

B110



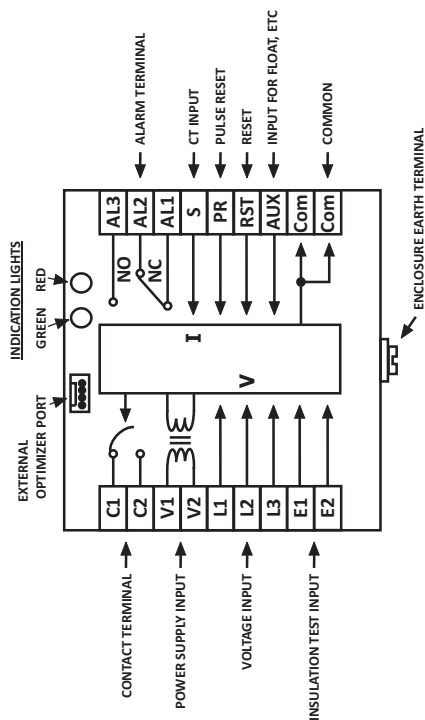
MOTORSCOPE®
THE RELIABLE ELECTRIC MOTOR GUARD

The MOTORSCOPE®

The power used by a working system varies with the application but must stay within safe limits. Power consumption outside this range indicates a faulty motor or system. The load or power consumption is measured at the input of the motor. When the calibration button is pressed, with the jumper in place, the *MOTORSCOPE* defines the safe range for the system. The motor must, at that time, run under normal working conditions. The power supply has to be correct and stable, this is checked constantly. The *MOTORSCOPE* keeps the motor running as long as the safe limits are not exceeded.

The *MOTORSCOPE* has a RS232 output for serial communication. This RS232 port is used to communicate with the *OPTIMIZER*, a PC or the *TELEMETRY* unit. The *OPTIMIZER* is used to improve settings, or to copy the data of the last 43 trips from a *MOTORSCOPE* unit to a PC. A software package can be purchased to view this data.

B110 MOTORSCOPE With Built-In OPTIMIZER



FEATURES OF THE MOTORSCOPE B110



PROTECTION:

The **MOTORSCOPE B110** protects your electrical motor against:

- ☞ Over-load (e.g. pump jammed)
- ☞ Under-load (e.g. run-dry)
- ☞ Over- / Under-voltage
- ☞ Phase Failure
- ☞ Phase sequence changes
- ☞ Phase Imbalance



SAFETY:

The **MOTORSCOPE B110** and the enclosed **Insulation Test Box**, forms an integrated insulation test module. Each time before startup, the motor's leads are tested for earth-leakage currents. In the event that the leakage current is too high, the controller will not start the motor.



OPTIMIZATION:

The **MOTORSCOPE B110** features a complete integrated **OPTIMIZER** with a 32 character dot-matrix display. The **OPTIMIZER** is a tool which is used to display or alter various settings of the **MOTORSCOPE B110** controller. Refer to pages 9-13 for the **OPTIMIZER's** user manual.



OTHER FEATURES:

The **MOTORSCOPE B110** also sports the following features:

- ☞ **Alarm Relay:** To switch an alarm ON in error conditions.
- ☞ **Reset and Pulse Reset**
- ☞ **Recovery Timer:** This timer can be adjusted to set the under-load auto-restart time between 4 minutes and 16 hours.
- ☞ **Auxiliary Inhibit:** This input may be used to remotely switch the controller ON/OFF.
- ☞ **Real Time Clock:** This feature enables the storage of the exact time of the last 43 motor trips for accurate logging purposes.

TECHNICAL SPECIFICATION

MOTORSCOPE B110 (400V; 525V; 1000V)

Control Voltage: V1-V2 = 110V; 230V; 400V; 525V
Depending on the on-board transformer ordered.

Motor Voltage: L1-L2-L3 = 415V; 525V; 1000V
Depending on fitted controller. (1000V needs a voltage converter.)

