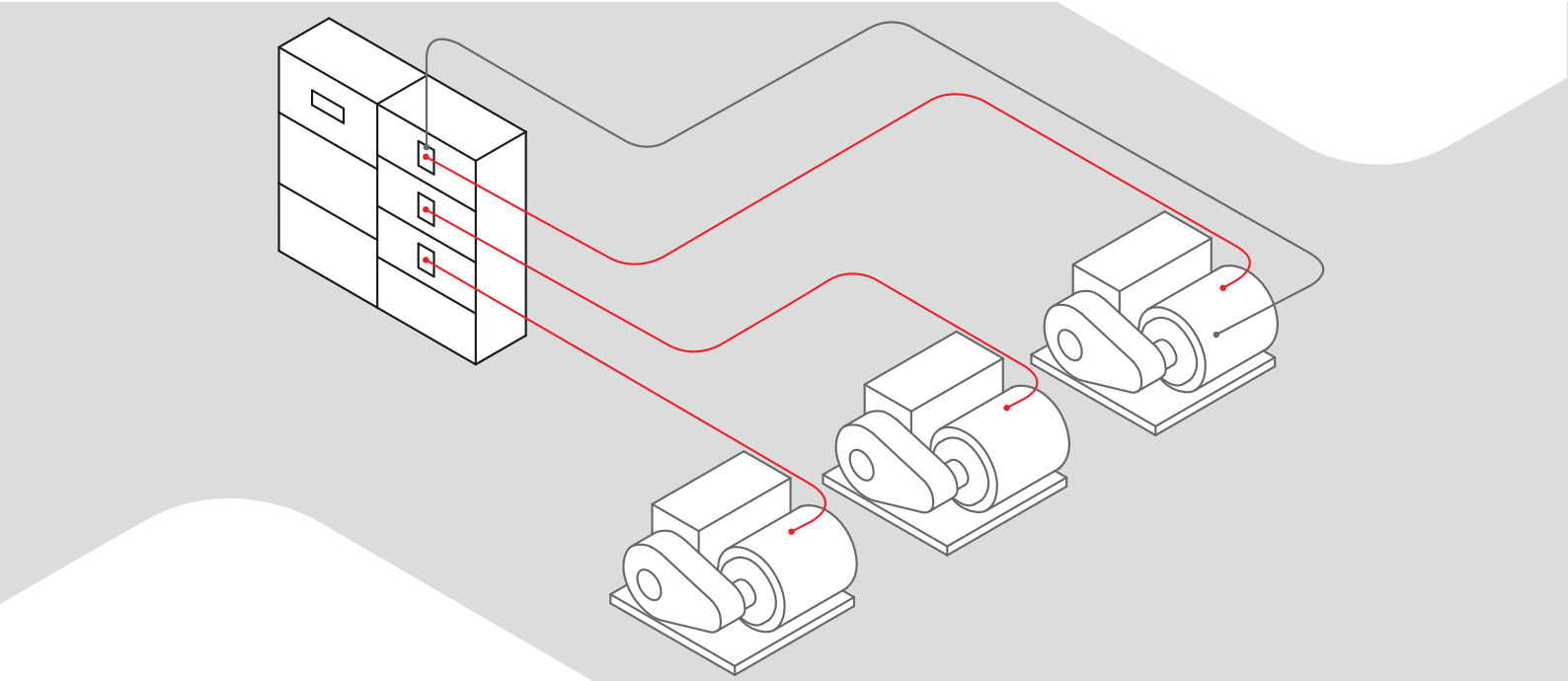
SAFETY AND RELIABILITY

# Motor Protection



‘Starting’, ‘Switching’ and ‘Protecting’ are main three concerns when designing systems with three-phase asynchronous motor.

Motors are most used machines in industrial environment, they consume the biggest amount of power in an electrical plant.
Hence why reduction in power consumption can be an area of interest both in operational aspect and improving power efficiency.
Such reduction can be achieved using variable-speed drives with inverters, implementing power factor correction to avoid penalities by supply authorities or perhaps implementing high-efficiency motors.
Either way, in such operation, safety and reliability of any solution is paramount and it must be carefully considered during design stage when choosing how to manage motor starting and its protection.
Overloads may cause overtemperatures which could result in irreversible damages to motors or its surround facilities.

