NEW ELEC
MOTOR PROTECTION & CONTROL TECHNOLOGY

KA LV Motor Protection Relay

Installation and Setting Up Procedure

About product

The KA Series of Electronic Motor Protection and control relays are housed in a small footprint, DIN rail mount. Fixed thermal curves (Class 15 Cold - Class 5 Hot) with thermal pre-loading, match the Hot and Cold stall times of the motor during operation.

The KA relay is mains powered auto-selecting 400V or 525V supply whilst the KB and KC relays require either 110V or 220V AC auxiliary supply.

The KA relays provide a single unit solution in pumping applications that traditionally would have used a combination of thermal overload, undercurrent and restart timers. The unit provides overload, under-load, single-phasing, unbalanced current, over-voltage, under-voltage and phase rotation protection.

The relays are available in the range from 0,5A to 25A, directly through the current transformer module block. Also available in the range from 50A to 200A using external current tranformers in xxx:5 ratio.

Protection Features Include

- Overload (for both cyclic and sustained overload conditions)
- Single phasing / unbalance
- Stall protection
- Undercurrent / load loss
- Phase rotation
- Over-voltage
- Under-voltage

Description of Operation

Overload protection is provided against cyclic and sustained overloads. Pre-loading with thermal memory, utilising accurate hot and cold thermal curve characteristics to IEC 255-8 provides this protection.

The thermal IDMT curve is Class 15 cold and Class 5 hot. This curve will provide adequate protection in the event of a motor stall, both during starting and running conditions.
Should the motor load exceed the thermal capacity allowed by the thermal IDMT curve (Class15 cold and Class 5 hot curve), the motor overload LED indicator will be illuminated, the relay healthy indicator switched off and the main trip relay de-energised to stop the motor.

The same motor overload LED can be used to read the actual load current being drawn by the motor during normal running conditions. This is achieved by pressing and holding the control panel-mounted reset push-button, while trimming back the maximum load current dial, until the motor overload LED switches on. The calibration on the maximum load current dial where this occurs, is the actual load current being drawn by the motor.

In the event of a motor overload trip, the entire thermal capacity of the motor has been utilised. If auto reset has been selected, the motor overload LED will flash at a one second rate until the thermal capacity

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has integrated to 33%. At this point the overload LED will switch off and the relay healthy LED will switch on to indicate that the motor can be returned to service. The relay will reset to a Class 5 hot curve.

If manual reset is selected the motor overload LED will remain on until the control panel-mounted reset button is pressed. If the reset push-button is pressed and the thermal capacity has not integrated to 33%, the auto reset sequence is initiated. If the thermal capacity has integrated to >33%, then the overload LED will switch off, the relay healthy LED will switch on, and the main trip relay will be re-energised and the motor returned to service.

Phase unbalance protection is provided independent of motor load. In the event of the three line currents becoming unbalanced by more than 30%, a 5 second trip delay is initiated. After tripping, the phase unbalance LED will be illuminated, the relay healthy indicator switched off, and the main trip relay de-energised to stop the motor.

Should the motor load current, during normal operation, drop below the minimum load % MLC dial setting, while still being >10% of the maximum load current dial value for the full 10 second period, the minimum load LED will be illuminated, the relay healthy indicator switched off and the main trip relay de-energised to stop the motor.

If, during the 10 second trip time period, the motor load current increases above minimum load % MLC dial setting, and then once more drops below the minimum load % MLC dial setting value, a new 10 second trip delay period is initiated.

The minimum load value can be adjusted during normal running conditions by pressing and holding the control panel-mounted reset push-button, while trimming up the minimum load % MLC dial, until the “Min Load Trip” LED turns on. The calibration on the minimum load % MLC dial where this occurs is the actual % load of the maximum load dial setting being drawn by the motor.

If the control panel-mounted auto/manual selector switch is in the auto position it will have no bearing on the minimum load reset as this will only be reset manually. SHOULD YOUR APPLICATION REQUIRE AN AUTO-RESET ON THE MINIMUM LOAD FUNCTION THIS MUST BE SPECIFIED AT THE TIME OF ORDER.

