

# USER MANUAL

## KEA 320 / KEA 320 RP





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## 1 Amendments

Created	Amendments	Name
2019-10-16	Creation	Twesten



## 2 Brief Overview

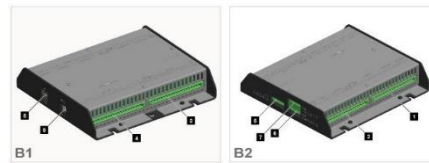


Fig. 1: KEA 320 RP Series

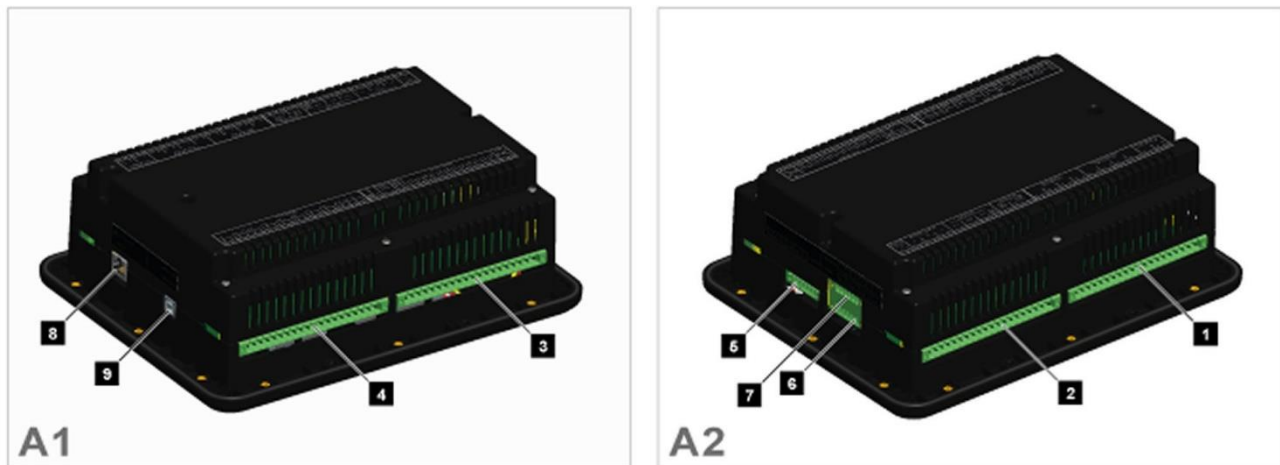


Fig. 2: KEA 320 Series

- |   |  |
|---|--|
| <p>A KEA 320 (-LT) (plastic housing with display)</p> <p>B KEA 320 RP (sheet metal housing)</p> <p>1 Mains/generator/busbar PT terminal</p> <p>2 Analog inputs/outputs, generator CT, and mains/GND current terminal</p> <p>3 Discrete inputs, MPU, power supply, and D+ terminal</p> | <p>4 Relay outputs terminal</p> <p>5 CAN bus interface connector CAN #1</p> <p>6 CAN bus interface connector CAN #2</p> <p>7 RS-485 interface connector RS-485 #1</p> <p>8 ETHERNET interface connector (RJ45) LAN #1</p> <p>9 USB interface connector (2.0, slave) SERVICE port</p> |
|---|--|

The KEA 3X0 series are control units for engine-generator system management applications. The control units can be used in applications such as: co-generation, stand-by, AMF, peak shaving, import/export or distributed generation.

The KEA 3X0 series is also applicable for islanded, island parallel, mains parallel and multiple unit mains parallel operations.



### Scope of delivery

The following parts are included in the scope of delivery. Please check prior to the installation that all parts are present.

