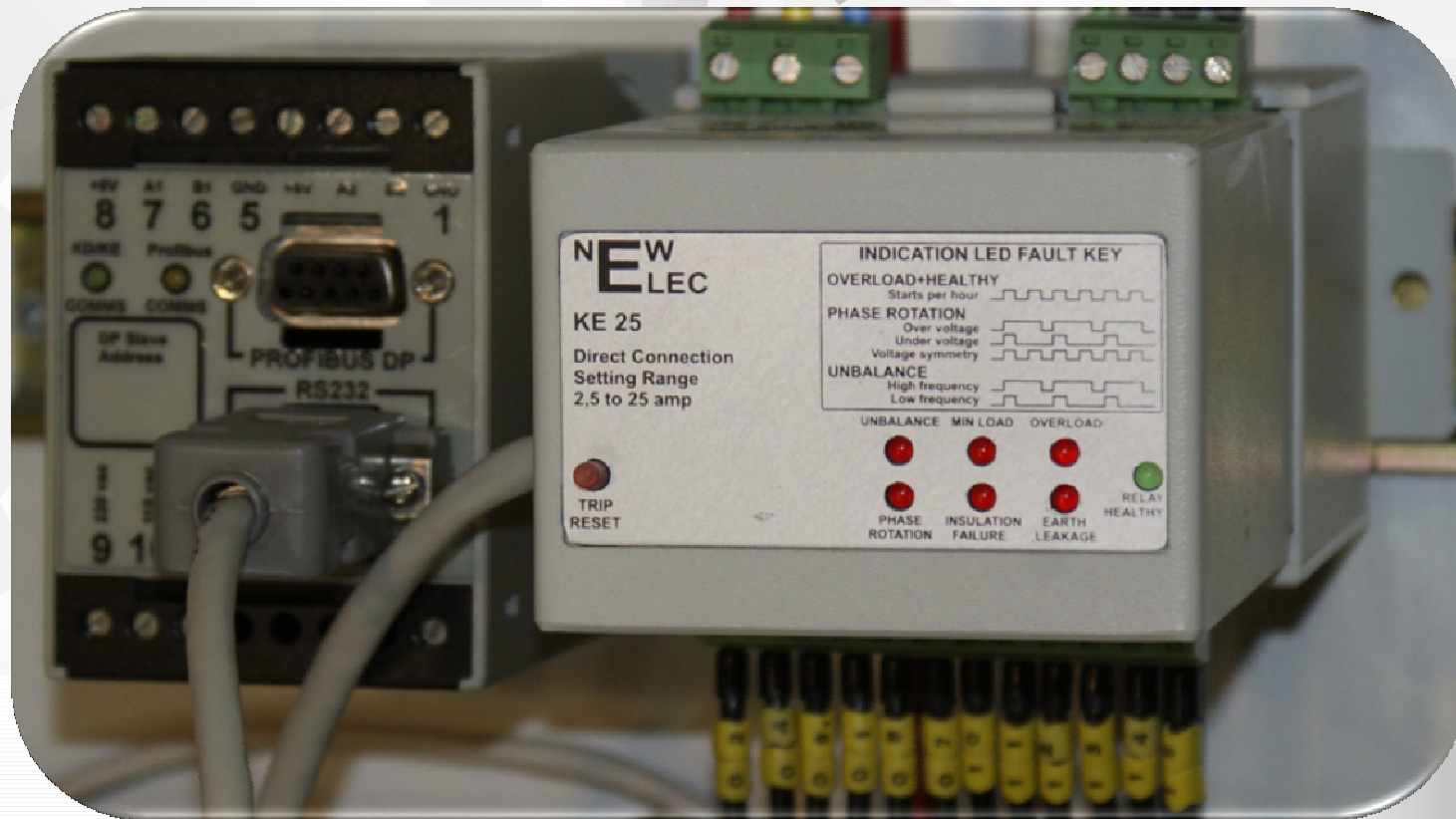


KE Relay





Mission Statement

**“Looking after your 3 phase
induction motors”**



Introduction

- NewElec Pretoria (Pty) Ltd established in 1980
- ISO 9001/ 2000 accredited in November 2001
- Profibus Certification
- Specializing in the design and manufacture of LV motor protection and control relays

KE Relay

Management Features

Protection Features

Features and Control

KE Relay

Management Features

- Apparent Power and Real Power Measurement
- Statistical Data
- Last 60 Faults Record
- Last 2000 Events Record
- 3 Phase Recorder
- Training Simulator
- Management Feature Benefits

KE Relay

Apparent Power and Real Power Measurement

The KE Relay measures the Real Power (KWatt.h) as well as the Apparent Power (KVA.h) of the motor. This is derived from line voltage, phase voltage and power factor (where applicable). This provides the clients with the necessary information in determining whether or not the motor is the correct size for the application.