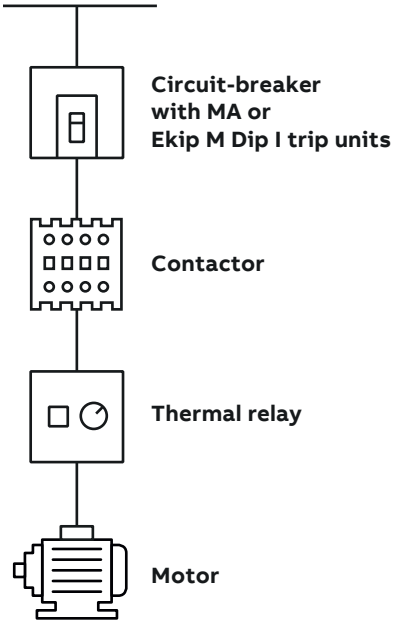
Fire hazards, while start-up can be a critical phase for the motor itself. In particular, even steady-state operation needs to be adequately monitored and protected to deal with any faults that may occur.
IEC 60947-4-1 Standard ‘Electromechanical contactors and motor-starters’ defines type of devices that can be used and what factors must be considered in avoiding aforementioned issues

- Electrical specifications of the motor (type, power rating, efficiency, cos phi)
- Starting type and diagram
- Fault current and voltage in sections of network where motor is installed.

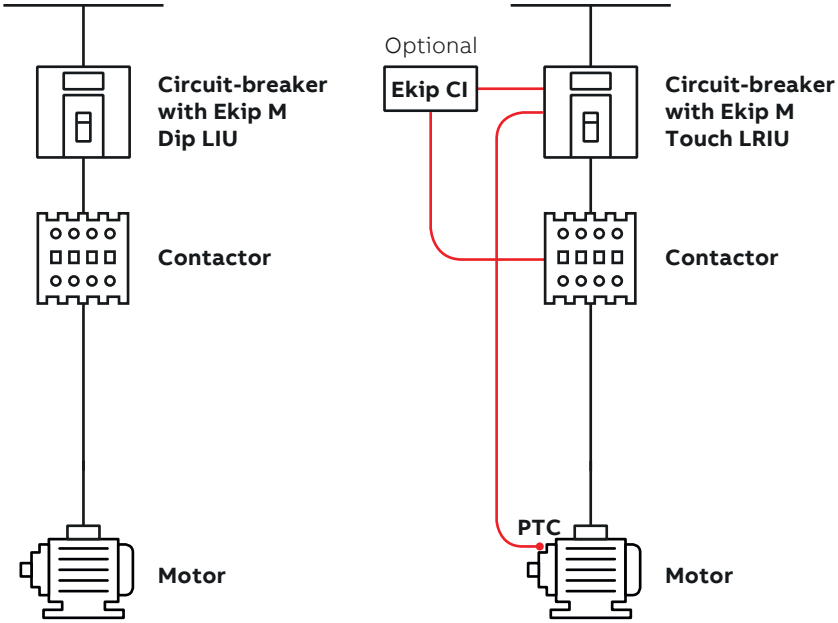
Circuit breakers and operating devices can be easily selected through the coordination tables a tool provided by ABB (see QR Code on the last page).
When it comes to direct starting, ABB offers different solutions thanks to the new M series trip units:

- Thermal magnetic MA
- Ekip M Dip I
- Ekip M Dip LIU
- Ekip M Touch LRIU

## Traditional system




## Advanced protection systems




The following are few of the solutions that can be provided with circuit breaker for short-circuit protection, a thermal relay for overload protection and a contactor for motor switching.

**Thermal magnetic MA**
Available up to 630A, it implements exclusively the protection against short-circuit. With the possibility to set adjustable thresholds higher than the standard power distribution version, it stands out for compactness and exceptional performances in terms of breaking capacity and limitation of the specific let-though energy. They can be used in a wide start-up range, up to 250kW at 400V.