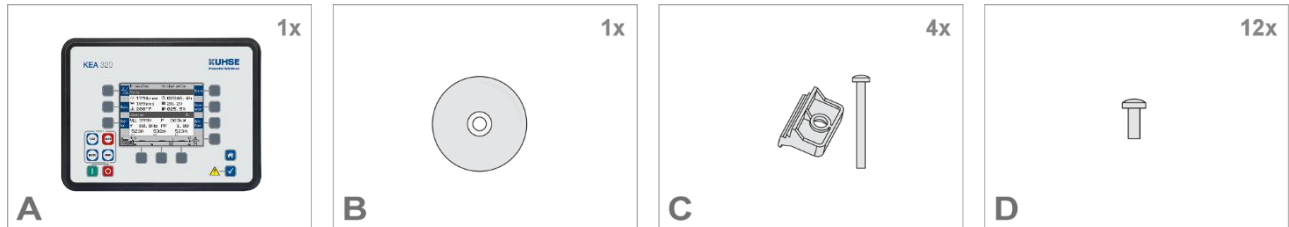


Fig. 3: Scope of delivery - schematic

- |  |  |
|--|--|
| <p>A KEA 320 RP/KEA 320(-LT) genset control (plastic or sheet metal housing). All screwable terminal connectors are coming with plug and jack.</p> <p>B Product CD (configuration software and manual)</p> | <p>C and D with plastic housing KEA 320(-LT) only:</p> <p>C Clamp fastener installation material - 4 x</p> <p>D Screw kit installation material - 12 x</p> <p>Printed QR Code sticker - 2 x) (not shown)</p> |
|--|--|



Configuration files and Technical Manual are available at the CD-ROM and additionally on device internal memory. Opening USB connection to the KEA 3X0 offers read access to the files listed below but with status "delivery" - please be aware that this files are not updated. Please contact Kuhse for the latest versions.

Files stored at KEA 3X0 device:

- Configuration
  - msi-file (installing application files and ToolKit)
  - eds-file (zipped)
- Documentation
  - Technical Manual (PDF)
- Reports
  - EOL Test report



