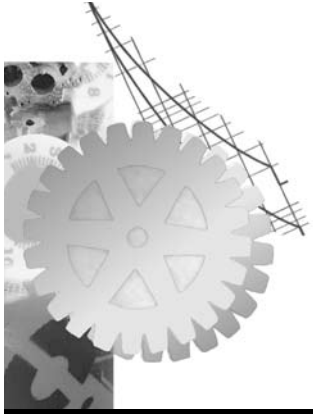


NEW ELEC
MOTOR PROTECTION & CONTROL TECHNOLOGY

330 M Series Crane Motor Protection Relay

INSTALLATION AND SETTING UP PROCEDURE

1. Protection Features

- Overloading (for both cyclic and sustained overload conditions)
- Start stall
- Phase unbalance / single phasing
- Factory preset "S" rating and Cyclic Duration Factor (C.D.F.)

The protection features 1 and 3 are adjustable and can be set to the specifications of the motor on the two dials mounted on the control panel.

2. Description of Operation

This unique motor protection relay is designed to limit the protected motor's temperature rise to be contained within the designed limits of the motor, specified by the motor manufacturer, in the form of rated Full Load current for a specified load pattern defined by the "S" rating, and duty cycle defined by the C.D.F. specified as a % of operating time at load pattern, followed by a rest period, during which the motor is to be at standstill. Typical specified load patterns catered for in the 330M Crane motor protection relay are S3, S4 and S5, whereas typical Cyclic Duration Factors (C.D.F.) that can be specified are 25%, 40% or 60%. The motor nameplate will list the different full load current values for the different "S" ratings and C.D.F. The required power output and load pattern required by the process will determine which Maximum Load current value and C.D.F. to be selected. (Refer to the useful info section on this CD ROM or our website for detailed information on this topic). Operating the motor within these parameters will prevent thermal overload, whether cyclic or sustained.

Overload Protection

Adjusting the Max Load % C.T Ratio dial mounted on the 330M Crane Relay control panel to the full load current specified for the motor nameplate "S" rating for the specified "C.D.F." to match the process load requirement, provides overload protection with no nuisance trips. The load setting dial is adjustable from 30 to 100 % of the current transformers fitted. The current transformer must have a 1amp secondary - class 1/5VA are adequate since they translate to 5P10 /0,5 VA rating due to the low secondary burden of the NewElec 330M Crane Motor protection relay.

Example:

* Assume a motor full load current of 82 amp
* Fitted current transformer ratio 150:1
* Calculated 330M Crane Relay Max Load Current dial setting

$$\frac{82 \times 100}{150} = 54{,}6\ \%\ (55\ \%)$$

When placing the order, the required information relating to "S" rating and C.D.F. will be requested to enable the thermal model to be factory preset on the unit. These values will be marked on the relay control panel to allow customer confirmation of the "S" rating and the C.D.F. selected.

These parameters are significant in that the NewElec 330 M relay will utilise the "S" rating and C.D.F. information to calculate the motor heating and cooling rates at the motor full load current value set on the Max Load Current dial on the NewElec 330M relay control panel ensuring that the motor load and C.D.F. are not exceeded.

An Overload condition occurs when the load current drawn by the motor exceeds the value set on the Max Load % C.T Ratio dial. This is conveniently indicated by the 'Overload' LED switching 'ON' when the load current exceeds the value set on the Max Load % C.T Ratio dial. It switches 'OFF' once the load current decreases below the value set on the Max Load % C.T Ratio dial. The value, and duration by which the load current exceeds the set current, as well as the remaining thermal capacity level mapped on the 330M Thermal curve will determine the Thermal Overload trip time, after which the "Overload" and the "Thermal Lock Out" LEDs will be switched 'ON' and the Main Trip Relay will de-energise (fail safe operation) the two potential free changeover contacts, output contacts and latched terminals (7, 8 and 9 and 10,11 and 12 respectively).

Resetting the 330M relay once it has tripped on Overload can be done once the "Thermal Lock Out" LED has switched 'OFF' indicating that sufficient Thermal Capacity has been regained. The actual Reset action is performed by pressing either the local reset button OR the remote reset button (wired to terminals 5 and 6) which will turn off the "Overload" Trip LED and re-energise the Main Trip Relay to allow the motor to be restarted.

To illustrate the Overcurrent / Thermal Capacity integration and decay with a RMS load pattern, consider a motor designed for a "S4" 150 starts per hour duty at a 40 % C.D.F. The NewElec 330M Relay Thermal curve trip delay is 15 sec @ 200% motor full load.