**Ekip M Dip I**
Available for the Tmax XT molded case circuit breakers range of up to 1600A, it represents the first level of electronic trip unit that guarantees a finest adjustment of the thresholds and immunity to the room temperature in comparison with MA trip units. It allows selection of most suitable tripping values for any type of motor for rated current up to 1250A and 560kW at 400V.

Compared to the traditional system, these advanced solutions integrate additional protection functions. ABB supplies two different solutions with different performances.

**Ekip M Dip LIU**
This electronic trip unit available up to 800A, in addition to the previous solution with short-circuit protection only, includes overload protection so that a thermal relay is not needed. The overload protection is in accordance with the indications and classes defined by IEC 60947-4-1 Standard.
Moreover, thanks to Unbalance protection, also the phase loss of the system is monitored in order to promptly protect the motor against phase loss and unbalance.

**Ekip M Touch LRIU**
It allows a large number of specific protections, thus ensuring high trip accuracy and extremely reliable operations, while granting a complete motor protection fully integrated into the circuit breaker.
This solution is even able to interact directly with the contactor and gives the chance to be connected to a PTC sensor to monitor the temperature of the motor and to open the contactor in case of overtemperature.

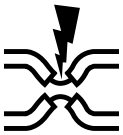
## Ekip M Touch LRIU is the best solution

Ekip M Touch LRIU provides additional protection functions:

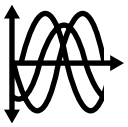
**Overload protection**, with thresholds complying with IEC 60947-4-1 and relevant Annex 2.
The tripping time is defined by choosing the appropriate trip class. Moreover, with the thermal memory function always active, the unit trips in a shorter time than the time set for a cold fault condition whenever a new overload occurs before the thermal memory automatically resets.

**Rotor blockage protection**, which ensures the operating conditions defined by IEC 60947-4-1 Annex 2.

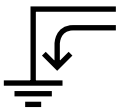
- The ‘Jam’ condition to protect the motor against rotor jamming during normal operation to ensure the start-up phase to be properly performed.
- The ‘Stall’ condition to protect and operate the motor against rotor jamming upon start-up.



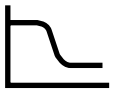
**Short-circuit protection**, which guarantees an immediate trip when a short-circuit occurs, thus ensuring the correct start-up in the presence of high current values flowing for some milliseconds.



**Phase unbalance protection**, which acts against unbalances among the currents circulating in the phases.



**Earth fault protection**, which trips in case of faults between the phases and the earthing conductor.

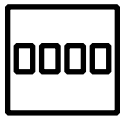


**Undercurrent protection**, which avoids damages to the motor under conditions of reduced or null load.

## Introducing the new ‘Ekip CI’ module...

Ekip M Touch LRIU provides additional protection functions:

**PTC connection**: with thresholds complying with IEC 60947-8, A PTC (PT100) sensor can be connected to the trip unit. When temperature exceed a set threshold, trip unit opens the circuit breaker.



**Interface to the contacto**r: motor protection can be optimized by using both contactor and circuit-breaker simultaneously.
In case of fault, instead of opening the circuit breaker, trip unit commands contactor, which can guarantee a higher number of switching operation consistently rather than a circuit-breaker (Approx 1 million).

## Communication, Connectivity and measurement with Ekip M Touch LRIU

Ekip M Touch LRIU enables connectivity through several communication protocols, in addition, connectivity to EDCS - ABB AbilityTM Electrical Distribution Control System, anytime, anywhere.

Ekip M Touch LRIU allows high accuracy of measurenet of the main parameters ssuch as current, voltage, energy, power, power factor, etc.

## Bill of Material for advanced protection functions system with Ekip M Touch LRIU


**Ekip M Touch trip units**
A new generation of protection trip units easy to program and read.

**Ekip CI**
This module interacts with
contactor, and allows PTC sensor connection.

**Ekip Supply**
An auxiliary power supply module.

**Ekip Cartridge**
Accommodate external modules and connect them to the trip unit.

**For more details**
Coordination tables

**ABB Australia Pty Limited**
For enquiries
Phone: 1800 60 20 20
E-mail: AU-EP-Sales@abb.com

**www.abbaustralia.com.au**



9AKK107680A7352 – 2020.06