RESISTOR VALUE'S

External CT: 250:1 2.5VA (22mm Inside Ø)

Current Range	Resistor Over CT	CT Ratio
1 - 12A	32 OHM	1
10 - 24A	16 OHM	2
20 - 48A	8 OHM	4
40 - 96A	4 OHM	8
90 - 192A	2 OHM	16

POWER RANGE: 1 - 80KW (415V)
1 - 120KW (525V)

For bigger motors a CT with a greater ratio must be chosen
(Ex: 500:1)

FREQUENCY RANGE: 40 - 70 Hz

CONSUMPTION: 3 VA

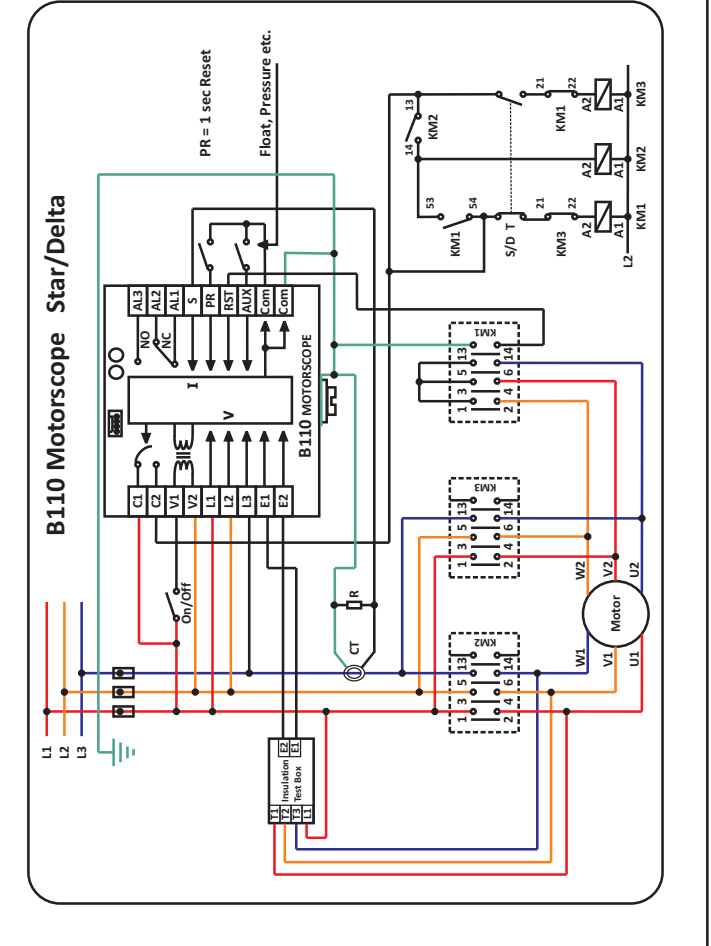
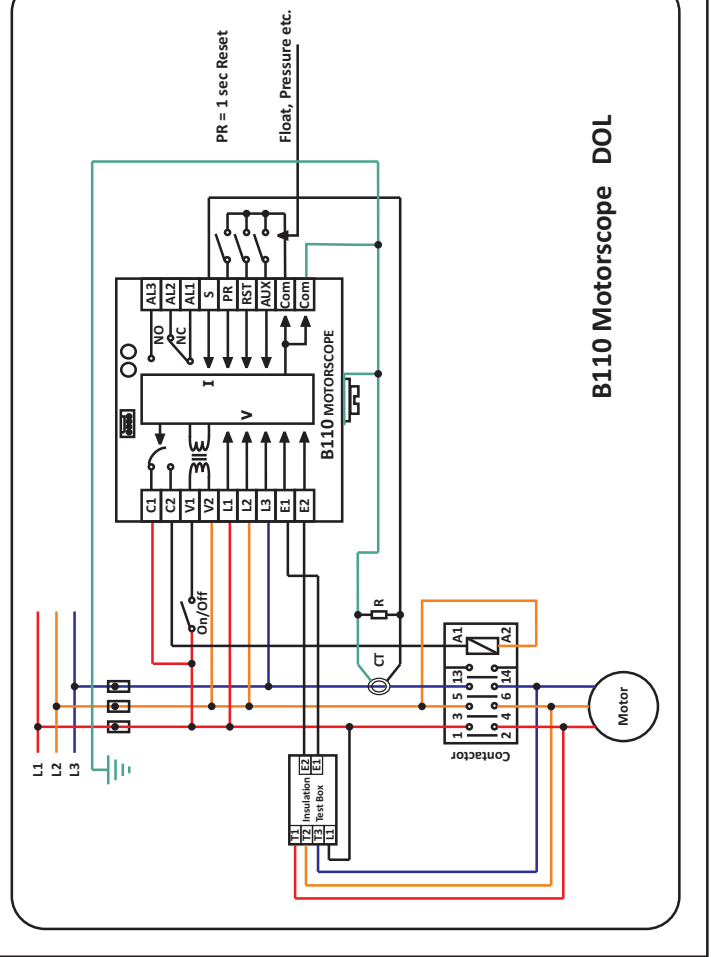
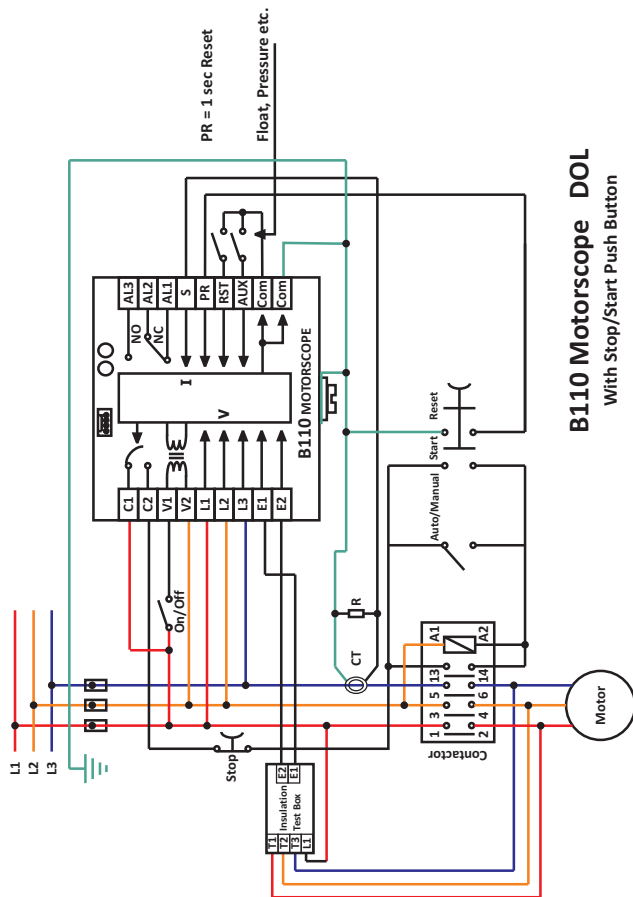
RELAY OUTPUT: 415V - 16A 525V - 5A