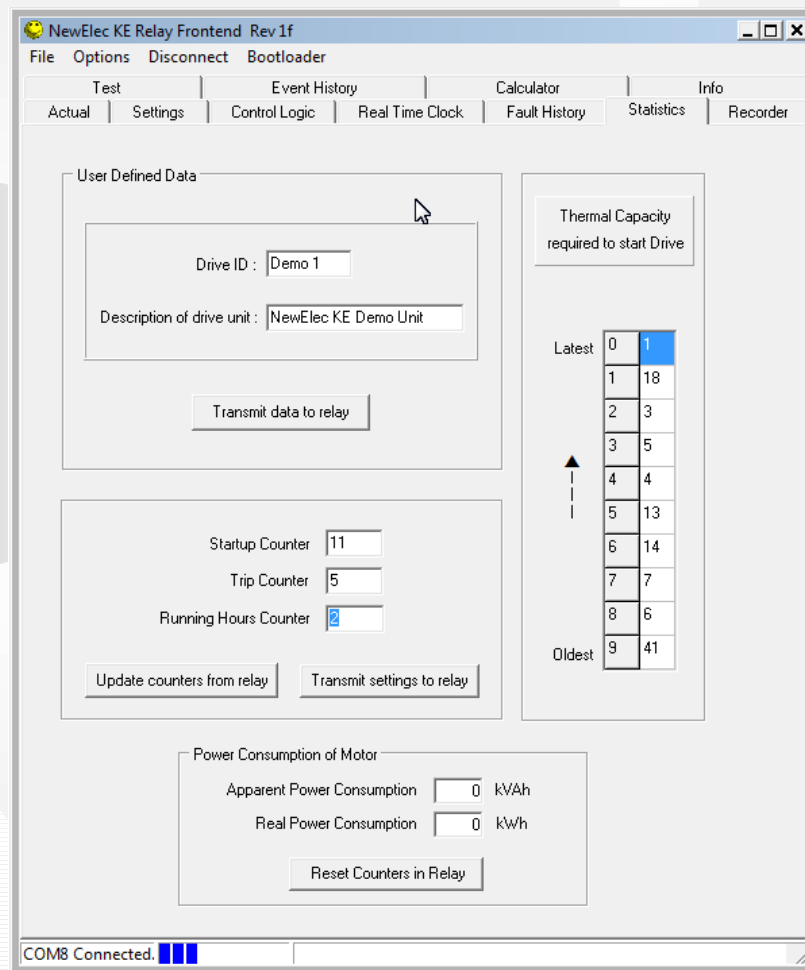
In the event of a motor being over-sized for the application, a poor power factor and excessive electricity consumption result in high energy costs and a poor green footprint.

With the information provided by the relay, steps can be taken in order to improve the power factor. A smaller motor can also be considered for the application, should it be feasible to replace.

Increasing energy costs and the push towards a greener footprint make this feature a valuable asset in any plant.

KE Relay

Statistical data



The screenshot displays the 'NewElec KE Relay Frontend Rev 1f' software interface. The main window is titled 'NewElec KE Relay Frontend Rev 1f' and contains a menu bar with 'File', 'Options', 'Disconnect', and 'Bootloader'. Below the menu bar are several tabs: 'Test', 'Event History', 'Calculator', 'Info', 'Actual', 'Settings', 'Control Logic', 'Real Time Clock', 'Fault History', 'Statistics', and 'Recorder'. The 'Statistics' tab is currently selected.

The interface is divided into several sections:

- User Defined Data:** Contains a 'Drive ID' field with the value 'Demo 1' and a 'Description of drive unit' field with the value 'NewElec KE Demo Unit'. A 'Transmit data to relay' button is located below these fields.
- Counters:** Includes 'Startup Counter' (11), 'Trip Counter' (5), and 'Running Hours Counter' (2). Buttons for 'Update counters from relay' and 'Transmit settings to relay' are present.
- Power Consumption of Motor:** Shows 'Apparent Power Consumption' (0 kVAh) and 'Real Power Consumption' (0 kWh). A 'Reset Counters in Relay' button is located below.
- Thermal Capacity:** A section titled 'Thermal Capacity required to start Drive' containing a table of data.