## 2.1 Terminal Allocation

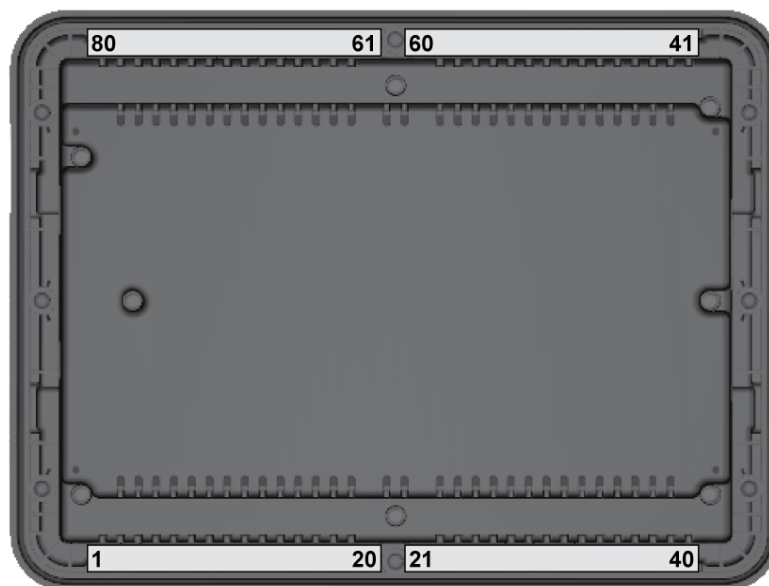


Fig. 4: Terminals KEA 3X0-P1(-LT) plastic housing

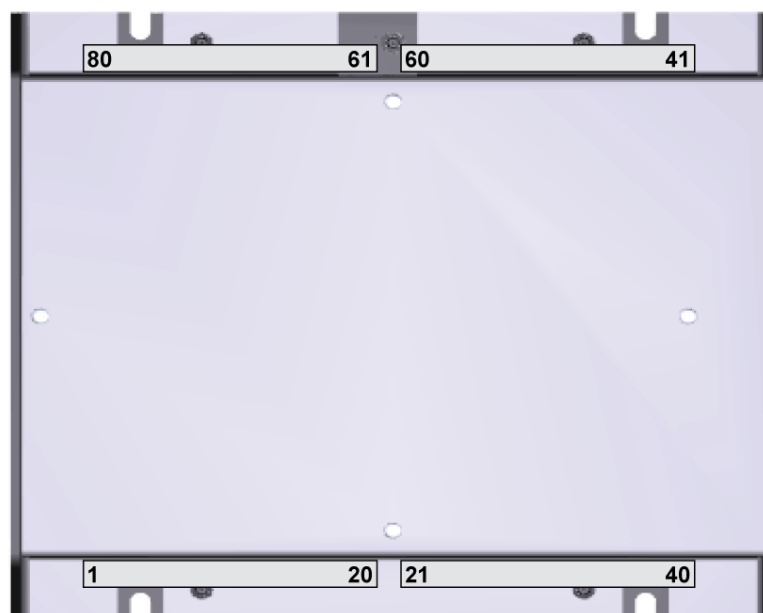
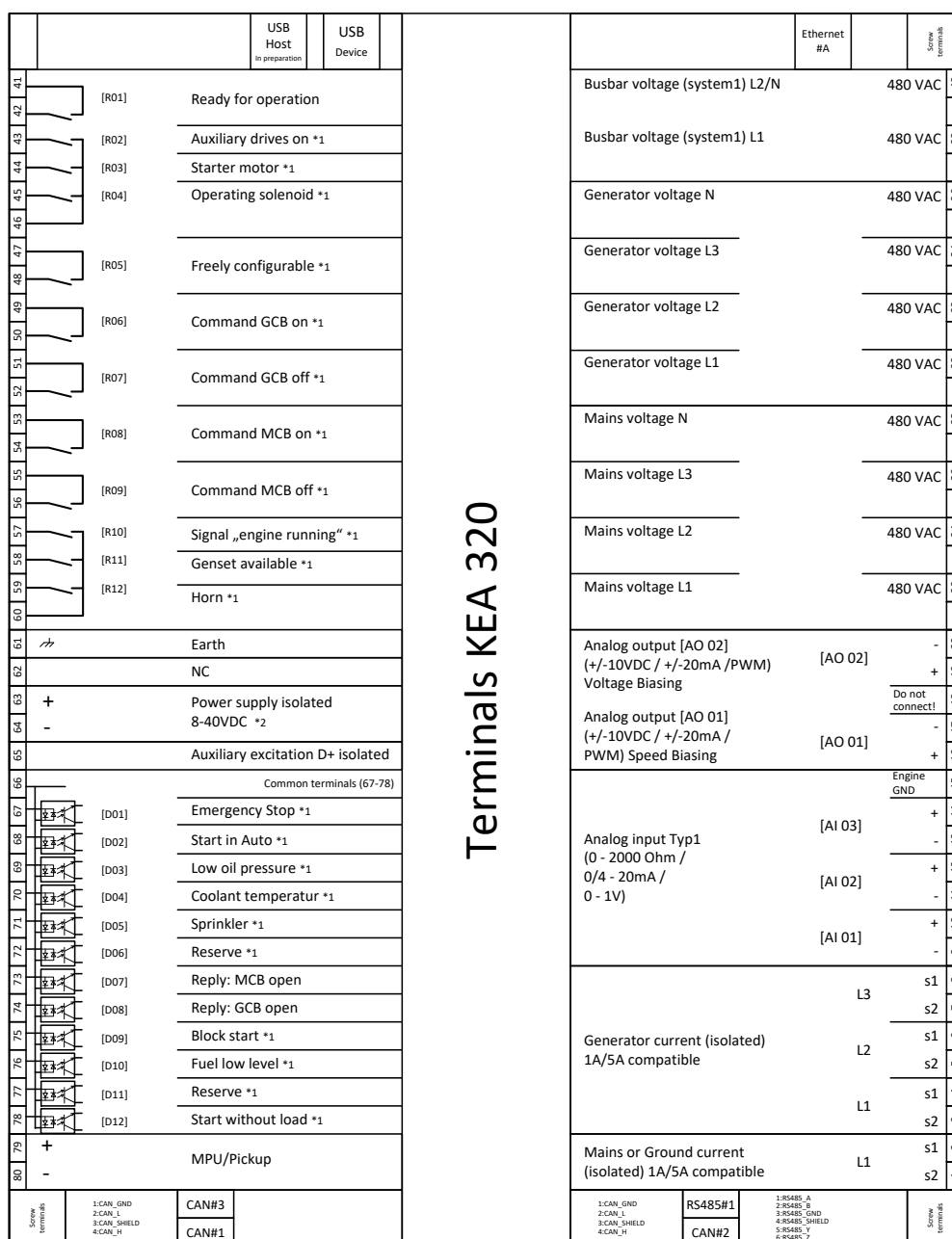


Fig. 5: Terminals KEA 3X0-P1 sheet metal housing





- Use the protective earth (PE) connector located at the bottom center of the sheet metal housing instead.



\*2  $V_{nom} = 12/24V$  SELV

Fig. 6: Wiring diagram KEA 320 RP/KEA 320 (-LT)



### 3 Front Panel Access



The following chapters only apply to model with front panel and display.

#### Front Panel / HMI / display

Please see chapter for detailed description of the front panel with display and buttons.



Buttons can be disabled by ToolKit with parameter 12978 p. 148/ S. 945 "Lock keypad".

#### 3.1.1 Basic Navigation

##### Main screen

After power-up the control unit displays the main screen / HOME screen (Fig. 7).