Calculate Load Pattern period

Cycle time: 150 cycles per hour
Single cycle: 3600 seconds / 150 = (24s)

40 % C.D.F: implies TIME ON $\frac{40 \times 24}{100}$ = 9,6 (10s)

TIME OFF 24 – 10 = (14s)

If one were to tabulate the thermal development in the motor as a result of using the motor in the manner shown below, the following would be the result:

THERMAL MEMORY PLOT
S4 Duty.150 Starts /Hour. 40 % C.D.F. – Trip Curve 2 x Ifl – 15 seconds

% LOAD	TIME SECONDS	% THERMAL CAPACITY USED	LOAD PATTERN
0	0	0	
200	5	33	Cycle 1
95	5	29,06	97% load C.D.F. 40%
0	14	9,87	Normal Load
200	5	42,87	Cycle 2
95	5	37,70	97% load C.D.F. 40%
0	14	12,83	
200	5	45,83	Cycle 3
95	5	40,31	97% load C.D.F. 40%
0	14	13,71	Normal Load
200	5	46,71	Cycle 4
95	5	41,09	97% load C.D.F. 40%
0	14	13,98	Normal Load
200	5	46,98	Cycle 5
95	5	41,32	97% load C.D.F. 40%
0	14	14,06	Normal Load
200	12	94,06	Cycle 6
95	5	82,73	85% load C.D.F. 55%
0	14	28,15	OVERLOADING
200	5	61,15	Cycle 7
95	5	53,78	97% load C.D.F. 40%
0	14	18,30	Normal Load
200	5	51,30	Cycle 8
95	5	45,12	97% load C.D.F. 40%
0	14	15,30	Normal Load

As can be seen above, a 12 second period at 2 times motor full load during the 6th cycle caused the thermal utilization of the motor to increase, but on a reduced RMS load current of 85% over the extended measurement cycle of 31 seconds, as opposed to specified 24 seconds. This is the NewElec 330M Thermal model taking into account that the C.D.F. increased from 40% to 55% over the 6th cycle resulting in a larger utilisation of the motors thermal capacity model (increase significantly 94 % used). Whereas a standard Thermal model in a standard electronic thermal overload would have reflected a lower utilization of the motor thermal capacity since the C.D.F. is not taken into account.

Phase Current Unbalance

Phase current unbalance and Single phasing protection are provided for by the 330 M crane motor protection relay. The phase unbalance detection threshold is adjustable on the Max Unbalance Ratio % dial between 2% to 40 % of the value set on the Max Load % C.T Ratio dial mounted on the front of the 330M control panel.

Upon detection of a phase loss or an unbalance level greater than the value set on the Max Unbalance Ratio % dial, the "Unbalance" LED will switch "ON", and if within 5 seconds the unbalance level drops below the value set on the Max Unbalance Ratio % dial, the 'Unbalance' LED will switch 'OFF' failing which the 'Unbalance' LED is latched 'ON', and the Main Trip Relay will de-energise (Fail safe Operation) the two potential free changeover contacts, output contacts and latched terminals (7, 8 and 9 and 10, 11 and 12 respectively).

Resetting the 330M relay once it has tripped on "Unbalance" can be done immediately by pressing either the local reset button OR the remote reset button (wired to terminals 5 and 6) which will turn off the "Unbalance" and the "Trip" LEDs and re-energise the Main Trip Relay to allow the motor to be restarted.

Overload Test Pushbutton

A control panel-mounted miniature test pushbutton is fitted to provide maintenance personnel a facility to check the IDMT thermal protection curve of the 330 M relay. Pressing and holding down this button for 15 seconds will subject the relay to a simulation of 2 x Motor Full Load setting for that duration of time and will cause the relay to trip on overload. It is a facility that confirms the thermal curve accuracy.

Trip State Indication Meter

A thermal trip state indicator may be optionally wired to terminals 17 and 18 of the 330M crane motor protection relay. Experience has shown enormous benefit in so doing as it allows the crane operator a visual indication of a combination of the Thermal Capacity and Actual Load Current of the motor while in operation. When this indicator is mounted in the machine operator's cabin, a glance at the indicator will show just how hard he/she may still work the crane or winch before a trip occurs. The indicator may be mounted up to 1000 meters away from the protection relay.

The 330 M may, as an option, be fitted with an auto/manual toggle switch for auto resetting an overload trip only.

3. Information required for Initial Settings

You will need to know the full load current rating of the protected motor for the specified C.D.F.

4. Setting up Procedure

The following must be checked before switching on the control supply to the relay:

- The wiring connections are in accordance with the NewElec 330M ECD schematic diagram.
- Check that the Primary and Secondary polarity of the current transformers are at correct polarity.
- Check that the "S" rating and C.D.F. % depicted on the relay control panel corresponds to the duty of the protected motor.
- Set the Max Load % C.T Ratio dial to the full load rating of the protected motor (refer to the over load section in this document for an example).
- Set the Max Unbalance Ratio - % dial to an initial setting of 10 %.
- Switch on the auxiliary power supply to the relay.
- If a NewElec 330 M thermal trip state indicator has not been fitted to terminals 17 and 18, then connect a 1mA d.c meter across these terminals (+) to terminal 17 and (-) to terminal 18.
- Start your motor and operate as the normal load cycle demands. If the motor is loaded to its maximum load pattern, the meter reading will oscillate between ± 0,150 and 0,6 mA during the load pattern.
- The final setting on the Maximum Unbalance Ratio % dial is achieved while the motor is operating at its normal load pattern. Rotate the dial counter clockwise until the unbalance LED illuminates. If left at this position (which identifies the inherent unbalance in the motor windings) the relay will trip the motor in approximately 5 seconds. Before this occurs, note the % level of unbalance, add 5 % and leave as a final setting.