The table shows the latest thermal capacity required to start the drive for each of the 10 drives (0-9). The 'Latest' drive (0) has a value of 1, and the 'Oldest' drive (9) has a value of 41.

Drive ID	Thermal Capacity required to start Drive
0	1
1	18
2	3
3	5
4	4
5	13
6	14
7	7
8	6
9	41

The status bar at the bottom indicates 'COM8 Connected' with a signal strength indicator.

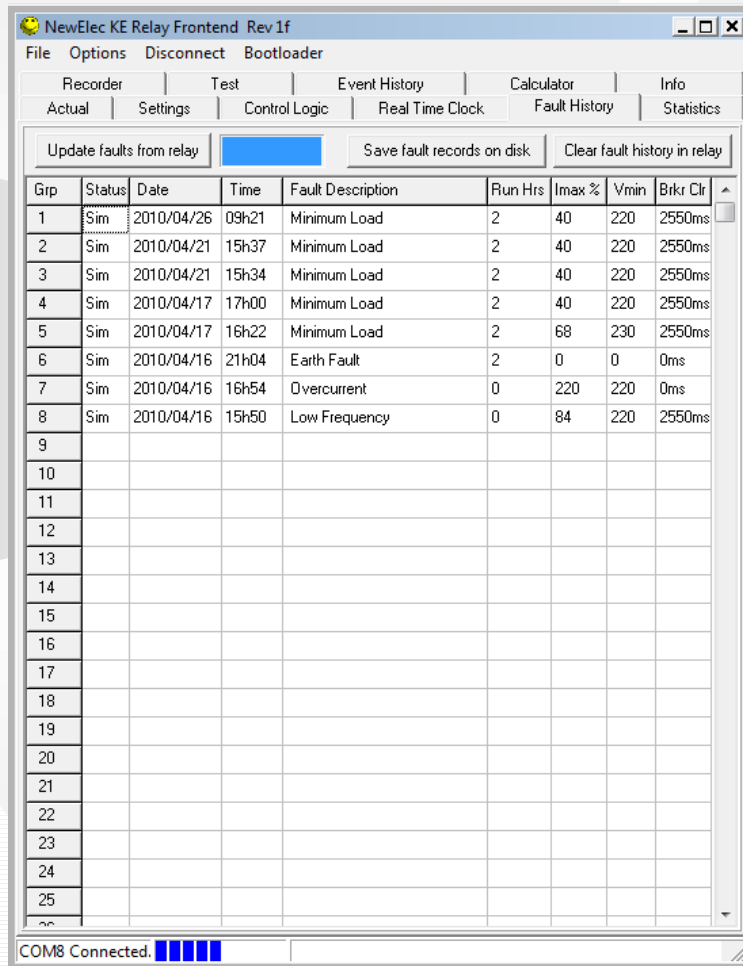
Essential Statistical Data ensures that information retrieved from the relay can be used for maintenance purposes before failure of the drive.

The Drive ID and Description ensure the information pertains to the correct drive.

Various selectable Communication protocols mean that automation of the plant via PLC and SCADA systems is seamless.

KE Relay

Last 60 Faults Record



The screenshot shows the 'NewElec KE Relay Frontend Rev1f' software window. The interface includes a menu bar (File, Options, Disconnect, Bootloader) and a toolbar with buttons for Recorder, Test, Event History, Calculator, Info, Actual, Settings, Control Logic, Real Time Clock, Fault History, and Statistics. Below the toolbar are three buttons: 'Update faults from relay', 'Save fault records on disk', and 'Clear fault history in relay'. The main area contains a table with 8 columns: Grp, Status, Date, Time, Fault Description, Run Hrs, I_{max} %, V_{min}, and Brkr Clr. The table lists 8 fault records, with rows 9 through 25 being empty. The status bar at the bottom indicates 'COM8 Connected' with a signal strength indicator.