The main screen can be divided into the following basic sections:

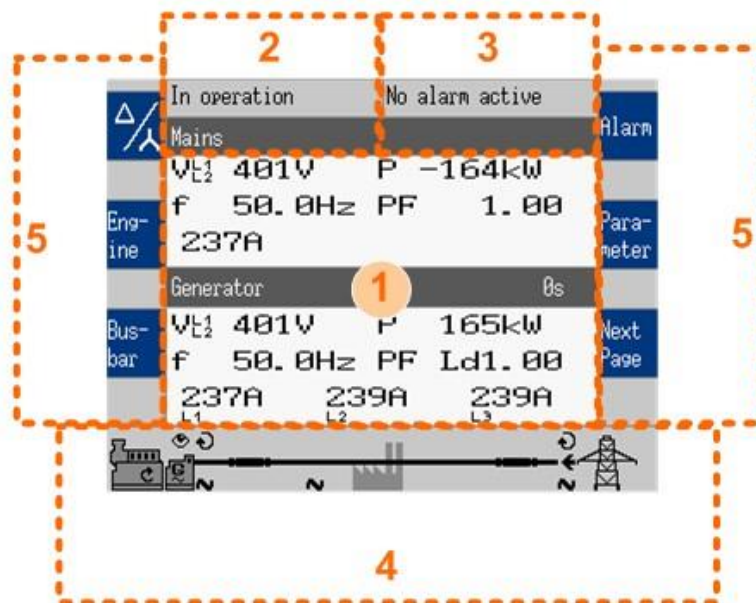


Fig. 7: Main screen

- 1 Values
- 2 Status Messages
- 3 Alarm Messages
- 4 Single Line Diagram
- 5 Current Softkey Functions



## Values [1]

The "values" section (Fig. 70/1) of the screen illustrates all measured power related information including voltages, currents, frequencies, power, and power factor values.



If the mains data display is disabled, the main screen will only show generator data with bigger digits.



The section's content changes based on the selected sub-menu screen. For information on specialized menu screens refer to Chapter 4.1.5 "Specialized Menu Screens" on page 107.

## Status messages [2]

The "status message" section (Fig. 70/2) of the screen shows the actual operating information.



For a list of all operation states refer to Chapter 9.5.3 "Status Messages" on page 984.

## Alarm messages [3]

The "alarm message" section (Fig. 70/3) of the screen shows the last alarm message that is occurred and not yet acknowledged.



For a list of all alarm messages refer to Chapter 9.5.4.2 "Alarm Messages" on page 988.

## Single line diagram [4]

The single line diagram (Fig. 70/4) shows the current status of the engine and power circuit breakers.




















This section is also used for manual operation of the genset. For additional information refer to Chapter 5.2.2 "Operating Mode MANUAL" on page 514.

## Softkeys [5]

The softkeys (Fig. 70/5) permit navigation between screens, levels and functions as well as configuration and operation.

Group	Softkey	Caption	Description
Display		Display Mode	Next step to display all measured (delta/wye) voltages one after the other.
		Customer configurable screen 1 (and 2)	Change to "customer specific screen 1 (or 2)"
			<b>Notes</b> The name of this softbuttons is configurable, too.



Group	Softkey	Caption	Description
		CAN 1	Change to "CAN interface 1 state" screen.
		CAN 2	Change to "CAN interface 2 state" screen.
		Ext. I/O	Change to external discrete I/Os screen.
		Int. I/O	Change to internal discrete I/Os screen.
		Reset Value Display Reset Maintenance	Reset the maximum value display. Reset the maintenance counter.
Operation		Increase Value	Increase selected value.
		Decrease Value	Decrease selected value.
		Confirm Input	Confirm and store changed value.
		Acknowledge Message	Acknowledge/Delete message/event.
		Open Breaker	Open mains/generator breaker (MANUAL mode).
		Close Breaker	Close mains/generator breaker (MANUAL mode).
		Code req.	Request a blink code for one error message from the ECU. Repeated pressing of this softkey displays all stored error messages (J1939 Special Screen).
		Reset	Reset the blink code (J1939 Special Screen).
Navigation		Move Up	Select previous value/entry.
		Move Down	Select next value/entry.
		Move Cursor Position	Move cursor position
		Return	Return to previous menu.
		Next Page	Go to following page/screen of the current menu.
		Parameter Screen	Show parameter screen.
		Alarm Screen	Show alarm screen.



