

# ke-FKR4 (D)



## Digital Phase Failure and Phase Sequence Device



- $V_{L1}, V_{L2}, V_{L3}$
- $V_{L12}, V_{L23}, V_{L13}$
- Phase Sequence Control
- Over Voltage Protection
- Under Voltage Protection
- Unbalanced Voltage Protection
- Over Frequency Protection
- Under Frequency Protection
- Latch Function
- TRUE RMS

**Display Function:**

- $\bullet \circ \circ$  L1 L2 L3  $V_{L1}$  220
- $\circ \bullet \circ$  L1 L2 L3  $V_{L2}$  220
- $\circ \circ \bullet$  L1 L2 L3  $V_{L3}$  220
- $\bullet \bullet \circ$  L1 L2 L3  $V_{L12}$  380
- $\bullet \circ \bullet$  L1 L2 L3  $V_{L23}$  380
- $\circ \bullet \bullet$  L1 L2 L3  $V_{L13}$  380

Select: (Up direction) when pressing continuously, screen displays frequency of system. When button release device continue to show voltage.

### General

In three phase systems, it measures RMS values of AC voltages and system frequency sensitively. Using up direction button (Select) phase-neutral voltages and phase-phase voltages monitor sequentially ke-FKR4(D) has many features.

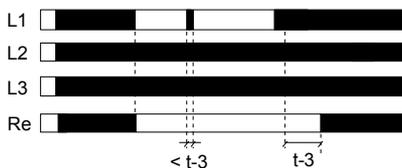
- Those are;
- Phase Failure
  - Phase Sequence
  - Over Voltage Protection
  - Under Voltage Protection
  - Voltage Unbalance (asymmetry) Protection
  - Over Frequency Protection
  - Under Frequency Protection

When device is turn on if its adjusted voltages and frequency in its interval and if phase sequence is correct relay switch on. If any of error occurred ( except phase failure and phase sequence ) at the end of adjusted time relay switch off its contact. When system return normal values, at the end of time out relay switch on.

**IMPORTANT:** L1 - N is device supply inputs. Thus, the applied L1 - N voltage must be rated voltage of system. The measured frequency also must the frequency of the system.

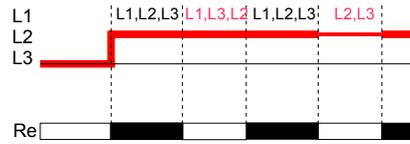
### Phase Failure: (u-U)

Before starting system, it controls phase absence then if all phases exists Normal LED turn on and relay contact switch on. In case of missing of any L1,L2,L3 phases, Normal LED turn off and relay switch off its contact. In this case when pressing Reset button, u-U warn appears on display.



### Phase Sequencing: (Seq)

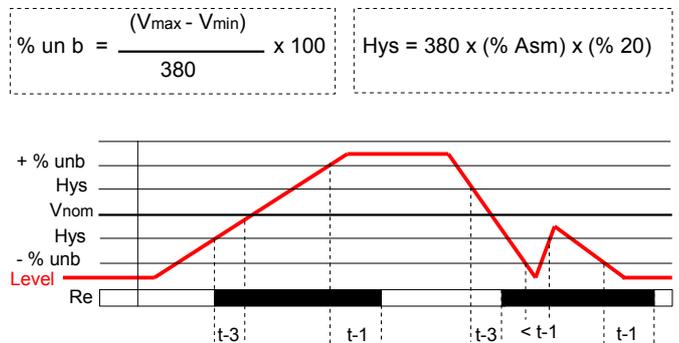
In case of wrong phase order, Normal LED turned off and relay contact is not switch on. In this case if Reset button pushes seq warn displayed. If phase order is corrected, Normal LED turned on and out relay switch on.