Grp	Status	Date	Time	Fault Description	Run Hrs	I _{max} %	V _{min}	Brkr Clr
1	Sim	2010/04/26	09h21	Minimum Load	2	40	220	2550ms
2	Sim	2010/04/21	15h37	Minimum Load	2	40	220	2550ms
3	Sim	2010/04/21	15h34	Minimum Load	2	40	220	2550ms
4	Sim	2010/04/17	17h00	Minimum Load	2	40	220	2550ms
5	Sim	2010/04/17	16h22	Minimum Load	2	68	230	2550ms
6	Sim	2010/04/16	21h04	Earth Fault	2	0	0	0ms
7	Sim	2010/04/16	16h54	Overcurrent	0	220	220	0ms
8	Sim	2010/04/16	15h50	Low Frequency	0	84	220	2550ms
9								
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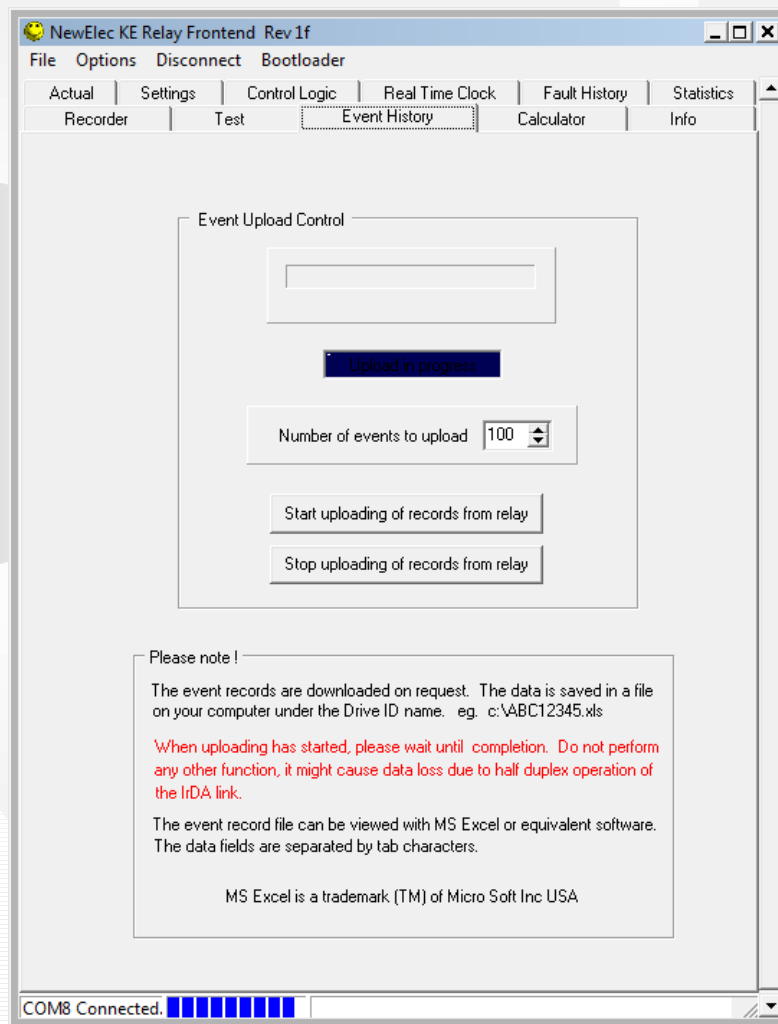
The Last 60 Faults Record is Date and Time stamped with the fault description, Running Hours of the drive, Current Maximum, Voltage Minimum and Breaker Clearance Time.

This information can be uploaded and stored for viewing in MS Excel later or data capture into a SAP system.

Particularly helpful for maintenance planning on a plant.