Incorrect phase rotation will result in the phase rotation LED being illuminated, the relay healthy indicator switched off, and the main trip relay de-energised. This will prevent motor operation with incorrect phase sequence and resultant damage to driven equipment.
Once the phase rotation has been corrected, the phase rotation LED will be switched off, the relay healthy LED switched on, and the main trip relay re-energised. This will then allow the motor to be started.

In the event of an over-voltage condition where the main circuit voltage becomes greater than 115 % of the rated supply, a 10 second trip delay is initiated. After this, the phase rotation LED is illuminated and pulsed at a 75% duty over a 4 second period, the relay healthy LED is switched off, and the main trip relay de-energised. Once the main circuit voltage level reduces to below 115%, the flashing phase rotation LED will switch off, the relay healthy LED is switched on, and the main trip relay re-energised.
This will then allow the motor to be started.

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In the event of an under-voltage condition where the main circuit voltage becomes less than 90 % of the rated supply, a 10 second trip delay is initiated. After this, the phase rotation LED is illuminated and pulsed at a 25% duty over a 4 second period, the relay healthy LED is switched off, and the main trip relay de-energised. Once the main circuit voltage level increases to above 90% the flashing phase rotation LED is switched off, the relay healthy LED is switched on and the main trip relay re-energised. This will then allow the motor to be started.

Descriptive LED indications have been provided for ease of fault diagnosis and information. The following red LED trip indicators with clear descriptive fault conditions have been mounted on the control panel to assist maintenance personnel in determining the exact cause of a trip.

- Motor Overload
- Phase Unbalance
- Min Load
- Phase Rotation/Over & Under-voltage

A green LED indicating relay healthy status

Information required for Initial Settings

This user-friendly relay requires only that you set the motor full load current on the "Max Load Current Amp" dial to coincide with the protected motor's full load capability. Prior knowledge of the no load current value of the protected motor, if known, will be useful. However, it is not necessary, as a procedure will be outlined below to determine this value.

Note: This relay has a fixed cold thermal curve of 15 seconds which integrates to a 5 second curve as the motor reaches its full thermal capacity. Use of this product on large motors designed for cold thermal curves in excess of 15 seconds will result in over protection of the motor.

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Setting up Procedure

- Ensure that the selected KA relay does in fact cover the full load current range of the protected motor. Note that the models KA 1; KA 5; KA 10 and KA 25 do not require any additional current transformers. The relay MUST be installed in the MAIN CIRCUIT of the starter. Being compact in design the built-in single-turn feed-through primary winding transformers permit the main circuit cable conductors of up to 7 mm to pass through the protection relay. In the case of the models KA 50; KA 100 and KA 200 interposing current transformers of 50:5; 100:5 and 200:5 respectivelyare required. The secondary winding of these interposing current transformers are then wired through the single-turn feed-through primary winding transformers at the rear of the relay. CARE SHOULD BE OBSERVED IN ENSURING THAT THE POLARITY OF THE CURRENT TRANSFORMERS IS THE SAME FOR EACH PHASE AND THAT THE DIRECTION OF CURRENT FLOW FROM THE SECONDARY SIDE OF THE TRANSFORMERS IS UNIFORM FOR ALL PHASES. If this is not done, nuisance unbalance trips will occur.
- The KA range of relays is powered directly from the main line phase voltage of either 380 OR 525 Volt a.c. For this reason we recommend the insertion of a 2 Amp fuse on each line to afford some protection to possible high surge voltages. It is equally important to adhere to the correct phase sequencing (rotation) on the supply side of the relay. Connect up the phase inputs in the sequence indicated on the relay label. The phase rotation LED will extinguish the moment the rotation is correct.
- Connect the N.C contact in series with your trip circuit, (usually the main contactor holding coil) and, if required, the N.O contact can be used for signalling or control purposes.
- Proceed to set the motor full load current on the "MAX LOAD CURRENT AMPS" dial.
- Approximate (unless you already know) the percentage drop in load the fully loaded motor will experience during a no load condition and set that % value on the "MIN LOAD % MLC AMPS" dial
- Set the auto / manual reset toggle according to your preference for the thermal lock out period after an overload trip condition.
- The motor protection relay is now ready