### Voltage Unbalanced: (unb)

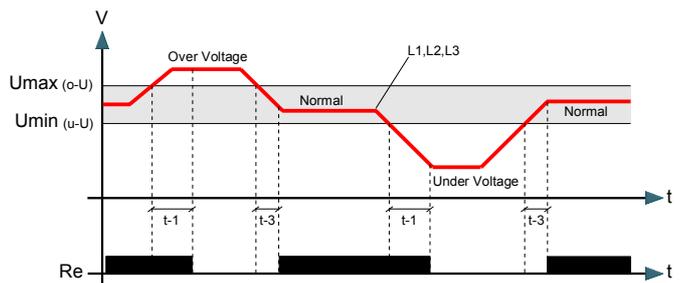
The phase-phase voltage unbalance limit can be adjusted between (5%-20%). When it exceeds the adjusted limit, the device switched off its out contact at the end of t-1 delay. In this case when pushing Reset button unb warn appear on the screen. For the returning normal state, asymmetry values should under 20% (hysteresis value). In this case at the end of t3 time Normal LED turned on and output contact switch on. If the phase-phase voltage unbalance, return adjusted value shorter than t-1 time, output relay does not release its contact. Hysteresis is %20.

Example: Let's say that asymmetry value is set to 15% for a 3 x 380VAC. In this case, relay contact switch off at  $(380 - (380 \times 0.15)) = 323$  V. Switch on the contact is performed at  $323 + (380 \times 0.15 \times 20\%) = 334$  V. (20% is the hysteresis).



### Over and Under Voltage: (o-U),(u-U)

Under voltage (u-U) it can adjusted between  $U_{\text{min}} = (300 - 370)$  V. Over voltage (o-U) it can adjusted between  $U_{\text{max}} = (390 - 460)$  V. If the voltage drops below the adjusted under voltage limit, when u-U shows on the screen and device switch off its output contact end of the t-1 time Normal LED turned on. In this case when pushing Reset button u-U warn appear on its screen. If the voltage exceed the adjusted over voltage limit, Normal LED turned off and output relay switch off. In this case when pushing Reset button o-U warn appears on its screen.



### LOCKING FUNCTION: (LATCH)

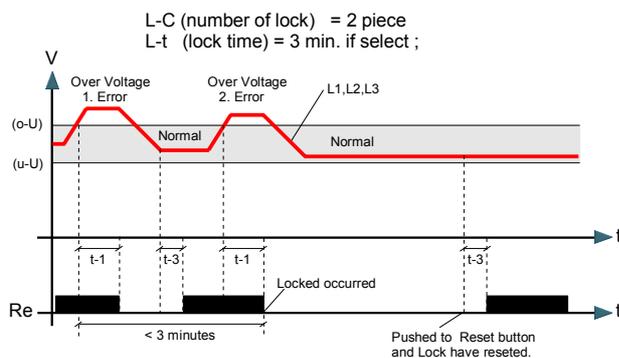
It can be controlled by two parameters. Locking time and Locking counter. If the number of opening reaches the adjusted locking counter within the adjusted locking time then device switch off its contact and locks its functions until the user pressed Reset button. If the locking counter is adjusted to oto then this function is disable and device never locks itself.

### L-t: Locking Time ( 001 - 060 min. )

It is well know the frequently occurring faults may damage system. For that the device when number of faults reaches the adjusted locking number within this locking time. This way the system is protected and user has chance to investigate the problem.

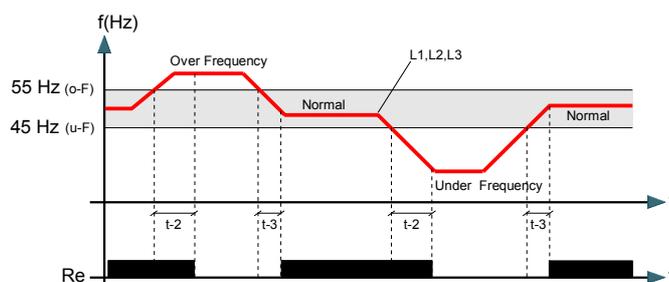
### L-C: Locking Counter ( oto , 001 - 010 piece )

The number of faults allowed within the period L-t. If number of faults exceeds this adjusted counter value device locks itself. User must press Reset button then the fault passes in order to unlock the device. If L-C is set to oto then this property is disabled.



