

This manual describes all functions and the parameterisation of the control units KEA 101 to 112. All possible functions of these units are listed here. Notice for this reason, that some of them might not be implemented in your unit. The Service Manual, belonging to your unit, shows the actual functions. The programming software PARAWIN shows only the used parameters as well.

Important:

If the data of a unit with a software version before the 28.02.2006 was loaded into one with a software version after the 28.02.2006 or vice versa, disconnect the supply for about 30 seconds to let the parameters become true.

Use only the actual valid version of PARAWIN as the linecard of control units is permanently increased. You find the update in <http://www.kuhse.de/>, go to SERVICE and DOWNLOAD.

DOCUMENT HISTORY

Revision	Modification	Released	Revision	Modification	Released
10/2005	First edition				
05-12-07	Speed governor, PF controller	05-12-07			
06-03-22	Speed sinal direction	06-03-22			

Changes without further notice reserved.

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DIRECT ENTRIES VIA DISPLAY AND KEYS

Values or parameters are selected, as you would read a book. The further down listed groups are arranged as 'pages'. You can scroll forwards and backwards through these groups by pressing the [→] and [←] cursor keys. The entries of each group can be read from top to bottom like lines of text. Select a line by pressing the cursor keys [↓] (down) and [↑] (up). The selection starts again with the other end of the 'page', when the top or bottom of the 'page' is reached.

To modify a parameter, first enter the relevant IDENT-NUMBER. The function 'SHOW PARAMETERS' (see further down) must be set to [+]. However, parameters of group 0, -GENERAL PARAMETERS-, can be modified without entering this number. Parameters are modified as follows:

1. Select the required parameter group with the [←] and [→] buttons. One or two parameters are displayed.
2. Press OFF and LED TEST (function: PARA ON or PARA OFF) together. This opens parameterisation mode as can be seen by the specific cursor [■]. The selection of the group cannot be changed now.
3. Select the required parameter line (if two are displayed) with the [↓] and [↑] buttons.
4. Press OFF and ALARM OFF (function ENTER) together to select the parameter line. The shape of the cursor confirms the selection, as it underscores (e.g. 126) now the part of the parameter that is to be modified. The chosen parameter cannot be deselected now.
5. Select the figure or letter of the parameter that you want to modify with the [←] and [→] cursor keys. Numerical parameters can be increased or decreased by increments of 1 with the [↑] and [↓] buttons. Press the same buttons to negate parameters that are displayed with a letter (+/- sign, alarm coding etc.).
6. Press OFF and ALARM OFF together to store the displayed parameter. Press OFF and LED TEST instead of OFF and ALARM OFF to abort parameterisation.

Display contrast setting

Hold down LED TEST and press key [↑] to increase the display contrast (makes the display darker) or LED TEST and key [↓] to lower it (makes the display lighter).

PIN NUMBER, IDENT-NUMBER

You first have to enter the relevant IDENT NUMBER if you want to modify a parameter. This number is compared with the PIN NUMBER, and if they are identically, the user is authorised to parameterise the device. The user can choose any PIN NUMBER between 00000 and 50000. The PIN NUMBER and IDENT NUMBER are factory set to 00000.

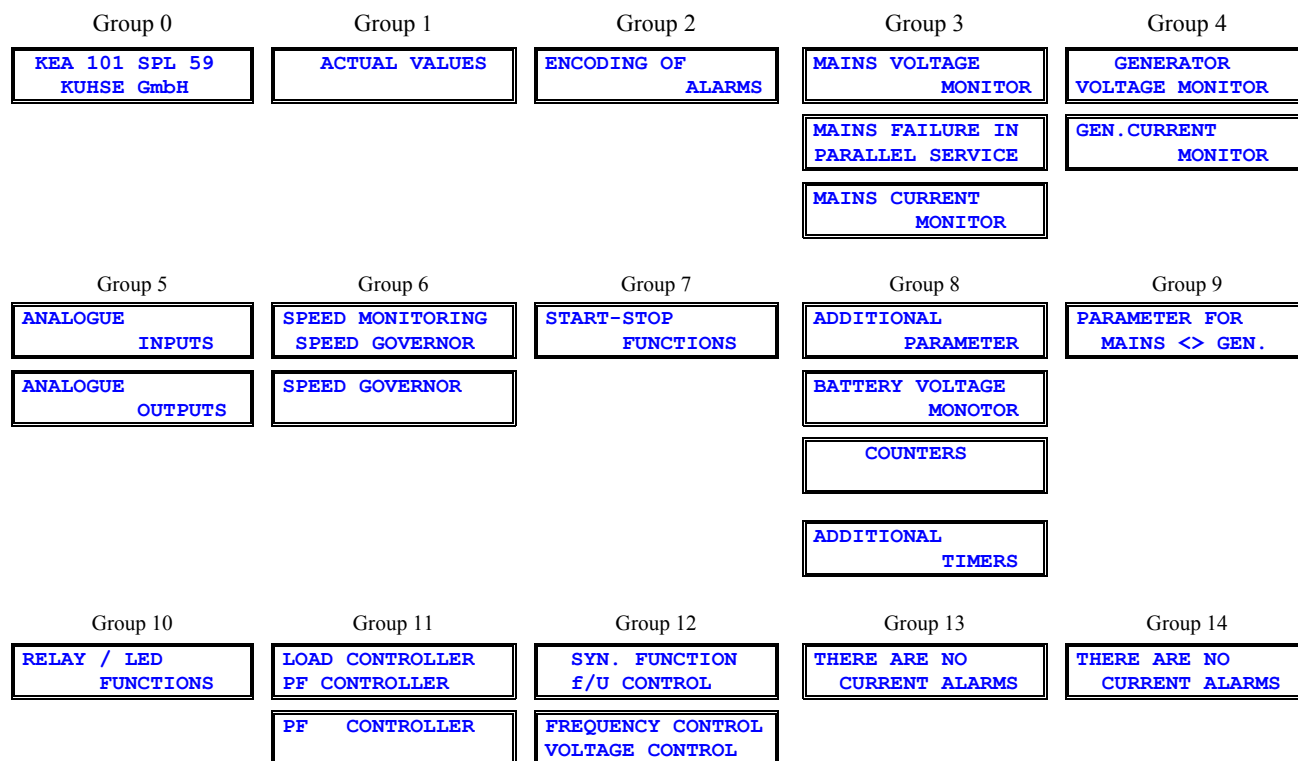
A special IDENT NUMBER can be obtained on enquiry from the factory if you forget your PIN NUMBER, so that a new PIN NUMBER can be entered. Modify the PIN NUMBER as follows:

- Enter the currently valid IDENT-NUMBER. The pin number is now also shown.
- Enter a new PIN NUMBER.
- The IDENT-NUMBER previously entered is now no longer valid.

The IDENT-NUMBER is deleted 15 minutes after the last input, if the user has not previously set it to an invalid value.

The automatic deletion of the IDENT NUMBER is however not carried out while 00000 is set as the PIN.

MENU STRUCTURE



GENERAL PARAMETERS, GROUP 0

KEA 101 SPL-3
KUHSE GmbH

Control unit type is displayed.

90567 ORDER NMR
12345 F-NUMBER

Display of the KUHSE order number and the control units production number. This information is important for later contact with the factory.

SOFTWARE
001/25.04.05

Software date and version number.

***** IDENT-NMR
***** PIN NUMBER

Input the IDENT and PIN NUMBERS.

You don't need to enter a valid IDENT NUMBER to modify parameters in this group.

BACK LIGHT OFF
120 sec DELAY

Duration of the backlight of the display. It is switched on for this time when any key is pressed. The switch-off delay starts after each last press of a button. This period can be set by increments of 10 seconds from 10 to 2400 seconds. The light remains on if any alarm is present.

SHOW PARAMETERS
+ [+]YES [-]NO

In normal operation it is useful to use the [←] and [→] buttons between the display of ACTUAL VALUES and CURRENT ALARMS. The parameter groups are skipped over if this parameter is set to [-].

Enter a [+] if you want to change a parameter to view the parameter groups. Irrespective of this setting, you can always press LED TEST and [←] to go direct to ACTUAL VALUES or LED TEST and [→] to CURRENT ALARMS.

.LANGUAGE
0 0=DE, 1=UK

All text is available in two languages (e.g. German and English). You can select the language with this parameter: enter [0] for German or [1] for English.

03.05.05
12:17:35

Date and time.

The software clock of the control unit has to be set after any power failure. The control unit is fitted with a battery-buffered hardware clock if events are to be saved or printed (Option).

WARNING NOTES

- Care must be taken when connecting the device, as it may be destroyed if incorrectly connected.
- All details of the connection specifications must be fulfilled.
- The PE(N) must be connected for security reasons to terminal 5 on the X403.
- The leakage current of the noise filters is 22 mA in case of a 2-phase voltage lost.
- Only adequately qualified personnel should undertake the installation and commissioning.
- The relevant regulations, especially the VDE regulations, must be observed.
- The SERVICE MANUAL should be read carefully before commissioning.
- The device must be parameterised in such a way that any risk to persons or property is prevented.
- The charging device must be switched off before the battery is disconnected.
- The negative pole of the battery must be grounded at the input terminal of the switchboard. The minimum conductor cross-section is 10 mm².
- The screens of the analogue input wiring must be connected to the earth screws on the KEA cover, and must have no connection to any other metal parts.
- The supply voltage can be set to 12 or 24 V DC with a switch on the RZ 071-D.
- When the supply voltage of the control unit has been switched off, you must wait at least 20 seconds before applying it again.
- All coils must be fitted with reverse diodes to prevent high voltage peaks. All other coils or inductive loads must also be fitted with suppressor elements. The same applies for all relays and inductors that are used in the switchboard or controlled externally.

VOLTAGE MONITOR

**This chapter explains the parameterisation and all possible functions. Some functions and their parameters, depending on the model of the KEA, might be lacking in your control unit.
The actual included functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.**

Changes without further notice reserved.

VOLTAGE MONITOR

The parameterisations of the mains- and the generator voltage monitor are alike. The following parameters are used. It is illustrated how the parameters are shown at the screen of the programming software PARAWIN and at the display of the KEA control unit. The parameters for the direct setting are in the groups MAINS MONITOR or GEN. MONITOR.

Screen of PARAWIN		Display shows:
	++++ Mains Voltage Monitor ++++	MAINS VOLTAGE MONITOR
1	185 V - If voltage lower, mains undervoltage	MAINS VOLTAGE <u 185 V < alarm
2	205 V - If voltage higher, no mains undervoltage	MAINS VOLTAGE <u 205 V =>normal
3	Yes - Mains undervoltage enabled?	MAINS VOLTAGE <u + MONITOR? + YES
4	No - Mains undervoltage is alarm too?	Setting see: ENCODING OF ALARMS
5	M-U-W-I - Encoding of alarm mains undervoltage	MAINS VOLTAGE >u 250 V > alarm
	250 V - If voltage higher, mains overvoltage	MAINS VOLTAGE >u 245 V =< normal
	245 V - If voltage lower, no mains overvoltage	MAINS VOLTAGE >u - MONITOR? + YES
	No - Mains overvoltage enabled?	Setting see: ENCODING OF ALARMS
	No - Mains overvoltage is alarm too?	MAINS VOLTAGE <f 49.50 Hz < alarm
	M-U-W-I - Encoding of alarm mains overvoltage	MAINS VOLTAGE <f 49.70 Hz =>normal
	49.50 Hz - If frequency lower, mains underfrequency	MAINS VOLTAGE <f - MONITOR? + YES
	49.70 Hz - If frequency higher, no mains underfrequency	Setting see: ENCODING OF ALARMS
	No - Mains underfrequency enabled?	MAINS VOLTAGE >f 51.50 Hz > Alarm
	No - Mains underfrequency is alarm too?	MAINS VOLTAGE >f 51.20 Hz =<normal
	M-U-W-I - Encoding of alarm mains underfrequency	MAINS VOLTAGE >f - MONITOR? + YES
	51.50 Hz - If frequency higher, mains overfrequency	Setting see: ENCODING OF ALARMS
	51.20 Hz - If frequency lower, no mains overfrequency	MAINS PHASE ROT. 30 DEGR > Alarm
	No - Mains overfrequency enabled?	Setting see: ENCODING OF ALARMS
	No - Mains overfrequency is alarm too?	MAINS VOLT. <uf 1.0 s DELAYED
	M-U-W-I - Encoding of alarm mains overfrequency	MAINS VOLT. >uf 1.0 s DELAYED
6	30 degr - Maximum phase rotation error	MAINS VOLT. OK 2.0 s DELAYED
7	Yes - Phase rotation error is alarm too?	
8	M-U-W-I - Encoding of alarm 'Phase rotation error mains'	
9	1.0 sec - Response delay of mains undervoltage and -frequency	
10	1.0 sec - Response delay of mains overvoltage and -frequency	
11	2.0 sec - Delay of mains voltage within its limits	

Parameter 1:

The monitored 'under'-function is stated as DISTURBED, if the actual value falls below the set point

The monitored 'over'-function is stated as DISTURBED, if the actual value exceeds this set point.

Parameter 2:

The monitored 'under'-function is stated as NORMAL, if the actual value exceeds the set point.

The monitored 'over'-function is stated as NORMAL, if the actual value falls below the set point.

Parameter 3:

<YES> means, that this function is monitored, <NO> means, that a failure of this function is ignored.

Parameter 4:

An alarm can be announced in addition if a monitored voltage or frequency is out of its range. The alarm itself has no influence of the actual voltage or frequency monitoring. That means if the monitor has detected a failure and triggered the alarm and later on the monitored function is again within its limit, the alarm is still present until it is cancelled. For the internal controlling however, the actual state is used which means that the monitored function is effective as NORMAL.

Important: If a function should announce an alarm, the monitoring of a function must be enabled as well!

Parameter 5:

This is the encoding for the before mentioned alarm. The parameters are found in ENCODING OF ALARMS if the parameterisation via the display of the unit is used.

Important: An emergency supply is inhibited, if an alarm of the mains voltage monitor is encoded for SHUT DOWN or GENERATOR OFF!

Parameter 6:

The phase rotation (phase angles of 120 degrees between all phases are normal) of the voltage is monitored. The mains voltage is stated as disturbed if the absolute value of $(120 \pm \text{actual angle})$ exceeds this parameter or if the voltage has a left turning rotation.

The monitoring of the phase rotation is disabled if the parameter is set to 120 degrees. This can monitor single-phase systems. The voltage must be applied in this case to all three voltage inputs of the KEA.

Parameter 7:

An alarm can be announced if the phase rotation is disturbed. The alarm itself has no influence of the actual phase rotation monitoring. That means if the monitor has detected a wrong phase rotation and triggered the alarm and later on the phase rotation is correct again, the alarm is still present until it is cancelled. For the internal controlling however, the actual phase rotation used which means that the phase rotation is stated as NORMAL.

Parameter 8:

This is the encoding for the before mentioned alarm. The parameters are found in ENCODING OF ALARMS if the parameterisation via the display of the unit is used.

The consumer can be protected against a phase rotation failure by setting the parameter IMMEDIATELY CONSUMERS OFF IF MAINS FAILS? (See TRANSFER MAINS – GENERATOR) to <Yes>.

Important: An emergency supply is inhibited if this alarm is encoded for SHUT DOWN or GENERATOR OFF!

Parameter 9:

An undervoltage or underfrequency failure is delayed for this time. The delay can be preset in the range of 0.1 to 24.0 seconds with increments of 0.1 second. Please observe, that the start delay for a standby genset is the sum of this delay and the start delay.

Parameter 10:

An overvoltage or overfrequency failure is delayed for this time. The delay can be preset in the range of 0.1 to 24.0 seconds with increments of 0.1 second. Please observe, that the start delay for a standby genset is the sum of this delay and the start delay.

Parameter 11:

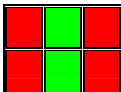

After this delay the voltage is stated as NORMAL when the voltage, frequency and phase rotation are after a failure again with their limits. The delay can be preset in the range of 0.1 to 24.0 seconds with increments of 0.1 second.

VOLTAGE MONITOR

FUNCTION

Four red and two green indicators each are provided for the mains- and generator voltage monitoring. They show if the voltages are within the nominal range or if and which deviations are present.

These indicators, located under the mains and generator –symbol signalise:

Underfrequency	$f <$		$f >$	Overfrequency
Undervoltage, Phase sequence	$U <$		$U >$	Overvoltage

The two green indicators show, that all monitored functions of voltage, frequency and phase rotation are within their limits. The red ones show only failures if the associated function is enabled. All functions of the voltage monitor and all limits can be parameterised. The undervoltage failure is also shown if the phase sequence is disturbed or left turning.

The associated indicator starts flashing if an enabled function is out of its limits. Both green indicators remain on until the response delay of this function is up. The red indicator lights then steadily and the controller states now the voltage as DISTURBED.

The red indicator distinguishes as soon as the function is back again within its limits and the release delay is started. Both green indicators are flashing during this delay time. They change to a steady light and the voltage is stated as normal when the release delay time is up.

The indicators for the generator voltage are switched off in the operation mode OFF or if in AUTOMATIC mode a start command is absent. The indication for the mains voltage is always active.

CALIBRATION

The voltage monitor is software calibrated. A new scaling can be made with the programming software PARAWIN. Execute the following sequence for entering the calibration function.

1. Enter as IDENT-Number the word <MEISTER>.
2. Load then the parameter from the unit.
3. Open <Adjustment> in menu Options.

Follow now the instructions of the adjustment procedure. The simulated actual voltage must be at the same time applied to all three phases. The menu shows the voltage level, which has to be simulated.

Press the Enter-key when the desired voltage is applied to the input terminals. The PARAWIN stores the measured value. Apply the upper level when the lower reference level is stored. The measured values are checked for plausibility. The alignment is aborted if an error is detected. The new alignment is finally stored if the values are plausible and the security question was answered with <OK>.

Click the ABORT-button if the alignment is not desired. This function is then skipped.

RELOADING OF THE FACTORY CALIBRATION

You can reload the factory calibration by selecting in menu <Options> the software <Factory Settings> if your alignment has failed.

CURRENT MONITOR

**This chapter explains the parameterisation and all possible functions. Some functions and their parameters, depending on the model of the KEA, might be lacking in your control unit.
The actual included functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.**

Changes without further notice reserved.

CURRENT MONITOR

The parameterisations of the mains- and the generator voltage monitor are alike. The following parameters are used. It is illustrated how the parameters are shown at the screen of the programming software PARAWIN and at the display of the KEA control unit. The parameters for the direct setting are in the groups MAINS MONITOR or GEN. MONITOR and follow after the voltage settings.

Screen of PARAWIN		Display shows:
	++++ Mains Current Monitor +++++	MAINS CURRENT MONITOR
1	600 A - Primary current of CT generator	PRIMARY CURRENT 600 A MAINS CT
2	5 A - Secondary current of CT generator	Setting only with PARAWIN
3	600 A - Rated current of generator	MAINS NOMINAL 600 A CURRENT
4	120 % - Generator overcurrent step I	MAINS CURRENT I> 120 % >alarm
5.1	80 % - Release of generator overcurrent, step I	MAINS CURRENT I> 80 % => normal
6.1	10.0 sec - Delay of generator overcurrent, step I	MAINS CURRENT I> 10.0 s DELAYED
7.1	Yes ... - Monitoring of generator overcurrent step I enabled?	MAINS CURRENT I> + MONITOR? + YES
8.1	Yes ... - Generator overcurrent step I is an alarm too?	Setting see: ENCODING OF ALARMS
9.1	M-U-W-I ... - Encoding of alarm generator overcurrent step I	MAINS CURR. I>> 300 % >alarm
10	300 % - Generator overcurrent, step II	MAINS CURR. I>> 300 % >alarm
5.2	80 % - Release of generator overcurrent, step II	MAINS CURR. I>> 80 % => normal
6.2	0.5 sec - Delay of generator overcurrent, step II	MAINS CURR. I>> 0.5 s DELAYED
7.2	Yes ... - Monitoring of generator overcurrent step II enabled?	MAINS CURR. I>> + MONITOR? + YES
8.2	Yes ... - Generator overcurrent step II is an alarm too?	Setting see: ENCODING OF ALARMS
9.2	M-U-W-I ... - Encoding of alarm generator overcurrent step II	MAINS UNBALANCED 30 % >alarm
11	30 % - Unbalanced generator currents	MAINS UNBALANCED 30 % =< normal
12	10 % - Release of unbalanced generator currents	MAINS UNBALANCED 10 % =< normal
13	20.0 sec - Delay of unbalanced generator currents	MAINS UNBALANCED 20.0 s DELAYED
7.3	No ... - Unbalanced generator currents are monitored?	MAINS UNBALANCED - MONITOR? + YES
8.3	No ... - Unbalanced generator currents is an alarm too?	Setting see: ENCODING OF ALARMS
9.3	M-U-W-I ... - Encoding of alarm unbalanced generator currents	MAINS THERMAL 600 A OVERLOAD
14	600 A - Rated current for thermal overload of generator	MAINS THERM OVLD 300 s COOLING
15	300 sec - Cooling down time for thermal overload of generator	MAINS THERM OVLD - MONITOR? + YES
7.4	No ... - Monitoring of thermal overload of generator enabled?	Setting see: ENCODING OF ALARMS
8.4	No ... - Thermal overload of generator is an alarm too?	
9.4	M-U-W-I ... - Encoding of alarm 'Thermal overload of generator'	

Notice: The explanations of parameter e.g. 5.1, 5.2, etc. are alike.