Tip:
Applicable once the motor is running. When using the KA motor protection relay on an application where the motor load s relatively constant it may be a good idea to set the "Maximum Load Current Amps" dial to coincide with the actual mechanical load being drawn by the motor. This can be achieved by holding in the reset button while at the same time slowly turning counter clockwise on the "MAXIMUM LOAD CURRENT AMPS" dial until the red "Overload" LED lights up.

When this point is reached, you will have established the actual load current being drawn by the protected motor. Now, while still holding down the reset button gently turn the "Maximum Load Current" dial clockwise until the "overload" LED extinguishes and leave as a final setting.

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The result of this setting-up method will enhance the protection to the motor in that frequent overload trips would signal possible bearing degradation which would translate as extra abnormal load to the motor in overcoming additional frictional forces.
In a similar fashion, if the motor is run under no load, while consistently pressing the reset button on the control panel, it is possible to accurately determine the % drop in load. This is achieved by setting the "MIN LOAD % MLC AMPS" dial to the minimum value and then rotating the setting knob slowly clockwise until the MIN LOAD LED lights up. Leave this as a final setting.

Adding or Removing Features on Site

No additional features can be set OR disabled on site.

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Specifications

Input Converter

Class : Class 1
Rating : 0,1VA
Frequency Response : 40 to 66Hz

Overload Trip Delay Curves

Cold

$$T\ Trip = 15\ (35,49)\ Ln \left[\frac{(I/Ie)2 - (Ip/Ie)2}{((I/Ie)2 - 1)} \right]$$

Hot

$$T\ Trip = 5\ (35,49)\ Ln \left[\frac{(I/Ie)2 - (Ip/Ie)2}{((I/Ie)2 - 1)} \right]$$

Accuracy : ± 5% 1,2 x Ie to 6 x Ie
: ± 10% 1,01 x Ie to 1,2 x Ie

Underload Detection

Range : 10 to 100% of Maximum Load Dial
Trip Delay : 1 to 10 seconds

Fault Indication

Operation : Latch on trip
Resetting Fault Indication : Latch

Maximum Load Current Setting

Level Setting Accuracy : ± 2%
Linearity : ± 2%
Repeatability : ± 1%
Detection Level : ± 2%
Calibration : Amps

Overload Thermal Lock-out Time to Recover 33% Capacity

Example shown for a 15 sec curve selection : T reset = Curve [2.33 (35,49 x 2) 15 log (100/70)] - Motor Running

Main Trip Relay : 5 Amps 220V A.C.
Configuration : 1 n/o + 1 n/c
Terminals : n/c 7 and 8
: n/o 9 and 10