## Status symbols

Menu screen	Symbol	Caption	Description
Main Screen		Voltage Display Mode	The index of the symbol indicates whether delta or wye voltage is displayed and which phases are displayed.
Single Line Diagram		Rotating Field CW	Generator, mains or busbar rotating field moves clockwise.
		Rotating Field CCW	Generator, mains or busbar rotating field moves counter-clockwise.
		Power Detected	Power is detected at the respective measuring point (generator, busbar or mains).
		Monitoring Enabled	Indicates that the engine delayed monitoring has expired and the monitoring functions are enabled.
		Power Imported	Power is imported (at mains interchange).
		Power Exported	Power is exported (at mains interchange).
Alarm List		Alarm Condition Present	Indicates that corresponding alarm condition is still present.
		Alarm class A/B/C/D/E/F present	Symbol with "!" indicates that an alarm of class A/B/C/D/E/F is present.
		Alarm class A/B/C/D/E/F not present	Symbol without "!" indicates that an alarm of class A/B/C/D/E/F is not present.
Setpoints		Generator Power	Indicates the generator power (actual value).
		Mains Power	Indicates the mains power (actual value).
Synchroscope		Phase Angle	Indicates the actual phase angle between busbar and mains or busbar and generator.
Sequencing		Breaker Closed	GCB of respective genset in sequence is closed.
		Breaker Open	GCB of respective genset in sequence is open.
		Add-on	Generator is becoming "Add-on" to the (multiple) genset system.
		Add-off	Generator is going "Add-off" from the (multiple) genset system.
LogicsManager		Delay ON	Delay before output becomes TRUE.
		Delay OFF	Delay before output becomes FALSE.
		TRUE/enabled	Variable is TRUE (LogicsManager). The bit is enabled (CAN Interface). Relay activated (Discrete Outputs)
		FALSE/disabled	Variable is FALSE (LogicsManager). The bit is disabled (CAN Interface). Relay deactivated (Discrete Outputs)





The following chapters list notes related to the specific menu screens.

For information on standard softkeys and status symbols refer to Chapter 4.1.1 “Basic Navigation” on page 98.

### 3.1.2 The HOME Screen

#### General notes

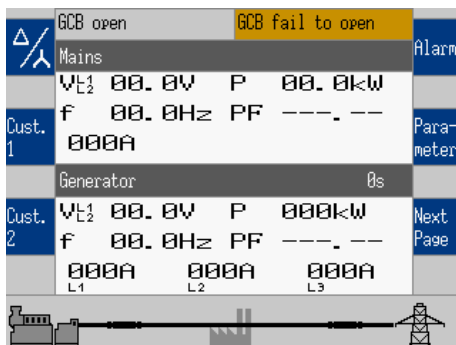








Fig. 8: HOME page/screen

- The “Home” button is a one-click way back to the overview starting point: the HOME page / HOME screen
- The “Home Screen” offers display alternatives via parameter 4103 p. 148 “Home screen data”
  - Generator
  - Generator/Mains
  - Generator/Busbar
  - Generator/Engine
- To display the single line diagram with/without mains is selectable via parameter 4129 p. 148 “Online diagram with mains”
- Two customizable buttons enable selection of indications to display engine and auxiliary values (full access via ToolKit, name/description cannot be changed via HMI)
- Find menu: “Parameter → Configure HMI → Configure customer screen x”
- Two display brightness levels can be switched by LogicsManager. Can be used for e.g.:
  - Key activation determined
  - Brightness reduction on navigation bridge (vessels)
  - Saving energy
- Find menu: “Parameter Configure HMI → Configure display”
- Lock keypad function is determined by LogicsManager 12978 p. 148/ p. 945. Result is available as logical command variable 11924 p. 926/ p. 936 (and can be used with 86.30).
- Find menu (ToolKit only!): “Parameter → Configure HMI → Configure display”



## Display alternatives

The HOME screen allows a number of pre-selectable and soft- button controlled display variants.

- Generator
  - Voltages (pp - pn) - selectable via softbutton [1]
  - Power
  - Power Factor PF
  - Frequency
  - Currents (L1, L2, L3)
- Generator/Mains
  - Generator values as described above and additionally for Mains
  - Voltage
  - Frequency
  - Current
  - Power
  - Power factor
- Generator/Busbar
  - Generator values as described above and additionally for Busbar
  - Voltage
  - Power
  - Frequency
- Generator/Engines
  - Generator values as described above and additionally for Engine
  -  Engine speed (rpm)
  -  Oil pressure (bar or psi)
  -  Water temperature (°C or °F)
  -  Operating hours (h)
  -  Battery voltage (V)
  -  Fuel level (%)

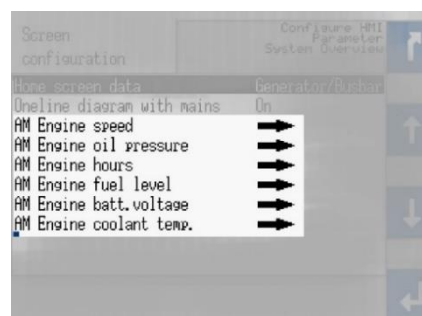


Fig. 9: AnalogManagers for "Engine" values at Home Screen





### **Engines" parameter selection**

The values to be displayed at "Engines" can be selected via AnalogManager definition of the parameters at "Parameter → Configure HMI

→ Screen configuration". Menu texts and symbols cannot be changed!

