be observed depending on the version.

1.2.1 Residual risks

Despite intended use, the drive converter can reach unexpected operating conditions in case of error, with wrong parameterization, by faulty connection or non-professional interventions and repairs. This can be:

- wrong direction of rotation
- motor speed too high
- motor is running into limitation
- motor can be under voltage even in standstill
- automatic start

1.2.2 Unintended use

The operation of other electric consumers is prohibited and can lead to the destruction of the unit. The operation of our products outside the indicated limit values of the technical data leads to the loss of any liability claims.

If the product is used in machines, which work under exceptional conditions or if essential functions, life-supporting measures or an extraordinary safety step must be fulfilled, the necessary reliability and security must be ensured by the machine builder.

1.3 Transport, storage and proper use

The transport is carried out by qualified persons in accordance with the environmental conditions specified in this manual. Drive converter shall be protected against excessive strains.



Transport of drive converters with an edge length >75 cm

The transport by forklift without suitable tools can cause a deflection of the heat sink. This leads to premature aging or destruction of internal components.

- ▶ Transport of drive converters on suitable pallets.
 - ▶ Do not stack drive converters or burden them with other heavy objects.
-



Drive converters contain electrostatic sensitive components.

- ▶ Avoid contact.
 - ▶ Wear ESD-protective clothing.
-

Do not store drive converters

- in the environment of aggressive and/or conductive liquids or gases.
- with direct sunlight.
- outside the specified environmental conditions.

1.4 Installation

⚠ DANGER



Do not operate in an explosive environment!

- ▶ The COMBIVERT is not intended for the use in potentially explosive environment.

⚠ CAUTION



Maximum design edges and high weight!

Contusions and bruises!

- ▶ Never stand under suspended loads.
- ▶ Wear safety shoes.
- ▶ Secure drive converter accordingly when using lifting gear.

To prevent damages to the device:

- Make sure that no components are bent and/or isolation distances are changed.
- The device must not be put into operation in case of mechanical defects. Non-compliance with the applicable standards.
- Do not allow moisture or mist to penetrate the unit.
- Avoid dust permeating the device. Allow for sufficient heat dissipation if installed in a dust-proof housing.
- Note installation position and minimum distances to surrounding elements. Do not cover the ventilation openings.
- Mount the drive inverter according to the specified degree of protection.
- Make sure that no small parts fall into the COMBIVERT during assembly and wiring (drilling chips, screws etc.). This also applies to mechanical components, which can lose small parts during operation.
- Check the reliable fit of the device connections in order to avoid contact resistances and sparking.
- Do not walk-on drive converter.
- The safety instructions are to be kept!

1.5 Electrical connection

DANGER

Voltage at the terminals and in the device!

Danger to life due to electric shock !

- ▶ Never work on the open device or never touch exposed parts.
- ▶ For any work on the unit switch off the supply voltage, secure it against switching on and check absence of voltage by measurement.
- ▶ Wait until all drives has been stopped in order that no regenerative energy can be generated.
- ▶ Await capacitor discharge time (5 minutes) if necessary, measure DC voltage at the terminals.
- ▶ If personal protection is required, install suitable protective devices for drive converters.
- ▶ Never bridge upstream protective devices (also not for test purposes).
- ▶ Connect the protective earth conductor always to drive converter and motor.
- ▶ Install all required covers and protective devices for operation.
- ▶ The control cabinet shall be kept closed during operation.
- ▶ Residual current: This product can cause a DC current in the protective earth conductor. When a residual current device (RCD) or a residual current monitor (RCM) is used for the protection of direct or indirect contact, only a RCD or RCM of Type B is permitted for this product on the power supply side.
- ▶ Drive converters with a leakage current $> 3.5 \text{ mA AC}$ current (10 mA DC current) are intended for a stationary connection. Protective earth conductors must be designed in accordance with the local regulations for equipment with high leakage currents according to EN 61800-5-1, EN 60204-1 or DIN IEC 60364-5-54.



If personnel protection is required during installation of the system, suitable protective devices must be used for drive converters.

https://www.keb.de/fileadmin/media/Manuals/knowledge/04_techinfo/00_general/tj_rcd_0400_0002_gbr.pdf



Installations which include drive converters shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements, e.g. act respecting technical equipment, accident prevention rules etc.. They must always be complied with, also for drive converters bearing a CE marking.