Underload Detection

Range : 10 to 100% of Maximum Load Dial
Trip Delay : 1 to 10 seconds

Environmental Specifications

Reference Standards IEC 255
Isolation N/O contact

1kV for 1 minute to IEC 255-5 C

Impulse Withstand

5kV to IEC 255-4 EIII

Isolation Separate Contacts

1kV for 1 minute to IEC 255-5 C

High Frequency

IEC 255-4 C III

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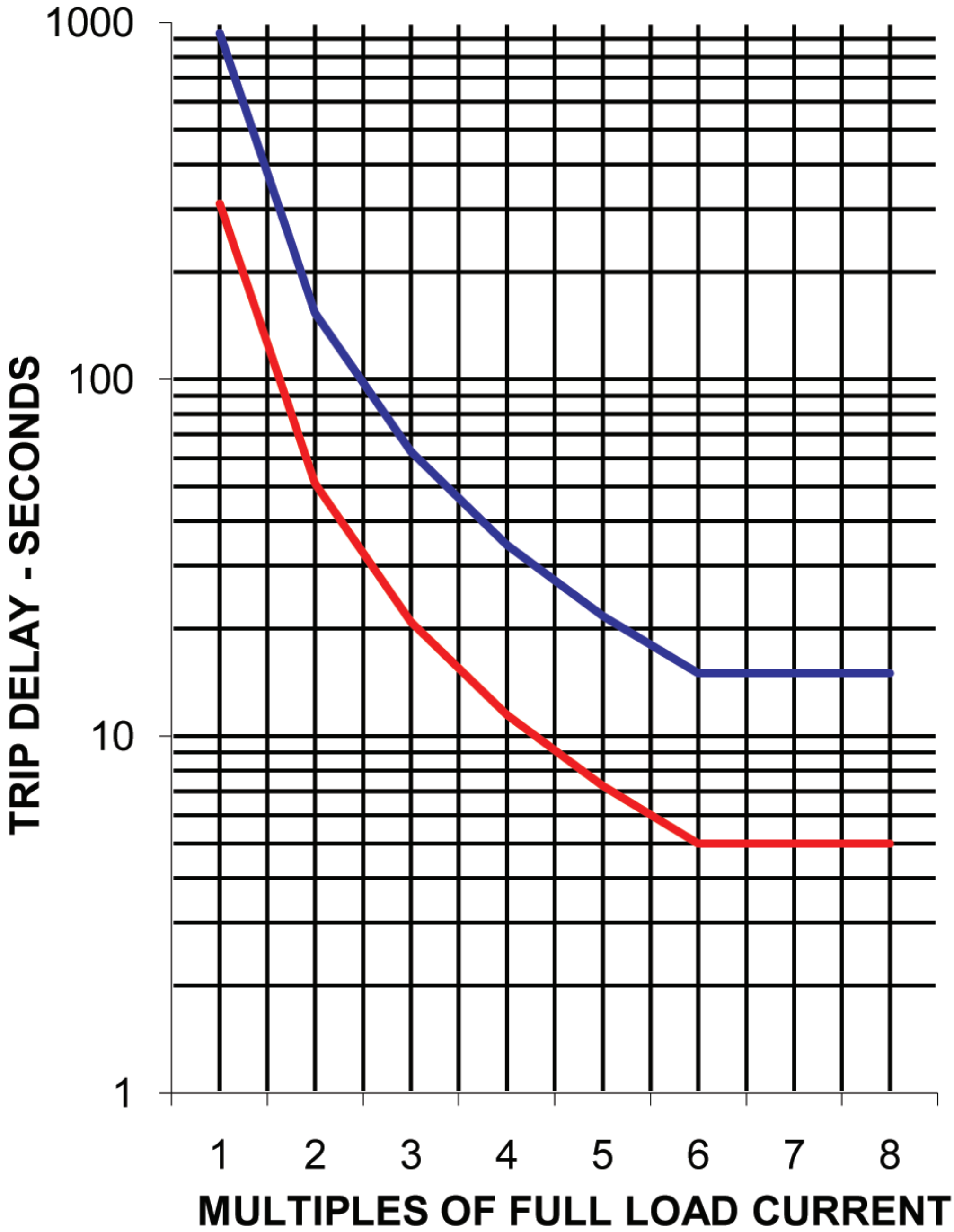
Thermal Trip Curves



