BETRIEBSANLEITUNG

INSTRUCTION MANUAL

R4-F

KEB COMBIVERT R4-F Version 1.0

00.R4.F1A-K100

KEB

07/2002

D Seiten D-3 . . . D-66

Vorbemerkung

Bevor Sie mit der Installation des KEB COMBIVERT R4-F beginnen, lesen Sie diese Anleitung bitte sorgfältig und beachten Sie unbedingt die darin enthaltenen Hinweise und Vorschläge.
Diese Betriebsanleitung muß jedem Anwender zugänglich gemacht werden. Vor jeglichen Arbeiten muß sich der Anwender mit dem Gerät vertraut machen. Darunter fällt insbesondere die Kenntnis und Beachtung der Sicherheits- und Warnhinweise. Lesen Sie deshalb unbedingt die „Technische Dokumentation Teil 1". Sicherheitsrelevante Texte sind *kursiv* ausgezeichnet.
Die im Kapitel „Sicherheitshinweise" aufgeführten Hinweise sollten aus folgenden Gründen unbedingt beachtet werden:

- Sicherheit für Mensch und Maschine
- Funktion und Störanfälligkeit
- TÜV-Abnahmen und Zertifizierung
- Garantie und Gewährleistung

Gefahr Warnung Vorsicht	Wird verwendet, wenn Leben oder Gesundheit des Benutzers gefährdet sind oder erheblicher Sachschaden auftreten kann.
Achtung, unbedingt beachten	Unbedingt beachten! Besondere Hinweise für den sicheren und störungsfreien Betrieb.
Tip Hinweis Information	Hilfestellung, Tip

Nur qualifiziertes Elektro-Fachpersonal

Alle Arbeiten zum Transport, Anschluß, zur Inbetriebnahme und Instandhaltung sind von qualifizierten, verantwortlichen Fachpersonal auszuführen. Unsachgemäßes Verhalten kann schwere Personen- und Sachschäden verursachen. Ein sicherer und störungsfreier Betrieb ist nur bei Einhaltung der jeweils gültigen Vorschriften gemäß DIN VDE 0100, DIN VDE 0113, DIN VDE 0160, DIN VDE 0875 sowie einschlägiger örtlicher Bestimmungen gegeben.

GB Pages GB-3 . . . GB-66

Preliminary Remark

Before starting with the installation of the KEB COMBIVERT R4-F, read this instruction manual carefully and absolutely observe the instructions and suggestions contained in it.
This instruction manual must be made available to every user. Before carrying out any work the user must familiarize himself with the unit. This applies in particular to the knowledge and observation of the safety and warning instructions. For that reason it is absolutely necessary to read the „Technical Documentation Part 1" first.
Safety-relevants texts are written in italics.
The notes specified in the chapter „Safety Instructions" should be strictly observed for the following reasons:

- Safety for man and machine
- Function and susceptibility to faults
- TÜV-acceptance and certification
- Warranty

Danger Warning Caution	Is used, if life or health of the user are endangered or substantial damage to property can occur.
Attention, absolutely observe	Absolutely observe! Special instructions for a safe and troublefree operation.
Tip Instruction Information	Help, Tip

Only qualified electro-technical personnel

All work referring to transport, connection, commissioning and maintenance are to be executed by qualified, responsible technical personnel. Inappropriate behaviour can cause severe bodily injuries or damage to property. A safe and troublefree operation is given only in compliance with the respective valid regulations according to DIN VDE 0100, DIN VDE 0113, DIN VDE 0160, DIN VDE 0875 as well as the relevant local regulations.

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1. Safety Instructions

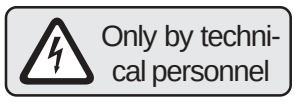
General instructions

KEB COMBIVERT R4-F are operated with voltages which can cause a lethal impact upoon contact. During operation and dependent on the type of protection they can have live, blank as well as hot surfaces.

If inverters connected to a KEB COMBIVERT R4-F are regenerative operated and the switch-off time of the KEB COMBIVERT R4-F (parameter Pn.59) in the case of power failure is adjusted to > 0 s, then energy is also refed into the mains supply at power failure. For that reason a lethal voltage can exist in the system after switch off of the mains supply.

Before working on the system it is absolutely necessary to carry out measurement in the system to verify the safe isolations from supply !

In the cases of unallowed removal of necessary covers, inappropriate application, wrong installation or operation, exists the danger of severe injuries to persons or property damages.

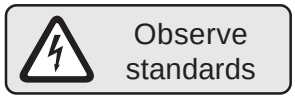


All work regarding transport, installation and commissioning as well as maintenance are to be carried out by qualified technical personnel only (observe IEC 364 or CENELEC HD 384 (VDE 0100) and national rules for the prevention of accidents).

Qualified technical personnel in the sense of this manual defines persons, which due to their training and experience have knowledge of the relevant standards and are instructed in the special field of power transmission and are therefore able to judge the assigned task and recognize possible dangers (adhere to EN 50178 (VDE 0100, VDE 0160), EN 60204 (VDE 0113) as well as to the valid local regulations).

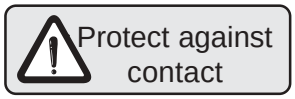
Use as prescribed

KEB COMBIVERT R4-F serve for the feedback of energy from the DC-link circuit of the frequency inverter. The operation of the KEB COMBIVERT R4-F is permissible only in connection with frequency inverters. The connection of other electrical consumers to the R4-F feed-in and feedback units is inadmissible and can lead to the destruction of the unit.



The commissioning (i.e. the taking up of the intended use) of the KEB COMBIVERT R4-F is forbidden until it is determined that the plant or the machine corresponds to the regulations of the EC-guideline 89/392/EWG (machine guideline) as well as the EMC-guideline (89/336/DWG) and their modifications.

KEB COMBIVERT R4-F meets the demands of the low-voltage guideline 73/231/EWG. The harmonized standards of the series EN 50178 (VDE 0160) in connection with EN 60439-1 (VDE 0660 Part 500) and EN 60146 (VDE 0558) are applied.



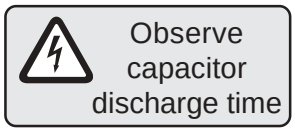
Transport and storage

KEB COMBIVERT R4-F is to be protected against inadmissible stress. In particular components may not be bent and/or isolation distances be changed during transport and handling.

The units contain electro-statically endangered components which can be destroyed by improper handling. Therefore the contact of electronic components and contacts must be avoided. In the case of mechanical defects on electrical and electronic components the unit may not be taken into operation, since the adherence to applied standards is no longer warranted.

Installation

At the installation it is absolutely necessary to observe sufficient minimum distances as well as sufficient cooling. Climatic conditions according to EN 50178 (VDE 0160) are to be kept.

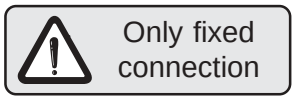


Electrical connection

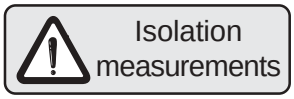
Before carrying out any installation and connecting work the plant is to be swiched off circuit and protected accordingly.

After the safety isolation of the KEB COMBIVERT R4-F the DC-link capacitors are charged with high voltage for a short period. For that reason any work on the unit may be started only 5 minutes after power off.

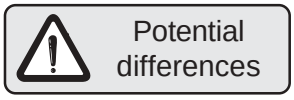
The connection of the KEB COMBIVERT R4-F is admissible only to symmetrical networks with a conductor voltage phase (L1, L2, L3) against N/PE of max. 290 V.



KEB COMBIVERT R4-F is intended only for a fixed connection, since especially with the use of filters discharge currents > 3.5 mA occur. A protective conductor cross section of at least 10 mm² copper or the laying of a second conductor electrically parallel to the protective conductor over separate terminals is prescribed. Generally ground star-shaped with shortest possible connection to main earth (avoid earth loops).



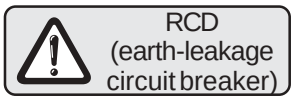
During an isolation measurement according to EN 60204 (VDE 0113) the unit must be completely disconnected because of the destructive danger to the power semiconductors. This is admissible according to standard, since all units in the context of the final inspection at KEB undergo a high-voltage test as described in EN 50178 (VDE 0160).



When using components that do not employ potential-isolated in-/outputs, it is necessary that a potential equality exists between the components to be connected (e.g. through equalizing line). In the case of disregard it can lead to the destruction of the components through equalizing currents.

A trouble-free and safe operation of a KEB COMBIVERT R4-F is to be expected only when following connection instructions are observed. In the case of deviations from these specifications malfunctions and damages can occur in indivdual cases.

- Observe system voltage!
- Lay power and control cables separately (> 15 cm)!
- Use shielded/twisted control cables. Apply shield to one side of the KEB COMBIVERT R4-F on PE!
- For the controlling of the logical inputs use only suitable switching devices whose contacts are suited for extra-low voltages!
- Ground the housing of the KEB COMBIVERT R4-F well. Apply shields of power cables on both sides over a large area (remove laquer)!
- Ground the control cabinet or the plant star-point wise to the main earth (absolutely avoid earth loops!).



If protection of individuals is required at the installation of systems protection, the feed-in and feedback units must be secured in accordance with EN 50178 (VDE 0160) as follows:

- 3-phase units through RCMA's with separator (preferred use) or RCD's Type B (all-current sensitive FI's).

The tripping current of the RCD's should be 300 mA or higher in order to prevent a premature tripping through leakage currents of the inverter (approx. 200 mA).

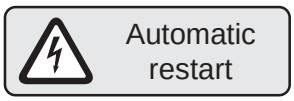
Dependent on the load, the motor cable length and the use of radio interference suppression filters substantially higher leakage currents can occur.

The connection instructions of the respective manufacturer as well as the valid local rules are to be observed at the connection.

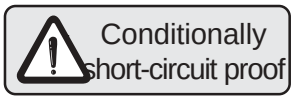
Depending on the existing system configuration (TN, IT, TT) further protective measures according to VDE 0100 Part 410 (Part 4, Chap. 41) are necessary.

For TN-systems it is e.g. the protection though overcurrent devices, at IT-systems the isolation monitoring with pulse-code measuring procedure. For all system configurations a protective separation can be used if the necessary power and line length permit this.

Operating instructions
Before start-up reattach all appropriate covers and check the terminals and screws for tight fit.

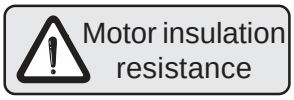


KEB COMBIVERT R4-F, dependent on the type, can be adjusted in such a way that they restart again automatically after a malfunction (e.g. undervoltage error). Therefore plants must be, if necessary, equipped with additional monitoring and procective devices (in accordance with the law on technical working materials, rules for the prevention of accidents etc.) .



The KEB COMBIVERT R4-F are conditionally short-circuit proof (EN 50178 (VDE 0160)). After resetting the internal protective devices the intended function is ensured. Exception:

- If ground faults or short-circuits occur repeatedly at the output it can lead to a defect in the unit.
- If a short-circuit occurs during the regenerative operation it can lead to a defect in the unit.



The increased DC-link voltage of approx. 680 V (instead of 540V at 400V-systems) can lead with motors connected in series to premature aging of the insulation system. Only motors with appropriate high voltage endurance should be used.

2. Product Description

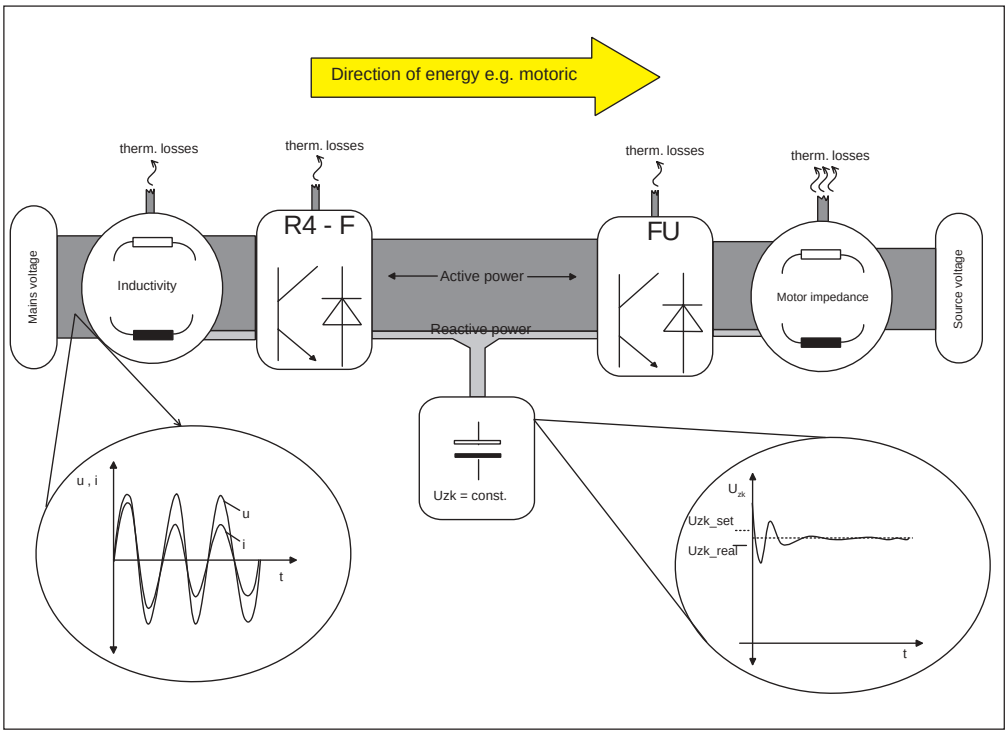
2.1 Use

The KEB COMBIVERT R4-F (sinusoidal feed-in and feedback unit) is suitable in combination with frequency inverters, which can be operated on a DC-Bus connection of 420...800 V and possess a re-charge shunt.

It is to be used where system reactions through non-sinusoidal voltage input shall or must be avoided. For regenerative operating cases, where up to now a braking module transformed the surplus energy in unused heat, the KEB COMBIVERT R4-F represents an economical solution.

The multi-variable control has the function to adjust a power factor of λ = +/- 1, i.e. only active power is taken from or fed back to the supply system. The DC-link voltage (UZK) is regulated onto a constant value. Due to the increased DC-link voltage (e.g. Uzk_set = 680 V) a larger armature operating range respectively a shifting of the field weakening range to higher frequencies can be adjusted with standard motors. Thus more overload reserves than with feed-in over uncontrolled rectifier bridges are available.

Energy balance, here for motoric operation



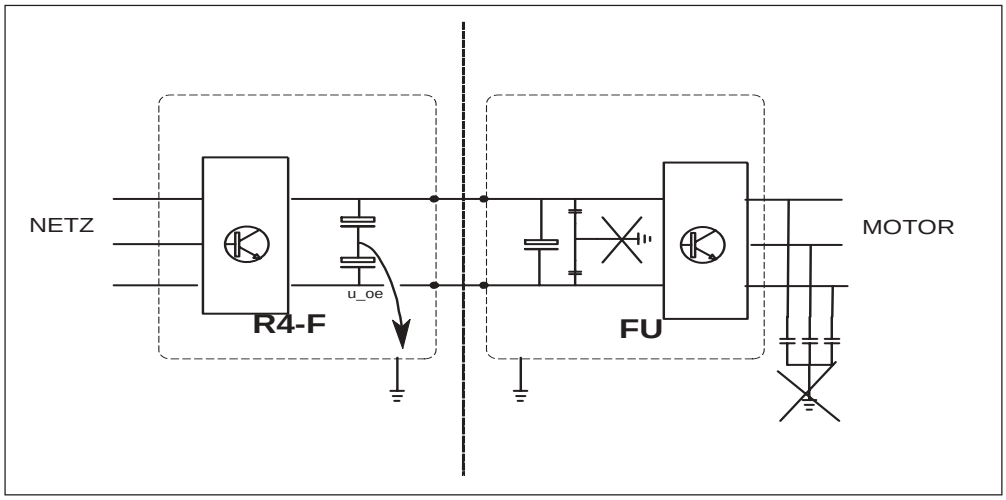
2.2 Operating Conditions

KEB COMBIVERT R4-F can be used everywhere, where the following operating conditions are given:

- 3-phase 300 - 440 V / 45-65Hz systems (phase voltage asymmetrical +/- 15%).
- frequency inverter with DC-Bus connection
- max. ambient temperature = 45°C.