## **4 Operation**

In operation the genset controller can be manually or remote controlled.

Front panel access is described in chapter 4.1 "Front Panel Access" on page 98.

Access via ToolKit is described in chapter 4.2.6 "View And Set Values In ToolKit" on page 131.

Access via Remote Panel RP 300 is described in chapter and the Technical Manual "37593 RP 300" .

Access via PLC depends on the interface and the data telegram used for communication.



For menu structure/menu tree see "Menu structure (menu tree)" on page 96.

### **4.1 Power ON**

#### **Behavior during starting KEA 3X0**

The start-up procedure of the KEA 3X0 device can be caused by the following reasons:

- Power ON
- Power cycling e.g. by 1701 p. 166 " Set factory default values"
- Power is back after voltage drop

This process is visualized by the HMI of the plastic housing version or the LEDs of the metal housing version.



#### **Using the USB Service Port**

With power ON and a PC/laptop connected via USB service port it can happen that the USB window that pops up doesn't show all files and/or the correct available free memory at the device: Please unplug/plug the USB connection after the KEA finished starting.

With power ON and connected USB service port it can happen that a connected USB device is not detected correctly: Please unplug/plug the USB connection after the KEA finished starting.



With power cycle of the KEA 3X0 the USB connection is lost: Please unplug/plug and/or start USB connection again after the KEA finished starting.

### **... starting plastic housing (HMI) version**

Power ON from zero power

- Buttons are illuminated
- Start-up screen appears
  - the red bar at the bottom monitors the degree of fulfillment
- HOME screen appears with measured values and state information
  - Illumination of buttons is disabled according to the default settings STOP button still might be illuminated
  - WARNING triangle is blinking if there are unacknowledged alarm messages

Power cycling

- Warning LED is twinkling in a high frequency
- (afterwards the standard process of Power ON is executed:)
- Buttons are illuminated
- Start-up screen appears
  - the red bar at the bottom monitors the degree of fulfillment
- HOME screen appears with the same measured values and state information as before power cycling

### **... starting metal housing version**

Power ON from zero power

- LEDs are twinkling
- LEDs are illuminated according to the state of the genset control

Power cycling

- Warning LED is twinkling in a high frequency
- (afterwards the standard process of Power ON is executed:)
- LEDs are twinkling
- LEDs are illuminated according to the state of the genset control



## 4.2 Change Operating Modes

### Startup

The genset controls starts in the operating mode defined by parameter 1795 [Startup in mode]. Refer to Chapter 4.4.5.1 "Configure Operation Modes" on page 306 for details.

### Select Operation Mode

Operation modes can be selected via

- front panel buttons (plastic housing variant or Remote Panel RP 300 or VNC client),
- HMI configuration (plastic housing variant or Remote Panel RP 300 or VNC client),
- remote settings via interfaces, or
- ToolKit

The following chapters describe the manually front panel access.

### 4.2.1 Operating Mode STOP

#### Usage



Use the STOP button to activate operating mode STOP.



Observe the notes on the system's reaction upon activation of operating mode STOP as listed below.

⇒ STOP LED is illuminated at the front panel; ToolKit home page shows STOP icon left beside the prime mover.

#### System reaction

In operating mode STOP neither the engine nor the GCB can be operated. Dependent on the application mode the power circuit breakers cannot be operated.



#### CAUTION!

#### Hazards due to improper use of operating mode STOP

Selecting the operating mode STOP is not the same as an EMERGENCY STOP.

In some cases the KEA will perform additional logic functions, such as an engine cool down period, before the engine is stopped.

- For emergency stop functionality use an EMERGENCY STOP discrete input, programmed as an F class alarm.



If the operating mode STOP is selected while the engine was already stopped the following applies:

- The GCB will not be closed.
- The fuel solenoid relay will not be enabled.
- The start request is ignored.
- The start push buttons (softkeys) are disabled.
- The engine/generator monitoring remains activated (exception: all monitoring that is delayed by the engine speed).