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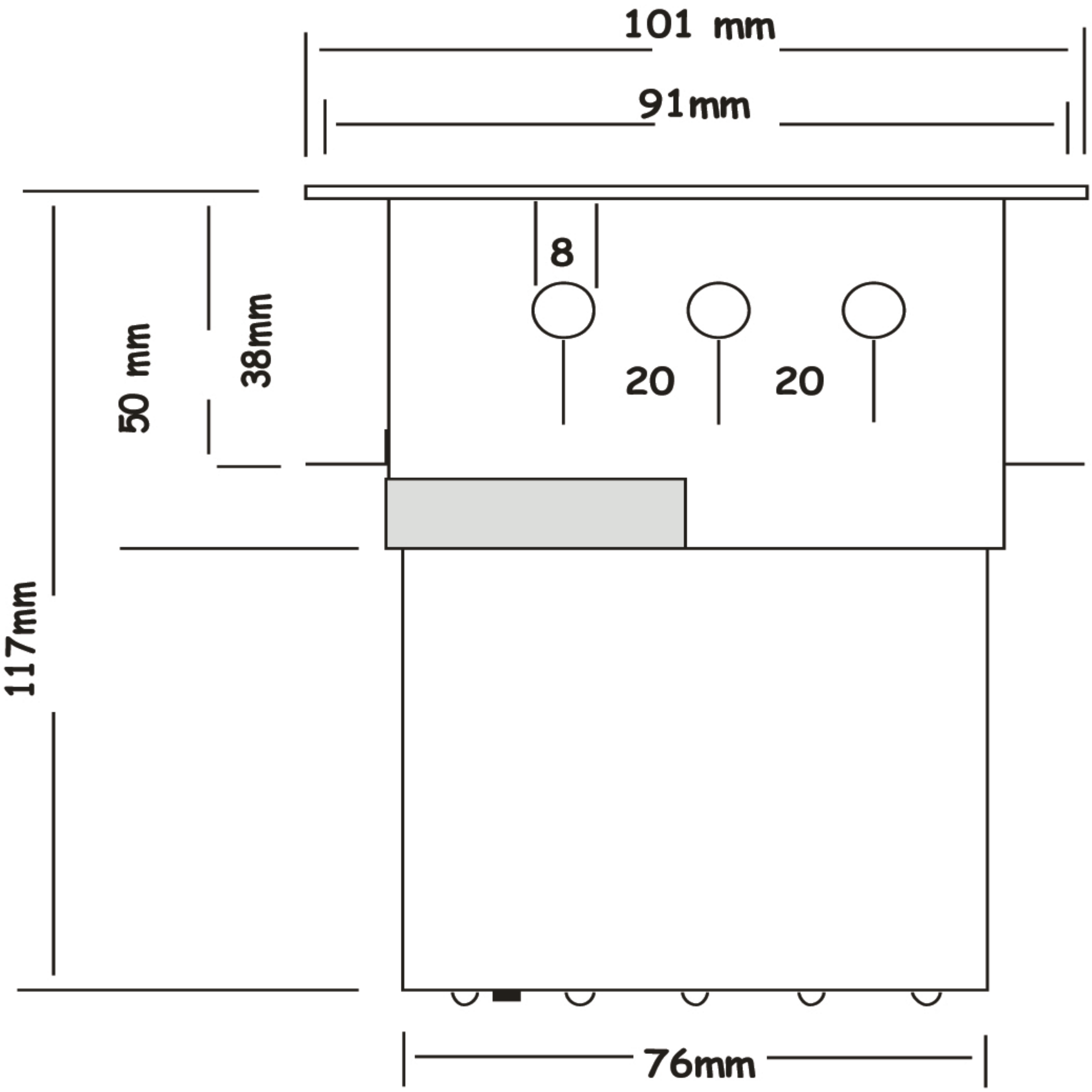
Dimensional Diagram