Because of the controlled pulse rectifier at the input of the KEB COMBIVERT R4-F it comes to substantial potential differences between the intermediate circuit potential and the earth potential.

For that reason no capacitive or inductive connections from the intermediate circuit to the earth potential may exist. Nevertheless, suppression capacitors are employed in some existing frequency inverters. The connection to the earth potential is to be removed after consultation with the manufacturer.



2.3 Unit Identification

XX.R4.XXX-XXXX

Slot-Option	0	Standard without slot assignment
	1-9 / A-Z	With assigned slot operator and/or assigned slot additional card
Clock frequency	0	System synchronous clocked / 8 - 16 kHz
Voltage	2 / 4	200 V- / 400 V-class
Connection	3	3-phase
	4, A	Reference to special/customer versions, 400 V-class
Unit housing		Housing size
Not defined	0	- - -
Type control card	S / F	Standard (block-shaped feedback) (S) sinusoidal feed-in/feedback (F)
Unit ype	R4	Feedback unit
Unit size		

3. Storage and Transport

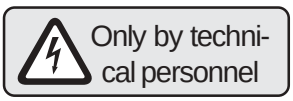
The storage of the KEB COMBIVERT R4-F has to take place in its original packaging. It must be protected against moisture and excessive cooling and thermal effect.

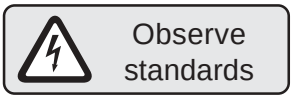
The transport over large distances has to take place in the original packaging. It must be secured against impacts and shocks.

Observe the labelling on the covering box!

After removing the covering box the KEB COMBIVERT R4-F is to be securely placed on stable base.

4. Installation





The installation and commissioning of the KEB COMBIVERT R4-F is permissble only through qualified technical personnel. A safe and trouble-free operation is ensured by the compliance with the valid regulations according to DIN VDE 0100, DIN VDE 0113, DIN VDE 0160, DIN VDE 0875 as well as the relevant local regulations. The unit is to be grounded over the protective conductor. The power connections L1_2, L2_2 and L3_2 as well as the connections for the synchronization (L1, L2, L3) are to be effected with shielded cables.

Attention, the terminals L1, L2, L3, as well as -IN, -OUT, +OUT, +IN and L1_2, L2_2, L3_2 carry dangerously high voltages in switched-on status!

All installation and connection work is to be done only in off-circuit condition!

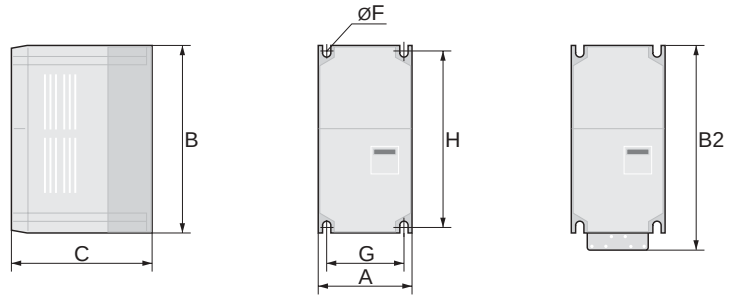
The DC-link capacitors of the KEB COMBIVERT R4-F are still charged with high voltage for some minutes after switch off. Therefore work on the unit may be carried out only 5 minutes after power off!

4. Installation

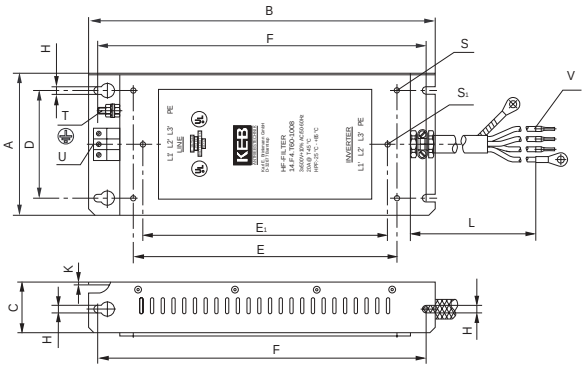
4.1 Unit Installation

4.1.1 Dimensions

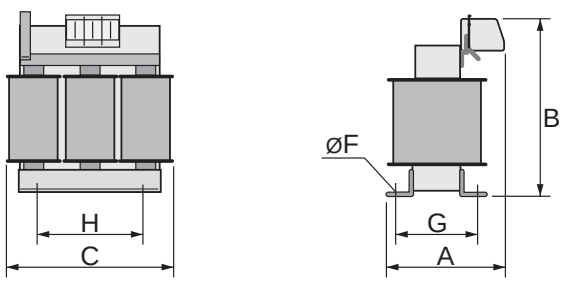
KEB COMBIVERT R4-F							
Housing size	A	B	C	F	G	H	Weight
G	170	340	255	7	150	330	10 kg
R	340	520	355	10	300	495	25-29 kg



Radio interference suppression filter								
Type	A	B	C	D	E	F	H	Weight
16.E4.T60-1001	181	415	56	150	330	400	7	3,2 kg
19.E4.T60-1001	300	445	66	250	330	420	7	6,1 kg



Commutating reactor							
Type	A	B	C	F	G	H	Weight
16.DR.R08-2351	15	237	230	8	123	152	17 kg
21.DR.R08-8541	21	337	300	11	162	200	45 kg



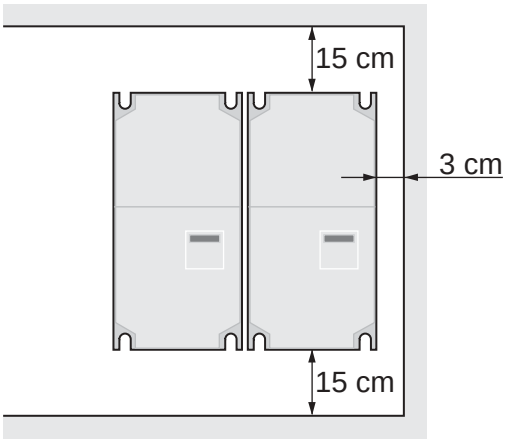
4.1.2 Environmental Conditions

Site altitude max. 2000 m. At installation above 1000 m a power reduction of 1 % per 100m must be taken into consideration, i.e. 1500 m above sea level = 95% P_{rated}.

Max. permissible limit values	KEB COMBIVERT R4-F
Ambient temperature in operation	-10°C . . . +45°C
Storage temperature	-25°C . . . +70°C
Transport temperature	-25°C . . . +70°C
Relative humidity	max. 95% no condensation (code letter *F* DIN 40040)

4.1.3 Installation Instructions

- Install and ground KEB COMBIVERT R4-F stationary.
- At the placing observe the minimum distances to surrounding elements (see installation instructions).
- Prevent the penetration of dust into the KEB COMBIVERT R4-F. For the installation into a dust-proof housing sufficient heat dissipation must be ensured.
- KEB COMBIVERT R4-F is to be protected against aggressive gases and fluids.
- Consumers that produce electrical or magnetic fields or exert influences on the voltage supply, are to be placed as far away as possible and measurements for the suppression of interferences must be taken.



The KEB COMBIVERT R4-F is intended for the vertical installation into the control cabinet. A minimum distance of 15 cm at the air inlet and outlet openings to the neighbouring modules is to be kept.
Feedback units are mountable one above the other without keeping a minimum distance. The same applies for the side by side mounting of feedback units with frequency inverters.

4.1.4 Directions for EMC-conform Wiring

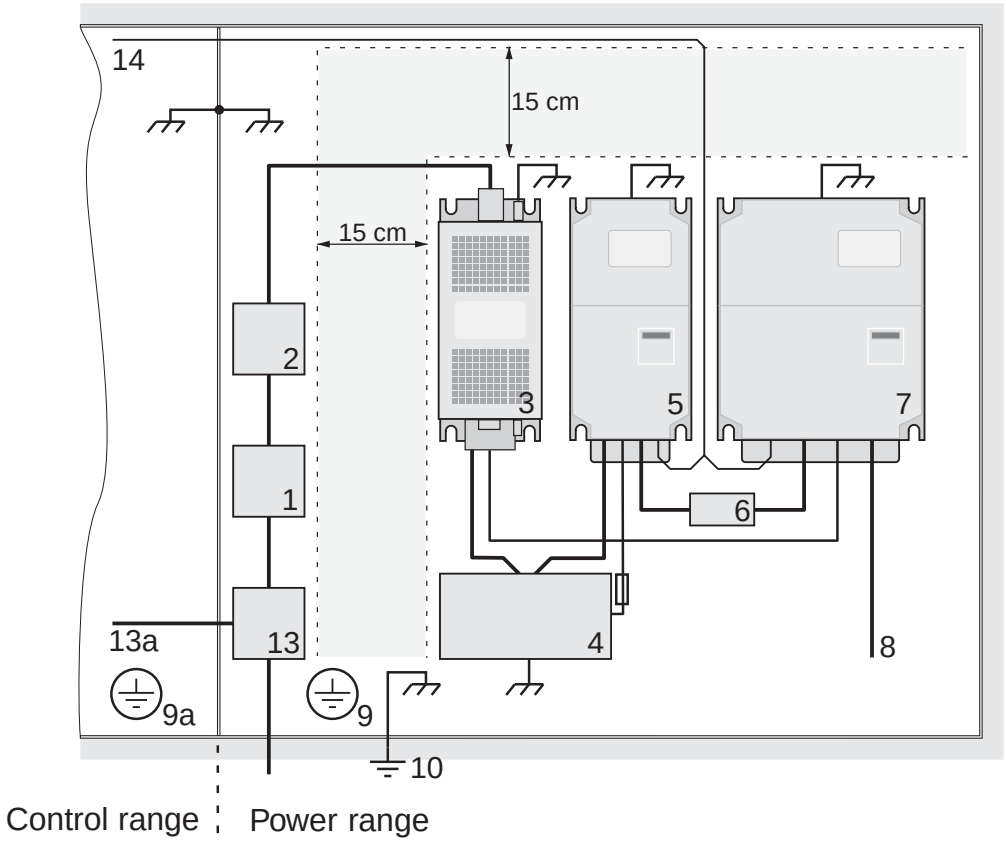
- Set up the control cabinet or plant proper and according to function
- In order to avoid interference coupling :

  a) power/supply cables,
  b) motor cables of frequency inverter/servo controller,
  c) control and data lines (low-volt level < 48 V),
  are to be installed with a minimum distance of 15 cm.

- To obtain low-resistance HF-connections, earthing and shielding as well as other metallic connections (e.g. mounting plate, installed devices) must be applied over a large area on a metallically bright base. Use earthing and potential equalization lines with the largest possible cross section (at least 10 mm^2) or thick earthing strips.
- If external radio interference suppression filters are used, they are to be placed with a distance of max. 30 cm to the interference source and installed with very good, area covering contact to the mounting surface.
- Always provide inductive switching devices (contactors, relays etc.) with suppression elements such as varistors, RC-elements or protective diodes.
- Keep all connections as short as possible and close to the reference potential, since freely pending lines work just like antennas.
- Avoid back-up loops on all connecting cables. Apply unoccupied litz wires to both sides of the protective conductor.
- With unshielded lines lead wires and return lines must be twisted to dampen symmetrical interferences.

On the following pages you find examples for set-up and wiring of an EMC-conform control cabinet.

Installation schematic - EMC-conform control cabinet setup

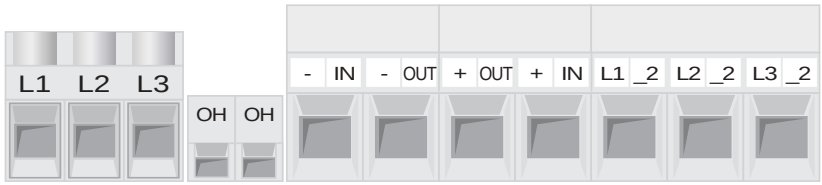


1	Mains fuse
2	Main contactor
3	Radio interference suppression filter
4	Commutating reactor
5	R4-feed-in and feedback unit
6	Intermediate circuit fuse
7	Frequency inverter
8	Motor feed cable
9	Mounting plate is common neutral point (PE)
9a	Neutral point (PE) for control range
10	Equipotential bonding with the housing earth
13	Supply connection
13a	Supply connection, control range
14	Control lines, housing is tied into over a large area

The above installation schematic represents the optimal solution in the arrangement of the units. If the dimensions of the control cabinet permit it, this schematic should be realized.

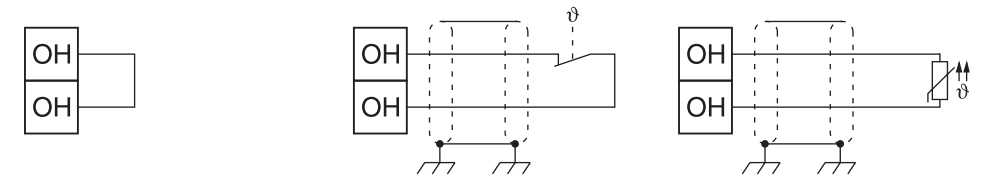
4.2 Connection Power Circuit

Terminal	Function
L1, L2, L3	Synchronization
OH, OH	Connection for temperature sensor for for commutating reactor
-IN, +IN	Input terminals for +/- DC-intermediate circuit
-OUT, +OUT	In-/output terminals for +/- DC-intermediate circuit
L1_2, L2_2, L3_2	3-phase supply connection



On the line-side and in the DC-intermediate circuit the unit must be protected with fuses of operating class gR. In order to avoid inadmissible high commutation notches a commutating reactor must be connected on line side. The connection of the synchronization line is carried out over pre-fusing max. 4 A (according to VDE line protection) with twisted cables 0.75 mm².

4.2.1 Temperature Monitoring Commutating Reactor



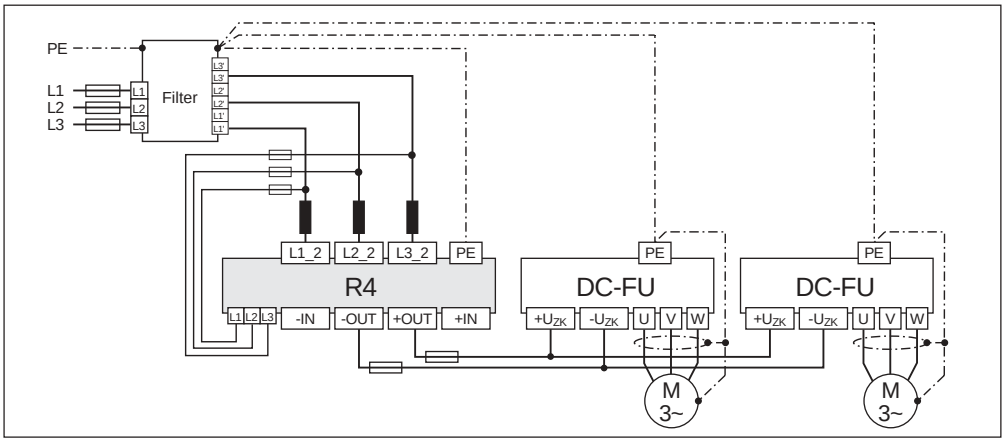
Bridge, if no monitoring takes place

Thermo-contact (NC contact)

Temperature sensor (PTC)
Response resistor ≥ 4 kΩ
Resetting resistor ≤ 750 Ω
(according to VDE 0664)

4.2.2 Standard Connection

Several frequency inverters can be connected to the DC-Bus. Pay attention to the total connected load.