For a trouble-free and safe operation, please pay attention to the following instructions:

- The electrical installation shall be carried out in accordance with the relevant requirements.
- Cable cross-sections and fuses must be dimensioned by the user according to the specified minimum/maximum values for the application.
- The wiring must be made with flexible copper cable for a temperature > 75°C.
- Connection of the drive converter is only permissible on symmetrical networks with a maximum line voltage (L1, L2, L3) with respect to earth (N/PE) of max. 300 V. An isolating transformer must be used for supply networks which exceed this value. In case of non-compliance the control is not longer considered as safe separate circuit.
- With existing or newly wired PELV circuits the person installing the units or machines must ensure the requirements are met.
- For drive converters that are not isolated from the supply circuit (in accordance with EN 61800-5-1) all control lines must be included in other protective measures (e.g. double insulation or shielded, earthed and insulated).
- When using components without isolated inputs/outputs, it is necessary that equipotential bonding exists between the components to be connected (e.g. by the equipotential line). Disregard can cause destruction of the components by the equalizing currents.

Restrictions for systems with earthed phase conductor (delta power system)!

- ▶ The control system is no longer regarded as “securely isolated circuit”, further protection measures are therefore required.
- ▶ With this type of power system, the max. voltage phase / earth must not exceed 528 V absolute.

1.5.1 EMC-confirm installation

Observance of the limit values required by EMC law is the responsibility of the customer.



Notes on EMC-compatible installation can be found here.
<https://www.keb.de/fileadmin/media/Manuals/emv/0000neb0000.pdf>



1.5.2 Voltage test

Testing with AC voltage (in accordance with EN 60204-1 Chapter 18.4) may not be executed, since there is danger for the power semiconductors in the drive converter.



Due to the radio interference suppression capacitors, the test generator will switch off immediately with a current fault.



According to EN 60204-1 it is permissible to disconnect already tested components. Drive converters of the KEB Automation KG are delivered ex works voltage tested to 100% according to product standard.

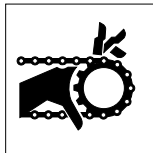
1.5.3 Insulation measurement

An insulation measurement (in accordance with EN 60204-1 chapter 18.3) with 500 Vdc is permissible, if all power unit connections (grid-connected potential) and all control connections are bridged with PE. At any unit it can be expected with an insulating resistance > 2 MΩ!

1.6 Start-up and operation

The drive converter must not be started until it is determined that the installation complies with the machine directive; Account is to be taken of EN 60204-1.

⚠ WARNING



Software protection and programming!

Hazards caused by unintentional behavior of the drive!

- ▶ Check especially during initial start-up or replacement of the drive converter if parameterization is compatible to application.
- ▶ Securing a unit solely with software-supported functions is not sufficient. It is imperative to install external protective measures (e.g. limit switch) that are independent of the drive converter.
- ▶ Secure motors against automatic restart.

⚠ CAUTION



High temperatures at heat sink and coolant!

Burning of the skin!

- ▶ Cover hot surfaces safe-to-touch.
- ▶ If necessary, attach warning signs on the system.
- ▶ Before touching, check the surface and cooling water lines.
- ▶ Before any working let the unit cool down.

- During operation, all covers and doors shall be kept closed.
- Use only approved accessories for this device.
- Never touch terminals, busbars or cable ends.



Observe the following instructions if a drive converter with electrolytic capacitors at the dc link circuit (see technical data) for more than one year was not in operation before start-up.

https://www.keb.de/fileadmin/media/Manuals/knowledge/04_techinfo/00_general/ti_format_capacitors_0400_0001_gbr.pdf



Switching at the output

Switching between motor and drive converter is prohibited for single drives during operation as this may trigger the protection gear of the device. Function "speed search" must be activated if switching can not be avoided. Control release may only be triggered after closing the motor contactor (e.g. by switching the control release).

Connecting and disconnecting is permissible with multiple motor drives if at least 1 motor is running during the switch-over process. The drive converter must be dimensioned to the occurring starting currents.

The speed search function must be activated if the motor is still running during a restart of the drive converter (mains on) (e.g. due to large rotating masses).

Switching an the input

For applications that require cyclic switching on and off of the drive converter, a time of at least 5 min must have elapsed after the last switch-on. If you require shorter cycle times please contact KEB Automation KG.

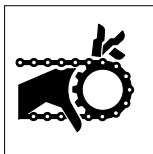
Short-circuit proof

The drive converters are conditional short-circuit proof. After resetting the internal protection devices, the function as directed is guaranteed.

Exceptions:

- If an earth-leakage fault or short-circuit often occurs at the output, this can lead to a defect in the unit.
- If a short-circuit occurs during regenerative operation (2nd or 4th quadrant, regeneration into the DC link), this can lead to a defect in the unit.