### Over and/or Under Frequency Protection : ( 40 – 70 Hz )

Under Frequency be able to set between (u-F) = 40 Hz .....[(o-F) - 0,4]  
Over Frequency be able to set between (o-F) = [(u-F) + 0,4]..... 70 Hz  
If required , it can be set only under frequency or only over frequency protection as well as both of protection can be disabled.  
If o-F = 55 Hz and u-F = oFF set, device works as over frequency protector only. (if system frequency above 55 Hz, under screen displays **o-F** warning and end of time t-2 relay switch off its output contact )  
if o-F = oFF and u-F = 45 Hz set , device works as under frequency protector only . (if system frequency below 45 Hz, under screen displays **u-F** warning and end of time t-2 relay switch off its out contact.)  
if o-F = oFF and u-F = oFF set, frequency protection is disabled.



### Parameters :

Device protection function can be set this portion .In this portion entering pushing SET button until appears **o-U**.

First parameter ;

**o-U : Over Voltage Setting** (between 390 V – 460 V can be set)  
Between phase-phase voltages ,in case of over adjusted values, device end of the time t-1 output relay switch off its contact .

**u-U : Under Voltages Setting** (between 300 V – 370 V can be set)  
Between phase-phase voltages ,in case of under adjusted values, device end of the time t-1 output relay switch off its contact .

**unb : Unbalanced Voltage (asymmetry) Setting** ( 0,05 – 0,20 )%5 – 20  
Between phase-phase voltages ,in case of under adjusted % value,device end of the time t-1 output relay switch off its contact .

**t-1 :On Delay Time (Voltages)** ( 00,1 – 99,9 sec)  
When occurred over voltage , under voltage and unbalanced voltage, if error stretch t-1 time ,device out relay switch off.

**t-2 : On Delay Time (Frequency)**( 00,1 – 99,9 sec)  
When over and under frequency occurred, if error stretch t-2 time ,device output relay switch off.

**t-3 : Returning Delay (Voltage and Frequency)**( 00,1 – 99,9 min)  
To close the output contact after opening because of both voltage and frequency faults ,the values should return to the normal ranges and after t-3 delay, the device switch on its output contact.

**L-C : Locking Counter** (oto , 001 – 010 piece )  
The number of the faults allowed within the period (L-t). If the number of faults exceeds this adjusted counter value then the device locks itself.  
The user must press Reset button after the device locks itself.  
If L-C is set to oto then this property is disable.

**L-t : Locking Time** ( 001 – 060 min. )  
The device locks itself when the number of faults reaches the adjusted locking number within this locking time. This way the system is protected and the user has the chance to nvestigate the problem.

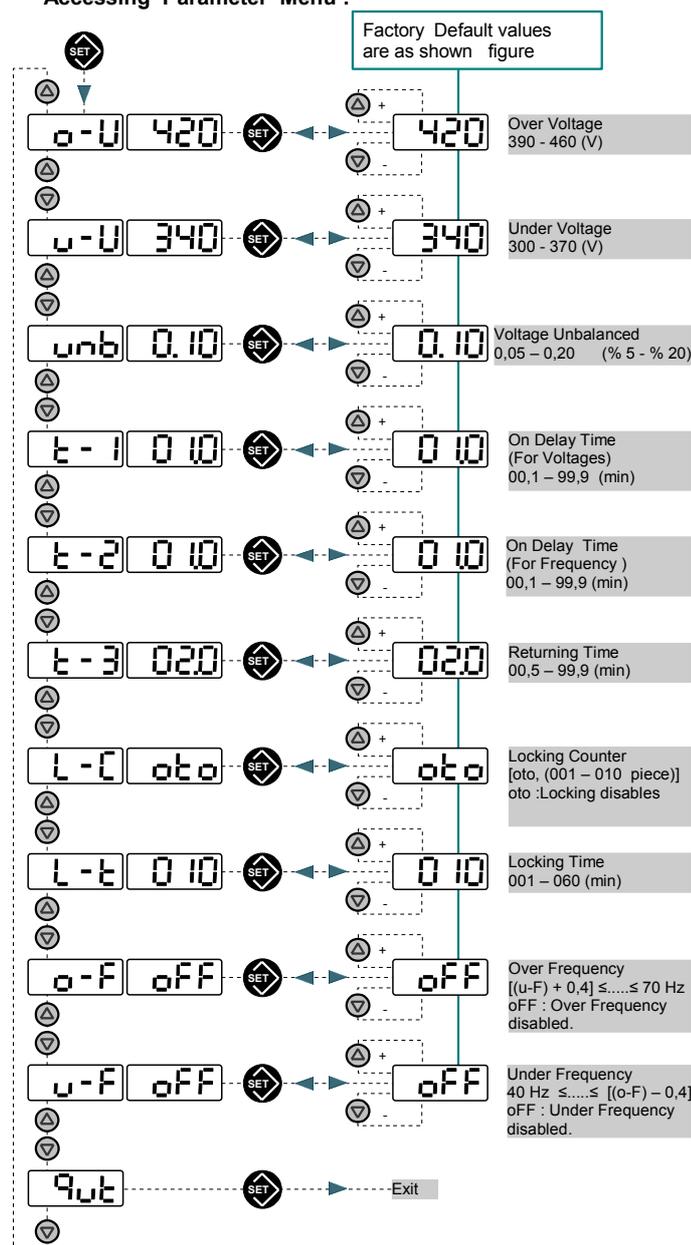
**o-F : Over Frequency Adjustment**  
It can be set between (o-F) = [(u-F) + 0,4]..... 70 Hz.  
If it is set to o-F = oFF then this protection is disabled.