Parameter 1, 2 and 3:

These are the data of the current transformer (CT) and the nominal current.

Parameter 4 and 5:

This function is used for the overcurrent monitoring. After a response time the overcurrent alarm occurs if the current in any phase exceeds this maximum value. The response delay is independent of the amount of overcurrent. The overcurrent alarm is released as soon as the currents in all three phases are lower than parameter 5.

Parameter 6:

Response delay for the overcurrent alarm. It can be preset in the range of 0.1 to 24.0 seconds with increments of 0.1 second.

Parameter 7:

<YES> means that this function is monitored, <NO> means, that a failure of this function is ignored.

Parameter 8:

An alarm can be announced if a monitored function is out of its range. The alarm itself has no influence of the actual function. That means if the monitor has stated e.g. an overcurrent and triggered the alarm and later on the monitored currents are again lower the release value, the alarm is still present until it is cancelled. For the internal controlling however, the overcurrent alarm is not present which means that the monitored function is effective as NORMAL.

Parameter 9:

This is the encoding for the before mentioned alarm. The parameters are found in ENCODING OF ALARMS if the parameterisation via the display of the unit is used.

Important: An emergency supply is inhibited, if an alarm of the mains current monitor is encoded for SHUT DOWN or GENERATOR OFF!

Parameter 10:

This function is for the short circuit protection. After a response time the short circuit alarm occurs if the current in any phase exceeds this maximum value. The response delay is independent of the amount of overcurrent. The short circuit alarm is released as soon as the currents in all three phases are lower than parameter 5.

Parameter 11 and 12:

These parameters are the monitoring of unbalanced currents. The currents are compared with each other. A timer is started if any difference is greater than the preset limit. The alarm UNBALANCED CURRENTS is announced when the delay time is up. The unbalanced statement is reset when all three differences are lower than the release limit.

The unbalanced current statement can be activated in mains parallel operation for detecting a blown fuse. The delay timer is not effective in this case.

Parameter 13:

Response delay for the unbalanced currents alarm. It can be preset in the range of 10 to 2400 seconds with increments of 10 seconds.

Parameter 14:

The overload is monitored for the response curve of a bimetal relay. The delay for the overload alarm depends on the overload factor. The response curve is shown at page 10.

Parameter 15:

A release delay begins when the load is fallen below the rated current. This release delay is equal to the re-cooling delay of a bimetal relay. It can be preset in the range of 10 to 2400 seconds with increments of 10 seconds.

FUNCTIONS

Overcurrent, short circuit

A response delay begins if the current in one or more phases exceeds the allowed maximum. The delay is reset if all three currents are lower than the maximum (not the release) current during this delay. An alarm occurs if the response delay time is up.

The signals OVERCURRENT and SHORT CIRCUIT are released if all three currents are below their release values.

Unbalanced currents

The monitoring of unbalanced currents is disabled as long as no current is higher than 10 % of the generators nominal current. Each current is compared with the other ones and the deviation is calculated as a percent value. A delay timer is started if any of the differences is greater than the allowed limit. The delay timer is reset if all differences are lower than the maximum (not the release) level during this delay. An alarm occurs if the response delay time is up.

The signal UNBALANCED CURRENTS is released if all three differences are below the release value.

Thermal overload

The function of a mechanical bimetal relay is software defined. The mean value of the three currents is calculated, hereof the percentage load of the generator and the overload factor. The response curve is shown further down. The unbalanced monitoring should be enabled for a complete protection.

As there is no re-cooling time of a mechanical relay, a release delay timer is provided for this function. The timer starts as soon as the load falls below 100%. It can be preset in the range of 10 to 2400 seconds with increments of 10 seconds.

CALIBRATION

The current monitor is software calibrated. A new scaling can be made with the programming software PARAWIN. Execute the following sequence for entering the calibration function.

1. Enter as IDENT-Number the word <MEISTER>.
2. Load then the parameter from the unit.
3. Open <Adjustment> in menu Options.
4. Skip the calibration of the voltages by clicking <Abort>.

Follow now the instructions of the adjustment procedure. The simulated current must be at the same time flow through all three phases: the three current inputs are connected one after the other. The menu shows the current level, which has to be simulated.

Press the Enter-key when the desired current flows through the input terminals. The PARAWIN stores the measured value. When the lower reference level is stored, apply the upper level. The measured values are checked for plausibility. The alignment is aborted if an error is detected. The new alignment is finally stored if the values are plausible and the security question was answered with <OK>.

Click the ABORT-button if the alignment is not desired. This function is then skipped.

RELOADING OF THE FACTORY CALIBRATION

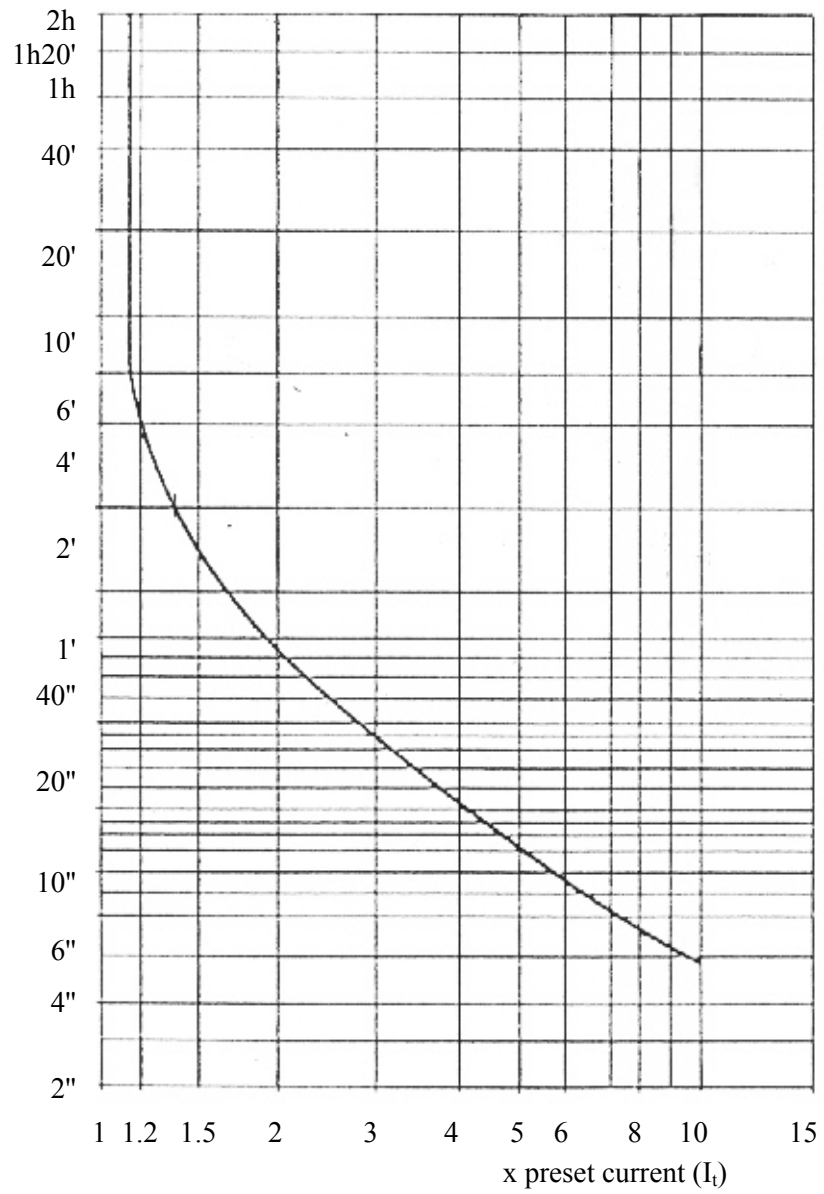
You can reload the factory calibration by selecting in menu <Options> the software <Factory Settings> if your alignment has failed.

CURRENT MONITOR

RESPONSE CURVE FOR THERMAL OVERLOAD

Response delay

Class 10A



**This chapter explains the parameterisation of all possible alarms. Some alarms and their parameters, depending on the model of the KEA, might be lacking in your control unit.
The actual included alarms are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.**

Changes without further notice reserved.

ALARM MONITORING

The following alarms are provided for the monitoring of the equipment and the genset.

- | | |
|---|--|
| <p>1 – 19: The labelling and the triggering can be configured by the customer</p> <p>20. Battery undervoltage</p> <p>21. Engine does come to a standstill</p> <p>22. Engine fails to start</p> <p>23. Overspeed</p> <p>24. Load controller failure</p> <p>25. Reverse power</p> <p>26. Synchronisation failure</p> <p>27. Mains CB does not cut-off</p> <p>28. Generator CB does not cut-off</p> <p>29. Phase rotation of mains voltage</p> <p>30. Phase rotation of generator voltage</p> <p>31. Mains CB tripped</p> <p>32. Generator CB tripped</p> <p>33. Mains overcurrent</p> | <p>34. Mains short circuit</p> <p>35. Mains unbalanced currents</p> <p>36. Mains thermal overload</p> <p>37. Generator overcurrent</p> <p>38. Generator short circuit</p> <p>39. Generator unbalanced currents</p> <p>40. Generator thermal overload</p> <p>41. Mains undervoltage</p> <p>42. Mains overvoltage</p> <p>43. Mains underfrequency</p> <p>44. Mains overfrequency</p> <p>45. Generator undervoltage</p> <p>46. Generator overvoltage</p> <p>47. Generator underfrequency</p> <p>48. Generator overfrequency</p> |
|---|--|

All alarms can be modified so that they are active or disabled. The customer can program with PARAWIN the alarm labelling and triggering of the alarms 1 to 19. These alarms can be controlled by the digital inputs of the relay unit RZ 071-D or by internally created (e.g. mains undervoltage, etc.) failure events. A list of the usable flags is shown further down.

The inputs for the alarms 13 and 14 are also monitored in the operation mode OFF. They are used for alarms (e.g. LEAKAGE), which must be monitored all the time. The audible signal is not switched on but the common alarm is given in the operation mode OFF. These alarms behave as normal alarms in all other operation modes except OFF.

The labelling of the internal alarms 20 – 48 is provided in English and German. The customer can select the language.

Encoding

The code letters mean:

M - Make-contact	D - delayed	W - Warning alarm	0 – Gen. CB cuts-off	Yes (+) Alarm enabled
B - Break-contact	U - undelayed	S - Engine shuts down	I – Gen. CB remains on	No (-) Alarm disabled

M-B: An alarm occurs if a make-contact (contact is normally open) is closed or if an internal flag (e.g. if a maximum limit is too high) is set. A break-contact (contact is normally closed) triggers an alarm if the contact opens or if an internal flag is reset (e.g. if a minimum limit is undershot). If for instance the oil pressure is monitored by an analogue signal, the alarm OIL PRESSURE must be configured for a break-signal, as the oil pressure is normally higher than the minimum.

D-U: A delayed alarm is monitored when the engine is running and the monitoring delay time is up (the green indication lights constantly). An undelayed alarm is also active at the standstill of the engine. All alarms, except 13 and 14, are disabled in the operation mode OFF.

W-S: A shut down alarm stops the engine and locks the automatic operation. A warning alarm is just announcing and keeps the engine running.

0-I: In addition it can be programmed with a warning alarm whether the generator is cut-off or remains on. The engine will shut down after the cooling down period and lock the AUTOMATIC mode if in this mode a warning alarm that has cut-off the generator CB is present (and not cancelled by the operator).

Yes-No: An alarm is enabled by 'Yes' and disabled by 'No' in the particular function group of PARAWIN. The parameterisation by the keys and display uses the letter [+] for enabling and [-] for disabling.

Functions of the Alarms

Engine does not come to a standstill

This alarm is announced when the engine is still running after the stopping procedure. This signalises that the stopping equipment of the engine (burned stopping solenoid, leaky gas valve, etc.) is defective.

Engine fails to start

This alarm comes up (the automatic operation is locked) when the engine is not running after the starting sequence.

Speed sensor failure

This alarm is triggered (the automatic operation is locked) when the engine stops during the normal operation without a stopping command.

Overspeed

The generator frequency or the signal of a pick-up is used for this monitoring. The alarm GENERATOR UNDERVOLTAGE must be enabled as a shutdown alarm when the generator frequency is used. This also protects the engine if the generator voltage fails. The following parameters are provided:

- Revolution for overspeed.
- Release speed.

Alarms 13 und 14

The input signals for these two alarms can be delayed for 0 to 250 seconds before an alarm is announced. That means that e.g. the alarm contact must be activated for the programmed time before the alarm comes up. Furthermore these two alarms are also enabled in the operation mode OFF, however without the audible signal. Fault signals, which have to be always signalled, can be monitored by this (e.g. tank filling level, leakage).

Mains CB tripped

The mains circuit breaker can be monitored for automatic tripping (e.g. by an installed overcurrent tripping devices). The alarm is internally triggered if no feed back signal MAINS CB IS ON is stated after running out of the mains CB closing pulse. The pulse duration must be programmed to a plausible value (e.g. 2 sec.) if a contactor is used instead of a CB.

Furthermore it can be selected whether the engine should start and take the load (according to VDE standard 0107) in the operation modes AUTO or TEST or not. The alarm must in this case be cancelled for changing back to mains supply after the reconnection delay.

Mains CB does not cut off

The alarm occurs when the mains CB is not off 2 seconds after the Off-command. This alarm can control a relay by which an additional mains coupling breaker can be switched off to allow the generator to supply the consumers.

Hint:

This alarm can be set as a warning one. The engine keeps running and would shut down after the cooling down period. In the meantime it could be possible to switch the mains breaker manually off and the engine can now immediately supply the emergency consumers.

Generator CB tripped

The generator circuit breaker can be monitored for automatic tripping (e.g. by an installed overcurrent tripping device). Additionally the mode WARNING/SHUTDOWN must be programmed for the assigned alarm signal. The alarm signal is internally triggered in case no feed back signal GENERATOR CB IS ON is detected after running out of the generator closing pulse. The pulse duration must be programmed to a plausible value (e.g. 2 sec.) if a contactor is used instead of a CB.

Generator CB does not cut off

The alarm occurs when the generator CB is not off 2 seconds after the Off-command. The genset gets an internal start command and by this keeps the engine running and the generator CB remains on.

The engine stops when in this case a shutdown alarm occurs. An additional generator coupling breaker can be switched off by a programmed relay to prevent that the engine is operated with reverse power.

Alarms of the voltage monitors

An alarm is announced if a monitored voltage or frequency of mains or generator is out of its range. The alarm itself has no influence on the actual voltage or frequency monitoring. That means if the monitor has stated a failure and triggered the alarm and later on the monitored function is again within its limit, the alarm is still present until it is cancelled. For the internal controlling however, the actual state is used which means that the monitored function is effective as NORMAL.

Monitoring of the currents

The mains and generator currents can be monitored for

- Overcurrent (e.g. 110%).
- Short circuit (e.g. 300%).
- Unbalanced currents and
- Thermal overload.

The function of a mechanical bimetal relay is software defined for the THERMAL OVERLOAD alarm. The response curve is shown further up in CURRENT MONITOR.

Synchronisation failure

A timer is started when the synchronisation begins. An alarm is triggered if no synchronisation had happened when this delay time is up. It is programmable if in this case a changeover with a break is done or if the synchronisation remains on.

Load controller failure

An alarm is indicated when after a preset time the actual load has not matched the preset load command (the actual load has to be at least once inside the dead band). The genset can be stopped or a peak load command can be removed in this case.

PF controller failure

An alarm is indicated when after a preset time the actual PF has not matched the preset PF (the actual PF has to be at least once inside the dead band). The genset can be stopped or a peak load command can be removed in this case.

Reverse power

The generator CB must be switched off if the engine fails in parallel operation. The following parameters are available for this monitoring:

- Amount of reverse power.
- Alarm delay.

Alarms of analogue inputs

The analogue inputs can be fitted with interface modules for several sensors. Modules for PT 100, PT 1000, current loops, thermocouples, oil pressure and temperature sensors of VDO, etc. are available. Each analogue input can be monitored for two alarm levels. The function and parameterisation is described further down in ANALOGUE INTERFACE.

Battery voltage monitor

The plus potential of the battery voltage must be applied to terminal 1 of X 401 for this alarm. A delay time is started if the voltage falls below the lower limit. The timer is reset when the voltage rises within this delay over this lower limit (not the upper limit). An alarm is announced when the delay time is up.

A relay (in a normally closed function) can be programmed for the direct output of the battery voltage monitor. A remote signal is possible by this even in the operation mode OFF.

The parameterisation is described in ADDITIONAL PARAMETERS.

ALARM MONITORING

Internally triggered Alarms

Shown are the parameters of one (total 19) alarm. Programmable are the labelling and the input trigger.

Screen of PARAWIN		Display shows:
	++++ Alarms ++++	ENCODING OF ALARMS
1	Alarm 01 STORAGE TANK < 3h	Setting see: ENCODING OF ALARMS
2	0401 - Flag for triggering of alarm 1	Setting see: ENCODING OF ALARMS
3	Yes - Active?	D0MW+ STORAGE TANK < 3h
4	M-D-W-0 - Encoding	D0MW+ STORAGE TANK < 3h

Parameter 1, alarm labelling:

Two lines are possible for the alarm label. The first line contains 10 letters (the first position must be a space!); the second line contains 16 letters. The limiters [|] show the beginning and end of a line. This text can be changed only with PARAWIN.

Parameter 2, trigger signal:

An alarm is announced by the preset trigger input. 16 digital inputs of the relay unit (terminals 1-14 and 27-28) and several flags are available. The list of the provided flags follows further down. The trigger can only be changed with PARAWIN.

Hint:

Flags can be combined and trigger the same alarm if the first two letters are the same. Example: An alarm shall be announced if the limit A or B of an analogue input is too high. The flag list shows:

Limit A of analogue input 1 too high	4401
Limit B of analogue input 1 too high	4402

The two left letters are equal (44) and are valid for both flags. The two left letters (01 and 02) are numbers in a hexadecimal writing. Their values must be added. The sum is 03 in this case. The combined flag is in this case 4403.

Parameter 3, active / not active:

An alarm is inhibited or enabled by this parameter. It should be set to <No> if the alarm is not used. An alarm is disabled by the sign [-] and enabled by [+] if the parameterisation is done via the keys and display.

Parameter 4:

Encoding of the alarm.

Additional internal Alarms

Some internal alarms (e.g. the alarms for the current monitoring of mains) are not used in the different types of KEAs. They can be used as customer defined alarms. The alarm text however are fixed and labelled with a number (e.g. alarm 33). These alarms can only be triggered by a MAKE signal. The further encoding is the same as that for the normal alarms.

ALARM MONITORING

FLAGS FOR TRIGGERING OF ALARMS

du/dt in mains parallel operation	4701
df/dt in mains parallel operation	4702
Engine does not come to a standstill	4420
Generator voltage failure	3BF0
Limit A of analogue input 1 too high	4901
Limit B of analogue input 1 too high	4902
Limit A of analogue input 2 too high	4904
Limit B of analogue input 2 too high	4908
Limit A of analogue input 3 too high	4910
Limit B of analogue input 3 too high	4920
Limit A of analogue input 4 too high	4940
Limit B of analogue input 4 too high	4980
Load controller failure	1904
PF controller failed	1908
Phase shift in mains parallel operation	4704
Reverse power mains	1501
Sensor failure analogue input 1	4610
Sensor failure analogue input 2	4620
Sensor failure analogue input 3	4640
Sensor failure analogue input 4	4680
Sensor failure analogue inputs 1, 2, 3 or 4	46F0
Synchronisation failure	4480
Terminal 1 of RZ 071-D	0410
Terminal 2 of RZ 071-D	0408
Terminal 3 of RZ 071-D	0404
Terminal 4 of RZ 071-D	0402
Terminal 5 of RZ 071-D	0401
Terminal 6 of RZ 071-D	0580

Terminal 7 of RZ 071-D	0540
Terminal 8 of RZ 071-D	0520
Terminal 9 of RZ 071-D	0510
Terminal 10 of RZ 071-D	0508
Terminal 11 of RZ 071-D	0504
Terminal 12 of RZ 071-D	0502
Terminal 13 of RZ 071-D	0501
Terminal 14 of RZ 071-D	0680
Terminal 15 of RZ 071-D	0640
Terminal 16 of RZ 071-D	0620
Terminal 17 of RZ 071-D	0610
Terminal 18 of RZ 071-D	0608
Terminal 19 of RZ 071-D	0604
Terminal 20 of RZ 071-D	0602
Terminal 21 of RZ 071-D	0601
Terminal 22 of RZ 071-D	0780
Terminal 23 of RZ 071-D	0740
Terminal 24 of RZ 071-D	0720
Terminal 25 of RZ 071-D	0710
Terminal 26 of RZ 071-D	0708
Terminal 27 of RZ 071-D	0704
Terminal 28 of RZ 071-D	0702
Terminal 29 of RZ 071-D	0701

This chapter explains the parameterisation and all possible analogue functions. Some functions and their parameters, depending on the model and modification of the KEA, might be lacking in your control unit.