KE Relay

2000 Event Records

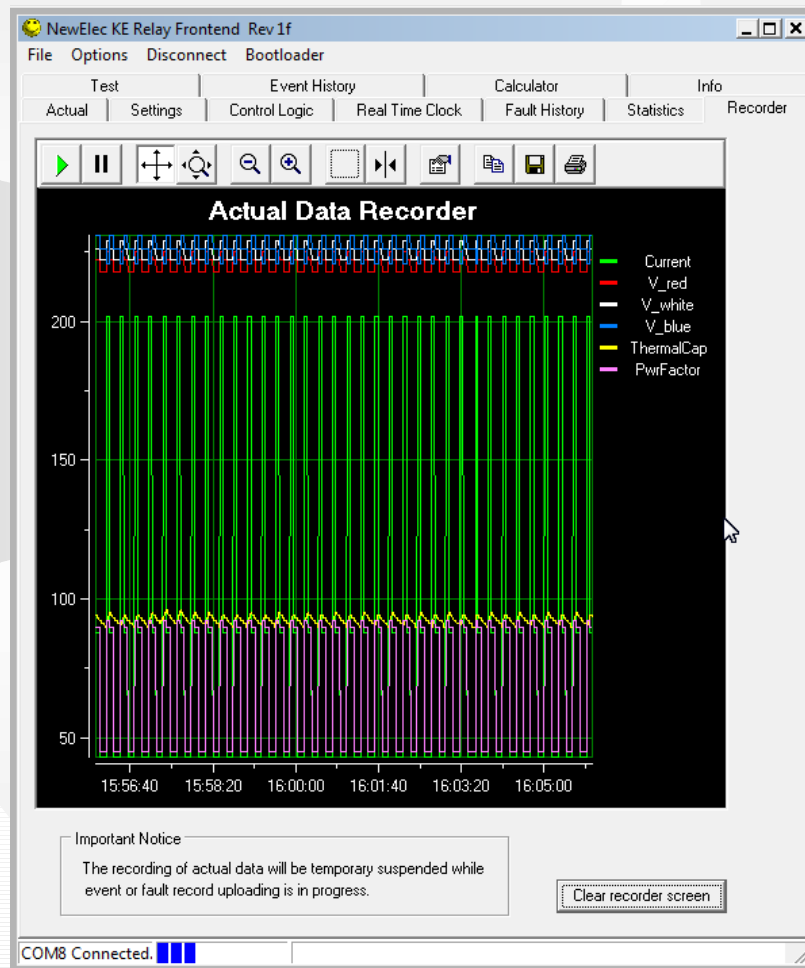


The Event Records are Date and Time stamped with the event description, Running Hours of the drive, Current Maximum, Voltage Minimum and Breaker Clearance Time.

Downloaded and viewed in MS Excel, the event records will show setting changes, stops and starts of the drive, alarm conditions and trips.

KE Relay

3 Phase Recorder

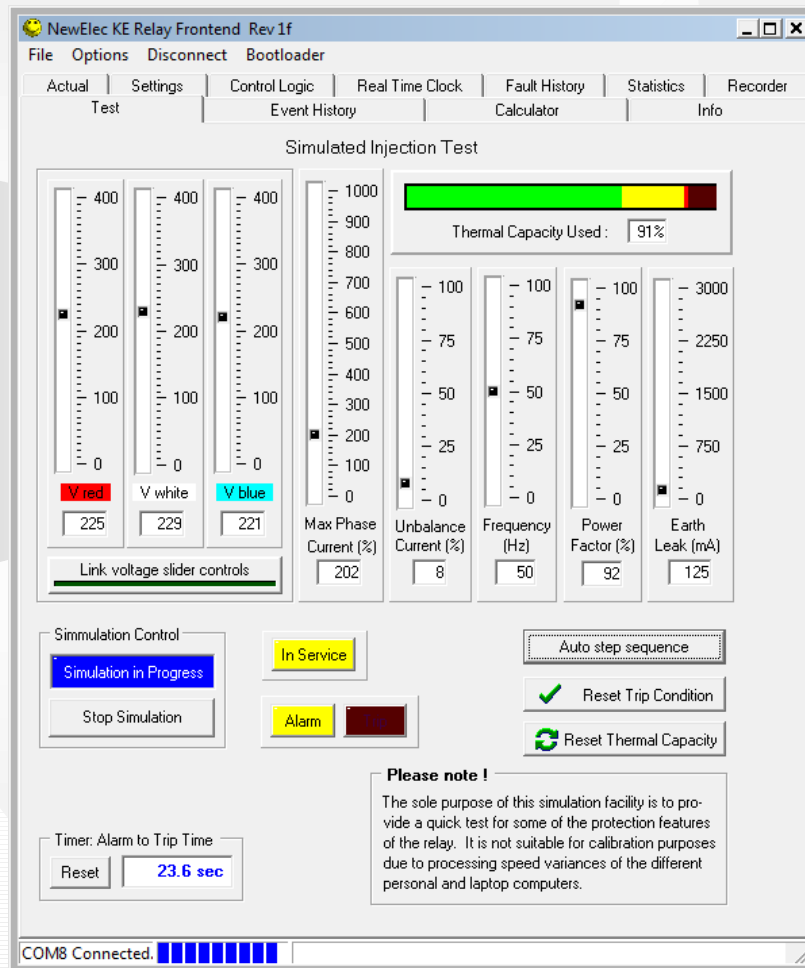


The 3 Phase Recorder allows the user to record the motor currents, voltages, thermal capacity and power factor. The motor performance can be monitored and analysed in real time.

Particularly useful when tripping occurs for no obvious reason. The recorder alleviates to some degree the need for sophisticated equipment to be carried round the plant.

