Functioning Principles of Electronic Controls XT IEC Contactors from 18A to 150A DC Control

Technical Data

May 2005
New Information

Application Description

Electronics control the actuation of the DC coils of XTCE018C through XTCE150G contactors to ensure that the optimum magnetic and mechanical parameters are applied across a wide voltage range. This is intended to avoid the general disadvantages of DC operated contactors such as:

- Minimal voltage range
- Random switch-on point
- High switch-on and constant power consumption
- Physically larger in depth
- External suppression required

A functional block diagram of the electronic control is shown in **Figure 1**.

Operation

An input suppressor circuit protects the control electronics from voltage transient interference on the mains. Reverse polarity protection is also provided. The turn-on process is initiated when the control voltage reaches the level necessary to assure a safe turn-on. Only then, will the timer activate the turn-on driver. The electronically controlled turn-on threshold reliably prevents the drive “flutter” created by the supply voltage being too low.

During the turn-on process the voltage applied to the coil is kept constant by a closed-loop regulator circuit. This not only improves the input voltage range compared to classic drive circuits, but provides a constant turn-on dynamic across the entire voltage range. It leads to constant pick-up times, to a reduction in mechanical loading and contact bounce, and consequently, to an increase in the electrical and mechanical life.

The turn-on process ends when the timer turns off the driver. At this point, power to the coil is assumed by a DC/DC converter circuit that supplies a constant voltage equal to 10% of the rated voltage. The converter is a power-saving switch-mode regulator with an input filter to suppress harmonic effects on the supply. The filter is designed to meet EN 55011 Class B radio interference requirements in all operating situations. As a result, use in public networks, as well as in domestic applications and bridges on ships, is possible without any limitations.

The output voltage of the DC/DC converter is coupled to the coil as the holding voltage in the freewheel circuit. It is rated to ensure higher mechanical shock resistance than classic drive circuits even though the holding power is very low. Due to the constant output voltage of the switch-mode regulator, the full mechanical shock resistance is retained even with the reduction of the supply down to the turn-off point.

A separate circuit detects the turn-off point when the input voltage drops to about 30% of rated voltage. Brief voltage dips, lasting up to half of a line cycle, do not lead to the shutdown of the contactor.

When the turn-off threshold is crossed, the circuit activates a freewheeling diode with a voltage drop designed for optimum coil turn-off. This makes the turn-off time of the contactor very consistent and fully independent of external circuitry. Turn-off has no harmonic effect on the input voltage and therefore an external suppressor is not required. All standards concerning EMC behavior of electronic components are met.

Benefits

The use of an electronic control has the following advantages:

- Larger rated voltage range
- Extended supply voltage tolerance band
- Defined switch-on point (no “flutter” with undervoltage)
- Reduction of the switch-on power
- Constant switch-on times
- Constant switch-on dynamics (mechanical/electrical lifespan)
- Very low holding power (about 5 to 10% of conventional drives)
- Defined low switch-off point
- Full shock resistance to the switch off point
- Constant switch-off times
- No harmonic effects on the supply
- No external suppressor required
- Same construction size for DC and AC operated contactors

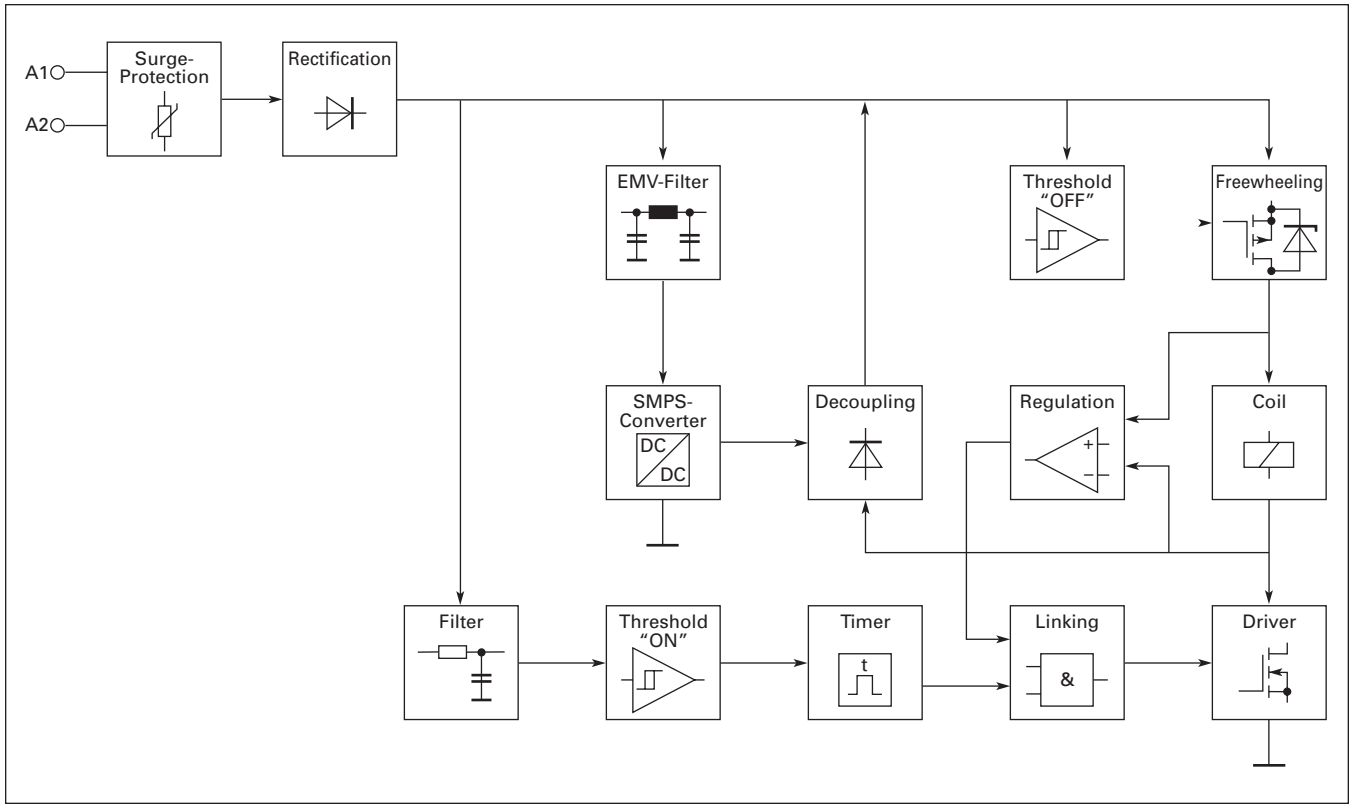

Figure 1. Diagram XTCE018C to XTCE150G — DC

Eaton Electrical Inc.
1000 Cherrington Parkway
Moon Township, PA 15108-4312
USA
tel: 1-800-525-2000
www.EatonElectrical.com

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