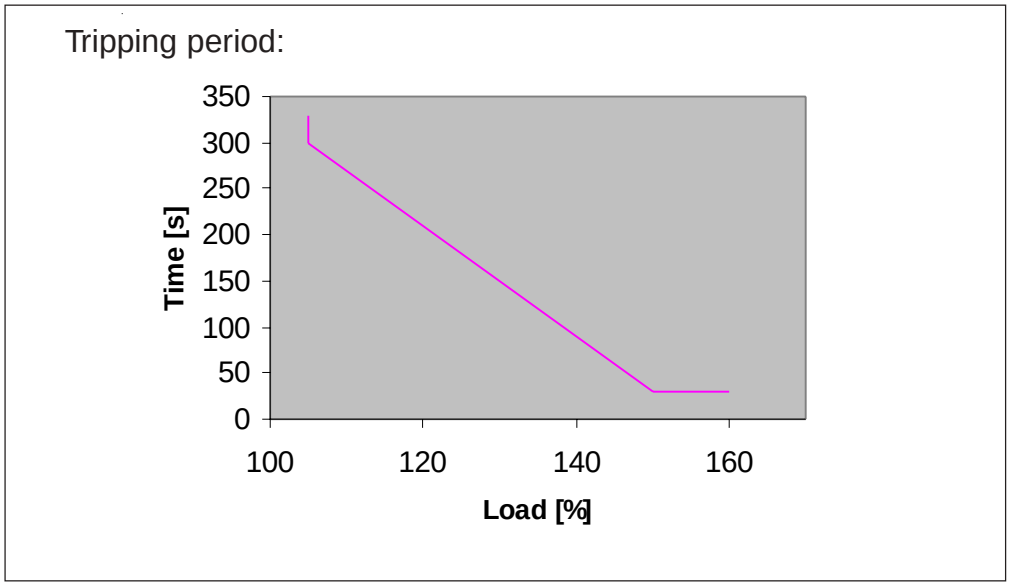


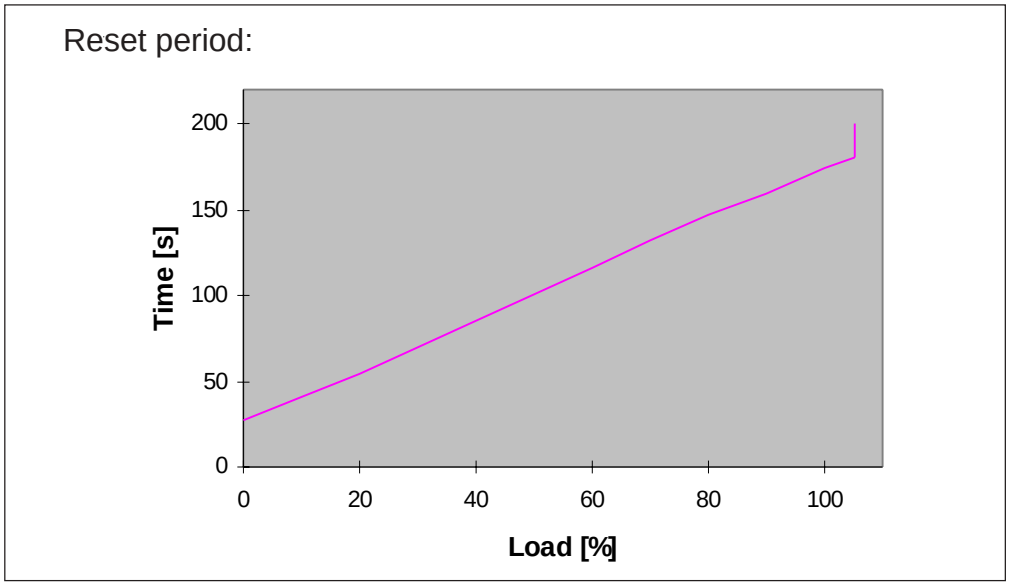
4.3 Technical Data

Unit nomination	KEB COMBVERT R4	14.R4.F	16.R4.F0G-3440	21.R4.F0R-3440
Unit design	Die-cast heat sink/			
	Plastic top			
	(G-housing)			
Unit dimensions	(H · B · T in mm)	340 · 170 · 255		520 · 340 · 355
Input fuse	external in	63 A		160 A
	control cabinet	(Operating class gR)		
D.C.-link fuse	external in	100 A		250 A
	control cabinet	(Operating class gR)		
Supply power circuit	DC-supply from	260 . . . 400 V	420 . . . 800 V DC	
	D.C.-link-FI			
Maximum leakage current	max.< [mA]	17		50
Type of protection	IP 20			
Line reactor - external	100% ED	16.DR.R08-2351		21.DR.R08-8541
		Ln = 2,20 mH		Ln = 0,85 mH
Mains filter - external		16.E4.T60-1001		19.E4.T60-1001
		In = 33 A		In = 90 A
	Symbol	**14.R4.F0G-3241**	**16.R4.F0G-3440**	**20.R4.F0R-3440**
System voltage class	Umains	180 . . . 220 V	300...440V	
System frequency	fmains	50...60 Hz ± 5Hz		
Number of system phases		3		
Rated voltage	U_n	200 V	400 V	
Rated apparent power	S_n	11 kVA	23 kVA	52 kVA
Rated D.C.-link voltage	U_{zk_n}	340 V	680 V	
Rated D.C.-link current	I_{zk_n}	33,5 A		76 A
*Max. incoming/energy recovery rating	1.5 S_{mains_max}	18,8 kVA	37,5 kVA	78 kVA
(U_n= 400 V overload operation)				
Rated current per line	I_n	33 A		75 A
(100% cyclic duration factor)				
Short-time max. overcurrent	I_{MAX}	49,5 A		135 A
(eff. line current [max. 30 sec.]				
Peak current - OC (line current)	I_{OC}	93,3 A		162 A
Supply voltage digital inputs	U_{dig}	13 . . . 30 V		
int. supply voltage	U_{out}	18 V		
(terminals 24V_{OUT})				
ext. supply voltage	U_{in}	24 V (-10%, +25%)		
(terminal 24V_{IN})				
Line cross section supply connection		10 mm^2		50 mm^2
Line cross section D.C.-link		16 mm^2		70 mm^2
Line crosss section sychronization		0,75 mm^2		

*) The absorbed apparent power is a function of the mains voltage ($S_{netz} = f(U_{netz})$)
$S_{netz} = \sqrt{3} \cdot U_{netz} \cdot I_n$, as the power factor is λ = +/- 1: $P_{netz} = S_{netz}$

4.4 OL - Function Overload Range





5. Control Terminal Strip X2

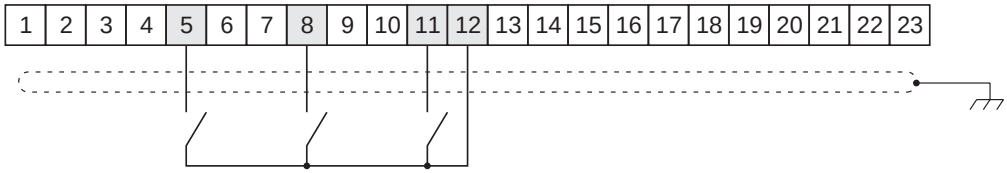
Terminal	Name	Specification	Description
X2.1 X2.2 X2.3	RLA1 RLB1 RLC1	Continuous limit current= 6A;400V~/300V- Switching capacity~ 1500 VA	RA1 / RC1 NO-contact RB1 / RC1 NC-contact
X2.4	free		
X2.5	I1	Noise immunity: 2kV logical 1: +/- (12..30V) Logic: NPN/PNP intern. input resistance: ca. 2kΩ	Programmable input
X2.6	Uout	+18V(+/- 20%); max 20mA At connection of external voltage is Uout ~ ext.voltage(X2.18)	+18V output
X2.7	EXTGND		Ground for Uout and dig. I/O
X2.8	ST	see terminal X2.5	Control release
X2.9	Uout	see terminal X2.6	
X2.10	EXTGND	see terminal X2.7	
X2.11	RST	see terminal X2.5	Reset
X2.12	Uout	see terminal X2.6	
X2.13	EXTGND	see terminal X2.7	
X2.14	OUT1	programmable PNP-transistor output, ca. 16V(+/- 20%) / max. 20mA at external supply ca. (Uout - 3V) +/-20%/ max. 20mA	Digital output
X2.15	ANOUT	Voltage range: +/- 10 V Internal resistance: 100 Ω Resolution: 12 Bit	Analog output
X2.16	GND		Ground for ANOUT
X2.17	free		
X2.18	24V IN	External voltage supply (+24..30V) for the I/O´s. If external components shall be supplied from Uout with current input > 110mA an external supply must be made available at terminal X2.18. Reference potential: EXTGND (Kl.19)	ext. voltage supply
X2.19	EXTGND	see terminal X2.7	
X2.20	free		
X2.21 X2.22 X2.23	RLA2 RLB2 RLC2	see terminal X2.1-X2.3	RA2 / RC2 NO-contact RB2 / RC2 NC-contact

5.1 Connection of Control Terminals

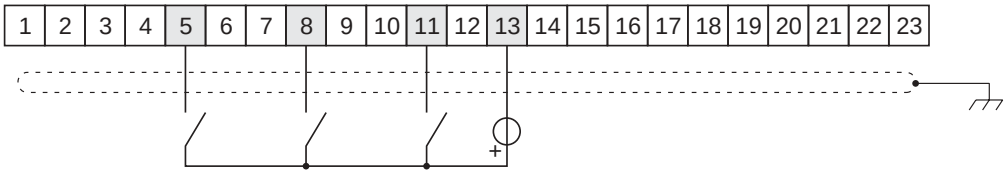
In order to avoid malfunctioning by interference voltage feed-in at the control inputs, following instructions should be considered:

- Use shielded/twisted cables.
- Attach shield on **one side** of the inverter to earth potential.
- Lay control and power cables **separately** (ca. 10...20 cm distance).
- Lay lines in right angle.
- Electrical isolation between terminals for in-/outputs and the analog output (i.e. **do not connect** EXTGND with GND).

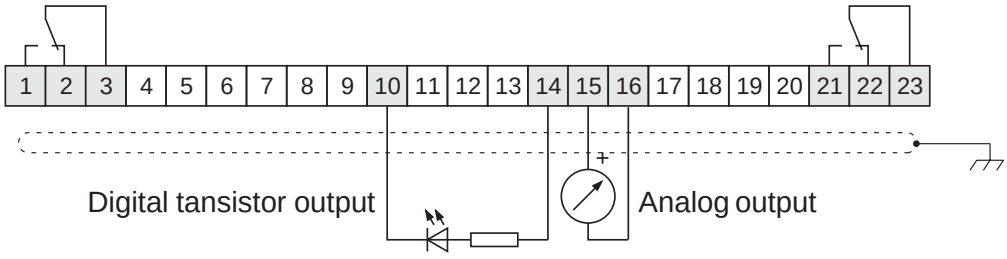
Internal voltage supply



External voltage supply of digital inputs



Digital / analog outputs



6. Operation of the Unit

6.1 Initialization

After connecting the supply voltage the KEB COMBIVERT R4-F is initialized. First the power circuit identification is checked. When identifying an invalid power circuit then the error "**E.PUC"** (**P**ower **U**nit **C**heck) is triggered and shown in the display of the operator. The error cannot be reset, the power circuit must be checked.
When identifying a valid power circuit, the KEB COMBIVERT R4-F changes into status „Syn". During this synchronization phase following processes run.

1. The line frequency is determined. If it is not within the tolerance of 45 - 65 Hz, the unit remains in the operating condition „Syn".

2. The rotary field is determined.

3. Check of phase assignment of synchronous signals to the system phases at the power circuit. If one phase is missing or in case of a wrong phase assignment the error **"E.Syn"** is triggered. The error cannot be reset. The connections must be checked and the feedback unit must be switched on again.

After successful synchronization the correct connection of the KEB COMBIVERT R4-F is ensured. If the release signal (terminal ST) is set, the KEB COMBIVERT R4-F automatically starts its function.

6.2 Control during Operation

Basically two possibilities of operating the KEB COMBIVERT R4-F are available:

1. Operation by means of Interface-Operator

2. Operation by means of personal computer and the system software KEB COMBIVIS

6.2.1 Operation with Interface Operator

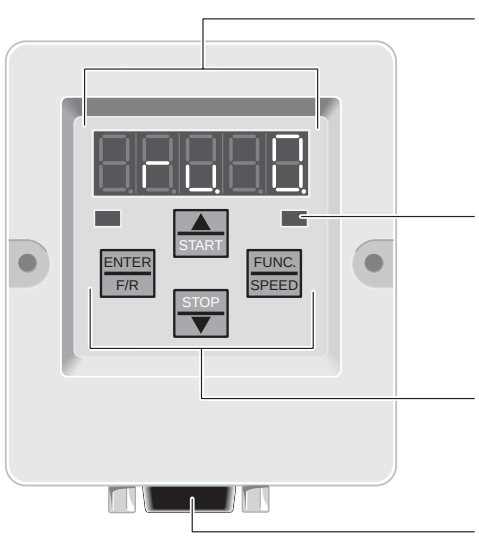
An operator is needed for the local operation of the KEB COMBIVERT R4-F, which is attached on the front side of the unit. To avoid malfunctions the inverter must be in status „nOP“ (control release X1.8 open) when attaching/pulling off the operator. When starting the KEB COMBIVERT R4-F without operator, the start up is done with the values stored last or with the factory setting. The LED-display of the operator indicates all operating conditions of the KEB COMBIVERT R4-F. By way of four keys operating parameters can be called or adjustments to different application conditions can be carried out. The password input is also possible.

Local Operation

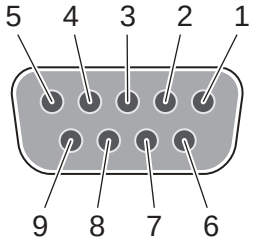
BUS- Operation

Additionally the operator has a 9-pole RS232/485 interface, which serves for the communication with a data transfer device.

Interface-Operator (Part no. 00.F4.010-1009)



Isolated RS232/485-Interface



Pin	RS485	Signal	Meaning
1	-	-	reserved
2	-	TxD	transmit signal/RS232
3	-	RxD	receive signal/RS232
4	A’	RxD-A	receive signalA/RS485
5	B’	RxD-B	receive signalB/RS485
6	-	VP	supply voltage +5V (I_{max} = 10mA)
7	C/C’	DGND	data reference potential
8	A	TxD-A	transmit signal A/RS485
9	B	TxD-B	transmit signalB/RS485

6.2.2 Operation with PC and System Softare KEB COMBIVIS

Instructions concerning the installation and operation of the system software KEB COMBIVIS are found in the corresponding software description.