**u-F : Under Frequency Adjustment**  
it can be set between (u-F) = 40 Hz .....[(o-F) - 0,4].  
If it is set to u-F = oFF then this protection is disabled.

**quit : Quit**  
If Set button is pressed there then the device goes back the measurement screen.

- Installation Instruction :**
- Read the user instructions and caution before installation
  - Be sure that the panel you are installing in when power off.
  - The device designed to be installed to the rail where the installation tap into the panel,
  - Do not under case open the front of device.
  - You should open the Terminals at the back side of the device after you must be sure that there is no power in the panel.  
Connect the device as shown in the connection scheme.
  - Be sure that the terminals are connected tightly to the device.
  - Use a power switch between the network line and the device's supply. Moreover you should connect the 1A rapid fuse before measurement inputs for device protection.
  - If you are having any problem you can contact to KAEL Electronics Co. where you can reach address given below.

### Accessing Parameter Menu :



### Connection Scheme

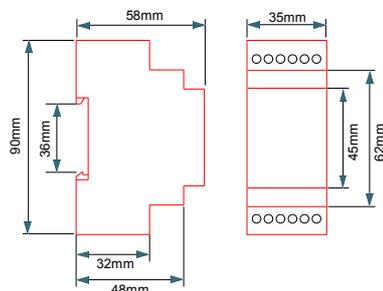


**Select:** (up direction) when pushing continuously, it shows systems frequency its screen. When release button, it continues to display voltage.

**Reset:**  
If pushing Reset button while system has any error, device shows alarm codes. If error case although disappeared, then device is not return to normal, latch-function occurred and it makes locked device. After checking error in system then restart device with pushing reset button.

**TECHNICAL INFORMATION:**

- Rated Voltage (Un) : 220Vac (L1-N)
- Operating Range : (0,8-1,1) x Un
- Frequency : 50 / 60 Hz
- Supply Power Consumption : < 4VA
- Voltage Measurement (Phase-Phase) : 10 – 500 VAC  
(For L1-N 176V - 242V)
- Voltage Measurement Power Consumption : <1VA (for one phase)
- Measurement Sensitivity : %1±1 digit
- Display : 3 Digit LED
- Contact Current : Max. 5A / 240Vac
- Device Protection Class : IP 20
- Connector Protection Class : IP 00
- Temperature : - 5 °C .... + 50 °C
- Connection Type : To connection rail in electrical panel
- Dimension :



**ATTANTION !!!**  
 - The messages Err1 and Err2 on the screen means that device is failure.  
 - Clean the device using dry dust cloth after turned off device.  
 - Read and follow the instruction on this manual and attached label.