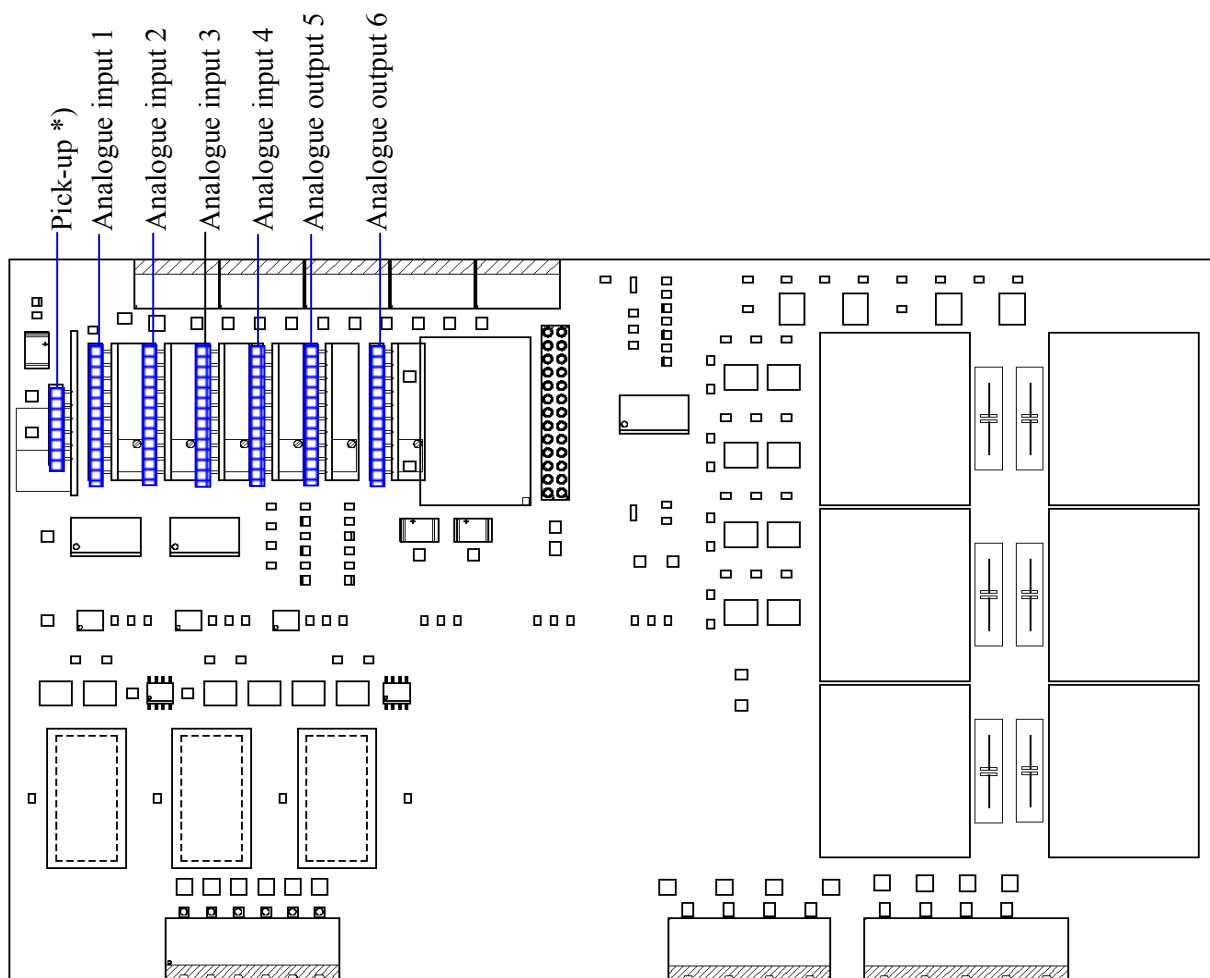
Changes without further notice reserved.

INTERFACE MODULES KEA 101 - 102

Different interface modules are available for the specific sensors. Output modules for current loops or voltage signals are available. The modules don't belong to the standard scope of delivery, so they have to be ordered additionally. The fitting of them is easy:

1. Switch off the supply and all measuring signals. (The current transformers have to be shorted before!).
2. Remove the cover by unscrewing the 4 screws.
3. Plug in the interface module at the desired position. The component side of the module has to show to the outer side.
4. Reassemble the cover and then connect the supply and all other signals.
5. Set the parameters for this analogue channel. The identifier of the module must be entered correctly.

POSITION OF THE INTERFACE MODULES



*) Further units don't have this slot as the pick-up interface is directly at the board.

CONNECTION OF ANALOGUE SIGNALS

The unit is fitted with four slots for analogue input modules. The slots 1 and 2 are for the connection of 4-wire sensors. Due to this, they can be used for all sensors, including PT 100/1000 and VDO sensors. The connection of PT 100/1000, voltage signals, current loops, VDO-sensors, etc. is shown at the end of this manual. A common return signal from the engine housing, connected to terminals 7 and 13 of X 401, is enough if two VDO-sensors are used. The slots 3 and 4 are for 2-wire sensors (thermocouple, current loops, etc.).

The shielding has to be connected only to the earth screws next to the terminal strip X 401 and not to the protective wire and must have no electrical connection to other metal parts!

PARAMETERISATION OF ANALOGUE INPUTS

Four analogue input channels are available for many tasks. The following parameter are necessary for this parameterisation.

Screen of PARAWIN			Display shows:
	++++ Analogue Inputs ++++		ANALOGUE- INPUTS
1	Input 01 DEGREE C COOLING WATER		Setting only with PARAWIN
2	8 - Identifier of Input		. . 8 TYPE INPUT 1 6 TYPE INPUT 2
3.1	90 - Upper limit A		+ 90 >INPUT 1A
4.1	85 - Lower limit A		+ 85 <INPUT 1A
5.1	10 sec - Delay of 'Upper limit A exceeded'		10.0 s DELAY 1A 1.0 s DELAY 1B
3.2	98 - Upper limit B		+ 98 >INPUT 1B
4.2	85 - Lower limit B		+ 85 <INPUT 1B
5.2	10 sec - Delay of 'Upper limit B exceeded'		1.0 s DELAY 1A 10.0 s DELAY 1B
6	0 - Lower reference		+ 0 MIN.REF 1
7	100 - Upper reference		+ 100 MAX.REF 1

Parameter 1:

A two-line text is provided for the identification of the analogue value. The first line contains 9 letters (the first position must be a space!); the second line contains 16 letters. The limiters [|] show the beginning and end of a line. This text can be changed only with PARAWIN.

Parameter 2:

The specific input module has to be inserted for each analogue sensor. The accordant identifier must be programmed for the correct measuring and scaling of the analogue value. The following table shows the available types (in November 2005).

The identifier '0' should be entered if a channel is not used. This skips the measuring and the associated flags are reset.

Identifiers for inputs			
0	Input is not used	1	PT 100/PT 1000
2	Thermocouple NiCr-Ni	3	0(4)-20 mA, displayed w/o decimal point
4	0-10 volts, displayed w/o decimal point	5	Oil pressure 5 bar, VDO sensor
6	Oil pressure 10 bar, VDO sensor	7	Temperature sensor VDO
8	Temperature sensor TH 11, 21, 31	9	0(4)-20 mA, displayed as '0.0'
10	0(4)-20 mA, displayed as '0.00'	11	0-10 volts, displayed as '0.0'
12	0-10 volts, displayed as '0.00'	13	Charger current

Parameter 3 and 4:

These are limit values. Be very sure that parameter 3 is mathematical greater than parameter 4.

Examples: The settings for UPPER and LOWER LIMIT [20 / -10] or [90 / 70] are correct, the values [20 / 30], [0 / 50] or [-10/-5] are wrong and would end in a malfunction.

Parameter 5:

A delay time is started if the actual value exceeds the upper limit or falls below the lower one. The internal flag is set or reset after this delay. The delay can be preset in the range of 0.1 to 24.0 seconds with increments of 0.1 second.

Parameter 6 and 7:

The function of these parameters depends on the used input modules. The parameters are described in IDENTIFIERS OF ANALOGUE INPUTS further down.

The lower reference for instance can define the figure that should be displayed at the lowest value (e.g. -5 volts, 0 mA, etc.); the upper reference acts in the same way for the upper value. Another use: these parameters are the calibrated values of 0 and 100 degrees centigrade.

FUNCTION OF ANALOGUE INPUTS

Each analogue input is monitored for two limits, marked with A and B. A delay is started if the actual value exceeds the upper limit (that is the mathematical greater value). The flag ACTUAL VALUE TOO HIGH is set after the delay. This delay is started again if the actual value falls below the lower limit. The flag ACTUAL VALUE TOO HIGH is reset after this delay.

Important! The upper limit must be mathematical greater than the lower limit! Examples:

The settings for UPPER and LOWER LIMIT [20 / -10] or [90 / 70] are correct, the values [20 / 30], [0 / 50] or [-10/-5] are wrong and would end in a malfunction.

The flag can control a relay or trigger an alarm according to the parameterisation. Example:

The oil pressure is monitored by analogue signal 1. The alarm #3 shall be triggered if the oil pressure falls below 1 bar. The oil pressure is normal if the actual pressure exceeds 2 bars.

1. The text for analogue input 1 is entered with PARAWIN as | bar | OIL PRESSURE|.
2. The identifier is set to 5 (Oil pressure 5 bar, VDO sensor).
3. The upper limit is set to 2 bars. The lower one to 1 bar.
4. The delay (for debouncing of the signal) is set to 1 second.
5. The text for alarm 3 is entered with PARAWIN as | PRESSURE| OIL < 1 bar|.
6. The trigger flag for this alarm is entered as 4401. (See table FLAGS FOR TRIGGERING OF ALARMS)
7. The alarm is set to a BREAK-input as the lower level is exceeded during the normal operation and the flag reset in a pressure loss.

IDENTIFIERS OF ANALOGUE INPUTS

Identifier 0: Input is not used

The identifier '0' should be entered if a channel is not used. This skips the measuring and the associated flags are reset.

Identifier 1: PT 100, PT 1000

PT 100 or PT 1000 sensors (and the VDO-sensors) can only be measured by the channel 1 and 2. The PT-sensors are connected with four wires. The resolution is 1 degree centigrade and the measuring range is from -10 to 120°C. The sensor is calibrated at 0°C and 100°C. A short-circuit or a broken wire will cause a SENSOR FAILURE alarm and shows the maximum value.

The value 255 must be entered for the LOWER REFERENCE and 755 for the UPPER REFERENCE.

Identifier 2: Thermocouple

A thermocouple can directly connected to all analogue inputs. The temperature is measured in the range from 100 to 700 °C with a resolution of 1 °C. Please notice, that a reference temperature of the thermocouple is not regarded. The compensation of the thermocouple must be done at site if it is necessary. A broken wire shows the maximum value and set the alarm flag for SENSOR FAILURE.

Identifiers 3, 9 and 10: Current loop

The maximum current are 30 mA. The input can be damaged if the current is too high. A possible voltage difference between the current loop and the battery minus must not exceed +/- 5 volts.

The range 0 – 20 mA is subdivided into 800 digits. That means that the range is measured with a resolution of about $1.25/1000$. Enter for the correct reading of the analogue value the figure, that should be displayed at 0 volt as LOWER REFERENCE and the figure to be displayed at 10 volts as UPPER REFERENCE.

The SENSOR FAILURE flag is set if the current exceeds 22 mA. A Lower Limit (with programmed alarm) of e.g. 2 mA can be set if a current loop of 4 – 20 mA should be monitored for a broken wire.

The value at the display is shown without a decimal point if the identifier #3 is set. It is displayed as '000.0' with identifier #9 and as '#00.00' with identifier #10.

Identifiers 4, 11 and 12: Voltage input 0 – 10 Volt

The input voltage must not exceed 15 volts. A possible voltage difference between the minus of the voltage signal and the battery minus must not exceed +/- 5 volts. The range 0 – 10 volts is subdivided into 800 digits. That means that the range is measured with a resolution of about $1.25/1000$. Enter for the correct reading of the analogue value the figure, that should be displayed at 0 volt as LOWER REFERENCE and the figure to be displayed at 10 volts as UPPER REFERENCE.

The SENSOR FAILURE flag is set if the voltage exceeds 12 volts. A Lower Limit (with programmed alarm) of e.g. 1 volt can be set if a voltage signal of 2 – 10 volts should be monitored for a broken wire.

The value at the display is shown without a decimal point if the identifier #4 is set. It is displayed as '000.0' with identifier #11 and as '#00.00' with identifier #12.

Identifiers 5 und 6: Oil pressure 5 and 10 bar, VDO-sensor

The oil pressure is shown with one decimal place. A sensor failure alarm is not possible due to the characteristic of the sensor. A broken wire shows the minimum value. The resistance of the sensor is from 0 to 180 ohms.

Identifier 7: Temperature sensor from VDO

The temperature is measured in the range from 45 to 120 °C. The resolution is 1°C. A sensor failure alarm is not possible due to the characteristic of the sensor. A broken wire shows the maximum value. The resistance of the sensor for the used range is from 240 to 22 ohms.

Identifier 8: Temperature sensors TH11, TH21, Th31

The temperature is measured in the range from 42 to 120 °C. The resolution is 1°C. A sensor failure alarm is not possible due to the characteristic of the sensor. A broken wire shows the maximum value.

Identifier 13: Charger current.

A special shunt is in series with the minus pole of the charger. The ripple of the current must be less than 3 %. The range for the measuring is 0 to 25 amp., the resolution is 0.1 amp.

HARDWARE OF THE OUTPUT MODULE

One output module for a current loop and another one for a voltage signal 0 – 10 volts are available. The outputs are isolated from every other potential. The output range is selected with a jumper (see drawing at end of manual):

1. -10 / 0 / +10 mA or -5 / 0 / +5 Volt or
2. 0 (4) / 20 mA or 0 (2) to 10 volts.

The analogue value that is to be transmitted is selected from a list further down. The parameters LOWER LIMIT AND UPPER LIMIT scale the output. The LOWER LIMIT defines the variable value for transmitting the lowest signal (0 or -10 mA or 0 or -5 volts); the UPPER LIMIT the signal for the highest signal (20 or 10 mA or 10 or +5 volts).

OUTPUT MODULES

Two analogue output channels are provided. They are marked with #5 and #6 and can be used for many tasks. It follows the parameterisation of one channel.

Screen of PARAWIN		Display shows:
	++++ Analogue Outputs +++++	ANALOGUE OUTPUTS
1	Output 05 DEGREE C COOLING WATER	Setting only with PARAWIN
2.1	31 - Identifier output	31 TYPE OUT 5
2.2		31 TYPE OUT 6
3.1	2480 - Address of analogue value	2480 ADDR. OUT 5
3.2		248C ADDR. OUT 6
4.1	0 - Lower limit	+ 0 MIN.OUT 5
5.1	100 - Upper limit	+ 100 MAX.OUT 5

Parameter 1:

A two-line text is provided for the identification of the analogue value. The first line contains 9 letters (the first position must be a space!); the second line contains 16 letters. The limiters [|] show the beginning and end of a line. This text can be changed only with PARAWIN.

The text and the scaled value are displayed for controlling under ACTUAL VALUES.

Parameter 2:

The transmitted value is shown under ACTUAL VALUES. The correct identifier must be programmed for showing the value as a scaled one. The identifier 30 should be programmed, if the output is not used.

Identifiers for outputs			
30	Output is not used	31	Displayed w/o decimal point
32	Displayed as '0.0'	33	Displayed as '0.00'
34	Signal to speed governor. The address is pre-set.		

Parameter 3:

This is the address of the transmitted variable value. The list of the possible values and their addresses follows further down. The identifier 34 (speed governor) has a fixed address.

Parameter 4 and 5:

These values are programmed in SPEED SIGNALS AND GOVERNOR if the channel is used for a speed governor (identifier 34). The LOWER LIMIT defines the variable value for transmitting the lowest signal (0 or -10 mA or 0 or -5 volts); the UPPER LIMIT the signal for the highest signal (20 or 10 mA or 10 or +5 volts). Some examples:

Important: Use the same decimal places as the selected actual value is shown in ACTUAL VALUES.

Example 1:

The voltage range is 230/400 volts and the current transformers are for 600/5 amps. The maximum apparent power at nominal voltage and current is in the range -414 to +414 kVA. The nominal generator load might be 282 kW (voltage 230/400 V, nominal current 510 A, power factor = 0.8). The output signal 4 to 20 mA should cover 0 to +300 kW. The jumper is set to an output signal 0-20 mA as described in HARDWARE OF THE OUTPUT MODULE. The LOWER LIMIT is set to -75 (-25% of 300 kW), the UPPER LIMIT to +300 kW.

Example 2:

The following parameterisation is made in SPEED SIGNALS AND GOVERNOR!

The signal to the speed governor is internally subdivided into 0 – 10 000 digits. These 10 000 digits cover the output range of 0 to 10 volts (or -5 to +5 volts). One digit represents 1 mV due to this. The output signal 0 to 10 volts is used for controlling the governor.

The signal 2.500 volts corresponds to the idle speed, 0.500 volts to about 46 Hz and 4.500 volts to about 53 Hz. The engine is fully loaded with a signal of 4.000 volts. This value must be found e.g. in mains parallel operation or with a dummy load. The LOWER SIGNAL LIMIT is by this 500, the UPPER SIGNAL LIMIT 4000 and the SIGNAL FOR IDLE SPEED 2500.

IDENTIFIER OF THE ANALOGUE OUTPUTS

The identifier is used for the mathematic correct display (as ACTUAL VALUE) of the transmitted value. The identifier should be set to 30 if an output is not used. The software skips by this part of the program.

Identifiers 31, 32 and 33: Decimal places of controlling display

The transmitted value is displayed for controlling in ACTUAL VALUES. This is necessary for a correct displaying, as the internal value has no decimal point.

Important: Use the identifier for the same decimal places as the selected actual value is shown in ACTUAL VALUES.

Identifier 34: Speed governor

The address of the transmitted value is fixed if a signal for a speed governor is transmitted. The parameter 4 and 5 are set in SPEED SIGNALS AND GOVERNOR.

CONNECTION OF THE OUTPUT MODULES

The signals are transmitted via terminal strip X 401.

Terminal 21 + Output of channel 5

Terminal 23 + Output of channel 6

Terminal 22 - Output of channel 5

Terminal 24 - Output of channel 6

The burdens of current loops must not exceed 400 ohms; the input resistance for voltage signals must not be lower than 22 k ohms.

ADDRESSES OF VARIABLE ANALOGUE VALUES FOR TRANSMITTING

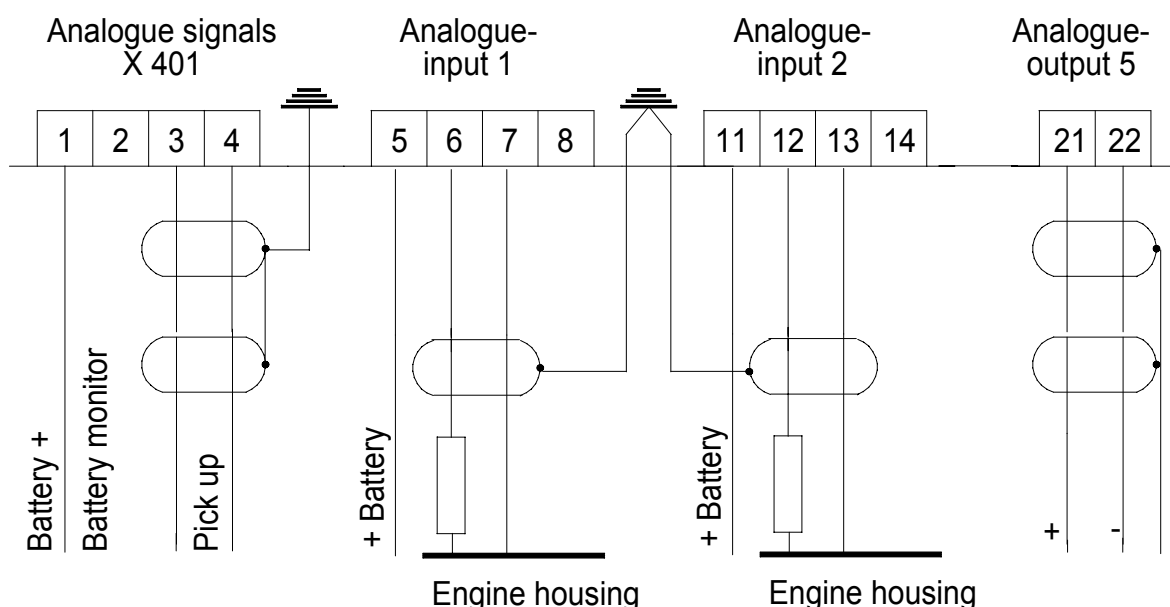
Address	Analogue signal	Address	Analogue signal
2480	Mains voltage L1	2492	Generator voltage L1
2482	Mains voltage L2	2494	Generator voltage L2
2484	Mains voltage L3	2496	Generator voltage L3
2486	Mains frequency	2498	Generator frequency
248C	Mains current L1	249E	Generator current L1
248E	Mains current L2	24A0	Generator current L2
2490	Mains current L3	24A2	Generator current L3
24CC	PF L2 of mains*) (0-90-180 = 0ind-1-0cap)	24CA	PF L2 of generator*) (0-90-180 = 0ind-1-0cap)
24CE	Loading of mains in %	24C4	Loading of generators in %
248A	Mains active power	249A	Generator active power
24B4	Mains apparent power	24B6	Generator apparent power
		24BC	15 min. maximum gen. current L1
24A4	Battery voltage	24BE	15 min. maximum gen. current L2
24A8	Analogue channel 1	24C0	15 min. maximum gen. current L3
24AA	Analogue channel 2		
24AC	Analogue channel 3	24A6	Engine speed
24AE	Analogue channel 4		

*) The transmitted analogue value corresponds to the angle between current and voltage vectors and is shifted 90 degrees ahead to get a continuous signal. Therefore [0] means -90 degrees (PF = 0, lag), [90] means 0 degrees (PF = 1) and [180] means 90 degrees (PF = 0, lead).