6.3 Keyboard Operation

6.3.1 Standard Operation

Regarding the operation over keyboard it is differentiated between two basic operating modes:

Mode 1 Representing and changing of parameter identification (number and group)
Mode 2 Representing and changing the parameter values

Changing between these modes is done by pressing the FUNCT-key. Pressing the FUNCT-key in mode 2 shows the value of the adjusted parameter. On pressing the key again the parameter identification is displayed.

6.3.2 Mode 1, Display of Parameter Identification

The individual specifications for the identification of the parameters are separated by points. One of these points flashes, thus showing the specification that can be modified with UP/DOWN. By pressing ENTER the flashing point can be moved to the left. If ENTER is pressed when the point of the parameter group flashes then the point of the parameter number flashes.

Changing the Parameter Group

To select another parameter group, press ENTER repeatedly until the point is behind the parameter group flashes. Now the desired parameter group can be adjusted with UP/DOWN. When changing the parameter group the parameter number is set to the lowest available number in the new group.

Changing the Parameter Number

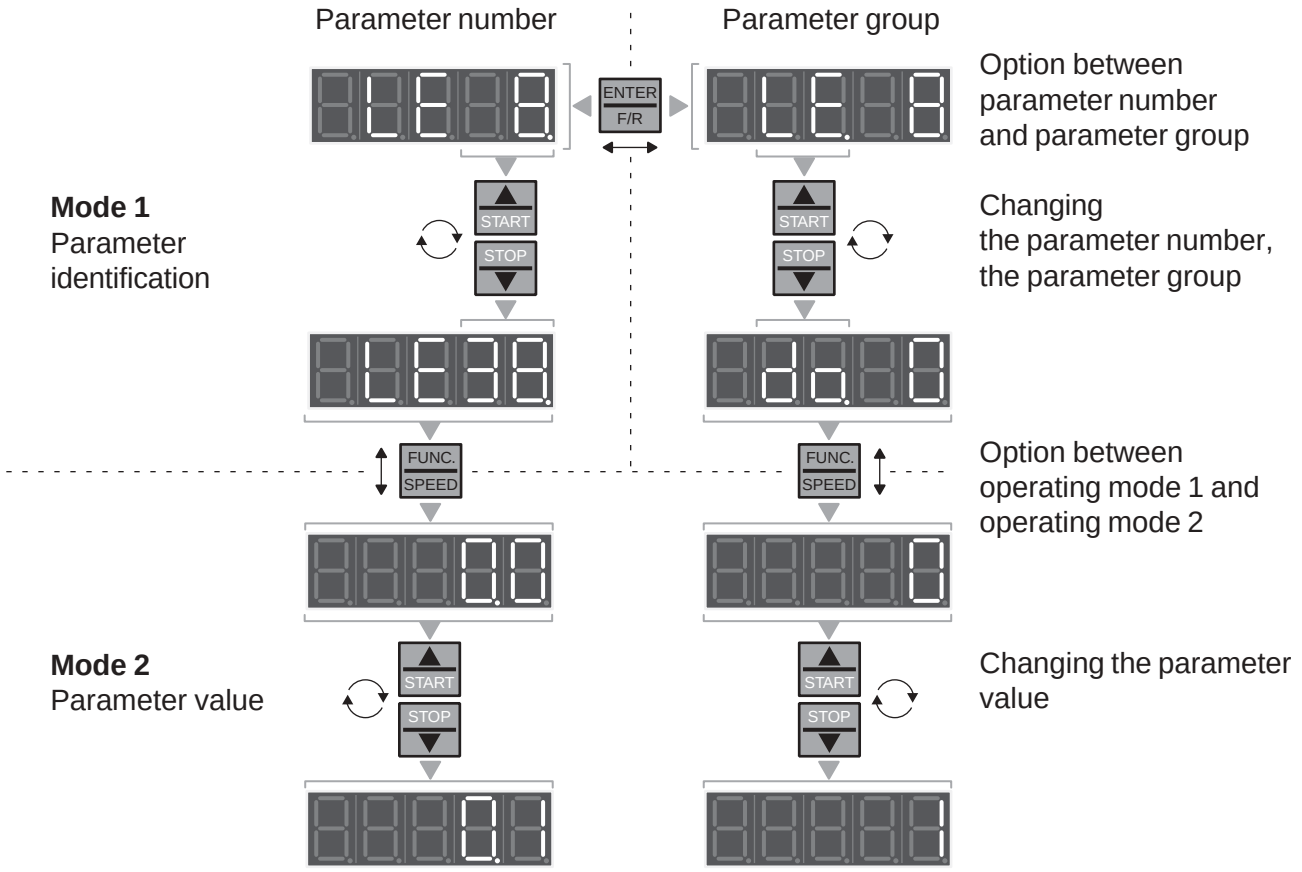
To change the parameter number, the flashing point must first be brought behind the display of the parameter number, afterwards the parameter number can be changed with UP/DOWN. If the highest parameter of a group is reached and UP pressed, the lowest parameter number of this group appears. When reaching the lowest parameter number and pressing DOWN appears the highest parameter number of this group. A change of the parameter number does not change the parameter group.

6.3.3 Mode 2, Changing of Parameter Values

In the parameter value display the value of adjusted parameters can be changed by pressing the keys UP or DOWN. The modifications are immediately effective and nonvolatile stored, i.e. they are still valid even after switching off the unit. It is not necesary to acknowledge the input with ENTER.

Enter Parameter

For some parameters it is not sensible for the value adjusted with UP/DOWN to become valid immediately. These parameter are called Enter-Parameter, as the input must be confirmed with ENTER. Pressing UP/DOWN only changes the display, but not the value stored in the feedback unit. If the displayed value is different to the stored value, it is marked by a point in the display. By pressing the ENTER-key the display value is stored in the KEB COMBIVERT R4-F and the point goes out. The parameter value display of an Enter-Parameter alays starts with the value stored in the KEB COMBIVERT R4-F.



6.4 Special Displays

Error message

In case a failure occurs in the KEB COMBIVERT R4-F, the display is overwritten with an error message. This error message is represented flashing.

By pressing ENTER the display of the error message is terminated and the display shows the parameter value of the last adjusted parameter.

Acknowledging the error message with ENTER is not an error reset, i.e. the error status in the KEB COMBIVERT R4-F is not reset. Thus it is possible to correct the adjustments before the error reset. An error reset is only possible by the terminals control release or reset.

Checkback signal

Some inputs are acknowledged by the KEB COMBIVERT R4-F with a checkback signal. Possible checkbacks are:

- „PASS“ Factory setting was loaded
- „nco“ Factory setting could not be loaded

These checkback signals must be acknowlegded with ENTER.

Error Acknowledge message with ENTER

7. Parameter Structure

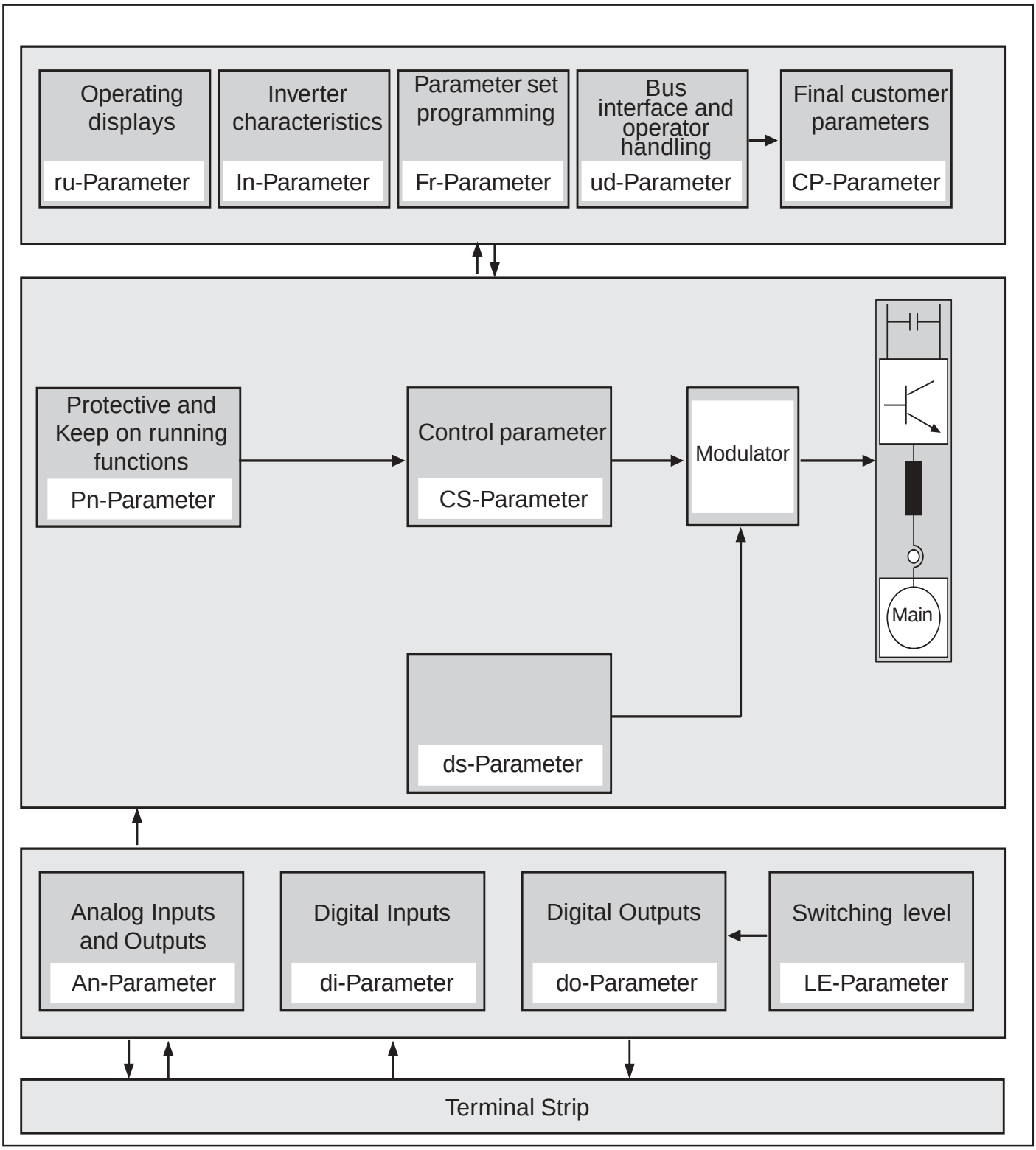
Each parameter is clearly described by three specifications.

1. Parameter number
2. Parameter group
3. Parameter set (only at programmable parameters)

The individual parameters of a group are differentiated by the number. Several parameters are functional-related combined in one parameter group. That means, all parameters, that are needed for the adjustment of one function, are in one parameter group. The KEB COMBIVERT R4-F has following parameter groups:

Run(ru) - Parameter	Contains all status displays, i.e. all values that changed during operation, without having changed the parameter
Protection(Pn) - Parameter	All protective functions and Keep-on-runnig functions (e.g. Auto Restart)
(dS) - Parameter	Switching frequency
Control(CS) - Parameter	Control parameter for D.C.-link circuit and current control
User-definition(ud) - Parameter	All parameters for the individual adjustment of the operator panel and serial interface
Free-prog.(Fr) - Parameter	Parameters for the programming and activation of parameter sets
Analog-I/O(An) - Parameter	Programming of the analog output
Digital-In(di) - Parameter	Programming of digital inputs
Digital-Out(do) - Parameter	Programming of digital outputs
Level(LE) - Parameter	Swtiching conditons for digital outputs
Information(In) - Parameter	Informationen about type of inverter, serial number and diagnosis parameters like error counter, QS-number etc.

7.1 Functions of the Parameter Groups



7.2 Password Structure

Password input

The password is entered by way of parameter ud.0 (Application mode) or cP.0 (Customer mode).

Contrary to the previous concept the password remains stored after Power-On, thus it is not necessary to release it again after every switch-on. There are 5 password levels, one of them is always active. A change of the password level is initated by the input of the new password. Inputs, which do not correspond to a valid password, are ignored. The service and supervisor password are not stored. If a unit is switched off while supervisor or service password are active, then after switch on the password is active again, which was active before the activation of the supervisor or service password.

Password list

1. **CP - READ-ONLY** Only the Customer-parameter group is visible, only CI.0 (Password) can be changed.

2. **CP - ON** Only the Customer-parameter group is visible, all parameters of the Customer-parameter group can be changed.

3. **CP - SERVICE** Corresponds to the password, however the parameter identification of the parameter is displayed, with which the Customer-parameter is occupied.

4. **APPLICATION** All Application-parameters are visible and can be changed. The Customer-group is not visible.

5. **SUPERVISOR** All parameters are visible and can be changed. The Customer-group is not visible.

Password	Password level
100	CP - READ-ONLY
200	CP - ON
330	CP - SERVICE
440	APPLICATION
xxx	SUPERVISOR

7.3 Operator Level 2: Customer-Mode

The parameters in the CP-parameter group can be specified by the user. Only CP.0 has a fixed assignment. It always contains the password input.

Which parameters are represented by the individual CP-parameters, is defined in the appropriate parameters of the ud-group (USER DEFINITION) (see page 44).

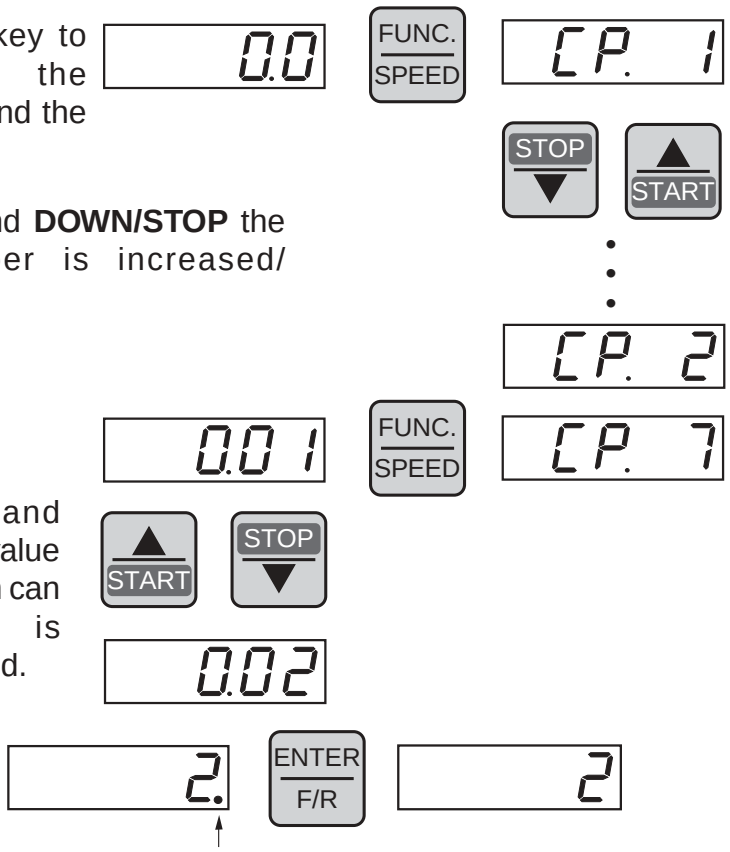
With the respective ud-parameter the address for the CP-parameters 1 - 24 can be determined. Restrictions and procedure are described in the chapter „Function description ud-parameters“. In the CP-group one changes between the parameters with UP/DOWN. A change of the group or the set is not possible. With FUNC it is being switched between the parameter value display and the parameter identification.