5. Adding or Removing Features on Site

No additional features may be removed or added to this product on site.

6. Specifications

INPUT CONVERTOR

Overload capacity	: 6 x In for 5 min
Frequency response	: 42 – 66 Hz

MAXIMUM LOAD SETTING

Linearity	: ± 4%
Repeatability	: ± 1%
Detection level	: ± 1%
Calibration	: 30 to 100% of current transformer ratio

CONTROL SUPPLY

110 or 220 Volt a.c	: 90 to 115% of specified voltage

MAIN RELAY CONTACTS

Ratings	: 5 Amp at 220 Volt a.c
Configuration	: 2 Form C

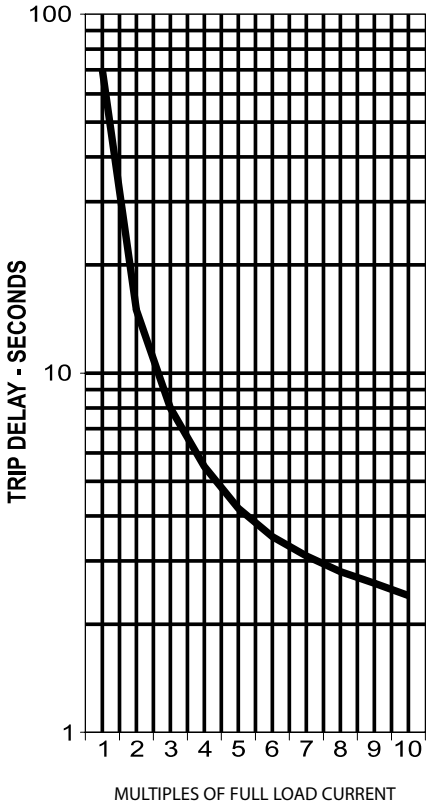
MAXIMUM UNBALANCE RATIO SETTING

Calibration	: 2 to 42% Ie
Accuracy	: ± 5%
Trip delay	: 5s ± 1s
Recommended setting	: 8 to 15% of dial setting

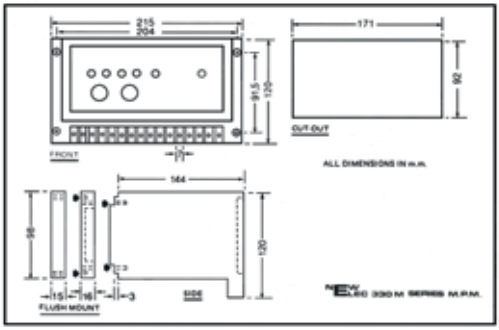
FAIL SAFE OPERATION

Trips on loss of supply

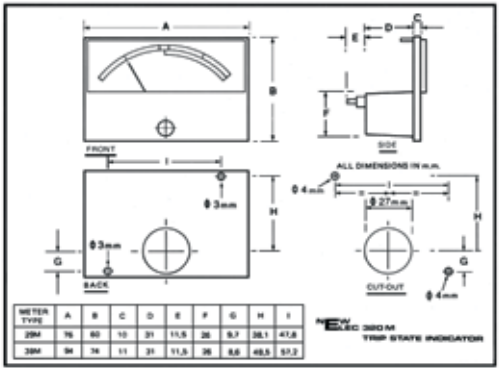
7. Thermal Trip Curve



8. Dimensional Diagram

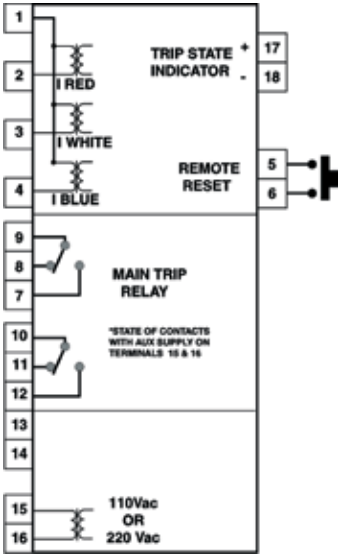


Trip State Indicator Dimensions



METER TYPE	A	B	C	D	E	F	G	H	I
29M	76	60	10	31	11,5	26	9,7	38,1	47,8
39M	94	74	11	31	11,5	26	8,6	48,5	57,2

9. Electrical Connection Diagram



10. Ordering Information

330M F 110 S4 / 150 / 40

C.T. RATIO selected to match motor lfl at "S" rating and C.D.F.

Code	Cyclic Duration Factor
25	25% C.D.F.
40	40% C.D.F.
60	60% C.D.F.

Mounting	Code
Flush (door mounted)	F
Chassis (panel mounted)	C

Code	Starting Duty
150	150 Complete starts/hour
300	300 Complete starts/hour

Control Supply	Code
220V AC 5 VA	220
110V AC 5 VA	110

Code	Thermal Rating of Machine
S3	Intermittent periodic operation
S4	As S3 but with starting
S5	As S4 but with elec. braking

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