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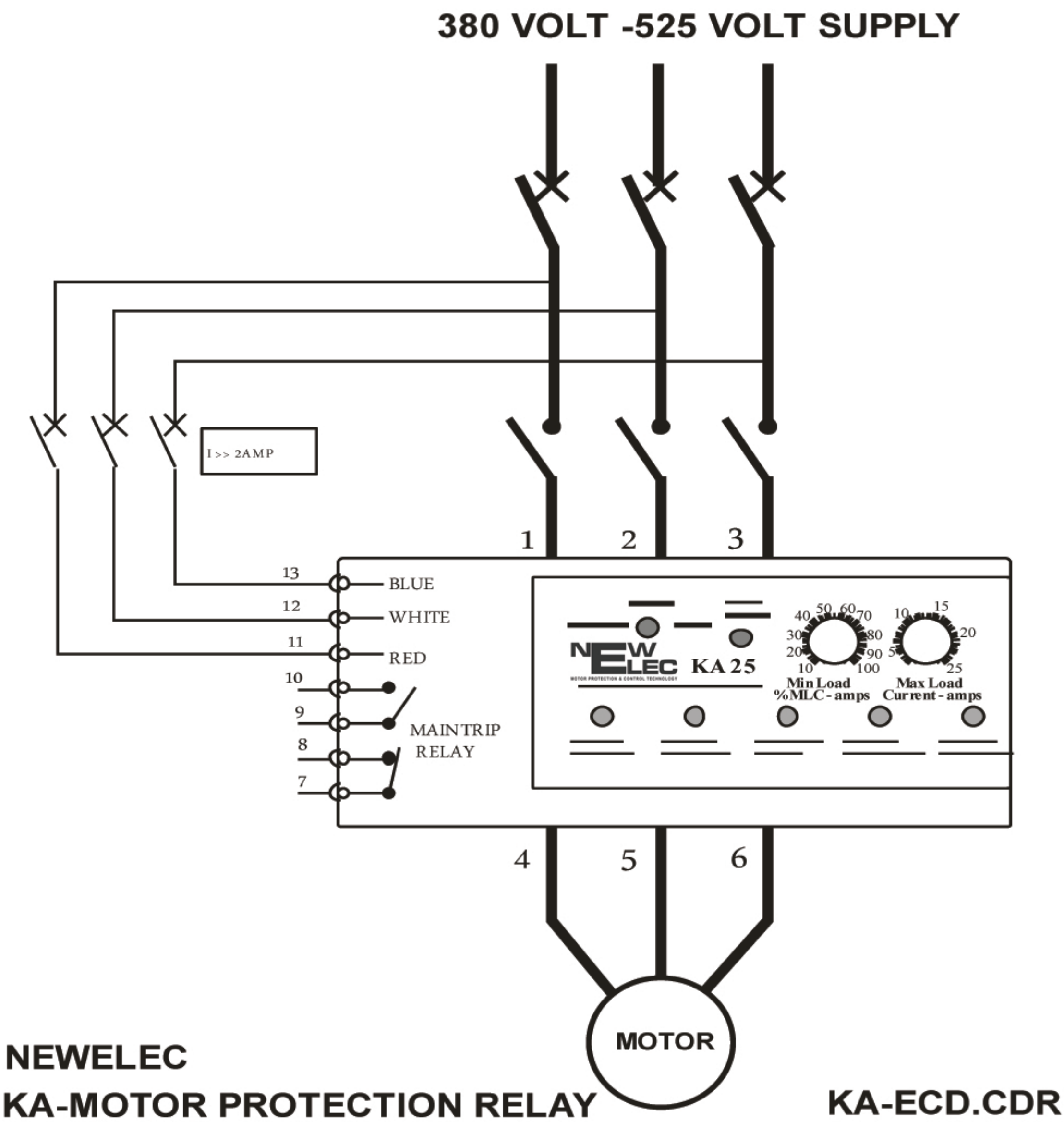
Wiring Diagram



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Ordering Information

Model or relay type	Current setting range	Interposing secondary current transformer ratio where required
KA 1	0,1 to 1 Amp	Not required
KA 5	0,5 to 5 Amp	Not required
KA 10	1 to 10 Amp	Not required
KA 25	2,5 to 25 Amp	Not required
KA 50	5 to 50 Amp	50:5 Class 12,5 VA
KA 100	10 to 100 Amp	100:5 Class 12,5 VA
KA 200	25 to 200 Amp	200:5 Class 12,5 VA

Example 1
Protection for 3kW 380V three-phase motor
Motor full load = 6,5A
Suggestion: KA10 / 380V

Example 2
Protection for 132kW 525V 4-pole, three-phase motor
Motor full load = 175A
Suggestion: KA200 / 525 / 200:5

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