To change from the operator control level 2 (application mode) to the operator control level 1 (customer-mode) or vice versa you must enter the respective passwords.

Use the function key to switch between the **parameter value** and the parameter number.

With **UP/START** and **DOWN/STOP** the parameter number is increased/ decreased.

With **UP/START** and **DOWN/STOP** the value of parameters which can be changed is increased/decreased.



The adjusted value is not immediately accepted in the **ENTER** parameters. When this type of parameter is changed a point appears behind the last digit. By pressing **ENTER** the adjusted value is accepted and non-volatile stored.

Display	Parameter in Application Mode	Parameter Description	Factory setting
CP. 0	Password input		customer on
CP. 1	Inverter status	ru. 00	
CP. 2	Uzk_actual	ru. 11	---
CP. 3	Uzk_max	ru. 12	---
CP. 4	Uzk_set	ru. 48	---
CP. 5	Uzk_set source	cs. 37	uzk_set constant
CP. 6	Uzk_set constant	cs. 28	680 V
CP. 7	kv UZK_set	cs. 24	1,2
CP. 8	kp Uzk-controller	cs. 25	2000
CP. 9	ki Uzk-controller	cs. 26	80
CP. 10	kp I_uvw	cs. 33	50000
CP. 11	kv UZK_izk	cs. 30	50
CP. 12	Apparent current	ru. 09	---
CP. 13	Load	ru. 07	---
CP. 14	max. apparent current	ru. 29	---
CP. 15	Function analog Out	An. 14	Apparent current
CP. 16	Amplification analog Out	An. 15	1
CP. 17	Input function	di. 03	disable
CP. 18	Condition 1	do. 01	enable
CP. 19	Condition 2	do. 02	ready
CP. 20	Output function 1	do. 09	do 1
CP. 21	Output function 2	do. 10	do 2
CP. 22	Load level 1	LE. 08	0
CP. 23	Apparent current level 1	LE. 12	0
CP. 24	DC-link voltage level 1	LE. 24	0

7.4 Restoring of Factory Setting

The factory setting can be restored any time. For that the following values must be adjusted via the keyboard of the operator. The inverter must be in operating status "***nop***" (no control release).

CP.0 = 440	**Fr.0 = - 2**	**ud.0 = 200**

8. Function Description

8.1 Run (ru)-Parameter

General

The run(ru)-parameter group combines all parameters that display the current operating status of the inverter. The parameters of this group are read-only. An exception form the peak value memories ru.8, ru.12 and ru.29, which are deleted by the input of any value.

Parameter Summary

ru.0	Inverter status
ru.7	Actual load
ru.8	Peak load
ru.9	Apparent current
ru.10	Active current
ru.11	DC-bus voltage
ru.12	DC-bus voltage / peak value
ru.14	Input terminal status
ru.15	Output terminal status
ru.16	Internal input status
ru.17	Internal output status
ru.24	Display OL-counter
ru.29	Peak current
ru.31	Operating-hour counter 1
ru.32	Operating-hour counter 2 modulation _on
ru.48	DC-link setpoint value
ru.49	Absorbed electrical energy
ru.50	Refed electrical energy
ru.52	Mains frequency

Inverter status (ru.0)

The inverter status (ru.0) displays the operating condition of the inverter. The meanings of the various displays are explained in the following table.

Display	Value	Description
noP	0	No Operation: Control release is not bridged,1 modulation off
E.OP	1	OverPotention, DC-bus voltage too high
E.UP	2	UnderPotention, DC-bus voltage too low
E.OC	4	OverCurrent, output current > 2 * I_{rated} (constant torque)
E.OH	8	OverHeat, overheating of the inverter
E.dOH	9	Choke OverHeat, temperature monitoring of the inductivity has triggered and prewarning time has run out
E.OL	16	OverLoad, overload of the inverter is running
E.nOL	17	No OverLoad, cooling time E.OL has run out, error can be reset
E.buS	18	Watchdog Error
E.EF	31	External Fault, error message with external unit
E.nOH	36	No OverHeat, overtempertature error is no longer present (E.OH or E.dOH), error can be reset
E.SEt	39	Set selection error
E.PuC	49	Power circuit identifier not valid
E.SYn	115	Faulty synchronization, e.g. phase assignment is not correct
E.net	122	Error after expiration of a deceleration time (pn.59) at phase failure.
E.rES	125	E.net was triggered and the waiting period of 16 sec. has elapsed. The error can be reset now.
bbl	76	Base-Block time runs out, inverter de-energised
r4on	117	Modulation is enabled, R4-F in operation (low load)
nEto	112	Phase failure after modulation release
SYn	120	Synchronized onto the network angle
Phau	119	Phase failure at blocked modulation
into	123	Feed-in (motoric operation)
retn	124	Feedback (generative operation)

Actual load (ru. 7)

Parameter ru.7 shows the actual load of the inverter in %. 100% means the output current which corresponds to the rated current of the inverter. Only positive values are displayed, i.e. a differentiation whether the inverter feeds-in or feeds-back is not possible on the basis of ru.7.

Peak load (ru.8)

ru.8 makes it possible to immediately detect peak loads within an operating cycle. In addition to it the highest value, that occurs in ru.7, is stored in ru.8. The peak memory can be deleted by pressing the UP or DOWN key, or by Bus by writing any value to the address of ru.8. The memory is deleted when the inverter is switched off.

Apparent current (ru.9)

In ru.9 the actual apparent current is displayed with a resolution of 0.1 A. The resolution over bus is likewise 0.1 A.

Active current (ru.10)

ru.10 displays the actual active current.

DC Voltage (ru.11, ru.12)

Display of the actual DC-bus voltage with a resolution of 1 V. The highest value is stored in ru.12. ru.12 can be deleted by pressing the UP or DOWN key. The peak memory can be deleted by bus by writing any value to ru.12.

Input terminal status (ru.14)

ru.14 shows the logical status of the input terminals. Logical combinations, strobe or edge-triggering are not taken into consideration.

Bit - No.	Decimal value	Input	Terminal
0	1	ST (Control release)	8
1	2	RST (Reset)	11
4	16	I1 (Prog. Input 1)	5

If one input is triggered, the corresponding decimal value is displayed. If several inputs are triggered, the sum of the decimal value is displayed.

Output terminal status (ru.15)

ru.15 permits the control of digital outputs. ru.15 takes into account the logic operations of the digital outputs (do.0, d0.9 to do.25). For each active output the appropriate decimal value is displayed. If several outputs are active, then the sum of the decimal values is displayed.

Bit - No.	Decimal value	Output	Terminal
0	1	Out 1 (Transistor output)	12
1	2	Out 2 (RelayRLA,RLB,RLC)	1, 2, 3
2	4	Out 3 (Relay FLA,FLB,FLC)	21, 22, 23
4	16	Out A (Internal output A)	none
5	32	Out B (Internal output B)	none
6	64	Out C (Internal output C)	none
7	128	Out D (Internal output D)	none

Internal input status (ru.16)

ru.16 shows the logic state of the digital inputs, input terminals, edge triggering and logic operation by way of the di-parameters and internal software inputs IA to ID. In dependence on ru.16 the functions programmed in di.3 to di.8 are executed.

Bit -No.	Decimal value	Input	Terminal
0	1	ST (Control release)	8
1	2	RST (Reset)	11
4	16	I1 (Prog. input 1)	5
8	256	IA (Internal input A)	none
9	512	IB (Internal input B)	none
10	1024	IC (Internal input C)	none
11	2048	ID (Internal input D)	none

If one input is triggered then the appropriate decimal value is displayed. If several inputs are triggered, then the sum of the decimal values is displayed.

Internal output status (ru.17)

ru.17 displays the results of the output function tables (do. 1 bis do. 3). If one switching condition is fulfilled, then the appropriate decimal value is displayed. If several switching conditions are fulfilled, then the sum of the decimal values is displayed.

Bit - No.	Decimal value	Output switching conditions
0	1	Out1 Condition (do. 1)
1	2	Out2 Condition (do. 2)
2	4	Out3 Condition (do. 3)
3	8	Out4 Condition (do. 4)

Display OL -counter (ru.24)

With the aid of this parameter the continuous load of the inverter can be evaluated, in order to prevent the occurrence of OL (in-time load reduction). The error OL is triggered, when the OL-counter has reached 100 %. The counter reading is displayed with a resolution of 0.1 %.

Apparent current/Peak value (ru.25)

Maximal motor current that occurred during an operating time. (displayed in A). The peak value can be deleted by pressing the key UP or DOWN. A switch-off of the inverter also results in a cancellation of the memory.

Heat sink temperature (ru.29)

ru.29 displays the current heat sink temperature in °C. The resolution is 1°C. At a temperature below 20° C noF is displayed.

Operating-hour counter 1 (ru.31)

With a resolution of 1 hour ru.31 displays the time the inverter was altogether switched on (supplied with voltage).

Operating-hour counter 2 (ru.32)

ru.32 displays, with a resolution of 1 hour, the time the inverter was altogether active (modulation active).

Electrical energy taken from (ru.49)

ru.49 displays, with a resolution of 1 kWh, the electrical energy, that was taken from the mains. The accuracy of the display depends, among other things, on the harmonic load of the mains voltage, since only the crest value of the mains voltage is determined and thus the calculated effective value deviates from the actual value. In addition there is the inaccuracy of the measured-value acquisition.

Electrical energy feedback (ru.50)

ru.50 displays, with a resolution of 1 kWh, the electrical energy, that was fed into the mains. The accuracy of the display depends, among other things, on the harmonic load of the mains voltage, since only the crest value of the mains voltage is determined and thus the calculated effective value deviates from the actual value. By bus the parameter can be deleted by overwriting it with the value 0.

System frequency (ru.52)

ru.52 displays, with a resolution of 0.1 Hz, the current system frequency.

8.2 Protection (Pn) - Parameter

Parameter summary

Pn.0	Automatic restart UP
Pn.1	Automatic restart OP
Pn.2	Automatic restart OC
Pn.16	Disconnecting time error E.dOH
Pn.23	Response to Watchdog
Pn.25	Response to dOH-error
Pn.26	Response to OH-error
Pn.59	Disconnecting time E.Net
Pn.61	Automatic restart E.NET

Automatic restart UP (Pn.0) OP (Pn.1) OC (Pn. 2)

With activated function the respective error is automatically reset.

Value	Meaning
0	Function switched off
1	Function switched on

Disconnecting time E.doH (Pn.16)

With this parameter the triggering of error E.dOH (series inductance) can be delayed after the external signal is applied.

(Pn.23, Pn.25, Pn.26)

Value	Response	Combivis display
0	Error message: E.xx immediate turn off of modulation. Remove the error for the restart and **actuate reset**.	0: Error/restart after reset
3	Status message: A.xx immediate turn off of modulation. Automatic restart, if error condition no longer exists.	3: Modulation off/ automatic restart
6	Status message: no effect on the inverter, **fault is ignored**.	6: Protective function off (no response)

Disconnecting time E.NET (Pn.59)

With this parameter the triggering of the error ***E.NET*** after the failure of one, two or all mains phases, which leads to the turn-off of the modulation, can be delayed ! ! ! Supervisor password protected ! ! !

E.NET (Pn .61)

Value	Meaning
0	Function switched off
1	Function switched on

ATTENTION

The display ***E.NET*** becomes active when a repeated phase failure is detected wthin a time period of 16 s or when the disconnecting time PhAU (pn.59) has expired. An automatic RESET is only possible after a safety period of 16 s. If the function automatic reset E.NET is disabled, then E.RES appears after expiration of the safety period, i.e. the error can be reset manually.

8.3 Control (cs) - Parameter

Parameter summary

cs.24	KV Uzk-setpoint factor
cs.25	KP Uzk-controller
cs.26	UZK-controller
cs. 28	KP Active current controller
cs.29	KI Active current controller
cs.30	KV Pilot control Uzk-controller
cs.31	KP Reactive current controller
cs.32	KI Reactive current controller
cs.33	KP Phase-current controller
cs.34	LIMIT PHAU counter
cs.37	Uzk_set source
cs.38	Uzk_set constant

KV UZK-setpoint (cs.24) The DC-link voltage setpoint is proportional to the crest value of the phase-to-phase mains voltage.

KP UZK-controller (cs.25) Determines the amplification of the proportional component of the UZK-controller.

KI UZK-controller (cs.26) Determines the amplification of the integral component of the UZK-controller.

KP Active current controller (cs.28) Determines the amplification of the proportional component of the active current controller.

KI Active current controller (cs.29) Determines the amplification of the integral component of the active current controller.

KV Pilot control UZK-controller (cs.30) The DC-link current serves for the pilot control of the UZK-controller. With this factor the voltage fluctuations in the DC-link can be minimized during dynamic processes.

KP Reactive current controller (cs.31) Determines the amplification of the proportional component of the reactive current controller.

KI Reactive current controller (cs.32) Determines the amplification of the integral component of the reactive controller.

KP Phase current controller (cs.33) Determines the amplification of the proportional component of the phase current controller.

Limit PHAU counter (cs.34)

Determines the limit for the triggering of a phase failure (nEto). If during operation it should come to error messages inspite of optimal controller parameterization (kp phase current controller cs.33), then this can be avoided by increasing the parameter. By writing the value ***0***, the function „phase failure detection“ is disabled during modulation release.

Uzk_set source (cs.37)

Determines the source of the setpoint value for the voltage Uzk.

Value	Meaning
0	Uzk_set (CS.38)
1	Uzk_set = f($\hat{U}_{mains}$ · CS.24)

Uzk_set constant (cs.38)

Preadjustment of a constant setpoint value for the DC-link voltage.

8.3.1 Allignment of the DC-link voltage regulator

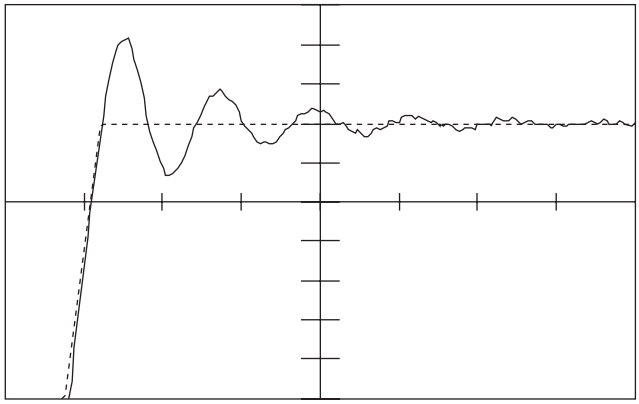
For the startup of the KEB Combivert R4-F the DC-link voltage regulator (Uzk-controller) must be adjusted. With the device a setpoint value jump can be recorded with the aid of the PC-program **KEB-COMBIVIS**.