COSPHI RANGE: 0 - 1 inductive

TEMP RANGE: -15 to +70 °C

MECHANICAL: Weight: 1Kg

Dimensions: 125 x 120 x 80 (LxHxW)



FIRST TIME STARTUP:

- 1: Fit appropriate resistor over CT. The CT must be in L3.
- 2: Press MODE & DOWN to Mode 0
Press UP until "ENABLED" is displayed
Press MODE & DOWN to MODE 22
Press UP until "CALIBRATE" is displayed

The B110 will show "CALIBRATE BUSY" and the motor will start.
The screen will show "CALIBRATE PASS" and the limits are set.

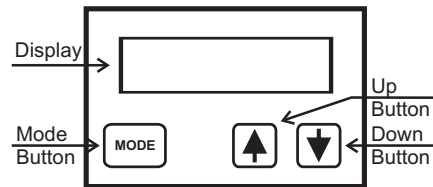
LET MOTOR RUN FOR 2 MIN.

- 3: Press MODE & DOWN to Mode 0
Press UP until "ENABLED" is displayed
Press MODE & DOWN to MODE 22
Press UP until "CALIBRATE" is displayed

The B110 will show "CALIBRATE BUSY".
The screen will show "CALIBRATE PASS" and the limits are set.

The B110 MOTORSCOPE is now set to protect your investment.

THE 18F OPTIMIZER



THE MODES OF THE OPTIMIZER

The OPTIMIZER has 23 different MODES, excluding the Programming Key (M 0). To get to a specific mode, press and hold "MODE", then press "▲" or "▼" until the desired mode number (M 0 to M23) is displayed. To change a specific value, change the Programming Key to "Enabled", then go to the desired MODE, then press "▲" or "▼".

DISPLAY

M0: Programming
Disabled

M1: Power
1689 Watt

M2: Voltage Ph.1
396 Volt

DESCRIPTION

Programming Key: This MODE should be changed to "Enabled" (Press "▲" or "▼"), to allow you to change the red values.

Present Power Consumption: (DEFAULT DISPLAY) This MODE displays the present power consumed by the motor in Watts. Range: 0 - 9999W or 10.00 - 999.9kW.

Voltage of Phase 1: The peak voltage is measured, then converted and displayed as a phase to phase value. Press and hold "▲" and "▼" for 3 seconds to get the RMS value.

M3: Voltage Ph.2
405 Volt

Voltage of Phase 2: The peak voltage is measured, then converted and displayed as a phase to phase value. Press and hold "▲" and "▼" for 3 seconds to get the RMS value.

M4: Voltage Ph.3
399 Volt

Voltage of Phase 3: The peak voltage is measured, then converted and displayed as a phase to phase value. Press and hold "▲" and "▼" for 3 seconds to get the RMS value.

M5: Current
3.35 Amp

Motor's Present Current Usage: The amount of current used by the electric motor at present, displayed in Amps.
Range: (1-15Amp) x C.T. Ratio (M10).

M6: Phase Angle
43 Degrees

Motor's Present Phase Angle (Phi): cos(phi) is the present power factor.
Range: 0 to 90 degrees.

M7: Error
None

Error Display Mode: This mode displays all controller specific errors. See page 13 for more information on controller and control errors.

M8: Delay Timer
2 Minutes

Motor Restart Delay Timer: The motor may only be started a certain number of times per hour. The default value is $T_r = 2\text{min} \times \text{C.T. Ratio (M10)}$. Press and hold "▲" and "▼" for 3 seconds to disable.

GUARANTEE EXPIRES IF DISABLED!

M9: Aux. Type
Normally Closed

Auxiliary Type: This is the state of the external relay contact. The default value is Normally Closed (thus the MOTORSCOPE runs when contact is closed), but can be changed to Normally Opened.

M10: CT-Ratio
1

C.T. Ratio: Please refer to the C.T. Ratio Table at the end of the description list, to obtain the correct C.T. Ratio, in order to display the correct consumed power and limits.
Range: 1 to 64. When using an external C.T. use correct shunt resistance.

M11: U/L Timer
1:00 (h:m)

Underload Restart Timer: This timer allows for a bore-hole to fill up after a run - dry condition before the motor is restarted. To change, press "▲" or "▼" or turn the pot on the MOTORSCOPE. Range: Off, 4min - 59min or 1.00 to 17.00hrs.

M12: Startup Tmr.
3 Seconds

Startup Timer: The number of seconds after power on, in which the MOTORSCOPE won't trip for any fault. This allows for the initial energy surge, which could be up to 5 times normal energy consumption. Range: 0-10sec.

M13: O/L Allow T.
1 Seconds

Overload Allow Timer: The number of seconds an overload condition is allowed before the MOTORSCOPE stops the motor. Range: 1 to 10 seconds.