KE Relay

Training Simulator



The Training Simulator is a tool that can be used to simulate running conditions. This allows the user to determine what the relay will do to protect the motor.

Training of employees is essential for familiarisation and understanding of the protection equipment.

KE Relay

Benefits of the Management Features

- Lower energy costs can be achieved
- A better green footprint is obtainable
- Preventative maintenance is possible
- More Efficient Production is achievable

KE Relay

Protection Features

- Over Current (Overload) Detection
- Underload (Minimum load) Detection
- Unbalanced Phase Current Detection
- Single Phase (Phase Loss) Detection
- Run Stall Detection
- Starts per Hour Control
- Vectorial Stall Detection
- Short Circuit Detection
- Voltage Symmetry Detection
- Over Voltage Detection
- Under Voltage Detection
- High or Low Frequency Detection
- Voltage Phase Rotation Detection
- Insulation Failure Detection
- Earth Leakage Detection
- Earth Fault Detection

KE Relay

Over Current (Overload) Detection

- Curve class settings: 3 seconds to 40 seconds
- IEC 60255-8 specification
- Motor full load setting (MLC): 10% to 100%
- Reset: Manual or three automatic resets per hour (when selected)
- Reset threshold settable: Between 0% to 80% Thermal Capacity or Dynamic Threshold
- Adjustment determined over last 10 starts.

KE Relay

Under Current (Underload) Detection

- Trip level adjustment: 10% to 100%
- Selection: Current level or power factor %
- Trip delay time: 1 to 10 seconds
- Start up delay: 1 to 200 seconds (To facilitate pump priming)
- Reset time: Manual or 10 seconds to 6 hours (9 steps)
- Feature selectable

KE Relay

Unbalanced Phase Current Detection

- Trip level adjustment: 0 to 50%
- Trip delay time: 1 to 10 seconds
- Reset: Manual
- Feature selectable

Single Phase (Phase Loss) Detection

- Trip delay time: 1 second fixed
- Feature selectable
- Reset: Manual

KE Relay

Run-Stall Detection

- Stall current trip level adjustment: 110% to 300%
- Stall trip delay time: 0 to 120 seconds adjustable
- Feature selectable
- Reset: Manual

Starts per Hour Control

- Starts setting: 1 to 60 starts per hour adjustable
- Consecutive starts: 1 to 3 starts per interval adjustable
- Reset: Automatic
- Feature selectable

KE Relay

Vectorial Stall Detection

Vectorial Stall is detected during the start up procedure of the motor. A motor normally starts up with a bad power factor which gradually improves as full speed is approached. If no power factor improvement is detected for longer then 33% of the curve class time the motor is tripped to prevent thermal and mechanical damage.

- Trip: Static or decreasing power factor
- Trip delay: 33% of curve class setting.
- Reset: Manual
- Feature selectable

KE Relay

Short Circuit Detection

- Articulated detection: If (ILOAD > 950% and Power factor < 85%) or (ILOAD > 300% and Power factor > 85%)
- Trip delay time: 1 second fixed
- Reset: Manual
- Feature selectable

Voltage Symmetry Detection

- Trip delay time: 10 seconds fixed
- Trip level adjustment: 70% to 99%
- Reset: Manual
- Feature selectable

KE Relay

Over Voltage Detection

- Trip delay time: 10 seconds fixed
- Trip level: Factory settings
- Reset: Manual
- Feature selectable

Under Voltage Detection

- Trip delay time: 10 seconds fixed
- Trip level: Factory settings
- Feature selectable
- Reset: Manual

KE Relay

High or Low Frequency Detection

- Trip delay time: 10 seconds fixed
- Trip level: Factory settings (45Hz to 55Hz)
- Reset: Manual
- Feature selectable

Voltage Phase Rotation Detection

- No trip delay time
- Auto reset once fault is fixed
- Feature selectable (forward, reverse, none)

KE Relay

Insulation Failure Detection

- Detection: Only in static state (motor not running)
- Trip delay time: 1 second fixed
- Trip level: Resistance < 20 kOhm (fixed)
- Reset: Manual
- Feature selectable

KE Relay

Earth Leakage Detection ($I_{EL} < 2A$)

- Selection between Instantaneous Definite Time or Inverse Definite Minimum Time.
- Instantaneous Definite Time ($100 \text{ ms} \geq t \geq 1000 \text{ ms}$), (50 ms steps)
- Inverse Define Minimum Time ($t \geq 130 \text{ ms}$)
- Harmonic filtering (suitable for VSD's and soft starters)
- Trip level: Adjustable
- Reset: Manual
- Feature selectable