If the operating mode STOP is selected while the engine was running the following applies:

- Dependent on the current application mode a soft shut down will be executed.
- Pressing the STOP button again opens the GCB.
- If the STOP button is pressed again, the cool down will be interrupted.

If the operating mode STOP is selected while the engine performs a cool down the following applies:

- Pressing the STOP button again causes an immediate stop of the cool down and stops the engine.



If the conditions of the LogicsManager function "Enable MCB" (parameter 12923 p. 236/ p. 945) are TRUE, the MCB will be closed again if it is open in STOP operating mode.



## 4.2.2 Operating Mode MANUAL

### General usage

In the MANUAL operating mode (mode button "MAN" illuminated) both the engine circuit breaker and the power circuit breaker can be operated via the push buttons along the bottom of the display (softkeys). Additionally the Start(I)/Stop(O) buttons can be used to start or stop the engine.

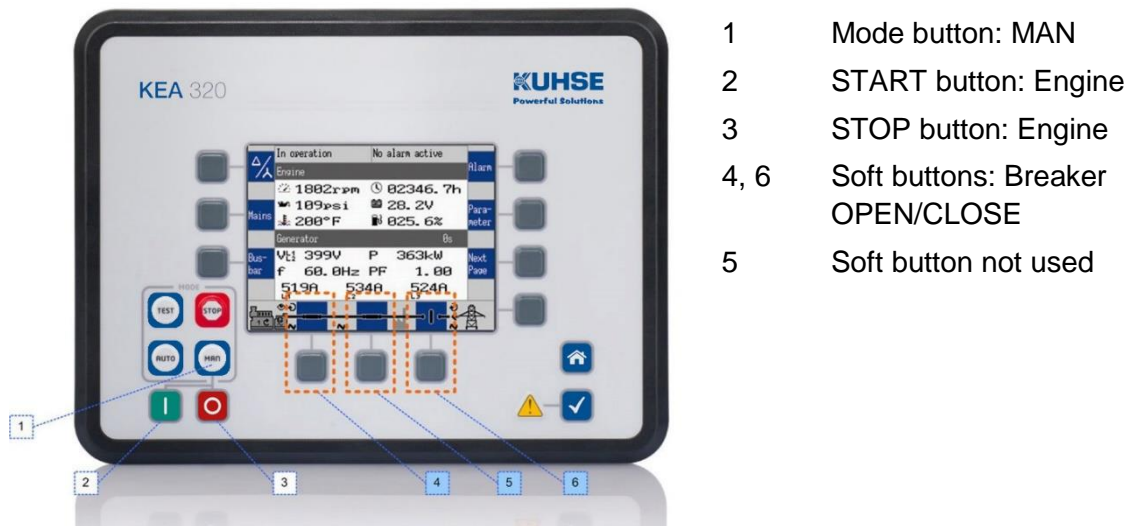


Fig. 10: KEA 3X0 MAN-buttons



Use the mode button "MAN" to activate operating mode MANUAL.  
⇒ The MAN button is illuminated.



The breakers will open immediately without power reduction. To open the breaker in a no-load condition, reduce the load manually in the setpoints screen (Chapter 4.1.5 "Specialized Menu Screens" on page 107)).

### Example for application mode A01

To start the engine:



Press the button [I] below the MAN button.

⇒ Success: The engine starts and the circular arrow and the eye symbol appear.

Failure: No change in the display until the "start failure" message appears.

To stop the engine:











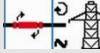
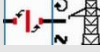
Press the button [O] right below the MAN button.

⇒ Success: The engine stops and the circular arrow and the eye symbol disappear.

Failure: No change in the display until the "stop failure" message appears.



## Overview

Function/Status	Symbol	Available in application mode			
		A01	A02	A03	A04
Start the engine	 : 	✓	✓	✓	✓
Stop the engine	 : 	✓	✓	✓	✓
Breaker open command is issued or a closure of the breaker is blocked			✓		
No defined breaker state			✓		
Open the GCB				✓	✓
Close the GCB				✓	✓
Open the MCB					✓
Close the MCB					✓







Symbol	Description
	Generator or mains rotating field moves clockwise.
	Generator or mains rotating field moves counter-clockwise.
	Power is detected at the respective measuring point (generator, busbar, or mains).
	Indicates that the engine delayed monitoring has expired and the monitoring functions are enabled.
	Power is imported (at mains interchange).
	Power is exported (at mains interchange).

Table 1: Status symbols



### 4.2.3 Operating Mode AUTOMATIC

#### General usage

In the AUTOMATIC operating mode ( "AUTO" ), all engine, GCB, and/or MCB functions are operated via an interface, or automatically by the control unit (i.e. a mains failure).