M14: U/L Allow T.
1 Seconds

Underload Allow Timer: The number of seconds an underload condition is allowed before the MOTORSCOPE stops the motor. Range: 1 to 241 seconds.

M15: Min. Ph. Angle
27 Degrees

Minimum Phase Angle: The minimum phase angle (phi) allowed. Range: 1 to 85 degrees.

M16: Log Function
None

Log File Handler: In this mode you can copy up to 16 MOTORSCOPE's last 43 trips to the OPTIMIZER, clear the OPTIMIZER's memory or view the trip data of the last uploaded Log File.

M17:Max. Current
4.92 Amp

Maximum Current Allowed: This value is set to normal consumed current + 37.5% during automatic calibration process, but can be manually altered. Range: 1 - 15 Amps x C.T. Ratio.

M18:Max Rec Pwr
1747 Watt

Maximum Recorded Power: This is the maximum value of the consumed power (M 1) since last power up. To reset, press and hold "▲" and "▼" for 3 seconds.

M19:Min Rec Pwr
1535 Watt

Minimum Recorded Power: This is the minimum value of the consumed power (M 1) since last power up. To reset, press and hold "▲" and "▼" for 3 seconds.

M20:Pwr H. Limit
2103 Watt

Power High Limit: During automatic calibration this value is set to consumed power + 25%, but may be manually altered. Range: 0 to 9999W or 10.00 to 999.9kW.

M21:Pwr L. Limit
1247 Watt

Power Low Limit: During automatic calibration this value is set to consumed power - 25%, but may be manually altered. Range: 0 to 9999W or 10.00 to 999.9kW.

M22:Rem. Request
None

Calibration / Uncalibration: In this mode, the **MOTORSCOPE** can be (re-)calibrated or it can be un-calibrated (only when the motor is not running).

M23:Real T.Clock
Date and Time

Real Time Clock (RTC): If the **MOTORSCOPE** has an onboard RTC, the year, month, day, hour and minutes may be read/set in that sequential order.

Programming
Controller Data

Programming Result: When a changed value is successfully implemented, "PASS" is displayed, else "FAIL" is displayed.

M 7 ERROR MESSAGES

M7:ControllerErr
(specific error)

Controller Errors: The controller errors consist various "(specific error)" values, which include: memory read or write errors, interrupt errors and other controller errors.

M7:Error
(specific error)

Control Errors:

- ☞ **Ph. Imbalance** - This is when there is more than 20% voltage difference between two of the supply power's phases.
- ☞ **Ph. Sequence** - This is when two of the supply power's phases are swapped.
- ☞ **No Current** - No electrical current is flowing to the motor. Check motor leads.
- ☞ **Serial Port** - The serial connection between the OPTIMIZER and MOTORSCOPE or PC is defective. Try again. If problem persists, contact supplier.
- ☞ **Insulation Test** - On some MOTORSCOPEs an insulation test (similar to an earth leakage test) is performed on the motor before startup. If an insulation failure is detected, the motor is not started up and this error is displayed.
- ☞ **Voltage Freq.** - This error is displayed if the frequency of supply voltage is outside of the allowable range (40 - 70Hz).

C.T. RATIO TABLE

MOTOR CURRENT:	1 to 14 Amp	10 to 28 Amp	20 to 56 Amp	40 to 112 Amp
C.T. RATIO:	1	2	4	8
LOAD RESISTANCE:	32Ω	16Ω	8Ω	4Ω

NOTES

C.T. Ratio ? _____

Hi Limit ? _____

Low Limit ? _____

PHI (Phase Angle) ? _____



N I S T
CONTROL SYSTEMS CC

Reg. no. CK90/32732/23

199 Bosbok Street
Waterval, Pretoria
PO Box 910-600
Pyramid 0120
South Africa

Tel. +27 (12) 545 0831
Fax. +27 (12) 545 0686
E-mail: nist@nistcontrol.com
Web: <http://www.nistcontrol.com>