INTERFACE MODULES KEA 111 - 112

Two analogue inputs are provided for the monitoring of the oil pressure and the engine temperature. Analogue input 1 is for the VDO oil pressure and input 2 for the temperature sensor. The analogue output gives a voltage signal to a speed governor.

CONNECTION OF THE ANALOGUE SIGNALS



Ana111-E

A common return signal to terminals 7 and 13 of X 401 from the engines housing can be used for both VDO-sensors. **The shielding has to be connected only to the earth screws next to the terminal strip X401 and not to the protective wire and must have not electrical connection to other metal parts!**

PARAMETERISATION OF ANALOGUE INPUTS

The following parameter are necessary for this parameterisation.

Screen of PARAWIN			Display shows:
	++++ Analogue Inputs ++++		ANALOGUE- INPUTS
1	Input 01 bar OIL PRESSURE		Setting see: ENCODING OF ALARMS
2	5 - Identifier of Input		..5 TYPE INPUT 1 8 TYPE INPUT 2
3.1	2.5 - Upper limit A		+ 2.5 > OUT 1A
4.1	2.0 - Lower limit A		+ 2.0 < OUT 1A
5.1	10 sec - Delay of 'Upper limit A exceeded'		10.0 s DELAY 1A 5.0 s DELAY 1B
3.2	2.0 - Upper limit B		+ 2.0 > OUT 1B
4.2	1.8 - Lower limit B		+ 1.8 < OUT 1B
5.2	5 sec - Delay of 'Upper limit B exceeded'		10.0 s DELAY 1A 5.0 s DELAY 1B

Parameter 1:

A two-line text is provided for the identification of the analogue value. The first line contains 9 letters (the first position must be a space!); the second line contains 16 letters. The limiters [|] show the beginning and end of a line. This text can be changed only with PARAWIN.

Parameter 2:

The identifier of the analogue module for the correct reading is entered here. The identifier <0> should be programmed if a channel is not used. The possible identifier of input 1 is <5> (pressure range 0-5 bar) or <6> (pressure range 0-10 bar). The identifier for input 2 is <7> (40 – 120 degrees centigrade).

Parameter 3 and 4:

These are limit values. Be very sure that parameter 3 is mathematical greater than parameter 4.

Examples:

The settings for UPPER and LOWER LIMIT [20 / -10] or [90 / 70] are correct, the values [20 / 30], [0 / 50] or [-10/-5] are wrong and would end in a malfunction.

Parameter 5:

A delay time is started if the actual value exceeds the upper limit or falls below the lower one. The internal flag is set or reset after this delay. The delay can be preset in the range of 0.1 to 24.0 seconds with increments of 0.1 second.

FUNCTION OF ANALOGUE INPUTS

Each analogue input is monitored for two limits, marked with A and B. A delay is started if the actual value exceeds the upper limit (that is the mathematical greater value). The flag ACTUAL VALUE TOO HIGH is set after the delay. This delay is started again if the actual value falls below the lower limit. The flag ACTUAL VALUE TOO HIGH is reset after this delay.

Important! The upper limit must be mathematical greater than the lower limit! Examples:

The settings for UPPER and LOWER LIMIT [20 / -10] or [90 / 70] are correct, the values [20 / 30], [0 / 50] or [-10/-5] are wrong and would end in a malfunction.

The flag can control a relay or trigger an alarm according to the parameterisation. Example:

The oil pressure is monitored by analogue signal 1. The alarm #3 shall be triggered if the oil pressure falls below 1 bar. The oil pressure is stated as normal, if the actual pressure exceeds 2 bars.

1. The text for analogue input 1 is entered with PARAWIN as | bar | OIL PRESSURE|.
2. The identifier is set to 5 (Oil pressure 5 bar, VDO sensor).
3. The upper limit is set to 2 bars. The lower one to 1 bar.
4. The delay (for debouncing of the signal) is set to 1 second.
5. The text for alarm 3 is entered with PARAWIN as | PRESSURE| OIL < 1 bar|.
6. The trigger flag for this alarm is entered as 4401. (See table FLAGS FOR TRIGGERING OF ALARMS)
7. The alarm is set to a BREAK-input as the lower level is exceeded during the normal operation and the flag reset in a pressure loss.

OUTPUT MODULE

The output module transmits a voltage signal for a speed governor. The output is isolated from every other potential. The output range is selected with a jumper (see drawing at end of manual):

8. -5 / 0 / +5 volts or
9. 0 (2) to 10 volts.

The function is fixed for the controlling of a speed governor. The parameterisation and the function are described in SPEED SIGNALS AND GOVERNOR.

SPEED MONITORING AND CONTROL

This chapter explains the parameterisation and all possible functions. Some functions and their parameters, depending on the model of the KEA, might be lacking in your control unit. The actual included functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.

Changes without further notice reserved.

SPEED MONITORING AND CONTROL

The following parameters are available for the speed sensing and the speed governor.

Screen of PARAWIN		Display shows:
	++++ Speed Monitoring and Control +++++	SPEED MONITORING SPEED GOVERNOR
1	Yes - 'Engine running' by generator voltage?	+ GEN.VOLT=RUN.
2	No - 'Engine running' by charging dynamo, D+?	- DYNAMO=RUNNING
3	Yes - Speed detection by pick-up?	+ PICK UP USED?
4	Yes - Contact for 'Immediate Stop' is NC?	+ STOP INPUT NC
5	4 sec - Undershoot timer of signal 'Engine running'	DELAY RUN.SIGNAL 4.0 s FALL BACK
6	4000 Hz - Frequency of speed sensor @ rated speed	f @ NOMINAL 4000 Hz SPEED
7	1500 rpm - Rated speed	NOMINAL SPEED 1500 rpm
8	60 rpm - No cranking speed	60 rpm < CRANK
9	70 rpm - Setting for cranking speed	70 rpm > CRANK
10	200 rpm - No ignition speed	200 rpm <FIRING
11	250 rpm - Setting for ignition speed	250 rpm >FIRING
12	1490 rpm - No rated speed	1490 rpm < RATED
13	1500 rpm - Setting for rated speed	1500 rpm > RATED
14	1550 rpm - No overspeed	1550 rpm <OVERSP
15	1680 rpm - Setting for overspeed	1680 rpm >OVERSP
16	Yes - Alarm 'Overspeed' is enabled?	Setting see:
17	M-U-S-0 - Encoding of alarm 'Overspeed'	ENCODING OF ALARMS
		SPEED GOVERNOR
18	No ... - Signal for speed governor is from -5000 to +5000?	- +/- 5V SIGNAL
19	Yes ... - Signal for speed governor is from 0 to +10 0000?	+ 0-10V TO GOVNR
20	Yes ... - Signal level normal [>u = >n] ?	ANALOGUE SIGNAL + normal u=>n>
21	500 ... - Lower signal limit	500 LIMIT <n
22	4800 ... - Upper signal limit	+ 4800 LIMIT >n
23	2500 ... - Signal for idle speed	SIGNAL FOR IDLE + 2500 SPEED
24	3 ... - Gain of speed governor	GAIN OF SPEED 3 GOVERNOR

Parameter 1, 2 and 3:

These parameters select the input source for the signal ENGINE IS RUNNING. A pick-up is obligatory in case a gas engine should be controlled, as the signal CRANKING SPEED REACHED is necessary for the start sequence. The signal ENGINE IS RUNNING is set if the voltage in any phase of the generator exceeds about 50 volts and parameter 1 is set to <Yes>.

Parameter 4:

A normally open (NO, make contact) or normally closed (NC, break contact) contact can control the input for IMMEDIATE STOP.

Parameter 5:

This timer is for the debouncing of the speed signal. It is possible when the engines stops that the speed of the engine falls not straight to zero but goes slightly up and down during the stopping procedure. This can e.g. happen if the engine is stopped by fuel valve. This timer prevents that components (e.g. louvers) are switched on and off several times if they are controlled by this signal. The timer can be preset in the range of 0.1 to 24.0 seconds with increments of 0.1 second.

Parameter 6 and 7:

The nominal speed and the frequency of the speed sensor at nominal speed must be entered here for the scaling of the engine speed. The generator frequency must be entered if no speed sensor is used.

Parameter 8 and 9:

The start sequence of a gas engine needs the signal CRANKING SPEED REACHED. The start sequence proceeds only after this signal is present. By this it is inhibited that gas flows into an engine that is not turning.

These two parameters have a possible lowest value, depending on the frequency of the speed sensor. PARAWIN corrects the inputs if they are too low. The values must be possible and correct if the keys and the display set them.

Parameter 10 and 11:

These are values for the signal ENGINE HAS FIRED. Please observe, that the cranking speed of a gas engine is higher (due to the less compression) than that of a diesel engine

Parameter 12 and 13:

This signal NOMINAL SPEED REACHED is often used for the CB control of asynchrony generators.

Parameter 14 and 15:

The frequency of the speed sensor is used for the overspeed alarm. The generator frequency is used if no pick-up exists. The alarm GENERATOR UNDERVOLTAGE must be enabled and programmed in this case as a shutdown one. The alarm GENERATOR OVERFREQUENCY is not the same as OVERSPEED.

Parameter 16 and 17:

This is the encoding for the before mentioned alarm. The parameters are found in ENCODING OF ALARMS if the parameterisation via the keys and display is used.

PARAMETER FOR AN ELECTRONIC SPEED GOVERNOR**Parameter 18 and 19:**

The range of the analogue signal to the speed governor is preset either to -5 to +5 volts or 0 to 10 volts. The following parameters represent the output signal in mV.

Parameter 20:

This parameter sets the influence of the commands SPEED HIGHER or LOWER to the output voltage. If the function is set to NORMAL, the output signal raises with the command SPEED HIGHER. If the parameter is set to <NO> the signal is decrease at commands SPEED HIGHER.

Parameter 21 and 22:

The minimum and maximum analogue signal to the speed governor is limited here.

Parameter 23:

This output signal is for the engines idle speed.

Parameter 24:

This parameter represents the gain of the governor. The figure 1 stands for the lowest, 10 for the highest regulation speed.

CONTROLLING OF THE SPEED GOVERNOR

The commands of the frequency control (frequency* lower, higher) and those of the load controller (load* lower, higher) are combined for the speed governor (speed governor* lower, higher). Commands of a preset duration are given for the regulation. A programmed break is inserted after each load command. This is to give the engine time to carry out the command (accelerate or decelerate). The durations of the commands and breaks are different for the frequency and load controlling. The commands to the speed governor are given as digital signals via relays or as an analogue signal.

The analogue signal is raised or lowered for the length of a speed command. The speed of the raising or lowering of the analogue signal during this time is preset by parameter 24. A rapid regulation is achieved either by longer command pulses or higher gain (parameter 24), a slower one by shorter command pulses or lower gain. The output signal is limited by the parameters 21 and 22. They inhibit an overload or underfrequency. The analogue signal is unchanged for the break between two commands.

The analogue speed control is always active in the modes MANUEL and TEST. The signal is set for a short time to idle speed if the generator breaker is switched off.

The range of the analogue output for the governor can be within +/-5 volts or 0 to 10 volts. The signal for the idle speed is preset by parameter 23.

*) Function names for the relay parameterisation with PARAWIN

Starting up

The following explanation is for a governor signal 0 to 10 volts. The parameters represent the output voltage in mV. The module for a current loop must be used if a current signal is necessary or the jumper has to be set +/- 5 volts if the range is +/- 5 volts. The starting up procedures is alike.

1. Select the range (parameter 1 or 2) and the control function (normal, reverse, parameter 20) for the connected governor.
2. Select the operation mode OFF.
3. Set the idle speed according to the manufacturers specification (e.g. 2.5 volts means: parameter 23 should be 2500). See SPEED SIGNALS AND GOVERNOR.
4. Set the lower (e.g. 500 for 0.5 volts) and the upper limit (e.g. 4500 for 4.5 volts) according to the manufacturers specification.
5. Start the engine in MANUAL.
6. Adjust the idle speed either at the governor or by varying parameter 23.
7. Raise the signal to the governor to the desired load limit. This must be done with a dummy load or if possible (peak load system) in parallel operation with mains (AUTO or TEST mode).
Select the readout of the speed in ACTUAL VALUES. Press the keys MANUAL or TEST and [↑] at the same time for the increasing or the keys MANUAL or TEST and [↓] for the decreasing of the speed signal.
8. Read the signal to the governor from the display (ACTUAL VALUES, analogue channel 5 or 6) and set the upper limit (parameter 22) to this value.
9. Lower manually the speed of the unloaded engine to the desired speed (e.g. 48 Hz). Read the signal to the governor from the display (ACTUAL VALUES, analogue channel 5 or 6) and set the lower limit (parameter 21) to this value.
10. For adjusting of the gain (parameter 24) select the parallel operation in mode TEST (the load controller is active) or start the engine in island mode (the frequency controller is active). If the regulation overshoots or is unstable decrease parameter 24. If the regulation is too slow, increase the parameter.

Manually speed adjustment

The speed can be adjusted manually. Select for this the readout of the speed in ACTUAL VALUES. Press the keys MANUAL or TEST and [↑] at the same time for increasing or the keys MANUAL or TEST and [↓] for decreasing the speed signal.

CONNECTION OF THE PICK-UP

The signal line of the pick-up is connected to terminal 3 and the return line to terminal 4 of terminal strip X 401.

The shielding has to be connected only to the earth screw next to the terminal strip X 401 and not to the protective wire and must have no electrical connection to other metal parts!

PARAMETER FOR START AND STOP

**This chapter explains the parameterisation and all possible functions. Some functions and their parameters, depending on the model of the KEA, might be lacking in your control unit.
The actual included functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.**

Changes without further notice reserved.

PARAMETER FOR START AND STOP

The following parameters are used for starting and stopping. It is illustrated how the parameters are shown at the screen of the programming software PARAWIN and at the display of the KEA control unit.

Screen of PARAWIN		Display shows:
	++++ Starting and Stopping +++++	START-STOP FUNCTIONS
1	No ... - Automatic start when mains CB tripped?	START IF MAINS - CB TRIPPES
2	No ... - Start if mains failure and simultaneously remote start?	START @ REMOTE - & MAINS FAILS
3	2 sec - Start delay	START DELAY 2.0 sec
4	10 sec - Cranking time	10 s CRANKING
5	7 sec - Break between two cranking attempts	7 s BREAK
6	2 sec - Break between cranking and ignition on (gas engine)	2.0 s CRANK-IGN
7	2 sec - Break between ignition on and gas valve open (gas engine)	2.0 s IGN - GAS
8	3 x - Amount of starting attempts, normal start	3 START AMOUNT
9	10 x - Amount of starting attempts, Sprinkler start	10 @ SPRINKLER
10	7 sec - Delay for 'Alarm monitoring on'	7 s MONITOR.ON 30 s STOP TIMER
11	60 sec - Mains recovery time	MAINS RESTORE 60 sec DELAY
12	300 sec - Cooling-down period	COOLING DOWN TIME 300 s STANDBY
13	900 sec - Cooling-down period after Sprinkler start	COOLING DOWN TIME 900 s SPRINKLER
14	30 sec - Timer for stopping solenoid	7 s MONITOR.ON 30 s STOP TIMER
15	Yes .. - Alarm 'Engine does not shut down' enabled?	Setting see: ENCODING OF ALARMS
16	M-U-S-0 - Encoding of alarm 'Engine does not shut down'	

Parameter 1:

The genset gets a start command when the alarm MAINS CB TRIPPED occurs and this parameter is set to <Yes>. The engine switches after the reconnection delay back to mains supply as soon as this alarm is cancelled.

Parameter 2:

This parameter defines whether the engine starts when the mains voltage fails and a remote start is present at the same time (<Yes>) or if the engine starts if either the mains fails or a remote start is present (<No>).

The genset will start and switch (in systems with overlapping synchronisation without a break, in all other ones with a break) to generator supply if this parameter is set to 'No'.

Parameter 3:

This is the time delay between the signal MAINS VOLTAGE FAILURE (and its delay) and the start command to the genset. The delay can be used for preheating the engine. The timer can be preset in the range of 0 to 24 seconds with increments of 0.1 second.

Parameter 4:

The starter motor is operated for the cranking time. The cranking duration must be prolonged if a gas engine is controlled, as there are additional delays between cranking, ignition on and opening of the gas valve. The timer can be preset in the range of 0 to 240 seconds with increments of 1 second.

Parameter 5:

This is the break between two starting attempts. The timer can be preset in the range of 0 to 240 seconds with increments of 1 second.

Parameter 6:

This timer is only for starting a gas engine. It is the delay between the beginning of cranking and switching on of the ignition. The timer can be preset in the range of 0 to 24 seconds with increments of 0.1 second.

Parameter 7:

This timer is only for starting a gas engine. It is the delay between ignition on and the opening of the gas valve. The timer can be preset in the range of 0 to 24 seconds with increments of 0.1 second.

Parameter 8 und 9:

These are the amount of starting attempts for emergency standby service and for sprinkler operation. The parameters are the total numbers of starting attempts: The value 3 means, that the cranking attempt is repeated twice.

Parameter 10:

The delay of the alarm monitoring is necessary for certain alarms (e.g. oil pressure). These alarms are inhibited during the standstill of the engine. The timer is started as soon as the engine has fired. The DELAYED alarms are enabled after the preset delay. The timer can be preset in the range of 0 to 240 seconds with increments of 1 second

Parameter 11:

The reconnection delay starts when the mains voltage is again back in its limit. The consumers are switched from generator to mains supply after this delay. The timer can be preset in the range of 10 to 2400 seconds with increments of 10 seconds.

Parameter 12:

The engine keeps running without load during the cooling down period. This is for cooling down the engine and the generator. The timer can be preset in the range of 10 to 2400 seconds with increments of 10 seconds.

Parameter 13:

The cooling down period after a sprinkler operation has in addition to the cooling down function the task to be immediately ready for fire fighting if the fire was not totally distinguished. The timer can be preset in the range of 10 to 2400 seconds with increments of 10 seconds.

Parameter 14:

The stop command is send to the engine for this time. All signals for ENGINE IS RUNNING must be off afterwards. The enabled alarm ENGINE DOES NOT COME TO A STANDSTILL is triggered if the engine is still running after the stopping time.

The stop is aborted if the engine gets during the stopping period a new starting command (again a mains failure) and the signal ENGINE IS RUNNING is still alive. The stop procedure is however completed if in this case the signal ENGINE IS RUNNING is already absent.

The timer can be preset in the range of 1 to 240 seconds with increments of 1 second.

Parameter 15 und 16:

A defect of the stop equipment is possible if the engine does not come to a standstill. Parameter 15 enables the dedicated alarm, parameter 16 set the encoding for it.

FUNCTIONS

Gas engine

A pick-up is obligatory in case a gas engine should be controlled, as the signal CRANKING SPEED REACHED is necessary for the start sequence. The start sequence proceeds only after this signal. By this is inhibited that gas flows into an engine that is not turning. The start sequence is as follows:

1. Starter motor on,
2. Ignition delayed (e.g. 2 sec.) on after reaching the cranking speed.
3. Delayed (e.g. another 2 sec.) opening of the gas valve after ignition on.
4. Keep cranking for another 7 seconds.
5. Close gas valve.
6. Starter motor off.
7. After 6 sec. ignition off.
8. After 1 sec. a new start attempt.

Diesel engine

The factory setting for start and stop of an emergency standby genset is as follows:

- Start delay 2 seconds.
- Cranking time 10 seconds.
- Break between two cranking attempts 7 seconds.
- 3 Starting attempts.
- Delay ALARM MONITORING ON 7 seconds.
- Reconnection delay 60 seconds.
- Cooling down period 180 seconds.
- Stop timer 30 seconds.

An additional push button for the preheat must be fitted for the manual operation if a diesel engine needs this signal. The start delay is used for the preheating when the engine is automatically started.

Sprinkler operation

The following parameters are effective for the sprinkler request and differ from those for a standby start.

- Amount of starting attempts.
- Cooling down period.
- Break of the emergency consumers for switching on of the sprinkler pump.

The sprinkler operation is described in the INSTRUCTION MANUAL.

TRANSFER MAINS – GENERATOR SUPPLY

**This chapter explains the parameterisation and all possible functions. Some functions and their parameters, depending on the model of the KEA, might be lacking in your control unit.
The actual included functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.**

Changes without further notice reserved.