- Set parameter cs.30 = 0 (memorize the value!).
- Install and start the programm ***KEB-COMBIVIS*** on the PC. Select with ***F8*** the programm ***INVERTER SCOPE*** and start it.
- Parameterize ***INVERTER SCOPE***:

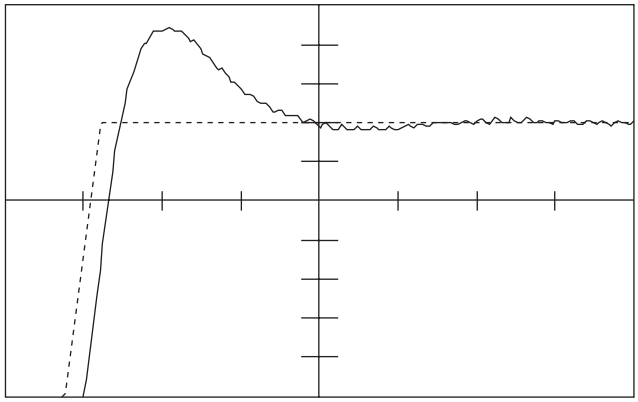
Operating mode:	Offline
Time period:	2 ms
Trigger position:	5%
Trigger condition:	1: ST
Channel 1:	ru.11
Channel 2:	ru.48

- Go with F3 into the operating mode of INVERTER SCOPE, calibrate the channels and adjust the time base (e.g. 25ms / DIV).
- Press ***F5***; the INVERTER SCOPE is ready for operation.
- Switch on control release.
- The recording of the Uzk-setpoint jump stops after some time automatically.
- Compare the recording with examples on the next page and adjust Uzk-control parameter accordingly.
- Repeat setpoint jump and record again until a clean transient reaction and thus an optimal control parameter are found.

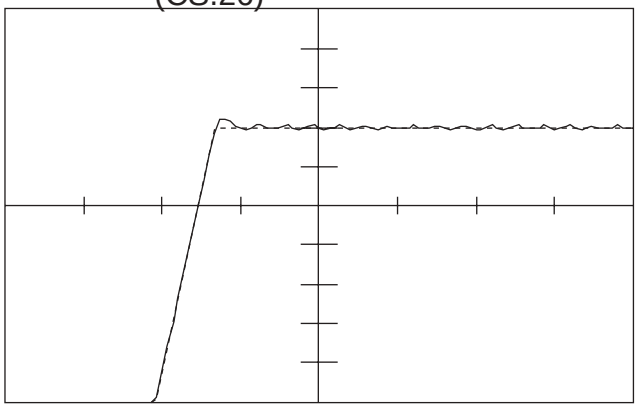
8.3.2 Adjusting help DC-link voltage controller



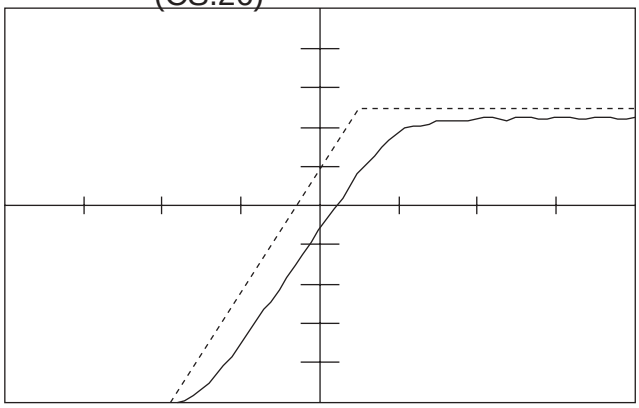
Problem: very long transient reaction
Remedy: Increase P-component (CS.25); if necessary, reduce I-component (CS.26)



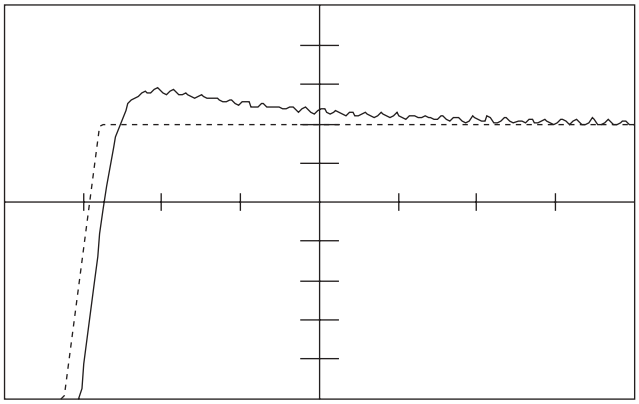
Problem: too high voltage overshoot
Remedy: increase P-component (CS.25) ; if necessary, reduce I-component (CS.26)



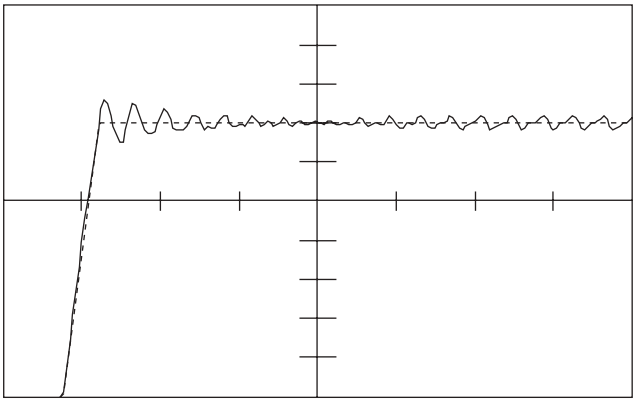
Problem: continuous oscillation at constant run
Remedy: reduce P-component (CS.25)



Problem: too slow transient reaction / permanent offset
Remedy: increase I-component (CS.26)



Problem: too long overshoot
Remedy: increase I-component (CS.26)



Problem: continuous oscillation with high amplitude
Abhilfe: reduce I-component (CS.26)

8.3.3 Improve dynamic

In order to minimize DC-link voltage fluctuations due to load fluctuations, the parameter cs.30 (kv precontrol Uzk-controller) can be adjusted. If the result is not satisfying, the active current control parameters cs.28 and cs.29 are to be increased.

But note: Control system can start to oscillate.

8.3.4 Optimize current characteristic

In order to compensate deviations of the current characteristic from the sine-wave form, the parameter cs.33 (kv phase current controller) must be adjusted. If no oscilloscope is available to represent the mains current, the parameter ru.9 (apparent current) can be used as substitute. For it applies:

The smaller the fluctuations at constant load, the sinusoidal the current characteristic.

8.4 Drive (ds)-Parameter

Parameter summary

	ds.13	Switching frequency

Switching frequency (ds.13)

Parameter ds.13 is an initialization parameter, i.e. new parameter values become active only after switching off the unit.

An increase of the switching frequency from 8 kHz to 16 kHz entails an increase of the switching losses and thus a reduction of the rated power of the COMBIVERT R4-F. Moreover the series inductance and the filter must be designed for the switching frequency of 16 kHz.

8.5 Free-programmable (Fr) Parameter

Parameter summary

Fr.0	Copy keyboard parameter set
Fr.1	Copy bus parameter set

Copy Set (Fr.0, Fr.1)

The function **init**.**def** copies the basic adjustments stored in the EPROM into the SET 0, **i.e. the control parameters of the CS-group with their default values are also loaded**.

Following restriction applies to copying the set:
init can only be executed at '**noP**' or '**syn**'.

8.6 User Definition (ud)-Parameter

Parameter summary

ud.0	Keyboard password
ud.1	Bus password
ud.2	Start parameter number
ud.3	Start parameter number
ud.6	Inverter address
ud.7	Baud rate
ud.8	Watchdog time
ud.15	CP.1 Address
ud.17	CP.2 Address
*****	
ud.53	CP.20 Address
ud.55	CP.21 Address
ud.57	CP.22 Address
ud.59	CP.23 Address
ud.61	CP.24 Address

Keyboard password (ud.0)

By entering the appropriate password it can be switched between the individual password levels. The password level adjusted over this parameter refers only to the input by keyboard as well as the displays of the LED-display. The independent password level for the operation over serial interface or Dual-Port-Ram protocol are preset by the parameter ud.1. The passwords are:

Password	Password level
100	CP - READ-ONLY
200	CP - ON
330	CP - SERVICE
440	APPLICATION
xxx	SUPERVISOR

The meaning of the individual password levels is described in chapter 6.5 Password Structure. If on operation of the key ***FUNCT*** it is being changed into the parameter value display of ud.0, then the current password level is displayed first. To enter a new password, the new password is adjusted with ***UP/DOWN***. This must be acknowledged with ***ENTER***. Afterwards the current password level is displayed again.

The keyboard password can also be adjusted via the serial interface or the Dual-Port-Ram protocol. This input corresponds to the input via keyboard, i.e. after adjusting the password by bus the LED display displays the current keyboard password level and changes upon operation of ***FUNCT*** to ud.0 respectively cP.0.

Bus password (ud.1)

By way of the bus password ud.1 the password levels for the operation over serial interface or Dual-Port-Ram protocol are adjusted. The password levels CP-ON, APPLICATION and SUPERVISOR are possible. The passwords and the meaning of the password levels correspond to those of the keyboard passwords. The bus password is not visible during keyboard operation.

Start parameter (ud.2, ud.3)

With the parameters start parameter group and start parameter number the parameter is selected, which is displayed after switching on the inverter. For that the desired parameter group is adjusted in ud.2 and the desired parameter number in ud.3. The parameter set is always set ***0***. If the combination of ud.2 and ud.3 results in a parameter that is not available or if the current password level at switch on is not sufficient to display the parameter, then the inverter starts with the display of ru.0.

If a password level < 3 is active when switching on the inverter, i.e. display of the user-defined parameter group, then the adjustment of ud.2 is ignored, ud.3 indicates the parameter number of the cP-parameter, whose value shall be displayed at the starting. If this parameter is not available, then cP.0 is displayed.

Inverter address (ud.6)

With ud.6 the address is adjusted, under which the inverter is addressed by „KEB COMBIVIS“ or another control. Values between 0 and 239 are possible, the default value is 1. If several inverters are operated on the Bus at the same time, it is absolutely necessary to assign them different addresses, since otherwise it can result in faulty communication, because under certain conditions several inverters may respond simultaneously. Further information is contained in the description of the DIN66019-Protocol.

Baud rate (ud.7)

Following values for the baud rate of the serial interface are possible:

Parameter value	Baud rate
0	1200 baud
1	2400 baud
2	4800 baud
3	9600 baud
4	19200 baud

If the value for the baud rate is changed over the serial interface, it can be changed again only over the keyboard or after adjustment of the baud rate of the master, since no communication is possible with different baud rates of master and slave.

Watchdog time (ud.8)

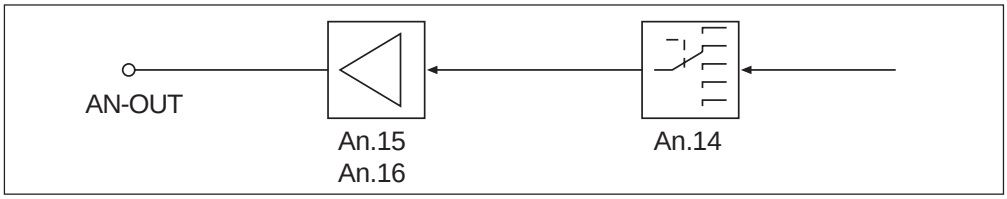
For a constant control of the communication it is possible to trigger an error message of the inverter after the expiration of an adjustable time without incoming telegrams. By adjusting the value ***0*** (off) the function can be deactivated.

8.7 Analog I/O (An)-Parameter

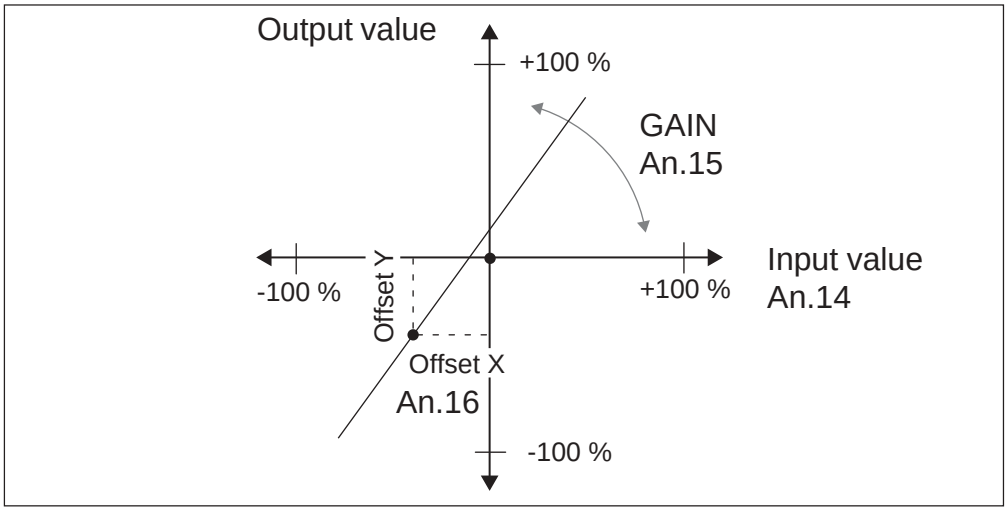
Parameter summary

An.14	Analog Out 1 Function
An.15	Analog Out 1 Gain
An.16	Analog Out 1 Offset X

Flow chart analog outputs



Characteristic amplifier of the analog outputs (An.15 - An.16)



Analog output 1 Function (An.14)

With this parameter the process variable can be selected which should be represented over the analog output. The resolution of the analog values is 10 bit, the smoothing time constant for the analog signals is approx. 5 ms.

Parameter value	Process variable	Range of 100%
0	current load	200%
1	DC-link voltage	1000 V

Analog output 1 (An.15, An.16)

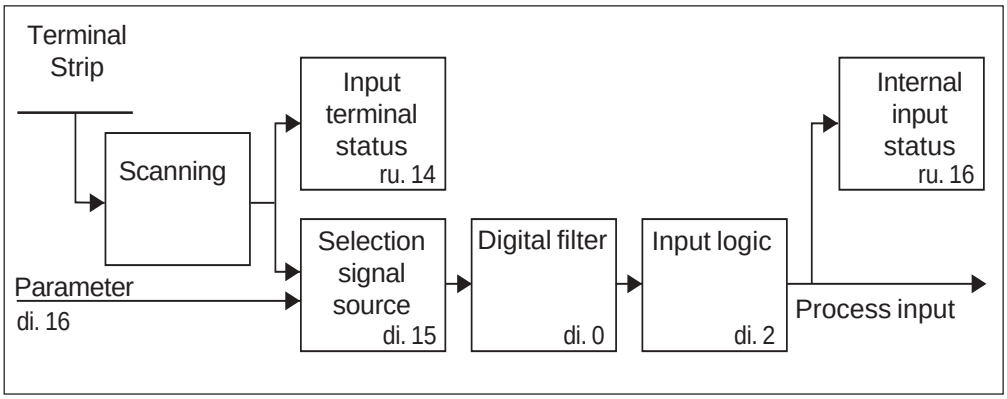
The rise of the characteristic curve is determined by the amplification (An.15). The offset X (An.16) is needed if signal fluctuations around a base value are to be visualized (e.g. actual value of DC-link voltage against setpoint value of DC-link voltage). Default in [%], resolution 0.1%.