The function of the KEA depends on the configuration of the unit and how the external signals are used.



→ Use the button [AUTO] to activate operating mode AUTOMATIC.  
⇒ If mode change was successful the button [AUTO] is illuminated.



For a more detailed description of the start/stop sequence of the engine and the associated parameters refer to Chapter 4.4.5.1.2 "Operation Mode AUTO - Automatic Run" on page 307.

The main functions are briefly described in the following sections.

#### Start engine

The engine is started via a remote start signal.

Prerequisites:

- The AUTOMATIC operating mode is enabled.
- The start request is enabled by the LogicsManager "Start req. in AUTO".
- No shut down alarm is present. (for explanation of the alarm classes refer to Chapter 9.5.1 "Alarm Classes" on page 982).
- The engine is ready for operation.
- The GCB is open.

#### Auto mains failure operation (AMF)



Auto mains failure operation is only available in application mode **A04**.

If the AUTOMATIC operating mode is enabled and the mains fail, the engine and the power circuit breakers will be operated according to the current application mode.

Prerequisites:

- The AUTOMATIC operating mode is enabled.
- The parameter "Emergency power" is configured to "On".
- The configured mains failure limits are reached.
- The configured delay times have expired.



- No shut down alarm is present. (for explanation of the alarm classes refer to Chapter 9.5.1 “Alarm Classes” on page 982).
- The engine is ready for operation.

## 4.2.4 Operating Mode TEST

### General usage

The operating mode ( “TEST” ) usually is a temporary operating mode. The idea is to test the genset.

TEST operating mode always starts the engine, when changing into this mode independent on an AUTOMATIC start order. Additionally the TEST operating mode supports the emergency and critical run as well (if a mains failure occurs during the test run). The operating mode TEST supports different sub modes so the operator can choose if the breakers shall be closed during test run or whether the operating mode is changed after the test run.



The function of the KEA depends on the configuration of the unit and how the external signals are used.



Use the button [TEST] to activate operating mode TEST.

⇒ If mode change was successful the button [TEST] is illuminated.



The illumination of the button becomes twinkling a short time before TEST run is over.

For a more detailed description of the start/stop sequence of the engine and the associated parameters refer to Chapter 4.4.5.1.3 “Operation Mode TEST” on page 309.

The main functions are briefly described in the following sections.



### 4.3 Restore Language Setting via HMI, Buttons and Softkeys

In order to change the language setting via HMI, press the (soft)keys in the following order:



Language parameter is on code level "0", so the instruction will work with each code level.

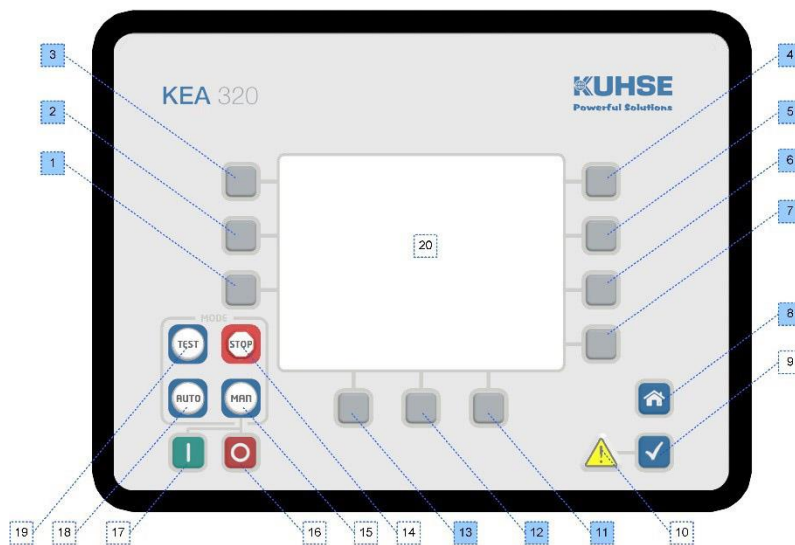


Fig. 11: Front panel and display

1. ➤ Press button [HOME] once to return to the start screen
2. ➤ Press softkey [6] once to access the "Parameter" screen
3. ➤ Press softkey [3] once to access the "Configure language / clock" screen
4. ➤ Press softkey [7] once to edit the language setting
5. ➤ Press softkeys [11] or [12] to select the desired language.
6. ➤ Press softkey [7] once to commit the language setting.  
⇒ The desired display language is restored.