TRANSFER MAINS – GENERATOR SUPPLY

The following parameters are used for controlling the mains and the generator CB. It is illustrated how the parameters are shown at the screen of the programming software PARAWIN and at the display of the KEA control unit.

Screen of PARAWIN		Display shows:
	++++ Transfer Mains - Generator +++++	PARAMETER FOR MAINS <> GEN.
1	No ... - Immediately consumers off if mains fails?	CONSUMER OFF IF - MAINS FAILS
2	2 sec - Break between generator CB off and mains CB on	2.0s GEN.>MAINS
3	2 sec - Break between mains CB off and generator CB on	2.0s MAINS>GEN.
4	2 sec - Pulse length for mains CB on	2 s IMP MAINS
5	2 sec - Pulse length for generator CB on	2 s IMP GEN.
6	10 sec - Consumers off for .. sec at Sprinkler start	GEN. OFF @ START 10.0 s SPRINKLER
7	Yes ... - Alarm 'Failure: Mains CB off' enabled? * M-U-W-I ... - Encoding of alarm 'Failure: Mains CB off'	Setting see: ENCODING OF ALARMS
8	Yes ... - Alarm 'Failure: Gen. CB off' enabled? M-U-W-I ... - Encoding of alarm 'Failure: Gen. CB off'	Setting see: ENCODING OF ALARMS
9	Yes ... - Alarm 'Mains CB tripped' enabled? * M-U-W-I ... - Encoding of alarm 'Mains CB tripped'	Setting see: ENCODING OF ALARMS
10	Yes ... - Alarm 'Generator CB tripped' enabled? M-U-W-I ... - Encoding of alarm 'Generator CB tripped'	Setting see: ENCODING OF ALARMS

Parameter 1:

The consumers are immediately switch off if a mains voltage failure occurs and this parameter is set to <Yes>. This is for the protection of sensible consumers. They are reconnected if the engine failed to start and the mains voltage returns.

The consumers are connected to the mains until the genset is ready to take the load if this parameter is set to <No>.

Parameter 2 and 3:

A break is inserted if the consumers are switched over from mains to generator supply and vice versa without an overlapping synchronisation. Coil operated contactors can fall into a secure off state due to this break. The timers can be preset in the range of 0 to 240 seconds with increments of 1 second.

Parameter 4 and 5:

This is pulse length to switch the mains and generator CB on. The timers can be preset in the range of 0 to 240 seconds with increments of 1 second.

Parameter 6:

Purpose: The generator supplies the consumers after a mains failure. The consumer can be switched off for a short time if now a sprinkler request occurs and the sprinkler pump is switched on. There is no break of the consumers supply if this time is set to <0>. The timer can be preset in the range of 0 to 24.0 seconds with increments of 0.1 second.

Parameter 7:

The return signal MAINS CB OFF must be present 2 seconds after the OFF-command. No emergency supply is possible if the mains CB does not switch off. These two parameters enable or disable the alarm MAINS CB DOES NOT CUT OFF and set the encoding.

Important! The genset is locked if this alarm is encoded as a shutdown one or if the generator is switched off!

Parameter 8:

The return signal GENERATOR CB OFF must be present 2 seconds after the OFF-command. The alarm GENERATOR CB DOES NOT CUT OFF comes up after this delay if it is enabled. The genset gets an internal start and remains in isolated operation or in peak load systems in parallel mode if this alarm is present. The alarm must be for this reason encoded as a warning one which keeps the generator CB on.

The engine stops if now a shutdown alarm occurs. A relay can be programmed with the function COUPLING BREAKER OFF. This can switch off an additional coupling breaker that might be installed for security reasons

Parameter 9:

The function and encoding of the alarm MAINS CB TRIPPED is set here. The alarm is internally triggered if no feed back signal MAINS CB IS ON is present after the mains CB closing pulse. Furthermore it can be selected whether the engine should start or not (according VDE standard 0107) in the AUTO or TEST mode. The alarm must be cancelled in this case for switching back to mains supply after the reconnecting delay.

Important! The genset is locked if this alarm is encoded as a shutdown one or if the generator is switched off!

Parameter 10:

The generator circuit breaker can be monitored for automatic tripping (e.g. by an installed overcurrent tripping device). The alarm is internally triggered if no feed back signal GENERATOR CB IS ON is present after the generator closing pulse. These parameters set the encoding of the alarm and whether this alarm is enabled or not.

RELAY AND INDICATOR FUNCTIONS

This chapter explains the parameterisation of all possible relays. Some relays or functions, depending on the model of the KEA, might be lacking in your control unit.

The actual included relays and functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.

Changes without further notice reserved.

PARAMETERISATION OF RELAY- AND INDICATOR FUNCTIONS

The parameterisation with PARAWIN is menu guided and the selectable functions are listed as plaintexts. Two lists with functions and corresponding flags for the direct programming via the keys and display follow further down. There are two lists: the first shows the functions and the second the flags in alphabetic order.

Screen of PARAWIN		Display shows:
	++++ Relay and Indicator Functions +++++	RELAY- / LED FUNCTIONS
1	LD1 Flag 0608	0608 LED 1 0000 LED 2
2	K1T Horn	0E02 PANEL K1 0000 PANEL K2
3	K 1 Operating solenoid	RELAY ON RZ-D 0F80 RELAY K 1

Parameter 1, parameterisation of the four indication LEDs

The four LED of the right row can be controlled by many events. They are marked by LD1, LD2, LD3 and LD4 in PARAWIN and by LED1, LED 2, LED3 and LED 4 if their functions are set via the keys and display. An indication LED can be switched on by a signal, applied to a terminal of the relay unit, by an alarm or by an internal flag. The mostly used functions are listed in PARAWIN and in the list further down.

The indication LED can show many working conditions. Examples:

The LED will light as long as a signal is applied to terminal 18 of the relay unit if for controlling of the LED the flag <0608> is preset.

If the LED should indicate a sensor failure, set the control to flag <46F0> (see list for input of alarms further up).

Set the input of the LED to the flag of an alarm if an indication LED should light in addition to the displayed alarm.

Parameter 2, parameterisation of the operator panel relays

The controlling of the three relays of the operator panel is made as described before. They are marked with K1T, K2T and K3T in PARAWIN and with PANEL K1 to PANEL K3 for the direct programming.

Parameter 3, parameterisation of the relays of RZ-071 D and RZ-071 E

The controlling of these relays is made as described before. They are marked with K1 to K26.

The following lists show the flags and their corresponding functions. If a function is not listed in PARAWIN, select SPECIAL FUNCTION and enter the flag. The direct programming uses these flags.

RELAY AND INDICATOR FUNCTIONS

FLAGS FOR INDICATORS AND RELAYS, FUNCTION SORTED

Alarm 1	2101	Command 'Frequency higher'	3704	Preheat for diesel engine	3E01
Alarm 10	2202	Command 'Frequency lower'	3702	Push-button LED TEST operated	0220
Alarm 11	2204	Command 'Generator CB on'	3F02	Rated speed reached	3C04
Alarm 12	2208	Command 'Load higher'	4608	Relay for pre-start conditions	3410
Alarm 13	2210	Command 'Load lower'	4604	RZ 071-D, terminal 1	0410
Alarm 14	2220	Command 'Mains CB off'	3F01	RZ 071-D, terminal 2	0408
Alarm 15	2240	Command 'Voltage higher'	3780	RZ 071-D, terminal 3	0404
Alarm 16	2280	Command 'Voltage lower'	3740	RZ 071-D, terminal 4	0402
Alarm 17	2301	Common of all alarms	3840	RZ 071-D, terminal 5	0401
Alarm 18	2302	Common of all alarms, NC signal	3880	RZ 071-D, terminal 6	0580
Alarm 19	2304	Common of shut-down alarms	3810	RZ 071-D, terminal 7	0540
Alarm 2	2102	Common of shut-down alarms, NC signal	3820	RZ 071-D, terminal 8	0520
Alarm 3	2104	Common of warning alarms	3804	RZ 071-D, terminal 9	0510
Alarm 4	2108	Common of warning alarms, NC signal	3808	RZ 071-D, terminal 10	0508
Alarm 5	2110	Coupling breaker off	4C20	RZ 071-D, terminal 11	0504
Alarm 6	2120	Cranking speed reached	3C01	RZ 071-D, terminal 12	0502
Alarm 7	2140	Engine is available	3304	RZ 071-D, terminal 13	0501
Alarm 8	2180	Engine is running	0D10	RZ 071-D, terminal 14	0680
Alarm 9	2201	Engine is running at mains operation	4140	RZ 071-D, terminal 15	0640
Alarm battery undervoltage	2308	Frequency higher	3704	RZ 071-D, terminal 16	0620
Alarm cranking failure	2320	Frequency lower	3702	RZ 071-D, terminal 17	0610
Alarm engine keeps running	2310	Gas valve	3E08	RZ 071-D, terminal 18	0608
Alarm 'generator CB off' failed	2408	Generator load higher	4608	RZ 071-D, terminal 19	0604
Alarm generator CB tripped	2420	Generator load lower	4604	RZ 071-D, terminal 20	0602
Alarm generator currents unbalanced	2540	Generator overload	25F0	RZ 071-D, terminal 21	0601
Alarm generator overcurrent I	2510	Generator voltage within its limits	3320	RZ 071-D, terminal 22	0780
Alarm generator overcurrent II	2520	Genset in island mode	3708	RZ 071-D, terminal 23	0740
Alarm generator overfrequency	2680	Genset in parallel mode	3720	RZ 071-D, terminal 24	0720
Alarm generator overvoltage	2620	Horn on	0e02	RZ 071-D, terminal 25	0710
Alarm generator underfrequency	2640	Ignition on	3E10	RZ 071-D, terminal 26	0708
Alarm generator undervoltage	2610	Ignition speed reached	3C02	RZ 071-D, terminal 27	0704
Alarm generator: therm. overload	2580	Impulse command 'Generator CB on'	3F08	RZ 071-D, terminal 28	0702
Alarm load controller failed	2380	Impulse command 'Mains CB on'	3F04	RZ 071-D, terminal 29	0701
Alarm 'mains CB off' failed	2404	Kuhse KRV on	4C10	Sensor failure channel 1	4610
Alarm mains CB tripped	2410	Limit A of channel 1 exceeded	4901	Sensor failure channel 2	4620
Alarm mains currents unbalanced	2504	Limit A of channel 2 exceeded	4904	Sensor failure channel 3	4640
Alarm mains overcurrent I	2501	Limit A of channel 3 exceeded	4910	Sensor failure channel 4	4680
Alarm mains overcurrent II	2502	Limit A of channel 4 exceeded	4940	Signal 'Generator reverse power'	1480
Alarm mains overfrequency	2608	Limit B of channel 1 exceeded	4902	Signal 'Mains reverse power'	1501
Alarm mains overvoltage	2602	Limit B of channel 2 exceeded	4908	Speed governor higher	4B1
Alarm mains underfrequency	2604	Limit B of channel 3 exceeded	4920	Speed governor lower	4B08
Alarm mains undervoltage	2601	Limit B of channel 4 exceeded	4980	Starter motor	3E02
Alarm mains: thermal overload	2508	Mains supply mode	3710	Stopping solenoid	3E04
Alarm monitoring is on	0D20	Mains voltage within its limits	3310	Synchronisation of generator CB	3C40
Alarm overspeed	2340	Operation mode AUTO	0040	Synchronisation of mains CB	3C80
Alarm phase sequence of gen. wrong	2480	Operation mode MANUAL	0020		
Alarm phase sequence of mains wrong	2440	Operation mode OFF	0010		
Alarm reverse power	2401	Operation mode TEST	0080		
Alarm synchronisation failed	2402	Operation solenoid	0F80		
Battery undervoltage, NC signal	4001	Overspeed reached	3C08		
Check synchroniser	4C08				

RELAY AND INDICATOR FUNCTIONS

FLAGS FOR INDICATORS AND RELAYS, FLAG SORTED

0010	Operation mode OFF	2220	Alarm 14		signal
0020	Operation mode MANUAL	2240	Alarm 15	3810	Common of shut-down alarms
0040	Operation mode AUTO	2280	Alarm 16	3820	Common of shut-down alarms, NC signal
0080	Operation mode TEST	2301	Alarm 17	3840	Common of all alarms
0220	Push-button LED TEST operated	2302	Alarm 18	3880	Common of all alarms, NC signal
0401	RZ 071-D, terminal 5	2304	Alarm 19	3C01	Cranking speed reached
0402	RZ 071-D, terminal 4	2308	Alarm battery undervoltage	3C02	Ignition speed reached
0404	RZ 071-D, terminal 3	2320	Alarm cranking failure	3C04	Rated speed reached
0408	RZ 071-D, terminal 2	2340	Alarm overspeed	3C08	Overspeed reached
0410	RZ 071-D, terminal 1	2380	Alarm load controller failed	3C40	Synchronisation of generator CB
0501	RZ 071-D, terminal 13	2401	Alarm reverse power	3C80	Synchronisation of mains CB
0502	RZ 071-D, terminal 12	2402	Alarm synchronisation failed	3E01	Preheat for diesel engine
0504	RZ 071-D, terminal 11	2404	Alarm 'mains CB off' failed	3E02	Starter motor
0508	RZ 071-D, terminal 10	2408	Alarm 'generator CB off' failed	3E04	Stopping solenoid
0510	RZ 071-D, terminal 9	2410	Alarm mains CB tripped	3E08	Gas valve
0520	RZ 071-D, terminal 8	2420	Alarm generator CB tripped	3E10	Ignition on
0540	RZ 071-D, terminal 7	2440	Alarm phase sequence of mains wrong	3F01	Command 'Mains CB off'
0580	RZ 071-D, terminal 6	2480	Alarm phase sequence of gen. wrong	3F02	Command 'Generator CB on'
0601	RZ 071-D, terminal 21	2501	Alarm mains overcurrent I	3F04	Impulse command 'Mains CB on'
0602	RZ 071-D, terminal 20	2502	Alarm mains overcurrent II	3F08	Impulse command 'Generator CB on'
0604	RZ 071-D, terminal 19	2504	Alarm mains currents unbalanced	4001	Battery undervoltage, NC signal
0608	RZ 071-D, terminal 18	2508	Alarm mains: thermal overload	4140	Engine is running at mains operation
0610	RZ 071-D, terminal 17	2510	Alarm generator overcurrent I	4604	Command 'Load lower'
0620	RZ 071-D, terminal 16	2520	Alarm generator overcurrent II	4604	Generator load lower
0640	RZ 071-D, terminal 15	2540	Alarm generator currents unbalanced	4608	Command 'Load higher'
0680	RZ 071-D, terminal 14	2580	Alarm generator: therm. overload	4608	Generator load higher
0701	RZ 071-D, terminal 29	25F0	Generator overload	4610	Sensor failure channel 1
0702	RZ 071-D, terminal 28	2601	Alarm mains undervoltage	4620	Sensor failure channel 2
0704	RZ 071-D, terminal 27	2602	Alarm mains overvoltage	4640	Sensor failure channel 3
0708	RZ 071-D, terminal 26	2604	Alarm mains underfrequency	4680	Sensor failure channel 4
0710	RZ 071-D, terminal 25	2608	Alarm mains overfrequency	4901	Limit A of channel 1 exceeded
0720	RZ 071-D, terminal 24	2610	Alarm generator undervoltage	4902	Limit B of channel 1 exceeded
0740	RZ 071-D, terminal 23	2620	Alarm generator overvoltage	4904	Limit A of channel 2 exceeded
0780	RZ 071-D, terminal 22	2640	Alarm generator underfrequency	4908	Limit B of channel 2 exceeded
0D10	Engine is running	2680	Alarm generator overfrequency	4910	Limit A of channel 3 exceeded
0D20	Alarm monitoring is on	3304	Engine is available	4920	Limit B of channel 3 exceeded
0e02	Horn on	3310	Mains voltage within its limits	4940	Limit A of channel 4 exceeded
0F80	Operation solenoid	3320	Generator voltage within its limits	4980	Limit B of channel 4 exceeded
1480	Signal 'Generator reverse power'	3410	Relay for pre-start conditions	4B08	Speed governor lower
1501	Signal 'Mains reverse power'	3702	Command 'Frequency lower'	4B1	Speed governor higher
2101	Alarm 1	3702	Frequency lower	4C08	Check synchroniser
2102	Alarm 2	3704	Command 'Frequency higher'	4C10	Kuhse KRV on
2104	Alarm 3	3704	Frequency higher	4C20	Coupling breaker off
2108	Alarm 4	3708	Genset in island mode		
2110	Alarm 5	3710	Mains supply mode		
2120	Alarm 6	3720	Genset in parallel mode		
2140	Alarm 7	3740	Command 'Voltage lower'		
2180	Alarm 8	3780	Command 'Voltage higher'		
2201	Alarm 9	3804	Common of warning alarms		
2202	Alarm 10	3808	Common of warning alarms, NC		
2204	Alarm 11				
2208	Alarm 12				
2210	Alarm 13				

INTERNAL SYNCHRONIZER

**This chapter explains the parameterisation and all possible functions. Some functions and their parameters, depending on the model of the KEA, might be lacking in your control unit.
The actual included functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.**

Changes without further notice reserved.

INTERNAL SYNCHRONISER

The parameters for synchronising are divided into three parts in PARAWIN. They are combined to one group for the direct parameterisation.

Screen of PARAWIN		Display shows:
	++++ Internal Synchronizer ++++	SYN. FUNCTION f/U CONTROLLER
1	Yes - Internal synchronizer enabled?	INT. SY-FUNCTION + [+] = active
2	0.30 Hz - Max. difference of frequencies	0.30 Hz <DIFF. f
3	10 +/-% - Max. difference of voltages	10 % < DIFF. U
4	120 msec - Closing time of CB	LEAD TIME OF 120 ms ON-PULSE
5	0.5 sec - Pulse length of command 'CB on' *	LENGTH OF 0.5 s ON-PULSE
6	180 sec - Alarm 'Synchronisation failed' after .. seconds	SYNCHR. FAILED 180 s DELAYED
7	No ... - Transfer load in case of 'Synchronisation failed'?	SWITCH OVER AT - SYNCHR. FAILED
8	Yes ... - Alarm 'Synchronisation failed' enabled? *	Setting see: ENCODING OF ALARMS
9	M-U-W-I . - Encoding of alarm 'Synchronisation failed'	
10	0.5 sec - Command length for frequencies matching	0.5 s f-COMMAND
11	2.5 sec - Break between two speed commands	2.5 s f-BREAK
12	0.8 sec - Command length for voltages matching	0.8 s U-COMMAND
13	2.5 sec - Delay between two voltage commands	2.5 s U-BREAK

Parameter 1:

Set this parameter to <No> if an external synchroniser is used. The relays for SYNCHRONISATION OF MAINS CB or GENERATOR CB, the alarm SYNCHRONISATION FAILURE and the function of parameter 7 (TRANSFER LOAD IN CASE OF 'SYNCHRONISATION FAILED') are always effective.

Parameters 2 and 3:

The upper limits of the voltage and frequency deviations are entered here. The synchronisation is inhibited as long as any difference is greater than the preset limit. The frequency difference is entered in the range of 0.1 to 0.6 Hz with increments of 0.01 Hz, the voltage difference in the range of 4 to 20% with increments of 1%. The voltages and frequencies are shown in ACTUAL VALUES in the manner of double volt- and double frequency meters.

Parameter 4:

This time is the delay of the circuit breaker. The synchronisation pulse starts for this time earlier as the true synchronism. The contacts of the CB close therefore exactly at the moment of synchronism. The range for this setting is 40 to 250 msec.

Parameter 5:

This is the total length of the synchronisation pulse (range 0.1 to 1 second, increments of 0.1 second). Please observe that this pulse can be set longer than the real delay to synchronism. Set the pulse length therefore only as long as needed.

Parameters 6 and 7:

A timer is started at the beginning of the synchronisation. The timer is stopped if the synchronisation has taken place. The internal flag SYNCHRONISATION FAILURE is set if the synchronisation has not taken place within this time. The flag can trigger an alarm or control a relay. The timer can be preset in the range of 0 to 2400 seconds with increments of 10 seconds. Furthermore you can program if the load transfer is now made with a break (<Yes>) or if trying to synchronise is continued (<No>). The alarm SYNCHRONISATION FAILURE must be enabled (parameter 8 set to <Yes>) for this function.

Parameters 8 and 9:

An alarm can be triggered if the duration of the synchronisation is too long. See parameters 6 and 7. Parameter 9 is the encoding for this alarm. The parameters are found in ENCODING OF ALARMS if the parameterisation via the keys and the display of the unit is used.

Parameters 10 and 11:

This is the control timing for the matching of the frequencies. A break follows after each command pulse to give the engine time to accelerate or decelerate. This timing is also used for the FREQUENCY CONTROLLING IN ISLAND OPERATION. The timers can be preset in the range of 0 to 24 seconds with increments of 0.1 second.

Parameters 12 and 13:

This is the control timing for the matching of the voltages. A break follows after each command pulse to give the voltage regulator (AVR) time to carry out the command. This timing is also used for the VOLTAGE CONTROLLING IN ISLAND OPERATION. The timers can be preset in the range of 0 to 24 seconds with increments of 0.1 second.