8.8 Digital Input (di)-Parameter

Parameter Summary

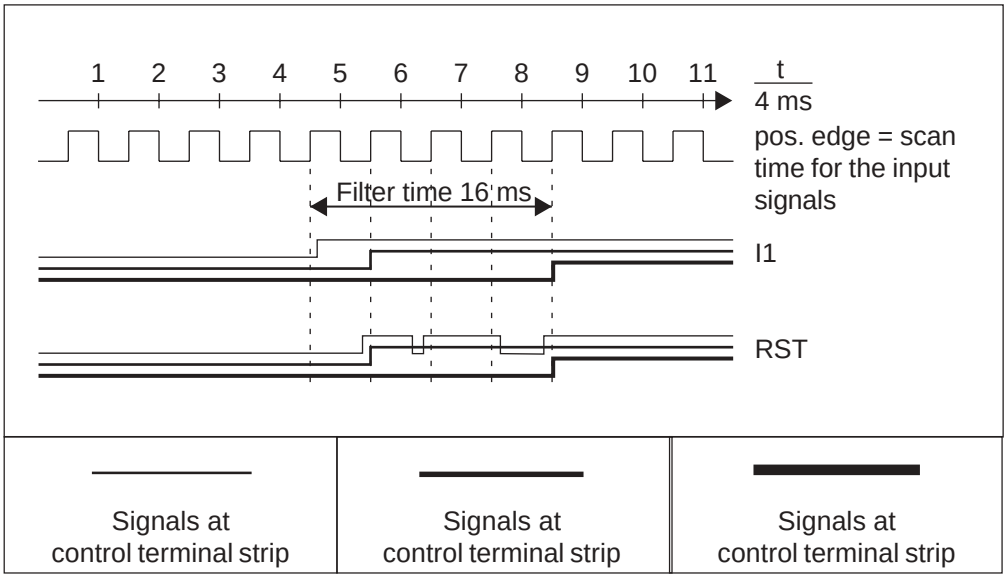
di.0	Digital interference suppressor filter
di.1	NPN / PNP selection
di.2	Input logic
di.3	Input function I1
di.7	Input function IA
di.8	Input function IB
di.9	Input function IC
di.10	Input function ID
di.15	Select signal source
di.16	Digital input setting

Input processing



Digital noise filter (di.0)

The digital filter reduces the sensitivity to interferences at the control inputs. With this parameter the response time of the inputs is adjusted. During the response time a constant input status must exist at all inputs before the signal is accepted as valid.



NPN/PNP-Selection (di.1)

Selection of PNP or NPN logic for the input terminals.

Parameter value	Logic of the input terminal
0	NPN
1	PNP

Bit-Coded Parameter di.2, di.14 - di.18

With the bit-coded di. parameters the appropriate decimal value is adjusted for each input for which the corresponding function is to be activated. If the function should be valid for several inputs, the sum of the decimal value is adjusted. Exceptions apply to input ST which are described at the individual parameters. Following assignment applies:

Bit - No.	Decimal value	Input
0	1	ST
1	2	RST
4	16	I1

Input logic (di.2)

With this parameter it is adjusted whether an input signal is 1- or 0-active (inverted). Input ST is not inverted!

Input functions (di.3 - di.10)

With these parameters the function of the programmable inputs (I1 to I4) and the programmable software inputs (IA, IB, IC, ID) are adjusted.

Parameter value	Input function
0	no function
1	input triggers external error (E.EF)

Select Signal Source (di.15)

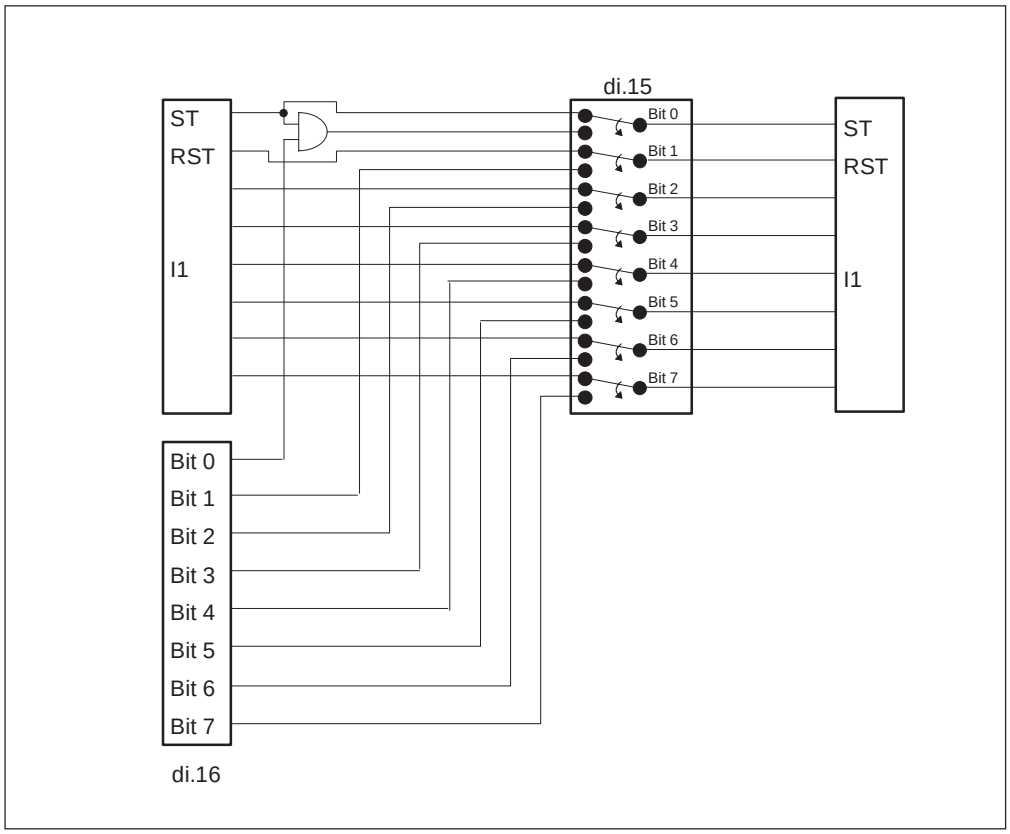
In the parameter di.15 it can be selected for each input, whether the status of the control terminal strip or the status of parameter di. 16 is evaluated.

Digital Input Setting (di.16)

Over di.16 inputs can be set via software. For this the corresponding inputs must be selected in di.15.

Exception: Input ST. If digital input of control release is adjusted (Bit 0 of di.15 = 1), the signal must be preset via terminal strip **and** parameter di.16 (Bit 0)!

Control Terminal Strip



8.9 Digital Output (do)-Parameter

Parameter Summary

do.0	Output logic
do.1	Switching condition 1
do.2	Switching condition 2
do.3	Switching condition 3
do.4	Switching condition 4
do.9	Select switching condition Out 1
do.10	Select switching condition Out 2
do.11	Select switching condition Out 3
do.13	Select switching condition Out A
do.14	Select switching condition Out B
do.15	Select switching condition Out C
do.16	Select switching condition Out D
do.17	Logic switching condition Out 1
do.18	Logic switching condition Out 2
do.19	Logic switching condition Out 3
do.21	Logic switching condition Out A
do.22	Logic switching conditionOut B
do.23	Logic switching conditon Out C
do.24	Logic switching condition Out D
do.25	Linkage of switching conditions

The output logic enables the inverting of the digital outputs. The parameter is bit-coded.

Output logic (do.0)

Bit - No.	Decimal value	Output	Terminal
0	1	Out 1 (Transistor output)	12
1	2	Out 2 (Relay RLA,RLB,RLC)	1, 2, 3
2	4	Out 3 (Relay FLA,FLB,FLC)	21, 22, 23
4	16	Out A (Internal output A)	none
5	32	Out B (Internal output B)	none
6	64	Out C (Internal output C)	none
7	128	Out D (Internal output D)	none

For each output that is to be inverted the corresponding decimal value is adjusted. If several outputs should be inverted, the sum of the decimal values is adjusted.

Swtiching Condition 4 (do.1 - do.4)

With these parameters the switching conditions are adjusted, which via parameters do.9 to do.25 are assigned to the outputs Out 1 to Out 3 and the internal outputs Out A to Out D:

Value	Output function
0	always inactive
1	always active
2	Ready
3	Run
4	Fatal error
5	DC-link voltage > DC-link voltage level
6	Apparent current > apparent current level
7	Signal of PTC series inductance
8	Signal of heat sink temperature
9	Current controller in the limitation
10	DC-link voltage controller in the limitation
11	Any controller in the limitation
12	Utilization (ru.7) > utilization level (LE.8 ... LE.10 (15))
13	OL counter > 80%
14	Phase failure

Select Switching Condition (do.9 - do.11, do.13 - do.16)

Bit-No.	Decimal value	Switching condition
0	1	do.1
1	2	do.2
2	4	do.3
3	8	do.4

Several conditions can also apply to one output. In that case the sum of the decimal value is to be adjusted.

From attaining a specific operating status of the inverter (e.g. apparent current > apparent current level) to the generation of the corresponding output signal a processing time of some ms can go by.

In order to activate a switching condition for the appropriate output, the respective decimal value is adjusted in the parameter „select switching condition OutX“. The status of the switching condition is displayed in parameter ru.17. Each switching condition can be inverted by adjusting the corresponding decimal value in the parameter „logic of switching condition OuX“.

Linkage of Switching Conditions (do.25)

Parameter do.25 determines, whether the switching conditions, which are selected for an output, are linked by an AND-operation (Bit X = 1) or by an OR-operation (Bit X = 0).

Bit - No.	Decimal value	Output
0	1	Out 1
1	2	Out 2
2	4	Out 3
4	16	Out A
5	32	Out B
6	64	Out C
7	128	Out D

Example to do.0 - do.25

Conditions for output Out 1:
Utilization > 80 % and
DC-link voltage < DC-link voltage level

Conditions for output Out 2:
DC-link voltage > DC-link voltage level or
apparent current < apparent current level

Adjustment:

1. Switching conditons
do. 1 = 12 (utilization > utilization level)
LE. 9 = 80 %
do. 2 = 5 (DC-link voltage > DC-link voltage level)
LE.24 = 700 V
do. 3 = 14 (apparent current > apparent current level)
LE.14 = 30 A

2. Select switching condition
do. 9 (Out 1) = 3 (Bit 0 and Bit 1 set => cond. 1 and cond. 2 active)
do.10 (Out 2) = 6 (Bit 1 and Bit 2 set => cond. 2 and cond. 3 active)

3. Logic of switching conditions
do.17 (Out 1) = 2 (Bit 1 set => cond. 2 inverted)
do.18 (Out 2) = 4 (Bit 2 set => cond. 3 inverted)

4. Linkage of switching conditions
do.25 = 2 (Bit 0 = 1 => cond. for Out 1 are AND-operated
Bit 1 = 0 => cond. for Out 2 are OR-operated)

5. Logic of digital outputs
do. 0 = 0 (the outputs are not inverted)

8.10 Level (LE)-Parameter

Parameter Summary

LE.8	Load level 1
LE.9	Load level 2
LE.10	Load level 3
LE.11	Load level 4
LE.12	Apparent current level 1
LE.13	Apparent current level 2
LE.14	Apparent current level 3
LE.15	Apparent current level 4
LE.24	DC-link voltage level 1
LE.25	DC-link voltage level 2
LE.26	DC-link voltage level 3
LE.27	DC-link voltage level 4
LE.38	Current hysteresis

Load Level 1-4 (LE.8 - LE.11)

These parameters are the comparative values for the load-dependent switching conditions of the digital outputs. Load level 1 is valid for output condition 1 etc.

Value range: 0 ... 199 %
Resolution: 1 %

Apparent Current Level 1-4 (LE.12 - LE.15)

These parameters are the comparative values for the apparent current-dependent switching conditions of the digital outputs. Apparent current level 1 is valid for output condition 1 etc.

Value range: 0 ... 150 A
Resolution: 0.1 A

DC-link voltage-level 1-4 (LE.24 - LE.27)

These parameters are the comparative values for the DC-link voltage-dependent switching conditions of the digital outputs. DC-link voltage level 1 is valid for output condition 1 etc.

Value range: 0 ... 1000V
Resolution: 1V

Current hysteresis (LE.38)

With this parameter the height of the current hysteresis is adjusted.

Value range: 0 ... 150 A
Resolution: 0.1A

8.11 Information (In)-Parameter

Parameter Summary

In.0	Inverter type
In.1	Inverter rated current
In.3	max. switching frequency
In.4	Software identification
In.5	Software date
In.6	Config-file-no.
In.7	Serial No. (Date)
In.8	Serial No. (Counter)
In.9	Serial No. (AB-No. high)
In.10	Serial No. (AB-No. low)
In.11	Customer No. (high)
In.12	Customer No. (low)
In.13	QS - Number
In.40	Last error
In.41	Error counter OC
In.42	Error counter OL
In.43	Error counter OP
In.44	Error counter OH
In.45	Error counter WD

Inverter Type (In.0)

Bit-No.	Meaning	
0	Voltage class	0 = 200 V, 1 = 400 V
1...5	Unit size	
6...8	Type of control card	3 = OC.R4
9	Expension	
10	free	
11...12	Max. switch.frequency	0 = 2 kHz, 1 = 4 kHz, 2 = 8 kHz, 3 = 16 kHz
13...15	Type of housing	= G = H = K = L = M = N = R = D

Inverter Rated Current (In.1)

Displays inverter rated current in A (resolution 0.1 A).

Max. Switching Frequency (In.3)

Displays the maximum possible switching frequency for this inverter in kHz (resolution 1 kHz).

Software Identification (In.4)

Software version number and control hardware are encoded in this parameter.

Software Date (In.5)

Displays the software date. The value consists of the day, the month and the year. But only the last 2 digits of the year are shown.

Example: Display = 1507.4
Date = 15.07.94

Configfile Number (In.6)

This parameter serves for the identification of the software used on the control by KEB COMBIVIS. The configuration occurs automatically with the call of COMBIVIS and connected inverter.

Serial Number, Customer Number (In.7 - In.12), QS-Number (In.13)

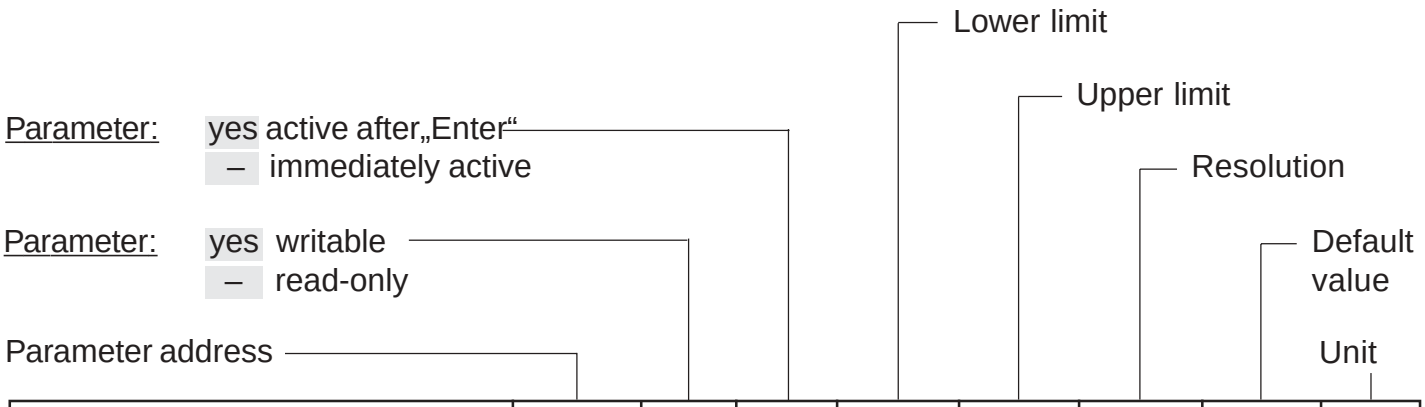
Serial number and customer number identify the inverter. The QS-number contains production-internal information.

Error Counter (In.40 - In.45)

Error counters (for E.OC, E.OL, E.OP, E.OH, E.buS) specify the total number of occurred errors of each type. The maximum number is 255.