KE Relay

Earth Fault Detection ($I_{EL} > 2A$)

- Harmonic filtering (suitable for VSD's and soft starters)
- Trip delay time: 1 second fixed
- Trip level: 2A fixed
- Reset: Manual
- Feature selectable

KE Relay

Setting up the Protection Features

The screenshot displays the 'NewElec KE Relay Frontend Rev1f' software window. The interface includes a menu bar (File, Options, Disconnect, Bootloader) and a tabbed area with 'Settings' selected. The main area is titled 'Parameter Settings and Feature Selection' and contains several sections of controls:

- Unbalance Current Trip Level:** 20 %
- Unbalance Current Trip Delay:** 10 sec
- Voltage Symmetry Trip Level:** 85 %
- Line Voltage Selector:** Auto V
- Starts per hour allowed:** 6
- Number of consecutive starts:** 3
- Instantaneous (Definite Time):** Selected
- Earth Leakage Trip Level:** 250 mA
- Earth Leakage Trip Delay:** 100 ms
- Overvoltage Enable:**
- Undervoltage Enable:**
- Voltage Symmetry Enable:**
- Voltage Phase Rotation Enable:**
- V Phase Rotation Reversed (BWR):**
- Frequency Monitor Enable:**
- Fail-Save Enable:**
- Auto Thermal Reset Select:**
- Moving Average Filter Enable:**
- Dynamic TCap Reset TH Adj Enable:**
- Starts per Hour Enable:**
- Earth Leakage Enable:**
- Insulation Lockout Enable:**
- Motor Full Load Setting (MLC):** 80 %
- Thermal Curve Class Selector:** 9 sec
- Set Thermal Capacity Level:** 92 %
- Thermal Cap Reset Threshold:** 70 %
- Min Load Restart Delay:** 20 min
- Min Load Current Trip Level:** 50 %
- Min Load Pwr Fac Trip Level:** 50 %
- Min Load Startup Trip Delay:** 1 sec
- Min Load Runtime Trip Delay:** 10 sec
- Run-Stall Trip Level:** 300 %
- Run-Stall Trip Holdoff Delay:** 2 sec
- Current Unbalance Enable:**
- Short Circuit Enable:**
- Single Phasing Enable:**
- Run Stall Enable:**
- Vectorial Stall Enable:**
- Minimum Load Enable:**
- Undercurrent Select:**
- Power Factor Select:**

Buttons at the bottom include 'Read (Rx) settings from relay' and 'Write (Tx) settings to relay'. The status bar at the bottom left shows 'COM8 Connected' with a progress indicator.

KE Relay

Features and Control

- Input Voltages (110V to 1050V)
- Communication: ProfiBus
- Power Factor Measurement
- Power Dissipation Measurement
- Programmable Output
- Logic Function Blocks
- Timers
- Real Time Clock
- Calculators
- Free Frontend Software
- Advantages of using NewElec Relays
- Approvals

KE Relay

Input Voltages

- Auto
- 110V
- 400V
- 525V
- 1050V

Communication Protocols

- Profibus DPV-0

KE Relay

Power Factor Measurement

- Is the relationship between real power and apparent power
Power factor % = $((V \times I \times \text{Cos}\theta) / (V \times I)) \times 100\%$
Power factor = $\text{Cos}\theta$
- Range: 0 to 100% (leading / lagging)

Power Dissipation Measurement

- Type: Apparent power (kVA) and Real power (kWatt)
- Derived from line voltage, phase voltage and power factor (where applicable)

KE Relay

Control Logic

All configurable inputs have 60 possibilities which include alarm flags, trip flags, timer outputs, function block outputs and RTC output.

Logic Function Blocks

- Amount of function blocks: 3
- Three fully configurable inputs per logic function block
- Sum of product or product of sums operation

Field Inputs and Programmable Outputs

- 1 Fully Programmable Output Relay
- Single set of potential free switch-over contacts
- Set of contacts for Remote Reset

KE Relay

Timers

- Timer A and Timer B
- Time setting: 0 to 50 minutes
- Start input: Configurable
- Reset / Inhibit input: Configurable

Real Time Clock (24 Hour)

- Start / Stop time: Hours and minutes configurable
- 24 hour clock (Year, month, date, hours and minutes)
- Battery backup (5 days with 1 Farad super capacitor)