FUNCTION

The internal synchroniser has two independent synchronisation channels and takes into consideration the closing time of the circuit breaker. An independent internal check synchroniser (with adjustable release angle) acts as the second channel.

A double volt-, a double frequency meter and a synchronoscope with a symbolic turning pointer are found in ACTUAL VALUES.

230 V 50.00 Hz
234 V 50.23 Hz

Double volt- and frequency meter. The upper line shows the mains or busbar values, the lower one the values of the system that is to be synchronised.

..>.....|.....
.....

Display of the synchronoscope. The signs [>] and [<] act like the pointer of a pointer synchronoscope. Synchronism is at the sign [|].

The duration of the synchronisation is monitored and an alarm can be triggered if it is too long. Furthermore you can preset if in this case

- The load transfer is made with a break.
- Trying to synchronise is continued or the genset is shutdown.

The differences of voltages and frequencies are checked for maximum limits. The synchronisation pulse is inhibited as long as any of them is out of range. Commands for matching are given to the genset in this case. A break is made after each command to give the genset time to carry out the command. The synchronisation is inhibited during this break.

Matching of voltages

The matching of voltages can be made for synchronising. The mean voltages from both systems are compared. The synchronisation is inhibited if the difference is greater than the limit. The voltage of the synchronised system is matched to the fixed system by commands either to a motor operated voltage adjuster or direct to the AVR as an analogue signal or via the CAN-bus (if provided). A break is made after each command to give the voltage regulator time to carry out the command. The command- and break pulses are the same as those used for VOLTAGE CONTROL IN ISOLATED OPERATION.

This voltage matching and the function VOLTAGE CONTROL IN ISOLATED OPERATION allows to take the load with an overlapping synchronisation from an undervoltage mains system and then raise the voltage to the normal level in isolated operation.

Matching of frequencies

The difference of the frequencies must not be too small or too great. The beat is longer than 20 seconds if the difference is too small (less than 0.05 Hz). Commands to raise the frequency are given in this case to get a quick synchronisation.

The synchronisation is inhibited if the difference is greater than the limit. The frequency of the synchronised system is matched to the fixed system by commands either to a motor operated potentiometer of the speed governor or direct to the speed governor as an analogue signal or via the CAN-bus (if provided). A break is made after each command to give the engine time to carry out the command. The command- and break pulses are the same as those used for FREQUENCY CONTROL IN ISOLATED OPERATION.

INTERNAL SYNCHRONIZER

Check synchroniser

The adjustment of the check synchroniser is not critical. The enabling angle is set by a potentiometer, which can be operated through a hole in the upper side of the cover. The mechanical turning angle of the potentiometer covers 270 degrees, corresponding to an electrical angle of 3 to 30 degrees. The ccw end corresponds to 3 degrees.

FREQUENCY CONTROL IN ISOLATED OPERATION

The parameters follow those for the synchronisation if directly programmed via the keys and display. The PARAWIN has an own group for these parameters.

Screen of PARAWIN		Display shows:
	++++ Frequency Controller at isolated Operation +++++	FREQUENCY CONTR. VOLTAGE CONTROL
1	Yes - Frequency controller enabled?	+ f-CONTR.active + U-CONTR.active
2	49.50 V - Lower frequency limit	49.50 Hz min
3	50.50 V - Upper frequency limit	50.50 Hz max
4	0.5 sec - Command length for frequency controlling	0.5 s f-COMMAND
5	3.0 sec - Break between two speed commands	3.0 s f-BREAK

Parameter 1:

This parameter is for enabling or disabling of the frequency controlling in isolated operation.

Parameters 2 and 3:

These parameters define the dead band of the frequency controller. No command is given if the actual frequency is within these limits. Corresponding commands are given to the speed governor if the frequency is outside of these limits.

Parameters 4 and 5:

The frequency is either adjusted by a motor operated potentiometer of the speed governor or direct to the speed governor by an analogue signal or via the CAN-bus (if provided). The length of the command pulse is set here. A break is made after each command to give the engine time to carry out the command. The command and break pulses are the same as used for the synchronisation. The timers can be preset in the range of 0 to 24 seconds with increments of 0.1 second.

FUNCTION

A lower and an upper limit are preset for the frequency controlling. No commands are given to the engine if the actual frequency is in the dead band between the upper and the lower frequency. Corresponding commands are given if the frequency is outside this window. A break is inserted between two commands to give the engine time to carry out the command.

The signals to the speed governor are described in SPEED SIGNALS AND GOVERNOR.
--

INTERNAL SYNCHRONIZER

VOLTAGE CONTROL IN ISOLATED OPERATION

The parameters follow those for the synchronisation if directly programmed via the keys and display. The PARAWIN has an own group for these parameters.

Screen of PARAWIN		Display shows:
	++++ Voltage Controller at isolated Operation +++++	FREQUENCY CONTR. VOLTAGE CONTROL
1	Yes - Voltage controller enabled?	+ f-CONTR.active + U-CONTR.active
2	228 V - Lower voltage limit	228 volts min.
3	235 V - Upper voltage limit *	235 volts max.
4	0.5 sec - Command length for voltage controlling	0.5 s U-Command
5	0.5 sec - Break between two speed commands	0.5 s U-Break

Parameter 1:

This parameter is for enabling or disabling of the voltage controlling in isolated operation.

Parameters 2 and 3:

These parameters define the dead band of the voltage controller. No command is given if the mean value of the actual voltage of the three phases is within these limits. Corresponding commands are given to the voltage regulator if the voltage is outside of these limits.

Parameters 4 and 5:

The voltage is either adjusted by a motor operated potentiometer of the voltage regulator or direct to the voltage regulator (AVR) by an analogue signal or via the CAN-bus (if provided). The length of the command pulse is set here. A break is made after each command to give the voltage regulator time to carry out the command. The command- and break pulses are the same as used for the synchronisation. The timers can be preset in the range of 0 to 24 seconds with increments of 0.1 second.

FUNCTION

A lower and an upper limit are preset for the voltage controlling. No commands are given to the generator if the actual voltage is in the dead band between the upper and the lower voltage. Corresponding commands are given if the voltage is outside this window. A break is inserted between two commands to give the engine time to carry out the command.

LOAD- AND PF-CONTROLLER

**This chapter explains the parameterisation and all possible functions. Some functions and their parameters, depending on the model of the KEA, might be lacking in your control unit.
The actual included functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.**

Changes without further notice reserved.

LOAD- AND PF CONTROLLER

The parameters for the load and PF controller are divided in PARAWIN into two groups. They are combined in one menu for the direct programming. It is illustrated how the parameters are shown at the screen of the programming software PARAWIN and at the display of the KEA control unit.

Screen of PARAWIN		Display shows:
	++++ Load Controller ++++	LOAD CONTROLLER PF CONTROLLER
1	Yes - Internal load controller enabled?	+ LOAD CONTR. ON
2	No - Operation mode 'Variable Load Control' on?	- VARIABLE LOAD
3	No - Load set point via CAN?	LOAD SET POINT - VIA CAN
4	300 kW - Rated load of generator	NOMINAL LOAD 300 kW
5	290 kW - Fixed load command	290 kW FIX. LOAD
6	10 kW - Dead band of load controlling	10 kW DEAD GAP
7	2.5 sec - Command length for load control	2.5 s COMMAND
8	4.5 sec - Break between two load commands	4.5 s BREAK
9	180 sec - Period for engine loading	UPLOADING 180 s INTERVAL
10	30 kW - CB off when load < ... kW *	UNLOAD DOWN TO 30 kW
11	180 sec - Monitoring time for unloading *	MONITORING TIME 180 s UNLOADING
12	180 sec - Delay of alarm 'Load Controller failed'	DELAY LOAD CONTR 180 s FAILED
13	Yes - Alarm 'Load Controller failed' enabled?	ALARM LOAD CONTR + [+ = active]
14	M-U-S-0 - Encoding of Alarm 'Load Controller failed'	Setting see: ENCODING OF ALARMS
15	-30 kW - Limit for 'Reverse Power'	REVERSE POWER - 30 kW
16	10.0 sec - Delay of alarm 'Reverse Power'	REV. POWER ALARM 10.0 s DELAYED
17	Yes - Alarm 'Reverse Power' enabled?	REV. POWER ALARM [+ = active]
18	M-U-S-0 - Encoding of alarm 'Reverse Power'	Setting see: ENCODING OF ALARMS

Parameter 1:

Set the parameter to <No> or to <-> (for programming via keys and display) if the internal load controller is not used. All necessary signals for an external load controller are always available.

Parameter 2:

This parameter is only valid if the load controller is enabled. The parameter is set to <No> if the loading of the genset is fixed and set by parameter 5. The loading in case of a variable load controlling must be applied either via the analogue input 4 or via the CAN-bus. The scaling of the analogue load command is described further down in FUNCTION OF THE LOAD CONTROLLER.

Parameter 3:

Set the parameters 2 and 3 to <Yes> if the load signal is transmitted via the CAN-bus.

Parameter 4:

The parameter 'rated load of the generator' limits the set point for the load. This limit cannot be exceeded. Set this parameter to a higher value, if the genset should temporarily be loaded up to 110%.

Parameter 5:

This is the set point for the fixed loading.

Parameter 6:

A dead band is defined for the load controller. The controller is in a steady state and no commands are given to the engine if the actual load is within the range of (set point +/- this parameter).

Parameters 7 and 8:

The load is either controller by a motor operated potentiometer of the speed governor or direct to the speed governor by an analogue signal or via the CAN-bus (if provided). The length of the command pulse (parameter 7) is set here. A break (parameter 8) is made after each command to give the engine time to carry out the command. The timers can be preset in the range of 0 to 24 seconds with increments of 0.1 second.

Parameter 9:

The temporary set point of the loading is internally set to 20% of the actual set point as soon as the generator CB is on. This temporarily load signal is increased every 10 seconds so that the engine is loaded as desired after the preset loading time. The controller follows now immediately the set point of the loading.

Parameter 10:

The engine is unloaded before the generator CB is switched off. The CB is switched off as soon as the load falls below this value.

Parameter 11:

The duration of the unloading sequence is monitored. The generator CB is switched off independent from the actual load after this maximum unloading time.

Parameters 12, 13 and 14:

The function of the load controller is monitored. The actual load must be at least one time within the dead band during the monitored time. Otherwise the internal flag LOAD CONTROLLER FAILURE is set.

Set parameter 12 to <Yes> if this flag should trigger the alarm LOAD CONTROLLER FAILURE. Parameter 13 sets the encoding of this alarm.

Parameters 15, 16, 17 and 18:

The genset is monitored for reverse power during parallel operation. Parameter 15 sets the limit for the reverse power. The internal flag REVERSE POWER is set delayed (parameter 16) if the power of the genset falls below this limit. Parameter 17 has to set to <Yes> if this alarm should be announced. Parameter 18 is the encoding of this alarm.

FUNCTION OF LOAD CONTROLLER

The load controller works either with a preset (fixed) or with a variable set point of the loading. The genset is loaded up in parallel operation with mains to the preset load command or if variable load controlling is selected (for load sharing) up to the set point, applied either to the analogue input 4 or sent via the CAN-bus. The controller is enable in the operation mode AUTO and TEST.

The genset is first loaded with 20% of the set point of the loading. This temporarily set point is slowly increased during the up-loading time to 100%. The engine follows without any delay the set point if the actual value was once in the dead band.

The genset is slowly unloaded if the generator should be switched off. The generator is switched off as soon as the actual load is less than the preset limit (parameter 10). A timer is started at the beginning of the unloading sequence. A malfunction of the speed governor might be possible if the unloading is not finished within the preset time. The generator is therefore switched off without being unloaded.

SIGNALS FOR EXTERNAL LOAD CONTROLLER

The internal load controller can be locked if an external one is used. The commands for the external load controller, - LOAD CONTROLLER ON and UNLOADING -, have to be programmed to two relays. The command LOAD CONTROLLER ON is given as soon as the engine is in parallel operation. The command UNLOADING is given if the genset is in parallel operation and the start command for the genset is removed. The generator is either switched off by a signal applied to terminal 22 of the relay unit (GENERATOR UNLOADED) or if the actual generator load is lower than the unloaded point.

External set point for loading

The set point for loading must be applied to the analogue channel 4 or via the CAN-bus (See CAN-Manual) if the load controller is set to VARIABLE LOAD. This input is fitted with an interface module for 0 – 20 mA and needs to be programmed. Example:

The current of 4 mA corresponds to a loading command of 10 kW, a current of 20 mA to a loading of 300 kW. The slot for the analogue input 4 is fitted with an interface module with the identifier 3. The LOWER REFERENCE is always the value corresponding to 0 mA even if the current loop is 4 – 20 mA. The value is calculated as follows:

$$(P_{20mA} - P_{4mA}) / 16 \text{ mA} = A \text{ [kW/mA]} \quad (300-10) / 16 = 18.125 \text{ [kW/mA]}$$

One mA corresponds due to this calculation to 18.125 kW. 4 mA are $18.125 \times 4 = 72.5$ kW. The zero point is 72.5 kW away from the 4 mA point and by this is the

$$\text{LOWER REFERENCE} = P_{4mA} - 72.5 \quad 10 - 72.5 = -62.5 \text{ kW}$$

The LOWER REFERENCE is set to (rounded) -63 kW, the UPPER REFERENCE to 300kW.

A combined formula is $\text{LOWER REFERENCE} = (5 \times P_{4mA} - P_{20mA}) / 4$

LOAD- AND PF-CONTROLLER

PARAMETERISATION OF THE PF CONTROLLER

Screen of PARAWIN		Display shows:
	++++ Power Factor Controller at parallel Operation +++++	POWER FACTOR CONTROLLER
1	Yes ... - PF controller enabled?	+ MAINS GUIDANCE
2	Yes ... - Actual value is PF from mains?	+ CONTROL active
3	-0.80 ... - Lower limit of generator's PF	-0.80 PF < LIMIT
4	-0.99 ... - Upper limit of generator's PF	-0.99 PF > LIMIT
5	-0.85 ... - Lower PF for controlling	-0.85 PF min.CTL
6	-0.95.... - Upper PF for controlling	-0.95 PF max.CTL
7	1.5 sec - Command length for PF controlling	1.5 s COMMAND
8	5.0 sec - Break between two PF commands	5.0 s BREAK
9	Yes ... - PF controller, swap commands +/-?	Set only with ParaWin
10	300 sec - Alarm 'PF controller failed' after .. seconds	DELAY COS CONTR. 300 s FAILED

Parameter 1:

This parameter is for enabling or disabling of the power factor (PF) controller.

Parameter 2:

This parameter is set to <Yes> if the mains current acts as the actual value for the PF controller. Set it to <No> if the actual value is the PF of the generator.

Parameters 3 and 4:

The PF of the generator is monitored. The actual PF must be between these two limits. This monitoring is important in case the mains PF is controlled and the generator cannot deliver enough reactive power. These two parameters act as 'limit switches'. A positive value means 'lag', a negative one means 'lead'.

Parameters 5 and 6:

These parameters define the dead band of the PF controller. No command is given if the actual PF is within these limits. Corresponding commands are given to the voltage regulator (AVR) if the PF is outside of these limits. A positive value means 'lag', a negative one means 'lead'.

Parameters 7 and 8:

The voltage is either adjusted by a motor operated potentiometer of the voltage regulator or direct to the voltage regulator (AVR) by an analogue signal or via the CAN-bus (if provided). The length of the command pulse is set here. A break is made after each command to give the voltage regulator time to carry out the command. The command- and break pulses are the same as those used for the synchronisation. The timers can be preset in the range of 0 to 24 seconds with increments of 0.1 second.

Parameter 9:

The commands for voltage controlling are give separately for voltage and PF control to the voltage regulator or in addition as combined commands of both controllers. The commands of the PF controller can be swapped for this signal, so that the command higher from the voltage controller and the command lower from the PF controller activate the same output.

Parameter 10:

The function of the PF controller is monitored. The actual PF must be at least one time within the dead band during the monitored time. Otherwise the internal flag PF CONTROLLER FAILURE is set.

One of the first 19 alarms can be used for announcing this failure. Program in this case with PARAWIN:

- The text (| FAILURE| PF CONTROLLER| .
- The flag (PF controller failed, 1908).
- Encoding for this alarm.

FUNCTION OF THE PF CONTROLLER

Power plants without monitoring of the mains current

The PF controller is enabled during parallel operation if the generator current of L2 (this is the actual value for the controlling) exceeds 10% of the nominal current. The excitation of the generator is controlled to keep the PF of the generator inside the preset PF window. The controlling is obtained by pulse commands to a motor driven voltage adjuster of the generator. The controlling by an analogue signal or via the CAN-bus is under design.

The generator voltage is brought back during the cooling down period to the preset window of the VOLTAGE CONTROL IN ISOLATED OPERATION.

Power plants with monitoring of the mains current

The parameterisation selects whether the PF of the mains input or the PF of the generator output is to be controlled. The mains- and the generator current of each L2 must exceed 10% of the nominal current to enable the PF controller in case the PF of mains is controlled. If the PF of the generator is controlled, only the current of the generator must be higher than 10%. The excitation of the generator is controlled to keep the PF of the generator inside the preset PF window. The controlling is obtained by pulse commands to a motor driven voltage adjuster of the generator. The controlling by an analogue signal or via the CAN-bus is under design.

The allowed range of the generator excitation might be left in case the mains PF is controlled and the generator is not able to deliver enough reactive power. A second PF-window prevents this malfunction. The voltage or excitation of the generator gets suitable commands if the PF of the generator leaves this window.

The generator voltage is brought back during the cooling down period to the preset window of the VOLTAGE CONTROL IN ISOLATED OPERATION.

PROTECTION OF PARALLEL OPERATION

**This chapter explains the parameterisation and all possible functions. Some functions and their parameters, depending on the model of the KEA, might be lacking in your control unit.
The actual included functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.**

Changes without further notice reserved.

PROTECTION OF PARALLEL OPERATION

The following parameters are used for the monitoring of a mains voltage failure during a mains parallel operation. It is illustrated how the parameters are shown at the screen of the programming software PARAWIN and at the display of the KEA control unit.

Screen of PARAWIN		Display shows:
	++++ Protection for Parallel Operation ++++	MAINS FAILURE IN PARALLEL SERVICE
1	1.0 sec - Enabling delay of protection	DELAY PARALLEL 1.0 s MONITOR
2	15 V - Mains failure if $du/dt > \dots$ volts	MAINS: du/dt 15 V >alarm
3	Yes - du/dt enabled?	MAINS: du/dt + MONITOR? + YES
4	0.2 Hz - Mains failure if $df/dt > \dots$ Hz	MAINS: df/dt 0.20 Hz >alarm
5	Yes - df/dt enabled?	MAINS: df/dt + MONITOR? + YES
6	15 degr - Mains failure if phase shift is $> \dots$ degrees [ANSI 78]	MAINS VECT.SHIFT 15 DEGR >alarm
7	Yes - Phase shift enabled?	MAINS VECT.SHIFT + MONITOR? + YES
8	300 kW - Consumption from mains, upper limit	MAX. MAINS LOAD 300 kW IMPORT
9	200 kW - Consumption from mains, lower limit	MIN. MAINS LOAD 200 kW IMPORT
10	60 sec - Delay for 'Consumption out of limits'	DEL. MAINS LOAD 60 s IMPORT LOW
11	No - Consumption from mains enabled for mains failure detection?	MAINS LOW INPUT - MONITOR? + YES
12	Yes - Mains unbalanced current enabled for mains failure detection?	MAINS UNBALANCED + MONITOR? + YES

Parameter 1:

The mains failure monitoring is enabled after a short delay when the systems are in parallel. This inhibits a wrong detection as possible voltage changes or a wrong phase shift can occur when the systems are synchronised. The timer can be preset in the range of 0.1 to 4 seconds with increments of 0.1 second.

Parameter 2:

Not only fixed limits for the voltage monitoring are used for the mains failure detection but also the difference of the voltages during 4 periods. The advantage of this (du/dt) is that short speedy voltage changes signalise a mains failure too. Parameter 2 defines the maximum limit.

Parameter 3:

This parameter enables or disables the monitoring of du/dt .

Parameter 4:

Not only fixed limits for the frequency monitoring are used for the mains failure detection but also the difference of the frequencies during 4 periods. The advantage of this (df/dt) is that short speedy frequency changes signalise a mains failure too. Parameter 4 defines the maximum limit.

Parameter 5:

This parameter enables or disables the monitoring of df/dt .

Parameter 6:

A vector shift of the voltages occurs if the mains voltage fails and due to this the load of the generator changes as well. A mains failure is stated if the actual shift is greater than the preset one.

Parameter 7:

This parameter enables or disables the vector shift monitoring.

Parameter 8 und 9:

The load import from mains can be monitored by two limits. This function can be used for various purposes: e.g. a mains failure is detected if the load consumption from mains falls below a lower limit or a peak load start command for the genset is created if the mains load is too high.

Parameter 10:

The internal flag MAINS LOAD IMPORT HIGH is delayed set if the actual mains load is greater than the upper limit and delayed reset if it is lower than the lower limit. The timer can be preset in the range of 1 to 240 seconds with increments of 1 second.