9. Parameter Summary

9.1 Table ru-Parameter



Parameter		Addr.			min	max	Step	default	[?]
ru0	Inverter status	2000h	–		0	200	table	–	–
ru7	Actual load	2007h	–		0	200	0.1	–	%
ru8	Peak load	2008h	yes				0.1	–	%
ru9	Apparent current	2009h	–				0.1	–	A
ru10	Active current	200Ah	–				0.1	–	A
ru11	DC-link voltage	200Bh	–				1	–	V
ru12	DC-link voltage peak value	200Ch	yes				1	–	V
ru14	Input terminal status	200Eh	–				table	–	–
ru15	Output terminal status	200Fh	–				table	–	–
ru16	Internal input status	2010h	–				table	–	–
ru17	Internal output status	2011h	–				table	–	–
ru24	Display OL-counter	2012h	–		0,0	100	0.1	–	%
ru25	Apparent current/peak value	2019h	yes				0.1	–	A
ru29	Heat sink temperature	201Dh	–		0	100	1	–	°C
ru31	Operating hour counter 1	201Fh	–		0	65535	1	–	h
ru32	Operating hour counter 2	2020h	–		0	65535	1	–	h
ru48	Act. DC-link voltage setpoint	2030h	–		–	–	1	–	V
ru49	Electrical energy consumption	2031h	yes		0	65535	1	–	kWh
ru50	Electrical energy recovery	2032h	yes		0	65535	1	–	KWh
ru52	System frequency	2034h	–		45	65	0.1	–	Hz

9.2 Table pn-Parameter

Parameter	Addr.			min	max	Step	default	[?]
Pn0 Automatic restart UP	2200h	–				table	0	
Pn1 Automatic restart OP	2201h	–				table	0	
Pn16 Disconnect time error E.dOH	2216h	–		0	120		60	
Pn23 Response to Watchdog	2217h	–	yes	0	7	1	6	–
Pn25 Response to dOH error	2219h	–	yes	0	7	1	6	–
Pn26 Response to OH error	221Ah	–	yes	0	7	1	6	–
Pn59 Delay time E.net	223bh	–		0	1,00	0,01	0	sec.
Pn61 Automatic restart E.net	223dh	–		0	1	1	0	–

9.3 Table cs-Parameter

Parameter	Addr.			min	max	Step	default	[?]
CS24 KV UZK_set	2D18h	–		1.05	1.70	0.1	1,20	
CS25 KP UZK	2D19h	–		0	65535	1	2000	–
CS26 KI UZK	2D1Ah	–		0	65535	1	80	–
CS28 KP ID	2D1Ch	–		0	65535	1	1500	–
CS29 KI ID	2D1Dh	–		0	65535	1	100	–
CS30 KV UZK_izk	2D1Eh	–		0	130	1	50	–
CS31 KP IQ	2D1Fh	–		0	65535	1	200	–
CS32 KI IQ	2D20h	–		0	65535	1	6	–
CS33 KP I_uvw	2D21h	–		0	65535	1	50000	–
CS34 LIMIT PHAU COUNTER	2D22h	–		0	32767	1	1500	–
CS37 UZK_set source	2D25h	–	yes	0	1	1	0	–
CS38 UZK_set constant	2D26h	–	yes	210	720	1	LTK	V

9.4 Table ud-Parameter

Parameter	Addr.			min	max	Step	default	[?]
ud0 Keyboard password	2600h	yes	yes	0	9999	1	0	–
ud1 Bus password	2601h	yes	yes	0	9999	1	0	–
ud2 Start parameter group	2602h	yes	–	ru	table	table	ru	–
ud3 Start parameter number	2603h	yes	–	0	255	table	1	–
ud6 Inverter address	2606h	yes	yes	0	239	1	1	–
ud7 Baud rate	2607h	yes	yes	1200	57600	table	9600	Baud
ud8 Watchdog Time	2608h	yes	yes	0 : off	10,00	0.01	0 : off	sec.
ud13 cP.0 address	260Dh	yes	yes	–	–	1	2600 (cp.0)	–
ud15 cP.1 address	260Fh	yes	yes	0	7FFFF	1	2000 (ru.00)	–
ud17 cP.2 address	2611h	yes	yes	-1 : off	7FFFF	1	200B (ru.11)	–
ud19 cP.3 address	2613h	yes	yes	0	7FFFF	1	200C (ru.12)	–
ud21 cP.4 address	2615h	yes	yes	0	7FFFF	1	2030 (ru.48)	–
ud23 cP.5 address	2617h	yes	yes	0	7FFFF	1	2D25 (cs.37)	–
ud25 cP.6 address	2619h	yes	yes	0	7FFFF	1	2D1C (cs.28)	–
ud27 cP.7 address	261Bh	yes	yes	0	7FFFF	1	2D1B (cs.27)	–
ud29 cP.8 address	261Dh	yes	yes	0	7FFFF	1	2D19 (cs.25)	–
ud31 cP.9 address	261Fh	yes	yes	0	7FFFF	1	2D1A (cs.26)	–
ud33 cP.10 address	2621h	yes	yes	0	7FFFF	1	2D20 (cs.32)	–
ud35 cP.11 address	2623h	yes	yes	0	7FFFF	1	2D1E (cs.30)	–
ud37 cP.12 address	2625h	yes	yes	0	7FFFF	1	2009 (ru.09)	–
ud39 cP.13 address	2627h	yes	yes	0	7FFFF	1	2007 (ru.07)	–
ud41 cP.14 address	2629h	yes	yes	0	7FFFF	1	201B (ru.29)	–
ud43 cP.15 address	262Bh	yes	yes	0	7FFFF	1	280E (an.14)	–
ud45 cP.16 address	262Dh	yes	yes	0	7FFFF	1	280F (an.15)	–
ud47 cP.17 address	262Fh	yes	yes	0	7FFFF	1	2903 (di.03)	–
ud49 cP.18 address	2631h	yes	yes	0	7FFFF	1	2A01 (do.01)	–
ud51 cP.19 address	2633h	yes	yes	0	7FFFF	1	2A02 (do.02)	–
ud53 cP.20 address	2635h	yes	yes	0	7FFFF	1	2A09 (do.09)	–
ud55 cP.21 address	2637h	yes	yes	0	7FFFF	1	2A0A (do.10)	–
ud57 cP.22 address	2639h	yes	yes	0	7FFFF	1	2B08 (le.08)	–
ud59 cP.23 address	263Bh	yes	yes	0	7FFFF	1	2B0C (le.12)	–
ud61 cP.24 address	263Dh	yes	yes	0	7FFFF	1	2B18 (le. 24)	–

9.5 Table Fr-Parameter

	Parameter	Addr.			min	max	Step	default	[?]
Fr0	Copy param. set (keyboard)	2700h	yes	yes	0	7	1	0	–
Fr1	Copy parameter set (bus)	2701h	yes		0	7	1	0	–

9.6 Table An-Parameter

	Parameter	Addr.			min	max	Step	default	[?]
An14	Analog Out 1 Function	280Eh	yes	yes	0	6	1	0	–
An15	Analog Out 1 Gain	280Fh	yes		-20.00	20.00	0.01	1.00	–
An16	Analog Out 1 Offset X	2810h	yes		-100.0	100.0	0.1	0.0	%

9.7 Table di-Parameter

	Parameter	Addr.			min	max	Step	default	[?]
di0	Digital noise filter	2900h	yes		0.0	20.0	0.1	0.5	ms
di1	NPN/PNP-selection	2901h	yes	yes	0 : pnp	1 : npn	1	0 : pnp	–
di2	Input logic	2902h	yes	yes	0	127	1	0	–
di3	Input function I1	2903h	yes	yes	0	1	1	1	–
di7	Input function IA	2907h	yes	yes	0	1	1	0	–
di8	Input function IB	2908h	yes	yes	0	1	1	0	–
di9	Input function IC	2909h	yes	yes	0	1	1	0	–
di10	Input function ID	290Ah	yes	yes	0	1	1	0	–
di15	Select signal source	290Fh	yes	yes	0	127	1	0	–
di16	Digital input setting	29010h	yes	yes	0	127	1	0	–

9.8 Table do-Parameter

Parameter	Addr.			min	max	Step	default	[?]
do0 Output logic	2A00h	yes	yes	0	31	1	0	–
do1 Switching condition 1	2A01h	yes	yes	0	20	1	1	–
do2 Switching condition 2	2A02h	yes	yes	0	20	1	2	–
do3 Switching condition 3	2A03h	yes	yes	0	20	1	3	–
do4 Switching condition 4	2A04h	yes	yes	0	15	1	4	–
do9 Select switching condition Out 1	2A09h	yes	yes	0	15	1	1	–
do10 Select switching condition Out 2	2A0Ah	yes	yes	0	15	1	2	–
do11 Select switching condition Out 3	2A0Bh	yes	yes	0	15	1	4	–
do13 Select switching condition Out A	2A0Dh	yes	yes	0	15	1	0	–
do14 Select switching condition Out B	2A0Eh	yes	yes	0	15	1	0	–
do15 Select switching condition Out C	2A0Fh	yes	yes	0	15	1	0	–
do16 Select switching condition Out D	2A10h	yes	yes	0	15	1	0	–
do17 Logic switching condition Out 1	2A11h	yes	yes	0	15	1	0	–
do18 Logic switching condition Out 2	2A12h	yes	yes	0	15	1	0	–
do19 Logic switching condition Out 3	2A13h	yes	yes	0	15	1	0	–
do21 Logic switching condition Out A	2A15h	yes	yes	0	15	1	0	–
do22 Logic switching condition Out B	2A16h	yes	yes	0	15	1	0	–
do23 Logic switching condition Out C	2A17h	yes	yes	0	15	1	0	
do24 Logic switching condition Out D	2A18h	yes	yes	0	15	1	0	–
do25 Linkage of switching condition	2A19h	yes	yes	0	31	1	0	–

9.9 Table LE-Parameter

Parameter	Addr.			min	max	Step	default	[?]
LE8 Load level 1	2B08h	yes		0.0	200	1	0	%
LE9 Load level 2	2B09h	yes		0.0	200	1	0	%
LE10 Load level 3	2B0Ah	yes		0.0	200	1	0	%
LE11 Load level 4	2B0Bh	yes		0.0	200	1	0	%
LE12 Apparent current level 1	2B0Ch	yes		0.0	50.0	0.1	0	A
LE13 Apparent current level 2	2B0Dh	yes		0.0	50.0	0.1	0	A
LE14 Apparent current level 3	2B0Eh	yes		0.0	50.0	0.1	0	A
LE15 Apparent current level 4	2B0Fh	yes		0.0	50.0	0.1	0	A
LE24 DC-link voltage 1	2B18h	yes		0.0	2025	1	0	V
LE25 DC-link voltage 2	2B19h	yes		0.0	2025	1	0	V
LE26 DC-link voltage 3	2B1Ah	yes		0.0	2025	1	0	V
LE27 DC-link voltage 4	2B1Bh	yes		0.0	2025	1	0	V
LE38 Current hysteresis	2B26h	yes		0.0	150	0.1	0.2	A

9.10 Table In-Parameter

	Parameter	Addr.			min	max	Step	default	[?]
In0	Inverter type	2C00h	–				table	Name plate	–
In1	Inverter rated current	2C00h	–		0	370	0.1	LTK	A
In3	max. switch. frequency	2C00h	–		0	16	0		
In4	Software identification	2C00h	–				0.1		–
In5	Software date	2C00h	–				0.1		–
In6	Configfile No.	2C00h	–		0	255	1	69	–
In7	Serial No. (Date)	2C00h	–		0	65535	1	0	–
In8	Serial No. (Counter)	2C00h	–		0	65535	1	0	–
In9	Serial No. (AB-No. high)	2C00h	–		0	65535	1	0	–
In10	Serial No. (AB-No. low)	2C00h	–		0	65535	1	0	–
In11	Customer number (high)	2C00h	–		0	65535	1	0	–
In12	Customer number (low)	2C00h	–		0	65535	1	0	–
In13	QS Number	2C00h	–		0	255	1	0	–
In40	Last error	2C00h	–		0	63	1	0	–
In41	Error counter OC	2C00h	–		0	255	1	0	–
In42	Error counter OL	2C00h	–		0	255	1	0	–
In43	Error counter OP	2C00h	–		0	255	1	0	–
In44	Error counter OH	2C00h	–		0	255	1	0	–
In45	Error counter WD	2C00h	–		0	255	1	0	–
In46	Last Hardlock	2C00h	–		0	255	1	0	–
In47	Password level 0	2C00h	–		0	9999	1		–
In48	Password level 1	2C00h	–		0	9999	1		–
In49	Password level 2	2C00h	–		0	9999	1		–
In50	Password level 3	2C00h	–		0	9999	1		–
In54	soft. ver. dsp	2C00h	–		0	255	1		
In55	soft. date dsp	2C00h	–		0	32767	1		

9.11 Table Supervisor-Parameter

These parameters are changeable only with supervisor password and hardlock.

	Parameter	Addr.			min	max	Step	default	[?]
In25	Analog Output Offset	2C1Ah	yes		0	255	1	250	
In26	Analog Output Gain	2C1Bh	yes		0	255	1	147	
In32	Offset Synchronization	2C1Fh	yes		0	65536	1	0	

10. Maintenance

No extraordinary maintenance is required.

11. Out of Service, Dismantling and Waste Disposal

Out of Service

1. Ensure standstill of the drive – frequency inverter
2. Deactivate control – KEB COMBIVERT R4-F, terminal ST
3. Disconnect mains – main contactor

Dismantling

When dismantling the KEB COMBIVERT R4-F please pay special attention to the capacitor discharge time!

Before starting to work on the plant, the safe isolation from supply must be verified with measurements in the system!

All installation and connection work must be done when the system is switched off!

The intermediate circuit capacitors of the KEB-COMBIVERT R4-F are still charged with high voltage for a short period of time. The unit can be worked on again, after it has been switched off for 5 minutes.

Waste Disposal

The KEB COMBIVERT R4-F does not contain PCB elements.
The waste disposal items must be given to a special waste disposal!

Error	Term	Reason
Undervoltage	**E.UP**	DC-link voltage has fallen below the permissible value - input voltage too small or instable - voltage losses due to incorrect cabling
Overvoltage	**E.OP**	DC-link voltage has risen above the permissible value - input voltage too high - interference voltages at input
Overcurrent	**E.OC**	Happens when the specified peak current is exceeded or an earth fault occurred.
Overload	**E.OL**	Happens when an excessive load is applied longer than for the permissible time (see parameter ru. 24) - error or overload in the application - R4-F feed-in and feedback unit is wrongly dimensioned
Cooling time finished	**E.nOL**	After error E.OL a cooling phase must be waited for. This message is displayed after the cooling phase is completed. The error can be reset.
Overtemperature	**E.OH**	Happens when the cooling temperature > 90 °C. - insufficient cooling - ambient temperature too high
No Over-temperature	**E.nOH**	No internal overtemperature error. Error E.OH can be reset.
Overtemperature commutation-choke	**E.dOH**	External overtemperature error is triggered when the commutating choke is overheated. - ambient temperature too high. - mains commutating choke dimensioned wrongly.
External error	**E.EF**	If this message is displayed without the error signal defined by the user, the following can happen. - Interference voltages at the input. Remedy: Increase of digital interference suppression filter (parameter di. 0).
Synchronization	**E.SYn**	Happens when phases of the mains supply conductor and synchronization lines are incorrectly allocated. Remedy: Correction of allocation.
Mains failure	**E.net**	Happens when mains supply conductors are not connected or during mains failure the disconnecting time has elapsed (parameter Pn.59).
Reset	**E.RES**	Hold-off time elapsed, manual reset necessary.

Memo

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