KE Relay

Calculators

NewElec KE Relay Frontend Rev 1f

File Options Disconnect Bootloader

Actual Settings Control Logic Real Time Clock Fault History Statistics
Recorder Test Event History Calculator Info

Thermal Calculator

Trip Time Calculation	Cooling Time Calculation
Motor load current : <input type="text"/> %	Initial thermal capacity used : <input type="text"/> %
Thermal curve class : <input type="text"/> sec	Required thermal capacity : <input type="text"/> %
Thermal capacity used : <input type="text"/> %	Thermal time constant : <input type="text"/> sec
<input type="button" value="Calculate trip time"/> <input type="text"/> sec	Forced cooling : <input checked="" type="checkbox"/>
	<input type="button" value="Calculate cooling time"/> <input type="text"/> sec

Current Calculator (Delta Connection)

Full load power rating : kWatt
Line voltage : Volt
Power factor : %
Efficiency : %

Phase current : A
Line current : A

Earth Leakage IDMT Calculator

Actual leak current : mA
Leak current trip setting : mA
Time multiplier :

sec

Full Load Motor Setting Calculator

Phase Current : A
Relay model :

%

Thermal Curve Class Calculator

Max current @ lock rotor : %
Max time @ lock rotor : sec

sec

COM8 Connected. ■■■■

KE Relay

Frontend Software: Actual Values

The screenshot displays the 'NewElec KE Relay Frontend Rev 1f' software interface. The window title bar includes 'File', 'Options', 'Disconnect', and 'Bootloader'. Below the title bar is a menu bar with 'Recorder', 'Test', 'Event History', 'Calculator', and 'Info'. A secondary menu bar contains 'Actual', 'Settings', 'Control Logic', 'Real Time Clock', 'Fault History', and 'Statistics'. The main interface is divided into several sections:

- Drive Information:** Drive ID: Demo 1, Drive Description: NewElec KE Demo Unit.
- Operational Parameters:**
 - Thermal Capacity Used: 13 % (green bar)
 - Thermal Curve Class Setting: 9 sec
 - Thermal Trip Time Remainder: 78 sec (yellow bar)
 - Actual Current Level: 202 % (yellow bar)
 - Actual Phase Current Level: 808 A
 - Actual Current Unbalance: 8 %
 - Phase Voltage (red) Level: 225 V
 - Phase Voltage (white) Level: 229 V
 - Phase Voltage (blue) Level: 221 V
 - Voltage Symmetry: 98 %
 - Apparent Power Dissipation: 320.5 kVA
 - Real Power Dissipation: 294.8 kWatt
 - Earth Leakage Current: 125 mA
- Status Indicators:**
 - In Service (Motor Running): (yellow)
 - Phase Voltages Present: (yellow)
 - Line Voltage Selection: Auto V
 - Line Voltage (max): 397 V
 - Supply Frequency: 50 Hz
 - Power Factor: 92 %
 - Running Hours: 2
 - Main Trip Relay: (yellow)
 - Relay 2: (dark green)
 - Date: 2010/04/23, Time: 09h47m55s
 - Software: Rev 1f, Model: KE 5
 - Serial Nr: 00182344, Ext CT: 500 : 5
- Alarm and Trip Flags:**
 - Overcurrent: (yellow)
 - Vectorial / Run Stall: (dark red)
 - Current Unbalance: (dark red)
 - Single Phasing: (dark red)
 - Minimum Load: (dark red)
 - Low Frequency: (dark red)
 - High Frequency: (dark red)
 - Phase Rotation Error: (dark red)
 - Short Circuit: (dark red)
 - Overvoltage: (dark red)
 - Undervoltage: (dark red)
 - Voltage Symmetry: (dark red)
 - Isolation Lockout: (dark red)
 - Earth Leakage: (dark red)
 - Earth Fault: (dark red)
 - Starts per Hour Limit: (dark red)
- Relay Trip:** (green) with 'Reset' button.
- Thermal Capacity:** (green) with 'Reset' button.

The status bar at the bottom indicates 'COM8 Connected' with a progress indicator.

KE Relay

Advantages of using NewElec relays

- Local design and Manufacture
- 1 Year warranty on all our products (Including after repair)
- Relays can be repaired at 50% of their list price
- Local support backed up by our excellent customer service
- Ongoing new product development
- 30 years of Local and International experience

KE Relay

Approvals

- Profibus Certification Pending
- ISO 9001 Accreditation since November 2001
- Eskom approval GGS0852 (List of approved devices)

KE Relay

Thanks for your attention.

We trust this presentation was of benefit