Parameter 11:

This parameter enables or disables the monitoring if a low mains load should signalise a mains failure.

Parameter 12:

The signal UNBALANCED CURRENTS can monitor a blown mains fuse. The setting of the unbalanced currents (of CURRENT MONITOR) is used but the enabling or disabling is not effective here. Set this parameter to <Yes> if the unbalanced monitoring is used for the mains failure detection.

FUNCTIONS

The mains failure protection is enabled after a short delay when the parallel operation begins. This delay inhibits a wrong detection as possible voltage changes or a wrong phase shift can occur when the systems are synchronised. The relay K 6 of the relay unit switches immediately the mains CB off and the normal mains voltage monitor is set to UNDERVOLTAGE if a mains failure is detected. The response delay of the mains voltage monitor for the standby mode is not effective yet. The genset keeps running in idle mode or shuts down, depending on the parameterisation.

The reconnection delay is inserted if a mains failure was detected. This prevents nonessential load transfers between mains and genset if a new mains failure follows short after the first one. The genset will after the reconnection delay synchronise back to mains and enter the parallel operation (peak load command is present) or transfer the load back to mains (without the peak load command) with an overlapping synchronisation and shuts down after the cooling down period. The following functions are possible for the detection of a mains failure in parallel operation.

Voltage (du/dt) and frequency (df/dt) differential

The values of the voltages and frequencies are permanently stored and compared with the preceding ones. A mains failure is stated in parallel operation if the function is enabled and the difference between two corresponding voltages (du/dt) or frequencies (df/dt) is greater than the allowed preset value. The advantage of this monitoring is that short speedy voltage or frequency changes signalise a mains failure too.

Checking for limit values

The mains voltage is monitored for the limits of the standby mode. But differing from the standby mode all criterions (under- and overvoltage and -frequency) are undelayed monitored, even if a function is disabled for the standby mode. A mains failure is recognised by this monitoring, as a slow drifting of the voltage or of the frequency (du/dt or df/dt) might not detected a mains failure.

Vector shift

The length of each period is measured and compared with the preceding one. A deviation is calculated as electrical degree. This is the amount of the vector shift. A mains failure is possible if the actual shift is greater than the limit.

Minimum load import from mains

The load import from mains can be used for a mains failure detection if a minimum load consumption should not fall below a preset level. A mains failure is immediately detected as soon as the mains load falls below this limit if the function is enabled.

Unbalanced currents

The monitoring of unbalanced mains currents is possible in addition to all before described functions for a mains failure detection. This e.g. detects a blown fuse. The genset is overloaded if it tries now to produce the desired power only via two phases.

The limit for the unbalanced currents, set in the current monitor for mains, is used with out any delay time.

SEALING OF SETTING

A jumper inside the unit, at the middle PCB, is used for the sealing of the parameters for the parallel operation protection. The parameters 2 to 7 cannot be modified if this jumper is removed. No unauthorised person can change these parameters if the jumper is off and the cover of the KEA is sealed.

MAINS LOAD IMPORT FOR COMMON CONTROLLING

The load import from mains is monitored by two delayed limits. A delay timer (parameter 10) is started if it rises beyond the upper limit (parameter 8). The timer is reset if the load import falls below this limit (not the lower limit) during the delay. The internal flag MAINS LOAD IMPORT HIGH is set after the delay time.

The import must be lower than the lower limit (parameter 9) for the preset time (again parameter 10) before the internal flag MAINS LOAD IMPORT HIGH is reset.

This function can be used for many control purposes if it is not used for the detection of a mains failure in parallel operation. The flag can control e.g. a relay that starts and stops the engine or switches off consumer load if the load import from mains is too high.

ADDITIONAL PARAMETERS

**This chapter explains the parameterisation and all possible functions. Some functions and their parameters, depending on the model of the KEA, might be lacking in your control unit.
The actual included functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.**

Changes without further notice reserved.

ADDITIONAL PARAMETERS

Screen of PARAWIN		Display shows:
	++++ Battery Monitor ++++	ADDITIONAL PARAMETER
1	25.0 V - If voltage lower, battery undervoltage	BATT.UNDERVOLT. 25.0 V <alarm
2	26.5 V - If voltage higher, no battery undervoltage	BATT.UNDERVOLT. 26.5 V => normal
3	300 sec - Delay for battery undervoltage alarm	BATT.UNDERVOLT. sec DELAY
4	Yes - Battery undervoltage is an alarm too?	Setting see: ENCODING OF ALARMS
5	M-U-W-I - Encoding of alarm 'Battery undervoltage'	Setting see: ENCODING OF ALARMS

Parameters 1 and 2:

A delay timer is started as soon as the battery voltage falls below this limit. The timer is reset if the voltage exceeds this limit again during the delay. The internal flag alarm BATTERY UNDERVOLTAGE is set if after the delay the voltage is still below this limit.

The internal flag BATTERY UNDERVOLTAGE is immediately reset if the voltage exceeds the limit level of parameter 2.

Parameter 3:

The delay for the alarm BATTERY UNDERVOLTAGE is preset here in the range of 10 to 2400 seconds with increments of 10 seconds.

Parameters 4 and 5:

Setting parameter 4 to <Yes> activate the internal alarm BATTERY UNDERVOLTAGE. Parameter 5 is the encoding for this alarm. The parameters are found in ENCODING OF ALARMS if the parameterisation via the display of the unit is used. **Important:** An emergency supply is inhibited, if this alarm is encoded for SHUT DOWN or GENERATOR OFF!

FUNCTION OF BATTERY VOLTAGE MONITOR

The battery voltage must be applied to terminal 1 of X 401 if the battery voltage monitor is used. A response delay begins if the voltage falls below the lower limit (parameter 1). The timer is reset if the voltage exceeds this limit (not the release limit, parameter 2) during this delay. An alarm occurs if the response delay (parameter 3) is up.

The internal signal BATTERY UNDERVOLTAGE can be programmed independent of an enabled alarm to a relay that is activated if the battery voltage is good. This signal is always active even in the operation mode OFF.

Calibration

The battery voltage monitor can be calibrated with PARAWIN. The sequence is as follows:

1. Enter the word <MEISTER> as IDENT-Number.
2. Fetch then the parameters from the unit.
3. Open <Adjustment> in menu Options.

Follow now the instructions of the adjustment procedure. Skip the calibrations of voltages and currents by clicking <Abort>. Apply 24 volts DC to terminal 1 of X 401 (input of battery voltage monitor) and click <OK>. The new alignment is stored if the security question was answered with <OK>. Click the ABORT-button if this alignment should not be stored.

You can reload the factory calibration if your alignment has failed by selecting in menu <Options> the software <Factory Settings>.

ADDITIONAL PARAMETERS

START- AND RUNNING HOUR COUNTERS

The setting of the start- and running hour counters are only possible via the keys and display and not with PARAWIN. The counters are once shown as ACTUAL VALUES and secondly follow the parameters of the battery voltage monitor in ADDITIONAL PARAMETERS. They can only be set in ADDITIONAL PARAMETERS.

COUNTERS

The counters follow next.

000010 STARTS
000103 h RUNNNG

6-digit start counter. The cranking attempts are counted.
6-digit running hour counter.

OTHER TIMERS

	++++ Other Timers +++++	ADDITIONAL TIMERS
1	0 sec - Signal delay for alarm 13	0 sec ALARM 13
2	20 sec - Signal delay for alarm 14	20 sec ALARM 14
3	90 sec - Horn off after ... seconds	HORN OFF AFTER 90 sec

Parameter 1 und 2:

The input signals for the alarms 13 and 14 may be delayed for 0 to 250 seconds. That means the alarm contact must be active for the programmed time for initiating an alarm signal. These alarms can e.g. be used for the monitoring of tank filling level (swapping of the liquid is eliminated), leakage monitor (whose control box needs a 230 volts supply), etc. A wrong alarm would be given without this delay when e.g. the supply of the control box for a leakage alarm is off during the break at the load transfer from mains to generator and vice versa. The timers can be preset in the range of 0 to 240 seconds with increments of 1 second.

Parameter 3:

The audible signal is switched on if an unacknowledged alarm is present. This alarm is automatically acknowledged (not cancelled) to silence the audible signal if it is not manually done within a preset time. Another new alarm will switch the audible signal on again. The timer to silence the audible signal can be preset in the range of 0 to 2400 seconds with increments of 10 seconds.

ADDITIONAL PARAMETERS

The following warning hints and installation instructions must be stringently considered. This is also obligatory for the upgrading of older constructions.

- The wiring of the unit must be done carefully as a wrong wiring might damaged the unit.
- The PE(N) must stringently be connected to terminal 5 of terminal strip X 403.
- The leakage currents of the noise filters are 22 mA at a two-phase failure.
- Only sufficient qualified stuff may install and start up the construction.
- Applicable regulations, especially those of VDE, are to be observed.
- Read the Service Manual carefully and follow all hints before starting up.
- Programming of the unit must be carried out in such a way that any danger to people or equipment is impossible. Use only the actual valid version of ParaWin. See <http://www.kuhse.de/>, go to SERVICE and DOWNLOAD.
- If the battery is to be disconnected, the battery charger must always be switched off before.
- The minus pole of the supply voltage must be grounded at the input terminals. The wire gauge must be 10 mm² or more.
- The supply voltage range (12 or 24 V DC) is selected by a switch, located at the relay unit RZ 071-D.
- In case of disconnecting the battery (e.g. battery replacement) the battery charging unit must be always switched-off prior to this!
- Apply the supply voltage not before 20 seconds after its disconnection.
- All coils must be fitted with reverse diodes to prevent high voltage peaks. All other coils or inductive loads must alike be fitted with suppressor elements. This must be done for all relays or inductive components of the switchboard and for switchboard controlled external ones.
- Shorten the corresponding current transformers before removing the connectors X 502 or X 503 of the current measuring at the KEA.
- The shielding of the analogue wiring must only be connected the earth screws beside the terminal strip X 401 and may have no galvanic connection to any other metal parts.
- **If the data of a unit with a software version before the 28.02.2006 was loaded into one with a software version after the 28.02.2006 or vice versa, disconnect the supply for about 30 seconds to let the parameters become true.**

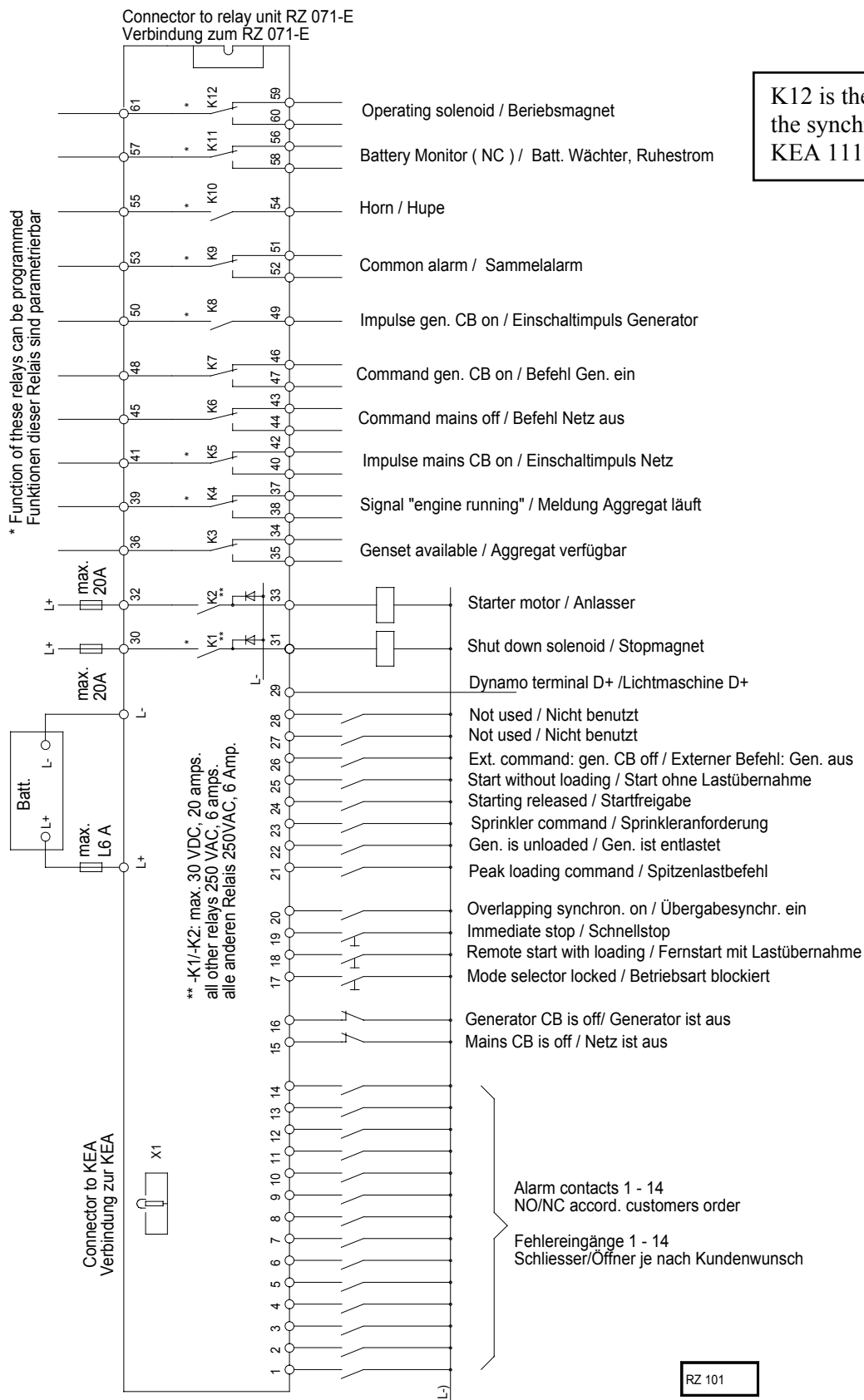
DOCUMENT HISTORY

Revision	Modification	Released	Revision	Modification	Released
06-01-03	First edition	06-01-03			
06-01-25	KEA 112 MOBL, KEA 102 INSL	06-01-25			
06-02-17	Analogue modules	06-02-17			
06-03-29	Warning hints	06-03-29			

Changes without further notice reserved.

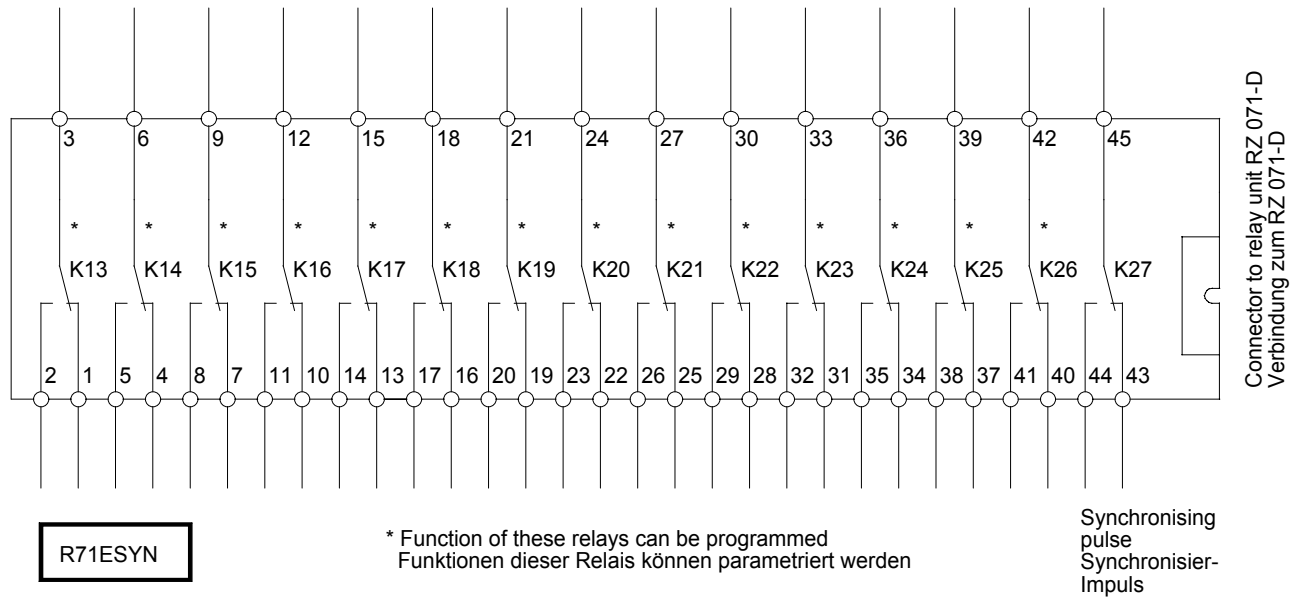
CONNECTION OF RZ 071-D

This drawing shows all possible functions. Some functions, depending on the model of the KEA, might be lacking in your control unit. The actual included functions are listed in the specific Service Manual and in addition shown in the parameter list of PARAWIN.