⚠ WARNING



Automatic Restart !

Drive converters may be set, dependent on type, to restart automatically following a fault stoppage (e.g. Undervoltage Error), when the fault conditions clear. System design must take this into account, if appropriate, and additional monitoring or protective features added where necessary.

NOTICE



Voltage Peaks !

When using IGBT inverters, high voltage peaks may arise in the motor due to the switching action of the inverter output devices. These must be taken into account when using motor cables longer than 15m or high frequency motors. In this case, the motor can be protected with a motor choke, dv/dt filter or sine filter.

1.7 Maintenance

The following maintenance work has to be carried out when required, but at least once per year by authorized and trained personnel.

- ▶ Check unit for loose screws and plugs and if necessary tighten up.
- ▶ Clean drive converter from dirt and dust deposits. Pay attention especially to cooling fins and protective grid of the fans.
- ▶ Examine and clean extracted air filter and cooling air filter of the control cabinet.
- ▶ Check the function of the fans of the drive converter. The fans must be replaced in case of audible vibrations or squeak.
- ▶ Make a visual test of the cooling circuit for leaks and corrosion at liquid-cooled drive converters. The cooling circuit must be completely empty if a unit shall be switched off for a longer period. The cooling circuit must be blown out additionally with compressed air at temperatures below 0°C.

1.8 Repair

In case of malfunction, unusual noises or smells inform a person in charge!

DANGER



Unauthorized exchange, repair and modifications!

Unpredictable malfunctions!

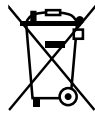
- ▶ The function of the drive converter is dependent on its parameterization. Never replace without knowledge of the application.
- ▶ Modification or repair is permitted only by KEB Automation KG authorized personnel.
- ▶ Only use original manufacturer parts.
- ▶ Infringement will annul the liability for resulting consequences.

In case of failure, please contact the machine manufacturer. Only the machine manufacturer knows the parameterisation of the used drive converter and can provide an appropriate replacement or induce the maintenance.

1.9 Disposal

Electronic devices of the KEB Automation KG are exclusively professional devices for further industrial processing (so-called B2B devices).

Manufacturers of B2B devices are obliged to take back and recycle devices manufactured after 14.08.2018. These devices may not be disposed at the collection centres of public sector disposal organisations.



If no deviating agreement has been made between the customer and KEB or no deviating mandatory legal regulation exists, KEB products marked in this way can be returned. Company and keyword to the return point can be taken from the list below. Shipping costs are paid by the customer. Thereupon the devices will be professionally recycled and disposed.

The entry numbers are listed country-specific in the following table. The corresponding KEB return addresses can be found on our website.

Withdrawal by	WEEE-Reg.-No.	Keyword
Austria		
KEB Automation GmbH	ERA: 51976	Stichwort „Rücknahme WEEE“
France		
RÉCYLUM - Recycle point	ADEME: FR021806	Mots clés „KEB DEEE“
Germany		
KEB Automation KG	EAR: DE12653519	Stichwort „Rücknahme WEEE“
Italy		
COBAT	AEE: (IT) 19030000011216	Parola chiave „Ritiro RAEE“

The packaging must be feed to paper and cardboard recycling.

2 Certification


2.1 CE-Marking

CE marked drive converters were developed and manufactured to comply with the regulations of the Low-Voltage Directive and EMC directive. The harmonized standards of the series EN61800-5-1 and EN 61800-3 were used.



This is a product of limited availability in accordance with EN61800-3. This product may cause radio interference in residential areas. In this case the operator may need to take corresponding measures.

The inverter / servo drive must not be started until it is determined that the installation complies with the machine directive as well as the EMC-directive (note EN60204).

2.2 Functional safety

	Driver converters with functional safety are marked with the FS logo on the type plate. These units are designed and manufactured in accordance with the Machine Directive. The harmonized standard of the serie EN61800-5-2 were used.
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2.3 UL Certifications

		Acceptance according to UL is marked at KEB devices with the adjacent logo on the type plate.
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The validity of the acceptance is only valid if the instructions given in the instruction manual are observed.

2.4 Further information and documentation

You can find additional documentation for download at "www.keb.de" by entering the material number in the search field.

Manuals - further parts of the instruction manual

Drawings - various formats for 3D-models (e.g. Step)

Software - Operating software COMBIVIS and driver

Certificates - Declaration of conformity, TÜV certificates

FAQ - Technical infos and FAQs

EPLAN - Connection drawings

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