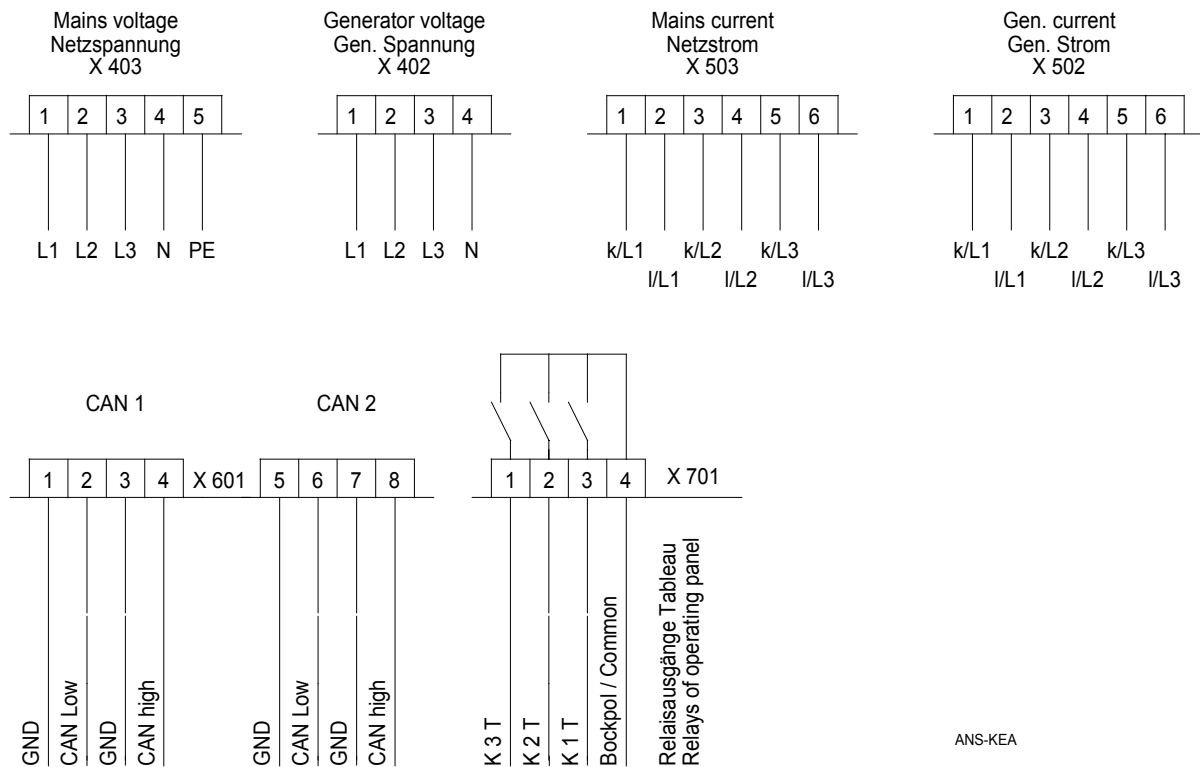


K12 is the relay for the pulse of the synchroniser for the KEA 111 – 112

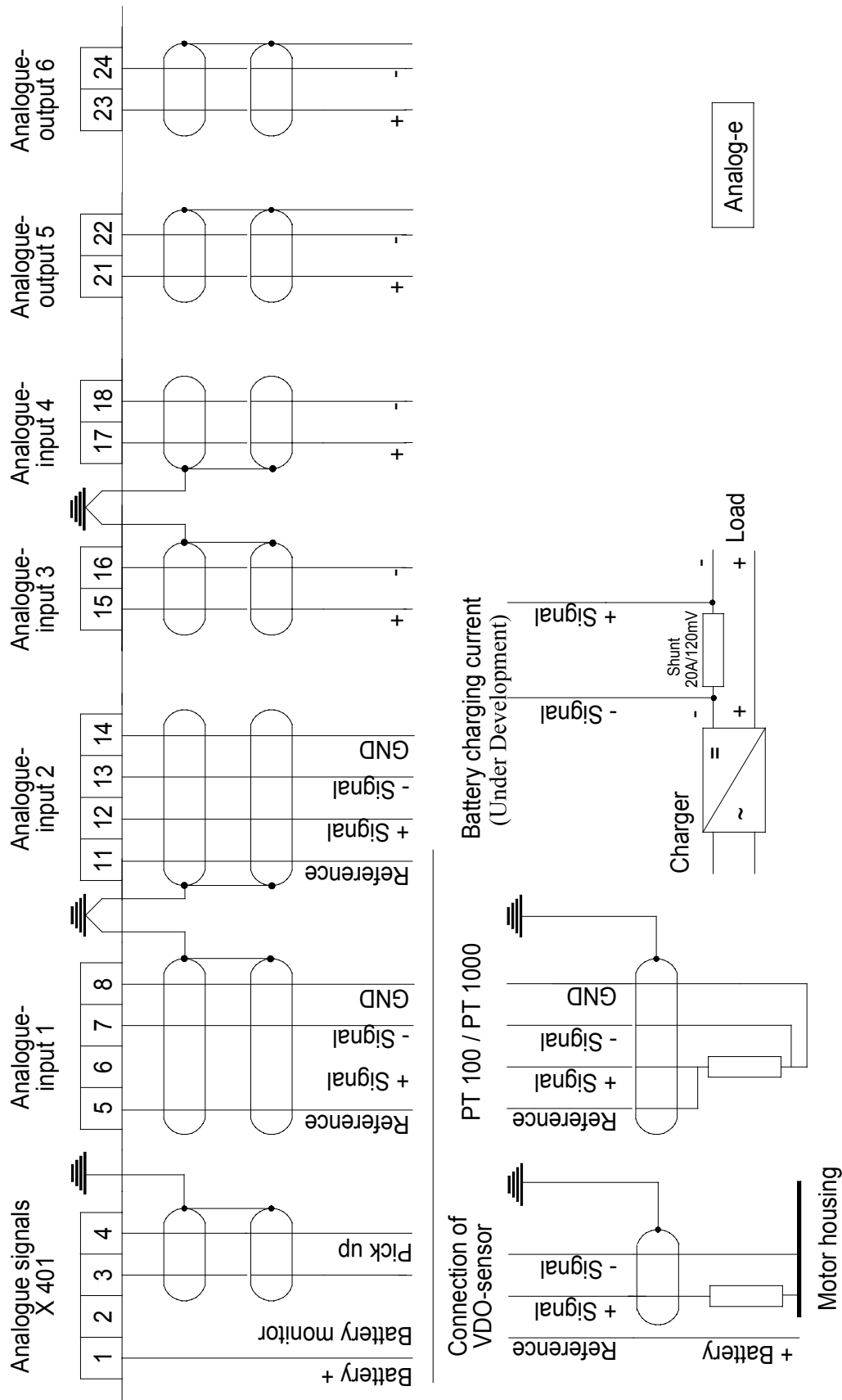
CONNECTION OF RELAY UNIT RZ 071-E



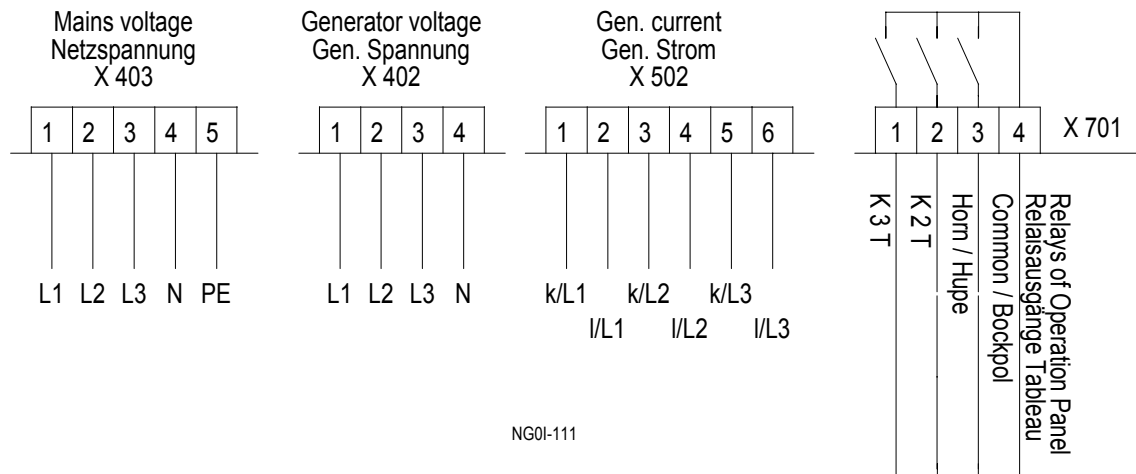
CONNECTIONS AT KEA 101 - 102



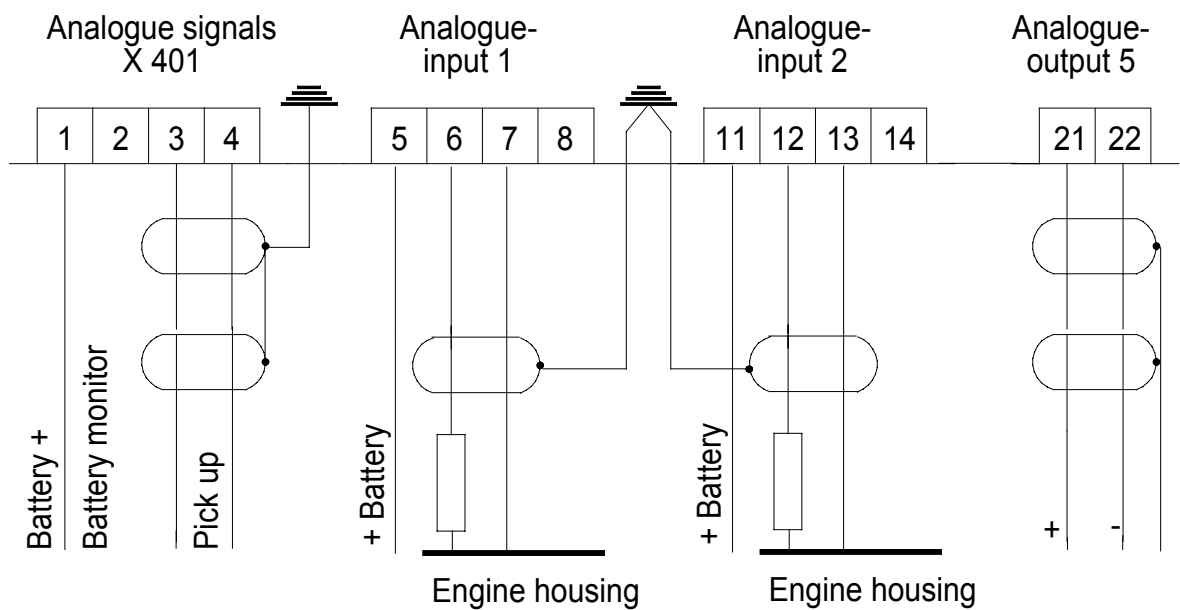
ANALOGUE INTERFACE KEA 101 - 102



CONNECTIONS AT KEA 111 - 112



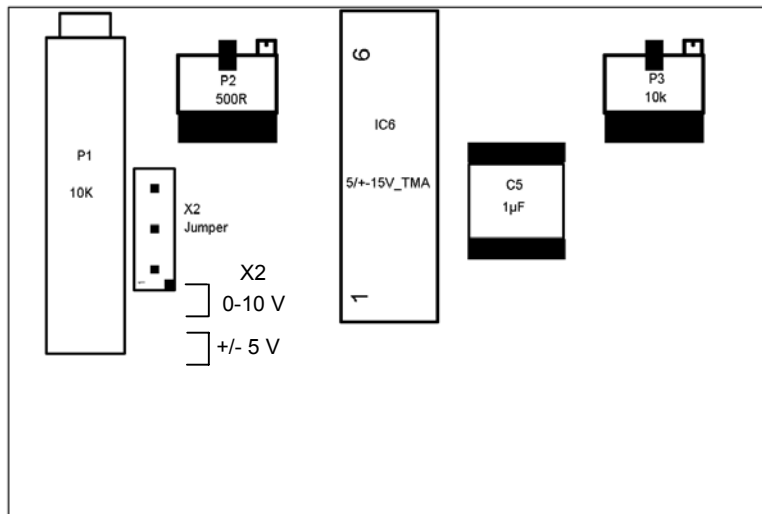
ANALOGUE INTERFACE KEA 111 - 112



Ana111-E

OUTPUT MODULE FOR 0-10 OR +/- 5 VOLTS

The calibration is only to be done in the factory. The jumper X2 selects the desired output signal.

**TECHNICAL DATA OUTPUT MODULE +/- 5 VOLTS OR 0-10 VOLTS.**

- Output is potential free.
- Voltage between output and supply voltage: < 500V AC .
- Connected signal line must be passive.
- Internal resistance of output: 1 kOhm .
- Input resistance of connected unit: >20 kOhm .
- Order number: 3197080110

TECHNICAL DATA OUTPUT MODULE 0 – 20 mA.

- Current loop is potential free.
- Voltage between output and supply voltage: < 500V AC .
- Connected signal line must be passive.
- Burden: <400 Ohm.
- Order number: 3197020110

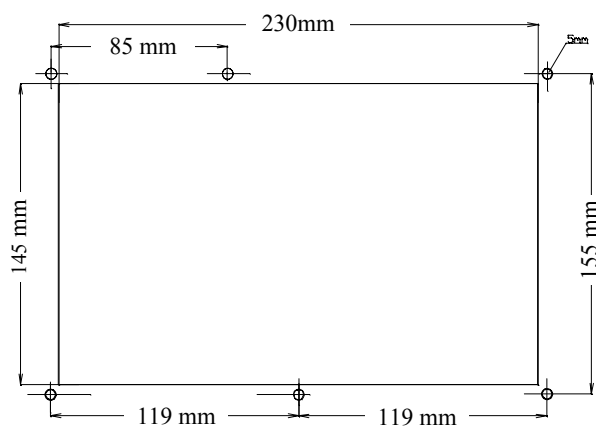
TECHNICAL DATA INPUT MODULE 0 – 20 mA.

- Burden: 30 Ohm.
- Maximum voltage difference between battery minus and signal input are +/-6V DC . The signal line must be possibly also connected to terminal 4 of terminal strip X401 (battery minus) if the signal is potential free, as it might be possible that due to static charge or irradiation a higher voltage may occur.
- Order number: 3197020110

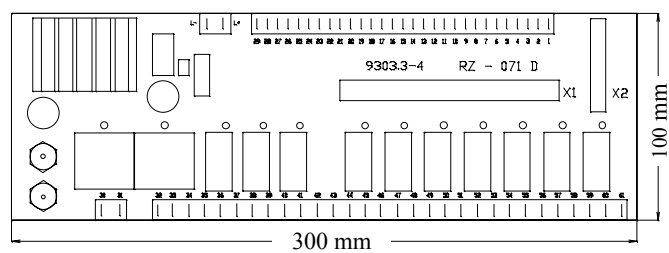
TECHNICAL DATA INPUT MODULE 0 – 10 VOLT.

- Input resistance: 50 kOhm .
- Maximum voltage difference between battery minus and signal input are +/-6V DC . The signal line must be possibly also connected to terminal 4 of terminal strip X401 (battery minus) if the signal is potential free, as it might be possible that due to static charge or irradiation a higher voltage may occur.
- Order number: 3197080110

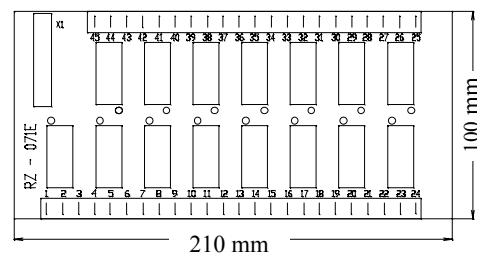
OUTLINES



Cut out in the panel door for
KEA, seen from outside



RZ 071-D



RZ 071-E

[illegible]

Key:
X – denotes a basic function.
2 – A figure denotes the number of functions, that can be added as options.

Types and implemented Functions of Control Units

[illegible]

TECHNICAL DATA OF KEA 101 TO 102, SOPHISTICATED LINE**KEA Controller**

- Device for frontal installation, dimensions: (\Rightarrow , \Uparrow , depth) 260 x 170 x 100 mm,
- Weight approx. 2.2 kg, can be installed wherever required,
- Protection class (installed) IP 44,
- Ambient temperature: Storage -20°C ... +70°C, Operation 0°C ... +55°C
- Supply voltage range 9-12-15V or 14-24-35V DC, voltage selector at RZ 071-D
- 3 customer defined relays, 35 V DC, 1 A. (e.g. for acoustic signallers),
- Standards/regulations VDE 100, Part 710.

Analogue Inputs and Outputs

- 3-phase mains* and generator voltage monitor. They can be set in increments of 1 Volt. If the rotary field is incorrect, the display shows <U. Accuracy class 0.5
 U_{Nom} 3 x 100 volts. They can be set from 40 to 150 volts.
 U_{Nom} 230/400 volts. They can be set from 50 to 300 volts.
 U_{Nom} 3 x 400 volts. They can be set from 150 to 480 volts.
 - Mains* and generator frequency monitor 50 or 60 Hz. They can be set to any value between 40 and 70 Hz. Accuracy class 0.5.
 - 3-phase mains** and generator current measurement. Accuracy class 0.5.
 I_{Nom} 1 Amp: measuring range 0.02 – 3 Amp. They can be set in increments of 4 mA.
 I_{Nom} 5 Amp: measuring range 0.1 – 15 Amp. They can be set in increments of 20 mA.
 - Battery voltage monitor.
- *) Only for KEA 101
 **) Only for KEA 101 SPLN

Options:

Four analogue inputs, which can be fitted with interface cards for

- o PT 100 / PT1000,
- o Current loops,
- o 0 - 10 V DC,
- o Thermocouple NiCr-Ni,
- o Temperature and pressure: VDO sensor,
- o Battery charging current*,

Two analogue outputs 0 – 20 mA or 0 – 10 V.

*) Under development.

Relay unit RZ 071-D:

- Device for attachment on a mounting rail, dimensions: (\Rightarrow , \Uparrow , depth) 300 x 100 x 90 mm,
- Weight approx. 0.7 kg, can be installed wherever required,
- Protection class IP 00,
- Fitted with:
 - o Input for charging dynamo D+ with pre-excitation for AC alternators,
 - o 14 ports for alarm contacts,
 - o 14 general control inputs,
 - o 12 relays, of which 8 can be configured, contact load:
 - 2 relays max. 35 V, 20 A DC,
 - 10 relays 250 V AC, 6 A

Relay unit RZ 071-E

- Device for attachment on a mounting rail, dimensions: (\Rightarrow , \Uparrow , depth) 210 x 100 x 50 mm,
 - Weight approx. 0.5 kg, can be installed wherever required, protection class IP 00
- Fitted with 15 relays, of which 14 can be configured, contact load max. 250 V AC, 6 Amps.

Serial interfaces

Optical fibre or USB interface (selected by a toggle switch) for parameterisation.

Options:

- CAN bus interface to a Common Control System,
- CAN bus interface to engine management (the protocol must be known and implemented),
- Modem (analogue, ISDN, GSM),
- Bus connection to other systems, for example via Profibus.
- Connection (RS 232) of printer (Epson format) for printing of events.

ORDER NUMBERS

Order number		2A10X	F	X	X
Mains voltage	Generator voltage				
3 x 100 volts	3 x 100 volts		1		
3 x 100 volts	230/400 volts		2		
3 x 100 volts	3 x 400 volts		3		
230/400 volts	3 x 100 volts		4		
230/400 volts	230/400 volts		5		
230/400 volts	3 x 400 volts		6		
3 x 400 volts	3 x 100 volts		7		
3 x 400 volts	230/400 volts		8		
3 x 400 volts	3 x 400 volts		9		
Special voltage or frequency range			0		
No current measuring	No current measuring			1	
No current measuring	CT ../1 amp			2	
No current measuring	CT ../5 amp			3	
CT ../1 amp	No current measuring			4	
CT ../5 amp	No current measuring			5	
CT ../1 amp	CT ../1 amp			6	
CT ../1 amp	CT ../5 amp			7	
CT ../5 amp	CT ../1 amp			8	
CT ../5 amp	CT ../5 amp			9	
Special current range				0	
Functions					
Standby operation only		N			
Standby with overlapping synchronisation		U			
Standby / peak load operation		S			
Standby/peak load / mains load import control*		B			
Stand-alone genset		I			

*) Under development

Analogue Input Modules	
PT 100	3197040111
PT1000	3197040112
Current loop 0 - 20 mA	3197020110
Voltage signal 0 - 10 V DC	3197080110
Thermocouple NiCr-Ni	3197020111
VDO-sensor for pressure and temp.	3105070100
Battery charging current (shunt needed)*	3197020112
Analogue Output Modules	
Output signal 0 – 20 mA	3105080100
Output signal 0 – 10 Volt	3105080110

*) Under development

Spare parts	
Relay unit RZ 071-D	2R71D00
Relay unit RZ 071-E	2R71E00
Connecting cable between RZ 071-D and KEA, 1.0 m long	1K71100
Connecting cable between RZ 071-D and KEA, 1.5 m long	1K71150
Connecting cable between RZ 071-D and KEA, 2.5 m long	1K71250
Check synchroniser	3105050100

Control units of Sophisticated Line	
Control unit with mimic diagram for mains and generator	2A101
Control unit with mimic diagram only for generator	2A102

TECHNICAL DATA OF KEA 111 TO 112, STANDARD LINE**KEA Controller**

- Device for frontal installation, dimensions: (\Rightarrow , \uparrow , depth) 260 x 170 x 100 mm,
- Weight approx. 2.2 kg, can be installed wherever required,
- Protection class (installed) IP 44,
- Ambient temperature: Storage -20°C ... +70°C, Operation 0°C ... +55°C
- Supply voltage range 9-12-15V or 14-24-35V DC, voltage selector at RZ 071-D
- 3 customer defined relays, 35 V DC, 1 A. (e.g. for acoustic signallers),
- Standards/regulations VDE 100, Part 710.

Analogue Inputs and Outputs

- 3-phase mains* and generator voltage monitor. They can be set in increments of 1 Volt. If the rotary field is incorrect, the display shows <U. Accuracy class 0.5
 U_{Nom} 3 x 100 volts. They can be set from 40 to 150 volts.
 U_{Nom} 230/400 volts. They can be set from 50 to 300 volts.
 U_{Nom} 3 x 400 volts. They can be set from 150 to 480 volts.
- Mains* and generator frequency monitor 50 or 60 Hz. They can be set to any value between 40 and 70 Hz. Accuracy class 0.5.
- 3-phase generator current measurement. Accuracy class 0.5.
 I_{Nom} 1 Amp: measuring range 0.02 – 3 Amp. They can be set in increments of 4 mA.
 I_{Nom} 5 Amp: measuring range 0.1 – 15 Amp. They can be set in increments of 20 mA.
- Battery voltage monitor.
- Two analogue inputs for VDO sensors for temperature and oil pressure.
- Analogue output +/- 5 volts or 0 – 10 volts for speed governor.

*) Only for KEA 111

Relay unit RZ 071-D:

- Device for attachment on a mounting rail, dimensions: (\Rightarrow , \uparrow , depth) 300 x 100 x 90 mm,
- Weight approx. 0.7 kg, can be installed wherever required,
- Protection class IP 00,
- Fitted with:
 - o Input for charging dynamo D+ with pre-excitation for AC alternators,
 - o 14 ports for alarm contacts,
 - o 14 general control inputs,
 - o 12 relays, of which 8 can be configured, contact load:
 2 relays max. 35 V, 20 A DC,
 10 relays 250 V AC, 6 A

Option**Relay unit RZ 071-E**

- Device for attachment on a mounting rail, dimensions: (\Rightarrow , \uparrow , depth) 210 x 100 x 50 mm,
 - Weight approx. 0.5 kg, can be installed wherever required, protection class IP 00
- Fitted with 15 relays, of which 14 can be configured, contact load max. 250 V AC, 6 Amps.

Serial interfaces

Optical fibre interface for parameterisation.

ORDER NUMBERS

Order number		2A11X	F	X	X
Mains voltage	Generator voltage				
3 x 100 volts	3 x 100 volts			1	
3 x 100 volts	230/400 volts			2	
3 x 100 volts	3 x 400 volts			3	
230/400 volts	3 x 100 volts			4	
230/400 volts	230/400 volts			5	
230/400 volts	3 x 400 volts			6	
3 x 400 volts	3 x 100 volts			7	
3 x 400 volts	230/400 volts			8	
3 x 400 volts	3 x 400 volts			9	
No current measuring	CT ../1 amp				2
No current measuring	CT ../5 amp				3
Stand-alone genset			I		
Functions					
Standby with overlapping synchronisation			E		
Standby / peak load operation			P		
Stand-alone genset			M		

Spare parts	
Relay unit RZ 071-D	2R71D00
Relay unit RZ 071-E	2R71E00
Connecting cable between RZ 071-D and KEA, 1.0 m long	1K71100
Connecting cable between RZ 071-D and KEA, 1.5 m long	1K71150
Connecting cable between RZ 071-D and KEA, 2.5 m long	1K71250
Check synchroniser	3105050100
VDO-sensor for pressure and temp.	3105070100
Output signal 0 – 10 Volt	3105080110

Control units of Sophisticated Line

Control unit with mimic diagram for mains and generator	2A111
Control unit with mimic diagram only for generator	2A112

